

**Stormwater Drainage Report
4526 89th Avenue SE
Mercer Island, Washington
KC Tax Parcel #019110-0225
Permit #: XXXX-XXX**

Prepared For:
JayMarc Homes, Inc.
Attn.: Paul Ollestad
7525 SE 24th Street
Suite #520
Mercer Island, Washington 98040
425-417-5849
paul@jaymarchomes.com

September 17, 2025

Prepared By:
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Darrell Offe, P.E.
13932 SE 159th Place
Renton, Washington 98058
425-260-3412
Darrell.Offe@comcast.net



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Section 2: Site Evaluation

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Appendix A: Geotechnical Evaluation

Section 1: Project Narrative:

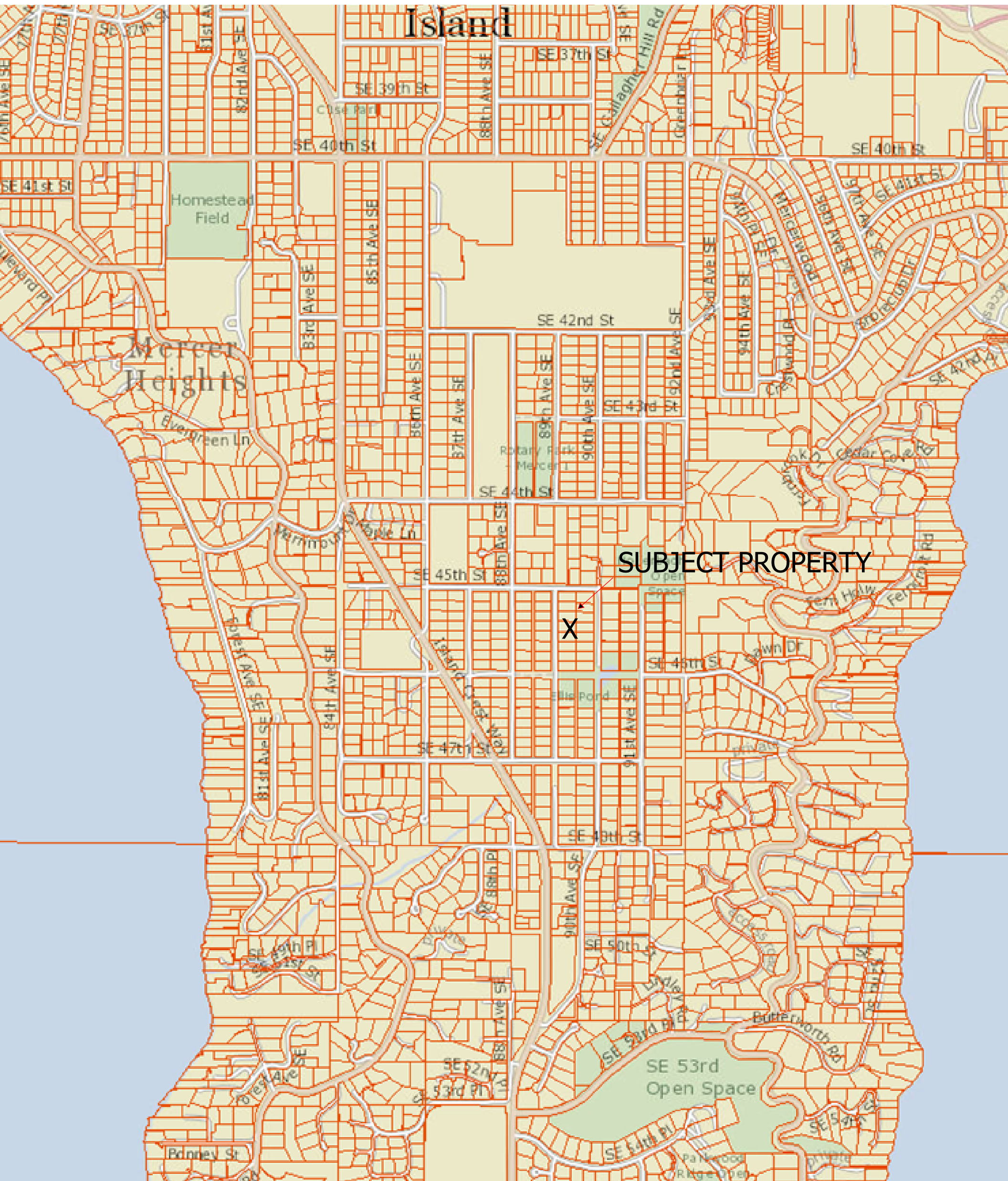
The subject property is located on the east side of 89th Avenue NE between SE 45th Street and SE 47th Street. The property is flat in nature. The high point is the NE corner at elevation 372.00, and the low point being the SW corner at elevation 370.70. There is a slight gradient from the rear (east side) towards 89th Avenue SE (west). The existing public storm system on the east side of 89th Avenue is at an invert elevation of 368.28. City of Mercer Island staff has indicated that a connection into the storm system on the east of 89th Avenue SE system will require onsite stormwater detention meeting the City of Mercer Island standards. A new detention tank on-site would be at an invert elevation below the existing drainage system within 89th Avenue SE; therefore, a non-gravity discharge (pump system) will be required to lift the stormwater from the detention tank into the public drainage system within 89th Avenue SE.

The existing structure, hard surfaces, and driveway will be removed. The existing access to the property is from 89th Avenue SE on the west side. The runoff from the existing house and hard surfaces sheet flows over the landscape areas and discharges into 89th Avenue SE. There is an existing public (City) catch basin (CB#26-55) located just off the southwest corner of the property along the asphalt edge of 89th.

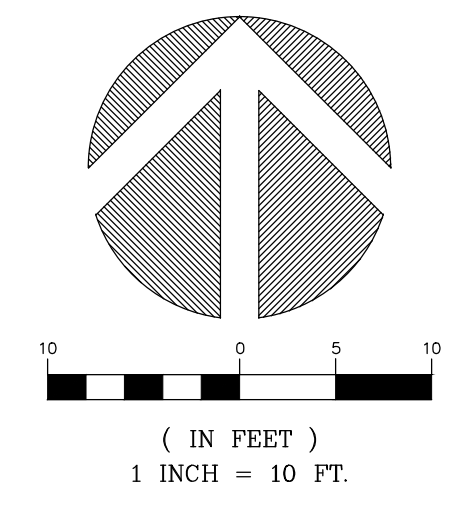
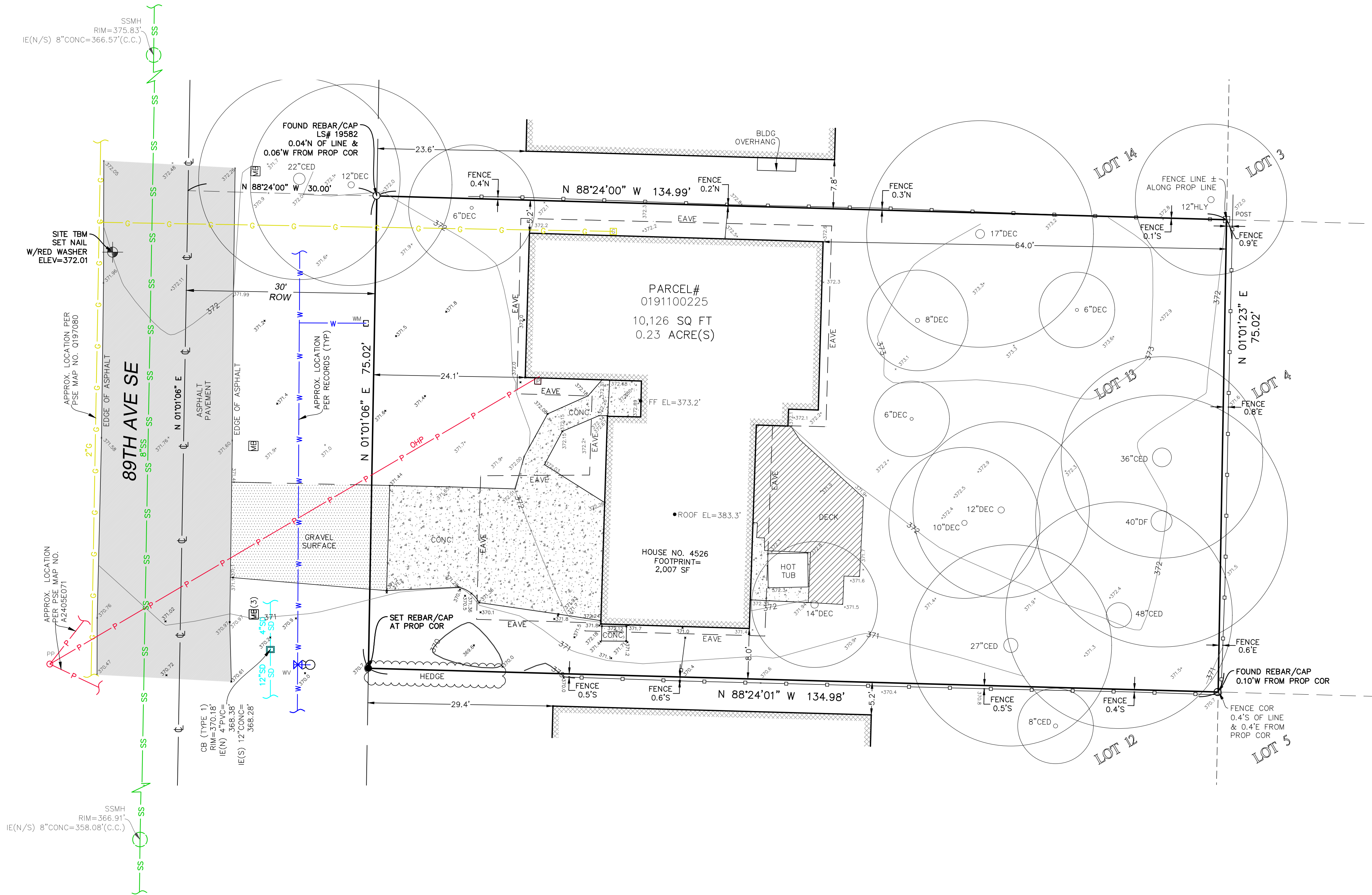
The site soils, using the City of Mercer Island October 2006 mapping, indicates the underlying soils to be Qvi (Vashon ice-contact deposits). These soils are not suitable for infiltration type stormwater treatment. A Geologist Report has been prepared by Cobalt Geosciences dated September 15, 2025 (attached to this Report) indicate Recessional Outwash and Glacial Till soils with measured infiltration rates at less than 0.3 inches per hour. Based upon both soil indicators above, the project is not suitable (feasible) for infiltration type BMP's.

The project will be evaluated for storm water treatment and control using the Amended December 2019 SWMMWW (DOE Manual).

VICINITY MAP



TOPOGRAPHIC & BOUNDARY SURVEY

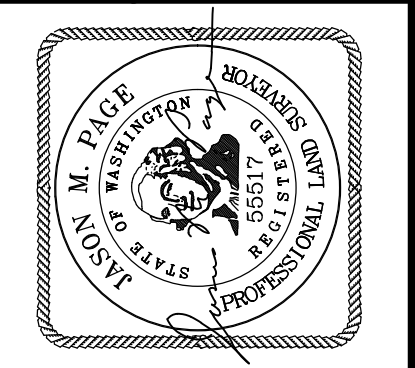


STEEP SLOPE/BUFFER DISCLAIMER:
 THE LOCATION AND EXTENT OF STEEP SLOPES SHOWN ON THIS DRAWING ARE FOR INFORMATIONAL PURPOSES ONLY AND CANNOT BE RELIED ON FOR DESIGN AND/OR CONSTRUCTION. THE PITCH, LOCATION, AND EXTENT ARE BASED SOLELY ON OUR GENERAL OBSERVATIONS ON SITE AND OUR CURSORY REVIEW OF READILY AVAILABLE PUBLIC DOCUMENTS; AS SUCH, TERRANE CANNOT BE LIABLE OR RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF ANY STEEP SLOPE INFORMATION. ULTIMATELY, THE LIMITS AND EXTENT OF ANY STEEP SLOPES ASSOCIATED WITH ANY SETBACKS OR OTHER DESIGN OR CONSTRUCTION PARAMETERS MUST BE DISCUSSED AND APPROVED BY THE REVIEWING AGENCY BEFORE ANY CONSTRUCTION CAN OCCUR.

INDEXING INFORMATION	
	NE 1/4 SW 1/4 SECTION: 18 TOWNSHIP: 24N RANGE: 05E, W.M. COUNTY: KING

TOPOGRAPHIC & BOUNDARY SURVEY
 PARCEL NO. 0191100225

JAYMARC HOMES PROJECT
 4526 89TH AVE SE
 MERCER ISLAND, WA 98040



TERRANE
 11235 SE 6th St, Suite 130
 Bellevue, WA 98004
 p: 425-458-4488 | e: info@terrane.net

JOB NUMBER:	251445
DATE:	07/25/25
DRAFTED BY:	AJU
CHECKED BY:	JMP
SCALE:	1" = 10'

REVISION HISTORY	

Section 2: Site Evaluation

Total Lot Area = 10,126 square feet (0.23 acres)

EXISTING CONDITIONS

Impervious:

Roof eave area = 2,881 sq. feet
Uncovered walkway/patio = 334 sq. feet
Uncovered driveway = 635 sq. feet ((PGHS))
Subtotal: 3,850 sq. feet

Pervious:

Lawn, trees, landscaping = *6,276 sq. feet*

PROPOSED (2025) CONDITIONS

Impervious (hard) surfaces:

House roof area w/overhang = 2,722 sq. feet
Uncovered driveway = 868 sq. feet ((PGHS))
Total Impervious (Hard) Surfaces = 3,590 sq. feet

Pervious Surfaces:

Ex. Lawn, trees, landscaping = 6,536 sq. feet
Total Pervious Surfaces = 6,536 square feet

((PGHS)) -Pollution Generating Hard Surface

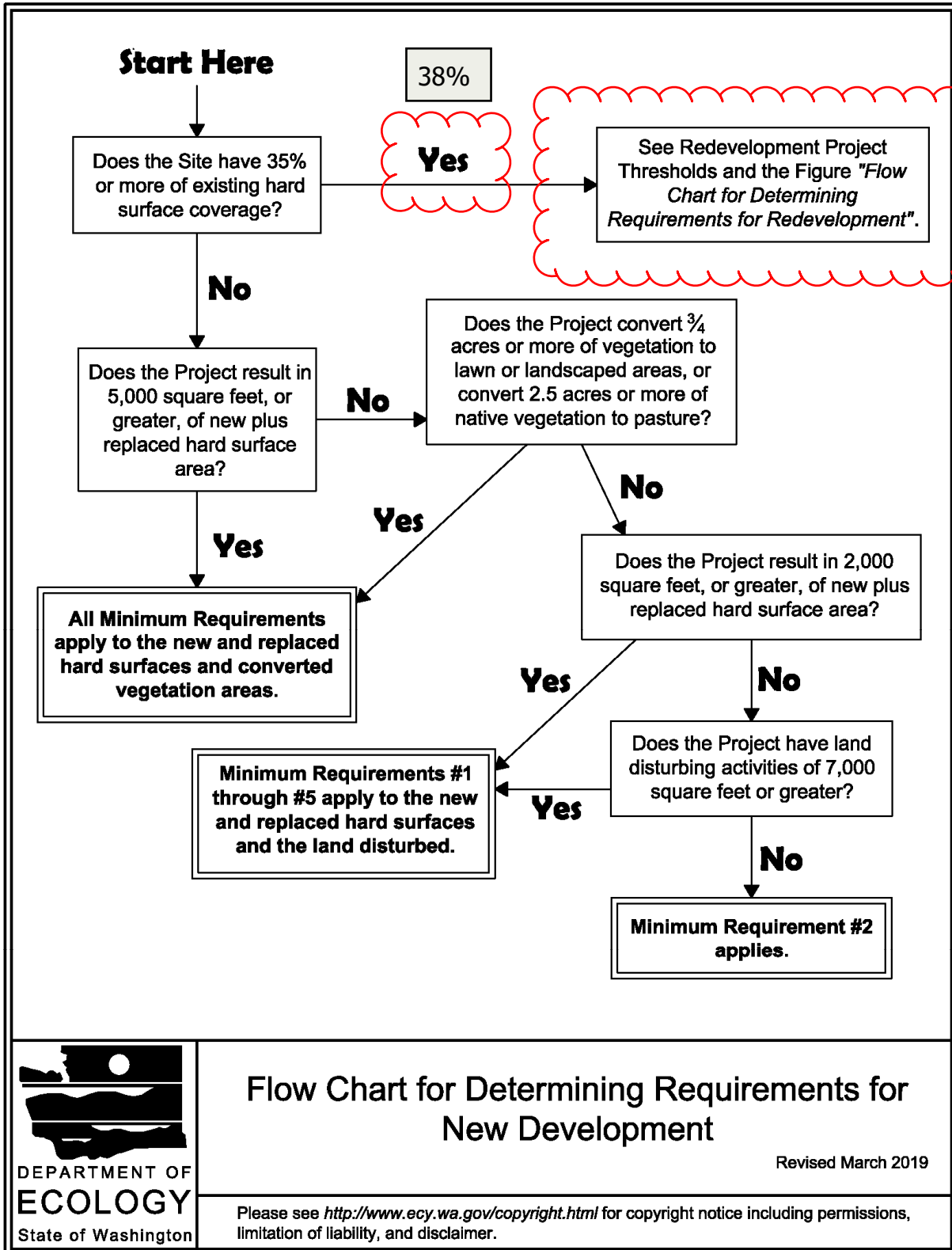
Summary of Project Information

Project Site Area	10,126 square feet
Existing Impervious Area	3,850 sq. feet
Existing Impervious Coverage	38.0%
New Impervious Area	307 sq. feet
Replaced Impervious Area	3,283 sq. feet
New plus Replaced Impervious	3,590 square feet
Proposed Impervious Area	3,590 square feet
Converted pervious: Native to lawn	0 sq. feet
Converted pervious: Native to pasture	0 sq. feet
Total Area of Land Disturbance	6,000 square feet

The existing property has greater than 35% (38.0%) impervious coverage and the total proposed project new plus replaced impervious surfaces will be less than 5,000 (3,590) square feet; using Figure I-3.2 – "Flow Chart for Determining Minimum Requirements for Redevelopment" page 90, 2019 Stormwater Management Manual for Western Washington, Minimum Requirements #1 – #5 apply to this project.

FLOW CHART FIGURE I-3.1 & 3.2

Figure I-3.1: Flow Chart for Determining Requirements for New Development

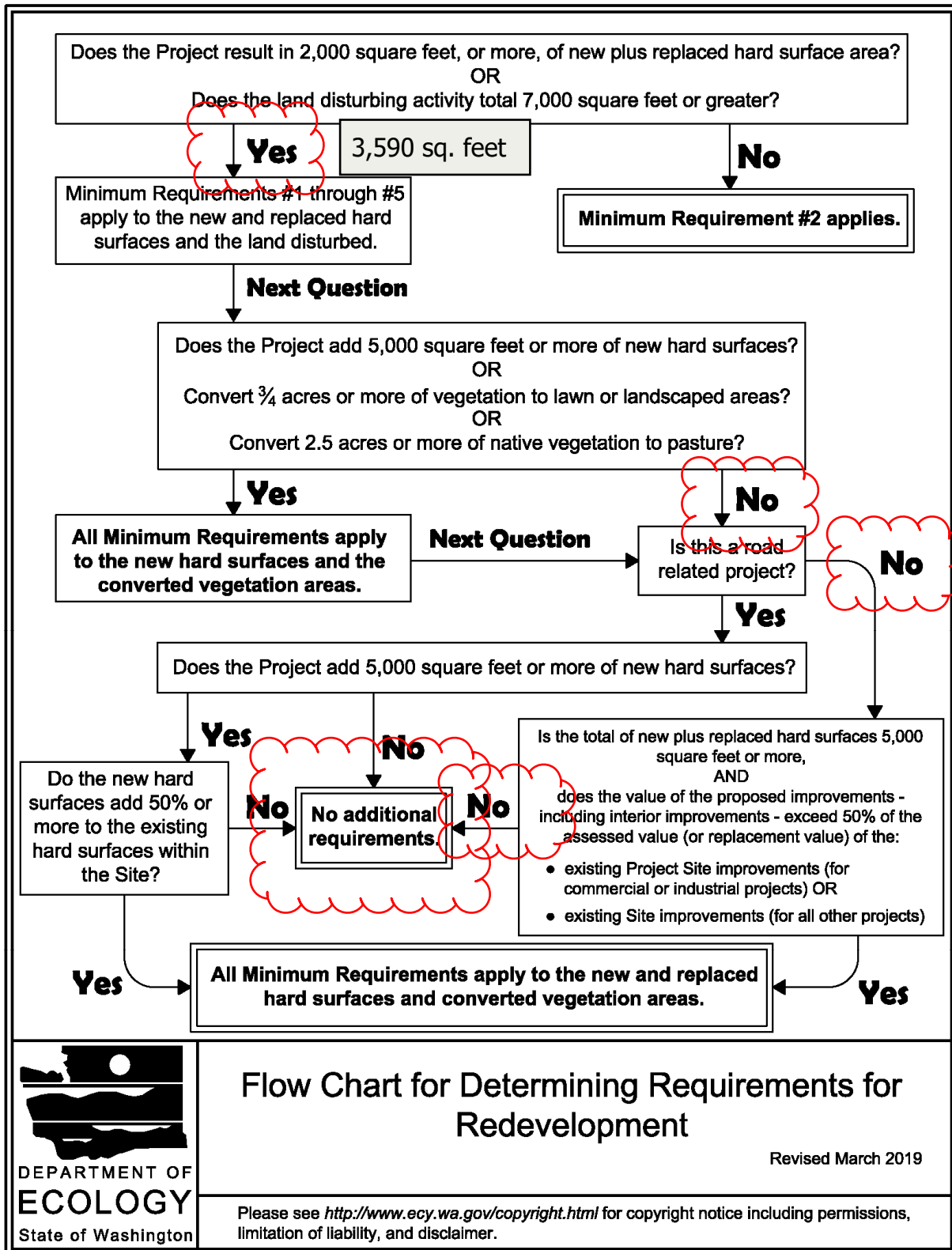


Flow Chart for Determining Requirements for New Development

Revised March 2019

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Figure I-3.2: Flow Chart for Determining Requirements for Redevelopment



Section 3: Minimum Requirements (MRs)

From 2019 SWMMWW Section I-3.4

Section I-3.4.1 MR1: Preparation of Stormwater Site Plans

A Stormwater site plan (drainage plan) has been prepared for this project together with construction details for installation of the proposed drainage control system. The Stormwater site plans and drainage narrative shall be submitted and reviewed by the City of Mercer Island as part of the building permit application.

NE 1/4 OF THE SW 1/4 OF SECTION 18, TOWNSHIP 24 NORTH., RANGE 5 EAST, W.M., KING COUNTY, WA.

EXISTING UTILITY LOCATIONS SHOWN HEREON ARE APPROXIMATE ONLY. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO DETERMINE THE EXACT VERTICAL AND HORIZONTAL LOCATION OF ALL EXISTING UNDERGROUND UTILITIES PRIOR TO COMMENCING CONSTRUCTION. NO REPRESENTATION IS MADE THAT ALL EXISTING UTILITIES ARE SHOWN HEREON. THE ENGINEER ASSUMES NO RESPONSIBILITY FOR UTILITIES NOT SHOWN OR UTILITIES NOT SHOWN IN THEIR PROPER LOCATION.
CALL BEFORE YOU DIG: 811

ONSITE TREE TABLE						
ID	Species	Dbh	Dripline	Classification	Limit of Development	
					LOD	RETAIN REMOVE
1	Laurel	6"	18'	Not Significant	10'	yes
2	Laurel	14"	18'	Significant	10'	yes
3	Cedar	27"	18'	Significant	10'	yes
4	cedar	48"	18'	Exceptional	10'	yes
5	Douglas-fir	40"	18'	Exceptional	10'	yes
6	Cedar	36"	18'	Exceptional	10'	yes
7	Laurel	12"	18'	Significant	10'	yes
8	Laurel	10"	18'	Significant	10'	yes
9	Laurel	6"	18'	Not Significant	10'	yes
10	Laurel	8"	18'	Not Significant	10'	yes
11	Laurel	6"	18'	Not Significant	10'	yes
12	Laurel	17"	18'	Significant	10'	yes

OFFSITE						
ID	Species	Dbh	Dripline	Classification	LOD	RETAIN REMOVE
OS#1	Cedar	22"	34'	N/A	14'	
OS#2	Laurel	7"	16'	N/A	14'	
OS#3	English Holly	10"	18'	N/A	10'	
OS#4	Cedar	10"	18'	N/A	10'	

LEGEND

ACU	AIR CONDITION UNIT	MONUMENT IN CASE (FOUND)	
AD	AREA DRAIN	PAVER SURFACE	
AS	ASPHALT SURFACE	POST	
B	BUILDING	P	POWER METER
CL	CENTERLINE ROW	PO	POWER (OVERHEAD)
CS	CONCRETE SURFACE	PP	POWER POLE W/ LIGHT
RW	RETAINING WALL	R	REBAR AS NOTED (FOUND)
EE	ELECTRICAL EASEMENT	RC	REBAR & CAP (SET)
D	DECK	RK	ROCKERY
FL	FENCE LINE (WOOD)	SL	SEWER LINE
GL	GAS LINE	SM	SEWER MANHOLE
GM	GAS METER	SD	STORM DRAIN LINE
HR	HOSE BIB RISER	ST	TREE (AS NOTED)
HFL	HEDGE FOLIAGE LINE	TL	WATER LINE
I1	INLET (TYPE 1)	WM	WATER METER
I2	INLET (TYPE 1) (SOLID)		

REV. NO.	DATE	DESCRIPTION
09/15/2025		

OFF ENGINEERS
 4526 89th Avenue SE
 Kent, WA 98032
 PHONE 425-240-3422
 CONTACT DAVID@OFF.EE

OFF

CHECKED BY: DLO
 DRAWN BY: SLS
 DESIGNED BY: DLO

PROJECT: 4526 89th Avenue SE
 CLIENT: JayMarc Homes, Inc.
 SHEET CONTENT: Stormwater Site Plan

DATE: 09/15/2025
 JOB NO.:
 DWG NO.:
 SHEET: 2 OF 4
 PERMIT #: 25xx-xxx

NOTE: A TV INSPECTION OF THE EXISTING SIDE SEWER FROM PROPERTY TO THE CITY SEWER MAIN IN 89th AVENUE SE IS REQUIRED PRIOR TO ANY WORK RELATED TO THE SIDE SEWER. IF THE RESULT OF THE TV INSPECTION IS NOT IN SATISFACTORY CONDITION, AS DETERMINED BY THE CITY OF MERCER ISLAND INSPECTOR, THE REPLACEMENT OF THE EXISTING SIDE SEWER IS REQUIRED TO THE SEWER MAIN.

SIDE SEWER NOTES

- S1 APPROXIMATE LOCATION OF EXISTING SANITARY SIDE SEWER.
- S2 INSTALL 30LF., 4" PVC SIDE SEWER @ MIN. 2% SLOPE W/SANITARY SEWER CLEANOUTS

NOTES:

- A 4" FOUNDATION DRAIN CONNECTION
- B INSTALL 1-1/2" METER AND 2" SERVICE LINE PER CITY OF MERCER ISLAND STANDARD PLAN W-14.
NOTE: CONTRACTOR TO COORDINATE FINAL LOCATION OF NEW METER WITH CITY OF MERCER ISLAND INSPECTOR AT TIME OF CONSTRUCTION
- C CB#1, TYPE 1 W/SOLID FRAME & LID RIM=370.80 IE=269.00, 2"(E)-FORCEMAIN IE=268.90, 6"(W)
- D CB#2, TYPE II-48", PUMP STRUCTURE RIM=372.00 IE=368.00, 4"(FOUNDATION DRAIN) IE=369.25, 2"(W)-FORCEMAIN IE=365.00, 6"(E) INSIDE FLOOR 48"=363.00
- E CB#3, CONTROL STRUCTURE, TYPE II-54"φ ((SEE DETAIL ON SHEET 3 OF 4)) W/SOLID LOCKING LID RIM=372.00 TOP=369.80, 8"(TOP OF RISER) IE=369.60, 2"(N)-VENT IE=368.80, 6"(NW)-DOWNSPOUT LINE IE=365.30, 6"(W), 36"(N) BOTTOM=363.30, 8"(BOTTOM OF RISER) INSIDE FLOOR 54"=361.30
- F ABANDON EXISTING WATER METER AND SERVICE

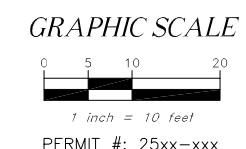
PUMP STATION NOTES:

- (1) Pump systems shall be owned, operated, maintained, repaired, and replaced (as needed) by property owner(s) served by such system.
- (2) The pump system shall have dual, alternating pumps with emergency on-site, back-up power supply and an external alarm system for system failures.
- (3) It is the sole responsibility of the home owner(s) if a flood or sewer backup occurs due to the failure of the pump system.
- (4) It is the responsibility of the home owner(s) to provide an adequate and functional backup system for the pump system in the event of a power failure.

NOTE: 4" PERFORATED FOUNDATION DRAIN REQUIRED BUT NOT SHOWN ON PLAN, CONNECT WHERE SHOWN ON PLAN INTO CB#2.

STORM PIPE PVC SHALL BE SDR-35 PVC AT SLOPE=2.00% MINIMUM (TYPICAL) UNLESS OTHERWISE NOTED

IMPERVIOUS SURFACES (NEW PLUS REPLACED):
 ROOF AREA (UNDER EAVES) = 2,722 SQ. FT.
 UNCOVERED DRIVEWAY AREA = 868 SQ. FT.
 TOTAL IMPERVIOUS AREAS = 3,590 SQ. FEET

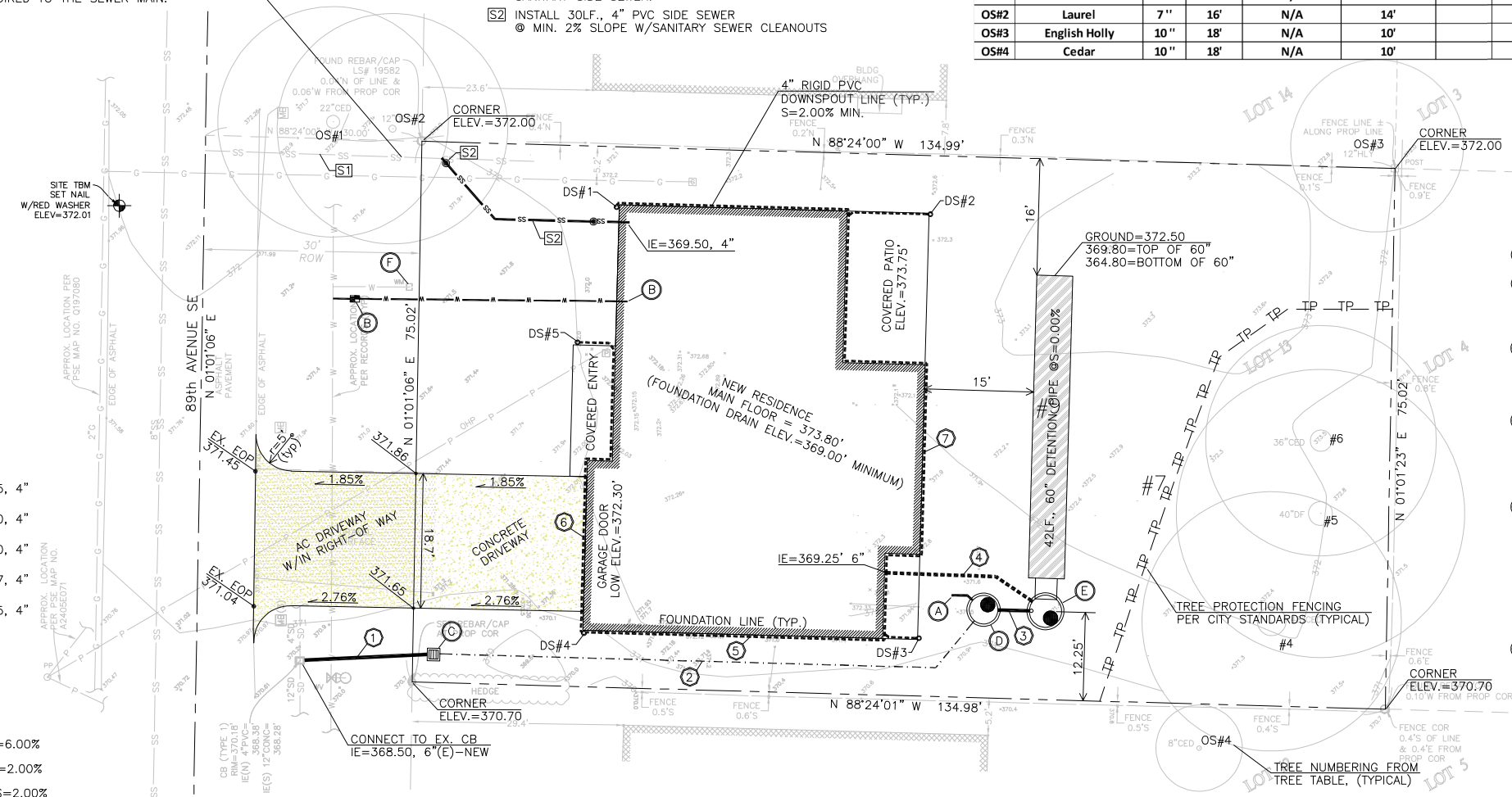


NOTE: CONNECT 4" FOUNDATION DRAIN AT LOCATION SHOWN ON PLANS - ONLY!

NOTE: THE LAWN AND LANDSCAPE AREAS ARE REQUIRED TO PROVIDE POST-CONSTRUCTION SOIL QUALITY AND DEPTH IN ACCORDANCE WITH BMP T5.13. THE PROJECT CIVIL ENGINEER MUST PROVIDE A LETTER OF CERTIFICATION TO ENSURE THAT THE LAWN AND LANDSCAPE AREAS ARE MEETING THE POST-CONSTRUCTION SOIL QUALITY AND DEPTH REQUIREMENTS SPECIFIED ON THE APPROVED PLAN SET PRIOR TO FINAL INSPECTION OF THE PROJECT.

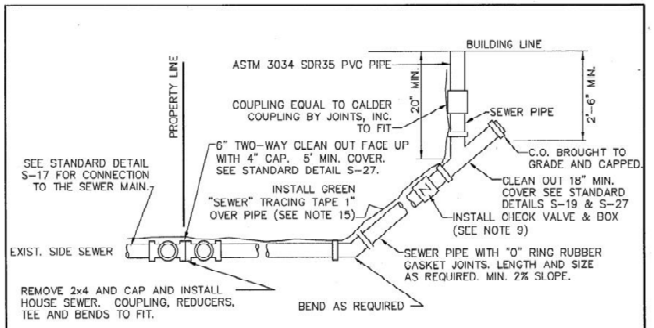
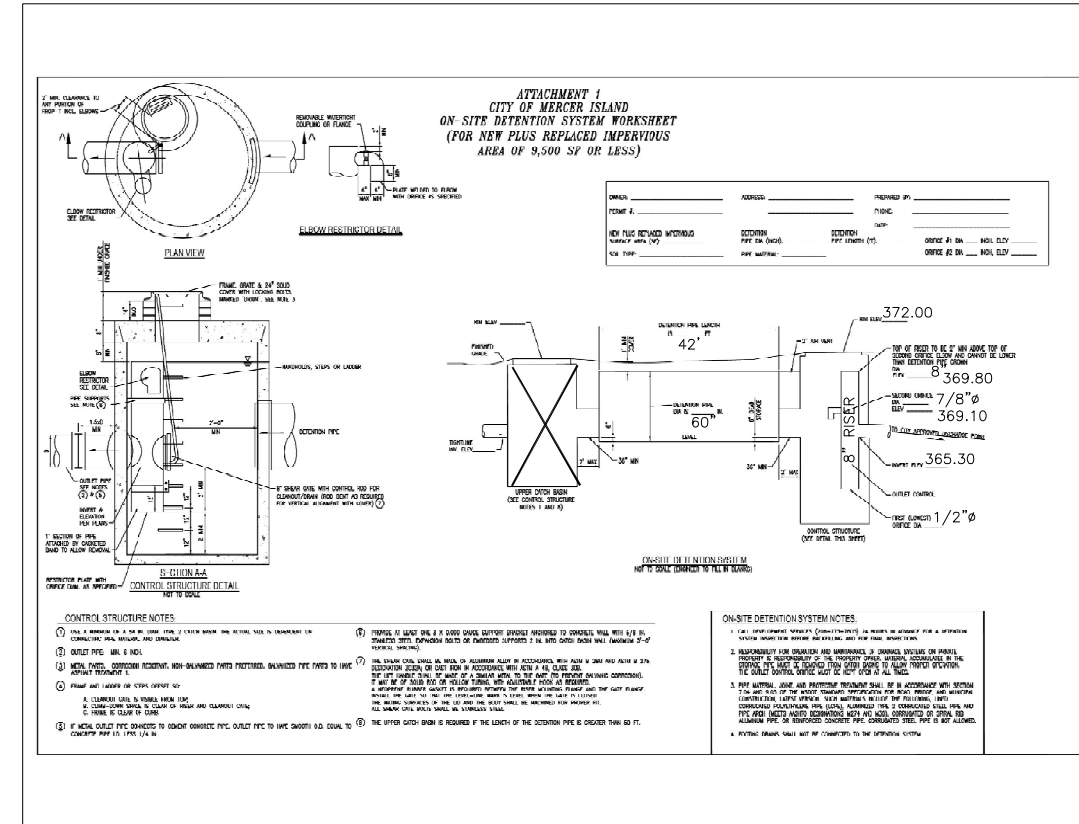
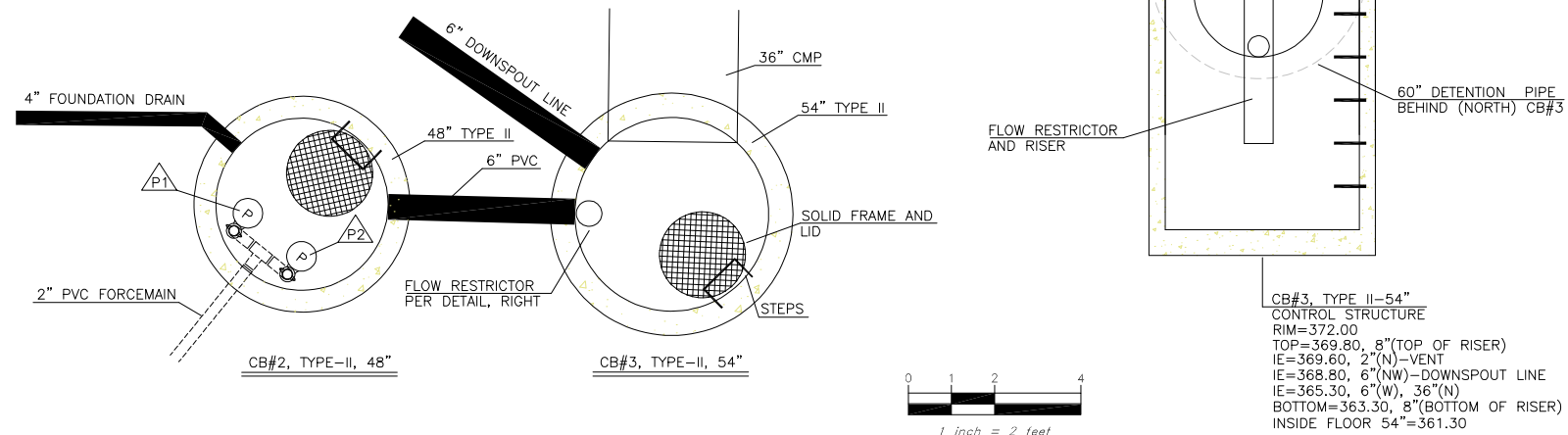
DOWNSPOUT TABLE	
DS#1	GROUND=372.00 DOWNSPOUT LINE=371.25, 4"
DS#2	GROUND=372.00 DOWNSPOUT LINE=371.00, 4"
DS#3	GROUND=372.00 DOWNSPOUT LINE=371.00, 4"
DS#4	GROUND=372.00 DOWNSPOUT LINE=370.27, 4"
DS#5	GROUND=372.00 DOWNSPOUT LINE=371.25, 4"

STORM PIPE TABLE	
1	18LF., 6" D.I. @ S=2.00%
2	78LF., 2" PVC FORCEMAIN
3	5LF., 6" PVC SDR-35 @ S=6.00%
4	22LF., 6" PVC SDR-35 @ S=2.00%
5	51LF., 4" PVC SDR-35 @ S=2.00%
6	49LF., 4" PVC SDR-35 @ S=2.00%
7	100LF., 4" PVC SDR-35 @ S=2.00%



PUMP TABLE

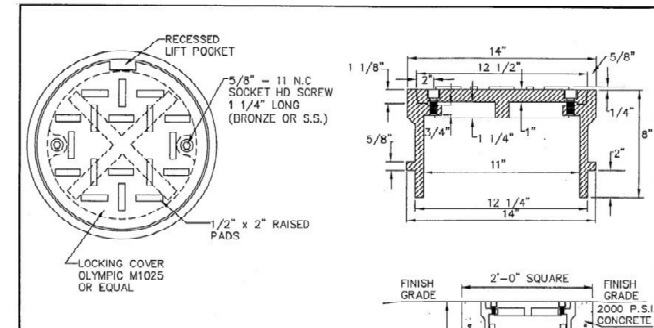
- P1** PUMP #1
PENTAIR HYDRAMATIC
MODEL: HP33
PUMP SPEC. 1/3hp /115Va/9.8amps
6 FEET TDH/ 16 GPM
2" DISCHARGE
PUMP #1 ON = 365.50
- P2** PUMP #2
HD FOWLER ITT GOULDS SUBMERSIBLE
SEWAGE PUMP: MODEL #WS0712BF
PUMP SPEC. 0.75hp /230Va/9.5amps
21 FEET TDH/ 104 GPM
W/ 2" DISCHARGE
PUMP #2 ON = 368.00



NOTES

- ELBOWS SHALL NOT BE GREATER THAN 45 DEGREES.
- CLEAN OUT IS REQUIRED FOR EACH PIPE LENGTH GREATER THAN 100' AND FOR EACH 90° ACCUMULATED ELBOW/100'.
- ALL HOUSE PLUMBING INLETS MUST BE CONNECTED TO THE SEWER. NO DOWN SPOUTS OR STORM DRAINAGE MAY BE CONNECTED TO THE SEWER SYSTEM.
- 18" MINIMUM COVERAGE OVER PIPE.
- LAY PIPE IN STRAIGHT LINE BETWEEN BENDS. MAKE ALL CHANGES IN GRADE OR LINE WITH 1/2 BEND OR WYE. 90° CHANGE WITH 1/8 BEND AND WYE.
- 4" SEWER PIPE MINIMUM SIZE ON PROPERTY. 2% MINIMUM GRADE.
- ALL CONSTRUCTION SHALL BE IN ACCORDANCE WITH CURRENT SEWER ORDINANCES.
- ALL CONSTRUCTION REQUIRES A PLAN SHOWING PROPERTY AND DIMENSIONS AND COMPLETION OF SIDE SEWER APPLICATION AND MAINTENANCE AGREEMENT, AS NEEDED.
- BACK WATER VALVE (CHECK VALVE) IS REQUIRED:
 - A. IF CONNECTED TO A SHARED SIDE SEWER.
 - B. IF CONNECTION AT HOUSE IS LOWER THAN BOTH UPSTREAM AND DOWNSTREAM MANHOLE.
- C. SEE S-23 & S-24 FOR LANE LINE REQUIREMENTS.
10. AS-BUILT DRAWING SHOWING LOCATION OF SIDE SEWER & ALL BENDS, C.O. ETC., IN RELATION TO THE HOUSE IS REQUIRED AFTER INSPECTION & INSTALLATION. SEE STANDARD DETAIL S-38 FOR A TYPICAL 'AS BUILT'.
11. THE MINIMUM PIPE SIZE FOR SIDE SEWERS SHALL BE:
 - 6" - WITHIN THE PUBLIC RIGHT-OF-WAY.
 - 4" - SINGLE FAMILY RESIDENCES.
 - 6" - 2 TO 4 SINGLE FAMILY RESIDENCES.
 - 8" - BUILDINGS OTHER THAN SINGLE FAMILY RESIDENCES.
12. UTILITY PIPE TRACER TAPE SHALL BE DETECTABLE BELOW GROUND SURFACE, COLOR CODED, WITH UTILITY NAME PRINTED ON TAPE. CONDUCTIVE WARNING TAPE REQUIRED OVER ALL WATER PIPE. TAPE SHALL BE MANUFACTURER'S STANDARD PERMANENT, BRIGHT-COLORED, CONTINUOUS PRINTED PLASTIC TAPE, ALUMINUM BACKED, INTENDED FOR DIRECT-BURIAL SERVICE. TAPE SHALL BE NOT LESS THAN 6" WIDE X 4 MILS THICK.

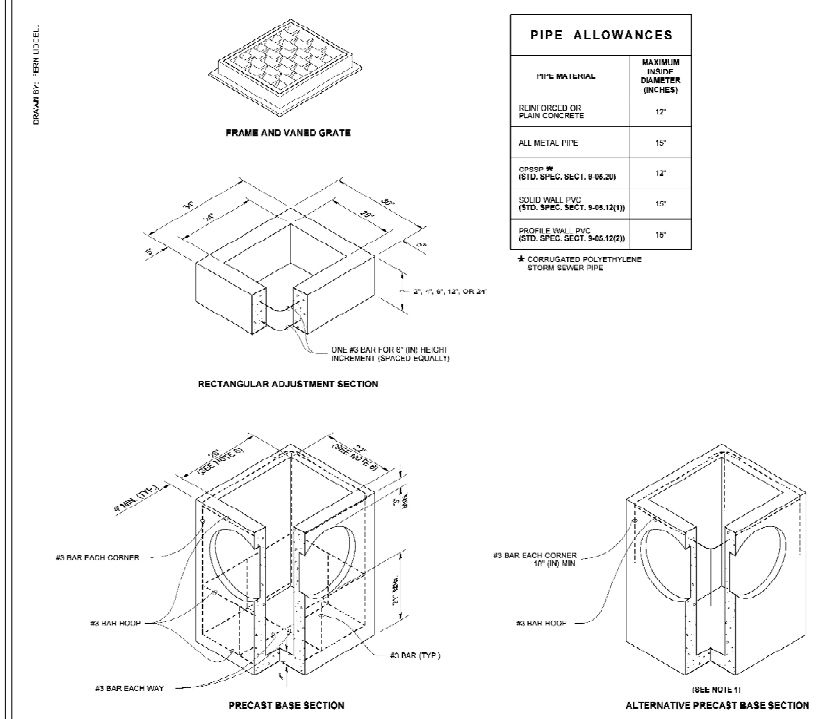
CITY OF MERCER ISLAND STANDARD DETAILS SEWER		
HOUSE SEWER CONNECTION		
0-5-2009	NO SCALE	S-18
REV DATE		APPROVED



NOTES

- SEE S-27 FOR INSTALLATION DETAILS.

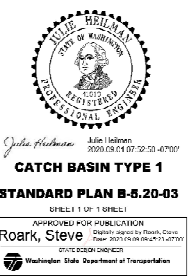
CITY OF MERCER ISLAND STANDARD DETAILS SEWER		
CLEAN OUT DETAIL		
6-5-2008	NO SCALE	S-19
REV DATE		APPROVED



PIPE MATERIAL	MAXIMUM INSIDE DIAMETER (INCHES)
GLASS REINFORCED OR PLAIN CONCRETE	12"
ALL METAL PIPE	15"
CRESPER®	12"
SOLID WALL PVC (STD. SPEC. SECT. 5-6.6-1210)	15"
PROFLEX® (STD. SPEC. SECT. 5-6.6-1210)	15"

* CORRUGATED POLYETHYLENE STORM SEWER PIPE

- NOTES**
- As acceptable alternative to the tabular shown in the PRECAST BASE SECTION, fibers (plastic) according to the Standard Specifications, or wire mesh having a minimum area of 0.12 square inches per foot shall be used with the construction required note shown in the ALTERNATIVE PRECAST BASE SECTION. Wire mesh shall not be placed in the underdrain.
 - The knockout diameter shall not be greater than 20" (in). Knockouts shall have a wall thickness of 2" (in) minimum to 2.25" (in) maximum. Provide a 1/2" (in) minimum gap between the knockout wall and the outside of the pipe. After the pipe is installed, fill the gap with joint mortar in accordance with Standard Specification Section 5-4.3.
 - The maximum depth from the finished grade to the lowest pipe invert shall be 5' (ft).
 - The frame and grate may be installed with the frame down, or integrally cast into the adjustment section with frame up.
 - The Precast Base Section may have a rounded floor, and the walls may be sloped at a rate of 1:24 or steeper.
 - The opening shall be measured at the top of the Precast Base Section.
 - All potpour holes shall be grouted full after the basin has been placed.



PROJECT	4526 89th Avenue SE	DESCRIPTION	
CLIENT	JayMarc Homes, Inc.	DATE	09/15/2025
SHEET CONTENT	Stormwater Site Plan	REV. NO.	
DESIGNED BY	DLO	DATE	
DRAWN BY	SLS	REV. NO.	
CHECKED BY	DLO	DATE	
DATE	09/15/2025	REV. NO.	
JOB NO.		DATE	
DWG NO.		REV. NO.	
SHEET	3	DATE	
OF	4	REV. NO.	

Section I-3.4.2 MR2: Construction Storm Water Pollution Prevention Plan (SWPP)

A Construction Stormwater Pollution Prevention Plan (SWPP) has been prepared and included within this Report. The CSWPP plan shall include construction installation of erosion control, establish a construction access, preservation of existing vegetation during construction, and protection of existing drainage inlets. This will include but not limited to: the use of the existing asphalt driveway (on the west side) to provide construction access from 89th Avenue SE; installing filter fabric silt fencing along the down gradient property lines (west and south); installation of filter socks within the public catch basins located within 89th Avenue SE; retention of native vegetated areas including tree/vegetation retention within the rear (east) and front (west) yards; and the use straw or chipped materials placed over exposed disturbed soils to prevent runoff from carrying solids.

TREE PROTECTION AREA (TPZ)

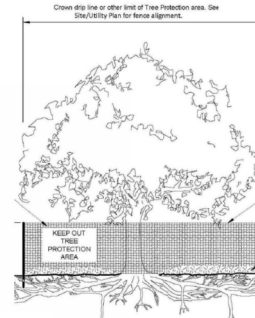
KEEP OUT!

DO NOT REMOVE OR ADJUST THE APPROVED LOCATION OF THIS TREE PROTECTION AREA

Trees enclosed by this fence are protected and are subject to the conditions of the tree permit. Violation of tree conditions may lead to:

1. Correction Notices or Stop Work Orders until compliance is achieved
2. RE Inspection Fees/financial penalties
3. Arborist reports recommending mitigation

- Notes**
1. No pruning shall be performed unless under the direction of the Project Arborist. Including limbing trees up.
 2. No grading, excavation, storage (materials, equipment, vehicles, etc.), or other unpermitted activity shall occur inside the protective fencing.
 3. Penalties for damaging by root damage/compaction or removing a saved tree may be a fine up to three times the value of the tree plus restoration (MICC 19.10.160).
 4. Any work in approved TPZ must be with the permission of the City Arborist (206) 275-7713, john.kenney@mercergov.org
 5. 5" course woodchips within the tree protection zone, but not against the tree trunk.



Tree protection fence: 6' chain link fence, solidly anchored into the ground, or if authorized High-density polyethylene fencing with 3.5" x 1.5" openings; color orange. Steel posts installed at 8' o.c.

2" x 6" steel posts or approved equal

Maintain existing grade with the tree protection fence unless otherwise indicated on the plans

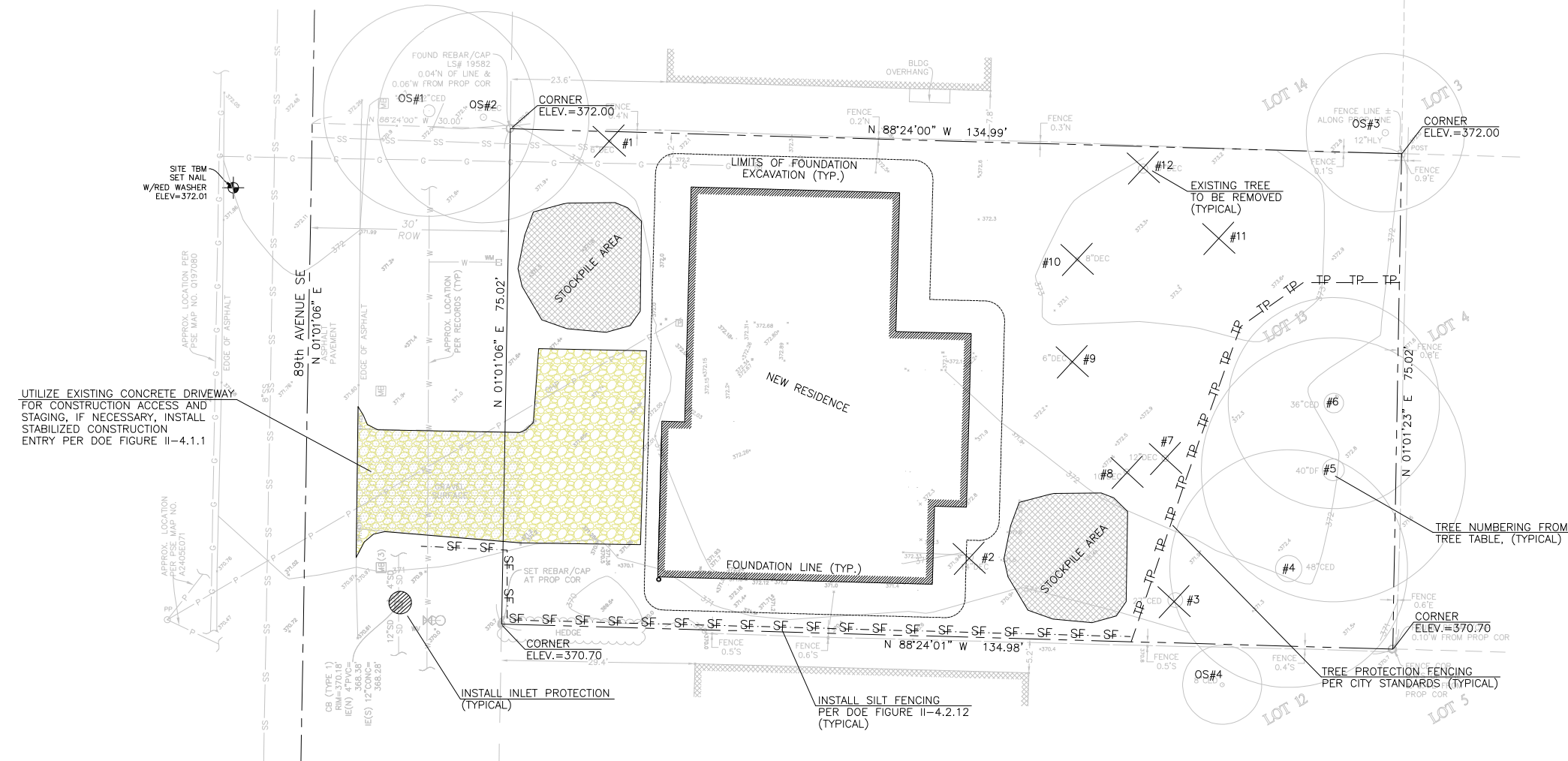
Any Work in the protected area must be with the permission of the City Arborist john.kenney@mercergov.org

ONSITE		TREE TABLE					Limit of Development	
ID	Species	Dbh	Dripline	Classification	LOD	RETAIN	REMOVE	
1	Laurel	6"	18'	Not Significant	10'		yes	
2	Laurel	14"	18'	Significant	10'		yes	
3	Cedar	27"	18'	Significant	10'		yes	
4	cedar	48"	18'	Exceptional	10'	yes		
5	Douglas-fir	40"	18'	Exceptional	10'	yes		
6	Cedar	36"	18'	Exceptional	10'	yes		
7	Laurel	12"	18'	Significant	10'		yes	
8	Laurel	10"	18'	Significant	10'		yes	
9	Laurel	6"	18'	Not Significant	10'		yes	
10	Laurel	8"	18'	Not Significant	10'		yes	
11	Laurel	6"	18'	Not Significant	10'		yes	
12	Laurel	17"	18'	Significant	10'		yes	
OFFSITE								
OS#1	Cedar	22"	34'	N/A	14'			
OS#2	Laurel	7"	16'	N/A	14'			
OS#3	English Holly	10"	18'	N/A	10'			
OS#4	Cedar	10"	18'	N/A	10'			

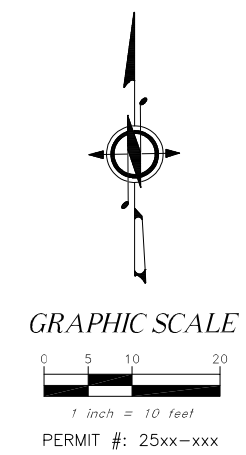
EXISTING UTILITY LOCATIONS SHOWN HEREON ARE APPROXIMATE ONLY. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO DETERMINE THE EXACT VERTICAL AND HORIZONTAL LOCATION OF ALL EXISTING UNDERGROUND UTILITIES PRIOR TO COMMENCING CONSTRUCTION. NO REPRESENTATION IS MADE THAT ALL EXISTING UTILITIES ARE SHOWN HEREON. THE ENGINEER ASSUMES NO RESPONSIBILITY FOR UTILITIES NOT SHOWN OR UTILITIES NOT SHOWN IN THEIR PROPER LOCATION.
CALL BEFORE YOU DIG: 811

LEGEND

ACU □	AIR CONDITION UNIT	⊗	MONUMENT IN CASE (FOUND)
AD	AREA DRAIN	PAV	PAVER SURFACE
AS	ASPHALT SURFACE	POST	POST
B	BUILDING	P	POWER METER
CL	CENTERLINE ROW	PO	POWER (OVERHEAD)
CS	CONCRETE SURFACE	PL	POWER POLE W/ LIGHT
RW	RETAINING WALL	RE	REBAR AS NOTED (FOUND)
EA	ELECTRICAL EASEMENT	RC	REBAR & CAP (SET)
D	DECK	R	ROCKERY
FL	FENCE LINE (WOOD)	SL	SEWER LINE
GL	GAS LINE	SM	SEWER MANHOLE
GM	GAS METER	SD	STORM DRAIN LINE
HR	HOSE BIB RISER	TR	TREE (AS NOTED)
HL	HEDGE FOLIAGE LINE	WL	WATER LINE
I1	INLET (TYPE 1)	WM	WATER METER
I1S	INLET (TYPE 1) (SOLID)		



PROJECT	4526 89th Avenue SE	DESIGNED BY	DLO	CHECKED BY	DLO
CLIENT	JayMarc Homes, Inc.	DRAWN BY	SLS	DATE	09/15/2025
SHEET CONTENT	Stormwater Site Plan	REV. NO.		DESCRIPTION	
DATE	09/15/2025				
JOB NO.					
DWG NO.					
SHEET	1	OF	4		



OFF ENGINEERS
 10000 1st Avenue SE, Suite 100
 Everett, WA 98203
 PHONE: 425-240-3422
 CONTACT: DAVID@OFF.EE
 P.E.



Section I-3.4.3 MR3: Source Control of Pollution

Source control BMP's will be utilized to contain pollution generating runoff. No concrete washout will be allowed on the property during construction. No fuel materials will be placed or stored on site during construction.

Section I-3.4.4 MR4: Preservation of Natural Drainage Systems and Outfalls

The subject property slopes from a high point at the northeast corner (at elevation 276.30) towards the southwest corner (at elevation 268.50). The existing house roof area discharges onto the ground with splash blocks and then sheet flows over the landscape area and into 83rd Avenue SE. The existing driveway sheet flows towards the shoulder of 83rd Avenue SE. Both these areas combine into public catch basin (CB#22-7) within 83rd Avenue SE at the southwest corner of subject property. The natural discharge and outfall from the subject property is sheet flow and collection by a public storm basin in the southwest corner of the property. The proposed discharge will be to convey the onsite drainage from the driveway and roof area within a storm pipe and connect to into CB#22-7. The natural outfall has been preserved by the new development.

The subject property was visited in September and November 2023 to review and evaluate on-site drainage patterns and walk and review the downstream system. The downstream system below CB#22-7 is an open ditch along the east side of 83rd Avenue SE (@ 4224 83rd). The drainage then crosses 83rd Avenue SE (at the southerly end of the road) and flows within an open ditch/landscape swale along the south side of 4225 83rd Avenue SE. The ditch flows west within private property and heavily vegetated area between 83rd Avenue SE and West Mercer Way. The downstream, where accessible, has no indications of flooding, overtopping, scouring.

Section I-3.4.5 MR5: On-Site Stormwater Management

The proposed project is D.O.E. flow control exempt; therefore, the drainage shall be evaluated using "List #3, For Flow Control Exempt" – Table I-3.2.

A Geotechnical Evaluation was prepared by Cobalt Geosciences and is attached to this Report in Appendix A.

Surface Type: Lawn and Landscaped Areas

Lawn and landscape areas – **feasible** - The use of Post-Construction Soil Quality and Depth shall be implemented within areas of the property that are not covered by hard surfaces and were disturbed during condition.

Surface Type: Roofs

1.a. Full Dispersion BMP T5.30 – **infeasible** due to lack of available 100' of vegetated flow path downgradient from the roof area.

1.b. Full Infiltration BMP T5.10A – **infeasible** due to lack of permeable soils.

2. Downspout Dispersion System BMP T5.10B – **infeasible** due to lack of available 50' flow path downgradient of the downspout leaders.

3. Perforated Pipe Connection BMP T5.10C - **infeasible** due to lack of permeable soils.

Surface Type: Other Hard Surfaces

1. Sheet Flow Dispersion BMP T5.12 – **infeasible** due to lack of available 25 feet of flow path downgradient from driveway.

2. Concentrated Flow Dispersion BMP T5.11 - **infeasible** due to lack of available flow path downgradient from hard surfaces.

Additional requirements per City of Mercer Island Municipal Code Section 15.09.050.A for Minimum Requirement #5

1. Minimum Requirement No. 5 applies to projects that:
 - a. Result in 2,000 square feet or greater hard surfaces – Applies to this property
 - b. Have a land disturbance activity of 7,000 square feet or greater – Does NOT apply to this property
 - c. Results in a net increase of impervious surface of 500 square feet or greater – Does NOT apply to this property

There are no available BMPs to provide treatment of the roof area or other hard surfaces. Therefore, a connection to the public storm system within 89th Avenue SE will be provided. However, the project does require Mercer Island detention standards due to downstream restrictions. A detention tank has been sized, following this Section, to meet the Cities standards. The depth of the proposed detention tank is below the gravity City storm drainage system within 89th Avenue SE, therefore, a pump (non-gravity discharge) will be utilized.

STORMWATER DETENTION DESIGN/INSTALL

There are downstream restrictions within the downstream drainage course that require City of Mercer Island detention systems to be installed within this drainage basin if the on-site soils are infeasible for infiltration of storm water. On-site soils are infeasible for infiltration type BMPs. Therefore, a storm water detention tank shall be provided on the property meeting the City of Mercer Island requirements. Detention sizing has been included within this Report.

Detention Tank sizing per Mercer Island Requirements

Table 1

ON-SITE DETENTION DESIGN FOR PROJECTS BETWEEN 500 SF AND 9,500 SF NEW PLUS REPLACED IMPERVIOUS SURFACE AREA

New and Replaced Impervious Surface Area (sf)	Detention Pipe Diameter (in)	Detention Pipe Length (ft)		Lowest Orifice Diameter (in) ⁽³⁾		Distance from Outlet Invert to Second Orifice (ft)		Second Orifice Diameter (in)	
		B soils	C soils	B soils	C soils	B soils	C soils	B soils	C soils
500 to 1,000 sf	36"	30	22	0.5	0.5	2.2	2.0	0.5	0.8
	48"	18	11	0.5	0.5	3.3	3.2	0.9	0.8
	60"	11	7	0.5	0.5	4.2	3.4	0.5	0.6
1,001 to 2,000 sf	36"	66	43	0.5	0.5	2.2	2.3	0.9	1.4
	48"	34	23	0.5	0.5	3.2	3.3	0.9	1.2
	60"	22	14	0.5	0.5	4.3	3.6	0.9	0.9
2,001 to 3,000 sf	36"	90	66	0.5	0.5	2.2	2.4	0.9	1.9
	48"	48	36	0.5	0.5	3.1	2.8	0.9	1.5
	60"	30	20	0.5	0.5	4.2	3.7	0.9	1.1
3,001 to 4,000 sf	36"	120	78	0.5	0.5	2.4	2.2	1.4	1.6
	48"	62	42	0.5	0.5	2.8	2.9	0.8	1.3
	60"	42	26	0.5	0.5	3.8	3.9	0.9	1.3
4,001 to 5,000 sf	36"	134	91	0.5	0.5	2.8	2.2	1.7	1.5
	48"	73	49	0.5	0.5	3.6	2.9	1.6	1.5
	60"	46	31	0.5	0.5	4.6	3.5	1.6	1.3
5,001 to 6,000 sf	36"	162	109	0.5	0.5	2.7	2.2	1.8	1.6
	48"	90	59	0.5	0.5	3.5	2.9	1.7	1.5
	60"	54	37	0.5	0.5	4.6	3.6	1.6	1.4
6,001 to 7,000 sf	36"	192	128	0.5	0.5	2.7	2.2	1.9	1.8
	48"	102	68	0.5	0.5	3.7	2.9	1.9	1.6
	60"	64	43	0.5	0.5	4.6	3.6	1.8	1.5
7,001 to 8,000 sf	36"	216	146	0.5	0.5	2.8	2.2	2.0	1.9
	48"	119	79	0.5	0.5	3.8	2.9	2.2	1.7
	60"	73	49	0.5	0.5	4.5	3.6	2.0	1.6
8,001 to 8,500 sf ⁽¹⁾	36"	228	155	0.5	0.5	2.8	2.2	2.1	1.9
	48"	124	84	0.5	0.5	3.7	2.9	1.9	1.8
	60"	77	53	0.5	0.5	4.6	3.6	2.0	1.6
8,501 to 9,000 sf	36"	NA ⁽¹⁾	164	0.5	0.5	NA ⁽¹⁾	2.2	NA ⁽¹⁾	1.9
	48"	NA ⁽¹⁾	89	0.5	0.5	NA ⁽¹⁾	2.9	NA ⁽¹⁾	1.9
	60"	NA ⁽¹⁾	55	0.5	0.5	NA ⁽¹⁾	3.6	NA ⁽¹⁾	1.7
9,001 to 9,500 sf ⁽²⁾	36"	NA ⁽¹⁾	174	0.5	0.5	NA ⁽¹⁾	2.2	NA ⁽¹⁾	2.1
	48"	NA ⁽¹⁾	94	0.5	0.5	NA ⁽¹⁾	2.9	NA ⁽¹⁾	2.0
	60"	NA ⁽¹⁾	58	0.5	0.5	NA ⁽¹⁾	3.7	NA ⁽¹⁾	1.7

Notes:

- Minimum Requirement #7 (Flow Control) is required when the 100-year flow frequency causes a 0.15 cubic feet per second increase (when modeled in WWHM with a 15-minute timestep). Breakpoints shown in this table are based on a flat slope (0-5%). The 100-year flow frequency will need to be evaluated on a site-specific basis for projects on moderate (5-15%) or steep (> 15%) slopes.

- Soil type to be determined by geotechnical analysis or soil map.
- Sizing includes a Volume Correction Factor of 120%.
- Upper bound contributing area used for sizing.

⁽¹⁾ On Type B soils, new plus replaced impervious surface areas exceeding 8,500 sf trigger Minimum Requirement #7 (Flow Control)

⁽²⁾ On Type C soils, new plus replaced impervious surface areas exceeding 9,500 sf trigger Minimum Requirement #7 (Flow Control)

⁽³⁾ Minimum orifice diameter = 0.5 inches

in = inch
ft = feet
sf = square feet

Basis of Sizing Assumptions:

Sized per MR#5 in the Stormwater Management Manual for Puget Sound Basin (1992 Ecology Manual)
SBUH, Type 1A, 24-hour hydrograph
2-year, 24-hour storm = 2 in; 10-year, 24-hour storm = 3 in; 100-year, 24-hour storm = 4 in
Predeveloped = second growth forest (CN = 72 for Type B soils, CN = 81 for Type C soils)
Developed = impervious (CN = 98)
0.5 foot of sediment storage in detention pipe
Overland slope = 5%

Sizing of required for on-site detention system

- (A) The Geotechnical Evaluation by Cobalt Geosciences has determined the underlying soils type to be Class B
- (B) The proposed total impervious surface is 3,590 square feet

Using "*City of Mercer Island On-Site Detention Design Requirements, Table 1*", the required detention tank will be 42 linear feet of 60" (5') CMP pipe.

Appendix A: Geotechnical Evaluation



September 15, 2025

Jay Marc Homes
C/O Darrell Offe
Offeengineers@gmail.com

RE: Geotechnical Evaluation
Proposed Residence
4526 89th Avenue SE
Mercer Island, Washington

In accordance with your authorization, Cobalt Geosciences, LLC has prepared this report to discuss the results of our geotechnical evaluation at the referenced site.

The purpose of our evaluation was to provide recommendations for foundation design, grading, and earthwork.

Site & Project Description

The site is located at 4526 89th Avenue SE in Mercer Island, Washington. The site consists of one rectangular shaped parcel (No. 0191100225) with a total area of 10,125 square feet.

The central portion of the property is developed with a residence and driveway. The remainder of the property is vegetated with grasses, bushes, and sparse trees.

The site is nearly level to slightly sloping in multiple directions with minimal relief and low magnitude. The site is bordered to the north, east, and east by residential properties, and to the west by 89th Avenue SE.

According to City of Mercer Island maps the site is within a seismic hazard area.

The proposed development includes a new residence and driveway. Stormwater will include infiltration or other systems depending on feasibility.

Site grading may include cuts and fills of 3 feet or less and foundation loads are expected to be light.

We should be provided with the final plans to verify that our recommendations remain valid and do not require updating.

Area Geology

The Geologic Map of Mercer Island, indicates that the site is underlain by Vashon Glacial Till

Vashon Glacial Till includes mixtures of silt, sand, clay, and gravel. These materials are usually impermeable and are typically dense to very dense below a weathered zone.

There are recessional deposits mapped in the area of the site. These can include sand and gravel and/or lacustrine silts. These deposits can exhibit liquefaction or other seismic susceptibilities depending on their density, composition, and whether groundwater is present at shallow depths.

Soil & Groundwater Conditions

As part of our evaluation, we excavated one test pit and one hand boring within the property, where accessible.

The explorations encountered approximately 6 inches of grass and topsoil underlain by approximately 3 to 3.5 feet of loose to medium dense, silty-fine to medium grained sand trace gravel (Weathered Glacial Till). These materials were underlain by dense, silty-fine to medium grained sand trace gravel (Vashon Glacial Till), which continued to the termination depths of the explorations. There is a chance that these deposits could be Vashon Ice Contact Deposits; however, they mostly resemble glacial till in our opinion.

Groundwater was not observed in the explorations. Very light interflow could be present at shallow depths on denser soils during the wet season.

Water table elevations often fluctuate over time. The groundwater level will depend on a variety of factors that may include seasonal precipitation, irrigation, land use, climatic conditions and soil permeability. Water levels at the time of the field investigation may be different from those encountered during the construction phase of the project.

Erosion Hazard

The Natural Resources Conservation Services (NRCS) maps for King County indicate that the site is underlain by Arents, Alderwood material (6 to 15 percent slopes) and Kitsap silt loam (2 to 8 percent). Based on our experience, the site soils would have a slight to moderate erosion potential in a disturbed state depending on the slope magnitude.

It is our opinion that soil erosion potential at this project site can be reduced through landscaping and surface water runoff control. Typically, erosion of exposed soils will be most noticeable during periods of rainfall and may be controlled by the use of normal temporary erosion control measures, such as silt fences, hay bales, mulching, control ditches and diversion trenches. The typical wet weather season, with regard to site grading, is from October 31st to April 1st. Erosion control measures should be in place before the onset of wet weather.

Seismic Hazard

The overall subsurface profile corresponds to a Site Class *D* as defined by Table 1613.5.2 of the International Building Code (IBC). A Site Class *D* applies to an overall profile consisting of medium dense to very dense soils within the upper 100 feet.

We referenced the U.S. Geological Survey (USGS) Earthquake Hazards Program Website to obtain values for S_s , S_i , F_a , and F_v . The USGS website includes the most updated published data on seismic conditions. The following tables provide seismic parameters from the USGS web site referenced parameters from ASCE 7-16 and ASCE 7-22.

Seismic Design Parameters (ASCE 7-16)

Site Class	Spectral Acceleration at 0.2 sec. (g)	Spectral Acceleration at 1.0 sec. (g)	Site Coefficients		Design Spectral Response Parameters		Design PGA
			F _a	F _v	S _{DS}	S _{D1}	
D	1.428	0.496	1.0	Null	0.952	Null	0.672

Seismic Design Parameters (ASCE 7-22)

Site Class	Spectral Acceleration at 0.2 sec. (g)	Spectral Acceleration at 1.0 sec. (g)	Site Coefficients		Design Spectral Response Parameters		Design PGA _M
			F _a	F _v	S _{DS}	S _{D1}	
D	1.59	0.63	-	-	1.14	0.88	0.72

Additional seismic considerations include liquefaction potential and amplification of ground motions by soft/loose soil deposits. The liquefaction potential is highest for loose sand with a high groundwater table. The site has a low likelihood of liquefaction. For items listed as “Null” see Section 11.4.8 of the ASCE.

Note: It is our opinion that the site does not contain seismic hazard areas based on the dense to very dense soil conditions at shallow depths. Also, groundwater was not observed in the explorations.

Statement of Risk

Per Section 19.07.160B3 of the Mercer Island City Code, development within geologic hazard areas require that a Geotechnical Engineer licensed within the State of Washington provide a statement of risk with supporting documentation indicating that one of the following conditions can be met:

- a. The geologic hazard area will be modified, or the development has been designed so that the risk to the lot and adjacent property is eliminated or mitigated such that the site is determined to be safe; or
- b. An evaluation of site specific subsurface conditions demonstrates that the proposed development is not located in a geologic hazard area; or
- c. Development practices are proposed for the alteration that would render the development as safe as if it were not located in a geologic hazard area; or

d. The alteration is so minor as not to pose a threat to the public health, safety and welfare.

The project meets the criteria of b from above. The site is underlain by denser glacial till which has a very low risk liquefaction.

Conclusions and Recommendations

General

The site is underlain by likely glacial till which becomes denser with depth. The proposed residential structure may be supported on a shallow foundation system bearing on medium dense or firmer native soils or on structural fill placed on the native soils. Local overexcavation of loose weathered native soils may be necessary depending on the proposed elevations and locations of the new footings.

Widespread infiltration of runoff is not feasible based on the soil conditions and possibility of shallow interflow perched on denser till during the winter months.

We recommend utilizing direct or perforated connection of runoff collection devices to City infrastructure. We can provide additional recommendations once a civil plan with planned grading and building elevations has been prepared.

Site Preparation

Trees, shrubs and other vegetation should be removed prior to stripping of surficial organic-rich soil and fill. Based on observations from the site investigation program, it is anticipated that the stripping depth will be 6 to 18 inches. Deeper excavations will be necessary in areas of existing foundation systems (where present), larger trees where roots persist, and in any areas underlain by undocumented fill.

The native soils consist of silty-sand with gravel. Most of the native soils may be used as structural fill provided they achieve compaction requirements and are within 3 percent of the optimum moisture. Some of these soils may only be suitable for use as fill during the summer months, as they will be above the optimum moisture levels in their current state. These soils are HIGHLY moisture sensitive and may degrade during periods of wet weather and under equipment traffic.

Imported structural fill should consist of a sand and gravel mixture with a maximum grain size of 3 inches and less than 5 percent fines (material passing the U.S. Standard No. 200 Sieve). Structural fill should be placed in maximum lift thicknesses of 12 inches and should be compacted to a minimum of 95 percent of the modified proctor maximum dry density, as determined by the ASTM D 1557 test method.

Temporary Excavations

Based on our understanding of the project, we anticipate that the grading could include local cuts on the order of approximately 3 feet or less for foundation and most of the utility placement. Temporary excavations should be sloped no steeper than 1.5H:1V (Horizontal:Vertical) in loose native soils and fill, 1H:1V in medium dense native soils and 3/4H:1V in dense to very dense native soils. If an excavation is subject to heavy vibration or surcharge loads, we recommend that the excavations be sloped no steeper than 2H:1V, where room permits.

Temporary cuts should be in accordance with the Washington Administrative Code (WAC) Part N, Excavation, Trenching, and Shoring. Temporary slopes should be visually inspected daily by a qualified person during construction activities and the inspections should be documented in daily reports. The contractor is responsible for maintaining the stability of the temporary cut slopes and reducing slope erosion during construction.

Temporary cut slopes should be covered with visqueen to help reduce erosion during wet weather, and the slopes should be closely monitored until the permanent retaining systems or slope configurations are complete. Materials should not be stored or equipment operated within 10 feet of the top of any temporary cut slope.

Soil conditions may not be completely known from the geotechnical investigation. In the case of temporary cuts, the existing soil conditions may not be completely revealed until the excavation work exposes the soil. Typically, as excavation work progresses the maximum inclination of temporary slopes will need to be re-evaluated by the geotechnical engineer so that supplemental recommendations can be made. Soil and groundwater conditions can be highly variable. Scheduling for soil work will need to be adjustable, to deal with unanticipated conditions, so that the project can proceed and required deadlines can be met.

If any variations or undesirable conditions are encountered during construction, we should be notified so that supplemental recommendations can be made. If room constraints or groundwater conditions do not permit temporary slopes to be cut to the maximum angles allowed by the WAC, temporary shoring systems may be required. The contractor should be responsible for developing temporary shoring systems, if needed. We recommend that Cobalt Geosciences and the project structural engineer review temporary shoring designs prior to installation, to verify the suitability of the proposed systems.

Foundation Design

The proposed structure may be supported on a shallow spread footing foundation system bearing on undisturbed medium dense or firmer native soils or on properly compacted structural fill placed on the suitable native soils. Any undocumented fill and/or loose native soils should be removed and replaced with structural fill below foundation elements.

Structural fill below footings should consist of clean angular rock 5/8 to 4 inches in size. We should verify soil conditions during foundation excavation work.

For shallow foundation support, we recommend widths of at least 16 and 24 inches, respectively, for continuous wall and isolated column footings supporting the proposed structure. Provided that the footings are supported as recommended above, a net allowable bearing pressure of 2,500 pounds per square foot (psf) may be used for design.

A 1/3 increase in the above value may be used for short duration loads, such as those imposed by wind and seismic events. Structural fill placed on bearing, native subgrade should be compacted to at least 95 percent of the maximum dry density based on ASTM Test Method D1557. Footing excavations should be inspected to verify that the foundations will bear on suitable material.

Exterior footings should have a minimum depth of 18 inches below pad subgrade (soil grade) or adjacent exterior grade, whichever is lower. Interior footings should have a minimum depth of 12 inches below pad subgrade (soil grade) or adjacent exterior grade, whichever is lower.

If constructed as recommended, the total foundation settlement is not expected to exceed 1 inch. Differential settlement, along a 25-foot exterior wall footing, or between adjoining column footings, should be less than 1/2 inch. This translates to an angular distortion of 0.002. Most settlement is expected to occur during construction, as the loads are applied. However, additional post-construction settlement may occur if the foundation soils are flooded or saturated. All footing excavations should be observed by a qualified geotechnical consultant.

Resistance to lateral footing displacement can be determined using an allowable friction factor of 0.40 acting between the base of foundations and the supporting subgrades. Lateral resistance for footings can also be developed using an allowable equivalent fluid passive pressure of 300 pounds per cubic foot (pcf) acting against the appropriate vertical footing faces (neglect the upper 12 inches below grade in exterior areas). The frictional and passive resistance of the soil may be combined without reduction in determining the total lateral resistance.

Care should be taken to prevent wetting or drying of the bearing materials during construction. Any extremely wet or dry materials, or any loose or disturbed materials at the bottom of the footing excavations, should be removed prior to placing concrete. The potential for wetting or drying of the bearing materials can be reduced by pouring concrete as soon as possible after completing the footing excavation and evaluating the bearing surface by the geotechnical engineer or his representative.

Concrete Retaining Walls

The following table, titled **Wall Design Criteria**, presents the recommended soil related design parameters for retaining walls with a level backslope. Contact Cobalt if an alternate retaining wall system is used. This has been included for new cast in place walls.

Wall Design Criteria	
"At-rest" Conditions (Lateral Earth Pressure – EFD ⁺)	55 pcf (Equivalent Fluid Density)
"Active" Conditions (Lateral Earth Pressure – EFD ⁺)	35 pcf (Equivalent Fluid Density)
Seismic Increase for "At-rest" Conditions (Lateral Earth Pressure)	14H* (Uniform Distribution)
Seismic Increase for "Active" Conditions (Lateral Earth Pressure)	7H* (Uniform Distribution)
Passive Earth Pressure on Low Side of Wall (Allowable, includes F.S. = 1.5)	Neglect upper 12 inches, then 300 pcf EFD ⁺
Soil-Footing Coefficient of Sliding Friction (Allowable; includes F.S. = 1.5)	0.40

*H is the height of the wall; Increase based on one in 500 year seismic event (10 percent probability of being exceeded in 50 years),

+EFD – Equivalent Fluid Density

The stated lateral earth pressures do not include the effects of hydrostatic pressure generated by water accumulation behind the retaining walls. Uniform horizontal lateral active and at-rest pressures on the retaining walls from vertical surcharges behind the wall may be calculated using active and at-rest lateral earth pressure coefficients of 0.3 and 0.5, respectively. A soil unit weight of 125 pcf may be used to calculate vertical earth surcharges.

To reduce the potential for the buildup of water pressure against the walls, continuous footing drains (with cleanouts) should be provided at the bases of the walls. The footing drains should consist of a minimum 4-inch diameter perforated pipe, sloped to drain, with perforations placed down and enveloped by a minimum 6 inches of pea gravel in all directions.

The backfill adjacent to and extending a lateral distance behind the walls at least 2 feet should consist of free-draining granular material. All free draining backfill should contain less than 3 percent fines (passing the U.S. Standard No. 200 Sieve) based upon the fraction passing the U.S. Standard No. 4 Sieve with at least 30 percent of the material being retained on the U.S. Standard No. 4 Sieve. The primary purpose of the free-draining material is the reduction of hydrostatic pressure. Some potential for the moisture to contact the back face of the wall may exist, even with treatment, which may require that more extensive waterproofing be specified for walls, which require interior moisture sensitive finishes.

We recommend that the backfill be compacted to at least 90 percent of the maximum dry density based on ASTM Test Method D1557. In place density tests should be performed to verify adequate compaction. Soil compactors place transient surcharges on the backfill. Consequently, only light hand operated equipment is recommended within 3 feet of walls so that excessive stress is not imposed on the walls.

Stormwater Management Feasibility

The site is underlain by relatively dense glacial till like materials. The unweathered till was cemented and acts as a restrictive layer. We performed a small scale pilot infiltration test (PIT) in TP-1. The test was performed in general accordance with the Washington State Department of Ecology stormwater manual.

The area was excavated to a testing depth of approximately 4 feet below the ground surface, just below a layer of fill. During testing, we reduced the flow rate into the hole to the minimum available with the equipment and water source being used and continued to observe a rising water level. Since a steady state rate was not achieved, we performed a falling head test until the testing water was fully infiltrated.

The design infiltration rate was determined by applying correction factors to the measured infiltration rate as prescribed in Volume III, Section 3.3.6 of the DOE. The measured rate must be reduced through appropriate correction factors for site variability (CF_V), uncertainty of test method (CF_T), and degree of influent control (CF_M) to prevent siltation and bio-buildup.

It should be noted that construction traffic or other disturbance to the target infiltration area could compact the soil, which may decrease the effective infiltration rates. The correction factors and resulting design infiltration rate are also shown in the table below.

Test Number	Test Depth (ft)	Measured Infiltration Rate (in/hr)	Correction Factors			Design Infiltration Rate (in/hr)
			CF _V	CF _T	CF _M	
TP-1	4.0	0.6	0.7	0.5	0.9	0.19

Widespread infiltration of runoff is not feasible based on the soil conditions and possibility of shallow interflow perched on denser till during the winter months.

We recommend utilizing direct or perforated connection of runoff collection devices to City infrastructure. Dispersion devices are generally feasible if there is adequate space.

We can provide additional recommendations once a civil plan with planned grading and building elevations has been prepared. We should be provided with final plans for review to determine if the intent of our recommendations has been incorporated or if additional modifications are needed.

Slab-on-Grade

We recommend that the upper 12 inches of the native soils within slab areas be re-compacted to at least 95 percent of the modified proctor (ASTM D1557 Test Method).

Often, a vapor barrier is considered below concrete slab areas. However, the usage of a vapor barrier could result in curling of the concrete slab at joints. Floor covers sensitive to moisture typically requires the usage of a vapor barrier. A materials or structural engineer should be consulted regarding the detailing of the vapor barrier below concrete slabs. Exterior slabs typically do not utilize vapor barriers.

The American Concrete Institutes ACI 360R-06 Design of Slabs on Grade and ACI 302.1R-04 Guide for Concrete Floor and Slab Construction are recommended references for vapor barrier selection and floor slab detailing.

Slabs on grade may be designed using a coefficient of subgrade reaction of 210 pounds per cubic inch (pci) assuming the slab-on-grade base course is underlain by structural fill placed and compacted as outlined above. A 4- to 6-inch-thick capillary break layer should be placed over the prepared subgrade. This material should consist of pea gravel or 5/8 inch clean angular rock.

A perimeter drainage system is recommended unless interior slab areas are elevated a minimum of 12 inches above adjacent exterior grades. If installed, a perimeter drainage system should consist of a 4-inch diameter perforated drain pipe surrounded by a minimum 6 inches of drain rock wrapped in a non-woven geosynthetic filter fabric to reduce migration of soil particles into the drainage system. The perimeter drainage system should discharge by gravity flow to a suitable stormwater system.

Exterior grades surrounding buildings should be sloped at a minimum of one percent to facilitate surface water flow away from the building and preferably with a relatively impermeable surface cover immediately adjacent to the building.

Erosion and Sediment Control

Erosion and sediment control (ESC) is used to reduce the transportation of eroded sediment to wetlands, streams, lakes, drainage systems, and adjacent properties. Erosion and sediment control measures should be implemented, and these measures should be in general accordance with local regulations. At a minimum, the following basic recommendations should be incorporated into the design of the erosion and sediment control features for the site:

- Schedule the soil, foundation, utility, and other work requiring excavation or the disturbance of the site soils, to take place during the dry season (generally May through September). However, provided precautions are taken using Best Management Practices (BMP's), grading activities can be completed during the wet season (generally October through April).
- All site work should be completed and stabilized as quickly as possible.
- Additional perimeter erosion and sediment control features may be required to reduce the possibility of sediment entering the surface water. This may include additional silt fences, silt fences with a higher Apparent Opening Size (AOS), construction of a berm, or other filtration systems.
- Any runoff generated by dewatering discharge should be treated through construction of a sediment trap if there is sufficient space. If space is limited other filtration methods will need to be incorporated.

Utilities

Utility trenches should be excavated according to accepted engineering practices following OSHA (Occupational Safety and Health Administration) standards, by a contractor experienced in such work. The contractor is responsible for the safety of open trenches. Traffic and vibration adjacent to trench walls should be reduced; cyclic wetting and drying of excavation side slopes should be avoided. Depending upon the location and depth of some utility trenches, groundwater flow into open excavations could be experienced, especially during or shortly following periods of precipitation.

In general, silty and sandy soils were encountered at shallow depths in the explorations at this site. These soils have low cohesion and density and will have a tendency to cave or slough in excavations. Shoring or sloping back trench sidewalls is required within these soils in excavations greater than 4 feet deep.

All utility trench backfill should consist of imported structural fill or suitable on site soils. Utility trench backfill placed in or adjacent to buildings and exterior slabs should be compacted to at least 95 percent of the maximum dry density based on ASTM Test Method D1557. The upper 5 feet of utility trench backfill placed in pavement areas should be compacted to at least 95 percent of the maximum dry density based on ASTM Test Method D1557. Below 5 feet, utility trench backfill in pavement areas should be compacted to at least 90 percent of the maximum dry density based on ASTM Test Method D1557. Pipe bedding should be in accordance with the pipe manufacturer's recommendations.

The contractor is responsible for removing all water-sensitive soils from the trenches regardless of the backfill location and compaction requirements. Depending on the depth and location of the proposed utilities, we anticipate the need to re-compact existing fill soils below the utility structures and pipes. The contractor should use appropriate equipment and methods to avoid damage to the utilities and/or structures during fill placement and compaction procedures.

CONSTRUCTION FIELD REVIEWS

Cobalt Geosciences should be retained to provide part time field review during construction in order to verify that the soil conditions encountered are consistent with our design assumptions and that the intent of our recommendations is being met. This will require field and engineering review to:

- Monitor and test structural fill placement and soil compaction
- Observe bearing capacity at foundation locations
- Observe slab-on-grade preparation
- Observe soil conditions at stormwater system locations
- Monitor foundation drainage placement
- Observe excavation stability

Geotechnical design services should also be anticipated during the subsequent final design phase to support the structural design and address specific issues arising during this phase. Field and engineering review services will also be required during the construction phase in order to provide a Final Letter for the project.

CLOSURE

This report was prepared for the exclusive use of Jay Marc Homes and their appointed consultants. Any use of this report or the material contained herein by third parties, or for other than the intended purpose, should first be approved in writing by Cobalt Geosciences, LLC.

The recommendations contained in this report are based on assumed continuity of soils with those of our test holes and assumed structural loads. Cobalt Geosciences should be provided with final architectural and civil drawings when they become available in order that we may review our design recommendations and advise of any revisions, if necessary.

Use of this report is subject to the Statement of General Conditions provided in Appendix A. It is the responsibility of Jay Marc Homes who is identified as “the Client” within the Statement of General Conditions, and its agents to review the conditions and to notify Cobalt Geosciences should any of these not be satisfied.

Sincerely,

Cobalt Geosciences, LLC



9/15/2025
Phil Haberman, PE, LG, LEG
Principal

Statement of General Conditions

USE OF THIS REPORT: This report has been prepared for the sole benefit of the Client or its agent and may not be used by any third party without the express written consent of Cobalt Geosciences and the Client. Any use which a third party makes of this report is the responsibility of such third party.

BASIS OF THE REPORT: The information, opinions, and/or recommendations made in this report are in accordance with Cobalt Geosciences present understanding of the site specific project as described by the Client. The applicability of these is restricted to the site conditions encountered at the time of the investigation or study. If the proposed site specific project differs or is modified from what is described in this report or if the site conditions are altered, this report is no longer valid unless Cobalt Geosciences is requested by the Client to review and revise the report to reflect the differing or modified project specifics and/or the altered site conditions.

STANDARD OF CARE: Preparation of this report, and all associated work, was carried out in accordance with the normally accepted standard of care in the state of execution for the specific professional service provided to the Client. No other warranty is made.

INTERPRETATION OF SITE CONDITIONS: Soil, rock, or other material descriptions, and statements regarding their condition, made in this report are based on site conditions encountered by Cobalt Geosciences at the time of the work and at the specific testing and/or sampling locations. Classifications and statements of condition have been made in accordance with normally accepted practices which are judgmental in nature; no specific description should be considered exact, but rather reflective of the anticipated material behavior. Extrapolation of in situ conditions can only be made to some limited extent beyond the sampling or test points. The extent depends on variability of the soil, rock and groundwater conditions as influenced by geological processes, construction activity, and site use.

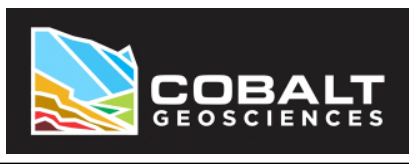
VARYING OR UNEXPECTED CONDITIONS: Should any site or subsurface conditions be encountered that are different from those described in this report or encountered at the test locations, Cobalt Geosciences must be notified immediately to assess if the varying or unexpected conditions are substantial and if reassessments of the report conclusions or recommendations are required. Cobalt Geosciences will not be responsible to any party for damages incurred as a result of failing to notify Cobalt Geosciences that differing site or sub-surface conditions are present upon becoming aware of such conditions.

PLANNING, DESIGN, OR CONSTRUCTION: Development or design plans and specifications should be reviewed by Cobalt Geosciences, sufficiently ahead of initiating the next project stage (property acquisition, tender, construction, etc), to confirm that this report completely addresses the elaborated project specifics and that the contents of this report have been properly interpreted. Specialty quality assurance services (field observations and testing) during construction are a necessary part of the evaluation of sub-subsurface conditions and site preparation works. Site work relating to the recommendations included in this report should only be carried out in the presence of a qualified geotechnical engineer; Cobalt Geosciences cannot be responsible for site work carried out without being present.



 **Approximate Test**
TP-1 Pit and Hand Boring Location
HB-1

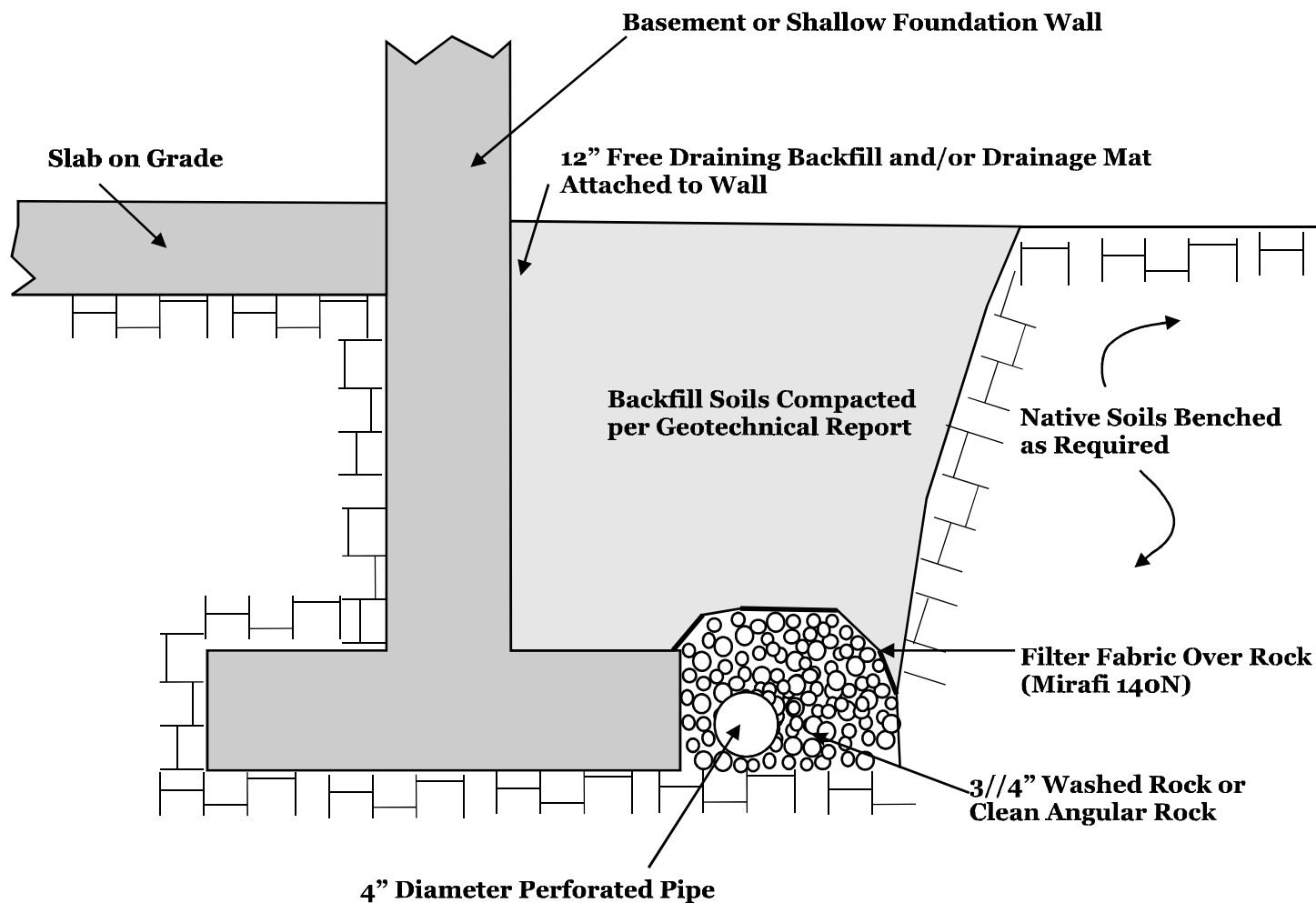
King County imap Image



Proposed Residence
 4526 89th Ave SE
 Mercer Island, Washington

Site Image
Figure 1

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 Kenmore, WA 98028
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cobaltgeo@gmail.com



Not to Scale



Typical Foundation Drain Detail

Attachment

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Unified Soil Classification System (USCS)

MAJOR DIVISIONS			SYMBOL	TYPICAL DESCRIPTION	
COARSE GRAINED SOILS (more than 50% retained on No. 200 sieve)	Gravels (more than 50% of coarse fraction retained on No. 4 sieve)	Clean Gravels (less than 5% fines)	GW	Well-graded gravels, gravels, gravel-sand mixtures, little or no fines	
		Gravels with Fines (more than 12% fines)	GP	Poorly graded gravels, gravel-sand mixtures, little or no fines	
		Gravels with Fines (more than 12% fines)	GM	Silty gravels, gravel-sand-silt mixtures	
		Gravels with Fines (more than 12% fines)	GC	Clayey gravels, gravel-sand-clay mixtures	
	Sands (50% or more of coarse fraction passes the No. 4 sieve)	Clean Sands (less than 5% fines)	SW	Well-graded sands, gravelly sands, little or no fines	
		Sands with Fines (more than 12% fines)	SP	Poorly graded sand, gravelly sands, little or no fines	
		Sands with Fines (more than 12% fines)	SM	Silty sands, sand-silt mixtures	
		Sands with Fines (more than 12% fines)	SC	Clayey sands, sand-clay mixtures	
		Silts and Clays (liquid limit less than 50)	Inorganic	ML	Inorganic silts of low to medium plasticity, sandy silts, gravelly silts, or clayey silts with slight plasticity
			Inorganic	CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
Organic	OL		Organic silts and organic silty clays of low plasticity		
Silts and Clays (liquid limit 50 or more)	Inorganic		MH	Inorganic silts, micaceous or diatomaceous fine sands or silty soils, elastic silt	
	Inorganic	CH	Inorganic clays of medium to high plasticity, sandy fat clay, or gravelly fat clay		
	Organic	OH	Organic clays of medium to high plasticity, organic silts		
HIGHLY ORGANIC SOILS	Primarily organic matter, dark in color, and organic odor	PT	Peat, humus, swamp soils with high organic content (ASTM D4427)		

Classification of Soil Constituents
<p>MAJOR constituents compose more than 50 percent, by weight, of the soil. Major constituents are capitalized (i.e., SAND).</p> <p>Minor constituents compose 12 to 50 percent of the soil and precede the major constituents (i.e., silty SAND). Minor constituents preceded by "slightly" compose 5 to 12 percent of the soil (i.e., slightly silty SAND).</p> <p>Trace constituents compose 0 to 5 percent of the soil (i.e., slightly silty SAND, trace gravel).</p>

Grain Size Definitions	
Description	Sieve Number and/or Size
Fines	< #200 (0.08 mm)
Sand	#200 to #40 (0.08 to 0.4 mm)
-Fine	#40 to #10 (0.4 to 2 mm)
-Medium	#10 to #4 (2 to 5 mm)
-Coarse	
Gravel	#4 to 3/4 inch (5 to 19 mm)
-Fine	3/4 to 3 inches (19 to 76 mm)
-Coarse	
Cobbles	3 to 12 inches (75 to 305 mm)
Boulders	>12 inches (305 mm)

Relative Density (Coarse Grained Soils)		Consistency (Fine Grained Soils)	
N, SPT, Blows/FT	Relative Density	N, SPT, Blows/FT	Relative Consistency
0 - 4	Very loose	Under 2	Very soft
4 - 10	Loose	2 - 4	Soft
10 - 30	Medium dense	4 - 8	Medium stiff
30 - 50	Dense	8 - 15	Stiff
Over 50	Very dense	15 - 30	Very stiff
		Over 30	Hard

Moisture Content Definitions	
Dry	Absence of moisture, dusty, dry to the touch
Moist	Damp but no visible water
Wet	Visible free water, from below water table





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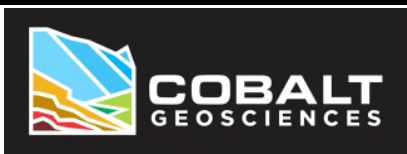
Soil Classification Chart

Figure C1

Test Pit TP-1

Date: September 2025	Depth: 6'	Groundwater: None
Contractor: Cobalt	Elevation:	Logged By: PH Checked By: SC

Depth (Feet)	Interval	Graphic Log	USCS Symbol	Material Description	Groundwater	Moisture Content (%)					
						Plastic Limit	Liquid Limit				
						DCP Equivalent N-Value					
						0	10	20	30	40	50
				<u>Topsoil/Vegetation</u>							
1			SM	Loose to medium dense, silty-fine to medium grained sand with gravel dark yellowish brown to grayish brown, dry to moist. (Weathered Glacial Till)							
2											
3											
4	■		SM	Dense, silty-fine to medium grained sand with gravel grayish brown, moist. (Glacial Till)							
5	■										
6				End of Test Pit 6'							
7											
8											
9											
10											






Proposed Residence
4526 89th Ave SE
Mercer Island, Washington

**Exploration
Logs**

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Hand Boring HB-1

Date: September 2025	Depth: 6'	Groundwater: None
Contractor: Cobalt	Elevation:	Logged By: PH Checked By: SC

Depth (Feet)	Interval	Graphic Log	USCS Symbol	Material Description	Groundwater	Moisture Content (%)					
						Plastic Limit	Liquid Limit				
						DCP Equivalent N-Value					
						0	10	20	30	40	50
				<u>Topsoil/Vegetation</u>							
1			SM	Loose to medium dense, silty-fine to medium grained sand with gravel dark yellowish brown to grayish brown, dry to moist. (Weathered Glacial Till)							
2											
3	■										
4			SM	Dense, silty-fine to medium grained sand with gravel grayish brown, moist. (Glacial Till)							
5	■										
6				End of Hand Boring 6'							
7											
8											
9											
10											



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