

# **STORM DRAINAGE REPORT**

## **PROPOSED RESIDENCE**

**3404 72<sup>ND</sup> PL. S.E.**

**MERCER ISLAND, WA**

Prepared for

RKK Construction  
3056 70<sup>th</sup> Avenue SE  
Mercer Island, WA 98040

July 2020

Darla Guerrero, P.E.  
15020 S.E. 46<sup>TH</sup> Street  
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Tel: 425-743-4307

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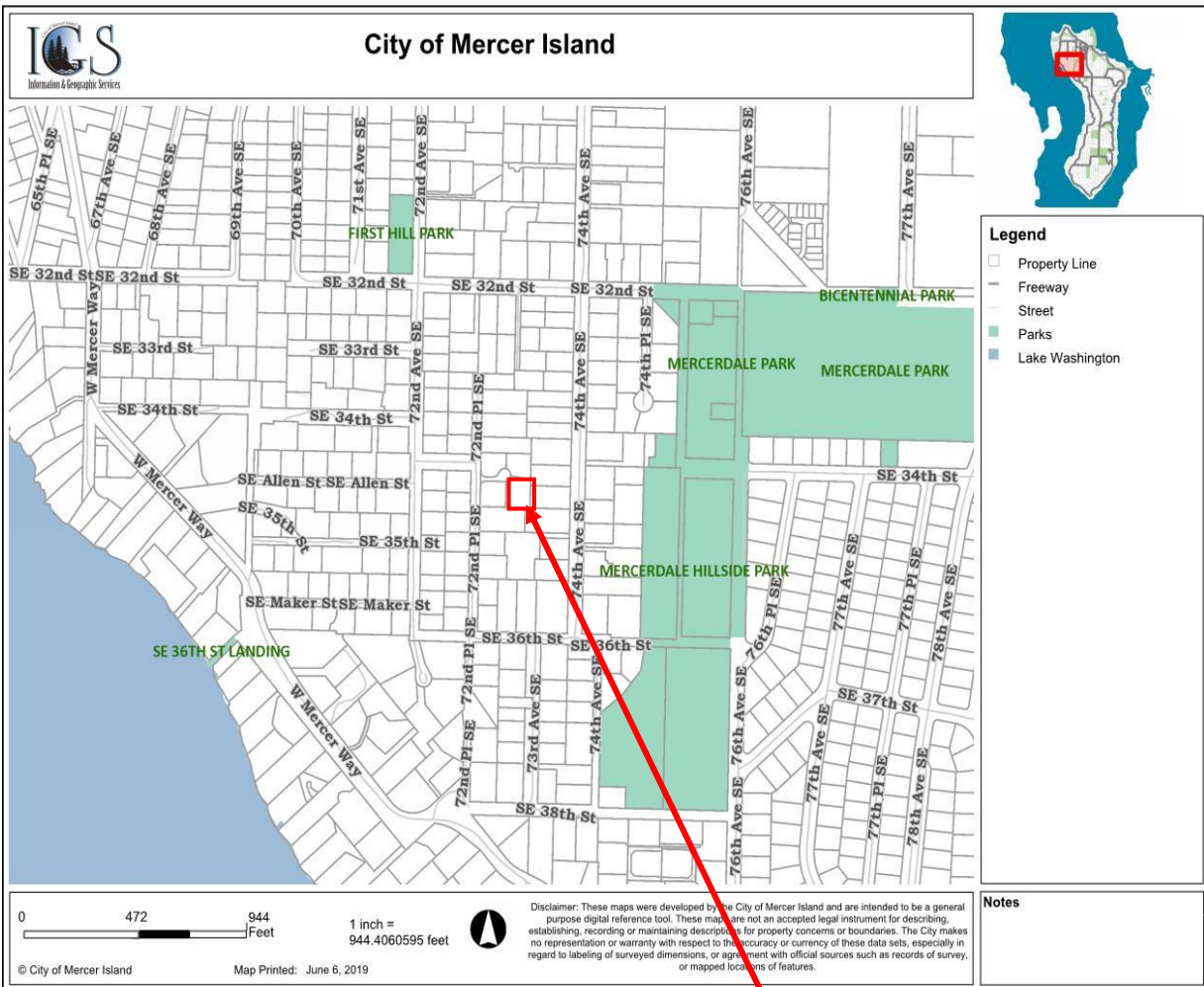
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**PROJECT SITE**

VICINITY MAP

# PROJECT DESCRIPTION

## **1.1 SITE LOCATION**

The subject property, 3404 72<sup>nd</sup> Place S.E., is located on the east side of 72<sup>nd</sup> Place S.E. and just east of S.E. 34th Street. (See Vicinity Map). The site will be developed with the construction of a single family residence with driveway, patio, walkway, and landscaping on the lot.

## **1.2 EXISTING CONDITIONS**

The site is presently developed with a single family residence and a gravel driveway. (See Figure 1.1 Existing Conditions Exhibit).

The lot slopes from the north to the south property line of the parcel. Slopes vary, but generally are approximately 5 to 6 percent. Soils are Vashon Recessional Outwash material (See Geotechnical Report Appendix A).

Storm runoff will enter the property from the developed adjacent lot to the north by overland flow. No flow will enter from the west, east or the south as contours fall off in those directions.

## **1.3 DEVELOPED CONDITIONS**

Lot development will include removal of existing structure and clearing and grading of the lot for the construction of a new single-family residence, driveway, patio, walkway, and landscaping. The new impervious area of the developed lot is 4,300 sf (See Figure 1.2 Developed Conditions Exhibit).

A storm drainage system was designed and constructed to collect runoff from the impervious areas of the roof, patio, walkway, and driveway with the short plat improvements. Roof runoff will enter gutters and be directed to downspouts connected the existing detention system located on the west side of the residence. Driveway runoff will be collected in a driveway drain. Stormwater from downspouts, yard drains and the driveway drains will be conveyed to a detention system.

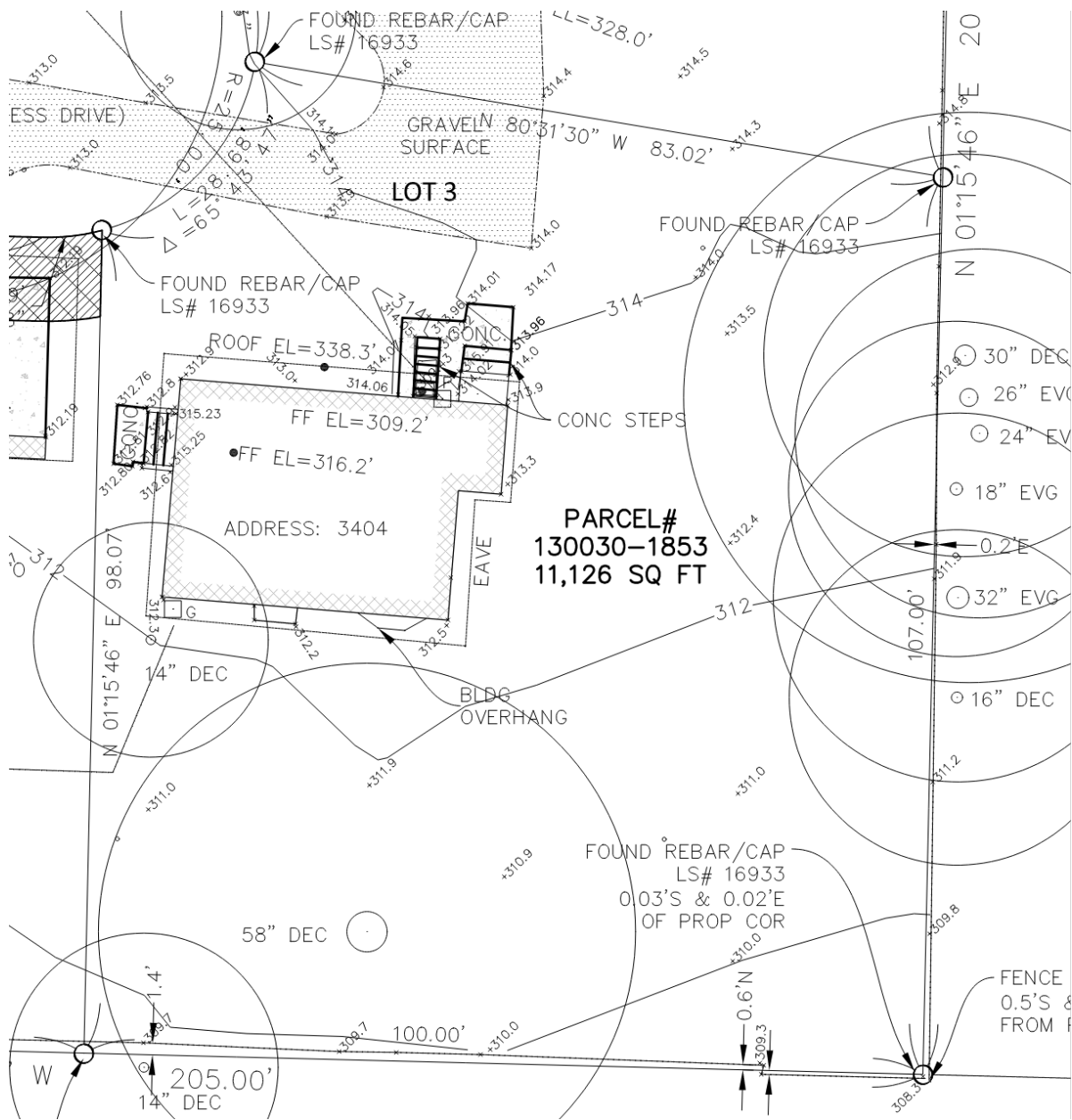


Figure 1.1 Existing Conditions Exhibit

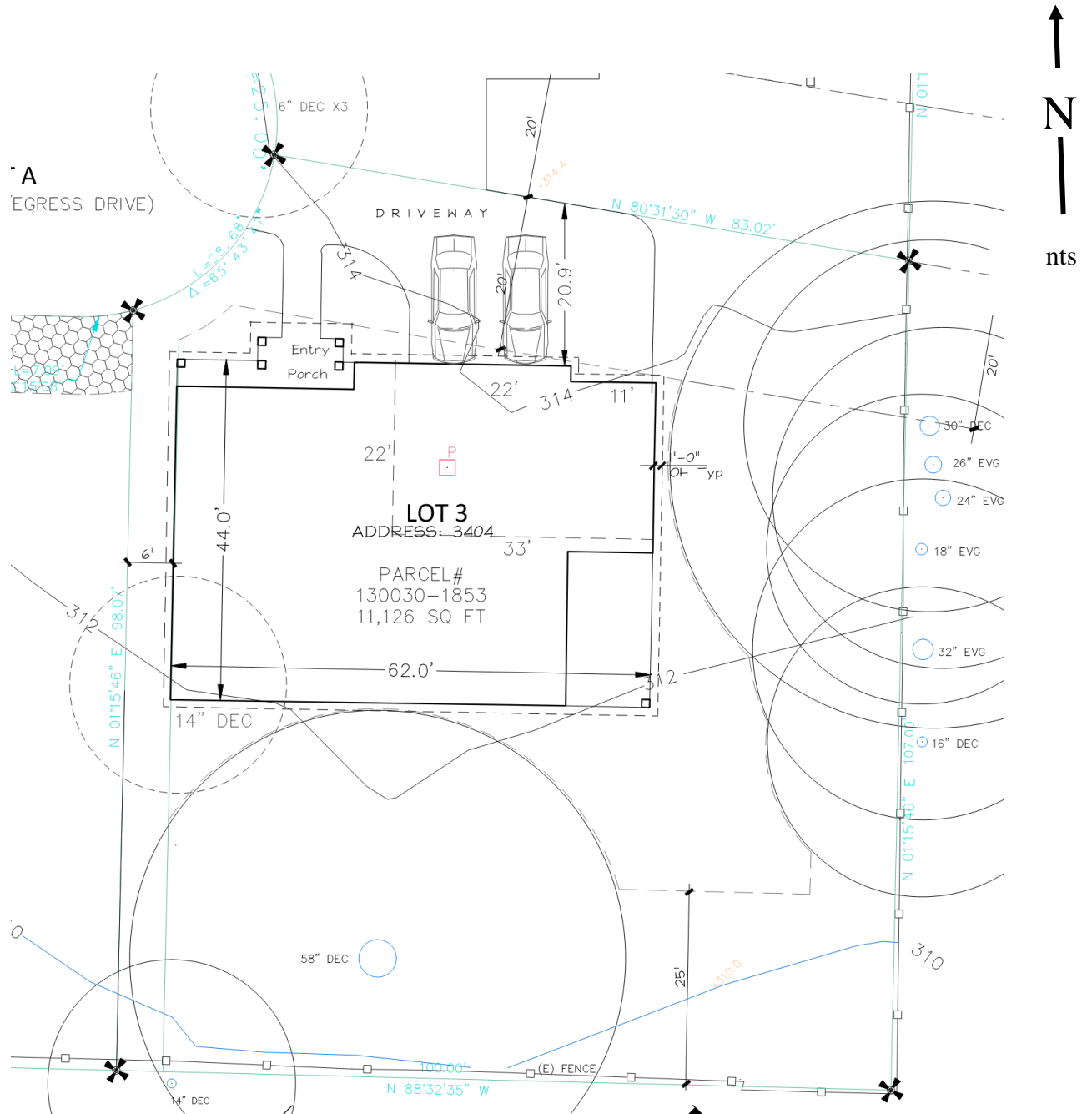


Figure 1.2 Developed Conditions Exhibit

## MINIMUM STORMWATER REQUIREMENTS

### **1.4 MINIMUM REQUIREMENTS (MR)**

Lot development will contain 4,300 square feet of new impervious surfaces and therefore the project must comply with minimum requirements MR1 through MR5. (See Figure I-2.4.2)

#### **1.4.1 MR #1 – PREPARATION OF STORMWATER SITE PLANS**

A stormwater site plan detailing the collection, conveyance, and discharge of stormwater from the site has been prepared and will be included in the building permit submittal. The stormwater site plan was prepared per the City of Mercer Island Development Services Standards. The detention system has been installed with the short plat improvement requirements.

#### **1.4.2 MR #2 – SMALL PROJECT STORMWATER SITE/PLAN REPORT**

A Small Project Stormwater Site/Plan Report and a Temporary Erosion Sediment Control Plan have been prepared and will be included in the building permit submittal. The Small Project Stormwater Site/Plan Report addresses the five (5) Minimum Requirements (MR).

#### **1.4.3 MR #3 – SOURCE CONTROL OF POLLUTION**

Source control BMP's are included in the SWPP Worksheet and are shown on the Temporary Erosion Sediment Control Plan. The source control BMPs are intended to prevent stormwater from coming in contact with pollutants.

#### **1.4.4 MR #4 – PRESERVATION OF NATURAL DRAINAGE SYSTEMS AND OUTFALLS**

The natural drainage direction is to the south and then to the storm drain system in 72<sup>nd</sup> Place SE and has been retained. Discharge leaving the property will enter the 72<sup>nd</sup> Place SE roadway drainage system which connects to an existing storm drain system in S.E 71<sup>st</sup> Street with eventual outfall into Lake Washington. A Downstream Level One Analysis was not required for this project as detention systems were installed per the short plat requirements.

#### **1.4.5 MR #5 – ONSITE STORMWATER MANAGEMENT**

This project triggers Minimum Requirements #1 through #5 and must meet the requirements in Figure I-2.5.1. No low impact development BMPs will be used on this site. The site Geotechnical Report states this site is appropriate for infiltration. (See Appendix A, Geotechnical Report)

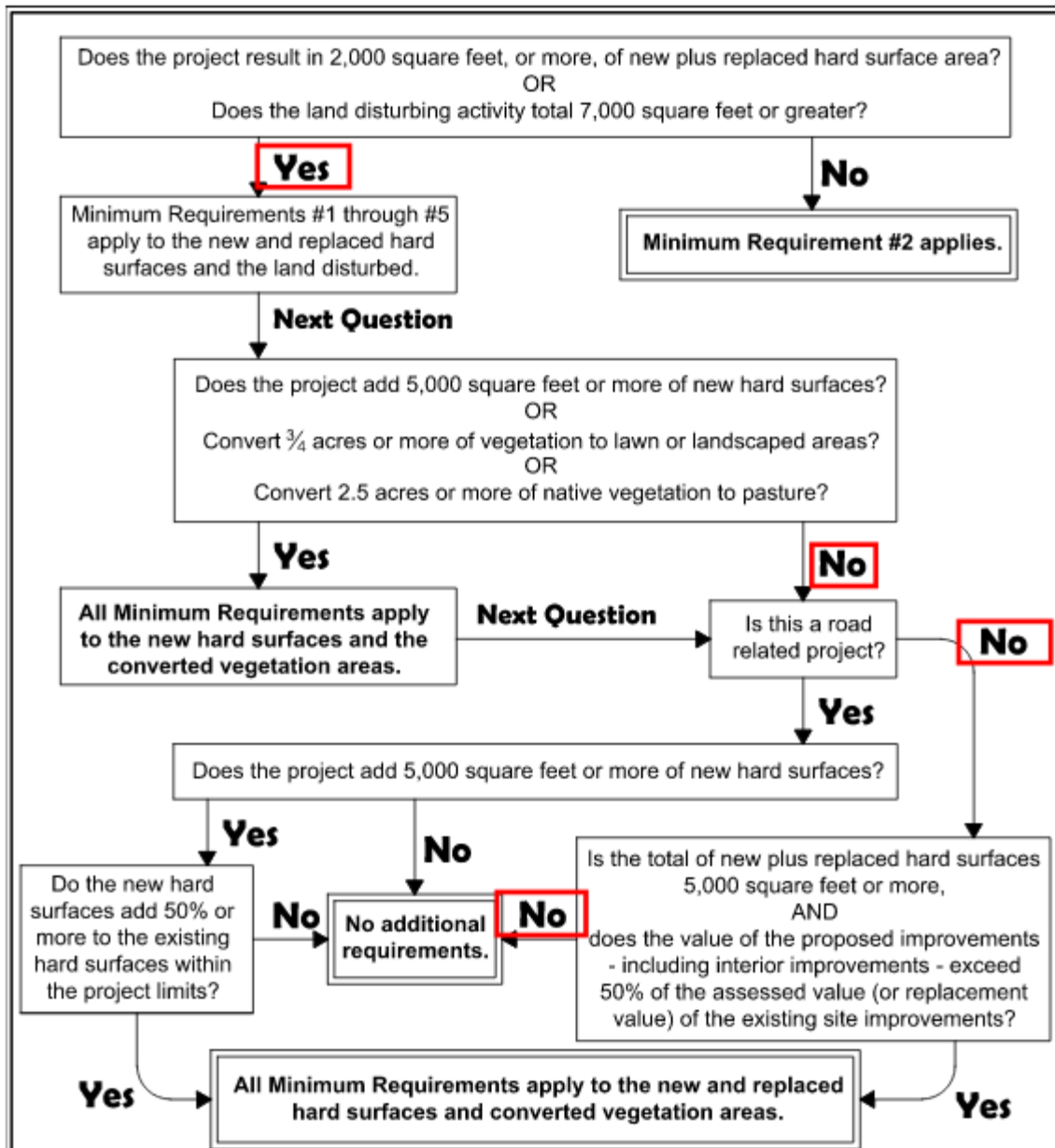


Figure I-2.4.2  
Flow Chart for Determining Requirements for  
Redevelopment



Revised June 2015

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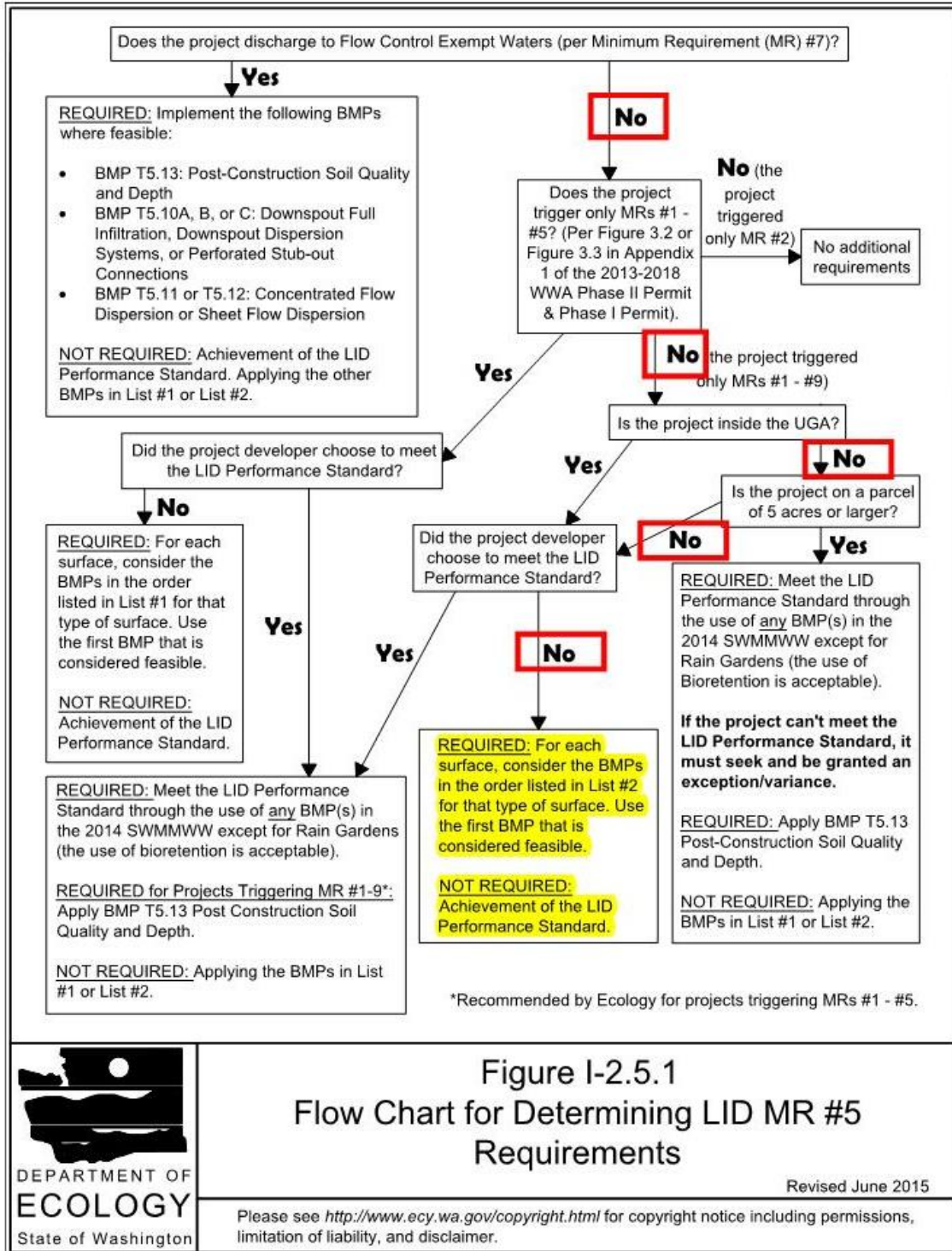


Figure I-2.5.1  
Flow Chart for Determining LID MR #5 Requirements



Revised June 2015

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# ONSITE STORMWATER MANAGEMENT

## **1.5 TIER 1: MINIMIZE RUNOFF GENERATION**

### **1.5.1 SMART SITE DESIGN**

The site development has been laid out to create minimum impact. The total impervious surface area for roof, patio, walk, and driveway is 4,300 square feet.

### **1.5.2 PRESERVE NATIVE VEGETATION**

With the exception of existing trees, there is no significant native vegetation outside the building areas. Selected existing trees will be preserved and maintained during construction.

Lawn and Landscape Areas: The site will provide Post-Construction Soil Quality and Depth in accordance with BMP T5.13 (See the TESC Plan and TESC Detail sheets). The topsoil layer shall have a minimum depth of 8-inches, mulching planting beds shall have 2-inches of organic material. The undisturbed areas will be maintained and protected during construction.

### **1.5.3 FULL DISPERSION AND FULL INFILTRATION**

Full dispersion or infiltration is not feasible per the Geotechnical Report.

The site soil is Vashon Recessional Outwash soil. City mapping shows the site is infeasible for onsite infiltration. The site Geotechnical Report states this site is not appropriate for dispersion. (See Appendix A, Geotechnical Report)

- Full Dispersion is not feasible per the Geotechnical Report.
- Full Infiltration is not feasible as the Geotechnical Report has determined the infiltration rate for each lot.
- Rain Gardens: The site is unsuitable suitable for rain gardens as the Geotechnical Report has determined the lots are not feasible for onsite infiltration.
- Downspout Dispersion is not feasible per Geotechnical Report.
- Perforated Stub-out Connection can be utilized the site is infeasible for onsite infiltration.

#### **1.5.4 AMENDED SOILS**

Amended soil will be used over the disturbed areas that will be landscaped per Post-Construction Soil Quality and Depth in accordance with BMP T5.13, see the TESC plan and TESC detail sheets.

#### **1.6 TIER 2: RETAIN RUNOFF ON SITE**

As discussed in full dispersion and full infiltration above, retention of runoff onsite is not a feasible option.

*Bioretention* will not be used for the same reasons listed for the Rain Gardens under Section 1.5.3 above.

*Pervious pavement for the driveway* will not be used for the same reasons listed above for Perforated Stub-out Connection under Section 1.5.3 above.

*Rain Harvesting* will not be used.

*Vegetated roof* is not a practical system due to the roof design and slope.

#### **1.7 TIER 3: INFILTRATE OR DISPERSE RUNOFF PRIOR TO DISCHARGE**

As discussed above in Section 1.5.3 dispersion and infiltration are not feasible on this site per the Geotechnical Report.

## **Appendix A: Geotechnical Report**



Earth Solutions NW LLC

Geotechnical Engineering, Construction  
Observation/Testing and Environmental Services

June 3, 2019  
ES-6695

RKK Construction, Inc.  
3056 – 70<sup>th</sup> Avenue Southeast  
Mercer Island, Washington 98040

Attention: Mr. Jason Koehler

**Subject: Infiltration Evaluation  
Levenson Property  
3404 and 3406 – 72<sup>nd</sup> Place Southeast  
Mercer Island, Washington**

Reference: Washington State Department of Ecology  
2014 Stormwater Management Manual for Western Washington

Terrane  
Topographic & Boundary Survey, dated April 18, 2019

M.A. Jones  
Geologic Framework for the Puget Sound aquifer system, Washington and British  
Columbia, 1999

United States Department of Agriculture  
Natural Resources Conservation Service  
Online Web Soil Survey (WSS) resource

Dear Mr. Koehler:

As requested, Earth Solutions NW, LLC (ESNW) has prepared this letter for the subject site. Our scope of services included subsurface exploration, infiltration testing, engineering analysis, and preparation of this letter.

**Project Description**

The subject site is located east of the intersection between Southeast 34<sup>th</sup> Street and 72<sup>nd</sup> Place Southeast, in Mercer Island, Washington, as illustrated on the attached Vicinity Map (Plate 1). The site consists of four adjoined residential tax parcels (King County Parcel Nos. 130030-1850, -1851, -1852, and -1853) totaling approximately 0.96 acres of land area. The property is currently developed with two single-family residences, a detached garage, a detached car port, and associated infrastructure improvements. We understand existing structures will be removed, and four new single-family residences and related improvements will be constructed.

RKK Construction, Inc.  
June 3, 2019

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If the design assumptions outlined in this section are incorrect or change, or if construction conditions differ from those encountered during our fieldwork, ESNW should be contacted to review the recommendations and conclusions provided in this letter.

### **Subsurface Conditions**

An ESNW representative observed, logged, and sampled eight test pits excavated across the subject site using a mini-trackhoe and operator provided by the client on May 7<sup>th</sup> and May 8<sup>th</sup>, 2019. The approximate locations of the test pits are depicted on Plate 2 (Test Pit Location Plan). Please refer to the attached test pit logs for a more detailed description of subsurface conditions. Representative soil samples collected at the test pit locations were analyzed in accordance with both Unified Soil Classification System (USCS) and United States Department of Agriculture (USDA) methods and procedures.

Topsoil was encountered in the upper approximate 6 to 12 inches of existing grades at the test pit locations, characterized by dark brown color, the presence of fine organic material, and small root intrusions. Surficial fill was encountered at test pit locations TP-2 and TP-5 and was restricted to the topsoil layer. Fill may also be present near existing structural improvements and along drive and access ways within the subject property. Where encountered, fill should be evaluated by ESNW at the time of construction to assess the suitability for use as structural fill and/or foundation support.

Underlying topsoil and fill, native soils primarily consisting of loose to medium dense silty sand with varying amounts of gravel (USCS: SM) were encountered. Underlying the upper silty sand layer, native soils were observed to vary amongst poorly graded sand with varying amounts of gravel, poorly graded sand with silt, poorly graded gravel with sand, poorly graded gravel with silt, well graded gravel with sand, and well graded gravel with silt and sand (USCS: SP, SP-SM, GP, GP-GM, GW, and GW-GM, respectively). The lower sands and gravels were encountered in a medium dense to dense and moist to wet condition. Where encountered, the gravel deposits were observed at depths ranging between three and five feet below existing grades. Intermittent silt lensing was observed in all test pit locations, with exception to test pit locations TP-7 and TP-8, at depths ranging between two and one-half to seven feet bgs.

### **Geologic Setting**

The referenced geologic map resource indicates the subject site and surrounding area are underlain by Vashon till (Qvt). The referenced WSS resource identifies arents of Alderwood material (Map Unit Symbol: AmB) across the site and surrounding areas. "Arents" refers to Alderwood soils that, despite possible historic disturbance from urban development, retain many features of Alderwood soils, which were formed in till plains. Based on the conditions encountered during our subsurface exploration, native site soils are more consistent with the typical make-up of Vashon recessional outwash deposits.

RKK Construction, Inc.  
June 3, 2019

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**Groundwater**

Light groundwater seepage was encountered at test pit location TP-2 at a depth of eight feet bgs and test pit location TP-6 at a depth of six and one-half feet bgs during our May 2019 exploration. It should be noted seepage rates and elevations fluctuate depending on many factors, including precipitation duration and intensity, the time of year, and soil conditions. In general, groundwater flow rates are higher during the wetter, winter months.

**Infiltration Evaluation**

Our evaluation of the proposed infiltration facilities was completed in general accordance with applicable requirements and procedures of the referenced 2014 Washington State Department of Ecology Stormwater Management Manual for Western Washington (2014 SWMMWW) as adopted by the City of Mercer Island. We understand individual infiltration facilities are proposed for each of the four lots on the property.

In-situ testing was completed in general accordance with the small-scale Pilot Infiltration Test (PIT) procedure, as outlined in Section 3.3.6 of Volume III of the 2014 SWMMWW. To evaluate the infiltration capacity of soils, in-situ testing was completed at TP-1 and TP-2 at a depth of three feet bgs and at TP-5, TP-6, and TP-7 at a depth of five feet bgs. Our testing program consisted of a soak period, steady state period, and falling head period. Due to the soil variability across the property, three separate preliminary infiltration rates were calculated for the predominant soil types observed at the property (silty sand, cleaner sand deposits, and gravels). The table below summarizes the short-term (measured) rate at each test location, in units of inches per hour (iph).

<b>Test Pit</b>	<b>Measured Rate (iph)</b>	<b>Depth (feet)</b>	<b>Soil Type</b>
TP-1, TP-2, & TP-6	1	3	Silty sand (SM)
TP-5	13.5	5	Poorly graded sand with silt (SP-SM)
TP-7	18.5	5	Well graded gravel with sand (GW)

Per the referenced 2014 SWMMWW, correction factors must be applied to the measured rates to account for site variability, testing methods, and influent control to prevent siltation. In our opinion, the following correction factors and calculated total correction factor should be applied to the measured field rates.

- CF<sub>v</sub> (site variability; number of tests) 0.33
- CF<sub>t</sub> (test method) 0.5
- CF<sub>m</sub> (degree of fluent control) 0.9
- CF<sub>t</sub> (total correction factor) 0.15

RKK Construction, Inc.  
June 3, 2019

ES-6695  
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Application of the total correction factor to the measured rates are provided in the table below:

<b>Test Pit</b>	<b>Design Rate (iph)</b>
TP-1, TP-2, & TP-6	0.15
TP-5	2.03
TP-7	2.78

From a geotechnical standpoint, infiltration is feasible within locations underlain by gravels and clean sand deposits. The silty sand deposits identified at the property generally exhibit poor infiltration potential and should not be targeted for infiltration facilities. Minimum vertical separation between the bottoms of the proposed facilities and groundwater must be considered during design. We recommend provisions for overflow be incorporated into final designs, wherever practicable.

Given the variability of the site soils infiltration potential, ESNW should be in correspondence with the facility designer to assist with applying appropriate rates to the targeted infiltrating soils at each proposed lot, acknowledging depth to restrictive layers, and identifying appropriate facility locations per each lot. Additionally, ESNW should be retained at the time of facility construction to confirm soils types and provide additional recommendations as needed.

**Limitations**

This letter has been prepared for the exclusive use of RKK Construction, Inc. and their representatives. A warranty is neither expressed nor implied. The recommendations and conclusions provided in this letter are professional opinions consistent with the level of care and skill that is typical of other members in the profession currently practicing under similar conditions in this area. Variations in the soil and groundwater conditions encountered at the test pit locations may exist and may not become evident until construction. ESNW should reevaluate the contents of this letter if variations are encountered. ESNW should be retained during construction to observe facility installation and to confirm soil types are as anticipated in this letter. Supplementary recommendations may be provided during construction, as necessary.



RKK Construction, Inc.  
June 3, 2019

ES-6695  
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We appreciate the opportunity to be of service to you and trust this letter meets your current needs. Should you have questions, or if additional information is required, please call.

Sincerely,

**EARTH SOLUTIONS NW, LLC**



Kyler T. Kelly  
Staff Geologist



Raymond A. Coglas, P.E.  
Principal Engineer

- Attachments: Plate 1 – Vicinity Map  
Plate 2 – Test Pit Location Plan  
Test Pit Logs  
Grain Size Distribution



Reference:  
 King County, Washington  
 Map 595  
 By The Thomas Guide  
 Rand McNally  
 32nd Edition



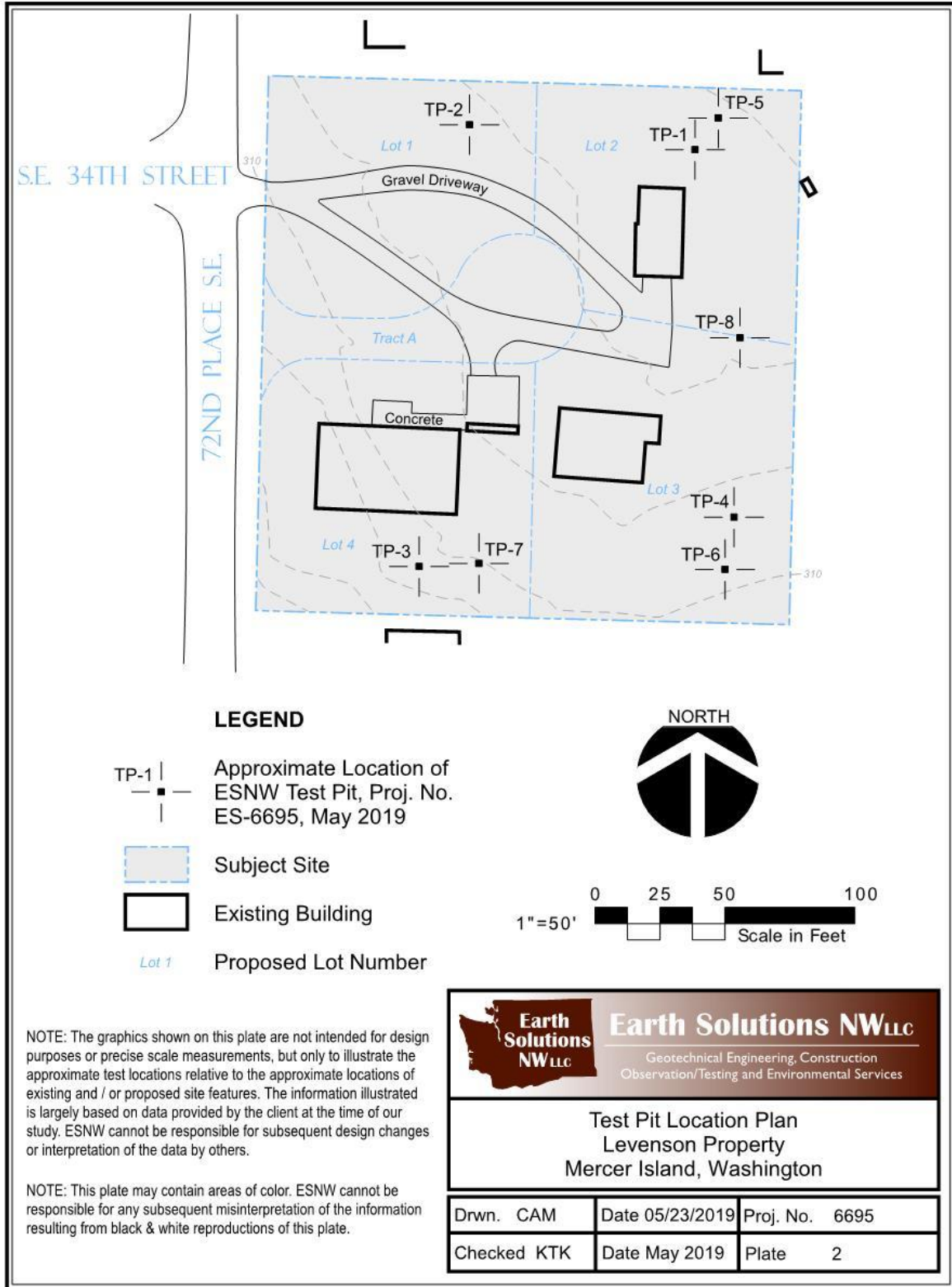
NOTE: This plate may contain areas of color. ESNW cannot be responsible for any subsequent misinterpretation of the information resulting from black & white reproductions of this plate.

**Earth Solutions NW LLC**

Geotechnical Engineering, Construction  
 Observation/Testing and Environmental Services

Vicinity Map  
 Levenson Property  
 Mercer Island, Washington

Drwn. CAM	Date 05/23/2019	Proj. No. 6695
Checked KTK	Date May 2019	Plate 1



## Earth Solutions NW<sub>LLC</sub> SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			SYMBOLS		TYPICAL DESCRIPTIONS
			GRAPH	LETTER	
COARSE GRAINED SOILS  MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	GRAVEL AND GRAVELLY SOILS  MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	CLEAN GRAVELS  (LITTLE OR NO FINES)		<b>GW</b>	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
		GRAVELS WITH FINES  (APPRECIABLE AMOUNT OF FINES)		<b>GP</b>	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
		GRAVELS WITH FINES  (APPRECIABLE AMOUNT OF FINES)		<b>GM</b>	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
	SAND AND SANDY SOILS  MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	CLEAN SANDS  (LITTLE OR NO FINES)		<b>SW</b>	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
				<b>SP</b>	POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES
		SANDS WITH FINES  (APPRECIABLE AMOUNT OF FINES)		<b>SM</b>	SILTY SANDS, SAND - SILT MIXTURES
				<b>SC</b>	CLAYEY SANDS, SAND - CLAY MIXTURES
				<b>PT</b>	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS
FINE GRAINED SOILS  MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS  LIQUID LIMIT LESS THAN 50		<b>ML</b>	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY	
			<b>CL</b>	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS	
			<b>OL</b>	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY	
	SILTS AND CLAYS  LIQUID LIMIT GREATER THAN 50		<b>MH</b>	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS	
			<b>CH</b>	INORGANIC CLAYS OF HIGH PLASTICITY	
			<b>OH</b>	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS	
HIGHLY ORGANIC SOILS				<b>PT</b>	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

DUAL SYMBOLS are used to indicate borderline soil classifications.

The discussion in the text of this report is necessary for a proper understanding of the nature of the material presented in the attached logs.



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 Telephone: 425-449-4704  
 Fax: 425-449-4711

**TEST PIT NUMBER TP-1**  
 PAGE 1 OF 1

PROJECT NUMBER ES-6695 PROJECT NAME Levenson Property  
 DATE STARTED 5/7/19 COMPLETED 5/7/19 GROUND ELEVATION 315 ft TEST PIT SIZE \_\_\_\_\_  
 EXCAVATION CONTRACTOR RKK Construction, Inc. GROUND WATER LEVELS:  
 EXCAVATION METHOD \_\_\_\_\_ AT TIME OF EXCAVATION ---  
 LOGGED BY KTK CHECKED BY HTW AT END OF EXCAVATION ---  
 NOTES Depth of Topsoil & Sod 12": grass AFTER EXCAVATION ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S. GRAPHIC LOG	MATERIAL DESCRIPTION
0				Dark brown TOPSOIL, trace roots to 2'
			TPSL 1.0	314.0 Brown silty SAND, loose, moist
		MC = 11.20% MC = 12.10% Fines = 20.60%	SM 4.0	311.0 -becomes medium dense -infiltration test at 3', caving to BOH [USDA Classification: slightly gravelly loamy SAND]
5		MC = 11.60%	SP-SM	Brown poorly graded SAND with silt, medium dense, wet -intermittent silt lenses from 4' to 6'  -small root intrusions
		MC = 17.80% Fines = 9.20%	8.5	306.5 [USDA Classification: slightly gravelly SAND]
				Test pit terminated at 8.5 feet below existing grade. No groundwater encountered during excavation. Caving observed from 3.0 feet to BOH. Bottom of test pit at 8.5 feet.

GENERAL BH / TP / WELL 6695.GPJ, GINT US.GDT 5/24/19




Earth Solutions NW  
 1805 - 136th Place N.E., Suite 201  
 Bellevue, Washington 98005  
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**TEST PIT NUMBER TP-2**  
 PAGE 1 OF 1

PROJECT NUMBER ES-6695 PROJECT NAME Levenson Property  
 DATE STARTED 5/7/19 COMPLETED 5/7/19 GROUND ELEVATION 314 ft TEST PIT SIZE \_\_\_\_\_  
 EXCAVATION CONTRACTOR RKK Construction, Inc. GROUND WATER LEVELS:  
 EXCAVATION METHOD \_\_\_\_\_ AT TIME OF EXCAVATION ---  
 LOGGED BY KTK CHECKED BY HTW AT END OF EXCAVATION ---  
 NOTES Depth of Topsoil & Sod 6"-12": grass AFTER EXCAVATION ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0					
			TPSL		Dark brown TOPSOIL, trace roots to 2.5' (Fill) -ceramic debris 313.0
		MC = 14.80% Fines = 41.20%	SM		Brown silty SAND, loose, moist -becomes medium dense -infiltration test at 3' [USDA Classification: slightly gravelly sandy LOAM] 310.0
5		MC = 15.60%	SP-SM		Brown poorly graded SAND with silt, medium dense, wet -intermittent silt lenses from 4' to 7' -small root intrusions -minor caving to BOH
		MC = 17.40%			-small root intrusions 306.0
		MC = 9.60% Fines = 3.20%	SP		Brown poorly graded SAND with gravel, dense, saturated -light groundwater seepage at 8' [USDA Classification: extremely gravelly coarse SAND] 305.0 Test pit terminated at 9.0 feet below existing grade. Groundwater seepage encountered at 8.0 feet during excavation. Caving observed from 6.0 feet to BOH. Bottom of test pit at 9.0 feet.

GENERAL\_BH / TP / WELL\_6695.GPJ GINT US.GDT 5/24/19

	Earth Solutions NW 1805 - 136th Place N.E., Suite 201 Bellevue, Washington 98005 Telephone: 425-449-4704 Fax: 425-449-4711		<b>TEST PIT NUMBER TP-3</b> PAGE 1 OF 1
	PROJECT NUMBER <u>ES-6695</u>	PROJECT NAME <u>Levenson Property</u>	
DATE STARTED <u>5/8/19</u>	COMPLETED <u>5/8/19</u>	GROUND ELEVATION <u>309 ft</u>	TEST PIT SIZE _____
EXCAVATION CONTRACTOR <u>RKK Construction, Inc.</u>		GROUND WATER LEVELS:	
EXCAVATION METHOD _____		AT TIME OF EXCAVATION <u>---</u>	
LOGGED BY <u>KTK</u>		CHECKED BY <u>HTW</u>	
AT END OF EXCAVATION <u>---</u>		AFTER EXCAVATION <u>---</u>	
NOTES <u>Depth of Topsoil &amp; Sod 6"-12": grass</u>			

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0					
			TPSL	0.0	Dark brown TOPSOIL, trace roots to BOH
				1.0	Brown silty SAND, medium dense, moist
		MC = 11.90%	SM	5.0	-increased gravel content -intermittent silt lenses to 6'
5			GP-GM	6.5	Gray poorly graded GRAVEL with silt, dense, moist -caving from 5' to BOH
		MC = 7.60%		6.5	
		MC = 4.30%	GP	8.5	Gray poorly graded GRAVEL with sand, dense, moist
		MC = 5.40%		8.5	
					Test pit terminated at 8.5 feet below existing grade. No groundwater encountered during excavation. Caving observed from 5.0 feet to BOH. Bottom of test pit at 8.5 feet.

GENERAL BH/TP /WELL 6695.GPJ\_GINT US.GDT 5/24/19



Earth Solutions NW  
 1805 - 136th Place N.E., Suite 201  
 Bellevue, Washington 98005  
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**TEST PIT NUMBER TP-4**  
 PAGE 1 OF 1

PROJECT NUMBER ES-6695 PROJECT NAME Levenson Property  
 DATE STARTED 5/8/19 COMPLETED 5/8/19 GROUND ELEVATION 312 ft TEST PIT SIZE \_\_\_\_\_  
 EXCAVATION CONTRACTOR RKK Construction, Inc. GROUND WATER LEVELS:  
 EXCAVATION METHOD \_\_\_\_\_ AT TIME OF EXCAVATION ---  
 LOGGED BY KTK CHECKED BY HTW AT END OF EXCAVATION ---  
 NOTES Depth of Topsoil & Sod 12": grass AFTER EXCAVATION ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0					
			TPSL		Dark brown TOPSOIL, trace roots to 6'
		MC = 8.70%	SM		Brown silty SAND, medium dense, moist -becomes dense, intermittent silt lenses to 6' -increased gravel content
5		MC = 6.90%	GP		Brown poorly graded GRAVEL with sand, dense, moist -minor caving to BOH
		MC = 7.80%			
		MC = 13.00%	SP		Gray poorly graded SAND with gravel, dense, moist
					Test pit terminated at 8.5 feet below existing grade. No groundwater encountered during excavation. Caving observed from 5.0 feet to BOH. Bottom of test pit at 8.5 feet.

GENERAL\_BH / TP / WELL\_6695.GPJ\_GINT US.GDT\_5/24/19








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**TEST PIT NUMBER TP-5**

PAGE 1 OF 1

PROJECT NUMBER ES-6695 PROJECT NAME Levenson Property  
 DATE STARTED 5/8/19 COMPLETED 5/8/19 GROUND ELEVATION 316 ft TEST PIT SIZE \_\_\_\_\_  
 EXCAVATION CONTRACTOR RKK Construction, Inc. GROUND WATER LEVELS:  
 EXCAVATION METHOD \_\_\_\_\_ AT TIME OF EXCAVATION ---  
 LOGGED BY KTK CHECKED BY HTW AT END OF EXCAVATION ---  
 NOTES Depth of Topsoil & Sod 12": grass AFTER EXCAVATION ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0					
			TPSL		Dark brown TOPSOIL, trace roots to BOH (Fill) -plastic debris 315.0
		MC = 14.00%	SM		Brown silty SAND with gravel, medium dense, moist -intermittent silt lenses to 6' -becomes dense 312.0
5		MC = 9.20% Fines = 8.20%	SP-SM		Brown poorly graded SAND with silt, dense, moist -infiltration test at 5' [USDA Classification: slightly gravelly SAND]
		MC = 11.70%			
		MC = 11.80% Fines = 9.30%			[USDA Classification: slightly gravelly coarse SAND] 307.5
					Test pit terminated at 8.5 feet below existing grade. No groundwater encountered during excavation. No caving observed. Bottom of test pit at 8.5 feet.

GENERAL BH/TP /WELL 6695.GPJ GINT US\_GDT 5/24/19



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**TEST PIT NUMBER TP-6**  
 PAGE 1 OF 1

PROJECT NUMBER ES-6695 PROJECT NAME Levenson Property  
 DATE STARTED 5/8/19 COMPLETED 5/8/19 GROUND ELEVATION 310 ft TEST PIT SIZE \_\_\_\_\_  
 EXCAVATION CONTRACTOR RKK Construction, Inc. GROUND WATER LEVELS:  
 EXCAVATION METHOD \_\_\_\_\_ AT TIME OF EXCAVATION ---  
 LOGGED BY KTK CHECKED BY HTW AT END OF EXCAVATION ---  
 NOTES Depth of Topsoil & Sod 12": grass AFTER EXCAVATION ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0					
			TPSL		Dark brown TOPSOIL, trace roots to 7.5'
				1.0	309.0
		MC = 14.90%			-becomes dense, intermittent silt lenses to 6.5'
5		MC = 17.40% Fines = 20.30%	SM		[USDA Classification: slightly gravelly loamy SAND] -infiltration test at 5' -becomes wet -minor caving to BOH -light groundwater seepage
		MC = 20.30%			
		MC = 17.40%			
		MC = 19.90% Fines = 19.10%		8.5	301.5
					Test pit terminated at 8.5 feet below existing grade. Groundwater seepage encountered at 6.5 feet during excavation. Caving observed from 6.0 feet to BOH. Bottom of test pit at 8.5 feet.

GENERAL BH / TP / WELL\_6695\_GPJ\_GINT\_US\_GDT\_5/30/19



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**TEST PIT NUMBER TP-7**

PAGE 1 OF 1

PROJECT NUMBER ES-6695 PROJECT NAME Levenson Property  
 DATE STARTED 5/8/19 COMPLETED 5/8/19 GROUND ELEVATION 310 ft TEST PIT SIZE \_\_\_\_\_  
 EXCAVATION CONTRACTOR RKK Construction, Inc. GROUND WATER LEVELS:  
 EXCAVATION METHOD \_\_\_\_\_ AT TIME OF EXCAVATION ---  
 LOGGED BY KTK CHECKED BY HTW AT END OF EXCAVATION ---  
 NOTES Depth of Topsoil & Sod 12": grass AFTER EXCAVATION ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S. GRAPHIC LOG	MATERIAL DESCRIPTION	
0				Dark brown TOPSOIL, trace roots to 7"	
			TPSL 1.0		309.0
			SM 2.5	Brown silty SAND with gravel, medium dense, moist	
		MC = 8.10%	SP-SM 3.5	Brown poorly graded SAND with silt, medium dense, moist	307.5
				Brown well-graded GRAVEL with sand, dense, moist	306.5
5		MC = 5.70% Fines = 4.80%	GW 6.0	-infiltration test at 5' [USDA Classification: extremely gravelly loamy coarse SAND]	304.0
		MC = 7.90%		Brown poorly graded GRAVEL with sand, dense, moist	
		MC = 9.50% Fines = 3.10%	GP 8.0	-moderate caving to BOH [USDA Classification: extremely gravelly coarse SAND]	302.0
				Test pit terminated at 8.0 feet below existing grade. No groundwater encountered during excavation. Caving observed from 7.0 feet to BOH. Bottom of test pit at 8.0 feet.	

GENERAL BH / TP / WELL: 6695.GPJ\_GINT\_US.GDT 5/24/19

	Earth Solutions NW 1805 - 136th Place N.E., Suite 201 Bellevue, Washington 98005 Telephone: 425-449-4704 Fax: 425-449-4711		<b>TEST PIT NUMBER TP-8</b> PAGE 1 OF 1
	PROJECT NUMBER <u>ES-6695</u>	PROJECT NAME <u>Levenson Property</u>	
DATE STARTED <u>5/8/19</u>	COMPLETED <u>5/8/19</u>	GROUND ELEVATION <u>314 ft</u>	TEST PIT SIZE _____
EXCAVATION CONTRACTOR <u>RKK Construction, Inc.</u>		GROUND WATER LEVELS:	
EXCAVATION METHOD _____		AT TIME OF EXCAVATION <u>---</u>	
LOGGED BY <u>KTK</u>	CHECKED BY <u>HTW</u>	AT END OF EXCAVATION <u>---</u>	
NOTES <u>Depth of Topsoil &amp; Sod 6": grass</u>		AFTER EXCAVATION <u>---</u>	

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S. GRAPHIC LOG	MATERIAL DESCRIPTION	
0					
			TPSL	Dark brown TOPSOIL, trace roots to BOH	313.5
			SM	Brown silty SAND with gravel, medium dense, moist	
		MC = 5.40% Fines = 9.30%	3.0		311.0
			GW-GM	Brown well-graded GRAVEL with silt and sand, dense, moist -moderate caving from 3' to BOH [USDA Classification: very gravelly loamy coarse SAND] -increased gravel and cobble size	
5			6.0		308.0
		MC = 3.10%		Test pit terminated at 6.0 feet below existing grade due to caving. No groundwater encountered during excavation. Caving observed from 3.0 feet to BOH. Bottom of test pit at 6.0 feet.	

GENERAL\_BH / TP / WELL\_6695.GPJ GINT US.GDT 5/24/19

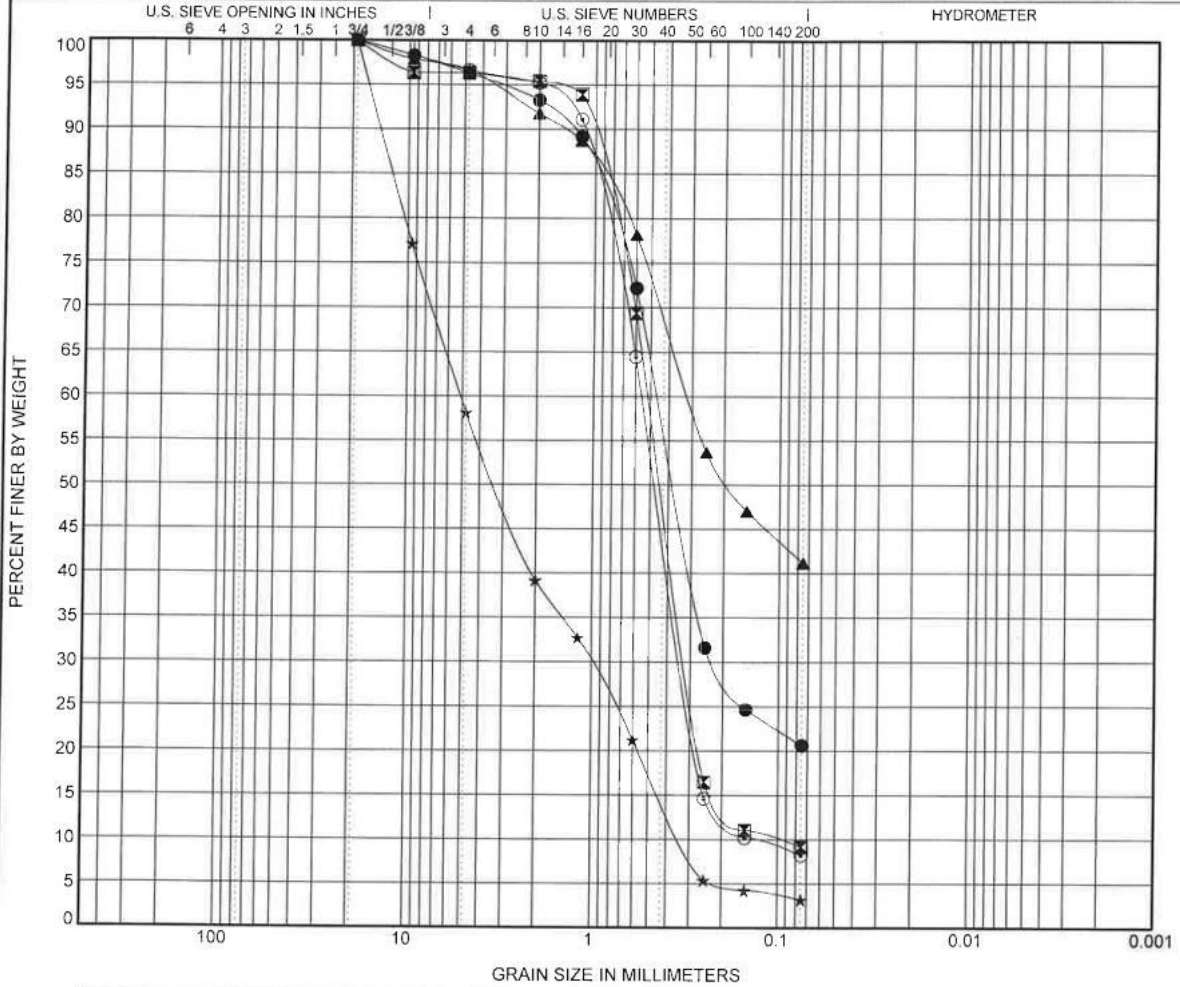


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GRAIN SIZE DISTRIBUTION

PROJECT NUMBER ES-6695

PROJECT NAME Levenson Property



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification	Classification		Cc	Cu						
● TP-01 3.0ft.	USDA: Brown Slightly Gravelly Loamy Sand. USCS: SM.									
☒ TP-01 8.5ft.	USDA: Brown Slightly Gravelly Sand. USCS: SP-SM.		1.88	5.07						
▲ TP-02 3.0ft.	USDA: Brown Slightly Gravelly Sandy Loam. USCS: SM.									
★ TP-02 9.0ft.	USDA: Brown Extremely Gravelly Coarse Sand. USCS: SP with Gravel.		0.61	15.75						
⊙ TP-05 5.0ft.	USDA: Brown Slightly Gravelly Sand. USCS: SP-SM.		1.36	3.92						
Specimen Identification	D100	D90	D60	D30	D10	LL	PL	PI	%Silt	%Clay
● TP-01 3.0ft.	19	1.315	0.461	0.222					20.6	
☒ TP-01 8.5ft.	19	1.059	0.514	0.313	0.101				9.2	
▲ TP-02 3.0ft.	19	1.479	0.313						41.2	
★ TP-02 9.0ft.	19	14.034	5.088	1.004	0.323				3.2	
⊙ TP-05 5.0ft.	19	1.148	0.555	0.328	0.142				8.2	

GRAIN SIZE USDA WITH D90 ES-6695 LEVENSON PROPERTY GPT US LAB.GDT 5/15/19

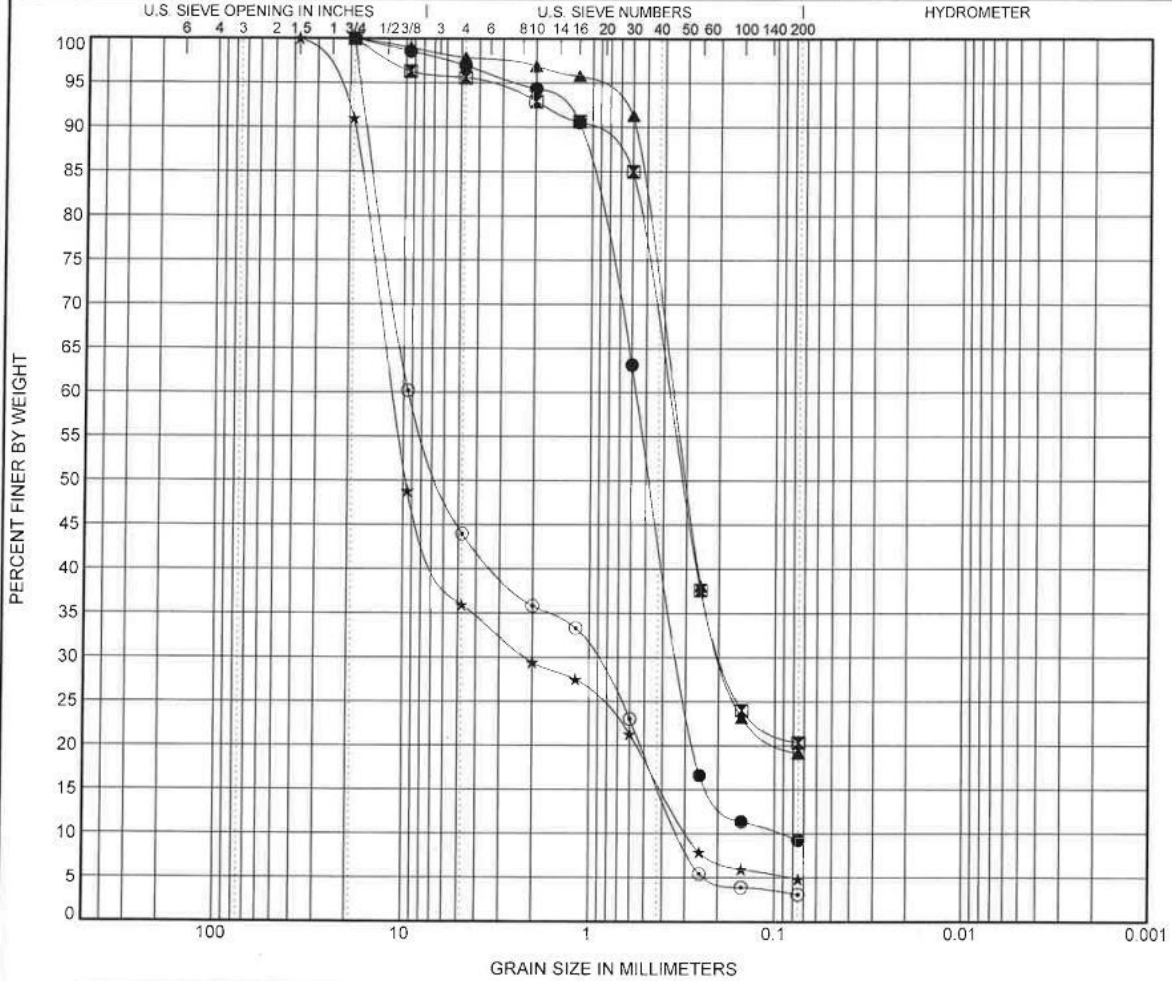


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GRAIN SIZE DISTRIBUTION

PROJECT NUMBER ES-6695

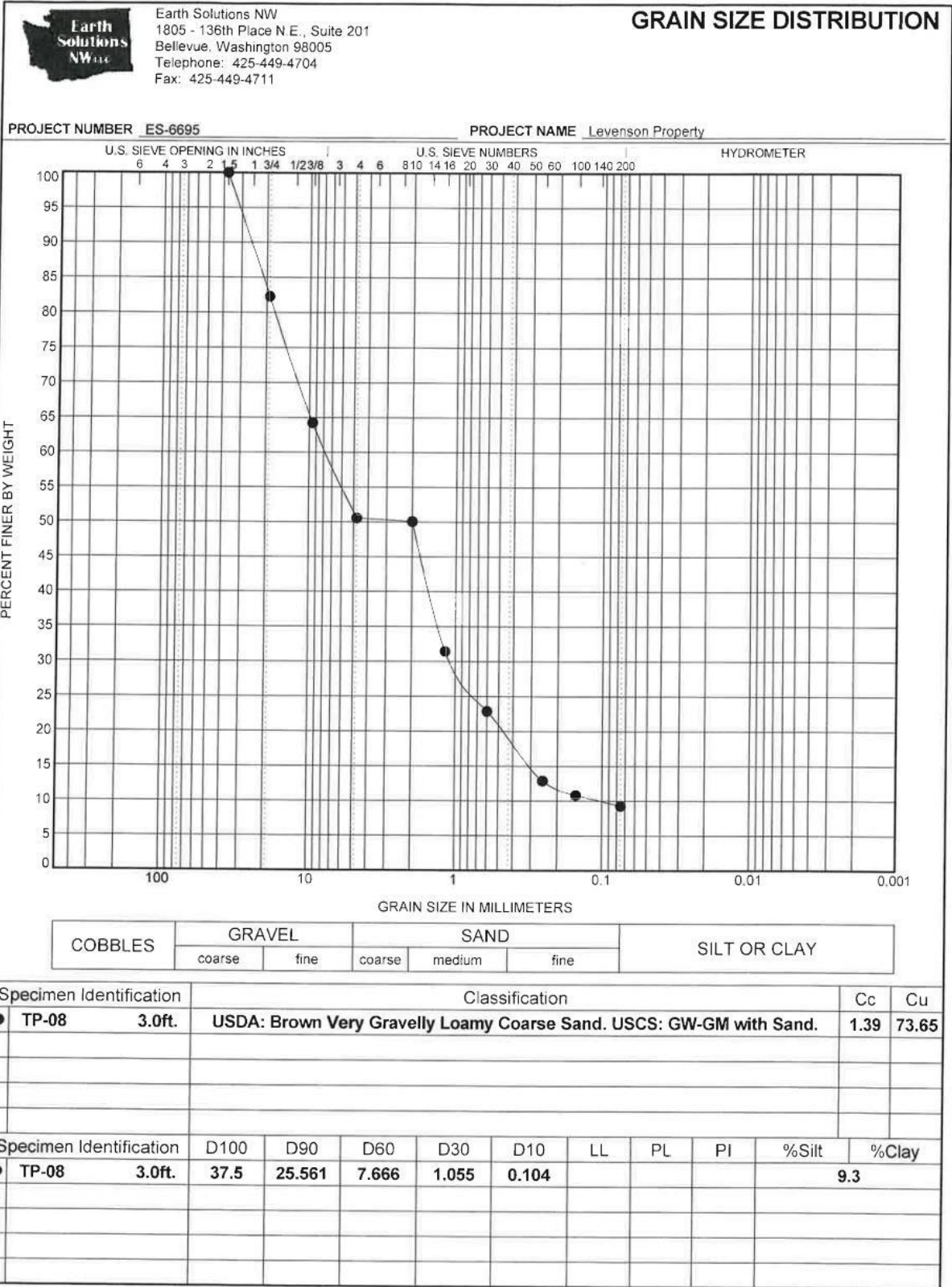
PROJECT NAME Levenson Property



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

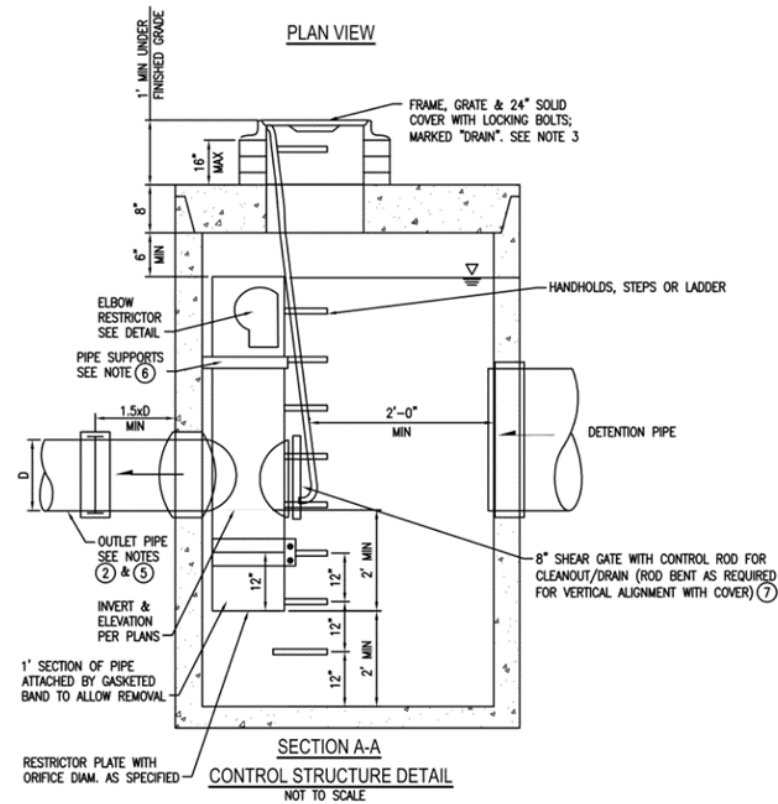
GRAIN SIZE USDA WITH D90 ES-6695 LEVENSON PROPERTY.GPJ\_GINT US.LAB.GDT\_5/15/19

Specimen Identification	Classification		Cc	Cu						
● TP-05 8.5ft.	USDA: Brown Slightly Gravelly Coarse Sand. USCS: SP-SM.		1.92	5.93						
⊠ TP-06 5.0ft.	USDA: Brown Slightly Gravelly Loamy Sand. USCS: SM.									
▲ TP-06 8.5ft.	USDA: Brown Slightly Gravelly Loamy Sand. USCS: SM.									
★ TP-07 5.0ft.	USDA: Brown Extremely Gravelly Loamy Coarse Sand. USCS: GW with Sand.		1.42	39.82						
⊙ TP-07 8.0ft.	USDA: Brown Extremely Gravelly Coarse Sand. USCS: GP with Sand.		0.31	30.04						
Specimen Identification	D100	D90	D60	D30	D10	LL	PL	PI	%Silt	%Clay
● TP-05 8.5ft.	19	1.165	0.566	0.322	0.095				9.3	
⊠ TP-06 5.0ft.	19	1.092	0.378	0.188					20.3	
▲ TP-06 8.5ft.	19	0.587	0.359	0.19					19.1	
★ TP-07 5.0ft.	37.5	18.701	11.422	2.161	0.287				4.8	
⊙ TP-07 8.0ft.	19	15.964	9.423	0.949	0.314				3.1	

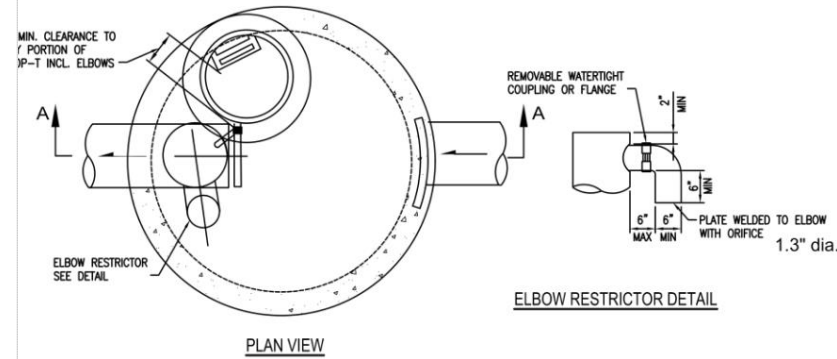


## **Appendix B: Detention Design**

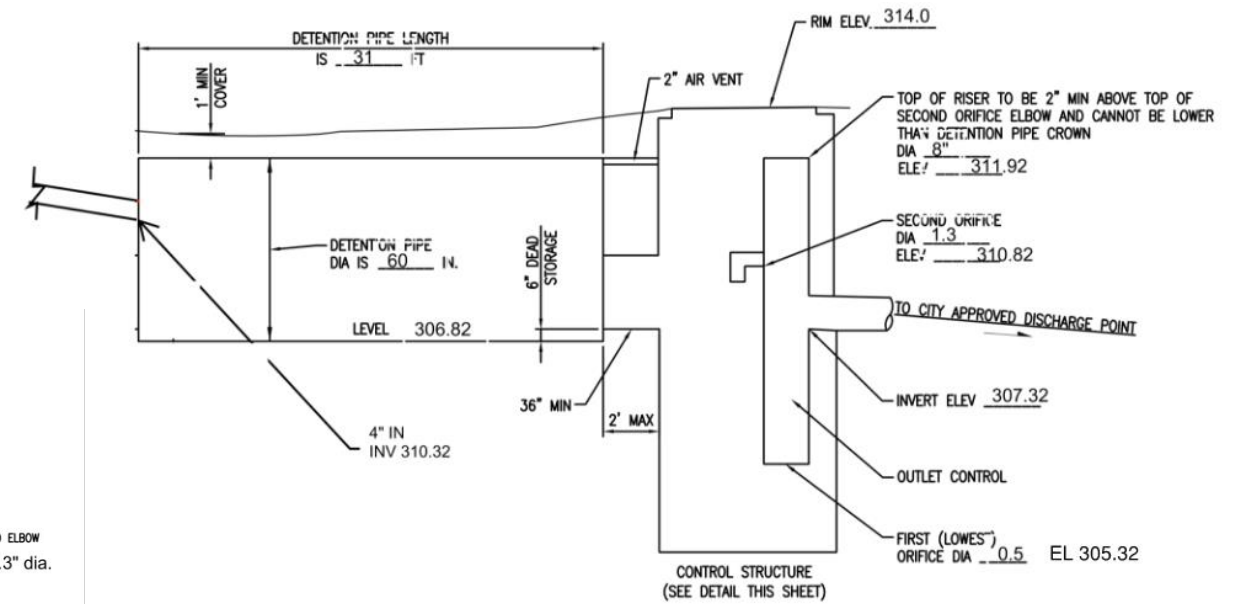




TYPICAL 60"Ø FLOW CONTROL STRUCTURE DETAIL  
NTS



FLOW RESTRICTOR DETAIL (LOTS 1, 2, 3 & 4)  
NTS



OWNER: Levenson SP ADDRESS: 3404 72nd Pl S.E. PREPARED BY: Darla Guerrero, PE  
 PERMIT #: \_\_\_\_\_ ADDRESS: Mercer Island, WA PHONE: 425-753-4307  
 DATE: October 8, 2019  
 NEW PLUS REPLACED IMPERVIOUS SURFACE AREA (SF): 4450 DETENTION PIPE DIA (INCH): 60" DETENTION PIPE LENGTH (FT): 31 ORIFICE #1 DIA 0.5 INCH, ELEV 307.32  
 SOIL TYPE: Type C PIPE MATERIAL: CMP ORIFICE #2 DIA 1.3 INCH, ELEV 310.82

LOT 3 DETENTION SYSTEM DETAIL  
NTS

**ON-SITE DETENTION SYSTEM NOTES:**

1. CALL DEVELOPMENT SERVICES (206-275-7605) 24 HOURS IN ADVANCE FOR A DETENTION SYSTEM INSPECTION BEFORE BACKFILLING AND FOR FINAL INSPECTIONS.
2. RESPONSIBILITY FOR OPERATION AND MAINTANANCE OF DRAINAGE SYSTEMS ON PRIVATE PROPERTY IS RESPONSIBILITY OF THE PROPERTY OWNER. MATERIAL ACCUMULATED IN THE STORAGE PIPE MUST BE REMOVED FROM CATCH BASINS TO ALLOW PROPER OPERATION. THE OUTLET CONTROL ORIFICE MUST BE KEPT OPEN AT ALL TIMES.
3. PIPE MATERIAL, JOINT, AND PROTECTIVE TREATMENT SHALL BE IN ACCORDANCE WITH SECTION 7.04 AND 9.05 OF THE WSDOT STANDARD SPECIFICATION FOR ROAD, BRIDGE, AND MUNICIPAL CONSTRUCTION, LATEST VERSION. SUCH MATERIALS INCLUDE THE FOLLOWING, LINED CORRUGATED POLYETHYLENE PIPE (LCPE), ALUMINIZED TYPE 2 CORRUGATED STEEL PIPE AND PIPE ARCH (MEETS AASHTO DESIGNATIONS M274 AND M36), CORRUGATED OR SPIRAL RIB ALUMINUM PIPE, OR REINFORCED CONCRETE PIPE. CORRUGATED STEEL PIPE IS NOT ALLOWED.
4. FOOTING DRAINS SHALL NOT BE CONNECTED TO THE DETENTION SYSTEM.

**CONTROL STRUCTURE NOTES:**

- ① USE A MINIMUM OF A 54 IN. DIAM. TYPE 2 CATCH BASIN. THE ACTUAL SIZE IS DEPENDENT ON CONNECTING PIPE MATERIAL AND DIAMETER.
- ② OUTLET PIPE: MIN. 6 INCH.
- ③ METAL PARTS: CORROSION RESISTANT. NON-GALVANIZED PARTS PREFERRED. GALVANIZED PIPE PARTS TO HAVE ASPHALT TREATMENT 1.
- ④ FRAME AND LADDER OR STEPS OFFSET SO:
  - A. CLEANOUT GATE IS VISIBLE FROM TOP;
  - B. CLIMB-DOWN SPACE IS CLEAR OF RISER AND CLEANOUT GATE;
  - C. FRAME IS CLEAR OF CURB.
- ⑤ IF METAL OUTLET PIPE CONNECTS TO CEMENT CONCRETE PIPE, OUTLET PIPE TO HAVE SMOOTH O.D. EQUAL TO CONCRETE PIPE I.D. LESS 1/4 IN.
- ⑥ PROVIDE AT LEAST ONE 3 X 0.090 GAUGE SUPPORT BRACKET ANCHORED TO CONCRETE WALL WITH 5/8 IN. STAINLESS STEEL EXPANSION BOLTS OR EMBEDDED SUPPORTS 2 IN. INTO CATCH BASIN WALL (MAXIMUM 3'-0" VERTICAL SPACING).
- ⑦ THE SHEAR GATE SHALL BE MADE OF ALUMINUM ALLOY IN ACCORDANCE WITH ASTM B 26M AND ASTM B 275, DESIGNATION ZG32A; OR CAST IRON IN ACCORDANCE WITH ASTM A 48, CLASS 30B. THE LIFT HANDLE SHALL BE MADE OF A SIMILAR METAL TO THE GATE (TO PREVENT GALVANIC CORROSION), IT MAY BE OF SOLID ROD OR HOLLOW TUBING, WITH ADJUSTABLE HOOK AS REQUIRED. A NEOPRENE RUBBER GASKET IS REQUIRED BETWEEN THE RISER MOUNTING FLANGE AND THE GATE FLANGE. INSTALL THE GATE SO THAT THE LEVEL-LINE MARK IS LEVEL WHEN THE GATE IS CLOSED. THE MATING SURFACES OF THE LID AND THE BODY SHALL BE MACHINED FOR PROPER FIT. ALL SHEAR GATE BOLTS SHALL BE STAINLESS STEEL.
- ⑧ THE UPPER CATCH BASIN IS REQUIRED IF THE LENGTH OF THE DETENTION PIPE IS GREATER THAN 50 FT.

## **Appendix C: Operations and Maintenance Manual**

**Table V-4.5.2(16) Maintenance Standards - Oil/Water Separators**

Maintenance Component	Defect	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
General	Monitoring	Inspection of discharge water for obvious signs of poor water quality.	Effluent discharge from vault should be clear with out thick visible sheen.
	Sediment Accumulation	Sediment depth in bottom of vault exceeds 6-inches in depth.	No sediment deposits on vault bottom that would impede flow through the vault and reduce separation efficiency.
	Trash and Debris Accumulation	Trash and debris accumulation in vault, or pipe inlet/outlet, floatables and non-floatables.	Trash and debris removed from vault, and inlet/outlet piping.
	Oil Accumulation	Oil accumulations that exceed 1-inch, at the surface of the water.	Extract oil from vault by vactoring. Disposal in accordance with state and local rules and regulations.
Maintenance Component	Defect	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
	Damaged Pipes	Inlet or outlet piping damaged or broken and in need of repair.	Pipe repaired or replaced.
	Access Cover Damaged/Not Working	Cover cannot be opened, corrosion/deformation of cover.	Cover repaired to proper working specifications or replaced.
	Vault Structure Damage - Includes Cracks in Walls Bottom, Damage to Frame and/or Top Slab	See "Catch Basins" (No. 5) Cracks wider than 1/2-inch at the joint of any inlet/outlet pipe or evidence of soil particles entering through the cracks.	Vault replaced or repairs made so that vault meets design specifications and is structurally sound.  Vault repaired so that no cracks exist wider than 1/4-inch at the joint of the inlet/outlet pipe.

**Table V-4.5.2(5) Maintenance Standards - Catch Basins**

Maintenance Component	Defect	Conditions When Maintenance is Needed	Results Expected When Maintenance is performed
General	Trash & Debris	<p>Trash or debris which is located immediately in front of the catch basin opening or is blocking inletting capacity of the basin by more than 10%.</p> <p>Trash or debris (in the basin) that exceeds 60 percent of the sump depth as measured from the bottom of basin to invert of the lowest pipe into or out of the basin, but in no case less than a minimum of six inches clearance from the debris surface to the invert of the lowest pipe.</p> <p>Trash or debris in any inlet or outlet pipe blocking more than 1/3 of its height.</p> <p>Dead animals or vegetation that could generate odors that could cause complaints or dangerous gases (e.g., methane).</p>	<p>No Trash or debris located immediately in front of catch basin or on grate opening.</p> <p>No trash or debris in the catch basin.</p> <p>Inlet and outlet pipes free of trash or debris.</p> <p>No dead animals or vegetation present within the catch basin.</p>
	Sediment	Sediment (in the basin) that exceeds 60 percent of the sump depth as measured from the bottom of basin to invert of the lowest pipe into or out of the basin, but in no case less than a minimum of 6 inches clearance from the sediment surface to the invert of the lowest pipe.	No sediment in the catch basin
	Structure Damage to Frame and/or Top Slab	Top slab has holes larger than 2 square inches or cracks wider than 1/4 inch. (Intent is to make sure no material is running into basin).	<p>Top slab is free of holes and cracks.</p> <p>Frame is sit-</p>

**Table V-4.5.2(5) Maintenance Standards - Catch Basins (continued)**

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

## **Appendix D: Downstream Level One Analysis**

**NOT REQUIRED**

## **Appendix E: City of Mercer Island Hazard Maps**

