APPENDIX C

Conceptual Site Plan prepared by CHS Engineer, LLC. Dated 11-14

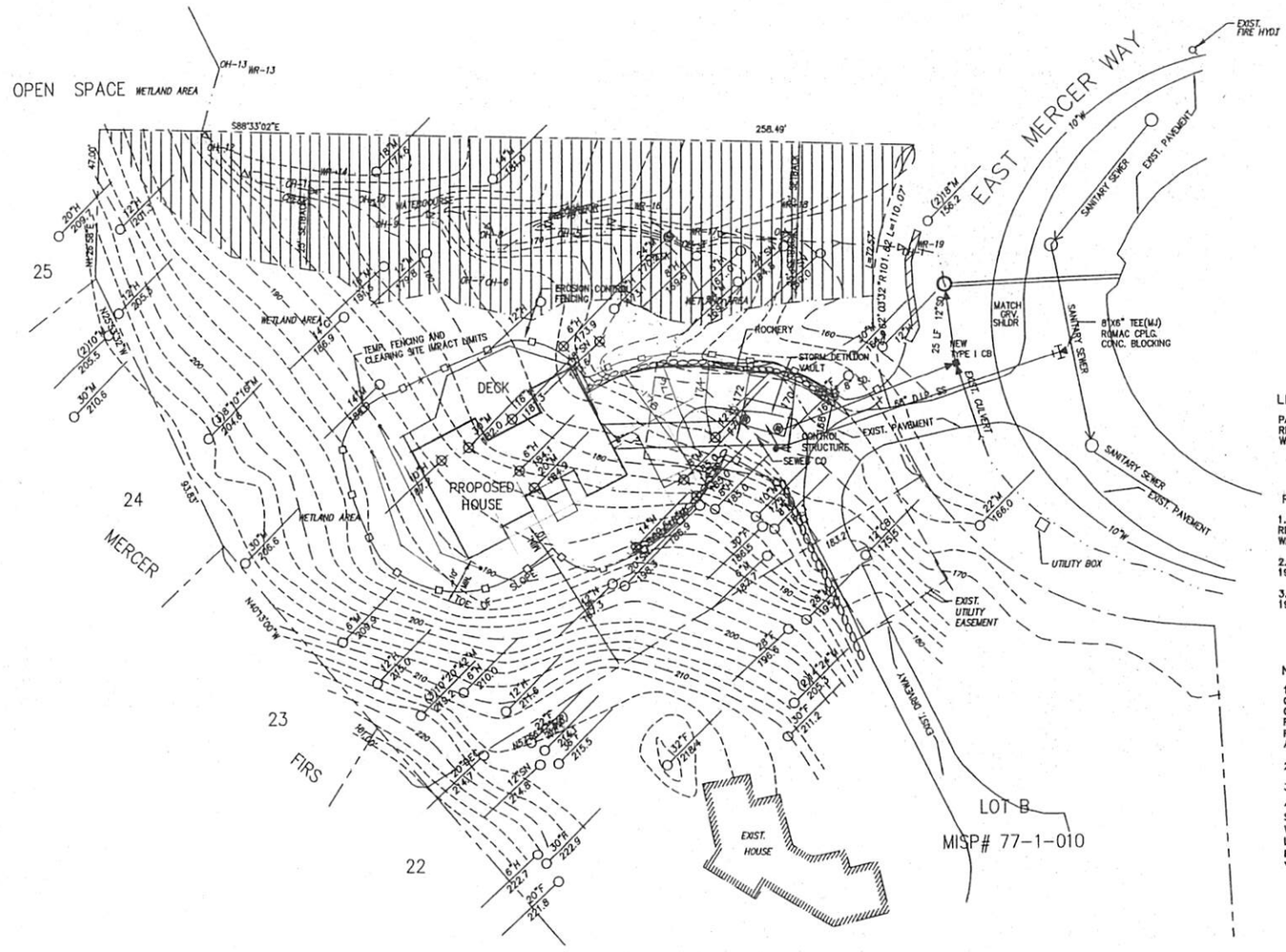
5637 Mercer Way – Revised Critical Areas Report by Sewall Wetland Consulting, Inc., dated March 5, 2015

Geotechnical Engineering Study Proposed Residence by GEO Group Northwest, Inc., dated March 12, 2015

Parkwood Trail and Subbasin 45B Watercourse Stabilization Project (WD 526C)

WWHM Modeling Output for Conceptual Detention Sizing

A PORTION OF GOVERMENT LOT 3, OF SECTION 19, TOWNSHIP 24 NORTH, RANGE 5 EAST, W.M., KING COUNTY, WASHINGTON



SCALE IN FEET

SCALE 1" = 20'

BASIS OF BEARING:

WASHINGTON STATE PLANE COORDINATE SYSTEM (NORTH ZONE, NAD 83/91)

VERTICAL DATUM: NAVD 88

CONTOUR INTERVAL = 2'

LEGAL DESCRIPTION:

PARCEL A OF GREG NEWITT SHORT PLAT MISP NO. 77-1-010, AS RECORDED UNDER RECORDING NUMBER 197703310851, RECORDS OF KING COUNTY, STATE OF WASHINGTON.

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3. PARKWOOD RIDGE IN VOLUME 76 OF PLATS, PAGE 81, UNDER FILE NUMBER 196410275804212.

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SITE PLAN

SHEET #1

01-08-15

BOUNDARY / TOPOGRAPHIC SURVEY

No. Date By Ckd Revision

CHS ENGINEERS, LLC
12507 BEL-RED ROAD SUITE 101
BELLEVUE, WA 98005-2500
TEL (425) 637-3600 - FAX (425) 637-3604
www.chsengineers.com

Drawn / Date JPC 11-14 | Designed / Date | Checked / Date

SUMMERS DEVELOPMENT

6637 EAST MERCER WAY
MERCER ISLAND, WA

Scales: Horiz. 1"=20' Vert. ____

Sheet 1 Of 1

Job No. 601411

Sewall Wetland Consulting, Inc.
PO Box 880
Fall City, WA 98024
Phone: 253-859-0515

March 5, 2015

Bill Summers
PO Box 261
Medina, WA 98039

RE: 5637 Mercer Way – *Revised* Critical Areas Report
SWC Job#14-207

1.0 INTRODUCTION

This report describes our observations of any jurisdictional wetlands, streams and buffers on or within 200' of the proposed single family home located at 5637 East Mercer Way in the City of Mercer Island, Washington (the "site").

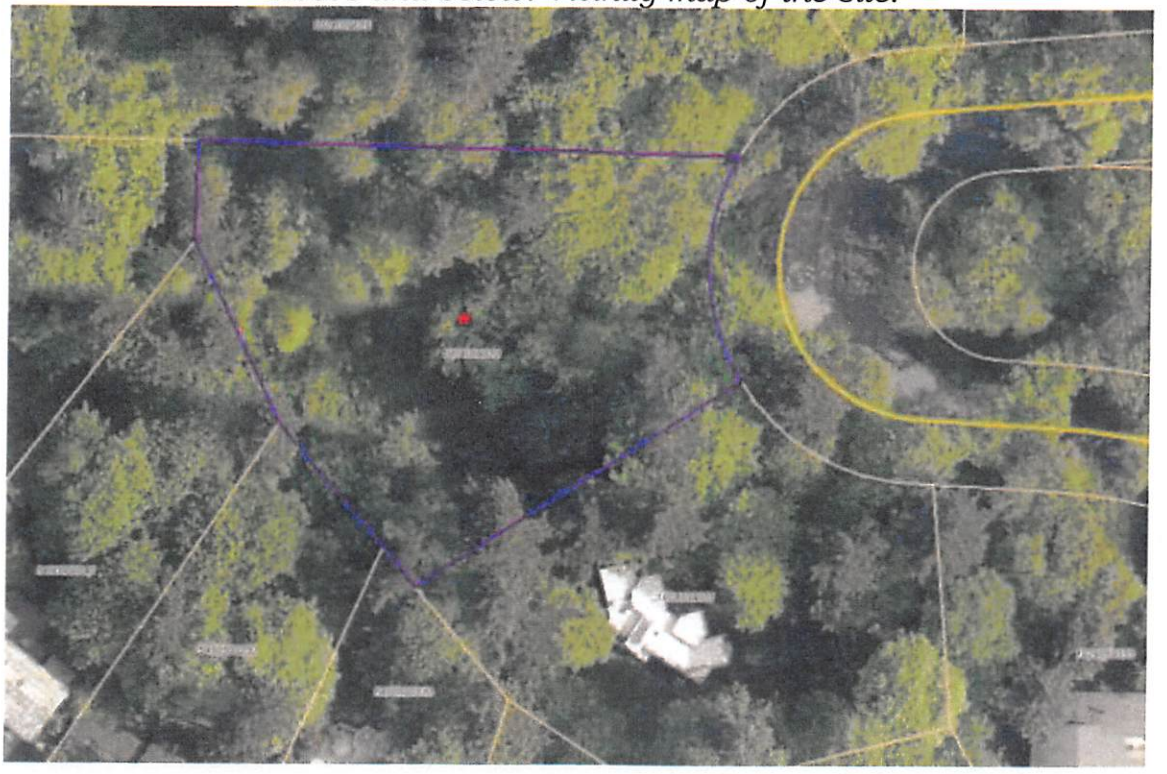
The site is an irregular shaped 0.88 acre parcel (Parcel #192405-0312) consisting of an east sloping site located within the SE ¼ of Section 19 Township 24 North, Range 5 East of the W.M.

METHODOLOGY

Ed Sewall of Sewall Wetland Consulting, Inc. inspected the site November 6, 2014. The site was reviewed using delineation methodology described in the *Corps of Engineers Wetlands Delineation Manual* (Environmental Laboratory, 1987), and the *Western Mountains, Valleys and Coast region Supplement* (Version 2.0) dated June 24, 2010, as required by the US Army Corps of Engineers.

Wetland Ratings were determined using the *Washington State Wetlands Rating System for Western Washington* Publication #04-06-025 dated August 2004 as well as the associated rating forms revised in 2006 & 2008.

Above and below: Vicinity map of the site.



Soil colors were identified using the 1990 Edited and Revised Edition of the ***Munsell Soil Color Charts*** (Kollmorgen Instruments Corp. 1990).

The *Washington State Wetlands Identification and Delineation Manual* and the *Corps of Engineers Wetlands Delineation Manual/Regional Supplement* all require the use of the three-parameter approach in identifying and delineating wetlands. A wetland should support a predominance of hydrophytic vegetation, have hydric soils and display wetland hydrology. To be considered hydrophytic vegetation, over 50% of the dominant species in an area must have an indicator status of facultative (FAC), facultative wetland (FACW), or obligate wetland (OBL), according to the National List of Plant Species That Occur in Wetlands: Northwest (Region 9) (Reed, 1988). A hydric soil is "a soil that is saturated, flooded, or ponded long enough during the growing season to develop anaerobic conditions in the upper part". Anaerobic conditions are indicated in the field by soils with low chromas (2 or less), as determined by using the Munsell Soil Color Charts; iron oxide mottles; hydrogen sulfide odor and other indicators. Generally, wetland hydrology is defined by inundation or saturation to the surface for a consecutive period of 12.5% or greater of the growing season. Areas that contain indicators of wetland hydrology between 5%-12.5% of the growing season may or may not be wetlands depending upon other indicators. Field indicators include visual observation of soil inundation, saturation, oxidized rhizospheres, water marks on trees or other fixed objects, drift lines, etc. Under normal circumstances, indicators of all three parameters will be present in wetland areas.

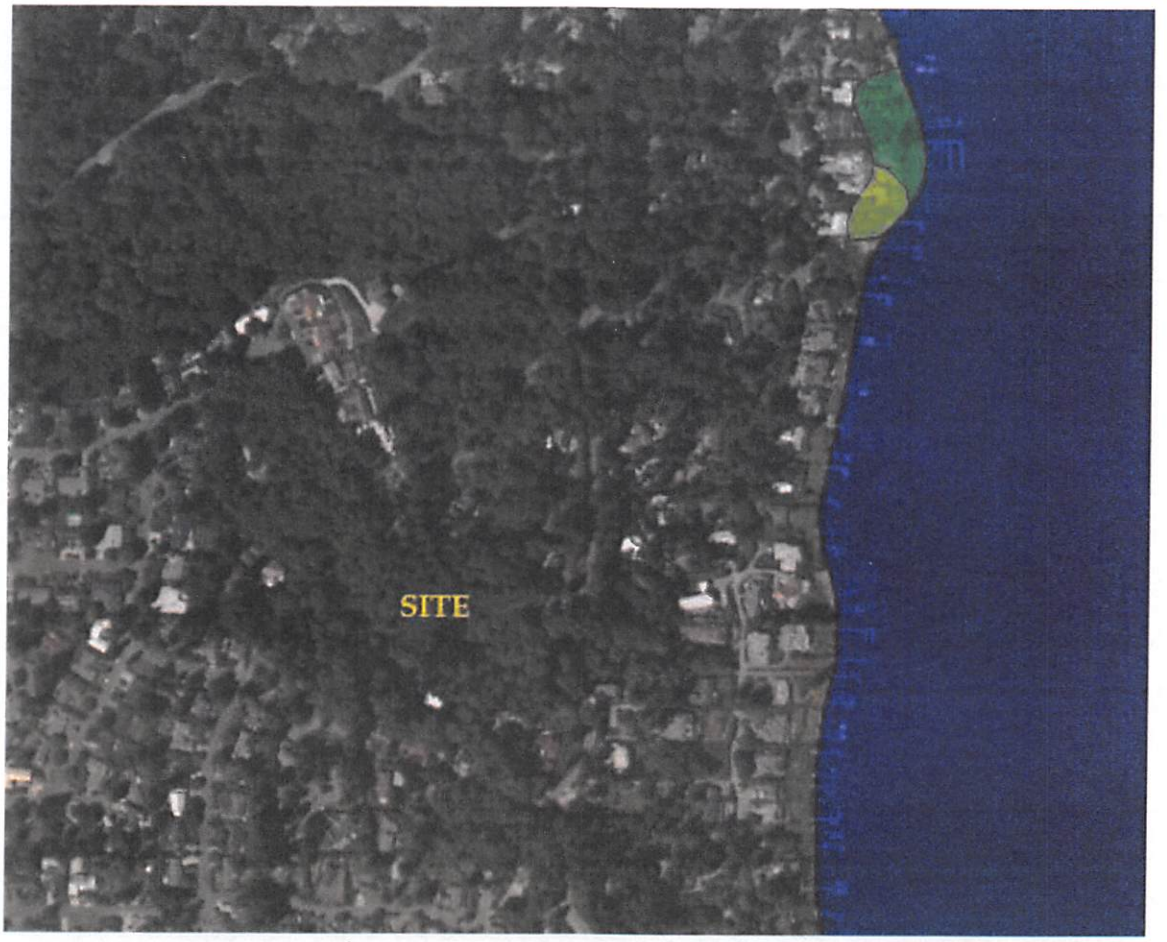
OBSERVATIONS

Existing Site Documentation.

Prior to visiting the site, a review of several natural resource inventory maps was conducted. Resources reviewed included the National Wetland Inventory Map and the NRCS Soil Survey online mapping and Data and the King County iMap website with wetland and stream layers activated.

National Wetlands Inventory (NWI)

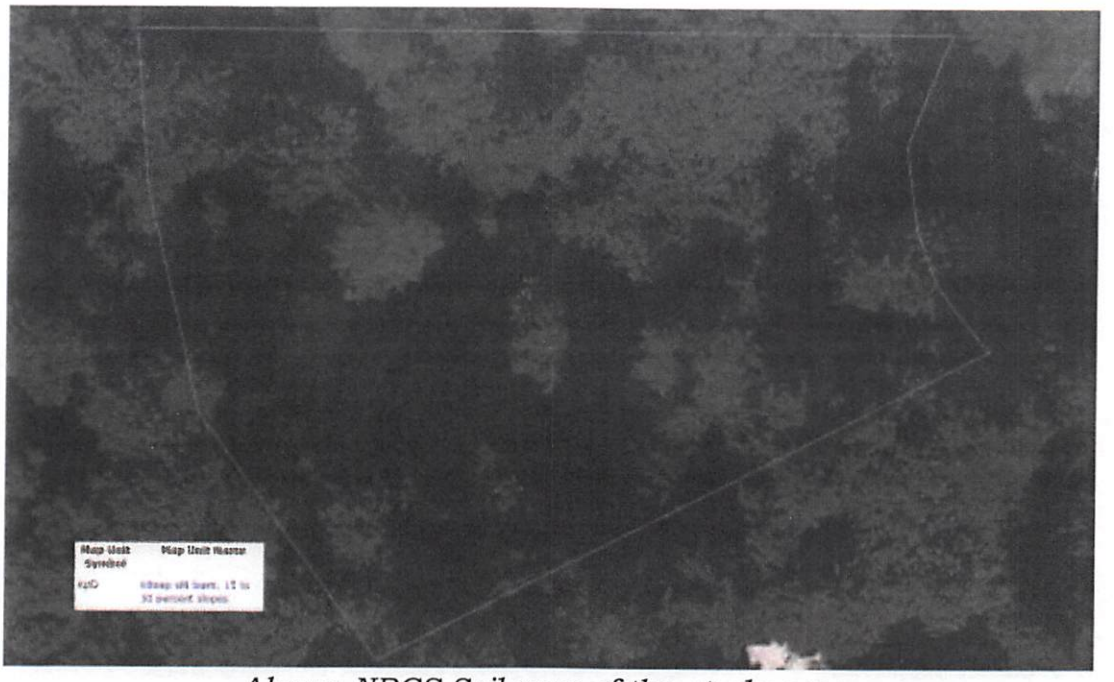
There are no wetlands mapped on or near the site on the NWI mapping for area of the site.



Above: NWI Map of the study area

Soil Survey

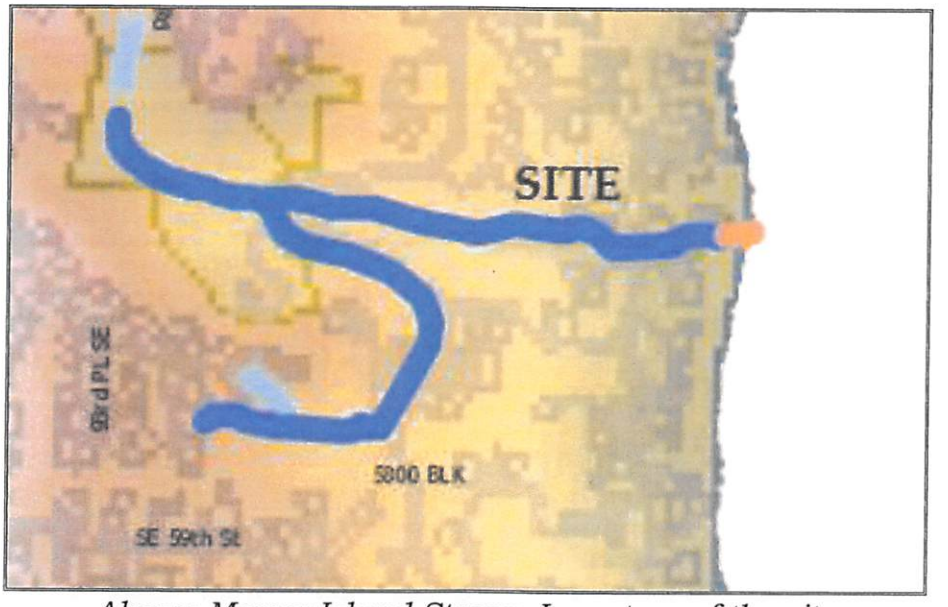
According to data on file with the NRCS Soil Survey, the site as mapped as Kitsap silt loam 15%-30% slopes. Kitsap soils are a moderately well-drained soils formed in lacustrine deposits. Kitsap soils are not considered "hydric" soils according to the publication Hydric Soils of the United States (USDA NTCHS Pub No.1491, 1991).



Above: NRCS Soil map of the study area.

City of Mercer Island Water Inventoried Watercourses

The City of Mercer Island stream inventory shows a perennial flowing non-fish bearing stream also known as a Type 2 watercourse with a 50' buffer.



Above: Mercer Island Stream Inventory of the site

Field observations

The site consists of a bowl shaped parcel sloping to the east with a stream and associated slope type wetlands associated with the stream. The site is generally forested, although a quarry spall driveway accesses the site off an existing paved driveway which passes through the site.

The site has steep slopes to the south as well as an undulating topography in the vicinity of the stream. The site is covered by a mix of red alder, western hemlock and some big leaf maple. Understory species include sword fern, red huckleberry, salmonberry and some stinging nettle.

Soil pits excavated in the upland portion of the site were found to have dry, gravelly loam soils with soil colors of 10YR 3/3-3/4. Soils were found to be dry within the upper 16" during our wet season observations.

Wetlands

As previously mentioned, a slope type wetland covers most of the site outside the steep slopes. Below is a description of these wetlands;

Wetland A

Wetland A consists of a forested slope type wetland that covers most of the site. This wetland was previously flagged by Wetland resources in 2004 and the delineation was found to still be accurate.

This slope-type wetland is vegetated with a mix of red alder, salmonberry, lady fern, skunk cabbage and some creeping buttercup. red-osier dogwood and lady fern.

Soil pits excavated within the wetland revealed a silt loam with a soil color of 2.5Y 2.5/1 with few, fine faint redoximorphic concentrations. Soils within the wetland were saturated at the surface during our wet season observation period.

Using the US Fish and Wildlife Wetland Classification Method (Cowardin et al. 1979), this wetland contains areas that would be classified as PFO1C.

Using the WADOE Wetland Rating system and rating the wetland as a depressional wetland, this wetland scored a total of 34 points with 18 for habitat. This indicates a Category III wetland. According to City of Mercer Island Municipal Code (MIMC) Chapter 19.07.080.C.1, Category III wetlands have a 50' standard buffer.

Stream A

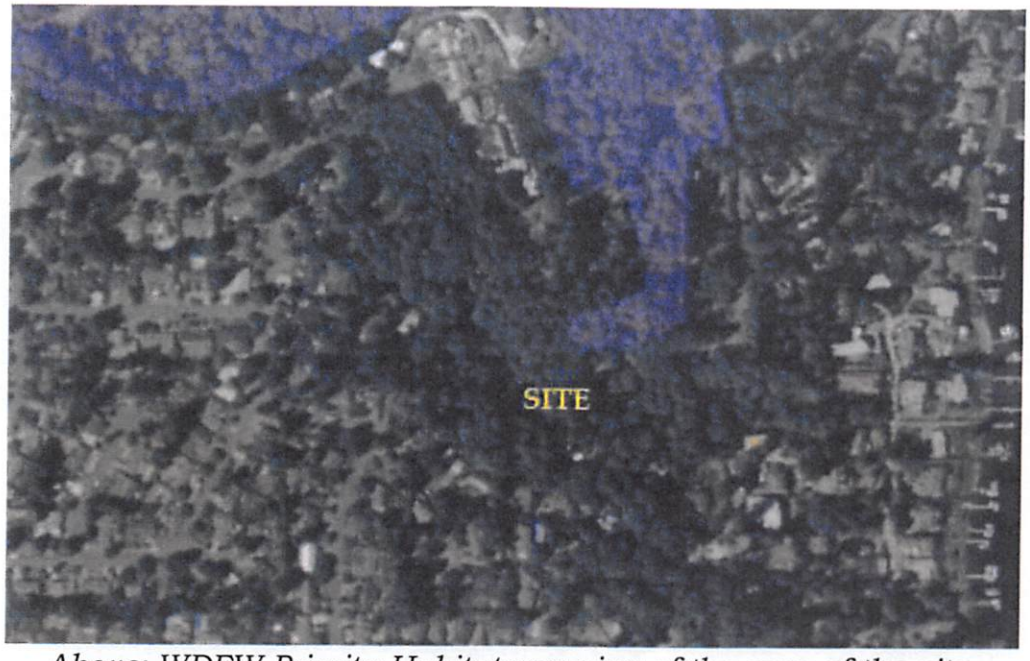
As previously mentioned, a small perennial stream flows easterly along the north side of the site. This stream originates in seeps from the bordering slope wetlands and flows somewhat steeply to the east where it cascades over a bank into a catch basin and then a culvert under Mercer Way. The stream flows in a 100' long culvert which is a barrier to any fish migration up through the culvert. As a result, this small channel has been mapped as the City as a Type 2 watercourse. Based upon MIMC Chapter 19.07.070.B.1, Type 2 watercourses have a 50' standard buffer.

Wildlife Habitat Conservation Areas

A review of the site revealed no state or federally listed species on or near the site. A review of the Washington State Department of Fish and Wildlife Priority Mapping system was conducted for the site. This mapping identifies state listed species as well as areas considered by WDFW to be "priority habitats". The mapping of the area of the site revealed no listed state or federal species utilizing the site. It does show and area to the north of the site as part of a "biodiversity corridor" (*purple shading*), which is a densely forested area with some steep slopes.

Functions and Values

Wetland A is a forested wetland and as such provides habitat to numerous species that tolerate being within close proximity to humans. The wetland main function is as a groundwater discharge point, which allows groundwater to reach the surface and provide hydrological sup[prt to the Type 2 watercourse passing through the site.



Above: WDFW Priority Habitat mapping of the area of the site.

PROPOSED PROJECT

The proposed project is the construction of a single family residence as current zoning allows. As previously described, the site is highly encumbered by critical areas including a stream, associated wetland, buffers and steep slopes. There is no part of the site located outside of these critical areas. As a result, in order to build a home on this site the application of MIMC Chapter 19.07.030.B "*Allowed alterations and reasonable use exception*" must be utilized. As described in this section of Code;

B. Reasonable Use Exception.

1. Application Process. If the application of these regulations deny reasonable use of a subject property, a property owner may apply to the hearing examiner for a reasonable use exception pursuant to permit review, public notice and appeal procedures set forth in Chapter 19.15 MICC.

2. Studies Required. An application for a reasonable use exception shall include a critical area study and any other related project documents, such

as permit applications to other agencies, and environmental documents prepared pursuant to the State Environmental Policy Act.

3. Criteria. The hearing examiner will approve the application if it satisfies all of the following criteria:

a. The application of these regulations deny any reasonable use of the property. The hearing examiner will consider the amount and percentage of lost economic value to the property owner;

The application of the standard regulations regarding wetlands, streams, steep slopes and buffers would not allow construction of a home on the site. The only feasible location to build a home will impact some wetland and buffer.

b. No other reasonable use of the property has less impact on critical areas. The hearing examiner may consider alternative reasonable uses in considering the application;

The site is zoned for a single family home use and there is no other alternative reasonable use of the site.

c. Any alteration to critical areas is the minimum necessary to allow for reasonable use of the property;

The following mitigation sequencing was conducted to determine the most appropriate impacts and mitigation;

This sequencing requires addressing the following criteria;

a. Avoid any disturbances to the wetland or buffer;

The entire site is wetland and buffer. There is no way to develop the site under any reasonable scenario without impacting both wetlands and buffers.

b. Minimize any wetland or buffer impacts;

In order to minimize impacts, the site plan has been designed to utilize the existing driveway access point and has pushed the reasonable size

home foot print as far away from the stream as is possible. The site plan also utilizes pin piles, which are not considered wetland fill, to minimize actual wetland impact. Buffer impacts have been minimized by having no lawn or landscaped areas, and having just the bare essentials, being the driveway and the home structure itself.

c. Restore any wetlands or buffer impacted or lost temporarily; and

This is not possible as the construction of a home is a permanent impact.

d. Compensate for any permanent wetland or buffer impacts by one of the following methods:

i. Restoring a former wetland and provide buffers at a site once exhibiting wetland characteristics to compensate for wetlands lost;

This is not possible as there are no "former" wetlands on the site.

ii. Creating new wetlands and buffers for those lost; and

This is not possible as there is no room to create new wetlands, or buffers on the site.

iii. Enhancing wetlands that have reduced function;

The wetlands on-site are proposed to be enhanced with an under planting of native conifers as well as the removal of weedy species and old trash and abandoned pipes in the wetland and stream. This will restore a conifer dominated component to this wetland and buffer area as well as remove exotic blackberry and English ivy from these critical areas. The addition of a conifer component will restore this wetland to a probable historic condition of being dominated by conifers. Currently the wetland is vegetated primarily with broadleaf species such as red alder which are early successional species. Conifers will provide denser cover and improved habitat for wildlife, as well as more shade to the site keeping surface waters cooler, which ultimately benefit fish species in the receiving water of the Type 2 watercourse.

Other factors to consider in this Reasonable Use review are;

1. Although zoned to permit two single family residences, only one is

proposed.

2. The square footage of the proposed residence is only 2,200 square feet (approx.), which is 51% of the 4,300 square foot average size of a new single family residence built on Mercer Island in 2013-2014 (See the attached single family permit summary attached hereto as Exhibit "A").

3. The house is sited on the most level portion of the property, outside of the applicable 50 foot watercourse buffer.

4. To further minimize the impact of the house's construction, it will be supported by a series of pin piles which both minimizes site disruption and interference with the property's natural drainage.

5. Excavation will be limited to the extent necessary to build the house and related driveway.

6. The property's impervious surfaces have been restricted to a total of Approximately 5,600 square feet, 10% of which are existing.

7. Only 15% of the lot will be covered, which represents less than 42% permitted by code.

In order to reduce impacts to the wetland, the home will be constructed on "pin piles" which are generally not considered a "fill" of wetlands. The home will be elevated above the wetland so no filling other than the driving of the piles through the soil will be needed for the home. A minor amount of fill will occur from the proposed driveway. The driveway will be located over the current location of the quarry spall driveway that exists on the site, further reducing impacts.

d. Impacts to critical areas are mitigated to the greatest extent reasonably feasible consistent with best available science;

In order to mitigate for the minimal impacts to the sites wetlands from the project, we are proposing under planting with conifers (sitka spruce and cedar) throughout the wetland in an area equal to the area of coverage by the project within the critical areas, to enhance the plant community within this wetland as well as removal of any blackberry and English ivy in the vicinity of the home. The proposed use of pin piles is the least impactive way to construct on a site like this and leaves all but

the vegetation intact within the area of the home construction, greatly reducing any loss of wetland function.

e. The proposal does not pose an unreasonable threat to the public health, safety, or welfare; and

The proposed construction of a home on the site will not impact public health or safety and will utilize the latest construction techniques to minimize impacts to critical areas.

f. The inability of the applicant to derive reasonable use of the property is not the result of actions by the applicant after the effective date of this chapter.

The ability of the owner to derive reasonable use of the property is not the result of any action at any time by the owner, and solely the fact that the site is covered by critical areas.

Stormwater

Stormwater from the new impervious surfaces on-site will be collected in a stormwater vault under the driveway and discharged to an existing culvert along the east end of the driveway. This water will then drain through the existing roadside ditch tpo the stream. This should mimic existing drainage patterns on the site.

Once approval of the proposed conceptual mitigation is received, a final detailed mitigation plan will be provided to the city for review and approval.

If you have any questions in regards to this report or need additional information, please feel free to contact me at (253) 859-0515 or at esewall@sewallwc.com .

Sincerely,
Sewall Wetland Consulting, Inc.

Ed Sewall
Senior Wetlands Ecologist PWS #212

REFERENCES

City of Mercer Island Municipal Code

Cowardin, L., V. Carter, F. Golet, and E. LaRoe. 1979. Classification of Wetlands and Deepwater Habitats of the United States. U.S. Fish and Wildlife Service, FWS/OBS-79-31, Washington, D. C.

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

Muller-Dombois, D. and H. Ellenberg. 1974. Aims and Methods of Vegetation Ecology. John Wiley & Sons, Inc. New York, New York.

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National Technical Committee for Hydric Soils. 1991. Hydric Soils of the United States. USDA Misc. Publ. No. 1491.

Reed, P., Jr. 1988. National List of Plant Species that Occur in Wetlands: Northwest (Region 9). 1988. U. S. Fish and Wildlife Service, Inland Freshwater Ecology Section, St. Petersburg, Florida.

Reed, P.B. Jr. 1993. 1993 Supplement to the list of plant species that occur in wetlands: Northwest (Region 9). USFWS supplement to Biol. Rpt. 88(26.9) May 1988.

USDA NRCS & National Technical Committee for Hydric Soils, September 1995. Field Indicators of Hydric Soils in the United States - Version 2.1

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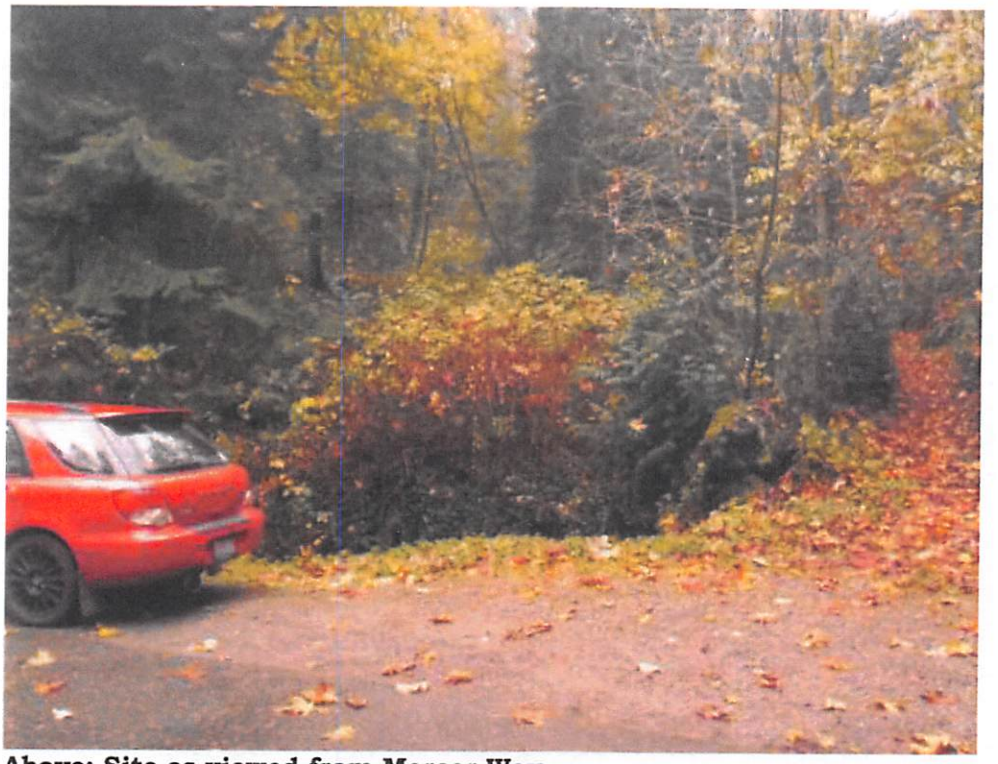
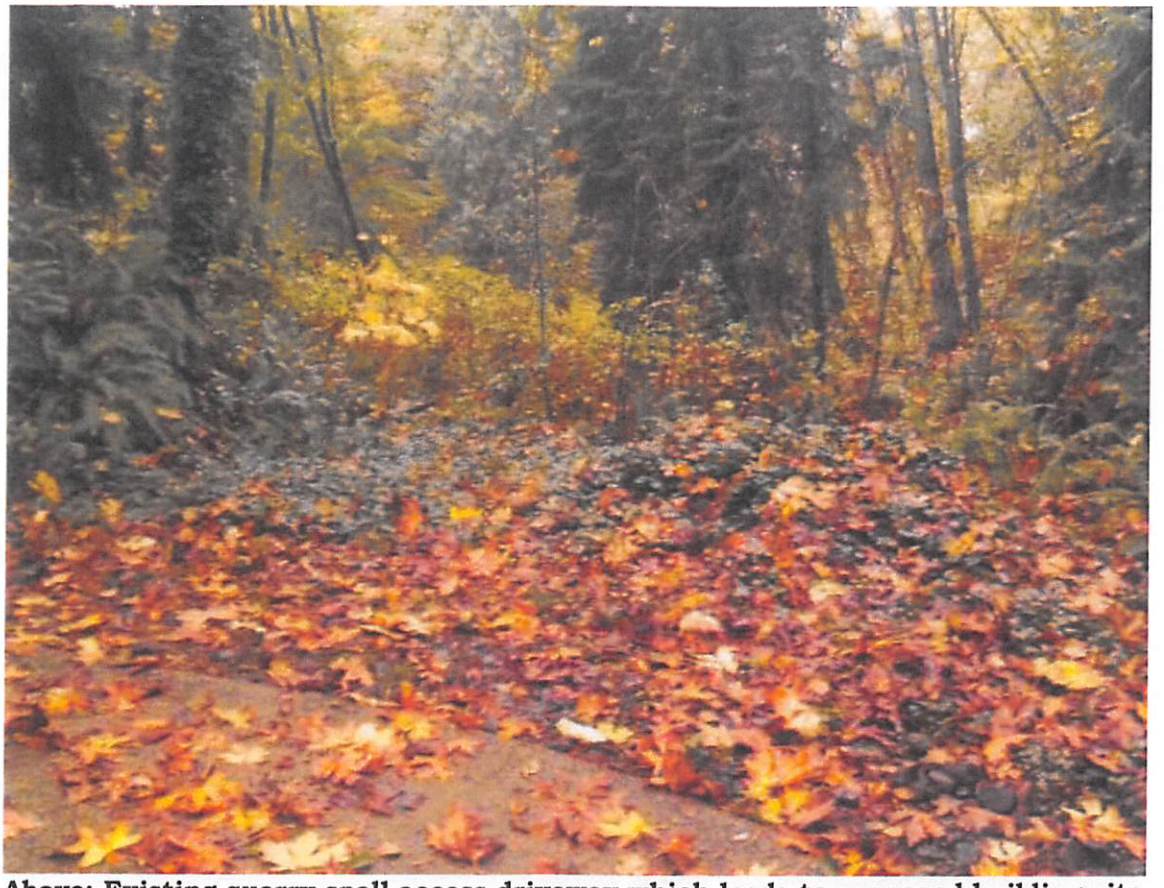


Above: Site as viewed from Mercer Way
Below: looking north across site near existing driveway entrance



Above: Existing quarry spall access driveway which leads to proposed building site

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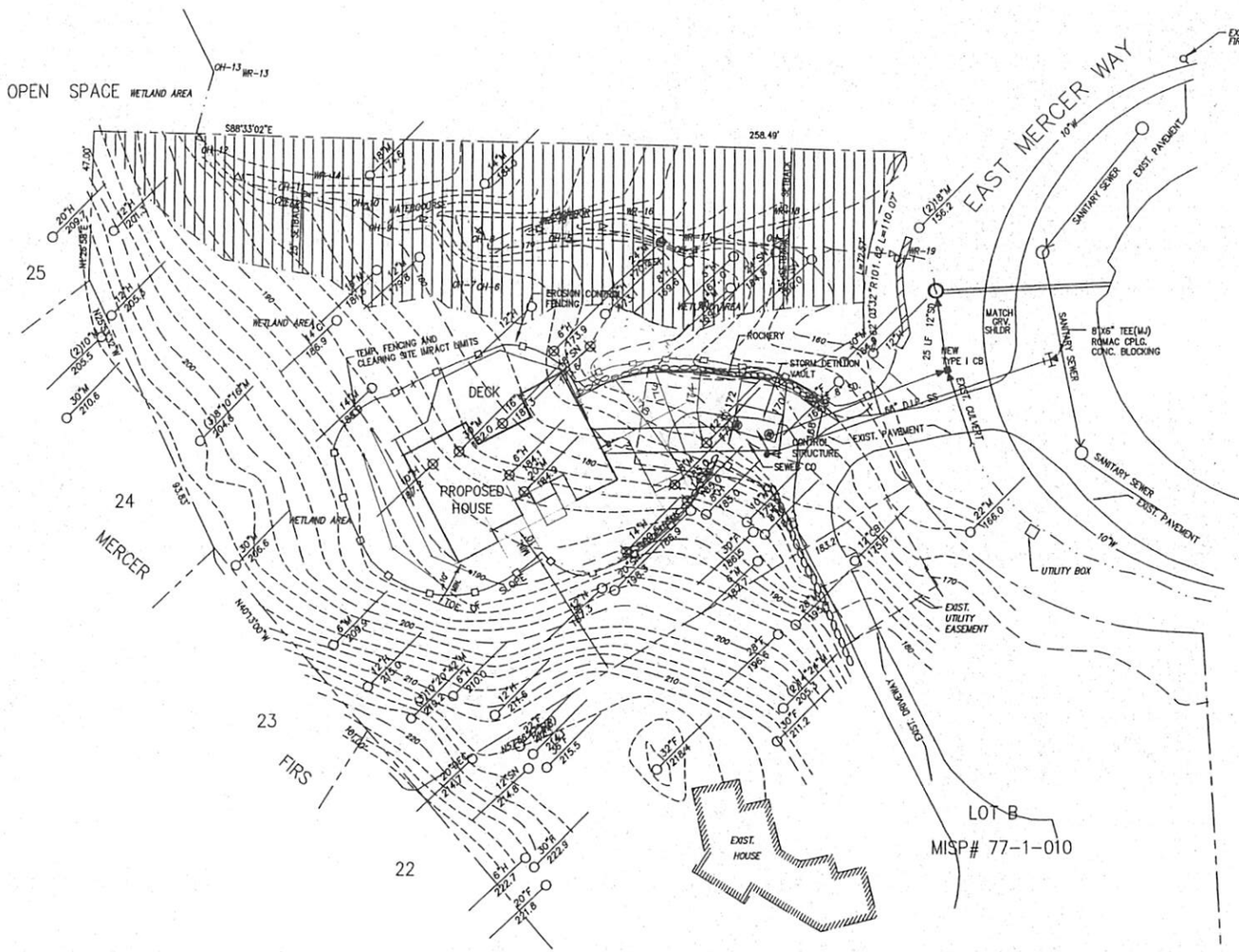

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SITE PLAN

SHEET #1

01-08-15

BOUNDARY / TOPOGRAPHIC SURVEY

No. | Date | By | Ckd | Revision

CHS ENGINEERS, LLC
12507 BEL-RED ROAD SUITE 101
BELLEVUE, WA 98005-2500
TEL (425) 637-3893 - FAX (425) 637-3894
www.chsengineers.com

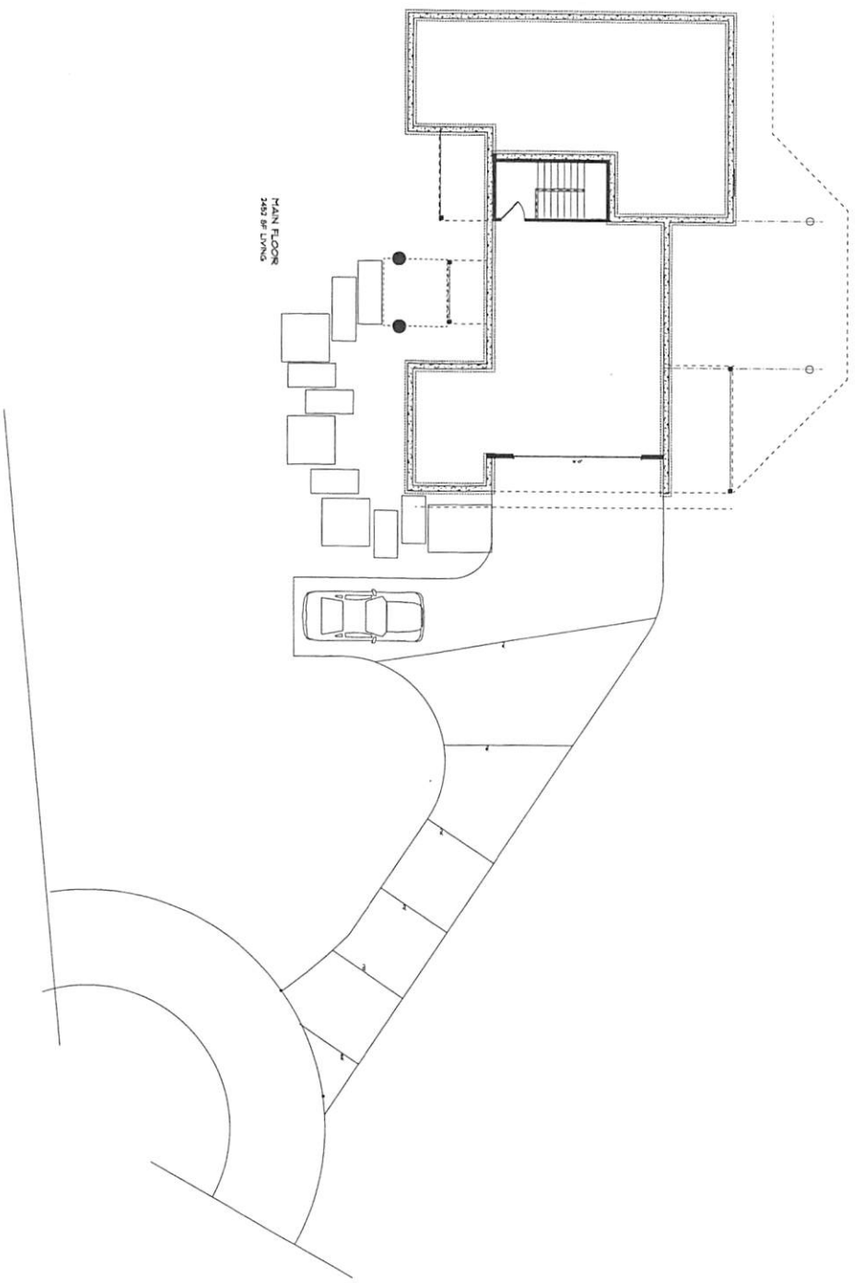
Drawn / Date JFC 11-14 | Designed / Date | Checked / Date

SUMMERS DEVELOPMENT

5637 EAST MERCER WAY
MERCER ISLAND, WA

Scales: Horiz. 1"=20' | Vert. | Sheet 1 of 1

Job No. 601411



DRIVEWAY PLAN

SHEET NO. 2

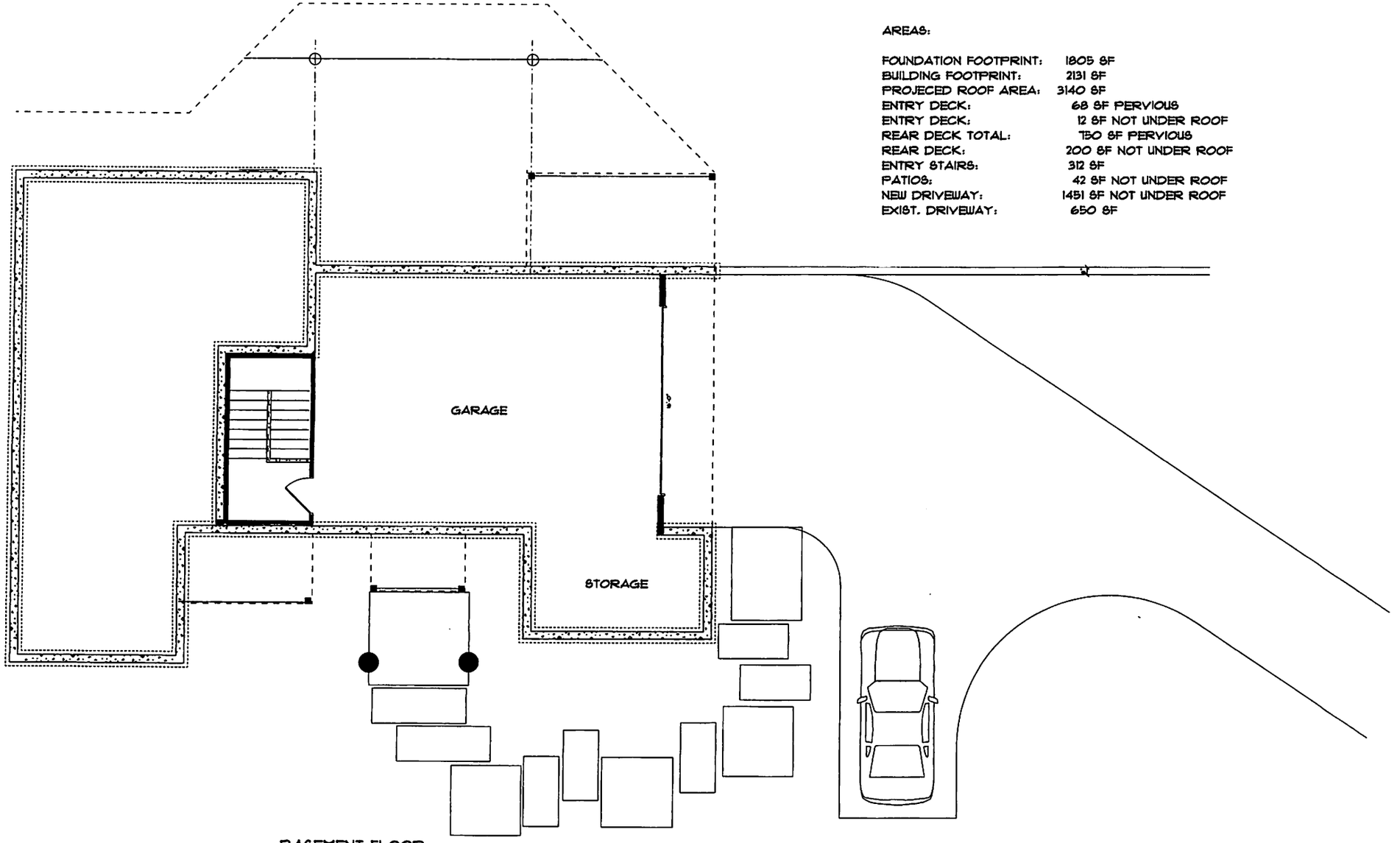
PROJECT NO. 14-014

DATE 12-9-14

MI Treehouse, LLC,
5631 EAST MERCER WAY
MERCER ISLAND, WA.

425.454.3098
HEALEY-JORGENSEN
ARCHITECHTS
2958 222ND PL SE, SAMMAMISH, WA 98075

420 REGISTERED ARCHITECT
RONALD R. HEALEY
STATE OF WASHINGTON



AREAS:

FOUNDATION FOOTPRINT:	1805 SF
BUILDING FOOTPRINT:	2131 SF
PROJECED ROOF AREA:	3140 SF
ENTRY DECK:	68 SF PERVIOUS
ENTRY DECK:	12 SF NOT UNDER ROOF
REAR DECK TOTAL:	750 SF PERVIOUS
REAR DECK:	200 SF NOT UNDER ROOF
ENTRY STAIRS:	312 SF
PATIOS:	42 SF NOT UNDER ROOF
NEW DRIVEWAY:	1451 SF NOT UNDER ROOF
EXIST. DRIVEWAY:	650 SF

BASEMENT FLOOR

STAIRS	134 SF
GARAGE	837 SF
TOTAL	971 SF

HEALEY-JORGENSEN ARCHITECHTS
425.454.3266
2366 222ND PL SE, SAMMAMISH, WA 98075

MII Treehouse, LLC,
3631 EAST MERCER WAY
MERCER ISLAND, WA.

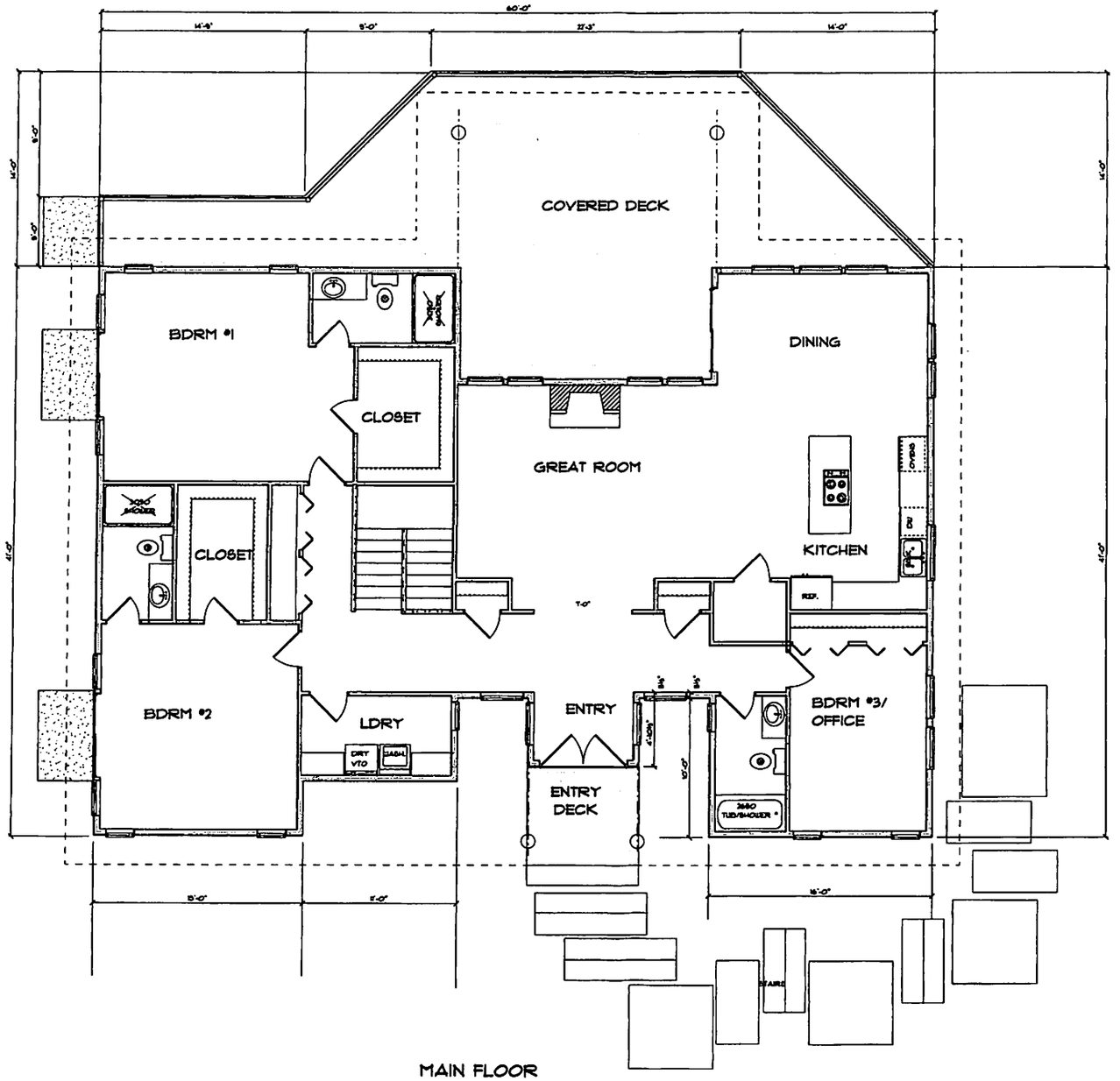
BASEMENT PLAN

SCALE 1/4" = 1'-0"

DATE 10-01-14

PROJECT NO. 14-074

SHEET NO. 3



MAIN FLOOR
2131 SF LIVING

HEALEY-JORGENSEN ARCHITECHTS
425-454-3066
2958 222ND PL. SE. SAMMAMISH, WA 98075

MII Treehouse, LLC,
3637 EAST MERCER WAY
MERCER ISLAND, WA.

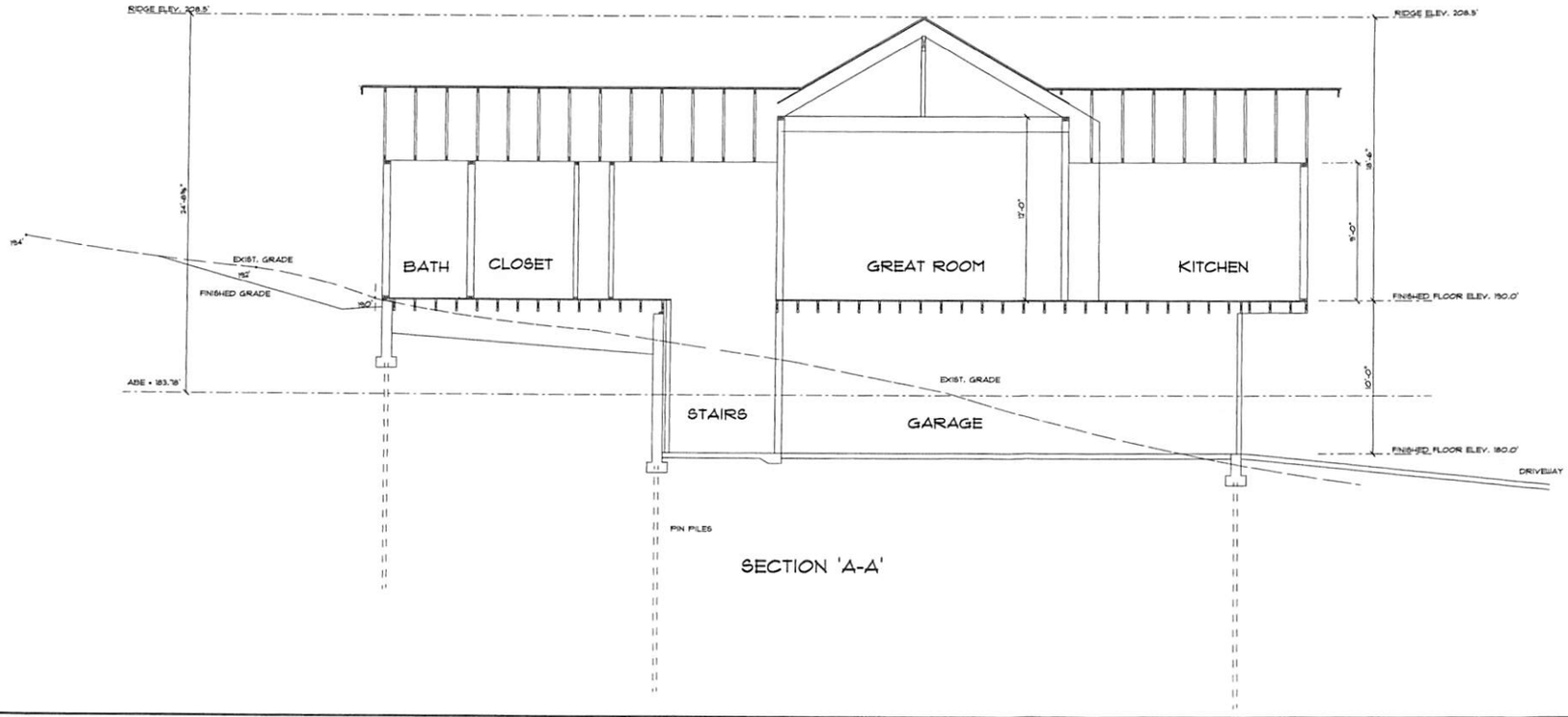
MAIN FLOOR

SCALE 1/4" = 1'-0"

DATE
10-1-14

PROJECT NO.
14-014

SHEET NO.
4



SECTION 'A-A'

RONALD R. HEALEY
STATE OF WASHINGTON
REGISTERED ARCHITECT

HEALEY-JORGENSEN
ARCHITECHTS
2908 222ND PL SE, SAMMAMISH, WA 98075
425.454.3096

MI Treehouse, LLC,
5631 EAST MERCER WAY
MERCER ISLAND, WA.

SECTION 'A-A'

SCALE 1/4" = 1'-0"

DATE
10-01-14

PROJECT NO.
14-014

SHEET NO.
6

NORTH ELEVATION

SOUTH ELEVATION

ADD REGISTERED ARCHITECT
RONALD W. HEALEY
STATE OF WASHINGTON

ha
HEALEY-JORGENSEN
ARCHITECHTS
425.454.3096
2958 222ND PL SE, SAMMAMISH, WA 98075

MI Treehouse, LLC,
5631 EAST MERCER WAY
MERCER ISLAND, WA.

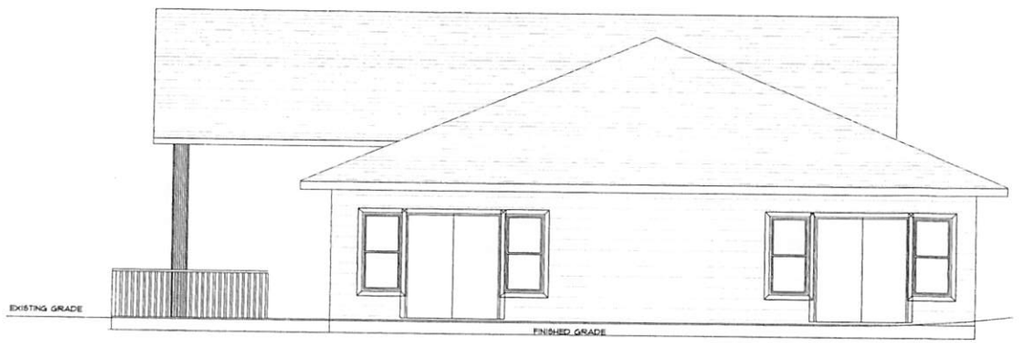
NORTH - SOUTH ELEVATIONS

SCALE 1/4" = 1'-0"

DATE
10-1-14

PROJECT NO.
14-074

SHEET NO.
7



WEST ELEVATION

EAST ELEVATION

hja
HEALEY-JORGENSEN ARCHITECHTS
425.454.3066
2958 222ND PL. SE. SAMMAMISH, WA 98075
REGISTERED ARCHITECT
RONALD R. HEALEY
STATE OF WASHINGTON

MI Treehome, LLC.
5631 EAST MERCER WAY
MERCER ISLAND, WA.

EAST - WEST ELEVATIONS

SCALE 1/4" = 1'-0"

DATE
10-1-14

PROJECT NO.
14-074

SHEET NO.
8

Wetland name or number A

WETLAND RATING FORM – WESTERN WASHINGTON
Version 2 - Updated July 2006 to increase accuracy and reproducibility among users
Updated Oct 2008 with the new WDFW definitions for priority habitats

Name of wetland (if known): Wet A - Mukilteo Way Date of site visit: 11·6·14

Rated by Ed Sewall Trained by Ecology? Yes__ No__ Date of training____

SEC: ___ TWNSHP: ___ RNGE: ___ Is S/T/R in Appendix D? Yes___ No___

Map of wetland unit: Figure ___ Estimated size .25ac

SUMMARY OF RATING

Category based on FUNCTIONS provided by wetland

I___ II___ III✓ IV___

Category I = Score >=70
Category II = Score 51-69
Category III = Score 30-50
Category IV = Score < 30

Score for Water Quality Functions	10
Score for Hydrologic Functions	6
Score for Habitat Functions	18
TOTAL score for Functions	34

Category based on SPECIAL CHARACTERISTICS of wetland

I___ II___ **Does not Apply**✓

Final Category (choose the "highest" category from above) III

Summary of basic information about the wetland unit

Wetland Unit has Special Characteristics		Wetland HGM Class used for Rating	
Estuarine		Depressional	
Natural Heritage Wetland		Riverine	
Bog		Lake-fringe	
Mature Forest		Slope	✓
Old Growth Forest		Flats	
Coastal Lagoon		Freshwater Tidal	
Interdunal			
None of the above	✓	Check if unit has multiple HGM classes present	

Wetland name or number A

Does the wetland unit being rated meet any of the criteria below?
If you answer YES to any of the questions below you will need to protect the wetland according to the regulations regarding the special characteristics found in the wetland.

Check List for Wetlands That May Need Additional Protection (in addition to the protection recommended for its category)	YES	NO
SP1. *Has the wetland unit been documented as a habitat for any Federally listed Threatened or Endangered animal or plant species (T/E species)?* For the purposes of this rating system, "documented" means the wetland is on the appropriate state or federal database.		✓
SP2. *Has the wetland unit been documented as habitat for any State listed Threatened or Endangered animal species?* For the purposes of this rating system, "documented" means the wetland is on the appropriate state database. Note: Wetlands with State listed plant species are categorized as Category I Natural Heritage Wetlands (see p. 19 of data form).		✓
SP3. *Does the wetland unit contain individuals of Priority species listed by the WDFW for the state?*		✓
SP4. *Does the wetland unit have a local significance in addition to its functions?* For example, the wetland has been identified in the Shoreline Master Program, the Critical Areas Ordinance, or in a local management plan as having special significance.		✓

To complete the next part of the data sheet you will need to determine the Hydrogeomorphic Class of the wetland being rated.

The hydrogeomorphic classification groups wetlands into those that function in similar ways. This simplifies the questions needed to answer how well the wetland functions. The Hydrogeomorphic Class of a wetland can be determined using the key below. See p. 24 for more detailed instructions on classifying wetlands.

Wetland name or number A

Classification of Wetland Units in Western Washington

If the hydrologic criteria listed in each question do not apply to the entire unit being rated, you probably have a unit with multiple HGM classes. In this case, identify which hydrologic criteria in questions 1-7 apply, and go to Question 8.

1. Are the water levels in the entire unit usually controlled by tides (i.e. except during floods)?
NO – go to 2 YES – the wetland class is **Tidal Fringe**

If yes, is the salinity of the water during periods of annual low flow below 0.5 ppt (parts per thousand)? **YES – Freshwater Tidal Fringe NO – Saltwater Tidal Fringe (Estuarine)**

If your wetland can be classified as a Freshwater Tidal Fringe use the forms for Riverine wetlands. If it is Saltwater Tidal Fringe it is rated as an Estuarine wetland. Wetlands that were called estuarine in the first and second editions of the rating system are called Salt Water Tidal Fringe in the Hydrogeomorphic Classification. Estuarine wetlands were categorized separately in the earlier editions, and this separation is being kept in this revision. To maintain consistency between editions, the term "Estuarine" wetland is kept. Please note, however, that the characteristics that define Category I and II estuarine wetlands have changed (see p.).

2. The entire wetland unit is flat and precipitation is the only source (>90%) of water to it. Groundwater and surface water runoff are NOT sources of water to the unit.
NO – go to 3 YES – The wetland class is **Flats**

If your wetland can be classified as a "Flats" wetland, use the form for **Depressional** wetlands.

3. Does the entire wetland unit meet both of the following criteria?
___ The vegetated part of the wetland is on the shores of a body of permanent open water (without any vegetation on the surface) at least 20 acres (8 ha) in size;
___ At least 30% of the open water area is deeper than 6.6 ft (2 m)?
NO – go to 4 YES – The wetland class is **Lake-fringe (Lacustrine Fringe)**

4. Does the entire wetland unit meet all of the following criteria?
___ The wetland is on a slope (*slope can be very gradual*),
___ The water flows through the wetland in one direction (unidirectional) and usually comes from seeps. It may flow subsurface, as sheetflow, or in a swale without distinct banks.
___ The water leaves the wetland without being impounded?
NOTE: *Surface water does not pond in these type of wetlands except occasionally in very small and shallow depressions or behind hummocks (depressions are usually <3ft diameter and less than 1 foot deep).*
NO - go to 5 YES – The wetland class is **Slope**

5. Does the entire wetland unit meet all of the following criteria?
___ The unit is in a valley, or stream channel, where it gets inundated by overbank flooding from that stream or river
___ The overbank flooding occurs at least once every two years.
NOTE: The riverine unit can contain depressions that are filled with water when the river is not flooding.
NO - go to 6 YES – The wetland class is **Riverine**

6. Is the entire wetland unit in a topographic depression in which water ponds, or is saturated to the surface, at some time during the year. *This means that any outlet, if present, is higher than the interior of the wetland.*
NO – go to 7 YES – The wetland class is **Depressional**

7. Is the entire wetland unit located in a very flat area with no obvious depression and no overbank flooding. The unit does not pond surface water more than a few inches. The unit seems to be maintained by high groundwater in the area. The wetland may be ditched, but has no obvious natural outlet.
NO – go to 8 YES – The wetland class is **Depressional**

8. Your wetland unit seems to be difficult to classify and probably contains several different HGM classes. For example, seeps at the base of a slope may grade into a riverine floodplain, or a small stream within a depressional wetland has a zone of flooding along its sides. GO BACK AND IDENTIFY WHICH OF THE HYDROLOGIC REGIMES DESCRIBED IN QUESTIONS 1-7 APPLY TO DIFFERENT AREAS IN THE UNIT (make a rough sketch to help you decide). Use the following table to identify the appropriate class to use for the rating system if you have several HGM classes present within your wetland. NOTE: Use this table only if the class that is recommended in the second column represents 10% or more of the total area of the wetland unit being rated. If the area of the class listed in column 2 is less than 10% of the unit; classify the wetland using the class that represents more than 90% of the total area.

HGM classes within wetland unit being rated	HGM class to use in rating
Slope + Riverine	Riverine
Slope + Depressional	Depressional
Slope + Lake-fringe	Lake-fringe
Depressional + Riverine along stream within boundary	Depressional
Depressional + Lake-fringe	Depressional
Salt Water Tidal Fringe and any other class of freshwater wetland	Treat as ESTUARINE under wetlands with special characteristics

If you are unable still to determine which of the above criteria apply to your wetland, or if you have more than 2 HGM classes within a wetland boundary, classify the wetland as **Depressional** for the rating.

Wetland name or number A

S	Slope Wetlands WATER QUALITY FUNCTIONS - Indicators that the wetland unit functions to improve water quality	Points (circle one)
S	**S 1. Does the wetland unit have the potential to improve water quality?**	*(see p.64)*
S	S 1.1 Characteristics of average slope of unit: Slope is1% or less *(a 1% slope has a 1 foot vertical drop in elevation for every 100 ft horizontal distance)* points = 3 Slope is 1% - 2% points = 2 Slope is 2% - 5% points = 1 Slope is greater than 5% points = 0	0
S	S 1.2 The soil 2 inches below the surface (or duff layer) is clay or organic *(use NRCS definitions)* YES = 3 points NO = 0 points	3
S	S 1.3 Characteristics of the vegetation in the wetland that trap sediments and pollutants: *Choose the points appropriate for the description that best fits the vegetation in the wetland. Dense vegetation means you have trouble seeing the soil surface (>75% cover), and uncut means not grazed or mowed and plants are higher than 6 inches.* Dense, uncut, herbaceous vegetation > 90% of the wetland area points = 6 Dense, uncut, herbaceous vegetation > 1/2 of area points = 3 Dense, woody, vegetation > ½ of area points = 2 Dense, uncut, herbaceous vegetation > 1/4 of area points = 1 Does not meet any of the criteria above for vegetation points = 0 Aerial photo or map with vegetation polygons	Figure ___ 2
S	**Total for S 1** *Add the points in the boxes above*	5
S	**S 2. Does the wetland unit have the opportunity to improve water quality?** Answer YES if you know or believe there are pollutants in groundwater or surface water coming into the wetland that would otherwise reduce water quality in streams, lakes or groundwater downgradient from the wetland. *Note which of the following conditions provide the sources of pollutants. A unit may have pollutants coming from several sources, but any single source would qualify as opportunity.* — Grazing in the wetland or within 150ft — Untreated stormwater discharges to wetland — Tilled fields, logging, or orchards within 150 feet of wetland — Residential, urban areas, or golf courses are within 150 ft upslope of wetland — Other YES multiplier is 2 NO multiplier is 1	*(see p.67)* multiplier 2
S	**TOTAL - Water Quality Functions** Multiply the score from S1 by S2 *Add score to table on p. 1*	10

Comments

Wetland name or number A

S	Slope Wetlands HYDROLOGIC FUNCTIONS - Indicators that the wetland unit functions to reduce flooding and stream erosion	Points (circle one)
	S 3. Does the wetland unit have the potential to reduce flooding and stream erosion?	*(see p.68)*
S	S 3.1 Characteristics of vegetation that reduce the velocity of surface flows during storms. *Choose the points appropriate for the description that best fit conditions in the wetland. (stems of plants should be thick enough (usually > 1/8in), or dense enough, to remain erect during surface flows)* Dense, uncut, **rigid** vegetation covers > 90% of the area of the wetland. points = 6 Dense, uncut, **rigid** vegetation > 1/2 area of wetland points = 3 Dense, uncut, **rigid** vegetation > 1/4 area points = 1 More than 1/4 of area is grazed, mowed, tilled or vegetation is not rigid points = 0	6
S	S 3.2 Characteristics of slope wetland that holds back small amounts of flood flows: The slope wetland has small surface depressions that can retain water over at least 10% of its area. YES points = 2 NO points = 0	0
S	*Add the points in the boxes above*	6
S	**S 4. Does the wetland have the opportunity to reduce flooding and erosion?** Is the wetland in a landscape position where the reduction in water velocity it provides helps protect downstream property and aquatic resources from flooding or excessive and/or erosive flows? *Note which of the following conditions apply.* — Wetland has surface runoff that drains to a river or stream that has flooding problems — Other ___ *(Answer NO if the major source of water is controlled by a reservoir (e.g. wetland is a seep that is on the downstream side of a dam)* YES multiplier is 2 NO multiplier is 1	*(see p. 70)* multiplier 1
S	**TOTAL - Hydrologic Functions** Multiply the score from S 3 by S 4 *Add score to table on p. 1*	6

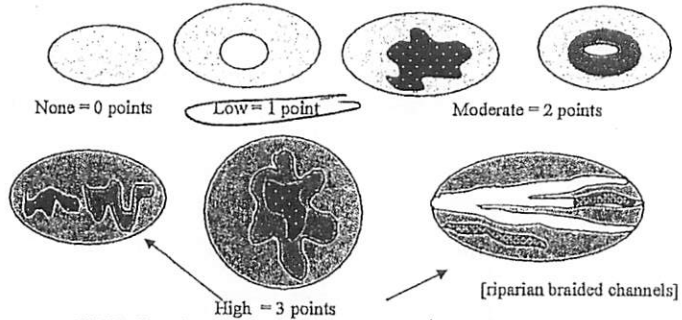
Comments

Wetland name or number A

These questions apply to wetlands of all HGM classes. HABITAT FUNCTIONS - Indicators that unit functions to provide important habitat	Points (only whole numbers)
H 1. Does the wetland unit have the potential to provide habitat for many species?	
H 1.1 Vegetation structure *(see p. 72)* *Check the types of vegetation classes present (as defined by Cowardin)- Size threshold for each class is ¼ acre or more than 10% of the area if unit is smaller than 2.5 acres.* ___Aquatic bed ___Emergent plants ✓ Scrub/shrub (areas where shrubs have >30% cover) ___Forested (areas where trees have >30% cover) *If the unit has a forested class check if:* ✓ The forested class has 3 out of 5 strata (canopy, sub-canopy, shrubs, herbaceous, moss/ground-cover) that each cover 20% within the forested polygon *Add the number of vegetation structures that qualify. If you have:* 4 structures or more points = 4 3 structures points = 2 2 structures points = 1 1 structure points = 0 Map of Cowardin vegetation classes	Figure ___ 2
H 1.2. Hydroperiods *(see p. 73)* *Check the types of water regimes (hydroperiods) present within the wetland. The water regime has to cover more than 10% of the wetland or ¼ acre to count. (see text for descriptions of hydroperiods)* ___Permanently flooded or inundated 4 or more types present points = 3 ___Seasonally flooded or inundated 3 types present points = 2 ___Occasionally flooded or inundated 2 types present points = 1 ✓ Saturated only 1 type present points = 0 ✓ Permanently flowing stream or river in, or adjacent to, the wetland ___Seasonally flowing stream in, or adjacent to, the wetland ___*Lake-fringe wetland* = 2 points ___*Freshwater tidal wetland* = 2 points Map of hydroperiods	Figure ___ 1
H 1.3. Richness of Plant Species *(see p. 75)* Count the number of plant species in the wetland that cover at least 10 ft². *(different patches of the same species can be combined to meet the size threshold)* *You do not have to name the species.* *Do not include Eurasian Milfoil, reed canarygrass, purple loosestrife, Canadian Thistle* If you counted: > 19 species points = 2 *List species below if you want to:* 5 - 19 species points = 1 < 5 species points = 0	1

Total for page 4

Wetland name or number A

H 1.4. Interspersion of habitats *(see p. 76)* Decide from the diagrams below whether interspersion between Cowardin vegetation classes (described in H 1.1), or the classes and unvegetated areas (can include open water or mudflats) is high, medium, low, or none.  None = 0 points Low = 1 point Moderate = 2 points High = 3 points [riparian braided channels] NOTE: If you have four or more classes or three vegetation classes and open water the rating is always "high". Use map of Cowardin vegetation classes	Figure ___ 1
H 1.5. Special Habitat Features: *(see p. 77)* *Check the habitat features that are present in the wetland. The number of checks is the number of points you put into the next column.* ✓ Large, downed, woody debris within the wetland (>4in. diameter and 6 ft long). ✓ Standing snags (diameter at the bottom > 4 inches) in the wetland ___Undercut banks are present for at least 6.6 ft (2m) and/or overhanging vegetation extends at least 3.3 ft (1m) over a stream (or ditch) in, or contiguous with the unit, for at least 33 ft (10m) ___Stable steep banks of fine material that might be used by beaver or muskrat for denning (>30degree slope) OR signs of recent beaver activity are present *(cut shrubs or trees that have not yet turned grey/brown)* ___At least ¼ acre of thin-stemmed persistent vegetation or woody branches are present in areas that are permanently or seasonally inundated. *(structures for egg-laying by amphibians)* ✓ Invasive plants cover less than 25% of the wetland area in each stratum of plants *NOTE: The 20% stated in early printings of the manual on page 78 is an error.*	3
H 1. TOTAL Score - potential for providing habitat *Add the scores from H1.1, H1.2, H1.3, H1.4, H1.5*	8

Comments

Wetland name or number A

H 2. Does the wetland unit have the opportunity to provide habitat for many species?	
H 2.1 Buffers *(see p. 80)* *Choose the description that best represents condition of buffer of wetland unit. The highest scoring criterion that applies to the wetland is to be used in the rating. See text for definition of "undisturbed."* — 100 m (330ft) of relatively undisturbed vegetated areas, rocky areas, or open water >95% of circumference. No structures are within the undisturbed part of buffer. (relatively undisturbed also means no-grazing, no landscaping, no daily human use) Points = 5 — 100 m (330 ft) of relatively undisturbed vegetated areas, rocky areas, or open water > 50% circumference. Points = 4 — 50 m (170ft) of relatively undisturbed vegetated areas, rocky areas, or open water >95% circumference. Points = 4 — 100 m (330ft) of relatively undisturbed vegetated areas, rocky areas, or open water > 25% circumference, . Points = 3 — 50 m (170ft) of relatively undisturbed vegetated areas, rocky areas, or open water for > 50% circumference. Points = 3 **If buffer does not meet any of the criteria above** — No paved areas (except paved trails) or buildings within 25 m (80ft) of wetland > 95% circumference. Light to moderate grazing, or lawns are OK. Points = 2 — No paved areas or buildings within 50m of wetland for >50% circumference. Light to moderate grazing, or lawns are OK. Points = 2 — Heavy grazing in buffer. Points = 1 — Vegetated buffers are <2m wide (6.6ft) for more than 95% of the circumference (e.g. tilled fields, paving, basalt bedrock extend to edge of wetland Points = 0. — Buffer does not meet any of the criteria above. Points = 1 Aerial photo showing buffers	Figure ___ 3
H 2.2 Corridors and Connections *(see p. 81)* H 2.2.1 Is the wetland part of a relatively undisturbed and unbroken vegetated corridor (either riparian or upland) that is at least 150 ft wide, has at least 30% cover of shrubs, forest or native undisturbed prairie, that connects to estuaries, other wetlands or undisturbed uplands that are at least 250 acres in size? (*dams in riparian corridors, heavily used gravel roads, paved roads, are considered breaks in the corridor*). YES = 4 points (*go to H 2.3*) NO = go to H 2.2.2 H 2.2.2 Is the wetland part of a relatively undisturbed and unbroken vegetated corridor (either riparian or upland) that is at least 50ft wide, has at least 30% cover of shrubs or forest, and connects to estuaries, other wetlands or undisturbed uplands that are at least 25 acres in size? OR a Lake-fringe wetland, if it does not have an undisturbed corridor as in the question above? YES = 2 points (*go to H 2.3*) NO = H 2.2.3 H 2.2.3 Is the wetland: within 5 mi (8km) of a brackish or salt water estuary OR within 3 mi of a large field or pasture (>40 acres) OR ✓ within 1 mi of a lake greater than 20 acres? YES = 1 point NO = 0 points	1

Total for page 4

Wetland name or number A

H 2.3 Near or adjacent to other priority habitats listed by WDFW *(see new and complete descriptions of WDFW priority habitats, and the counties in which they can be found, in the PHS report http://wdfw.wa.gov/hab/phslist.htm)* Which of the following priority habitats are within 330ft (100m) of the wetland unit? *NOTE: the connections do not have to be relatively undisturbed.* ___ **Aspen Stands:** Pure or mixed stands of aspen greater than 0.4 ha (1 acre). ___ **Biodiversity Areas and Corridors:** Areas of habitat that are relatively important to various species of native fish and wildlife (*full descriptions in WDFW PHS report p. 152*). ___ **Herbaceous Balds:** Variable size patches of grass and forbs on shallow soils over bedrock. ___ **Old-growth/Mature forests:** (Old-growth west of Cascade crest) Stands of at least 2 tree species, forming a multi-layered canopy with occasional small openings; with at least 20 trees/ha (8 trees/acre) > 81 cm (32 in) dbh or > 200 years of age. (Mature forests) Stands with average diameters exceeding 53 cm (21 in) dbh; crown cover may be less that 100%; crown cover may be less that 100%; decay, decadence, numbers of snags, and quantity of large downed material is generally less than that found in old-growth; 80 - 200 years old west of the Cascade crest. ___ **Oregon white Oak:** Woodlands Stands of pure oak or oak/conifer associations where canopy coverage of the oak component is important (*full descriptions in WDFW PHS report p. 158*). ✓ **Riparian:** The area adjacent to aquatic systems with flowing water that contains elements of both aquatic and terrestrial ecosystems which mutually influence each other. ___ **Westside Prairies:** Herbaceous, non-forested plant communities that can either take the form of a dry prairie or a wet prairie (*full descriptions in WDFW PHS report p. 161*). ___ **Instream:** The combination of physical, biological, and chemical processes and conditions that interact to provide functional life history requirements for instream fish and wildlife resources. ___ **Nearshore:** Relatively undisturbed nearshore habitats. These include Coastal Nearshore, Open Coast Nearshore, and Puget Sound Nearshore. (*full descriptions of habitats and the definition of relatively undisturbed are in WDFW report: pp. 167-169 and glossary in Appendix A).* ___ **Caves:** A naturally occurring cavity, recess, void, or system of interconnected passages under the earth in soils, rock, ice, or other geological formations and is large enough to contain a human. ___ **Cliffs:** Greater than 7.6 m (25 ft) high and occurring below 5000 ft. ___ **Talus:** Homogenous areas of rock rubble ranging in average size 0.15 - 2.0 m (0.5 - 6.5 ft), composed of basalt, andesite, and/or sedimentary rock, including riprap slides and mine tailings. May be associated with cliffs. ✓ **Snags and Logs:** Trees are considered snags if they are dead or dying and exhibit sufficient decay characteristics to enable cavity excavation/use by wildlife. Priority snags have a diameter at breast height of > 51 cm (20 in) in western Washington and are > 2 m (6.5 ft) in height. Priority logs are > 30 cm (12 in) in diameter at the largest end, and > 6 m (20 ft) long. If wetland has 3 or more priority habitats = 4 points If wetland has 2 priority habitats = 3 points If wetland has 1 priority habitat = 1 point No habitats = 0 points *Note: All vegetated wetlands are by definition a priority habitat but are not included in this list. Nearby wetlands are addressed in question H 2.4)*	3

Wetland name or number A

H 2.4 Wetland Landscape *(choose the one description of the landscape around the wetland that best fits) (see p. 84)*	7
There are at least 3 other wetlands within ½ mile, and the connections between them are relatively undisturbed (light grazing between wetlands OK, as is lake shore with some boating, but connections should NOT be bisected by paved roads, fill, fields, or other development. points = 5	
The wetland is Lake-fringe on a lake with little disturbance and there are 3 other lake-fringe wetlands within ½ mile points = 5	
There are at least 3 other wetlands within ½ mile, BUT the connections between them are disturbed points = 3	
The wetland is Lake-fringe on a lake with disturbance and there are 3 other lake-fringe wetland within ½ mile points = 3	
There is at least 1 wetland within ½ mile. points = 2	
There are no wetlands within ½ mile. points = 0	
	3
H 2. TOTAL Score - opportunity for providing habitat *Add the scores from H2.1,H2.2, H2.3, H2.4*	10
TOTAL for H 1 from page 14	8
Total Score for Habitat Functions – add the points for H 1, H 2 and record the result on p. 1	18

Wetland name or number A

CATEGORIZATION BASED ON SPECIAL CHARACTERISTICS

Please determine if the wetland meets the attributes described below and circle the appropriate answers and Category.

Wetland Type *Check off any criteria that apply to the wetland. Circle the Category when the appropriate criteria are met.*	Category
SC 1.0 Estuarine wetlands *(see p. 86)* Does the wetland unit meet the following criteria for Estuarine wetlands? — The dominant water regime is tidal, — Vegetated, and — With a salinity greater than 0.5 ppt. YES = Go to SC 1.1 NO ✓	
SC 1.1 Is the wetland unit within a National Wildlife Refuge, National Park, National Estuary Reserve, Natural Area Preserve, State Park or Educational, Environmental, or Scientific Reserve designated under WAC 332-30-151? YES = Category I NO go to SC 1.2	Cat. I
SC 1.2 Is the wetland unit at least 1 acre in size and meets at least two of the following three conditions? YES = Category I NO = Category II — The wetland is relatively undisturbed (has no diking, ditching, filling, cultivation, grazing, and has less than 10% cover of non-native plant species. If the non-native *Spartina* spp. are the only species that cover more than 10% of the wetland, then the wetland should be given a dual rating (I/II). The area of Spartina would be rated a Category II while the relatively undisturbed upper marsh with native species would be a Category I. Do not, however, exclude the area of Spartina in determining the size threshold of 1 acre. — At least ¾ of the landward edge of the wetland has a 100 ft buffer of shrub, forest, or un-grazed or un-mowed grassland. — The wetland has at least 2 of the following features: tidal channels, depressions with open water, or contiguous freshwater wetlands.	Cat. I Cat. II Dual rating I/II

Wetland name or number A

SC 2.0 Natural Heritage Wetlands *(see p. 87)*
Natural Heritage wetlands have been identified by the Washington Natural Heritage Program/DNR as either high quality undisturbed wetlands or wetlands that support state Threatened, Endangered, or Sensitive plant species.

SC 2.1 Is the wetland unit being rated in a Section/Township/Range that contains a Natural Heritage wetland? *(this question is used to screen out most sites before you need to contact WNHP/DNR)*
S/T/R information from Appendix D ___ or accessed from WNHP/DNR web site ___

YES ____ – contact WNHP/DNR (see p. 79) and go to SC 2.2 NO ✓

SC 2.2 Has DNR identified the wetland as a high quality undisturbed wetland or as or as a site with state threatened or endangered plant species?
YES = Category I NO ____not a Heritage Wetland

Cat. I

SC 3.0 Bogs *(see p. 87)*
Does the wetland unit (or any part of the unit) meet both the criteria for soils and vegetation in bogs? *Use the key below to identify if the wetland is a bog. If you answer yes you will still need to rate the wetland based on its functions.*

1. Does the unit have organic soil horizons (i.e. layers of organic soil), either peats or mucks, that compose 16 inches or more of the first 32 inches of the soil profile? (See Appendix B ~~for a field key to~~ identify organic soils)? Yes - go to Q. 3 No - go to Q. 2
2. Does the unit have organic soils, either peats or mucks that are less than 16 inches deep over bedrock, or an impermeable hardpan such as clay or volcanic ash, or that are floating on a lake or pond?
   Yes - go to Q. 3 No - Is not a bog for purpose of rating
3. Does the unit have more than 70% cover of mosses at ground level, AND other plants, if present, consist of the "bog" species listed in Table 3 as a significant component of the vegetation (more than 30% of the total shrub and herbaceous cover consists of species in Table 3)?
   Yes – Is a bog for purpose of rating No - go to Q. 4
   NOTE: If you are uncertain about the extent of mosses in the understory you may substitute that criterion by measuring the pH of the water that seeps into a hole dug at least 16" deep. If the pH is less than 5.0 and the "bog" plant species in Table 3 are present, the wetland is a bog.

1. Is the unit forested (> 30% cover) with sitka spruce, subalpine fir, western red cedar, western hemlock, lodgepole pine, quaking aspen, Englemann's spruce, or western white pine, WITH any of the species (or combination of species) on the bog species plant list in Table 3 as a significant component of the ground cover *(> 30% coverage of the total shrub/herbaceous cover)?*

2. YES = Category I No___ Is not a bog for purpose of rating

Cat. I

Wetland name or number A

SC 4.0 Forested Wetlands *(see p. 90)*
Does the wetland unit have at least 1 acre of forest that meet one of these criteria for the Department of Fish and Wildlife's forests as priority habitats? *If you answer yes you will still need to rate the wetland based on its functions.*

— **Old-growth forests:** (west of Cascade crest) Stands of at least two tree species, forming a multi-layered canopy with occasional small openings; with at least 8 trees/acre (20 trees/hectare) that are at least 200 years of age OR have a diameter at breast height (dbh) of 32 inches (81 cm) or more.

NOTE: The criterion for dbh is based on measurements for upland forests. Two-hundred year old trees in wetlands will often have a smaller dbh because their growth rates are often slower. The DFW criterion is and "OR" so old-growth forests do not necessarily have to have trees of this diameter.

— **Mature forests:** (west of the Cascade Crest) Stands where the largest trees are 80 – 200 years old OR have average diameters (dbh) exceeding 21 inches (53cm); crown cover may be less that 100%; decay, decadence, numbers of snags, and quantity of large downed material is generally less than that found in old-growth.

YES = Category I NO ✓ not a forested wetland with special characteristics

Cat. I

SC 5.0 Wetlands in Coastal Lagoons *(see p. 91)*
Does the wetland meet all of the following criteria of a wetland in a coastal lagoon?

— The wetland lies in a depression adjacent to marine waters that is wholly or partially separated from marine waters by sandbanks, gravel banks, shingle, or, less frequently, rocks
— The lagoon in which the wetland is located contains surface water that is saline or brackish (> 0.5 ppt) during most of the year in at least a portion of the lagoon *(needs to be measured near the bottom)*
YES = Go to SC 5.1 NO ✓ not a wetland in a coastal lagoon

SC 5.1 Does the wetland meets all of the following three conditions?

— The wetland is relatively undisturbed (has no diking, ditching, filling, cultivation, grazing), and has less than 20% cover of invasive plant species (see list of invasive species on p. 74).
— At least ¾ of the landward edge of the wetland has a 100 ft buffer of shrub, forest, or un-grazed or un-mowed grassland.
— The wetland is larger than 1/10 acre (4350 square feet)
YES = Category I NO = Category II

Cat. I
Cat. II

Wetland name or number A

SC 6.0 Interdunal Wetlands *(see p. 93)* Is the wetland unit west of the 1889 line (also called the Western Boundary of Upland Ownership or WBUO)? YES - go to SC 6.1 NO __ not an interdunal wetland for rating *If you answer yes you will still need to rate the wetland based on its functions.* In practical terms that means the following geographic areas: • Long Beach Peninsula- lands west of SR 103 • Grayland-Westport- lands west of SR 105 • Ocean Shores-Copalis- lands west of SR 115 and SR 109 SC 6.1 Is the wetland one acre or larger, or is it in a mosaic of wetlands that is once acre or larger? YES = Category II NO – go to SC 6.2 SC 6.2 Is the unit between 0.1 and 1 acre, or is it in a mosaic of wetlands that is between 0.1 and 1 acre? YES = Category III	**Cat. II** **Cat. III**
Category of wetland based on Special Characteristics *Choose the "highest" rating if wetland falls into several categories and record on p. 1.* If you answered NO for all types enter "Not Applicable" on p. 1.	NA

GEOTECHNICAL ENGINEERING STUDY
PROPOSED RESIDENCE
5637 EAST MERCER WAY
MERCER ISLAND, WASHINGTON

G-3827

Prepared for

Mr. William C. Summers
Treehouse MI, LLC
P.O. Box 261
Medina, Washington 98039

March 12, 2015

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GEO Group Northwest, Inc.
Geotechnical Engineers, Geologists
& Environmental Scientists

March 12, 2015

G-3827

Mr. William C. Summers
MI Treehouse, LLC
P.O. Box 261
Medina, Washington 98039

Subject: Geotechnical Engineering Study
Proposed Residence
5637 East Mercer Way
Mercer Island, Washington

Dear Mr. Summers:

GEO Group Northwest, Inc., is pleased to submit this geotechnical engineering report entitled "Geotechnical Engineering Study, Proposed Residence, 5637 East Mercer Way, Mercer Island, Washington." This report presents our findings, conclusions, and recommendations from investigation activities that we have completed at the above-subject project site for your proposed construction of a single-family residence.

We explored subsurface soil conditions at the site by drilling two exploratory soil borings. Soils encountered in the borings typically consisted of loose, fine sand and silty sand underlain by medium dense to dense, unsaturated silt. Groundwater was encountered at or near the ground surface in both of the borings.

The site soils encountered in the borings will not be suitable to directly support foundations due to their loose and wet condition. Also, due to the presence of groundwater seepage from the

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slopes on the south part of the site, substantial excavation into the soils at the site is not recommended, particularly in the area where wet, loose soil conditions are present.

It is our opinion that the proposed residence can be supported vertically on a system of small-diameter steel pipe piles that are founded in the dense silty soils below the site. Lateral support for the residence can be achieved either by using battered pipe piles or by using helical anchors.

As an alternative, we considered the use of conventional spread footings bearing on a 3-feet thick layer of crushed rock and geotextile fabric to support the residence. Upon closer analysis, however, we have concluded that such an approach may not adequately mitigate potential soil settlement and soil liquefaction problems.

Our recommendations, along with other geotechnical aspects of the project, are discussed in more detail in the text of the attached report.

We appreciate this opportunity to have been of service to you on this project. We look forward to working with you as the project progresses. Should you have any questions regarding this report or need additional consultation, please feel free to call us.

Sincerely,

GEO Group Northwest, Inc.

William Chang, PE.
Principal

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GEOTECHNICAL ENGINEERING STUDY
PROPOSED RESIDENCE
5637 EAST MERCER WAY
MERCER ISLAND, WASHINGTON

G-3827

1.0 INTRODUCTION

1.1 Project Description

GEO Group Northwest, Inc., has completed a geotechnical engineering study for the proposed development of a single-family residence on the property at 5637 E. Mercer Way, Mercer Island, Washington.

1.2 Scope of Investigation

The tasks we completed for this study included the following:

Year 1999:

1. Conducted a subsurface investigation at the site consisting of drilling two soil borings. The borings were drilled in the approximate proposed location the proposed residence at the time of the investigation;

2. Performed laboratory testing on soil samples collected from the borings, and prepared boring logs;

3. Performed engineering analysis for foundation support, grading considerations, earthwork criteria for on-site soils and imported soils, and pavement section design; and

4. Prepared a geotechnical report of our findings, conclusions, and recommendations.

Year 2015:

1. Performed a reconnaissance of the project site to update our knowledge of current site conditions;

2. Reviewed and updated, where appropriate, the findings, conclusions, and recommendations contained in our previous reports (our 1999 report and an updated 2005 report) for the project site; and

3. Prepared this new geotechnical report of our findings, conclusions, and recommendations for the currently proposed residence for the project site.

2.0 SITE CONDITIONS

2.1 Site Description

The project site is located on the west side of the 5600 block of East Mercer Way on Mercer Island, Washington, as shown on Plate 1 - Site Location Map. The site is bordered to the south by a single family residence (5643 East Mercer Way). A small stream flows from west to east across the northern part of the site. Lake Washington is located approximately 0.2 miles east of the site.

The site consists of an irregular shaped lot that comprises about 38,700 square feet. The site generally slopes downward toward the north and northeast toward a ravine with an east-running stream on the north side of the site. Elevations on site range between approximately 158 feet at stream course in the northeast corner and approximately 226 feet at the south corner which is on a steeply rising slope (with inclinations up to approximately 75 percent). The existing conditions and topography on the site are illustrated in Plate 2 - Site Plan.

2.2 Proposed Development

We understand the proposed residence is planned to be located on the relatively less steeply sloped middle part of the site, as illustrated in Plate 3 - Proposed Residence Plan. Slopes in this area have inclinations up to approximately 28 percent. The proposed floor elevation for the residence currently are 180 feet for the basement/garage and 190 feet for the main floor of the residence, as illustrated in Plate 4 - Proposed Residence Section. Elevation views of the proposed residence are presented in Plate 5A - North & South Elevations and Plate 5B - East & West Elevations.

2.2 Geologic Overview

According to the Geologic Map of Mercer Island, Washington, by Troost, K.G. and A.P. Wisher, published October 2006, the surficial geology in the site vicinity is mapped as consisting of Quaternary-age Advance Outwash Sand (Qva) on the geologic map. These soils typically consist of fine to medium grained sand with occasional silty layers. These soils typically are underlain with a relatively impermeable silt unit, referred to as Lawton Clay on the geologic map. The map also indicates that landslide deposits are located on and in the immediate vicinity of the site.

Groundwater typically accumulates in the lower portion of the outwash sand unit where it is underlain by the impermeable silt. This water then forms springs and seeps on slopes where the contact between the units is exposed. Under these conditions, the sand soils commonly are susceptible to instability such as landslides or earthflows.

3.0 SITE INVESTIGATION

3.1 1999 Subsurface Investigation

A GEO Group Northwest geologist supervised the drilling of two exploratory soil borings (B-1 and B-2) on August 10, 1999. The borings were completed by using a manually portable drilling rig and were located in the middle portion of the site, as indicated in Plate 2 - Site Plan. The

boring locations were estimated by using a roll tape and by visual reference to existing site features noted on the topographic survey that was provided to us.

Soils encountered in the borings typically consisted of a surficial layer of soft, wet, mucky fine silty sand topsoil. The topsoil was underlain with loose to medium dense, wet, fine grained, silty sand and sand. These soils were found to a depth of approximately 14 feet (equivalent to approximate elevation 173 feet in boring B-1 and approximately 20 feet (equivalent to approximately elevation 156 feet) in boring B-2. These soils were underlain with medium dense, damp to moist silt with occasional lenses of silty fine sand to the bottom depths of both borings. Logs of the soil borings are provided in Attachment 1 to this report.

Groundwater seepage was observed at the surface during our explorations at the site. Saturated soils were present approximately from ground surface to the bottom of boring B-1 at 15 feet deep, and heaving action of the wet sand into the borehole prevented further drilling of the boring. Saturated soils were encountered in boring B-2 from near ground surface to approximately 20 feet deep, but the heaving action of the wet sand was able to be mitigated.

During our activities, we also observed the presence of groundwater seepage at the base of the steep slope in the south part of the site (from southwest to southeast of the location of boring B-1).

3.2 2015 Site Reconnaissance

On March 9, 2015, we performed a reconnaissance of the site to update our knowledge of the site conditions. We observed that the site appears to have not been substantially modified since the time of our 1999 investigation activities. We observed that the ground surface conditions were similar to those we had found during the previous investigation, with presence of soft, wet, mucky sand on the middle part of the site below the base of the steep slope. We did not observe evidence of landslides on the site since the time of our previous investigation activities, such as exposed scarps, or apparent freshly exposed soils.

4.0 SEISMICITY

4.1 Puget Sound Seismic History

The project site is located within the Seattle metropolitan area. The greater Puget Sound region historically has experienced a number of small to moderate earthquakes and occasional strong shocks. Historical records for the region indicate that the Olympia earthquake of April 13, 1949, with a Richter magnitude of 7.1, produced ground-shaking of intensity VIII on the Modified Mercalli Scale near its epicenter. The Seattle-Tacoma earthquake of April 29, 1965, had a Richter magnitude of 6.5 and produced a ground-shaking of intensity IV to VIII near its epicenter. The most recent significant event, the Nisqually earthquake of February 28, 2001, with a Richter magnitude of 6.8, also produced ground shaking with intensities up to VIII. This level of ground-shaking is estimated to be the maximum that has occurred in the region during the approximately 160 years of the historic record.

4.2 Site Seismic Design Classification

Per the procedures specified in Section 1615 of the 2012 International Building Code (IBC), we conclude that the project site should be assigned a seismic design classification of Site Class F due to the presence of up to approximately 20 feet of potentially liquefiable soils (as discussed below in **Section 4.3 - Liquefaction Assessment**). However, the soils below a depth of approximately 20 feet are very dense and are suitable for assigning Site Class C (Very Dense Soil profile) to the proposed development of the site if the structures are fully supported on the deeper, very dense soils.

4.3 Liquefaction Assessment

Liquefaction is a phenomenon where loose granular materials below the water table temporarily behave as a liquid due to strong shaking or vibrations, such as earthquakes. Clean, loose and saturated granular materials are the soil types susceptible to liquefaction phenomena.

During our site investigation, subsurface soil consisted of wet, very loose to medium dense fine sand, silty fine sand, and silt. Water saturated loose sandy soils were encountered from ground

surface to approximately 15 to 20 feet in the borings. Therefore, it is our opinion that the shallow subsurface sandy soils at the site are susceptible to liquefaction, based on the observed soil types, densities, and moisture contents. Soils at depths below approximately 20 feet are not likely to be susceptible to liquefaction, because these soils consist primarily of unsaturated silt, based on the information obtained during our investigation.

5.0 CONCLUSIONS AND RECOMMENDATIONS

5.1 General

Based on the findings from our site investigation activities, it is our opinion that the site can be developed with a single-family residence. However, due to the presence of wet, loose sandy soils at the site and the presence of steep slopes exhibiting groundwater seepage at the site, we recommend that the residence be supported on a deep foundation system comprised o small-diameter steel pipe piles and possibly helical soil anchors that are driven into the dense underlying soils and are connected to a system of grade beams.

We also recommend that the proposed residence be designed such that the least possible amount of disturbance is made to the site soils on the steep slope area and below the steep slope area where wet, loose sands are present. For this reason, we recommend that site grading be minimized to only the amount that is necessary to achieve construction access and to construct the improvements (including the driveway) consistent with permit requirements. The residence could be built essentially at-grade or on an above-grade pile-supported deck, for example. Excavations in areas where wet, soft soils are present will need to be gently sloped or supported, and accumulation of groundwater seepage in such excavations is likely and will need to be mitigated.

Our recommendations regarding geotechnical aspects of the proposed development are presented in the following sections of this report. These subjects include site preparation and earthwork, building support, site drainage, and pavements.

5.2 Grading and Earthwork

Site Preparation

Disturbance to the site soils should be kept to a minimum, and no disturbance should occur within 25 feet of the stream in the north part of the site. Erosion control measures should be implemented around areas disturbed by construction activity to prevent sediment-laden surface runoff from being discharged off-site.

To provide equipment access to the site and to the building area, we recommend that a temporary entrance pad be used to bridge over the soft soils at the site and also provide drainage to the subgrade. To prepare working pad, the surface soils should be excavated to a depth of at least two feet below existing grade. A layer of woven geotextile filter fabric, such as Mirafi 600X or equivalent, should be placed over the subgrade prior to placing the quarry spalls, to provide separation of materials and pad reinforcement.

Site Work During Wet Weather

We understand that earthwork at the project site may be subject to a seasonal moratorium, per City of Mercer Island development regulations. Under these circumstances, earthwork at the site should not performed during the period from October 1 to March 31, and the site should be stabilized against potential development-related earth movement, erosion, or off-site sedimentation before the start of the moratorium period.

Temporary Erosion and Sediment Control

Implementing and maintaining effective temporary erosion and sediment control measures should be performed by the contractor during construction. Clearing and grading should be limited to areas where construction will occur, to the extent possible. Temporary erosion control should be installed downhill from areas disturbed by construction activity to prevent sediment-laden runoff from being discharged off site. We recommend that sediment traps, filter fabric fences, check dams, straw mulch, hay bales, stabilized construction entrances, wash pads, and other appropriate erosion control devices be used to provide temporary sediment and erosion control.

Temporary Excavation and Slopes

Under no circumstances should temporary excavation slopes be greater than the limits specified in local, state and federal government safety regulations. Temporary cuts greater than four feet in height should be sloped at an inclination no steeper than 2.5H:1V (Horizontal:Vertical) in medium dense to dense unsaturated soils, and no steeper than 1H:1V in the stiff unsaturated silt soils, unless specifically reviewed and approved by the geotechnical engineer. Excavations into saturated soils should be avoided where possible, because engineered support of such cuts (such as with shoring) will probably be required. Permanent cut and fill slopes at the site should be inclined no steeper than 2.5H:1V in non-saturated, competent soils.

We recommend that temporary and permanent cuts in the soils on or in proximity to the steep slope on the southern part of the site be avoided where possible (and not extend into saturated soils where they are necessary), due to the loose and wet soil conditions in this area.

Surface runoff should not be allowed to flow uncontrolled over the top of slopes into the excavated area. During wet weather, exposed cut slopes should be covered with plastic sheeting during construction to minimize erosion. We recommend that a GEO Group Northwest, Inc., representative be on site during excavation of cut slopes to evaluate slope stability, due to the anticipated presence of groundwater seepage and loose soil conditions.

Structural Fill

All structural fill material used to achieve design site elevations below the building area and below non-structurally supported sidewalks, driveways, and patios, should meet the requirements for structural fill. During wet weather conditions, material to be used as structural fill should have the following specifications:

1. Be free draining, granular material containing no more than five (5) percent fines (silt and clay-size particles passing the No. 200 mesh sieve);
2. Be free of organic material and other deleterious substances;
3. Have a maximum size of three (3) inches in diameter.

The fill material should be placed at or near the optimum moisture content. The optimum moisture content is the water content in soil that enables the soil to be compacted to the highest dry density for a given compaction effort.

We anticipate that the on-site material will be unsuitable in its existing condition for use as structural fill, due to its high moisture content and the presence of silt and organics in much of the material. During dry weather, however, any compactable non-organic soil may be used as structural fill, provided the material is near its optimum moisture content for compaction purposes. It should be noted that an imported granular fill material may provide more uniformity and be easier to compact to structural fill specifications.

If the on-site soils are to be used as engineered structural fill, it will be necessary to segregate the topsoil and any other organic- or debris from the soil. Also, the soil will need to be moisture conditioned to bring it near to its optimum moisture content for compaction. Once it is suitably prepared, the soil will then need to be protected from weather and from contamination with unsuitable materials until it is used.

Structural fill should be placed in thin horizontal lifts not exceeding 10 inches in loose thickness. In areas having slopes greater than 15 percent, horizontal benches should be cut to competent native soil before the fill is placed, in order to prevent possible later lateral movement. Structural fill under building areas (including foundation and slab areas), should be compacted to at least 95 percent of the maximum density, as determined by ASTM Test Designation D-1557-91 (Modified Proctor). Structural fill under pavements should be compacted to at least 90 percent of the maximum density, except for the top one foot which should be compacted to at least 95 percent. We recommend that GEO Group Northwest, Inc., be retained to evaluate the suitability of structural fill material and to monitor the compaction work during construction for quality assurance of the earthwork.

5.3 Building Support

Based on the results from our investigation activities, it is our opinion that the proposed residence should be supported on a deep foundation system that is founded in the dense silty soils that were encountered in the borings completed for this study. Such a foundation system can consist of small-diameter steel pipe piles and possibly helical anchors to support a system of

structural grade beams. The pipe piles can provide vertical support to the residence; lateral support to the residence can be provided either by battered pipe piles or by helical anchors.

Small-Diameter Pipe Piles

Pipe piles are typically are installed by driving them with a jackhammer or other pneumatic-type hammer to a condition where the resistance of the soils encountered essentially terminate the advance of the piles (this condition is called "refusal"). The depth at which refusal is achieved is dependent upon 1) the type of pipe and hammer that are used, 2) the characteristics of the subsurface soil, and 3) the allowable load-bearing capacity to be provided by the pile.

We estimate that refusal depths for the piles will be in the range of about 25 to 30 feet. These estimated depths are based on the anticipation that substantial thicknesses of very stiff to hard silt soils or dense sand soils are present below depths of about 20 feet at the site. Due to the shallow groundwater conditions at the site, we recommend that galvanized pipe be used for the piles.

The following available driving hammers, pipe sizes, allowable bearing capacities, and installation refusal criteria are recommended for supporting the residence:

Pipe Pile Design Criteria

Pipe Diameter	Pipe Specification	Hammer Weight Class	Hammer Type	Refusal Criteria*	Allowable Capacity
2 inch	Schedule 80	140 pound	jackhammer	60 sec/inch	2 tons
3 inch	Schedule 40	650 pound	TB225**	12 sec/inch	6 tons
3 inch	Schedule 40	850 pound	TB325**	10 sec/inch	6 tons
4 inch	Schedule 40	850 pound	TB325**	16 sec/inch	10 tons
4 inch	Schedule 40	1100 pound	TB425**	10 sec/inch	10 tons
6 inch	Schedule 40	1500 pound	TB425**	20 sec/inch	15 tons

* = Maximum penetration rate to be sustained through at least 3 consecutive minutes of driving
** = Teledyne pneumatic hammer model number, or equivalent

We estimate that the maximum total post-construction settlement should be one-half (1/2) inch or less. No reduction in pile capacities is required if the pile spacing is at least three times the pile diameter. A one-third increase in the above allowable pile capacities can be used when considering short-term transitory wind or seismic loads.

Vertical pipe piles do not generate significant lateral capacities. Instead, lateral forces can be resisted by passive earth pressure acting on grade beams or footings and by friction with the subgrade soils, where acceptable subgrade soil conditions are present. To fully mobilize the passive pressure resistance, the grade beams or footings must be constructed directly against competent native soil or compacted fill. For these conditions, our recommended allowable passive soil pressure for lateral resistance is 350 pcf equivalent fluid weight. A coefficient of friction of 0.35 may be used between a competent native soil or compacted fill subgrade and the foundation.

We note that the loose, wet sand soils in the proposed residence location are not acceptable for providing the above-recommended condition, and would need to be replaced with an acceptable pad of compacted fill. Other options for resisting lateral loads include using either battered pipe piles or helical anchors. Recommendations regarding helical anchors are provided below.

The performance of pipe piles is dependent on how and to what bearing stratum the piles are installed. Since a completed pile in the ground cannot be observed, it is critical that judgment and experience be used as a basis for determining the driving refusal and acceptability of a pile. Therefore, we recommend that GEO Group Northwest, Inc., be retained to monitor the pile installation operation, collect and interpret installation data and verify suitable bearing stratum. We also suggest that the contractor's equipment and installation procedures be reviewed by GEO Group Northwest, Inc., prior to pile installation to help mitigate problems which may delay the progress of the work.

Helical Anchors

The foundation for the proposed residence can be horizontally restrained by installing helical anchors into the underlying soil. Helical anchors, such as those developed by the A. B. Chance Company and Atlas Systems, Inc., consist of a steel square shaft with one or more helices on the

anchor shaft. Lateral loads can be resisted by installing additional helical anchors either perpendicular to the slope face or at an inclination of 30 degrees from vertical.

The ultimate capacity for helical anchors should be determined and verified in the field by a geotechnical engineer based on the installation torque that is achieved during installation. For Chance helical anchors, the ultimate capacity can be determined by the following empirical relationship:

$$QULT = Kt * T$$

where Kt is the empirical factor (= 10 ft-1 for square shaft anchors); and T is the installation torque.

The allowable capacity of the Chance helical anchor may also be developed when sufficient torque is recorded during installation. For example, based on the empirical correlation developed by the A. B. Chance Company, an installation torque of 4,000 ft-lbs roughly correlates to an ultimate capacity of 20 tons. Thus, the allowable capacity for the installed anchor with a factor of safety of 2 with respect to its ultimate capacity is approximately 10 tons.

Based on the soil conditions encountered in the borings, we anticipate that the anchors may need to extend a minimum distance of about 15 feet into the underlying soils below the residence in order to attain acceptable load capacity. The allowable capacity of 5 tons for the anchors is based on a factor of safety of 2.0 with respect to the ultimate tensile capacities, developed behind a 15 feet long no-load zone for the anchors.

The performance of helical anchors is dependent on the method and to what bearing stratum the anchors are installed. Since a completed anchor in the ground cannot be observed, it is critical that judgment and experience be used as a basis for determining the acceptability of an anchor. Therefore, we recommend that GEO Group Northwest, Inc., be retained to monitor the anchor installation operations, collect and interpret installation data, and verify acceptable loading capacity for the anchor has been attained.

5.4 Building Floors

We recommend that building floors be structurally supported and connected to the foundation system.

5.5 Conventional Concrete Basement and Retaining Walls

GEO Group Northwest, Inc., anticipates that the proposed residence may have a daylight basement level, based on the preliminary plans we have seen for the proposed residence. Therefore, our recommendations regarding conventional concrete basement and retaining walls are provided below for your information. The following recommendations apply to walls that retain fully drained soils. If basement or retaining walls will be retaining saturated soils, then we should be consulted to provide applicable design parameters.

Conventional concrete retaining walls that are free to rotate on top should be designed for an active soil pressure. Permanent retaining walls that are restrained horizontally at the top (such as basement walls) are considered unyielding and should be designed for a lateral soil pressure under the at-rest condition. The walls should be supported on dense, native soils or structural fill. Soil parameters for the wall design are as follows:

Active Earth Pressure
35 pcf, equivalent fluid pressure, for level ground behind the wall;
50 pcf, equivalent fluid pressure, for 2H:1V backslope behind the wall

At-Rest Earth Pressure
45 pcf, equivalent fluid pressure, for level ground behind the wall;
60 pcf, equivalent fluid pressure, for 2H:1V backslope behind the wall

Passive Earth Pressure
350 pcf, equivalent fluid pressure, for medium dense to dense soil and structural fill.

Base Friction
0.35 for undisturbed, dense soil or structural fill.

Surcharge loads imposed on walls by traffic (including construction vehicles), nearby structures, or other conditions, should be added to the active and at-rest earth pressures stated above. Also, downward sloping ground in front of walls should be considered with regard to potentially reducing the value of the allowable passive earth pressure stated above.

To prevent the buildup of hydrostatic pressure behind permanent basement or conventional retaining walls, we recommend that a vertical drain mat, Miradrain 6000 or equivalent, be used to facilitate drainage behind the wall. The drain mat core is placed against the wall with the filter fabric side facing the backfill. The drain mat should extend from the finished surface grade, down to the footing drain. In addition to the vertical drain mat, a prism of clean, granular, free draining structural backfill material at least 18 inches wide should be placed against the wall. The free-draining backfill should extend downward to the footing drain.

The top 12 inches of the fill behind the wall should consist of compacted and relatively impermeable soil. This cap material can be separated from the underlying more granular drainage material by a geotextile fabric, if desired. Alternatively, the surface can be sealed with asphalt or concrete paving. The surface should be sloped to drain away from the building wall. A schematic illustration of the wall and drainage system is presented in Plate 6 - Basement and Retaining Wall Backfill and Drainage.

The backfill in areas adjacent to concrete retaining walls should be compacted with hand held equipment or a hoe-pack. Heavy compacting machines (such as a vibratory roller) should not be allowed within a horizontal distance to the wall equivalent to one half the wall height, unless the walls are designed with the added surcharge.

5.6 Drainage

The finished ground at the site should be graded such that surface water is directed off the site. Water should not be allowed to stand in any area where footings, slabs or pavements are to be constructed. During construction, loose surfaces should be sealed at night by compacting the surface to reduce the potential for moisture infiltration into the soils. Final site grades should allow drainage away from the building. We suggest that the ground be sloped at a gradient of three percent for a distance of at least ten feet away from the building except in areas that are to be paved.

5.7 Pavement Subgrade

We recommend that the driveway for the new residence be supported on a thickened base of compacted ballast rock (at least 24" thick) that is underlain and overlain with a layer of woven geotextile fabric, such as Mirafi 500X or equivalent. The pavement section can then be

constructed over the upper layer of geotextile. The pavement section can consist of at least 6 inches of base course overlain with at least 2 inches of asphalt.

6.0 LIMITATIONS

This report has been prepared for the specific application to the proposed development of the site decsribed herein, and for the exclusive use of Mr. William C. Summers of MI Treehouse, LLC, and his authorized representatives or agents. We recommend that this report be included in its entirety in the project contract documents for reference during construction.

Our findings and recommendations stated herein are based on field observations, our experience and judgment. The recommendations are our professional opinion derived in a manner consistent with the level of care and skill ordinarily exercised by other members of the profession currently practicing under similar conditions in this area and within the budget constraint. No warranty is expressed or implied. In the event the soil condition vary during site work, GEO Group Northwest, Inc. should be notified and the above recommendation should be re-evaluated.

7.0 ADDITIONAL SERVICES

We recommend that GEO Group Northwest Inc. be retained to perform a general review of the final design and specifications of the proposed development to verify that the earthwork, foundation, drainage, pavement, and other geotechnical recommendations are properly interpreted and incorporated into the design and construction documents and are appropriate for the finalized layout of the proposed development.

We also recommend that GEO Group Northwest Inc. be retained to provide monitoring and testing services for geotechnically-related work during construction. A GEO Group Northwest, Inc., representative should observe geotechnically-related construction work for compliance with the geotechnical recommendations in this report, and should be available to discuss and recommend design changes, if needed, in the event substance conditions differ from those anticipated prior to the start of construction.

Respectfully Submitted,

GEO Group Northwest, Inc.

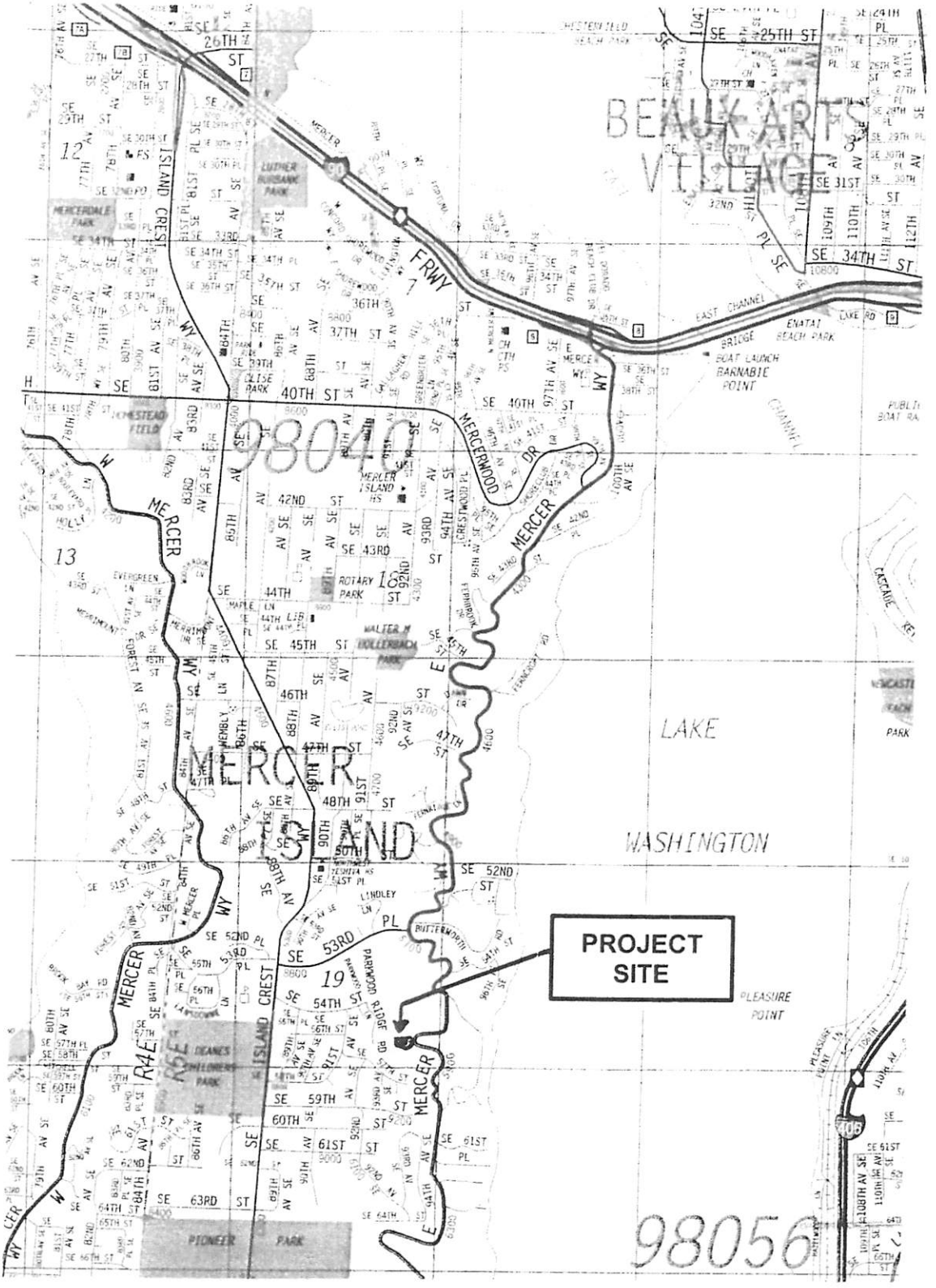
Keith Johnson
Geologist

William Chang, PE
Principal

PLATES

G-3827

GEO Group Northwest, Inc.



Source: Thomas Guide, 2007.

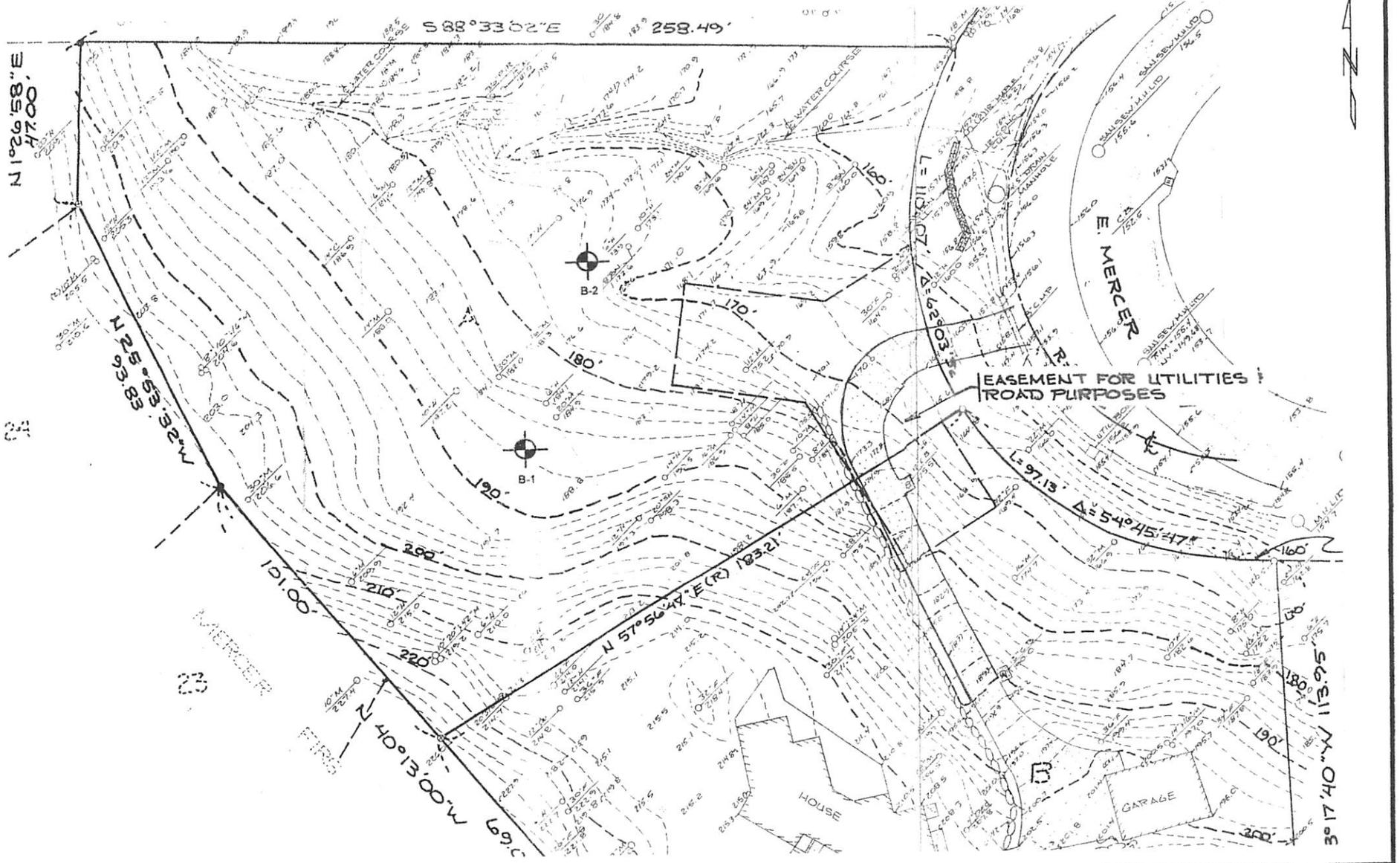
GEO Group Northwest, Inc.

Geotechnical Engineers, Geologists, & Environmental Scientists

SITE LOCATION MAP

PROPOSED RESIDENCE
5637 E. MERCER WAY
MERCER ISLAND, WASHINGTON

SCALE:	DATE:	MADE:	CHKD:	JOB NO:	PLATE
1" = 2,000'	3/11/2015	KJ	WC	G-3827	1



LEGEND

EXPLORATORY SOIL BORING DRILLED BY GEO GROUP
RTHWEST (APPROXIMATE LOCATION)

0 30 60
SCALE: 1 INCH = 30 FEET

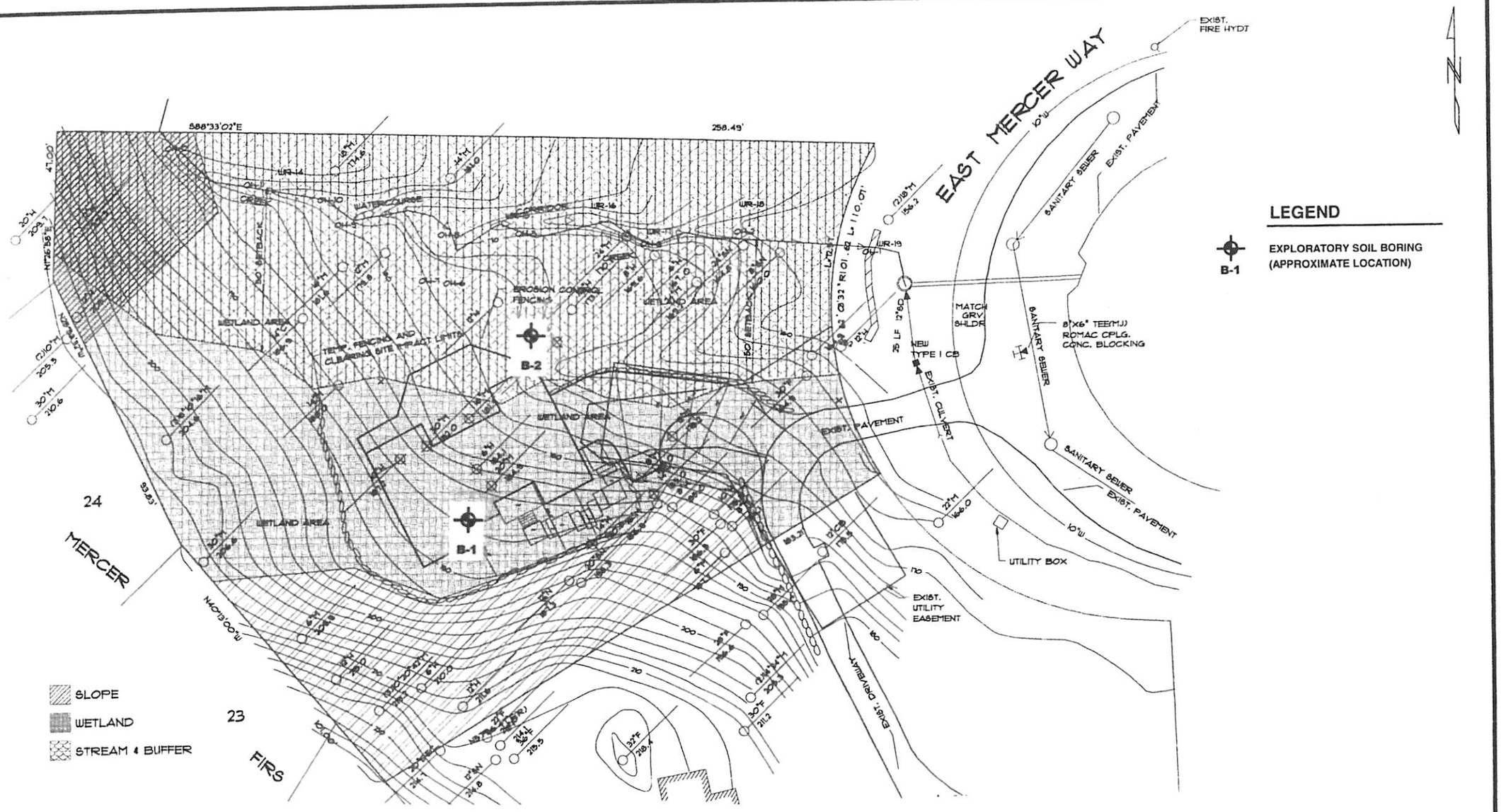
Portion of Lots A & B, Greg Newitt Short Plat (M.I.S.P. No. 77-1-010), by
fessional Land Surveyor, dated 1/16/98.

GEO Group Northwest, Inc.
Geotechnical Engineers, Geologists, & Environmental Scientists

SITE PLAN

PROPOSED RESIDENCE
5637 E. MERCER WAY
MERCER ISLAND, WASHINGTON

SCALE	1" = 30'	DRAWN BY	KJ	CHECKED BY	WC	DATE	3/10/2015	PROJECT NO.	G-3827	PLATE	2



Plan by Healy-Jorgensen Architects, dated 3/2/15.

LEGEND

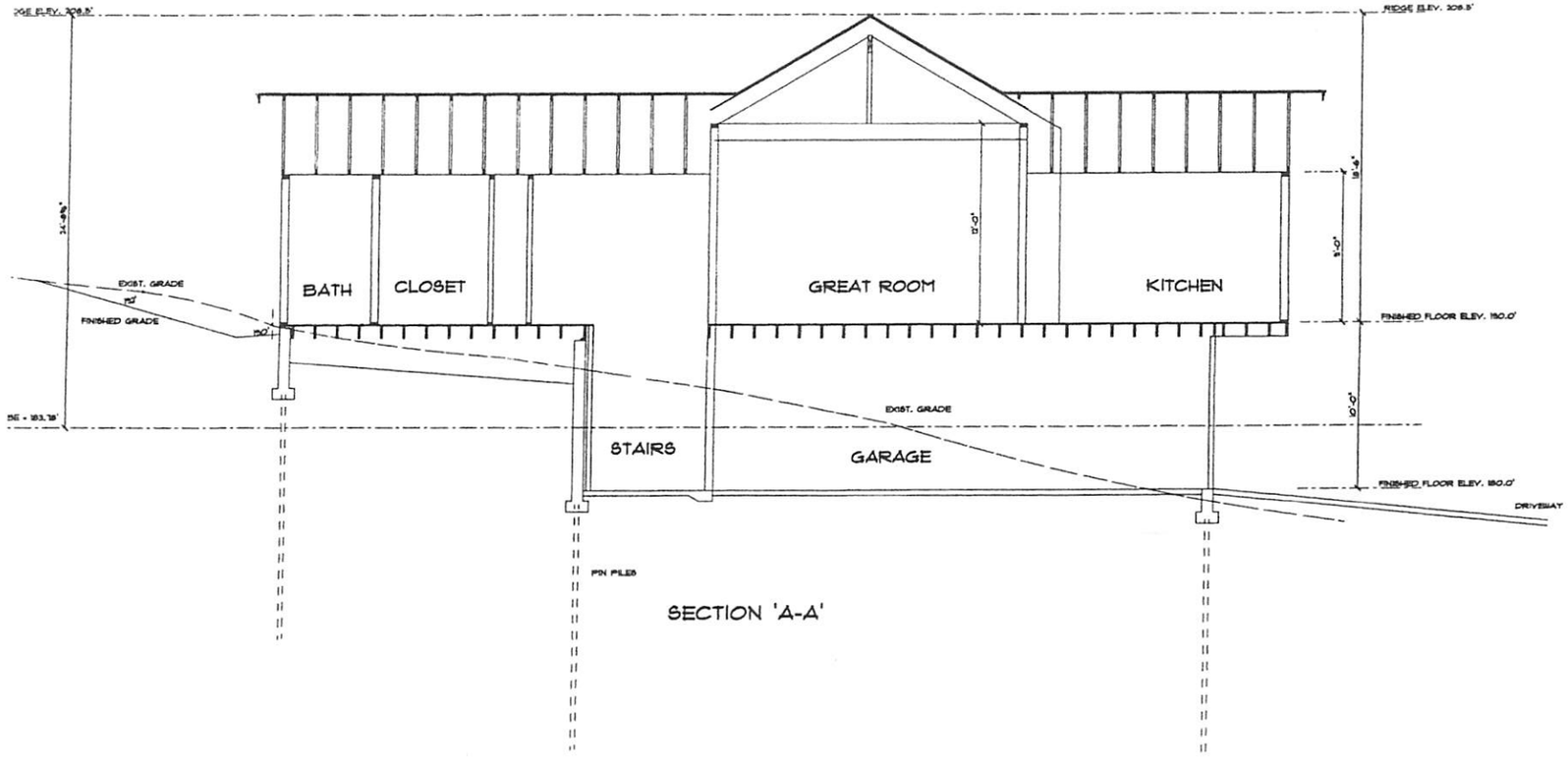
B-1 EXPLORATORY SOIL BORING (APPROXIMATE LOCATION)

GEO Group Northwest, Inc.
Geotechnical Engineers, Geologists, & Environmental Scientists

PROPOSED DEVELOPMENT PLAN

PROPOSED RESIDENCE
5637 E. MERCER WAY
MERCER ISLAND, WASHINGTON

SCALE	1" = 30'	DRAWN BY	KJ	CHECKED BY	WC	DATE	3/10/2015	PROJECT NO.	G-3827	PLATE	3



SECTION 'A-A'

Source: Section A - A' by Healy-Jorgensen Architects, dated 10/1/14.

GEO Group Northwest, Inc.
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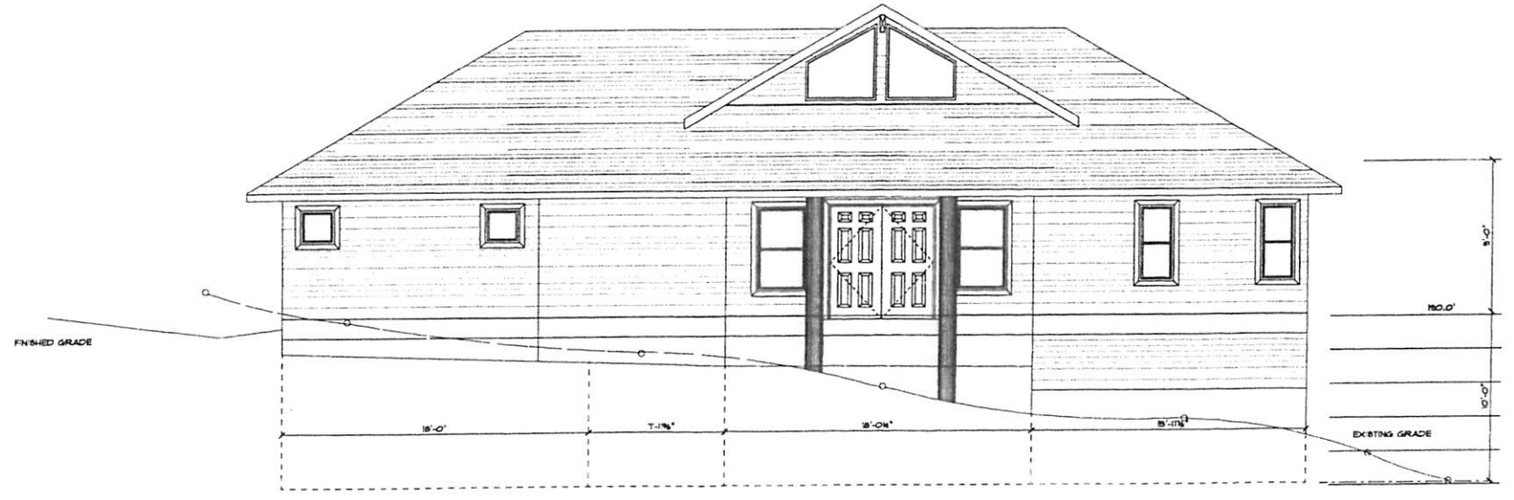
PROPOSED RESIDENCE SECTION

PROPOSED RESIDENCE
5637 E. MERCER WAY
MERCER ISLAND, WASHINGTON

SCALE	1" = 8'	DRAWN BY	KJ	CHECKED BY	WC	DATE	3/10/2015	PROJECT NO.	G-3827	PLATE	4

NORTH ELEVATION



SOUTH ELEVATION

.levations, by Healy-Jorgensen Architects, dated 10/1/14.

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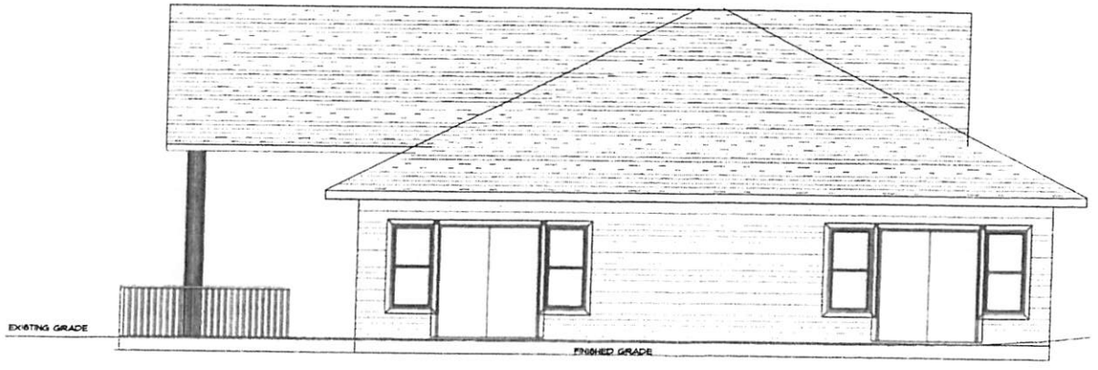
NORTH & SOUTH ELEVATIONS

PROPOSED RESIDENCE
5637 E. MERCER WAY
MERCER ISLAND, WASHINGTON

SCALE	1" = 8'	DRAWN BY	KJ	CHECKED BY	WC	DATE	3/10/2015	PROJECT NO.	G-3827	PLATE	5A

EAST ELEVATION



WEST ELEVATION

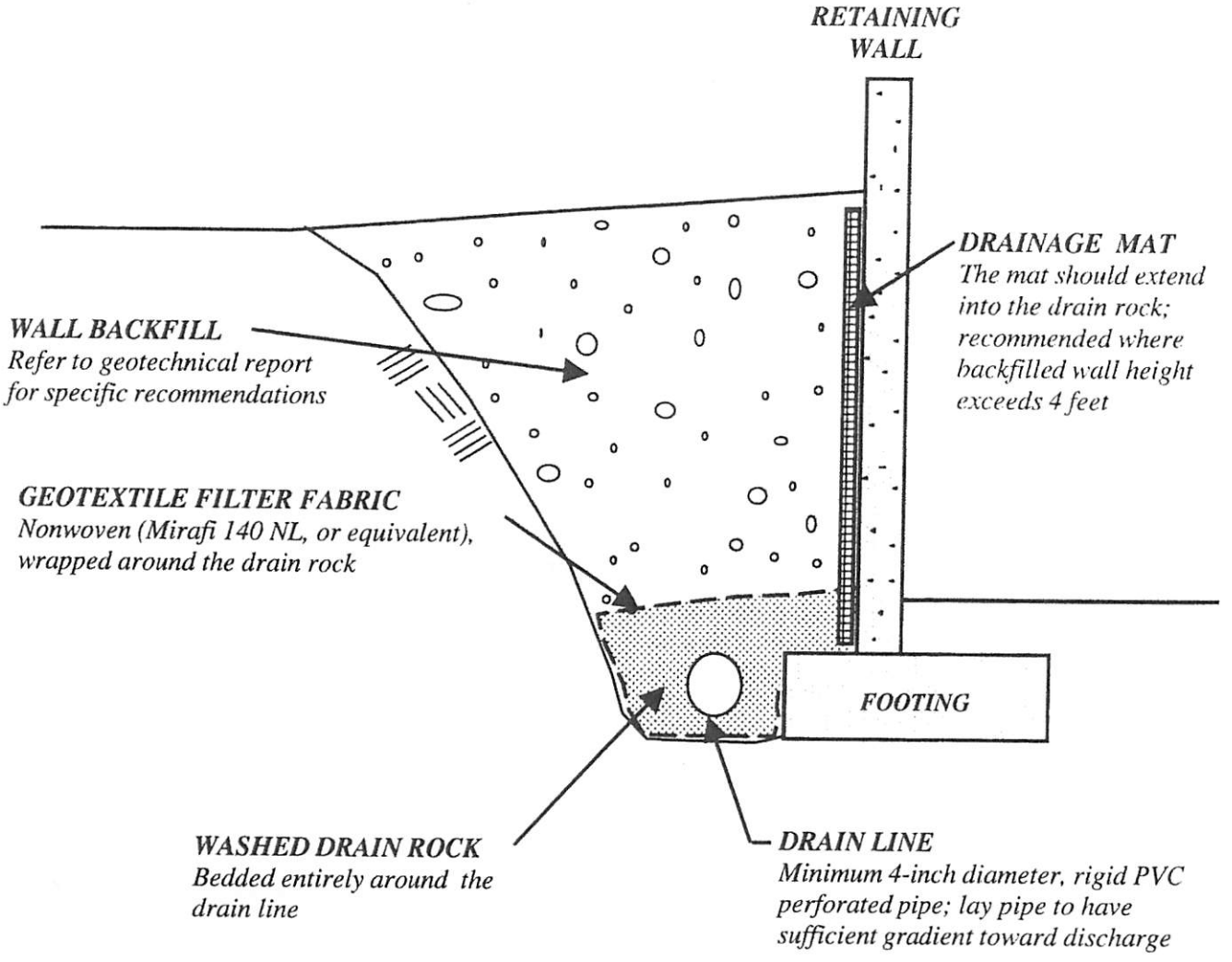
Source: East - West Elevations, by Healy-Jorgensen Architects, dated 10/1/14.

GEO Group Northwest, Inc.
Geotechnical Engineers, Geologists, & Environmental Scientists

EAST & WEST ELEVATIONS

PROPOSED RESIDENCE
5637 E. MERCER WAY
MERCER ISLAND, WASHINGTON

SCALE	1" = 8'	DRAWN BY	KJ	CHECKED BY	WC	DATE	3/10/2015	PROJECT NO.	G-3827	PLATE	5B



NOT TO SCALE

NOTES:

1.) Do not replace rigid PVC pipe with flexible corrugated plastic pipe.

2.) Perforated PVC pipe should be tight jointed and laid with perforations oriented downward. The pipe should be gently sloped to provide flow toward the tightline or discharge location.

3.) Do not connect other drain lines into the footing drain system.

4.) Backfill should meet structural fill specifications if it will support driveways, sidewalks, patios, or other structures. Refer to the geotechnical engineering report for structural fill recommendations.

GEO Group Northwest, Inc. Geotechnical Engineers, Geologists, & Environmental Scientists			TYPICAL BASEMENT AND RETAINING WALL BACKFILL AND DRAINAGE PROPOSED RESIDENCE 5637 E. MERCER WAY MERCER ISLAND, WASHINGTON			
SCALE NONE	DATE 3/11/2015	MADE KJ	CHKD WC	JOB NO. G-3827	PLATE 6	

ATTACHMENT A

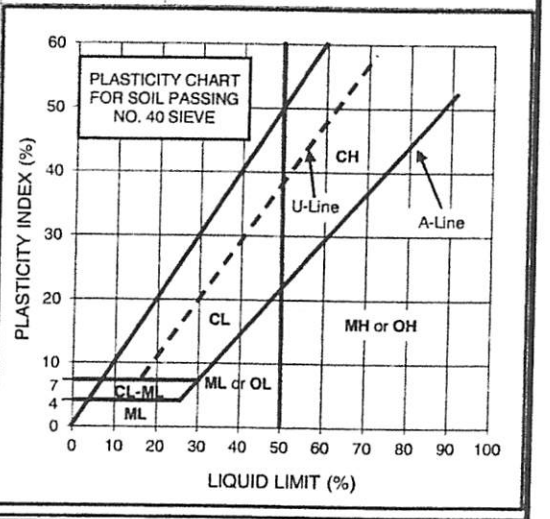
G-3827

BORING LOGS

SOIL CLASSIFICATION & PENETRATION TEST DATA EXPLANATION

UNIFIED SOIL CLASSIFICATION SYSTEM (USCS)

MAJOR DIVISION			GROUP SYMBOL	TYPICAL DESCRIPTION	LABORATORY CLASSIFICATION CRITERIA	
COARSE-GRAINED SOILS	GRAVELS (More Than Half Coarse Fraction is Larger Than No. 4 Sieve)	CLEAN GRAVELS (little or no fines)	GW	WELL GRADED GRAVELS, GRAVEL-SAND MIXTURE, LITTLE OR NO FINES	CONTENT OF FINES BELOW 5%	Cu = (D60 / D10) greater than 4 Cc = $(D30)^2$ / (D10 * D60) between 1 and 3
			GP	POORLY GRADED GRAVELS, AND GRAVEL-SAND MIXTURES LITTLE OR NO FINES		CLEAN GRAVELS NOT MEETING ABOVE REQUIREMENTS
		DIRTY GRAVELS (with some fines)	GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES	CONTENT OF FINES EXCEEDS 12%	GM: ATTERBERG LIMITS BELOW "A" LINE. or P.I. LESS THAN 4
			GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES		GC: ATTERBERG LIMITS ABOVE "A" LINE. or P.I. MORE THAN 7
More Than Half by Weight Larger Than No. 200 Sieve	SANDS (More Than Half Coarse Fraction is Smaller Than No. 4 Sieve)	CLEAN SANDS (little or no fines)	SW	WELL GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES	CONTENT OF FINES BELOW 5%	Cu = (D60 / D10) greater than 6 Cc = $(D30)^2$ / (D10 * D60) between 1 and 3
			SP	POORLY GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES		CLEAN SANDS NOT MEETING ABOVE REQUIREMENTS
		DIRTY SANDS (with some fines)	SM	SILTY SANDS, SAND-SILT MIXTURES	CONTENT OF FINES EXCEEDS 12%	ATTERBERG LIMITS BELOW "A" LINE with P.I. LESS THAN 4
			SC	CLAYEY SANDS, SAND-CLAY MIXTURES		ATTERBERG LIMITS ABOVE "A" LINE with P.I. MORE THAN 7
FINE-GRAINED SOILS	SILTS (Below A-Line on Plasticity Chart, Negligible Organics)	Liquid Limit < 50%	ML	INORGANIC SILTS, ROCK FLOUR, SANDY SILTS OF SLIGHT PLASTICITY		
		Liquid Limit > 50%	MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS, FINE SANDY OR SILTY SOIL		
	CLAYS (Above A-Line on Plasticity Chart, Negligible Organics)	Liquid Limit < 50%	CL	INORGANIC CLAYS OF LOW PLASTICITY, GRAVELLY, SANDY, OR SILTY CLAYS, CLEAN CLAYS		
		Liquid Limit > 50%	CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS		
Less Than Half by Weight Larger Than No. 200 Sieve	ORGANIC SILTS & CLAYS (Below A-Line on Plasticity Chart)	Liquid Limit < 50%	OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY		
		Liquid Limit > 50%	OH	ORGANIC CLAYS OF HIGH PLASTICITY		
HIGHLY ORGANIC SOILS			Pt	PEAT AND OTHER HIGHLY ORGANIC SOILS		



SOIL PARTICLE SIZE

FRACTION	U.S. STANDARD SIEVE			
	Passing		Retained	
	Sieve	Size (mm)	Sieve	Size (mm)
SILT / CLAY	#200	0.075		
SAND				
FINE	#40	0.425	#200	0.075
MEDIUM	#10	2.00	#40	0.425
COARSE	#4	4.75	#10	2.00
GRAVEL				
FINE	0.75"	19	#4	4.75
COARSE	3"	76	0.75"	19
COBBLES	76 mm to 203 mm			
BOULDERS	> 203 mm			
ROCK FRAGMENTS	> 76 mm			
ROCK	>0.76 cubic meter in volume			

GENERAL GUIDANCE FOR ENGINEERING PROPERTIES OF SOILS, BASED ON STANDARD PENETRATION TEST (SPT) DATA

SANDY SOILS				SILTY & CLAYEY SOILS		
Blow Counts N	Relative Density, %	Friction Angle ϕ, degrees	Description	Blow Counts N	Unconfined Strength q_u, tsf	Description
0 - 4	0 -15		Very Loose	< 2	< 0.25	Very soft
4 - 10	15 - 35	26 - 30	Loose	2 - 4	0.25 - 0.50	Soft
10 - 30	35 - 65	28 - 35	Medium Dense	4 - 8	0.50 - 1.00	Medium Stiff
30 - 50	65 - 85	35 - 42	Dense	8 - 15	1.00 - 2.00	Stiff
> 50	85 - 100	38 - 46	Very Dense	15 - 30	2.00 - 4.00	Very Stiff
				> 30	> 4.00	Hard

GEO Group Northwest, Inc.
Geotechnical Engineers, Geologists, & Environmental Scientists
13240 NE 20th Street, Suite 10, Bellevue, WA 98005
Phone (425) 649-8757 Fax (425) 649-8758

PLATE A1

BORING NO. B-1

Logged By: KJ Date Drilled: 8/10/1999 Surface Elev. 187 feet +/-

Depth ft.	USCS Code	Description	Sample Type	Sample No.	Blow Count per 6-inches	Water Content %	Other Tests & Comments
	OL	Organic topsoil, very soft, wet, black.					
	SM	SILTY SAND, very loose, wet, fine grained sand, 20-25% fines, trace black organics, occasional gray lenses, brown.		S1	1,1,1 (N=2)	44.4	
				S2	1/12",1 (N=1)	27.0	
5	SP-SM	SAND, loose, wet, 10% fines, fine grained, mottled gray and brown.		S3	1,2,3 (N=5)	28.0	
	SP-SM	As above, medium dense, 5-10% fines.		S4	5,6,6 (N=12)	29.2	
10	SP-SM	As above, 2.5 feet of sand heave into hole.		S5	5,6,9 (N=15)	27.9	
15	SM	SILTY SAND, medium dense to dense, moist to wet, 20% fines, very fine to fine grained sand, brownish gray.		S6	9,15, 16,28 (N=31*)	25.8	* = Blow counts may be affected by sand heave.
20		Bottom of boring: 17 feet. Drilling Method: Hollow-stem auger 0 to 17 feet. Sampling Method: 2-inch-O.D. standard penetration sampler driven using a 140 lb. hammer with a 30-inch drop. Groundwater encountered near ground surface during drilling. Boring backfilled with bentonite chips.					
25							
30							
35							
40							

LEGEND:
- 2" O.D. Split-Spoon Sampler
- 3" O.D. Shelby-Tube Sampler
- 3" O.D. California Sampler

GROUNDWATER OBSERVATION WELL:
- seal
- measured water level
- well tip (screen)

GEO Group Northwest, Inc.
Geotechnical Engineers, Geologists, & Environmental Scientists

BORING LOG

PROPOSED RESIDENCE
5637 E. MERCER WAY
MERCER ISLAND, WASHINGTON

JOB NO. G-3827	DATE 3/11/2015	PLATE A2

BORING NO. B-2

Logged By: KJ Date Drilled: 8/10/1999 Surface Elev. 176 feet +/-

Depth ft.	USCS Code	Description	Sample Type	Sample No.	Blow Count per 6-inches	Water Content %	Other Tests & Comments
	OL	Very soft, moist, black, organic topsoil and red decomposed wood, poor sample recovery.			1/18" (N=0)		Poor recovery.
5	SP-SM	SAND, loose, wet, fine to medium grained, 10-15% fines, rust-colored oxide staining, some black organics, brown.		S1	1,2,2 (N=4)	34.6	
	SP-SM	As above, loose.		S2	4,3,5 (N=8)	23.6	
10	SP-SM	As above, medium dense, trace coarse sand.		S3	4,7,9 (N=16)	21.4	
	SP	As above, loose, 5% fines, fine grained, grayish brown.		S4	4,4,4 (N=8)	27.4	
15	SM	SILTY SAND, loose, wet, fine to medium grained sand, 20-25% fines, trace small wood chips, rare coarse sand, trace reddish oxide staining, dark gray.		S5	3,2,3 (N=5)	23.8	
20	ML	SILT, stiff, damp to moist, trace fine sand, contains wet sand lenses, dark gray.		S6	5,11,12 (N=23)	30.6	
25	ML	As above, occasionally laminated (some brown laminae and organics, some wet sand lenses.		S7	5,9,10 (N=19)	28.1	
30		Bottom of boring: 27 feet. Drilling Method: Hollow-stem auger 0 to 27 feet. Sampling Method: 2-inch-O.D. standard penetration sampler driven using a 140 lb. hammer with a 30-inch drop. Groundwater encountered near ground surface during drilling. Boring backfilled with bentonite chips.					
35							
40							

LEGEND:
- 2" O.D. Split-Spoon Sampler
- 3" O.D. Shelby-Tube Sampler
- 3" O.D. California Sampler

GROUNDWATER OBSERVATION WELL:
- seal
- measured water level
- well tip (screen)

GEO Group Northwest, Inc.
Geotechnical Engineers, Geologists, & Environmental Scientists

BORING LOG

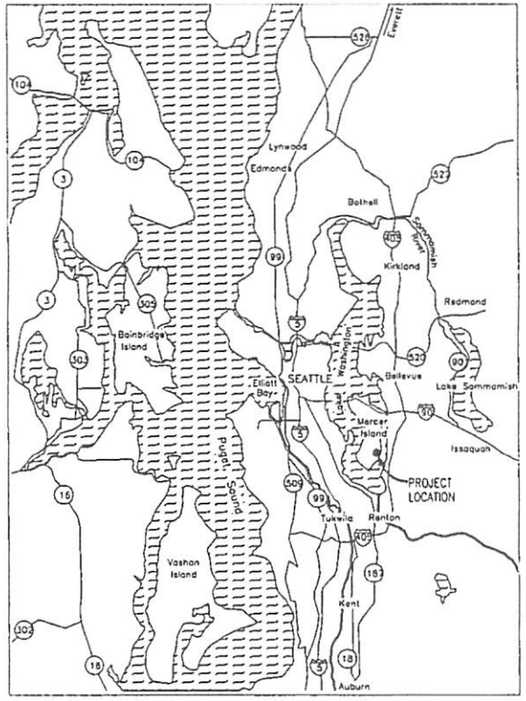
PROPOSED RESIDENCE
5637 E. MERCER WAY
MERCER ISLAND, WASHINGTON

JOB NO. G-3827 DATE 3/11/2015 PLATE A3

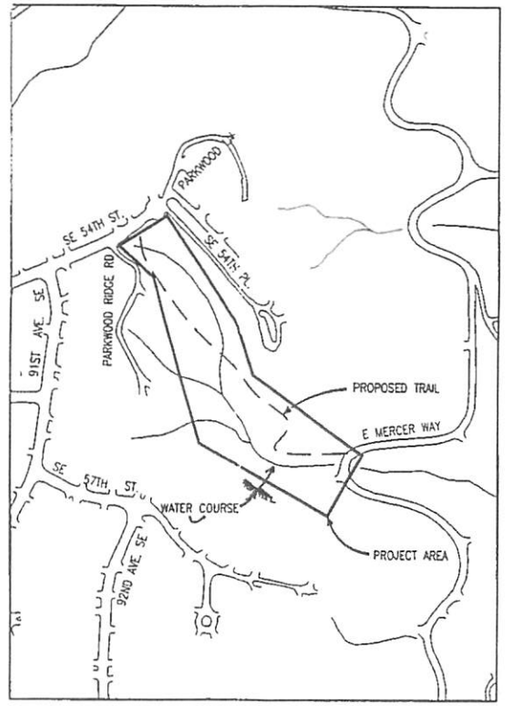
CITY OF MERCER ISLAND

PARKWOOD TRAIL & SUBBASIN 45B WATERCOURSE STABILIZATION PROJECT (WD 526C)

JUNE 2007



LOCATION MAP
SCALE: NTS



VICINITY MAP
SCALE: NTS

CITY OF MERCER ISLAND WASHINGTON

SHEET INDEX

DESIGNED: SBS
DRAWN: JF/PM
VERIFY SCALE: BAR IS ONE INCH ON ANSI "D" DRAWING

REV	DATE	CHK'D	APP'D	REVISION DESCRIPTION
0	6/15/07			ISSUED FOR BID

JACK C. BJORK STATE OF WASHINGTON 12178 REGISTERED PROFESSIONAL ENGINEER
EXPIRES 6-30-

R·W·BECK
R.W. Beck, Inc.
1001 Fourth Avenue, Suite 2500
Seattle, WA 98154-1004
(206) 695-4700

CITY OF MERCER ISLAND
PARKWOOD TRAIL AND SUBBASIN
45B WATERCOURSE STABILIZATION PROJECT

TITLE SHEET

PROJECT NUMBER: 11-01026-10000
SHT. 1 OF: 11
DRAWING NUMBER: G-1

GENERAL NOTES

1. FIELD SURVEY AND MAPPING PERFORMED BY CHS ENGINEERS, LLC.
2. APPROXIMATE LOCATION OF UNDERGROUND UTILITIES OR STRUCTURES SHOWN. THE CONTRACTOR SHALL TAKE ALL NECESSARY PRECAUTIONARY MEASURES TO PROTECT THE UTILITIES OR STRUCTURES SHOWN AND ANY OTHER UTILITIES OR STRUCTURES ON THE PROJECT SITE.
3. ALL WORK SHALL BE PERFORMED IN ACCORDANCE WITH APPLICABLE LOCAL, STATE, AND FEDERAL LAWS. ALL WORK SHALL CONFORM TO THE STANDARD SPECIFICATIONS.
4. THE CONTRACTOR SHALL BE RESPONSIBLE FOR LOCATING ALL EXISTING UNDERGROUND UTILITIES. CALL UNDERGROUND UTILITY LOCATE SERVICE AT TELEPHONE NUMBER 1-800-424-5555 A MINIMUM OF TWO WORKING DAYS PRIOR TO ANY EXCAVATION.
5. OVERHEAD ELECTRICAL POWER, TELEPHONE, CABLE TV, AND OTHER OVERHEAD LINES ARE GENERALLY NOT SHOWN. DETERMINE THE EXTENT OF HAZARDS OR IMPACTS ON CONSTRUCTION ACTIVITIES CREATED BY OVERHEAD OR UNDERGROUND ELECTRICAL POWER, TELEPHONE, CABLE TV, AND OTHER LINES IN ALL AREAS, AND FOLLOW PROCEDURES DURING CONSTRUCTION AS REQUIRED BY LAW AND REGULATIONS. TAKE WHATEVER PRECAUTIONS AND REMEDIAL MEASURES THAT MAY BE REQUIRED TO PROTECT PERSONS AND PROPERTY AND TO AVOID DISRUPTION OF SERVICE.
6. MATERIALS REQUIRED FOR FILL, BACKFILL, AND OTHER WORK WILL BE SECURED BY THE CONTRACTOR FROM A SITE MEETING ALL OF THE REQUIREMENTS USED IN THE SPECIFICATIONS. THE SITE WILL MEET THE LOCAL, STATE, AND FEDERAL REGULATIONS REQUIRING HEALTH, SAFETY, AND THE PUBLIC WELFARE.
7. BYPASS FLOWS DURING THE CONSTRUCTION, AND DURING THE REPLACEMENT, MODIFICATION, OR RESTORATION OF EXISTING FACILITIES.
8. NO WORK SHALL COMMENCE PRIOR TO A PRE-CONSTRUCTION CONFERENCE AT THE CITY OF MERCER ISLAND.

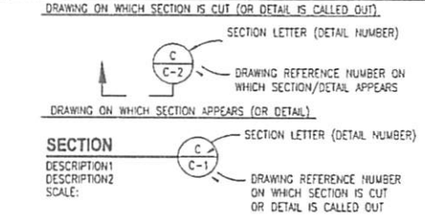
SURVEY INFORMATION

1. BASIS OF BEARINGS AND BOUNDARY CONTROL: PLAT OF PARKWOOD ESTATES, V.63, PG. 86-87; PLAT OF PARKWOOD RIDGE, V.76, PG. 81-82.
2. DATUM: NAVD 1929.
3. BENCHMARK: MI 1071 – BRASS NAIL WITH PUNCH IN CONCRETE IN MONUMENT CASE AT INTERSECTION OF ISLAND CREST WAY AND SE 54TH STREET.
4. BENCHMARK: 284-3-1 – NORTHEAST CORNER OF 4"x4" CONCRETE MONUMENT, 0.04+/- ABOVE BRASS, IN CASE AT INTERSECTION OF SE 54TH STREET AND 91ST AVE SE., ELEV 342.56

CONSTRUCTION NOTES

1. VERIFY THE LOCATIONS, ELEVATIONS, DIAMETERS, MATERIALS, AND OTHER PARAMETERS OF EXISTING FACILITIES TO WHICH NEW FACILITIES CONNECT BEFORE ORDERING MATERIALS.
2. IN-WATER WORK TO BE CONSTRUCTED DURING PERIOD IDENTIFIED IN HPA PERMIT (JUNE 16 TO SEPTEMBER 30).
3. MAINTAIN A MINIMUM ONE LANE OF TRAFFIC ACCESS AT ALL TIMES ON EAST MERCER WAY THROUGH PROJECT AREA DURING CONSTRUCTION. SEE SPECIFICATIONS FOR TRAFFIC CONTROL REQUIREMENTS.
4. GROUNDWATER WILL BE ENCOUNTERED DURING WORK.

SECTION INDICATOR AND DETAIL CONVENTION



TEMPORARY EROSION AND SEDIMENT CONTROL NOTES

1. THE IMPLEMENTATION OF THE TESC PLANS, AND THE CONSTRUCTION, MAINTENANCE, REPLACEMENT, UPGRADING, AND REMOVAL OF THE TESC FACILITIES IS THE RESPONSIBILITY OF THE CONTRACTOR UNTIL ALL CONSTRUCTION IS APPROVED AND THE SITE IS STABILIZED.
2. THE BOUNDARIES OF THE CONSTRUCTION LIMITS SHOWN ON THE PLANS SHALL BE CLEARLY FLAGGED PRIOR TO CONSTRUCTION. NO DISTURBANCE BEYOND THE CONSTRUCTION LIMITS IS ALLOWED. THE CLEARING LIMITS SHALL BE MAINTAINED BY THE CONTRACTOR FOR THE DURATION OF CONSTRUCTION.
3. THE TESC FACILITIES MUST BE CONSTRUCTED PRIOR TO, AND IN CONJUNCTION WITH, ALL WORK SO AS TO ENSURE THAT THE TRANSPORT OF SEDIMENT IS MINIMIZED.
4. THE TESC FACILITIES SHALL BE INSPECTED DAILY BY THE CONTRACTOR, AND MAINTAINED TO INSURE CONTINUED PROPER FUNCTIONING.
5. ANY AREAS OF EXPOSED SOILS, INCLUDING ROADWAY EMBANKMENTS, THAT WILL NOT BE DISTURBED FOR SEVEN DAYS OR MORE, SHALL BE STABILIZED WITH APPROVED TESC METHODS (E.G., SEEDING, MULCHING, PLASTIC COVERING).
6. ANY AREA NEEDING TESC MEASURES THAT DO NOT REQUIRE ATTENTION SHALL BE ADDRESSED WITHIN SEVEN (7) DAYS.
7. THE TESC FACILITIES ON INACTIVE SITES SHALL BE INSPECTED AND MAINTAINED A MINIMUM OF ONCE A MONTH, OR WITHIN FORTY-EIGHT (48) HOURS FOLLOWING A STORM EVENT.
8. AT NO TIME SHALL MORE THAN 3 FEET OF SEDIMENT BE ALLOWED TO ACCUMULATE WITHIN A SEDIMENT TRAP.
9. STABILIZED CONSTRUCTION ENTRANCES SHALL BE USED WHERE POSSIBLE WHERE VEHICLES WILL EXIT A CONSTRUCTION AREA ONTO PAVEMENT. STABILIZED CONSTRUCTION ENTRANCES SHALL BE IN ACCORDANCE WITH STANDARD PLAN I-14.
10. THE PAVEMENT SHALL BE CLEANED AT THE END OF EACH CONSTRUCTION DAY IF SEDIMENT IS DEPOSITED ONTO THE PAVEMENT DUE TO CONSTRUCTION ACTIVITY AND/OR VEHICLES.
11. WHERE STRAW MULCH FOR TEMPORARY EROSION CONTROL IS REQUIRED, IT SHALL BE APPLIED AT A MINIMUM THICKNESS OF 2 TO 3 INCHES.
12. UPON CONCLUSION OF CONSTRUCTION, THE CONSTRUCTION STAGING AREA SHALL BE RETURNED TO ITS PRE-CONSTRUCTION CONDITION AT A MINIMUM. ANY AREAS OF EXPOSED SOILS SHALL BE STABILIZED AND SEEDED.
13. REFUELING AND MAINTENANCE OF CONSTRUCTION EQUIPMENT SHALL OCCUR A MINIMUM OF 20 FEET AWAY FROM ANY STREAM.
14. SILT FENCES SHALL BE INSTALLED AT THE LOCATIONS INDICATED BY THE ENGINEER IN THE FIELD. SILT FENCES SHALL BE IN ACCORDANCE WITH STANDARD PLAN I-4, SILT FENCE.
15. INSTALL SEDIMENT TRAP AT THE DOWNSTREAM END OF THE STREAM CONSTRUCTION. SEDIMENT TRAP SHALL BE IN ACCORDANCE WITH STANDARD PLAN I-14. WATER COLLECTED IN THE SEDIMENT TRAP SHALL BE DISCHARGED OUT OF THE CONSTRUCTION AREA AT LESS THAN 50 NTU TURBIDITY. CONTRACTOR SHALL PREPARE A SEDIMENT TRAP DESIGN AND SUBMIT IT TO THE ENGINEER TO REVIEW. NO EARTH-DISTURBING ACTIVITY SHALL OCCUR PRIOR TO THE APPROVAL OF THE SEDIMENT POND PLAN.
16. TESC MEASURES (E.G., SEDIMENT TRAP, SILT FENCES, FLAGGING, STABILIZED CONSTRUCTION ENTRANCES) SHALL BE COMPLETELY REMOVED UPON COMPLETION OF THE CONSTRUCTION UNLESS INDICATED OTHERWISE BY THE ENGINEER.
17. TESC MEASURES SHALL BE USED WHERE APPROPRIATE IN THE CONSTRUCTION AREA. CONTRACTOR SHALL PREPARE AN EROSION AND SEDIMENT CONTROL PLAN, AND SUBMIT IT TO THE ENGINEER FOR APPROVAL. NO MATERIALS SHALL BE BROUGHT INTO THE SITE PRIOR TO APPROVAL OF THE TESC PLAN.

ABBREVIATIONS

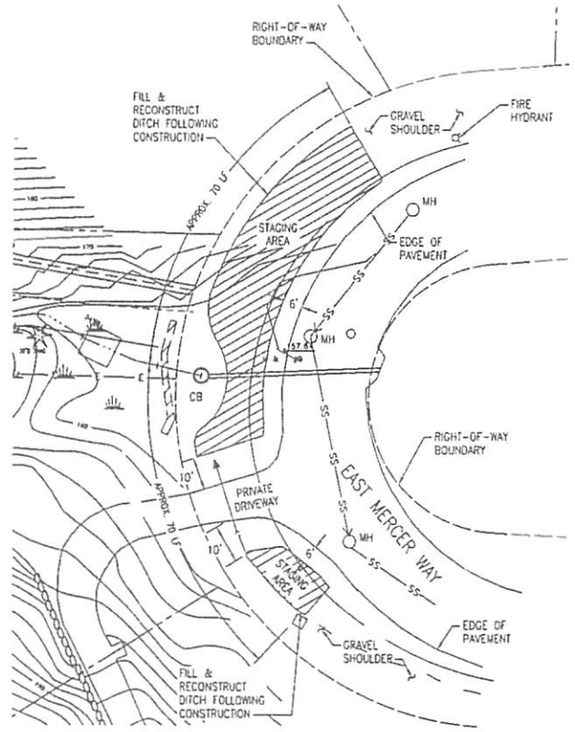
AC	ASBESTOS CEMENT
APPROX	APPROXIMATE
AVE	AVENUE
AVG	AVERAGE
BC	BOULDER CASCADE
C	CONIFEROUS TREE
CB	CATCH BASIN
CL	CENTERLINE
CONC	CONCRETE
CMP	CORRUGATED METAL PIPE
CY	CUBIC YARD
D	DECIDUOUS TREE
DIA, DIAM	DIAMETER
DWG	DRAWING
E	EAST
EL, ELEV	ELEVATION
ENGR	ENGINEER
EXIST, EX	EXISTING
FT	FEET
GC	GRADE CONTROL LOG
H&T	HUB AND TACK
HDPE	HIGH DENSITY POLYETHYLENE
HORIZ	HORIZONTAL
IN	INCH
IE	INVERT ELEVATION
LWD	LARGE WOODY DEBRIS
MAX	MAXIMUM
MH	MANHOLE
MIN	MINIMUM
MON	MONUMENT
N	NORTH
NE	NORTHEAST
NO	NUMBER
NTS	NOT TO SCALE
PL	PLACE, PROPERTY LINE
PVC	POLYVINYL CHLORIDE
S	SOUTH, SLOPE
SD	STORM DRAIN
SE	SOUTHEAST
SF	SQUARE FEET
SS	SANITARY SEWER
STA	STATION
ST	STREET
TESC	TEMPORARY EROSION AND SEDIMENT CONTROL
TYP	TYPICAL
VERT	VERTICAL
W	WEST, WATER
WSEL	WATER SURFACE ELEVATION

LINE TYPES

- PERMANENT EASEMENT
- PROPERTY BOUNDARY
- WATERCOURSE CENTERLINE
- CONSTRUCTION LIMITS
- EDGE OF FILLED CHANNEL
- WETLAND BOUNDARY
- SANITARY SEWER (EXIST)
- SANITARY SEWER (NEW)

LEGEND

DESCRIPTION	SYMBOL
EXISTING LOG REUSED	
CONIFEROUS TREE	
DECIDUOUS TREE	
LOG AND NUMBER	
BOULDER	
WATERCOURSE STABILIZATION LIMITS	
ROOT WAD	
WETLAND	



STAGING PLAN
SCALE: 1"=20'

1"=20'-0" 20 0 20 40
Scale Feet

DESIGNED					
SBS					
DRAWN					
JF/PM					
VERIFY SCALE BAR IS ONE INCH ON ANSI "D" DRAWING 0 1"					90% SUBMITTAL
	0	6/15/07			ISSUED FOR BID
	REV	DATE	CHK'D	APP'D	REVISION DESCRIPTION

JACK C. BJORK, STATE OF WASHINGTON, 12139, REGISTERED PROFESSIONAL ENGINEER
EXPIRES 6-30-

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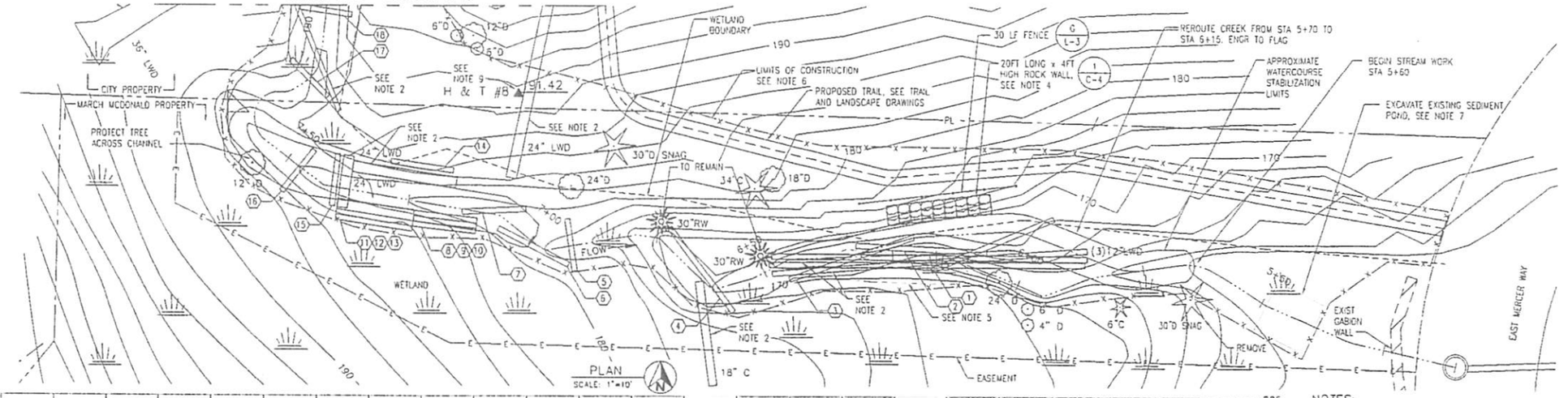
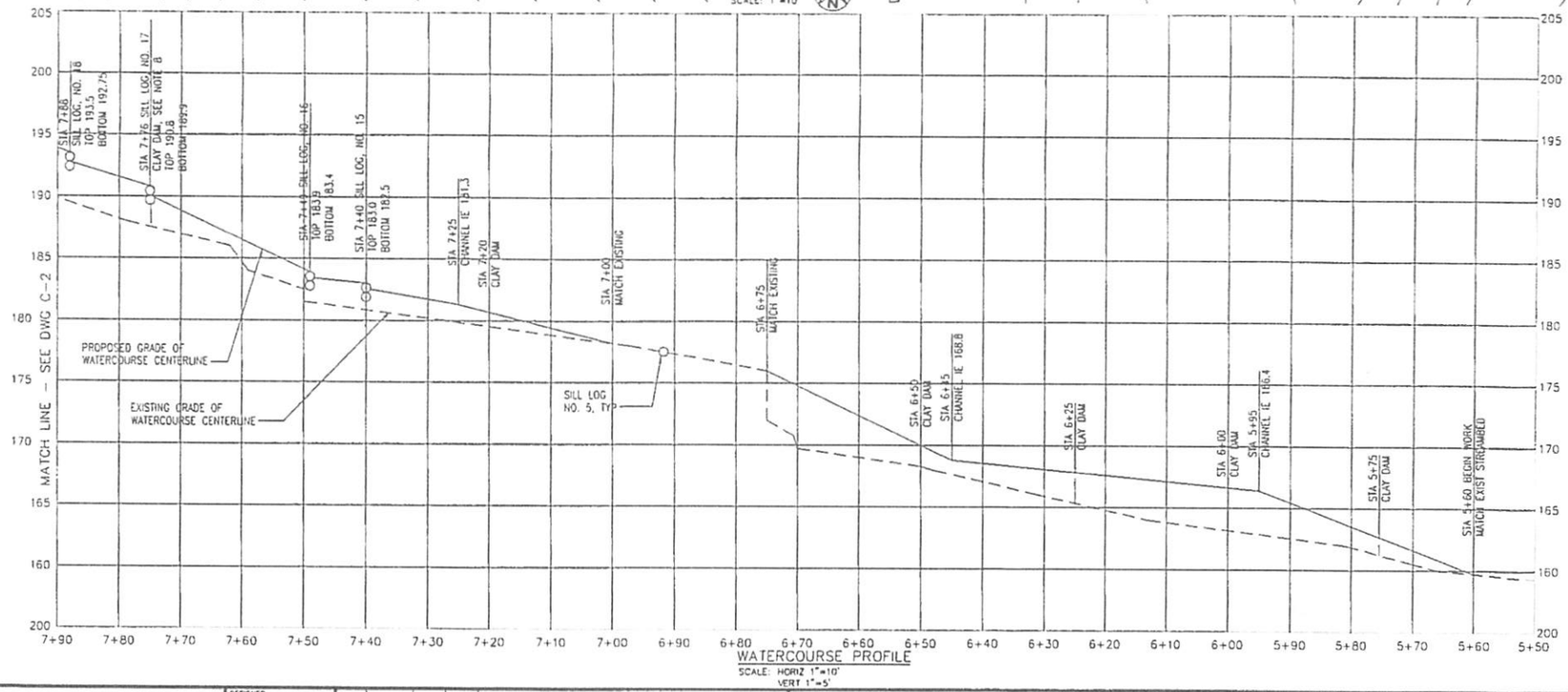
CITY OF MERCER ISLAND
PARKWOOD TRAIL AND SUBBASIN
458 WATERCOURSE STABILIZATION PROJECT

LEGEND, ABBREVATIONS AND NOTES

PROJECT NUMBER: 11-01026-10000
SHT 2 OF: 11
DRAWING NUMBER: G-2





NOTES:

1. ALL TREES TO BE PROTECTED AND REMAIN EXCEPT AS SPECIFICALLY CALLED OUT TO REMOVE.
2. EXISTING LWD (DOWNED LOGS) CAN BE REUSED. LOGS MAY BE OUTSIDE CONSTRUCTION LIMITS.
3. NO MECHANICAL EQUIPMENT ALLOWED ON WEST OR SOUTH SIDE OF WATERCOURSE
4. LOCATION OF ROCK WALL SHOWN IS APPROXIMATE AND SHALL BE FIELD LOCATED PRIOR TO CONSTRUCTION. FINAL LOCATION TO BE APPROVED BY ENGINEER. ROCKERY WILL BE INSTALLED AFTER EQUIPMENT IS NO LONGER NEEDED WEST OF THIS LOCATION. TEMPORARY FILL OR SUPPORT WILL BE NEEDED AT THIS LOCATION FOR UPSTREAM CONSTRUCTION.
5. CREEK FLOWS BENEATH EXIST LOGS AND TREE ROOTS HERE. REMOVE LOGS AND FILL VOID TO HEIGHT REQUIRED FOR CHANNEL RELOCATION.
6. LOCATION OF CONSTRUCTION LIMITS SHOWN IS APPROXIMATE AND SHALL BE FIELD LOCATED PRIOR TO CONSTRUCTION.
7. MAX SURFACE AREA OF SEDIMENT POND EXCAVATION IS ABOUT 100 SF. MAX DEPTH SHALL NOT EXCEED 3 FT.
8. PLACE CLAY BAGS BELOW LOGS OR INSTALL ADDITIONAL LOGS DOWN TO EXISTING STREAM BED.
9. PROTECT HUB AND TACK CONTROL POINTS.
10. EQUIPMENT WORKING IN STREAM SHALL BE NO WIDER THAN 6 FT AND LESS THAN 9,000 LBS UNLOADED. MATERIAL DELIVERY WILL BE VIA CREEKBED ONLY UPSTREAM OF STA 8+00.
11. ADDITIONAL ONSITE WOODY MATERIAL SMALLER THAN 6 IN DIAMETER WILL BE PLACED IN THE STREAM AS DIRECTED BY THE ENGINEER. PLACEMENT OF THIS MATERIAL IS INCIDENTAL.
12. CLEARED MATERIAL WILL BE DISPOSED ON CITY PROPERTY AT THIS SITE, AS DIRECTED BY ENGINEER.
13. LOG PLACEMENT AND ORIENTATION SHOWN IS APPROXIMATE. LOG LOCATIONS SHALL BE FLAGGED BY THE ENGINEER PRIOR TO PLACEMENT, THEN VERIFIED AND APPROVED BY THE ENGINEER AFTER PLACEMENT.

1"=10'-0" Scale: 10 5 0 10 20 Feet

1"=5'-0" Scale: 5 0 5 10 Feet

DESIGNED SBS					
DRAWN JF/PM					
VERIFY SCALE BAR IS ONE INCH ON ANSI "D" DRAWING 0 1"					
	0	6/15/07			ISSUED FOR BID
	REV	DATE	CHK'D	APP'D	REVISION DESCRIPTION

JACK C BJORK STATE OF WASHINGTON 12171 REGISTERED PROFESSIONAL ENGINEER
EXPIRES 6-30-

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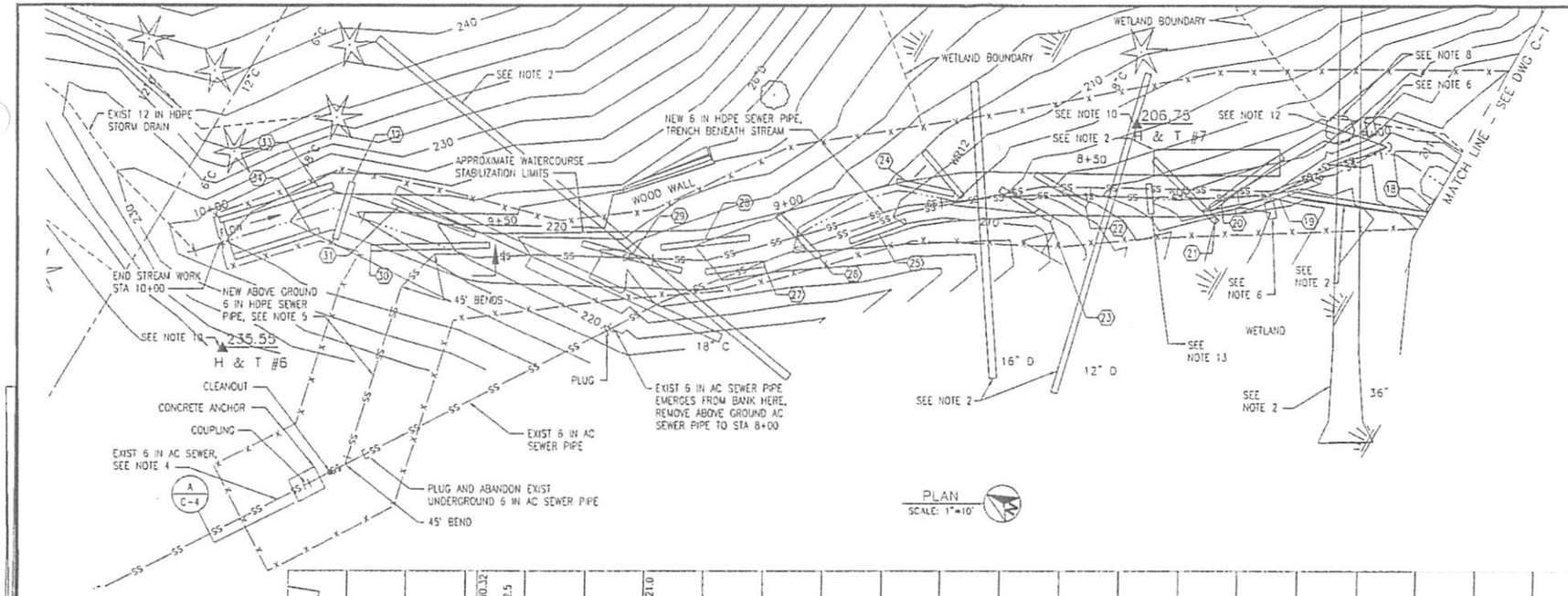
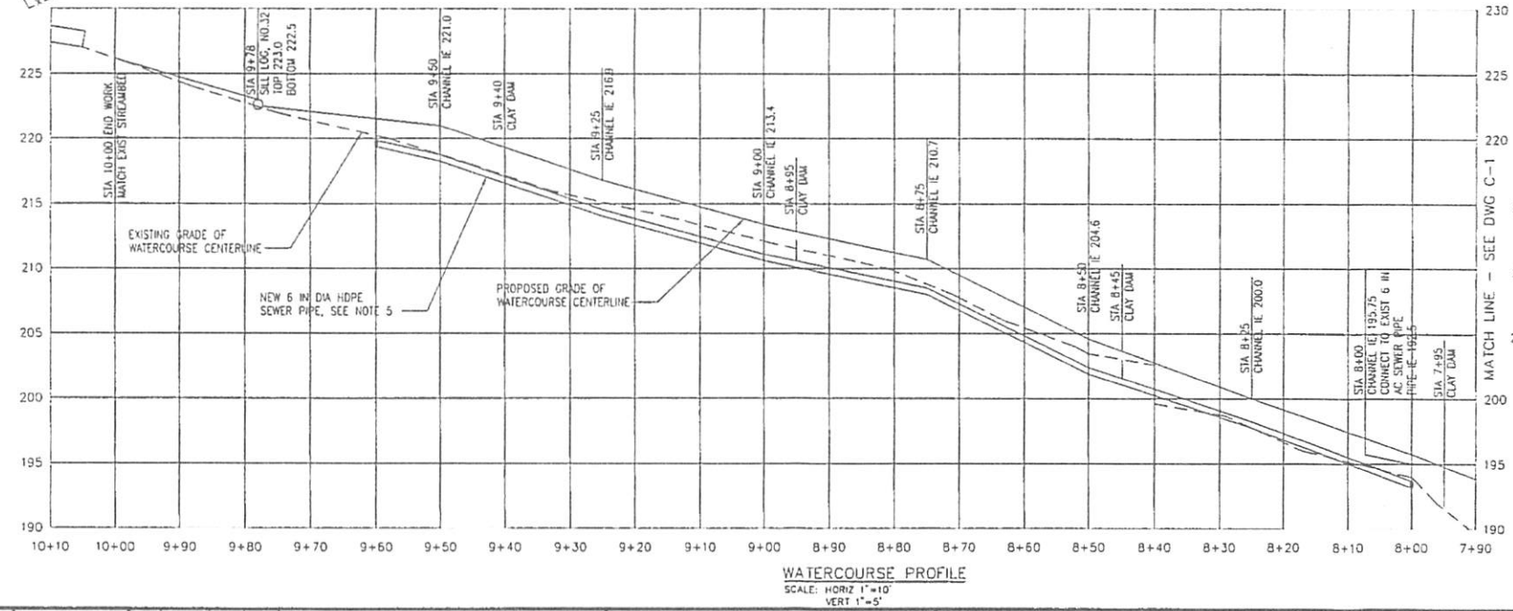
CITY OF MERCER ISLAND
PARKWOOD TRAIL AND SUBBASIN
458 WATERCOURSE STABILIZATION PROJECT

WATERCOURSE PLAN AND PROFILE
LOWER

PROJECT NUMBER: 11-01026-10000
SHT. 3 OF: 11
DRAWING NUMBER: C-1





WATERCOURSE PROFILE
SCALE: HORIZ 1"=10'
VERT 1"=5'

1"=10'-0" 10 5 0 10 20 Scale Feet

1"=5'-0" 5 0 5 10 Scale Feet

NOTES:

1. ALL TREES TO BE PROTECTED AND REMAIN EXCEPT AS SPECIFICALLY CALLED OUT TO REMOVE.
2. EXISTING LWD (DOWNED LOGS) CAN BE REUSED. LOGS MAY BE OUTSIDE CONSTRUCTION LIMITS.
3. NO MECHANICAL EQUIPMENT ALLOWED ON WEST OR SOUTH SIDE OF WATERCOURSE.
4. LOCATION OF BURIED SEWER IS APPROXIMATE. CONTRACTOR TO FIELD LOCATE.
5. PIPE MIN SLOPE 2%. MINIMUM BENDING RADIUS IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATION.
6. REMOVE ALL GABIONS IN STREAM BETWEEN STA 7+50 AND 9+00, NOT ALL ARE SHOWN. REMOVE WIRE OFFSITE.
7. FINAL WATERCOURSE ALIGNMENT WILL NOT FOLLOW DIRECT SEWER ALIGNMENT AS SHOWN. WATERCOURSE ALIGNMENT SHALL BE SINUOUS TO MIMIC EXIST ALIGNMENT AND SHALL BE STAKED IN-FIELD BY ENGINEER SUBSEQUENT TO INSTALLATION OF NEW SEWER PIPE.
8. CUT AND REMOVE SNAG. LEAVE STUMP. REUSE WOOD AS DIRECTED BY ENGINEER.
9. EQUIPMENT WORKING IN STREAM SHALL BE NO WIDER THAN 6 FT AND LESS THAN 9,000 LBS UNLOADED. MATERIAL DELIVERY WILL BE VIA CREEKBED ONLY UPSTREAM OF STA 8+00.
10. PROTECT HUB & TACK CONTROL POINTS.
11. LOG PLACEMENT AND ORIENTATION SHOWN IS APPROXIMATE. LOG LOCATIONS SHALL BE FLAGGED BY THE ENGINEER PRIOR TO PLACEMENT, THEN VERIFIED AND APPROVED BY THE ENGINEER AFTER PLACEMENT.
12. CONNECT NEW 6 IN HDPE SEWER PIPE TO EXIST 6 IN AC SEWER PIPE WITH ROMAC, TYPE 501 PIPE COUPLER.
13. REMOVE 3 FT HIGH LOG WEIR.

DESIGNED: SBS					
DRAWN: JF/PM					
VERIFY SCALE BAR IS ONE INCH ON ANSI "D" DRAWING 0 1"	0	6/15/07			ISSUED FOR BID
	REV.	DATE	CHK'D	APP'D	REVISION DESCRIPTION

JACK C. BJORK, STATE OF WASHINGTON, 12179, REGISTERED PROFESSIONAL ENGINEER, EXPIRES 8-30-

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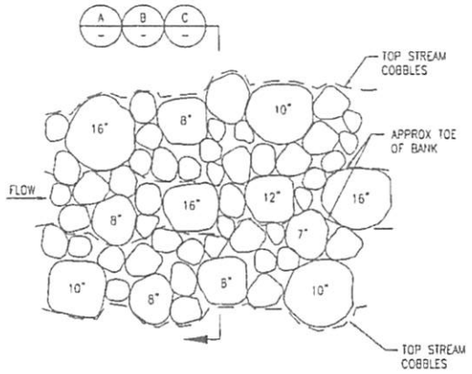
CITY OF MERCER ISLAND
PARKWOOD TRAIL AND SUBBASIN
45B WATERCOURSE STABILIZATION PROJECT

WATERCOURSE PLAN AND PROFILE
UPPER

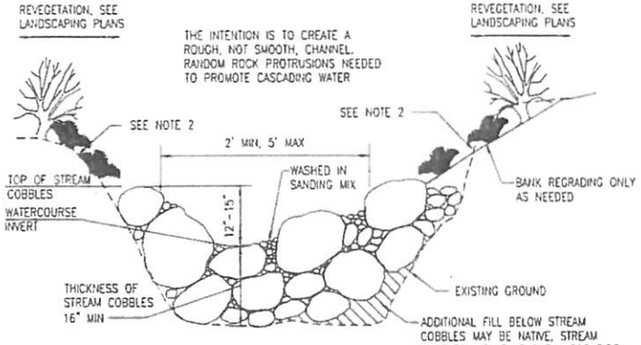
PROJECT NUMBER: 11-01026-10000
SHT. 4 OF 11
DRAWING NUMBER: C-2



NOTES:

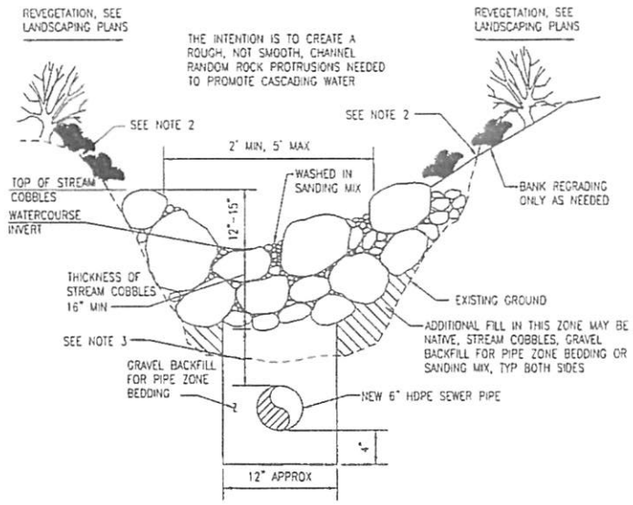
1. CONCEPTUAL DETAIL IS SHOWN IN 10 FT LENGTH. CONTRACTOR SHALL DUPLICATE CONFIGURATION TO MATCH LENGTH NEEDED.
2. INSTALL RANDOM ROCK PROTRUSION AND PLACEMENT TO PROMOTE CASCADING WATER.

TYPICAL PLAN OF ROCK PLACEMNT (1 / C-1, 1 / C-2)
WATER COURSE STABILIZATION
SCALE: NONE



STA 5+65 TO STA 8+00
STA 9+60 TO STA 9+85

TYPICAL SECTION (A / -, A / C-5, A / C-6)
WATER COURSE STABILIZATION
SCALE: NONE

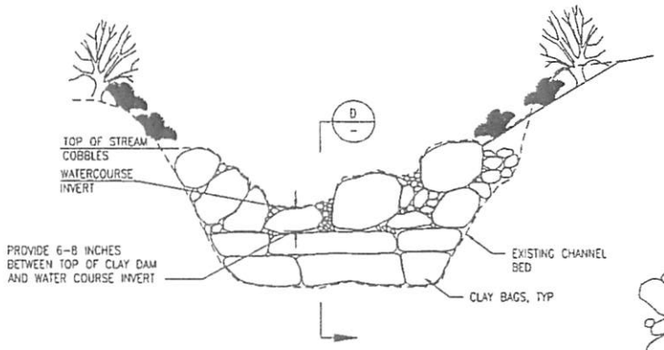


STA 8+00 TO STA 9+60

TYPICAL SECTION (B / -, B / C-5, B / C-6)
WATER COURSE STABILIZATION & PIPE TRENCH
SCALE: NONE

NOTES:

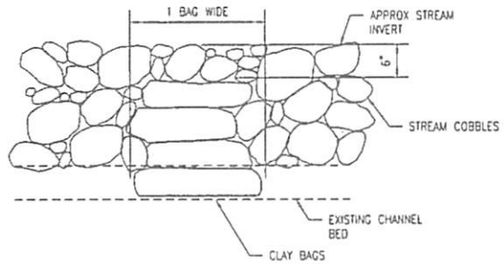
1. MATERIAL EXCAVATED FOR PIPE MAY BE REUSED FOR STREAM COBBLES OR SANDING MAX IF SPECIFICATIONS ARE MET.
2. INSTALL EROSION CONTROL MATTING IN LOCATION DIRECTED BY ENGINEER. STAKE IN ACCORDANCE WITH WSDOT STA PLAN I-13.
3. 1' OF COVER MUST BE PROVIDED DURING CONSTRUCTION TO AVOID DAMAGE TO PIPE.



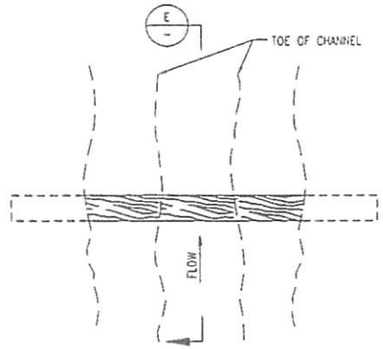
NOTES:

1. CONSTRUCT CLAY DAMS AT LOCATIONS SHOWN IN PROFILE.
2. PLACE CLAY BAGS LENGTHWISE ACROSS CHANNEL.

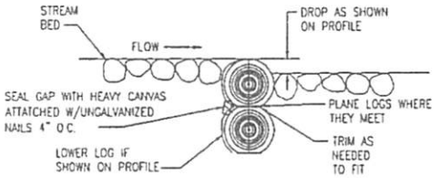
TYPICAL SECTION (C / -)
CLAY DAM
SCALE: NONE



SECTION (D / -)
CLAY DAM
SCALE: NONE



DETAIL (2 / C-1, 2 / C-2)
SILL LOG, TYP
SCALE: NONE



SECTION (E / -)
SILL LOG
SCALE: NONE

REV	DATE	CHK'D	APP'D	REVISION DESCRIPTION
0	6/15/07			ISSUED FOR BID

DESIGNED: SBS
DRAWN: JF/PM
VERIFY SCALE: BAR IS ONE INCH ON ANSI "D" DRAWING

JACK C. BJORK, STATE OF WASHINGTON, REGISTERED PROFESSIONAL ENGINEER, EXPIRES 6-30-

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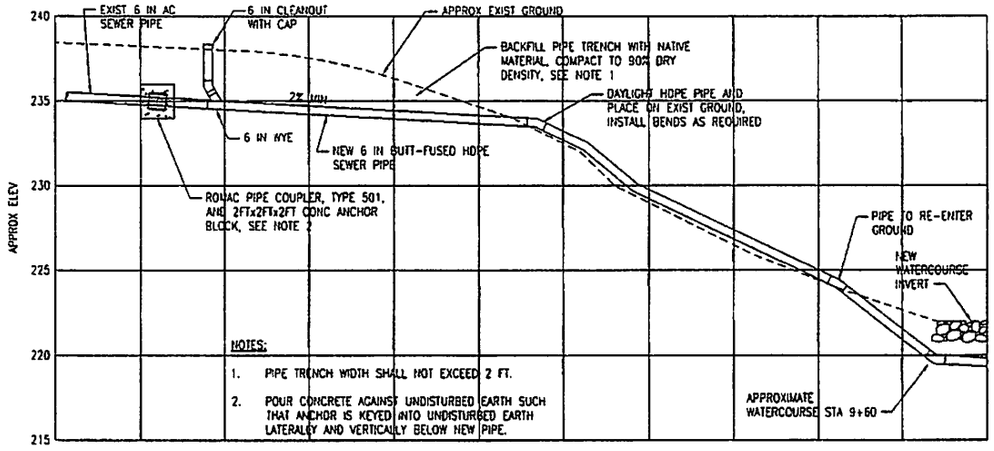
CITY OF MERCER ISLAND
PARKWOOD TRAIL AND SUBBASIN
45B WATERCOURSE STABILIZATION PROJECT

WATERCOURSE DETAILS
SHEET 1 OF 2

PROJECT NUMBER: 11-01026-10000
SHT. 5 OF 11
DRAWING NUMBER: C-3

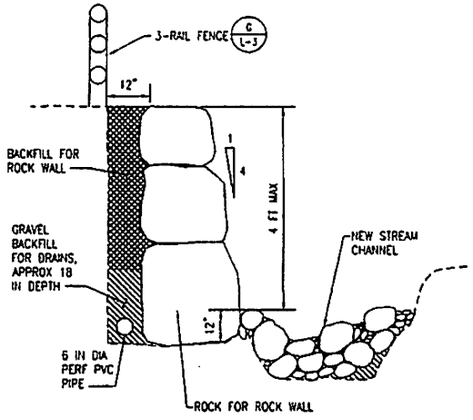


PROFILE (A / C-2)
NEW SEWER PIPE
SCALE: 1" = 4'

LWD TABLE			
①	TYPE	APPROX LENGTH (FT)	COMMENTS
1	LOG	20-25	1, 3
2	LOG	20-25	1
3	LOG	20-25	1
4	LOG	20-25	1
5	SILL LOG	10-12	SEE DET 2, SHT C-3
6	LOG	10-15	1
7	LOG	10-12	1, 3
8	LOG	10-12	2
9	LOG	10-12	2
10	LOG	10-12	2
11	LOG	12-15	2
12	LOG	12-15	2
13	LOG	12-15	2
14	LOG	10-12	1, 3
15	SILL LOG	10-12	SEE DET 2, SHT C-3
16	SILL LOG	10-12	SEE DET 2, SHT C-3
17	SILL LOG	10-12	SEE DET 2, SHT C-3
18	SILL LOG	10-12	SEE DET 2, SHT C-3
19	LOG	12-15	1
20	LOG	12-15	1
21	LOG	12-15	1
22	LOG	8-12	1
23	LOG	8-12	1
24	LOG	8-12	1
25	LOG	8-12	1
26	LOG	8-12	1, 3
27	LOG	8-12	1
28	LOG	12-15	1
29	LOG	15-18	1
30	LOG	18-20	1, 3
31	LOG	12-15	1
32	SILL LOG	9-12	SEE DET 2, SHT C-3
33	LOG	18-20	1
34	LOG	12-15	1

NOTES:

1. PLACE LOG IN STREAM CHANNEL AS SHOWN ON PLAN. LOG IS NOT ANCHORED. AT LEAST ONE END AND A SEGMENT OF LOG SHALL BE IN CONTINUOUS CONTACT WITH WATERCOURSE.
2. STACK LOGS ALONG RIGHT BANK AT 1H:1V SLOPE AS SHOW ON C-5, SECTION STA 7+25 PLANE LOG ⊕ LOG-LOG INTERFACE.
3. PLACE SMALL WOODY DEBRIS ON UPSTREAM SIDE OF LOG AS DIRECTED BY ENGINEER.



DETAIL (1 / C-1)
ROCK WALL AT STA 6+20
SCALE: NONE

NOTES:

1. ROCKERY NOT SUITABLE FOR CONSTRUCTION EQUIPMENT LOADING.

DESIGNED: SBS					
DRAWN: JF/PM					
VERIFY SCALE BAR IS ONE INCH ON ANSI "D" DRAWING	0	8/15/07			ISSUED FOR BID
0 1"	REV	DATE	CHK'D	APP'D	REVISION DESCRIPTION

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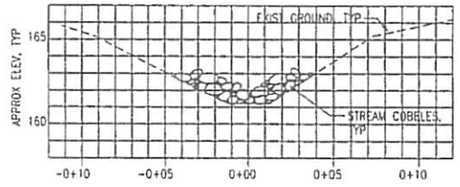
CITY OF MERCER ISLAND
PARKWOOD TRAIL AND SUBBASIN
458 WATERCOURSE STABILIZATION PROJECT

WATERCOURSE DETAILS
SHEET 2 OF 2

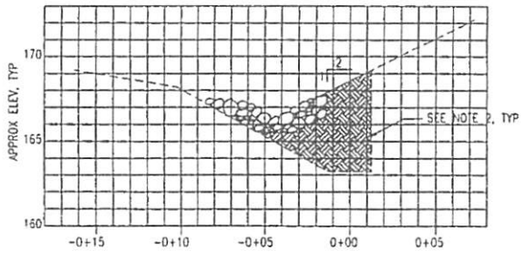
PROJECT NUMBER: 11-01026-10000
SHT. 6 OF: 11
DRAWING NUMBER: C-4

NOTES:

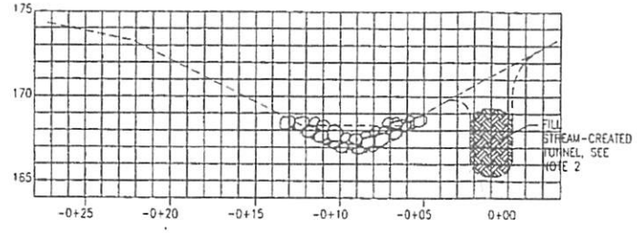
1. ELEVATIONS AND SECTIONS ARE APPROXIMATE AND BASED ON FIELD TAPE MEASUREMENTS.
2. FILL MAY BE NATIVE, STREAM COBBLES, GRAVEL BACKFILL FOR PIPE ZONE BEDDING, OR SANDING MIX.
3. SEE ALSO TYPICAL SECTIONS: A/B C-3
4. NEW/REUSED LWD NOT SHOWN.
5. ALL SECTIONS LOOKING DOWNSTREAM.
6. NO STREAMBED FILL REQUIRED BETWEEN STA 6+75 AND STA 7+00.



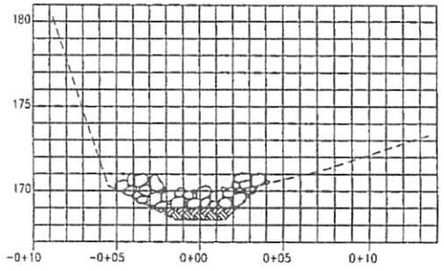
SECTION
CREEK STA 5+75
SCALE: 1"=4'



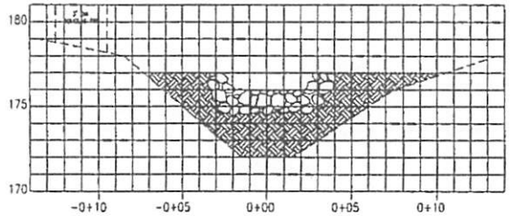
SECTION
CREEK STA 6+00
SCALE: 1"=4'



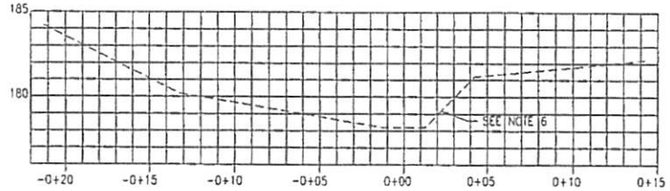
SECTION
CREEK STA 6+25
SCALE: 1"=4'



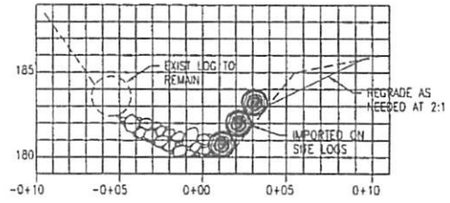
SECTION
CREEK STA 6+50
SCALE: 1"=4'



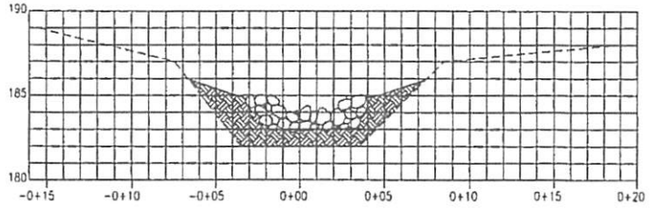
SECTION
CREEK STA 6+75
SCALE: 1"=4'



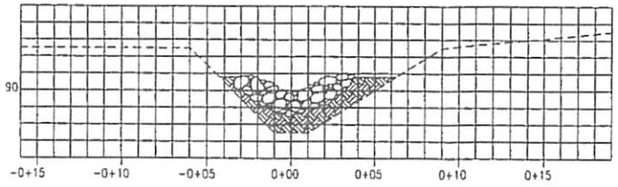
SECTION
CREEK STA 7+00
SCALE: 1"=4'



SECTION
CREEK STA 7+25
SCALE: 1"=4'



SECTION
CREEK STA 7+50
SCALE: 1"=4'



SECTION
CREEK STA 7+75
SCALE: 1"=4'

1"=4'-0" 4 2 0 4 8
Scale Feet

0	6/15/07				ISSUED FOR BID
REV	DATE	CHK'D	APP'D		REVISION DESCRIPTION

DESIGNED: SBS
DRAWN: JF/PM
VERIFY SCALE: BAR IS ONE INCH ON ANSI "D" DRAWING

JACK C. BJORK, STATE OF WASHINGTON, 21129, REGISTERED PROFESSIONAL ENGINEER
EXPIRES 6-30-

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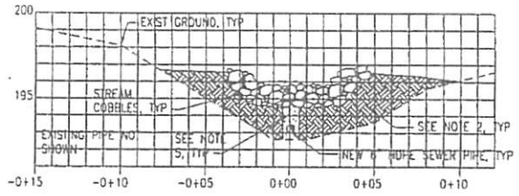
CITY OF MERCER ISLAND
PARKWOOD TRAIL AND SUBBASIN
45B WATERCOURSE STABILIZATION PROJECT

WATERCOURSE CROSS SECTIONS
SHEET 1 OF 2

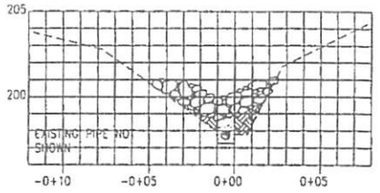
PROJECT NUMBER: 11-01026-10000
SHT. 7 OF: 11
DRAWING NUMBER: C-5

NOTES:

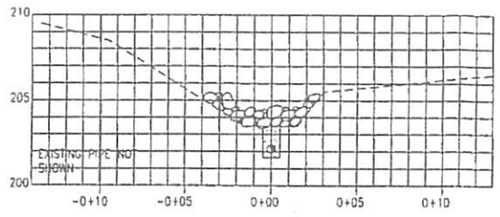
1. ELEVATIONS AND SECTIONS ARE APPROXIMATE AND BASED ON FIELD TAPE MEASUREMENTS.
2. FILL MAY BE NATIVE, STREAM COBBLES, GRAVEL BACKFILL FOR PIPE ZONE BEDDING, OR SANDING MIX.
3. SEE ALSO TYPICAL SECTIONS: A/B C-3
4. NEW/REUSED LWD NOT SHOWN.
5. GRAVEL BACKFILL FOR PIPE ZONE BEDDING.
6. ALL SECTIONS LOOKING DOWNSTREAM.



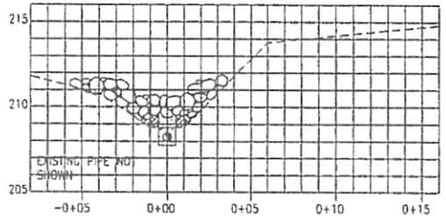
SECTION
CREEK STA 8+05
SCALE: 1"=4'



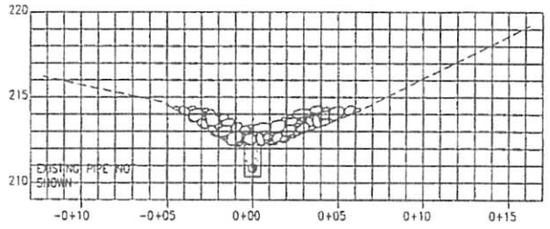
SECTION
CREEK STA 8+25
SCALE: 1"=4'



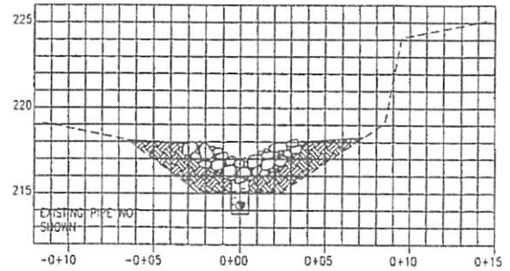
SECTION
CREEK STA 8+50
SCALE: 1"=4'



SECTION
CREEK STA 8+75
SCALE: 1"=4'



SECTION
CREEK STA 9+00
SCALE: 1"=4'



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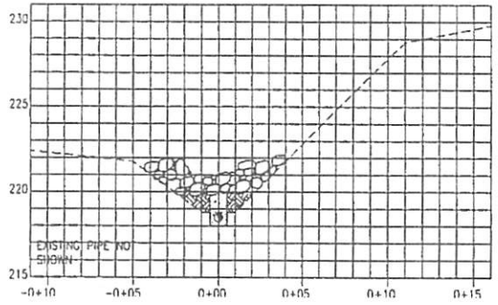
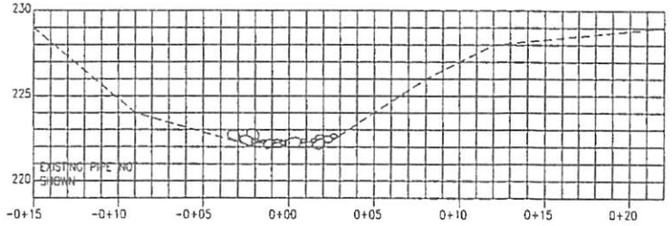
CREEK STA 9+25
SCALE: 1"=4'



SECTION
CREEK STA 9+50
SCALE: 1"=4'



SECTION
CREEK STA 9+75
SCALE: 1"=4'

1"=4'-0" 4 2 0 4 8
Scale Feet

DESIGNED					
SBS					
DRAWN					
JF/PM					
VERIFY SCALE					
BAR IS ONE INCH ON ANSI "D" DRAWING 0 1"					
	0	6/15/07			ISSUED FOR BID
	REV	DATE	CHK'D	APP'D	REVISION DESCRIPTION

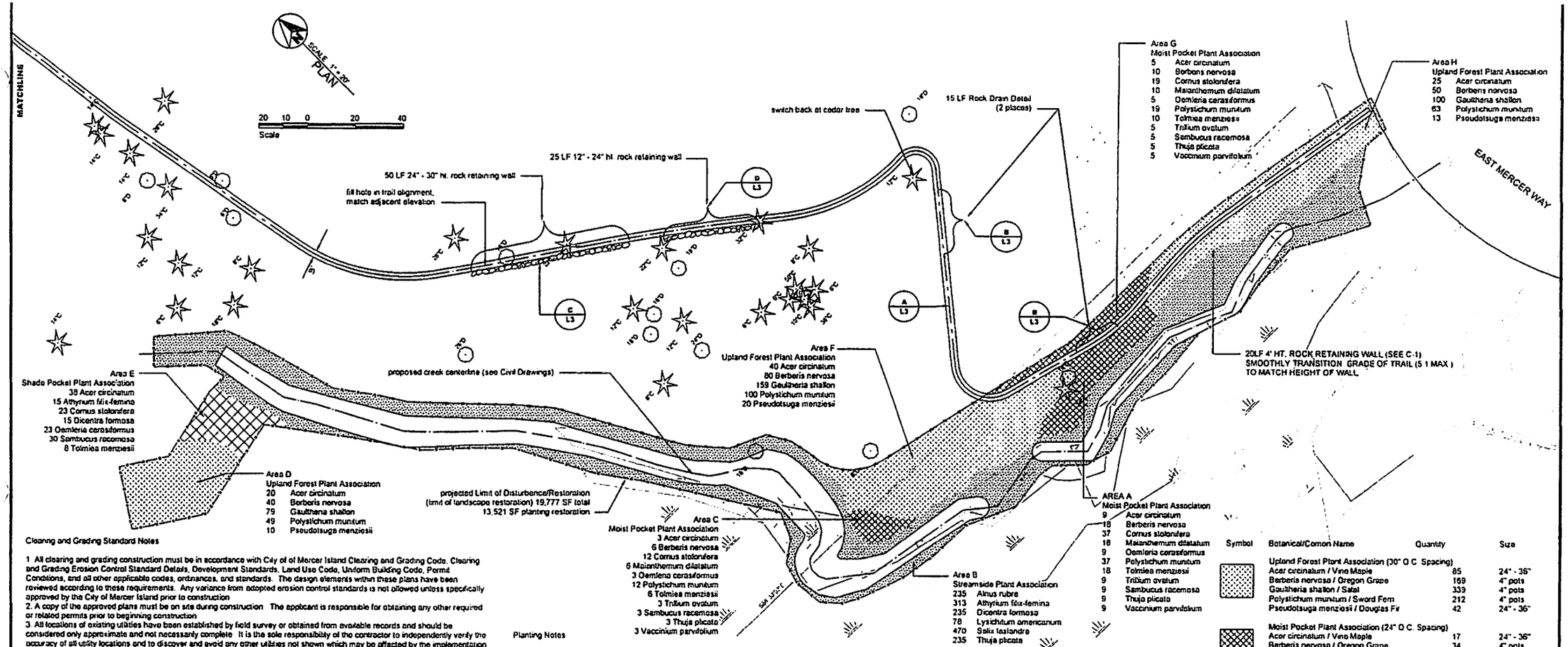
JACK C. BUDRA, STATE OF WASHINGTON, 22719, REGISTERED PROFESSIONAL ENGINEER, EXPIRES 6-30-

R·W·BECK
R.W. Beck, Inc.
1001 Fourth Avenue, Suite 2500
Seattle, WA 98154-1004
(206) 695-4700

CITY OF MERCER ISLAND
PARKWOOD TRAIL AND SUBBASIN
458 WATERCOURSE STABILIZATION PROJECT

WATERCOURSE CROSS SECTIONS
SHEET 2 OF 2

PROJECT NUMBER: 11-01026-10000
SHT. 8 OF. 11
DRAWING NUMBER: C-6



Cleaning and Grading Standard Notes

1 All clearing and grading construction must be in accordance with City of of Mercer Island Clearing and Grading Code, Clearing and Grading Erosion Control Standard Details, Development Standards, Land Use Code, Uniform Building Code, Permit Conditions, and all other applicable codes, ordinances, and standards. The design elements within these plans have been reviewed according to those requirements. Any variance from adopted erosion control standards is not allowed unless specifically approved by the City of Mercer Island prior to construction
2. A copy of the approved plans must be on site during construction The applicant is responsible for obtaining any other required or related permits prior to beginning construction
3. All locations of existing utilities have been established by field survey or obtained from available records and should be considered only approximate and not necessarily complete It is the sole responsibility of the contractor to independently verify the accuracy of all utility locations and to discover and avoid any other utilities not shown which may be affected by the implementation of this plan.
4 Clearing shall be limited to the area within the approved disturbance limits and trail corridor (typically seven feeet wide) Exposed soils must be covered at the end of each working day when working between October 1st and April 30th. From May 1st through September 30th exposed soils must be covered at the end of each construction week and also at the threat of rain
5. To reduce the potential for erosion of exposed soils or when rainy season construction is permitted, the following Best Management Practices are required Preserve natural vegetation for as long as possible. Protect exposed soil using plastic, straw, or mulch as directed by Engineer
6 Any project that is subject to rainy season restrictions will not be allowed to perform clearing and grading activities without written approval from the PCD Director. The rainy season extends from November 1st through April 30th as defined in the clearing and grading code

Site Preparation Notes

1. Protection of existing improvements include Provide, erect, and maintain barricades, coverings, or other types of protection necessary to prevent damage to existing trees, planting areas, trails, or other site improvements
2. Maintain vehicular and pedestrian traffic routes
3. Do not close or obstruct streets without permission from authorities having jurisdiction
4. Verify the trees to remove and areas to be cleared
5 Tree work will conform to ANSI Z133 A300 as well as all applicable OSHA and WISHA requirements
6 Cut all trees marked with pink ribbon down to stump height of 6 inches on the uphill side. Dead trees within clearing limits shall be felled to avoid damage to desirable trees, other plants, and property
7. Dead trees and woody material within the area of work that are partially fallen and hung up in other trees or still standing will be cut down sectioned and dispersed on site at least 20 feet from the trail Slash will be cut into lengths of 2 feet or less and placed to lie in ground contact Slash must lie in between existing native vegetation
8 Logs greater than 12 inches in diameter can be utilized in stabilization work and shall be cut not less than 8 feet in length

Planting Notes

1. All plant material shall be nursery grown under climate conditions similar to or harder than at the site and meet or exceed applicable standards
2. Plants shall be of normal habit of growth, healthy, vigorous, and free of disease, insects, insect eggs and larva
3 Prune no plants prior to delivery to site
4 Trees shall not be broken nor bark bruised, cut or removed in any manner.
5 Botanic and common names on drawings conform to industry standards.
6. Contractor shall verify all sources of supply to ensure that all plants of the species, size, and quality specified are available It is the contractor's responsibility to locate plant materials
7. Submit source of all plant material to the Engineer for acceptance one month prior to shipment to site Samples or a nursery visit may be required
8 All plant material shall be transported to plant locations with care to prevent damage. Tie back branches as necessary and protect bark from chafing with burlap bags. Do not drag plant material along ground without proper protection of roots and branches
9. Lift all trees by rootball only.
10 No bark scars will be accepted Protect bark from cables and lines with burlap cover or rubber mat. Tie back branches as necessary to avoid breakage during installation.
11 Do not plant when ground is frozen or excessively wet
12 Remove all plastic labels, materials, and synthetic burlap from planting pit after plant is in place. Remove from the site
13. Plants shall meet or exceed size and quality indicated in the plant list.
14 Plants will be planted according to planting detail drawings
15. Remove all inorganic burlap, container, wires or twine from plants prior to planting Thoroughly water backfill soil and water as necessary to establish plants during warranty period
16 Protect tree bark from abrasion due to installation
17 Soil amendments and mulch shall be Groco®, Steerco® or approved equal per detail
18 Contractor shall prepare all planting areas by fine grading and removing all deleterious material to plant growth, including all debris over 2 inches in any dimension, applying approved composted organic plant waste (compost), and thoroughly mixing, at the specified rates, with on-site soil to achieve finish grade

Symbol	Botanical/Comon Name	Quantity	Size
	Upland Forest Plant Association (30" O C Spacing)		
	Acer circinatum / Vine Maple	85	24" - 36"
	Berberis nervosa / Oregon Grape	159	4" pots
	Gaultheria shallon / Salal	339	4" pots
	Polystichum munitum / Sword Fern	212	4" pots
	Pseudotsuga menziesii / Douglas Fir	42	24" - 36"
	Moist Pocket Plant Association (24" O C. Spacing)		
	Acer circinatum / Vine Maple	17	24" - 36"
	Berberis nervosa / Oregon Grape	34	4" pots
	Cornus stolonifera / Red Osier Dogwood	68	1 gal
	Maianthemum dilatatum / False Lily-of-the-valley	34	1 gal
	Oemleria cerasiformus / Indian Plum	17	1 gal
	Polystichum munitum / Swordfern	68	4" pots
	Tolmiea menziesii / Pig-a-back	34	4" pots
	Trillium ovatum / Trillium	17	1 gal.
	Sambucus racemosa / Red Elderberry	17	1 gal
	Thuja plicata / Western Red Cedar	17	24" - 36"
	Vaccinium parvifolium / Red Huckleberry	17	1 gal.
	Shade Pocket Plant Association (24" O C Spacing)		
	Acer circinatum / Vine Maple	38	24" - 36"
	Athyrium filix-femina / Lady-fern	15	4" pots
	Cornus stolonifera / Red Osier Dogwood	23	1 gal.
	Dicentra formosa / Pacific Bleedingheart	15	4" pots
	Oemleria cerasiformus / Indian Plum	23	1 gal
	Sambucus racemosa / Red Elderberry	30	1 gal
	Tolmiea menziesii / Pig-a-back	8	1 gal
	Streamside Plant Association (24" O C Spacing)		
	Alnus rubra / Red Alder	235	1 gal
	Athyrium filix-femina / Lady-fern	313	4" pots
	Dicentra formosa / Pacific Bleedingheart	235	4" pots
	Lysichitum americanum / Skunk Cabbage	78	1 gal
	Salix lasiandra / Pacific Willow	470	whips
	Thuja plicata / Western Red Cedar	235	24" - 36"

State Of Washington Registered Landscape Architect

Richard B. Van De Mark
Certificate No. 481

REV	DATE	CHK'D	APP'D	REVISION DESCRIPTION
1	5-23-07			

DESIGNED
DRAWN
VERIFY SCALE
BAR IS ONE INCH ON ANSI "D" DRAWING 0 1"

LANDSCAPE ARCHITECT
RVLA, inc., p.s.
33103 SE 119th Street
Issaquah, WA 98027
phone - 425 222-7013
fax - 425 222-7012
e-mail - rvlaecentcast.net

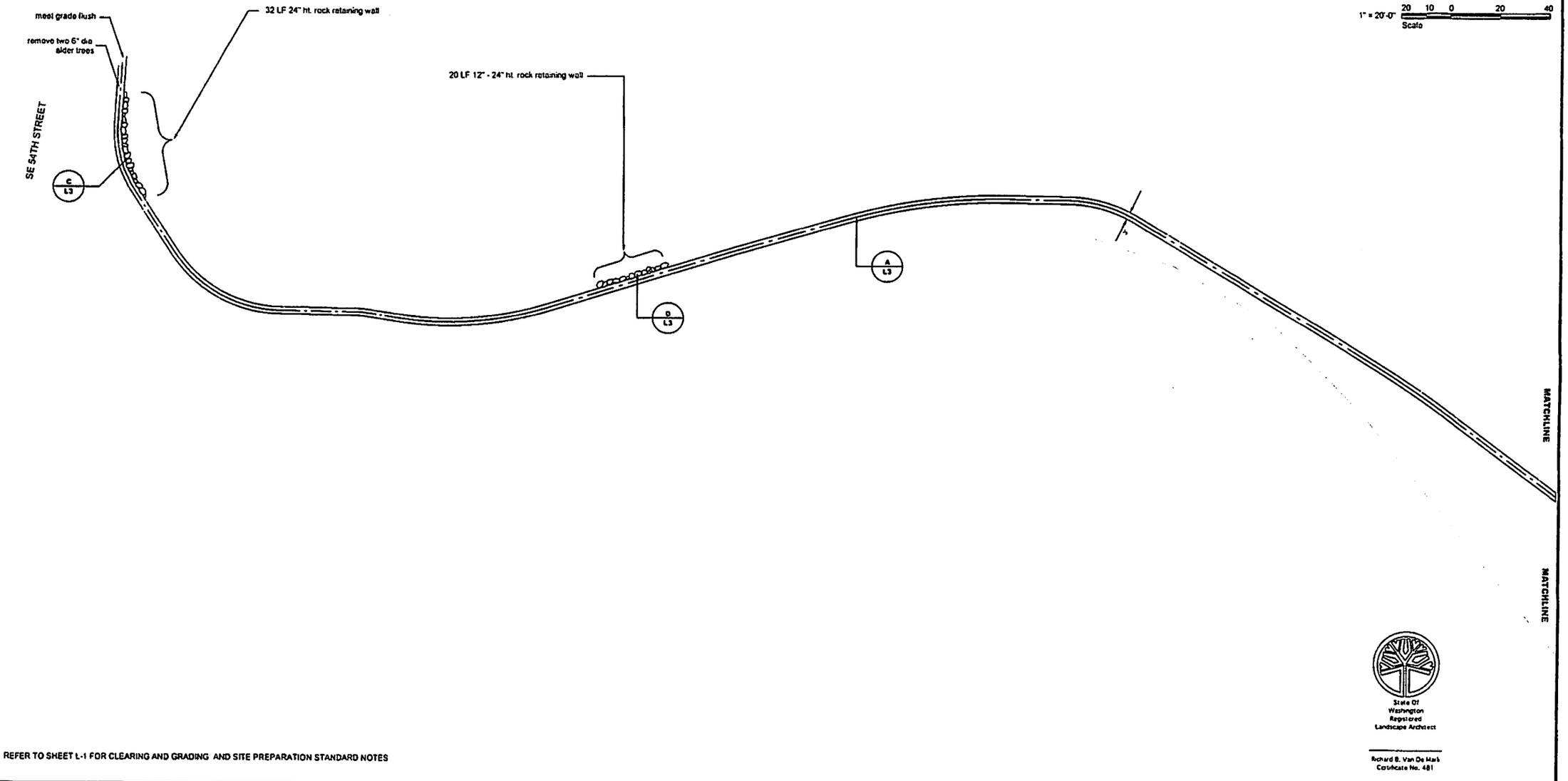
ENGINEER
RW BECK
R.W. Beck, Inc.
1001 Fourth Avenue, Suite 2500
Seattle, WA 98154-1004
(206) 695-4700

CITY OF MERCER ISLAND
PARKWOOD TRAIL AND SUBBASIN 45B
WATERCOURSE STABILIZATION PROJECT

TRAIL DEVELOPMENT & LANDSCAPE RESTORATION

SHEET 1

PROJECT NUMBER: 11-01026-10000
SHT. 9 OF: 11
DRAWING NUMBER: L - 1



REFER TO SHEET L-1 FOR CLEARING AND GRADING AND SITE PREPARATION STANDARD NOTES

State Of
Washington
Registered
Landscape Architect

Richard B. Van De Mark
Certificate No. 481

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0 1"

LANDSCAPE ARCHITECT
RVLA, inc., p.s.
22109 SE 110th Street
Issaquah, WA 98027
phone - 425 222-7013
fax - 425 222-7012
e-mail - rvlae@comcast.net

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Seattle, WA 98154-1004
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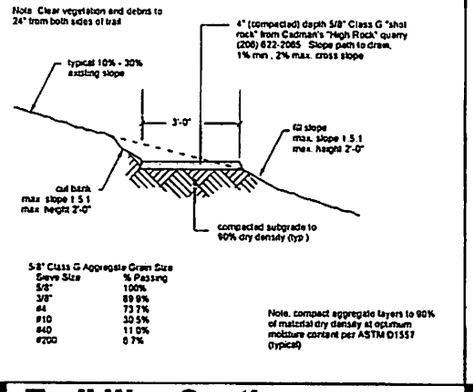
CITY OF MERCER ISLAND
PARKWOOD TRAIL AND SUBBASIN 45B
WATERCOURSE STABILIZATION PROJECT
TRAIL DEVELOPMENT & LANDSCAPE RESTORATION
SHEET 2

PROJECT NUMBER
11-01026-10000

SHT. 10 OF: 11

DRAWING NUMBER:
L - 2



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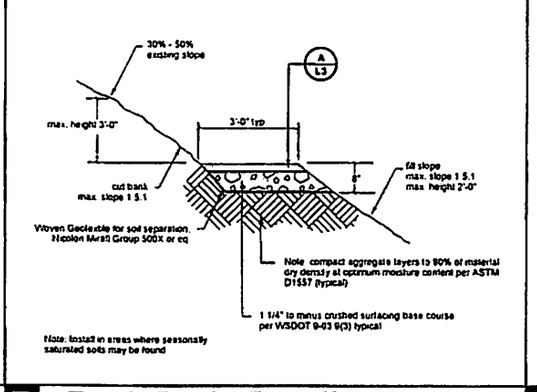
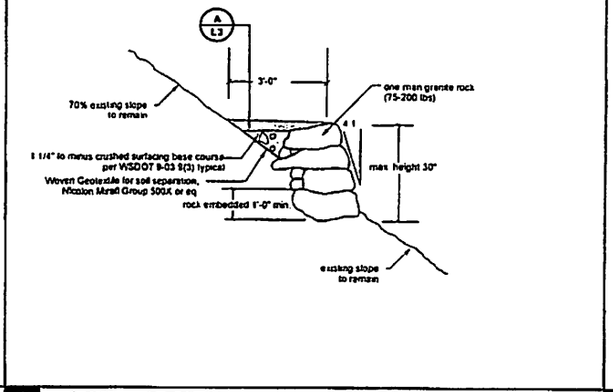
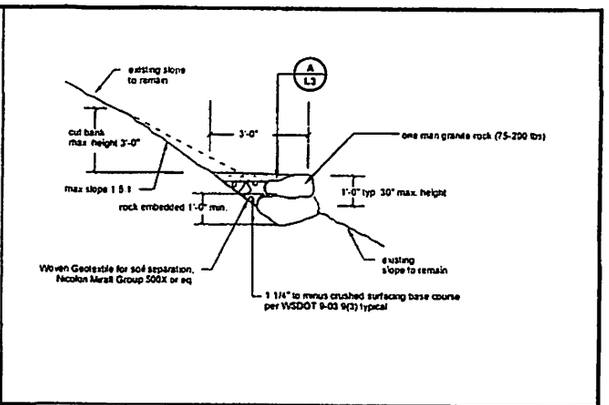


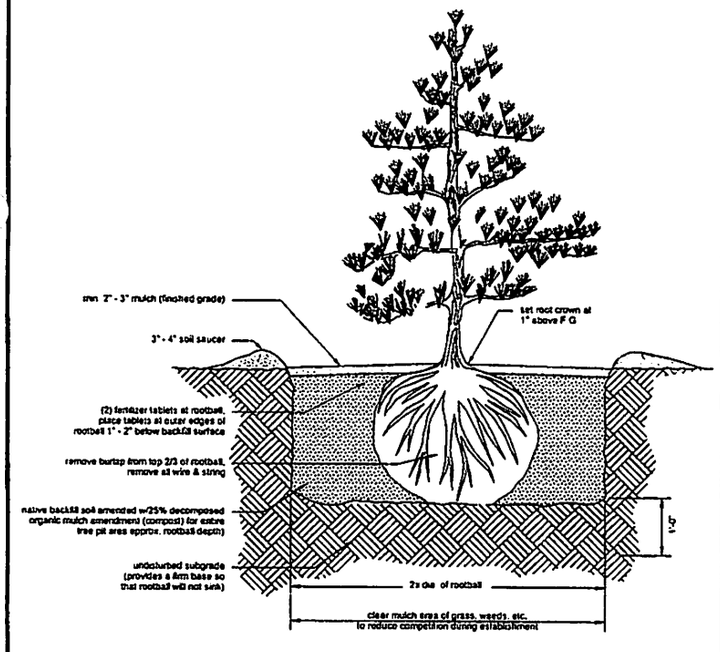
B Rock Drain Detail no scale



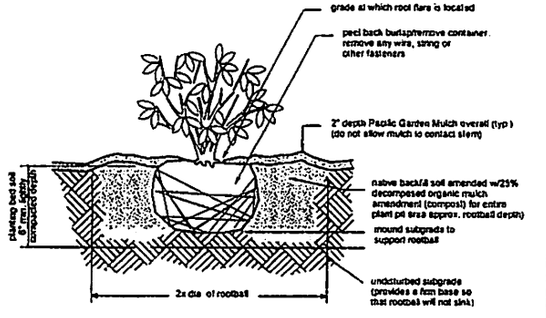
C 12" - 30" Rock Wall no scale



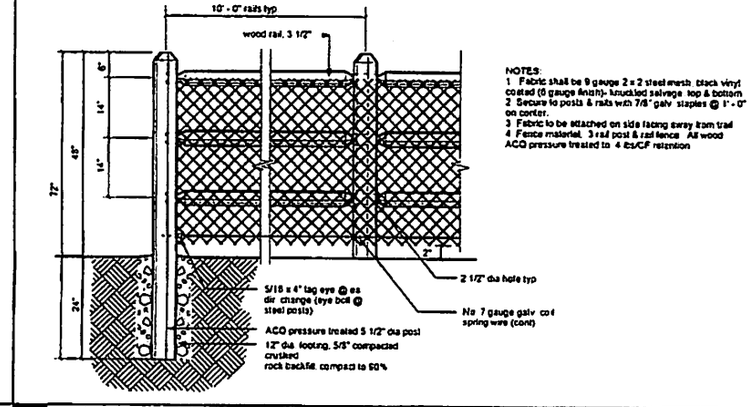
D 12" - 24" Rock Wall no scale



E Coniferous Tree Planting no scale



F Shrub/Groundcover Planting no scale



G 3-Rail Fence 3/4" = 1'-0"

State Of Washington Registered Landscape Architect

Richard B. Van De Mark
Certificate No. 481

REV	DATE	CHK'D	APP'D	REVISION DESCRIPTION
1	5 23 07			

DESIGNED

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(206) 695-4700

CITY OF MERCER ISLAND
PARKWOOD TRAIL AND SUBBASIN 45B
WATERCOURSE STABILIZATION PROJECT

TRAIL & LANDSCAPE DETAILS

PROJECT NUMBER: 11-01026-10000
SHT 11 OF 11
DRAWING NUMBER: L - 3

Western Washington Hydrology Model
PROJECT REPORT

Project Name: 150622
Site Address:
City :
Report Date : 6/22/2015
Gage : Seatac
Data Start : 1948/10/01
Data End : 1998/09/30
Precip Scale: 1.00
WWHM3 Version:

PREDEVELOPED LAND USE

Name : Basin 1
Bypass: No

GroundWater: No

Pervious Land Use	Acres
SAT, Forest, Mod	.115

Impervious Land Use	Acres

Element Flows To:

Surface	Interflow	Groundwater

Name : Basin 1
Bypass: No

GroundWater: No

Pervious Land Use	Acres

Impervious Land Use	Acres
ROADS FLAT	0.115

Element Flows To:

Surface	Interflow	Groundwater
Vault 1,	Vault 1,	

Name : Vault 1
Width : 17.45 ft.
Length : 17.45 ft.
Depth: 5ft.

Discharge Structure

Riser Height: 4 ft.
Riser Diameter: 18 in.
Orifice 1 Diameter: 0.30603 in. **Elevation:** 0 ft.
Orifice 1 Diameter: 0.56 in. **Elevation:** 2.668 ft.
Orifice 1 Diameter: 0.33 in. **Elevation:** 3 ft.
(Volume = 17.45′ x 17.45′ x 4′= 1,218 cu. ft.)

Element Flows To:

Outlet 1	Outlet 2

Vault Hydraulic Table

Stage(ft)	Area(acr)	Volume(acr-ft)	Dschrg(cfs)	Infilt(cfs)
0.000	0.007	0.000	0.000	0.000
0.056	0.007	0.000	0.001	0.000
0.111	0.007	0.001	0.001	0.000
0.167	0.007	0.001	0.001	0.000
0.222	0.007	0.002	0.001	0.000
0.278	0.007	0.002	0.001	0.000
0.333	0.007	0.002	0.001	0.000
0.389	0.007	0.003	0.002	0.000
0.444	0.007	0.003	0.002	0.000
0.500	0.007	0.003	0.002	0.000
0.556	0.007	0.004	0.002	0.000
0.611	0.007	0.004	0.002	0.000
0.667	0.007	0.005	0.002	0.000
0.722	0.007	0.005	0.002	0.000
0.778	0.007	0.005	0.002	0.000
0.833	0.007	0.006	0.002	0.000
0.889	0.007	0.006	0.002	0.000
0.944	0.007	0.007	0.002	0.000
1.000	0.007	0.007	0.002	0.000
1.056	0.007	0.007	0.003	0.000
1.111	0.007	0.008	0.003	0.000
1.167	0.007	0.008	0.003	0.000
1.222	0.007	0.009	0.003	0.000
1.278	0.007	0.009	0.003	0.000
1.333	0.007	0.009	0.003	0.000
1.389	0.007	0.010	0.003	0.000
1.444	0.007	0.010	0.003	0.000
1.500	0.007	0.010	0.003	0.000

1.556	0.007	0.011	0.003	0.000
1.611	0.007	0.011	0.003	0.000
1.667	0.007	0.012	0.003	0.000
1.722	0.007	0.012	0.003	0.000
1.778	0.007	0.012	0.003	0.000
1.833	0.007	0.013	0.003	0.000
1.889	0.007	0.013	0.003	0.000
1.944	0.007	0.014	0.003	0.000
2.000	0.007	0.014	0.003	0.000
2.056	0.007	0.014	0.004	0.000
2.111	0.007	0.015	0.004	0.000
2.167	0.007	0.015	0.004	0.000
2.222	0.007	0.016	0.004	0.000
2.278	0.007	0.016	0.004	0.000
2.333	0.007	0.016	0.004	0.000
2.389	0.007	0.017	0.004	0.000
2.444	0.007	0.017	0.004	0.000
2.500	0.007	0.017	0.004	0.000
2.556	0.007	0.018	0.004	0.000
2.611	0.007	0.018	0.004	0.000
2.667	0.007	0.019	0.004	0.000
2.722	0.007	0.019	0.006	0.000
2.778	0.007	0.019	0.007	0.000
2.833	0.007	0.020	0.007	0.000
2.889	0.007	0.020	0.008	0.000
2.944	0.007	0.021	0.009	0.000
3.000	0.007	0.021	0.009	0.000
3.056	0.007	0.021	0.010	0.000
3.111	0.007	0.022	0.011	0.000
3.167	0.007	0.022	0.011	0.000
3.222	0.007	0.023	0.012	0.000
3.278	0.007	0.023	0.012	0.000
3.333	0.007	0.023	0.013	0.000
3.389	0.007	0.024	0.013	0.000
3.444	0.007	0.024	0.014	0.000
3.500	0.007	0.024	0.014	0.000
3.556	0.007	0.025	0.015	0.000
3.611	0.007	0.025	0.015	0.000
3.667	0.007	0.026	0.015	0.000
3.722	0.007	0.026	0.016	0.000
3.778	0.007	0.026	0.016	0.000
3.833	0.007	0.027	0.016	0.000
3.889	0.007	0.027	0.017	0.000
3.944	0.007	0.028	0.017	0.000
4.000	0.007	0.028	0.017	0.000
4.056	0.007	0.028	0.209	0.000
4.111	0.007	0.029	0.559	0.000
4.167	0.007	0.029	1.012	0.000
4.222	0.007	0.030	1.549	0.000
4.278	0.007	0.030	2.157	0.000
4.333	0.007	0.030	2.830	0.000
4.389	0.007	0.031	3.562	0.000
4.444	0.007	0.031	4.348	0.000
4.500	0.007	0.031	5.185	0.000
4.556	0.007	0.032	6.069	0.000
4.611	0.007	0.032	6.999	0.000
4.667	0.007	0.033	7.973	0.000

4.722	0.007	0.033	8.987	0.000
4.778	0.007	0.033	10.04	0.000
4.833	0.007	0.034	11.13	0.000
4.889	0.007	0.034	12.26	0.000
4.944	0.007	0.035	13.43	0.000
5.000	0.007	0.035	14.63	0.000
5.056	0.007	0.035	15.86	0.000
5.111	0.000	0.000	17.13	0.000

MITIGATED LAND USE

ANALYSIS RESULTS

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	Flow(cfs)
2 year	0.007439
5 year	0.01555
10 year	0.020907
25 year	0.026992
50 year	0.030898
100 year	0.034267

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	Flow(cfs)
2 year	0.004506
5 year	0.007561
10 year	0.010311
25 year	0.01481
50 year	0.019045
100 year	0.024168

Yearly Peaks for Predeveloped and Mitigated. POC #1

Year	Predeveloped	Mitigated
1950	0.006	0.003
1951	0.026	0.004
1952	0.020	0.014
1953	0.004	0.003
1954	0.005	0.003
1955	0.010	0.004
1956	0.017	0.007
1957	0.016	0.004
1958	0.005	0.004
1959	0.010	0.004
1960	0.009	0.004
1961	0.015	0.013
1962	0.015	0.004
1963	0.000	0.003
1964	0.008	0.004
1965	0.012	0.004
1966	0.011	0.004
1967	0.005	0.003
1968	0.016	0.004
1969	0.004	0.003

1970	0.012	0.003
1971	0.005	0.004
1972	0.010	0.004
1973	0.023	0.011
1974	0.010	0.003
1975	0.009	0.004
1976	0.011	0.005
1977	0.011	0.004
1978	0.003	0.003
1979	0.004	0.004
1980	0.004	0.003
1981	0.002	0.011
1982	0.005	0.003
1983	0.012	0.015
1984	0.003	0.004
1985	0.012	0.003
1986	0.003	0.004
1987	0.002	0.013
1988	0.010	0.015
1989	0.000	0.003
1990	0.002	0.003
1991	0.007	0.016
1992	0.021	0.014
1993	0.004	0.003
1994	0.001	0.003
1995	0.000	0.003
1996	0.008	0.004
1997	0.021	0.013
1998	0.017	0.015
1999	0.008	0.004

Ranked Yearly Peaks for Predeveloped and Mitigated. POC #1

Rank	Predeveloped	Mitigated
1	0.0261	0.0155
2	0.0232	0.0150
3	0.0214	0.0148
4	0.0205	0.0147
5	0.0199	0.0143
6	0.0172	0.0141
7	0.0170	0.0134
8	0.0162	0.0131
9	0.0162	0.0126
10	0.0149	0.0110
11	0.0146	0.0109
12	0.0125	0.0067
13	0.0124	0.0050
14	0.0122	0.0042
15	0.0116	0.0040
16	0.0112	0.0040
17	0.0106	0.0040
18	0.0106	0.0039
19	0.0105	0.0038
20	0.0103	0.0038
21	0.0102	0.0038
22	0.0099	0.0038
23	0.0096	0.0038

24	0.0088	0.0037
25	0.0087	0.0037
26	0.0082	0.0037
27	0.0082	0.0037
28	0.0081	0.0036
29	0.0070	0.0036
30	0.0058	0.0036
31	0.0052	0.0036
32	0.0049	0.0035
33	0.0049	0.0035
34	0.0048	0.0035
35	0.0047	0.0035
36	0.0042	0.0034
37	0.0040	0.0034
38	0.0037	0.0034
39	0.0036	0.0034
40	0.0035	0.0034
41	0.0034	0.0033
42	0.0033	0.0033
43	0.0027	0.0033
44	0.0022	0.0032
45	0.0022	0.0032
46	0.0015	0.0031
47	0.0012	0.0030
48	0.0004	0.0029
49	0.0002	0.0029
50	0.0002	0.0028

POC #1
The Facility PASSED

The Facility PASSED.

Flow(CFS)	Predev	Dev	Percentage	Pass/Fail
0.0037	972	965	99	Pass
0.0040	877	390	44	Pass
0.0043	791	359	45	Pass
0.0045	727	348	47	Pass
0.0048	661	331	50	Pass
0.0051	611	320	52	Pass
0.0054	557	310	55	Pass
0.0056	508	299	58	Pass
0.0059	474	288	60	Pass
0.0062	427	280	65	Pass
0.0065	393	270	68	Pass
0.0067	363	261	71	Pass
0.0070	336	249	74	Pass
0.0073	307	238	77	Pass
0.0076	281	227	80	Pass
0.0078	255	212	83	Pass
0.0081	234	198	84	Pass
0.0084	223	184	82	Pass
0.0087	202	178	88	Pass
0.0089	185	165	89	Pass
0.0092	170	154	90	Pass
0.0095	158	148	93	Pass

0.0098	148	140	94	Pass
0.0100	132	134	101	Pass
0.0103	122	128	104	Pass
0.0106	111	115	103	Pass
0.0109	104	109	104	Pass
0.0111	94	99	105	Pass
0.0114	88	95	107	Pass
0.0117	80	84	104	Pass
0.0120	75	72	96	Pass
0.0122	67	65	97	Pass
0.0125	60	58	96	Pass
0.0128	58	47	81	Pass
0.0131	54	38	70	Pass
0.0133	52	32	61	Pass
0.0136	48	25	52	Pass
0.0139	43	19	44	Pass
0.0142	41	14	34	Pass
0.0144	38	11	28	Pass
0.0147	34	6	17	Pass
0.0150	31	2	6	Pass
0.0152	28	2	7	Pass
0.0155	26	1	3	Pass
0.0158	24	0	0	Pass
0.0161	24	0	0	Pass
0.0163	19	0	0	Pass
0.0166	18	0	0	Pass
0.0169	18	0	0	Pass
0.0172	15	0	0	Pass
0.0174	11	0	0	Pass
0.0177	9	0	0	Pass
0.0180	8	0	0	Pass
0.0183	8	0	0	Pass
0.0185	8	0	0	Pass
0.0188	8	0	0	Pass
0.0191	7	0	0	Pass
0.0194	7	0	0	Pass
0.0196	7	0	0	Pass
0.0199	6	0	0	Pass
0.0202	5	0	0	Pass
0.0205	5	0	0	Pass
0.0207	3	0	0	Pass
0.0210	3	0	0	Pass
0.0213	3	0	0	Pass
0.0216	2	0	0	Pass
0.0218	2	0	0	Pass
0.0221	2	0	0	Pass
0.0224	2	0	0	Pass
0.0227	2	0	0	Pass
0.0229	2	0	0	Pass
0.0232	1	0	0	Pass
0.0235	1	0	0	Pass
0.0238	1	0	0	Pass
0.0240	1	0	0	Pass
0.0243	1	0	0	Pass
0.0246	1	0	0	Pass
0.0249	1	0	0	Pass
0.0251	1	0	0	Pass

0.0254	1	0	0	Pass
0.0257	1	0	0	Pass
0.0260	1	0	0	Pass
0.0262	0	0	0	Pass
0.0265	0	0	0	Pass
0.0268	0	0	0	Pass
0.0271	0	0	0	Pass
0.0273	0	0	0	Pass
0.0276	0	0	0	Pass
0.0279	0	0	0	Pass
0.0282	0	0	0	Pass
0.0284	0	0	0	Pass
0.0287	0	0	0	Pass
0.0290	0	0	0	Pass
0.0293	0	0	0	Pass
0.0295	0	0	0	Pass
0.0298	0	0	0	Pass
0.0301	0	0	0	Pass
0.0303	0	0	0	Pass
0.0306	0	0	0	Pass
0.0309	0	0	0	Pass

Water Quality BMP Flow and Volume for POC 1.
On-line facility volume: 0 acre-feet
On-line facility target flow: 0 **cfs.**
Adjusted for 15 min: 0 **cfs.**
Off-line facility target flow: 0 **cfs.**
Adjusted for 15 min: 0 **cfs.**

Perlnd and Implnd Changes

No changes have been made.
