

FINAL
STORM DRAINAGE REPORT

FOR

Foo Property

CITY OF MERCER ISLAND, WASHINGTON



12/11/2020

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Date: June 2020
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Core No.: 20034



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SECTION 1. PROJECT OVERVIEW

This project site consists of one parcel in Mercer Island WA, at 3453 74th Avenue SE. See the Vicinity Map on the following page. More specifically the project is located in the SW ¼, of Section 12, Township 24 N, Range 4 East, W.M. The King County tax parcel ID number for the parcel is provided below in Table 1.1

Table 1.1 Parcel Areas

King County Parcel ID & Area	
Parcel 130030-1965	21,618 sf (0.50 acres)

The project is located within the R-8.4 zoning area. The site is bordered by single-family residences the North and west, by Mercerdale Hillside Park to the east, and by SE 36th St to the south. The existing site contains a single-family residence with its associated driveway and walkways. The remaining parcel area is undeveloped and is currently forested. The existing site topography of the site slopes between 3 and 6 percent on average from the north property line to the southwest property corner. However, a negligible area of the property drains to the southeast property corner. The project proposes to demolish the existing single-family residence with the detached garage and construct a new single-family residence with two accessory buildings, driveway, terraces, and walkways. The project has been designed using the guidelines and requirements established in the 2012 Department of Ecology Stormwater Management Manual as Amended in December 2014 (2014 DOE Manual) for the Puget Sound Basin requirements for surface water runoff control and water quality treatment. The King County Parcel and Districts Reports are included in Appendix A.

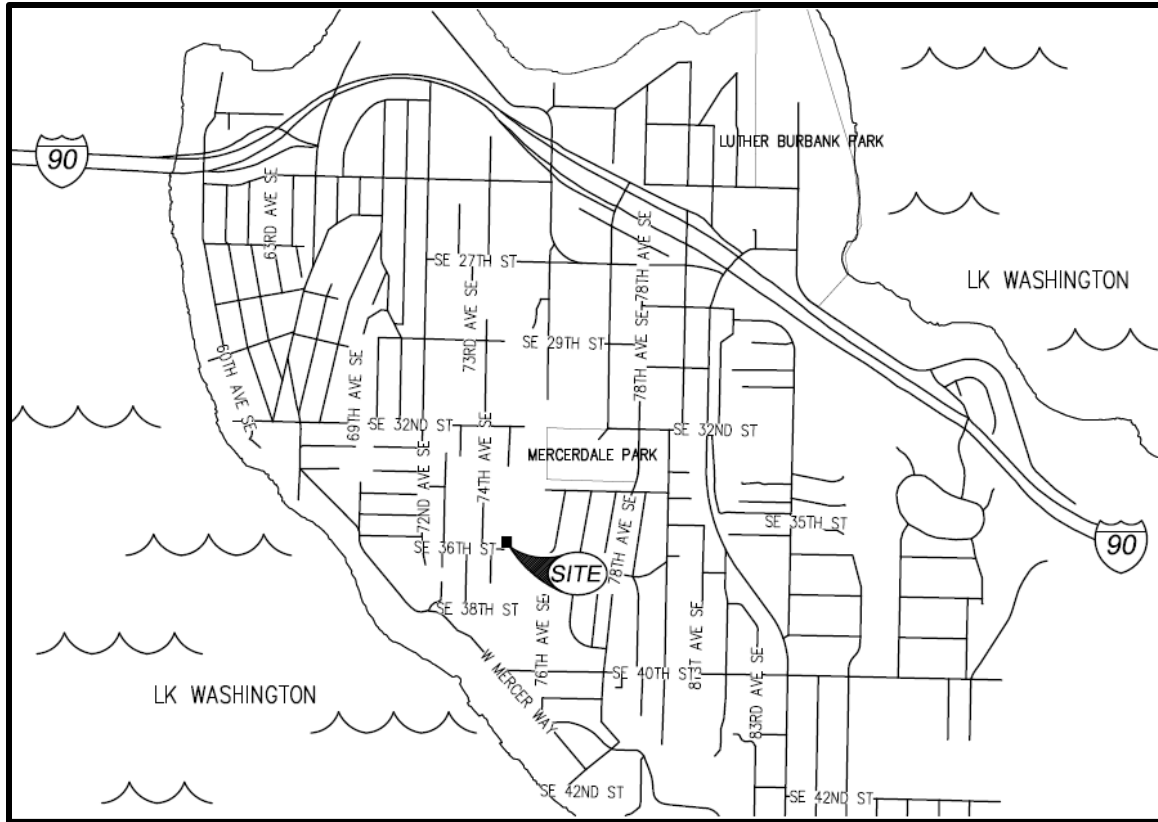


Figure 1.1: Vicinity Map

King County Department of Assessments

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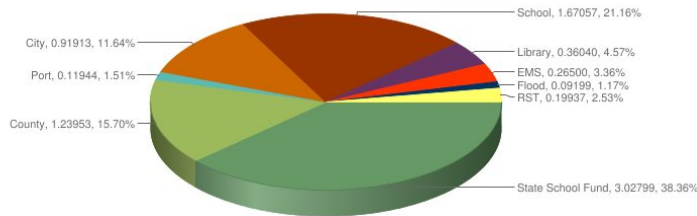
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PARCEL	
Parcel Number	130030-1965
Name	FOO SHANNON + INNHSUAN
Site Address	3453 74TH AVE SE 98040
Legal	CALKINS C C 1ST TO EAST SEATTLE 16 THRU 20 & E 15 FT OF 21 THRU 25 TGW POR OF VAC STS ADJ

BUILDING 1	
Year Built	1951
Total Square Footage	2850
Number Of Bedrooms	5
Number Of Baths	2.75
Grade	9 Better
Condition	Average
Lot Size	21618
Views	No
Waterfront	

TOTAL LEVY RATE DISTRIBUTION

Tax Year: 2020 Levy Code: 1031 Total Levy Rate: \$7.89342 Total Senior Rate: \$4.82852



46.77% Voter Approved

[Click here to see levy distribution comparison by year.](#)

TAX ROLL HISTORY

Valued Year	Tax Year	Appraised Land Value (\$)	Appraised Imps Value (\$)	Appraised Total (\$)	Appraised Imps Increase (\$)	Taxable Land Value (\$)	Taxable Imps Value (\$)	Taxable Total (\$)
2019	2020	1,067,000	380,000	1,447,000	27,000	1,067,000	380,000	1,447,000
2018	2019	1,047,000	343,000	1,390,000	0	1,047,000	343,000	1,390,000
2017	2018	947,000	307,000	1,254,000	0	947,000	307,000	1,254,000
2016	2017	866,000	301,000	1,167,000	0	866,000	301,000	1,167,000
2015	2016	784,000	273,000	1,057,000	0	784,000	273,000	1,057,000
2014	2015	725,000	248,000	973,000	0	725,000	248,000	973,000
2013	2014	615,000	243,000	858,000	0	615,000	243,000	858,000
2012	2013	567,000	224,000	791,000	0	567,000	224,000	791,000
2011	2012	597,000	184,000	781,000	0	597,000	184,000	781,000
2010	2011	626,000	192,000	818,000	0	626,000	192,000	818,000
2009	2010	645,000	197,000	842,000	0	645,000	197,000	842,000
2008	2009	800,000	244,000	1,044,000	0	800,000	228,000	1,028,000
2007	2008	570,000	323,000	893,000	0	570,000	307,000	877,000
2006	2007	509,000	260,000	769,000	0	509,000	244,000	753,000
2005	2006	463,000	234,000	697,000	0	463,000	234,000	697,000
2004	2005	425,000	210,000	635,000	0	425,000	210,000	635,000
2003	2004	425,000	210,000	635,000	0	425,000	210,000	635,000
2002	2003	425,000	210,000	635,000	0	425,000	210,000	635,000

Reference Links:

- [King County Taxing Districts Codes and Levies \(.PDF\)](#)
- [King County Tax Links](#)
- [Property Tax Advisor](#)
- [Washington State Department of Revenue \(External link\)](#)
- [Washington State Board of Tax Appeals \(External link\)](#)
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2001	2002	301,000	248,000	549,000	0	301,000	248,000	549,000
2000	2001	262,000	221,000	483,000	0	262,000	221,000	483,000
1999	2000	210,000	201,000	411,000	0	210,000	201,000	411,000
1998	1999	200,000	177,000	377,000	0	200,000	177,000	377,000
1997	1998	0	0	0	0	147,000	161,000	308,000
1996	1997	0	0	0	0	130,000	138,500	268,500
1994	1995	0	0	0	0	130,000	138,500	268,500
1992	1993	0	0	0	0	81,900	193,200	275,100
1991	1992	0	0	0	0	90,000	212,300	302,300
1990	1991	0	0	0	0	90,000	244,900	334,900
1988	1989	0	0	0	0	45,000	94,000	139,000
1986	1987	0	0	0	0	50,000	111,200	161,200
1984	1985	0	0	0	0	48,400	93,300	141,700
1982	1983	0	0	0	0	48,400	93,300	141,700

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SECTION 2. CONDITIONS AND REQUIREMENTS SUMMARY

The project has more than 35% of existing impervious coverage; thus, the project is classified as redevelopment. Per Figure 2.1 located at the end of this section of the 2014 DOE Manual, the proposed project adds 5,000 square feet or more of new plus replaced impervious surfaces. Therefore, minimum requirements 1 through 9 will be addressed per the 2014 DOE Manual. The applicable minimum requirements, and how the project proposes to address each, are listed below.

2.1 Minimum Requirements

2.1.1 Minimum Requirement #1: Preparation of Stormwater Site Plans

Civil Plans submitted under separate cover and a Final Storm Drainage Report herein have been prepared for the subject project.

2.1.2 Minimum Requirement #2: Construction Stormwater Pollution Prevention

A SWPPP is not applicable to the project since there is less than 1 acre of land disturbance and the projects is not part of a larger common plan of development.

2.1.3 Minimum Requirement #3: Source Control of Pollution

The project is not a commercial project; therefore, this requirement does not apply.

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

The project proposes to drain the onsite runoff to the existing conveyance system located on 74th Avenue SE, maintaining the natural discharge point for the site. The drainage system eventually outlets into Lake Washington. Refer to the Offsite Analysis in Section 3.

2.1.5 Minimum Requirements #5: On-site Stormwater Management

This project triggers minimum requirement 1 through 9 per the 2014 DOE Manual. Because the project is located within a UGA, the project should comply with either Low Impact Development Performance Standard and BMP T5.13: Post-Construction Soil Quality and Depth; or List #2. List #2 has been selected for this project. Stormwater BMP design is discussed in Section 4 of this report.

2.1.6 Minimum Requirement #6: Runoff Treatment

The project does not propose a pollution-generating hard surface (PGHS) larger than 5,000 sf nor a pollution generating pervious surface (PGPS) greater than $\frac{3}{4}$ acre. Therefore, a runoff treatment facility is not required.

2.1.7 Minimum Requirement #7: Flow Control

The project proposes less than 10,000 square feet of impervious surfaces. Also, the project will not cause a 0.10 cfs increase in the 100-year flow frequency due to the proposed development. Therefore, compliance with the flow control standard is not required. In addition, the City of Mercer Island provides their own guidance for the on-site detention requirement. The project will provide a detention pipe sized using the city provided sizing worksheet. Refer to Section 4 for design information of the on-site detention pipe.

2.1.8 Minimum Requirement #8: Wetland Protection

There are no wetlands onsite or offsite downstream of the project, therefore this requirement does not apply.

2.1.9 Minimum Requirement #9: Operation and Maintenance

An operation and maintenance manual is provided in Section 10 of this report.

Does the Project result in 2,000 square feet, or more, of new plus replaced hard surface area?
OR
Does the land disturbing activity total 7,000 square feet or greater?

Yes

No

Minimum Requirements #1 through #5 apply to the new and replaced hard surfaces and the land disturbed.

Minimum Requirement #2 applies.

Next Question

Does the Project add 5,000 square feet or more of new hard surfaces?
OR
Convert $\frac{3}{4}$ acres or more of vegetation to lawn or landscaped areas?
OR
Convert 2.5 acres or more of native vegetation to pasture?

Yes

No

All Minimum Requirements apply to the new hard surfaces and the converted vegetation areas.

Next Question

Is this a road related project?

No

Yes

Does the Project add 5,000 square feet or more of new hard surfaces?

Yes

No

Do the new hard surfaces add 50% or more to the existing hard surfaces within the Site?

No

No

No additional requirements.

Is the total of new plus replaced hard surfaces 5,000 square feet or more,
AND
does the value of the proposed improvements - including interior improvements - exceed 50% of the assessed value (or replacement value) of the:

- existing Project Site improvements (for commercial or industrial projects) OR
- existing Site improvements (for all other projects)

Yes

All Minimum Requirements apply to the new and replaced hard surfaces and converted vegetation areas.

Yes

Flow Chart for Determining Requirements for Redevelopment

Revised March 2019



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SECTION 3. OFFSITE ANALYSIS

Summary

Upstream:

The project site receives stormwater runoff from a couple of properties located to the north. Properties were identified to be 3434 74th Ave SE and 3442 74th Ave SE.

Downstream:

A level 1 downstream analysis was conducted for this project on May 20, 2020.

Weather Conditions: Overcast with a temperature of 57 degrees F.

Existing Conditions

The existing site topography slopes at approximately 2 percent to the southeast corner and the west. Hence, the site has two drainage basins with two separate flow courses.

The drainage basin to the west constitutes the first flow course where runoff sheetflows over property at 3450 74th Ave SE towards a catch basin on the east side of 74th Ave SE. From that point, stormwater runoff enters an existing drainage system made of a series of catch basins connected by 12" concrete pipes outstandingly. The drainage system runs to the west under SE 36th St and then makes a turn to the south under 73rd Ave SE. At the end of 73rd Ave SE, the tightline system makes a turn to the west towards 72nd Pl SE where at that point the flow course reaches ¼ mile downstream of the project site and the analysis is terminated. The tightline system had no observed blockages, buildup of debris or silt, and was otherwise free of capacity constraints.

The second drainage basin is sloped towards the southeast corner of the site. Stormwater runoff sheetflows in the direction of a catch basin located close to the eastern border of property 7411 SE 36th St. This catch basin outlets to a watercourse that runs across Mercerdale Hillside Park to the east. A man-made ditch located on the west side of 76th Ave SE receives the flow from the watercourse and directs it to the south. The ditch, then, conveys the runoff through a pipe to the other side of 76th Ave SE where a catch basin is located. This catch basin is part of a drainage system that runs under SE 37th Pl towards 77th Ave SE. The analysis is brought to an end at that point as the distance to the project site exceeds a ¼ mile.

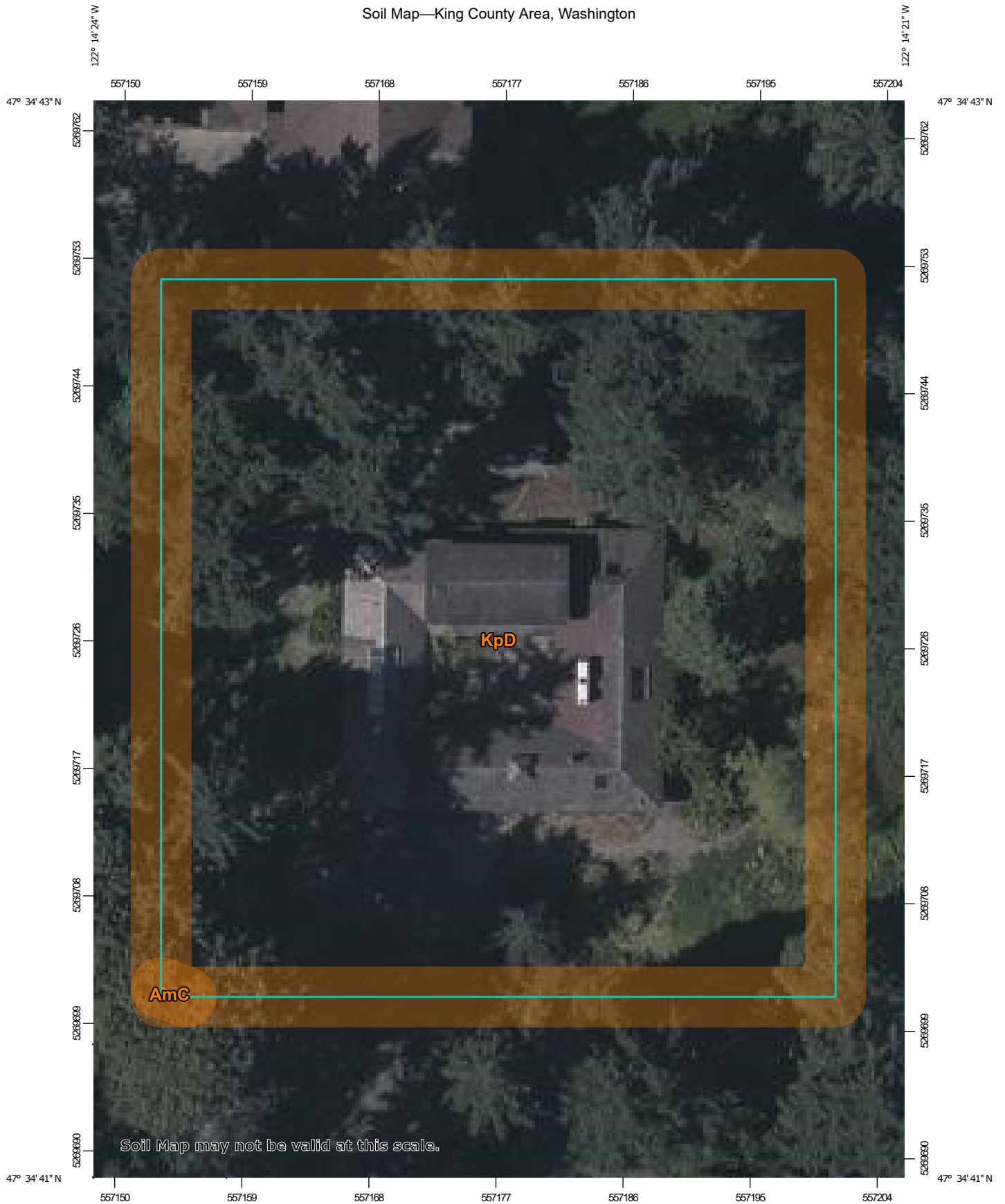
In summary, both flow courses exhibit a stable and well-maintained behavior. No signs of erosion or flooding problems were identified during the field inspection. The ultimate receiving water body for both courses is Lake Washington.

Proposed Conditions

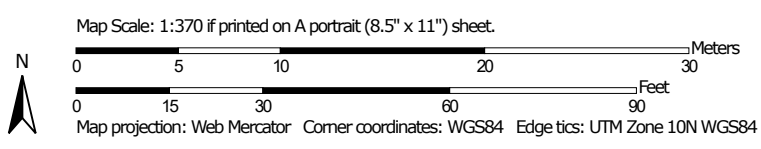
The project intends to collect stormwater runoff from building roof and footings and route it through two catch basins until connecting with the existing drainage system described above as the first flow course.

Nevertheless, the proposed grading of the site will likely follow the existing grade and hence, a part of the yard runoff will sheetflow towards the southeast corner and follow the second flow course as described above in the Existing Conditions.

Soil Map—King County Area, Washington



Soil Map may not be valid at this scale.



MAP LEGEND

Area of Interest (AOI)

 Area of Interest (AOI)

Soils

 Soil Map Unit Polygons

 Soil Map Unit Lines

 Soil Map Unit Points

Special Point Features



Blowout



Borrow Pit



Clay Spot



Closed Depression



Gravel Pit



Gravelly Spot



Landfill



Lava Flow



Marsh or swamp



Mine or Quarry



Miscellaneous Water



Perennial Water



Rock Outcrop



Saline Spot



Sandy Spot



Severely Eroded Spot



Sinkhole



Slide or Slip



Sodic Spot



Spoil Area



Stony Spot



Very Stony Spot



Wet Spot



Other



Special Line Features

Water Features



Streams and Canals

Transportation



Rails



Interstate Highways



US Routes



Major Roads



Local Roads

Background



Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service

Web Soil Survey URL:

Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: King County Area, Washington

Survey Area Data: Version 15, Sep 16, 2019

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

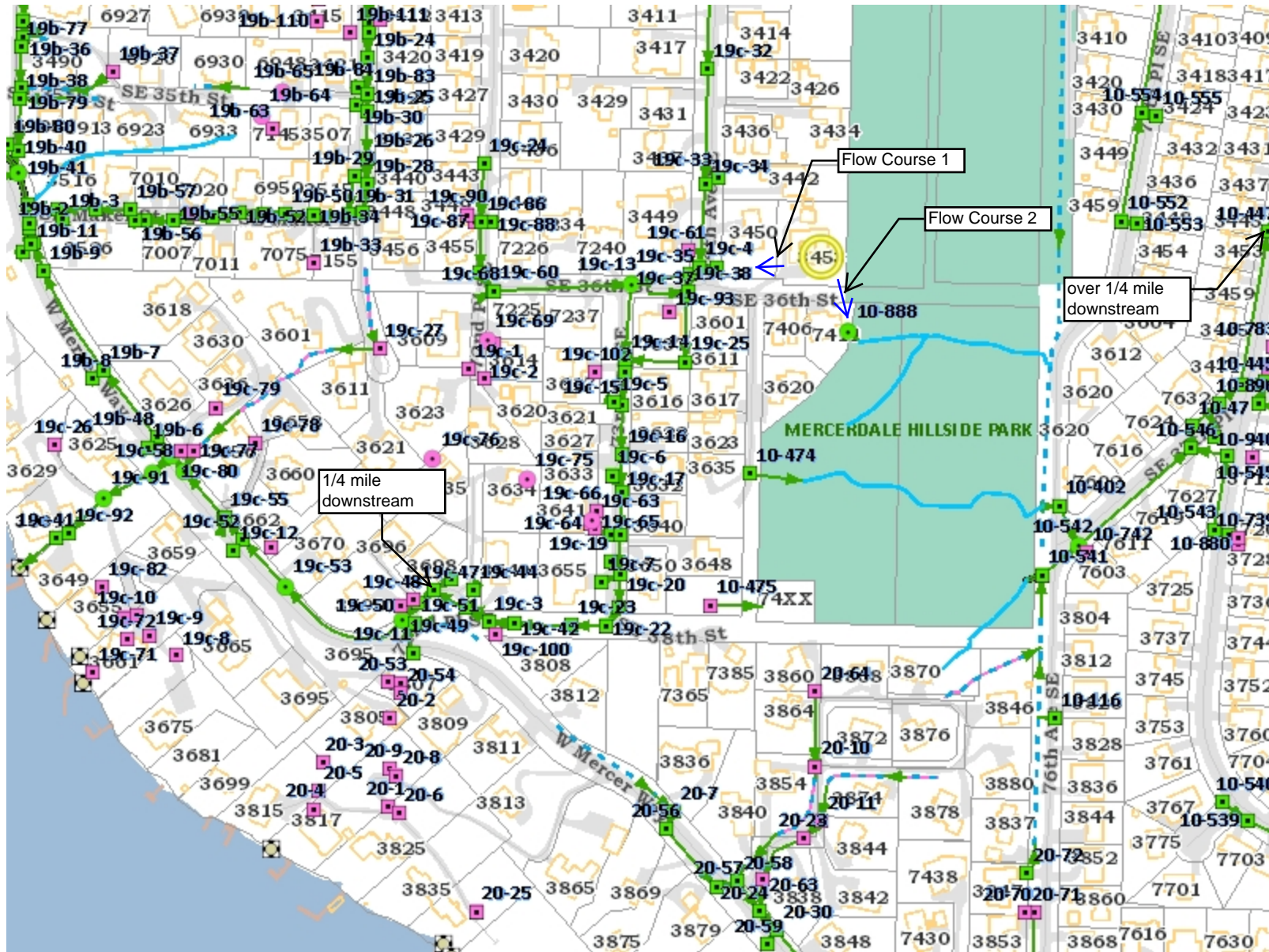
Date(s) aerial images were photographed: Jun 29, 2019—Jul 21, 2019

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

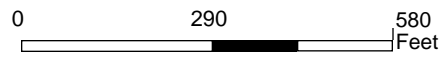
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
AmC	Arents, Alderwood material, 6 to 15 percent slopes	0.0	0.0%
KpD	Kitsap silt loam, 15 to 30 percent slopes	0.6	100.0%
Totals for Area of Interest		0.6	100.0%

20034 Downstream



Legend

- Storm Catch Basin**
 - CB, City Owned (Green square)
 - CB, Private (Pink square)
 - CB, Unknown (Dark green square)
 - Type 2, City Owned (Light green circle)
 - Type 2, Private (Pink circle)
 - Type 2, Unknown (Dark green circle)
- Storm Main**
 - Pipe (Green line with arrows)
 - Open Watercourse (Blue line)
 - Piped Watercourse (Green line)
 - Ditch (Dashed blue line)
 - Culvert (Dashed green line)
 - Other (Red line)
- Storm Main - Private (Pink line)
- Storm Discharge Point (Square with X)
- Address (Black text)
- Building (Orange outline)
- Property Line (Thin grey line)
- Docks (Brown rectangle)
- Freeway (Thick grey line)
- Street (Thin grey line)
- Paved Road (Light grey fill)
- Paved Driveway (Light grey fill)
- Paved Parking Area (Light grey fill)
- Parks (Green fill)
- Lake Washington (Blue fill)



1 inch = 580.352644833333 feet



Disclaimer: These maps were developed by the City of Mercer Island and are intended to be a general purpose digital reference tool. These maps are not an accepted legal instrument for describing, establishing, recording or maintaining descriptions for property concerns or boundaries. The City makes no representation or warranty with respect to the accuracy or currency of these data sets, especially in regard to labeling of surveyed dimensions, or agreement with official sources such as records of survey, or mapped locations of features.

Notes

SECTION 4. FLOW CONTROL AND WATER QUALITY DESIGN

4.1 Existing Site Hydrology

The existing site generally slopes to the east with a portion of the site sloping to the west. Runoff sheetflows over the existing lawn and down the steep slope east of the project site, as well as towards the right-of-way to the west. The existing site is covered in grass with several scattered trees, a single-family residence, and a gravel driveway. The total lot area is equal to 21,618 square feet. The project will leave some area at the north end of the site undisturbed to protect existing trees. In total, the project will disturb 16,221 square feet of land. The following tables in this section show the existing and developed condition areas.

Table 4-1: On-Site Existing Areas			
	Impervious	Pervious	Total
Roof	4,782	0	4,782
Driveway	3,609	0	3,609
Grass	0	7,830	7,830
Total (sf)	8,391	7,830	16,221
Total (ac)	0.19	0.18	0.37

4.2 Developed Site Hydrology & LID Feasibility

The project proposes one single family residence with associated walkways, garage, patios, driveway, utility connections and landscaping. Runoff from the proposed roof and driveway will be conveyed through a series of catch basins and connect to the existing conveyance system located in 74th Avenue SE to the west. Stormwater management BMPs have been evaluated per Minimum Requirement #5 in the following section.

Table 4.2 below shows the breakdown of the proposed impervious and pervious areas for the project. Note that these areas do not include area on site that is left undisturbed.

Table 4-2: On-Site Developed Areas			
	Impervious	Pervious	Total
Roof	4,053	0	4,053
Driveway/sidewalk	5,370	0	5,370
Landscaping	0	6,798	6,798
Total (sf)	9,423	6,798	16,221
Total (ac)	0.22	0.15	0.37

4.3 Detention Facility Sizing

The project proposes greater than 5,000 square feet of impervious surface and is therefore subject to the flow control requirement. The following circumstances require achievement of the standard flow control requirement for western Washington:

- Projects in which the total of effective impervious surfaces is 10,000 square feet or more in a threshold discharge area, or
- Projects that convert ¼ acres or more of vegetation to lawn or landscape, or convert 2.5 acres or more of native vegetation to pasture in a threshold discharge area, and from which there is a surface discharge in a natural or man-made conveyance system from the site, or
- Projects that through a combination of effective hard surfaces and converted vegetation areas cause a 0.10 cubic feet per second increase in the 100-year flow frequency from a threshold discharge area as estimated using the Western Washington Hydrology Model or other approved model and one-hour time steps (or a 0.15 cfs increase using 15-minute time steps).

The project proposes less than the thresholds for the first two bullets as shown in Table 4-2 above. The site is then modeled to show compliance with the threshold shown above using MGS Flood, an approved modeling software. The predeveloped condition is modeled using existing site conditions per Minimum Requirement #7 for the purpose of applying this threshold.

Table 4-3: Peak Discharge Rates

*** Point of Compliance Flow Frequency Data ***			
Recurrence Interval Computed Using Gringorten Plotting Position			
Predevelopment Runoff		Postdevelopment Runoff	
Tr (Years)	Discharge (cfs)	Tr (Years)	Discharge (cfs)
2-Year	5.283E-02	2-Year	6.451E-02
5-Year	6.539E-02	5-Year	8.414E-02
10-Year	7.699E-02	10-Year	0.100
25-Year	9.001E-02	25-Year	0.126
50-Year	0.102	50-Year	0.139
100-Year	0.112	100-Year	0.157
200-Year	0.131	200-Year	0.182
500-Year	0.156	500-Year	0.216

As shown in the results from the model above, the project will not cause a 0.10 cfs increase in the 100-year flow frequency due to the proposed development. Therefore, the project is exempt from the standard flow control requirement.

The City of Mercer Island also provides their own guidance for the on-site detention requirement. The following list is used to determine if on-site detention is required:

Is On-site Detention Required For My Project?

YES, if my project:

- 1) Results in 2,000 square feet, or greater, of new plus replaced hard surface area, or
- 2) Has a land disturbing activity or 7,000 square feet or greater, or
- 3) Results in a *net increase* of impervious surface of 500 square feet or greater.

AND

- 1) All of the on-site stormwater BMPs included on List #1 and List #2 are determined to be infeasible for roofs and/or other hard surfaces, and
- 2) Drainage from the site will be discharged to a storm and surface water system that includes a watercourse or there is a capacity constraint in the system.

NO, if my project:

- 1) Results in less than 2,000 square feet of new plus replaced hard surface area, and
- 2) Has a land disturbing activity less than 7,000 square feet, and
- 3) Results in a *net increase of less than 500 square feet* of impervious surface area.
- 4) The project discharges *directly* to Lake Washington, or findings from a ¼-mile downstream analysis confirm that the downstream system is free of capacity constraints.

Although the project is exempt from the standard flow control requirement, the project cannot implement any LID BMPs from List #2 to satisfy Minimum Requirement #9 and must therefore provide on-site detention consistent with Mercer Island's Engineering Standards. On-site detention will be provided by a tank sized using the city's sizing worksheet attached at the end of the section. From the worksheet, the project proposes between 9,000 and 9,500 square feet of impervious surface correlating to a tank 60" in diameter and 58 feet long. The control structure will have a 0.5-inch diameter orifice at the outlet elevation and a second orifice 3.7 feet from the bottom orifice with a diameter of 1.7 inches. Refer to the engineering plans submitted under separate cover for complete design information. The detention tank sizing worksheet is included at the end of this section.

Pump System

Due to the size of tank required, the project is not able to gravity drain stormwater runoff to the nearest downstream connection point, which is a catch basin located in the ROW in 74th Avenue SE to the west. A pump system is proposed downstream of the detention tank and has been designed for the 25-year discharge flow with a total dynamic head of 1.57 feet. The discharge flow of 0.126 cfs (from Table 4.3 above) is converted 56.6 gallons per minute to select a sufficient pump system.

The project proposes alternating ½-horsepower 2DW submersible dewatering pumps manufactured by Goulds. Refer to the Technical Brochure for the pump system located at the end of this section.

4.4 Water Quality Exemption

The project proposes less than 5,000 square feet of pollution-generating impervious surface; therefore, the project is exempt from providing a water quality treatment facility.

4.5 LID/BMP Sizing

Per List #2 the following BMPs were considered for the site:

Lawn and Landscaped Areas

- Post Construction Soil Quality and Depth in accordance with BMP T5.13 in Chapter 5 of Volume V (2014 DOE).

Response: This BMP will be implemented for all landscaped areas of the proposed project.

Roofs

- Full Dispersion in accordance with BMP T5.30 in Chapter 5 of Volume V of the DOE Manual, or Downspout Full Infiltration Systems in accordance with BMP T5.10A in Section 3.1.1 in Chapter 3 of Volume III (2014 DOE).

Response: The project site cannot support the required flow path; therefore, full dispersion of roof runoff is infeasible for this project. Based on review of the City of Mercer Island LID infiltration feasibility map, the project site is in an area where infiltration BMPs are not permitted.

- Bioretention BMPs that have a minimum horizontally projected surface area below the overflow which is at least 5% of the total surface area draining to it.

Response: The soils on site are not conducive to infiltration applications, therefore this BMP is considered infeasible.

- Downspout Dispersion Systems in accordance with BMP T5.01B in Section 3.1.2 in Chapter 3 of Volume III (2014 DOE).

Response: Downspout dispersion systems are infeasible due to concerns of landslide hazard areas on the project site.

- Perforated Stub-out Connections in accordance with BMP T5.10C: Perforated Stub-out Connections in Section 3.1.3 in Chapter 3 of Volume III (2014 DOE).

Response: Perforated stub-out connections are not proposed due to concerns of landslide hazard areas on the project site.

Other Hard Surfaces

- Full Dispersion in accordance with BMP T5.30 in Chapter 5 Volume V (2014 DOE).

Response: The project site cannot support the required flow path for full dispersion therefore this BMP is infeasible.

- Permeable pavement in accordance with BMP T5.15 in Chapter 5 of Volume V of the DOE Manual.

Response: The soils on site are not conducive to infiltration applications, therefore this BMP is infeasible.

- Bioretention BMPs that have a minimum horizontally projected surface area below the overflow which is at least 5% of the total surface area draining to it.

Response: The soils on site are not conducive to infiltration applications, therefore this BMP is infeasible.

- Sheetflow Dispersion in accordance with BMP T5.12, or Concentrated Flow Dispersion in accordance with BMP T5.11 in Chapter 5 of Volume V (2014 SWMMWW).

Response: Sheetflow Dispersion cannot be implemented on the project site due to site constraints and concerns of landslide hazard areas.

MGS FLOOD PROJECT REPORT

Program Version: MGSFlood 4.52
Program License Number: 200210008
Project Simulation Performed on: 12/10/2020 3:36 PM
Report Generation Date: 12/10/2020 3:36 PM

Input File Name: Foo Property Model.fld
Project Name: Foo Property
Analysis Title:
Comments:

PRECIPITATION INPUT

Computational Time Step (Minutes): 60

Extended Precipitation Time Series Selected
Climatic Region Number: 14

Full Period of Record Available used for Routing
Precipitation Station : 96003605 Puget East 36 in_5min 10/01/1939-10/01/2097
Evaporation Station : 961036 Puget East 36 in MAP
Evaporation Scale Factor : 0.750

HSPF Parameter Region Number: 1
HSPF Parameter Region Name : USGS Default

***** Default HSPF Parameters Used (Not Modified by User) *****

***** WATERSHED DEFINITION *****

Predevelopment/Post Development Tributary Area Summary

	Predeveloped	Post Developed
Total Subbasin Area (acres)	0.370	0.370
Area of Links that Include Precip/Evap (acres)	0.000	0.000
Total (acres)	0.370	0.370

-----SCENARIO: PREDEVELOPED

Number of Subbasins: 1

----- Subbasin : Subbasin 1 -----
-----Area (Acres) -----
Till Forest 0.180
Impervious 0.190

Subbasin Total 0.370

-----SCENARIO: POSTDEVELOPED

Number of Subbasins: 1

----- Subbasin : Subbasin 1 -----	
	-----Area (Acres) -----
Till Grass	0.150
Impervious	0.220

Subbasin Total	0.370

***** LINK DATA *****

-----SCENARIO: PREDEVELOPED

Number of Links: 0

***** LINK DATA *****

-----SCENARIO: POSTDEVELOPED

Number of Links: 1

Link Name: New Copy Lnk1
 Link Type: Copy
 Downstream Link: None

*****FLOOD FREQUENCY AND DURATION STATISTICS*****

-----SCENARIO: PREDEVELOPED

Number of Subbasins: 1

Number of Links: 0

-----SCENARIO: POSTDEVELOPED

Number of Subbasins: 1

Number of Links: 1

*****Groundwater Recharge Summary *****

Recharge is computed as input to PerIpd Groundwater Plus Infiltration in Structures

Total Predeveloped Recharge During Simulation	
Model Element	Recharge Amount (ac-ft)

Subbasin: Subbasin 1	27.643

Total:	27.643

Total Post Developed Recharge During Simulation	
Model Element	Recharge Amount (ac-ft)

****** Flow Duration Performance ******

Excursion at Predeveloped 50%Q2 (Must be Less Than or Equal to 0%):	70.8%	FAIL
Maximum Excursion from 50%Q2 to Q2 (Must be Less Than or Equal to 0%):	134.0%	FAIL
Maximum Excursion from Q2 to Q50 (Must be less than 10%):	99999.0%	FAIL
Percent Excursion from Q2 to Q50 (Must be less than 50%):	100.0%	FAIL

FLOW DURATION DESIGN CRITERIA: FAIL

****** LID Duration Performance ******

Excursion at Predeveloped 8%Q2 (Must be Less Than 0%):	23.0%	FAIL
Maximum Excursion from 8%Q2 to 50%Q2 (Must be Less Than 0%):	70.8%	FAIL

LID DURATION DESIGN CRITERIA: FAIL

CITY OF MERCER ISLAND

DEVELOPMENT SERVICES GROUP

9611 SE 36TH STREET | MERCER ISLAND, WA 98040

PHONE: 206.275.7605 | www.mercergov.org

Inspection Requests: Online: www.MyBuildingPermits.com VM: 206.275.7730



ON-SITE DETENTION DESIGN REQUIREMENTS

General Requirements

This guidance applies only to projects that meet the thresholds specified below in “Is On-site Detention Required for My Project?” if all of the on-site stormwater BMPs included on List #1 and List #2 are determined to be infeasible for roofs and/or other hard surfaces.

Is On-site Detention Required For My Project?

YES, if my project:

- 1) Results in 2,000 square feet, or greater, of new plus replaced hard surface area, or
- 2) Has a land disturbing activity or 7,000 square feet or greater, or
- 3) Results in a **net increase** of impervious surface of 500 square feet or greater.

AND

- 1) All of the on-site stormwater BMPs included on List #1 and List #2 are determined to be infeasible for roofs and/or other hard surfaces, and
- 2) Drainage from the site will be discharged to a storm and surface water system that includes a watercourse or there is a capacity constraint in the system.

NO, if my project:

- 1) Results in less than 2,000 square feet of new plus replaced hard surface area, and
- 2) Has a land disturbing activity less than 7,000 square feet, and
- 3) Results in a **net increase of less than 500 square feet** of impervious surface area.
- 4) The project discharges **directly** to Lake Washington, or findings from a ¼-mile downstream analysis confirm that the downstream system is free of capacity constraints.

Designing Your On-Site Detention System

All on-site detention system designs must be prepared by a professional engineer registered in the State of Washington. The Standard On-site Detention System worksheet (Attachment 1) must be submitted on 18" x 24" (minimum) size sheets.

Construction that results in 500 to 9,500 square feet of new plus replaced impervious surfaces:

Size system according to Table 1. The configuration of the on-site detention system shall be as shown on Attachment 1 (Standard On-Site Detention Systems Worksheet) or as specifically designed by the engineer for the site.

Note:

- The applicant may pay a fee-in-lieu-of constructing an on-site detention system when allowed by the City Engineer. The fee will not be an option when in the opinion of the City Engineer, undetained runoff from the development may adversely exacerbate an existing problem (MICC 15.11) or if flow control is required by Minimum Requirement #7.
- **Construction that results in more than 9,500 square feet of new plus replaced impervious surfaces and/or exceeds a 100-year flow frequency of 0.15 cubic feet per second (for moderate and steep sloped sites greater than a 5% slope):** Size system according to Minimum Requirement #7 (Flow Control) in the Stormwater Management Manual for Western Washington (Ecology 2014).

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

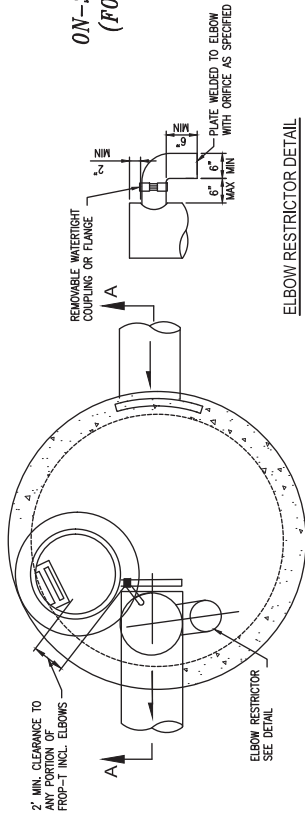
Predeveloped = second growth forest (CN = 72 for Type B soils, CN = 81 for Type C soils)

Developed = impervious (CN = 98)

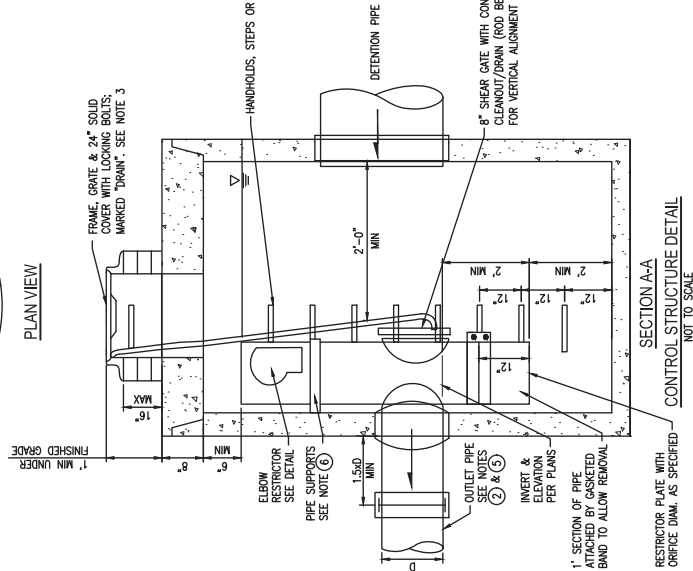
0.5 foot of sediment storage in detention pipe

Overland slope = 5%

**ATTACHMENT 1
CITY OF MERCER ISLAND
ON-SITE DETENTION SYSTEM WORKSHEET
(FOR NEW PLUS REPLACED IMPERVIOUS
AREA OF 9,500 SF OR LESS)**

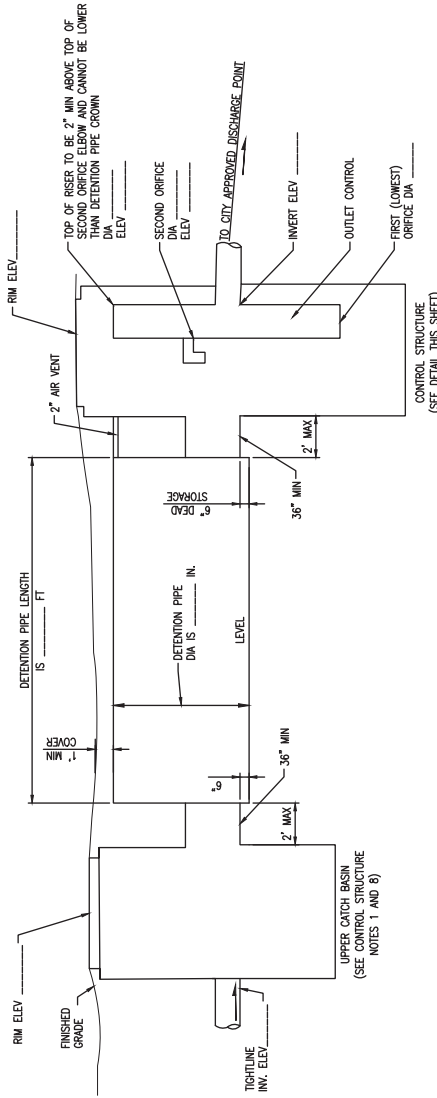


ELBOW RESTRICTOR DETAIL



**SECTION A-A
CONTROL STRUCTURE DETAIL
NOT TO SCALE**

OWNER: _____ ADDRESS: _____ PREPARED BY: _____
 PERMIT #: _____ PHONE: _____
 DATE: _____
 NEW PLUS REPLACED IMPERVIOUS SURFACE AREA (SF): _____ DETENTION PIPE LENGTH (FT): _____ ORIFICE #1 DIA _____ INCH, ELEV _____
 SOIL TYPE: _____ PIPE MATERIAL: _____ DETENTION PIPE DIA (INCH): _____ ORIFICE #2 DIA _____ INCH, ELEV _____



**ON-SITE DETENTION SYSTEM
NOT TO SCALE (ENGINEER TO FILL IN BLANKS)**

CONTROL STRUCTURE NOTES:

- 1 USE A MINIMUM OF A 54 IN. DIA. 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. CLEAR-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. DIAMETER STEEL EXPANSION BOLTS OR EMBEDDED SUPPORTS 2 IN. INTO CATCH BASIN WALL (MINIMUM 3'-0" VERTICAL SPACING).
- 7 THE SHEAR GATE SHALL BE MADE OF ALUMINUM ALLOY IN ACCORDANCE WITH ASTM B 26M AND ASTM B 275. THE LIFT HANDLE SHALL BE MADE OF A SIMILAR METAL TO THE GATE (TO PREVENT GALVANIC CORROSION). 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 LD 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.

ON-SITE DETENTION SYSTEM NOTES:

1. CALL DEVELOPMENT SERVICES (206-275-7669) 24 HOURS IN ADVANCE FOR A DETENTION SYSTEM INSPECTION BEFORE BACKFILLING AND FOR FINAL INSPECTIONS.
2. RESPONSIBILITY FOR OPERATION AND MAINTENANCE OF DRAINAGE SYSTEMS ON PRIVATE PROPERTY IS RESPONSIBILITY OF THE PROPERTY OWNER. MATERIAL ACCUMULATED IN THE DETENTION SYSTEM SHALL BE REMOVED BY THE PROPERTY OWNER AT HIS/HER OWN RISK. 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 3.05 OF THE WSDOT STANDARD SPECIFICATION FOR ROAD, BRIDGE, AND MUNICIPAL STRUCTURES. ALLOWED PIPE MATERIALS ARE: GALVANIZED TYPE 2 CORRUGATED STEEL PIPE AND CORRUGATED POLYETHYLENE PIPE (CPEP), ALUMINIZED TYPE 2 CORRUGATED STEEL PIPE AND PIPE WHICH MEETS AASHTO DESIGNATIONS M274 AND M35. CORRUGATED OR SPIRAL PIPE ALUMINUM PIPE, OR REINFORCED CONCRETE PIPE. CORRUGATED STEEL PIPE IS NOT ALLOWED.
4. FOOTING DRAINS SHALL NOT BE CONNECTED TO THE DETENTION SYSTEM.



FEATURES

- Impeller:** Polyurethane for wear and corrosion resistance.
- Adjustable Discharge:** Discharge can be installed for either vertical or horizontal installation using only 2 screws.
- Diffuser:** Polyurethane for wear and corrosion resistance.
- Mechanical Seal:** Dual seals for double leakage protection, outer seal - silicon carbide.
- Rubber Liner:** Protects against wear around impeller.
- Bottom Strainer:** Made of impact absorbing EPDM rubber, suction holes allow for low pump down.

2DW

SUBMERSIBLE DEWATERING PUMP



APPLICATIONS

Specifically designed to remove water from:

- Drainage ditches
- Trenches
- Basements
- Manholes
- Excavating drainage in the building trades

SPECIFICATIONS

Pump:

- Discharge size: 2" NPSM threaded hose coupling design, can be rotated
- Capacities: up to 84 GPM
- Total heads: up to 51 feet
- Maximum solids: any particles passing through strainer
- Mechanical seals: outer seal - silicon carbide, inner seal - carbon ceramic

- Temperature limit: 95°F (35° C) maximum
- Depth of immersion: 16.5 feet (5m) maximum

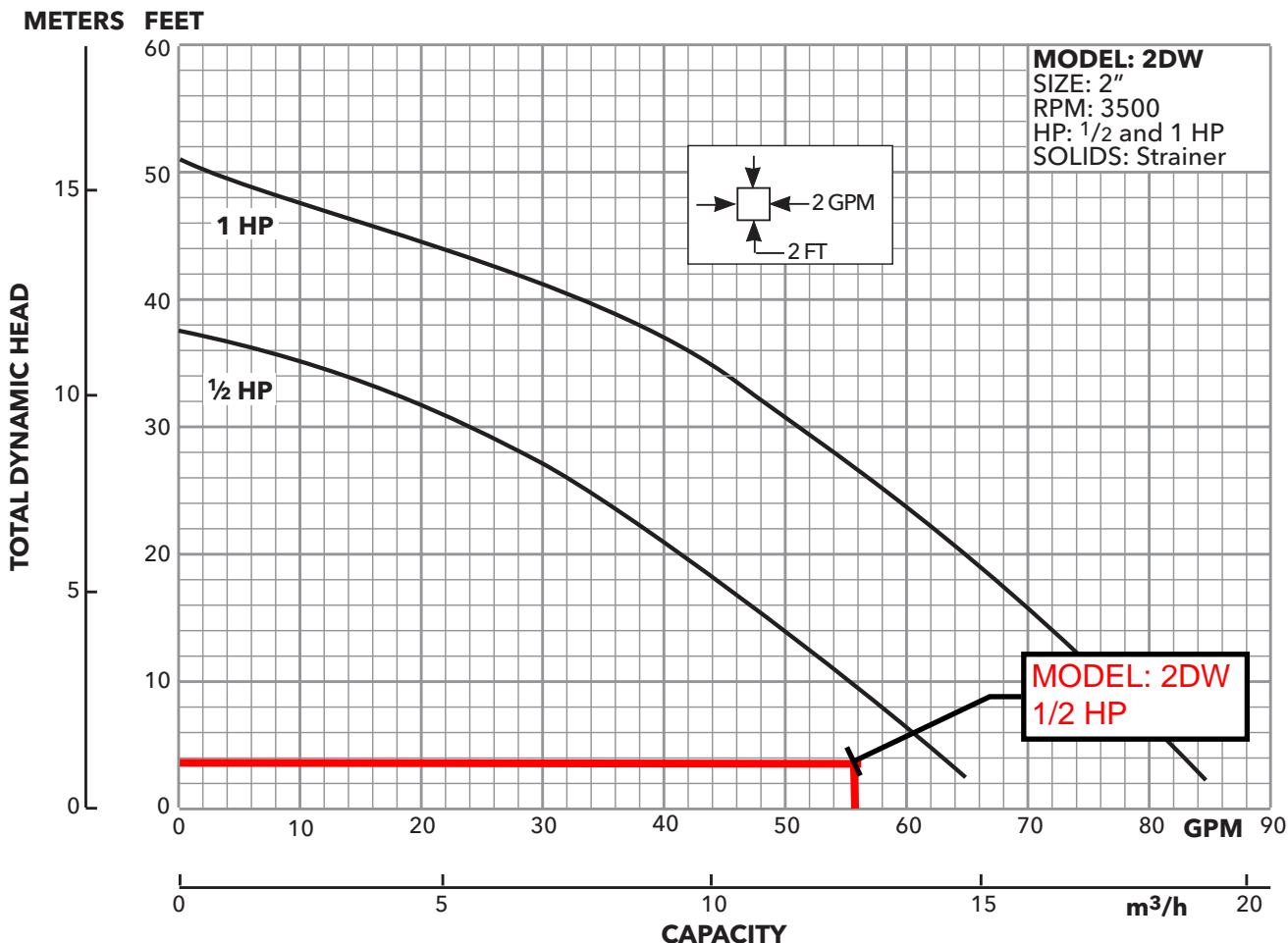
Motor:

- Single phase: 3500 RPM, 1/2 HP and 1 HP, 115 and 230 V, 60 Hz
- Built-in starter with full overload and temperature protection.
- Class F insulation.
- Air filled design.
- Upper and lower heavy duty ball bearing construction.
- Power cord: 50 feet.

AGENCY LISTINGS



Tested to UL778 and CSA 22.2 108 standards by Canadian Standards Association.
NRTL File #LR13533



REPLACEMENT KITS

Each kit contains the following parts:

Impeller Kit (15K97 for ½ HP, 15K98 for 1 HP) - Impeller, impeller screw, protective plug, washer, assembly instruction

Diffuser Kit (15K99 for both ½ HP and 1 HP) - Diffuser, barrel nuts, screws, washers, assembly instruction, sticker

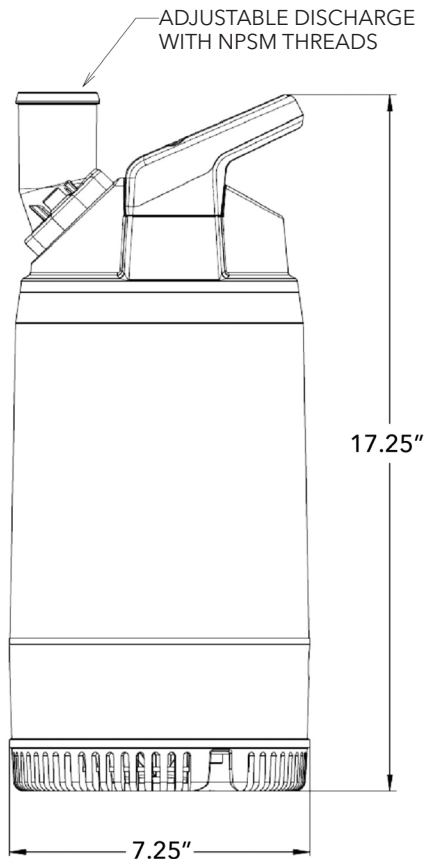
Outer seal Kit (15K14 for both ½ HP and 1 HP) - Mechanical face-seal unit, assembly instruction, sticker

O-ring Kit (15K100 for both ½ HP and 1 HP) - All o-rings

MODEL INFORMATION

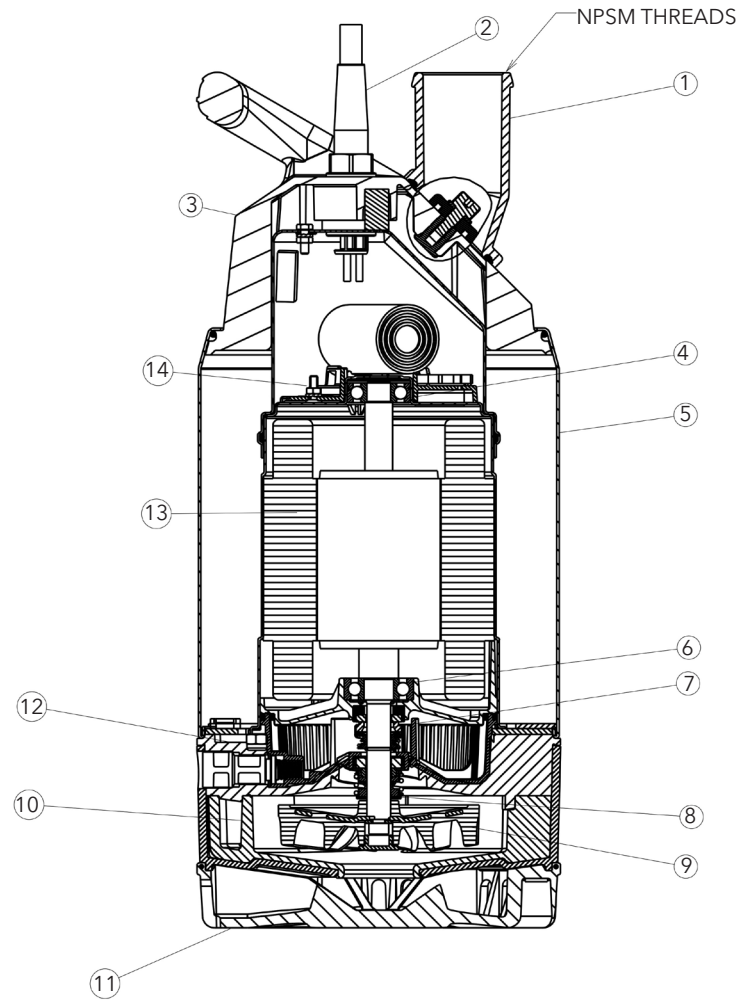
Order No.	HP	Volts	Phase	Maximum Amp	RPM	Height (in.)	Weight (lbs.)
2DW0511	½	115	1	5.5	3500	17.25	26
2DW0512		230		2.9			
2DW1011	1	115		9.8			
2DW1012		230		4.9			32

DIMENSIONS



COMPONENTS

Item No.	Description	
1	Discharge	Not Available
2	Power cord	Not Available
3	Handle/cover	Not Available
4	Support bearing	Not Available
5	Pump casing	Not Available
6	Main bearing	Not Available
7	Inner mechanical seal	Not Available
8	Outer mechanical seal	Available
9	Impeller	Available
10	Suction cover/diffuser	Available
11	Strainer	Not Available
12	Oil plug	Not Available
13, 14	Motor	Not Available



xylem
Let's Solve Water

Xylem Inc.
2881 East Bayard Street Ext., Suite A
Seneca Falls, NY 13148
Phone: (866) 325-4210
Fax: (888) 322-5877
www.gouldswatertechnology.com

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SECTION 5. CONVEYANCE SYSTEM ANALYSIS AND DESIGN

A conveyance system will be constructed as part of the project to discharge stormwater runoff from the site to the downstream connection point. Manning's equation is used to determine the size of the conveyance pipes.

Using Manning's equation:

$$Q = \frac{k}{n} A R_h^{2/3} S_0^{1/2}$$

Where:

Q = Flowrate (cfs)

V = Velocity (ft/s)

k = 1.49 (BG units)

n = Manning's Coefficient (0.012)

R_h = Hydraulic Radius

A = Flow Area (sf)

S₀ = Longitudinal Slope (ft/ft)

Using Manning's equation, an 8" pipe at a minimum slope of 0.5% can convey a flowrate of 4.31 cfs. The 100-year flowrate for the developed site is 0.157 cfs, therefore the pipe is sized sufficiently.

SECTION 6. SPECIAL REPORTS AND STUDIES

The following reports and assessments are provided for reference, under separate cover and for informational purposes only. Core Design takes no responsibility or liability for these reports, assessments or designs as they were not completed under the direct supervision of Core Design.

- Geotechnical Engineering Report (Provided under separate cover)
 - Prepared for: Jimmy (InnHsuan) and Shannon Foo
 - Prepared by: Yi-Hsun William Chao, P.E.
 - Dated: April 9, 2020
 - PanGEO Incorporated
 - 3213 Eastlake Avenue East, Suite B
 - Seattle, WA 98102

SECTION 7. OTHER PERMITS

There are no other permits required at this time.

SECTION 8. CSWPPP ANALYSIS AND DESIGN

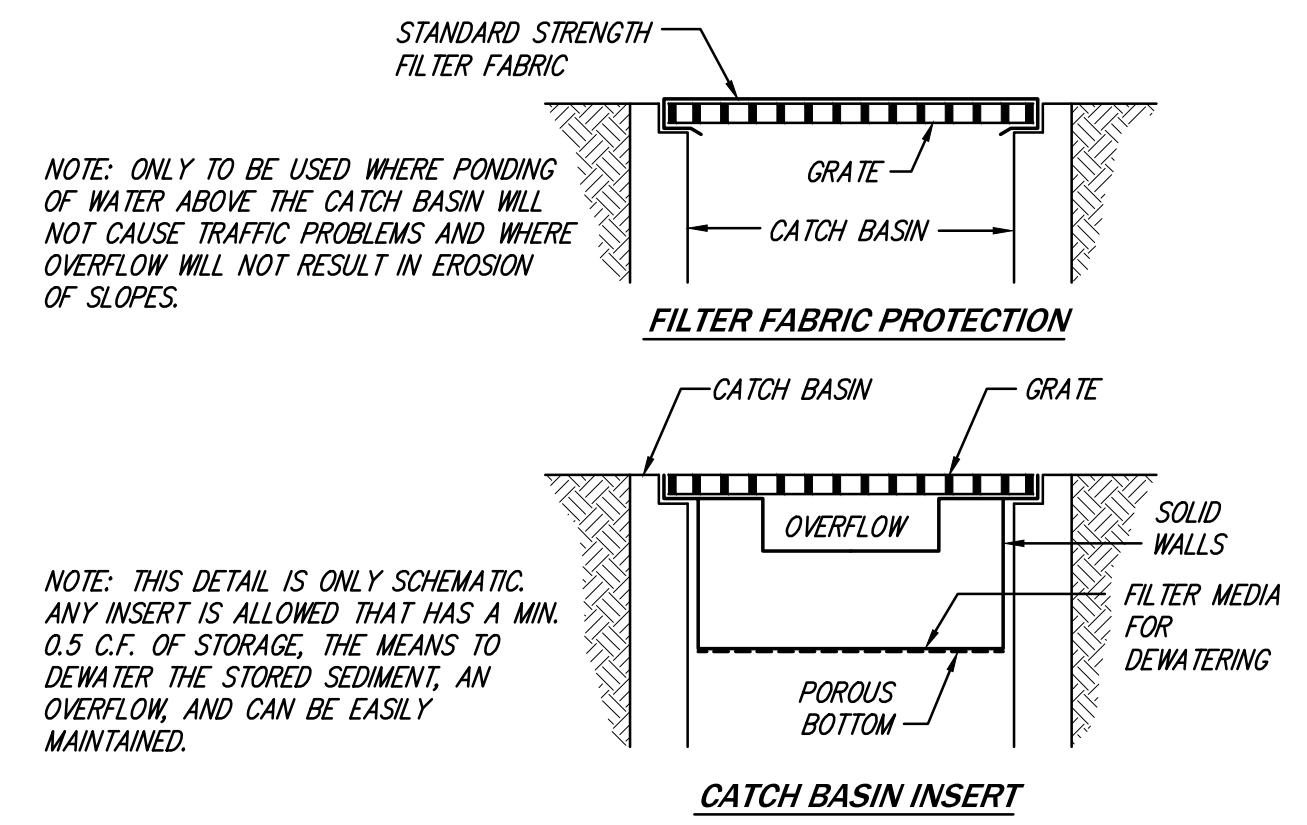
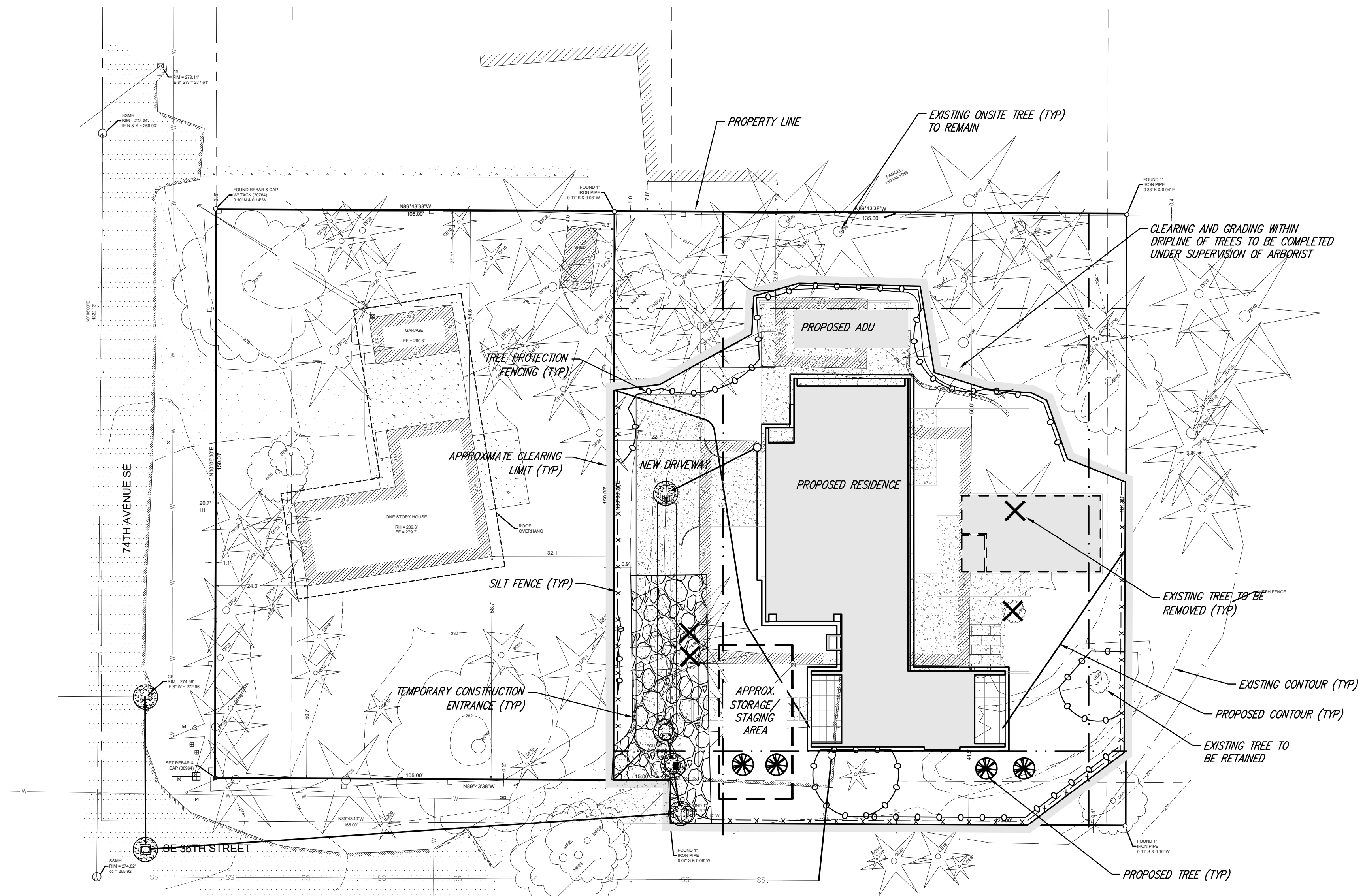
A TESC plan has been prepared and submitted with the civil plans.

The site will utilize Volume II of the 2014 SMMWW for the erosion and sedimentation control design to reduce the discharge of sediment-laden runoff from the site. Clearing limits will be established prior to any earthwork on the project site. Perimeter protection will be provided by silt fencing along the downstream perimeter of the disturbed areas to limit the downstream transport of sediment to streams, wetlands and neighboring properties.

Dust control, if required, will be provided by a water truck. A Certified Erosion and Sediment Control Lead inspector will be present onsite during earthwork activities. The inspector shall determine frequency of watering of the project site and will authorize and direct any additional erosion and sediment control measures as needed during all construction activities.

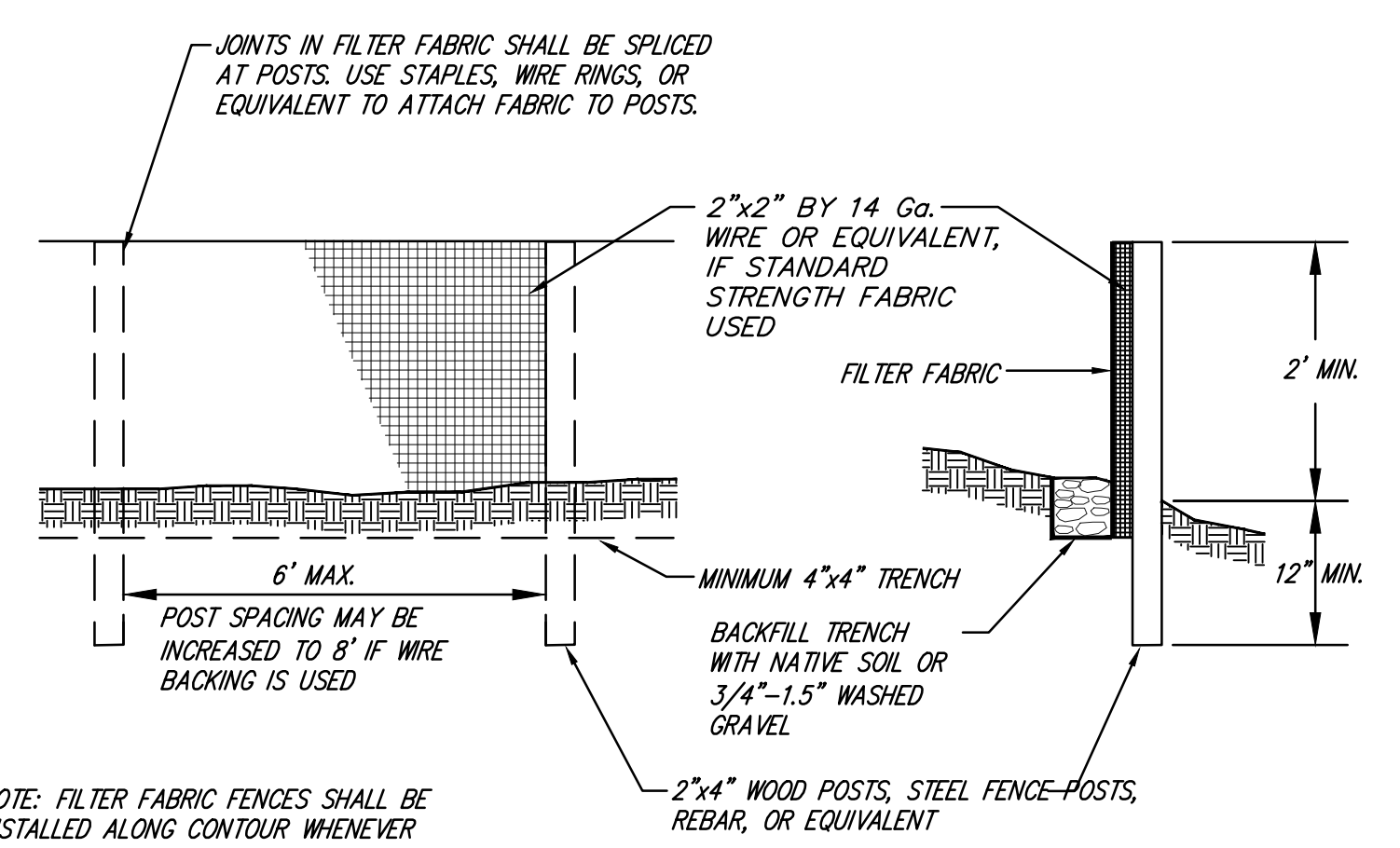
The erosion control plan will be comprised of temporary measures (stabilized construction entrance, silt fence, etc.) as well as permanent measures (hydroseeding, etc.). In general, construction activities will be sequenced such that the site disturbance is minimized at all times. Runoff from the site will sheetflow across cleared areas and disperse into vegetated, gently sloped areas.

Please refer to the Temporary Erosion and Sediment Control Plan (TESC Plan) that has been prepared for this project, included on the following page as Figure 8-1: TESC Plan.



FILTER FABRIC PROTECTION FOR CB'S

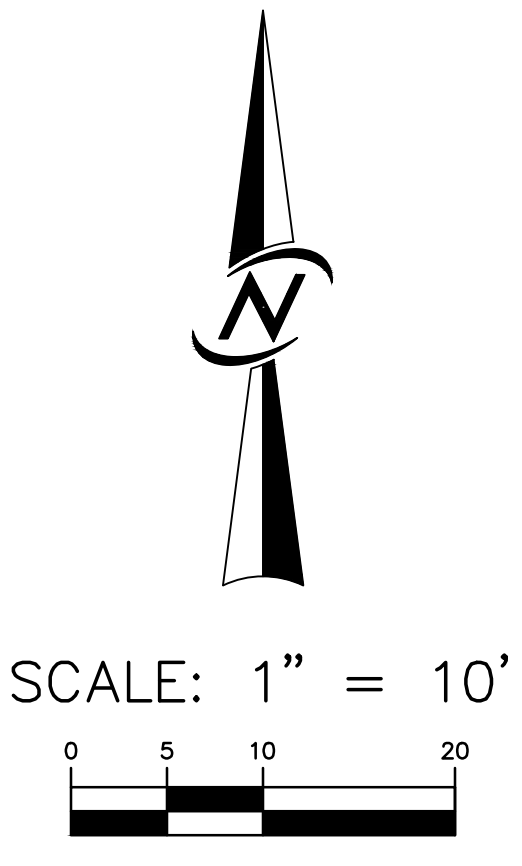
NO SCALE



NOTE: FILTER FABRIC FENCES SHALL BE INSTALLED ALONG CONTOUR WHENEVER POSSIBLE

FILTER FABRIC FENCE DETAIL

NO SCALE



LEGEND

- SEE SHEET C2.31 FOR DETAILS, NOTES AND CONSTRUCTION SEQUENCE.
- INLET FILTER (M.S.D.O.T. STD. DTL. 1-40.20-00)
 - FILTER FABRIC FENCE
 - CONSTRUCTION ACCESS
 - CLEARING LIMITS
 - EXISTING CONTOUR
 - PROPOSED CONTOUR
 - EX TREE TO BE REMOVED

UNDERGROUND LOCATOR SERVICE
CALL BEFORE YOU DIG!
811

PERMIT #XXXX-XXX

DATE	SEE STAMP DATE
DESIGNED	FLAVIO R. BAINOTTI
DRAWN	MARY MOORE
APPROVED	MICHAEL A. WOODY, PE
PROJECT MANAGER	JOSHUA BEARD

DATE: 12-10-20

NO.:

REVISIONS:

TESC PLAN
3453 74TH AVE SE
JIMMY & SHANNON FOO
2820 29TH AVE W
SEATTLE, WA 98199

CIVIL ENGINEERING
LANDSCAPE ARCHITECTURE
PLANNING
SURVEYING
DESIGN

CORE

12100 NE 195th St, Suite 300, Bothell, Washington 98011 425.885.7877

SHEET	OF
C2.01	5

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SECTION 9. BOND QUANTITIES, FACILITY SUMMARIES, AND DECLARATION OF COVENANT

9.1 Bond Quantities

This will be provided by final engineering approval if necessary.

9.2 Facility Summaries

Not applicable.

9.3 Declaration of Covenant

Not applicable.

SECTION 10. OPERATIONS AND MAINTENANCE

The operations and maintenance information has been provided on the following pages. It is a copy of the pertinent material out of Volume V of the 2014 SMMWW.

**Table V-4.5.2(3) Maintenance Standards - Closed Detention Systems
(Tanks/Vaults)**

Maintenance Component	Defect	Conditions When Maintenance is Needed	Results Expected When Maintenance is Performed
Storage Area	Plugged Air Vents	One-half of the cross section of a vent is blocked at any point or the vent is damaged.	Vents open and functioning.
	Debris and Sediment	Accumulated sediment depth exceeds 10% of the diameter of the storage area for 1/2 length of storage vault or any point depth exceeds 15% of diameter. (Example: 72-inch storage tank would require cleaning when sediment reaches depth of 7 inches for more than 1/2 length of tank.)	All sediment and debris removed from storage area.
	Joints Between Tank/Pipe Section	Any openings or voids allowing material to be transported into facility. (Will require engineering analysis to determine structural stability).	All joint between tank/pipe sections are sealed.
	Tank Pipe Bent Out of Shape	Any part of tank/pipe is bent out of shape more than 10% of its design shape. (Review required by engineer to determine structural stability).	Tank/pipe repaired or replaced to design.
	Vault Structure Includes Cracks in Wall, Bottom, Damage to Frame and/or Top Slab	Cracks wider than 1/2-inch and any evidence of soil particles entering the structure through the cracks, or maintenance/inspection personnel determines that the vault is not structurally sound. Cracks wider than 1/2-inch at the joint of any inlet/outlet pipe or any evidence of soil particles entering the vault through the walls.	Vault replaced or repaired to design specifications and is structurally sound. No cracks more than 1/4-inch wide at the joint of the inlet/outlet pipe.
Manhole	Cover Not in Place	Cover is missing or only partially in place. Any open manhole requires maintenance.	Manhole is closed.

**Table V-4.5.2(3) Maintenance Standards - Closed Detention Systems
(Tanks/Vaults) (continued)**

Maintenance Component	Defect	Conditions When Maintenance is Needed	Results Expected When Maintenance is Performed
	Locking Mechanism Not Working	Mechanism cannot be opened by one maintenance person with proper tools. Bolts into frame have less than 1/2 inch of thread (may not apply to self-locking lids).	Mechanism opens with proper tools.
	Cover Difficult to Remove	One maintenance person cannot remove lid after applying normal lifting pressure. Intent is to keep cover from sealing off access to maintenance.	Cover can be removed and reinstalled by one maintenance person.
	Ladder Rungs Unsafe	Ladder is unsafe due to missing rungs, misalignment, not securely attached to structure wall, rust, or cracks.	Ladder meets design standards. Allows maintenance person safe access.
Catch Basins	See "Catch Basins" (No. 5)	See "Catch Basins" (No. 5).	See "Catch Basins" (No. 5).

Table V-4.5.2(4) Maintenance Standards - Control Structure/Flow Restrictor

Maintenance Component	Defect	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
General	Trash and Debris (Includes Sediment)	Material exceeds 25% of sump depth or 1 foot below orifice plate.	Control structure orifice is not blocked. All trash and debris removed.
	Structural Damage	Structure is not securely attached to manhole wall. Structure is not in upright position (allow up to 10% from plumb). Connections to outlet pipe	Structure securely attached to wall and outlet pipe. Structure in correct position. Connections to outlet pipe are water tight; structure repaired or replaced and works as

Table V-4.5.2(4) Maintenance Standards - Control Structure/Flow Restrictor (continued)

Maintenance Component	Defect	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
		are not watertight and show signs of rust. Any holes - other than designed holes - in the structure.	designed. Structure has no holes other than designed holes.
Cleanout Gate	Damaged or Missing	Cleanout gate is not watertight or is missing. Gate cannot be moved up and down by one maintenance person. Chain/rod leading to gate is missing or damaged. Gate is rusted over 50% of its surface area.	Gate is watertight and works as designed. Gate moves up and down easily and is watertight. Chain is in place and works as designed. Gate is repaired or replaced to meet design standards.
Orifice Plate	Damaged or Missing	Control device is not working properly due to missing, out of place, or bent orifice plate.	Plate is in place and works as designed.
	Obstructions	Any trash, debris, sediment, or vegetation blocking the plate.	Plate is free of all obstructions and works as designed.
Overflow Pipe	Obstructions	Any trash or debris blocking (or having the potential of blocking) the overflow pipe.	Pipe is free of all obstructions and works as designed.
Manhole	See "Closed Detention Systems" (No. 3).	See "Closed Detention Systems" (No. 3).	See "Closed Detention Systems" (No. 3).
Catch Basin	See "Catch Basins" (No. 5).	See "Catch Basins" (No. 5).	See "Catch Basins" (No. 5).

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

Maintenance Component	Defect	Conditions When Maintenance is Needed	Results Expected When Maintenance is performed
General	Trash & 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).	Top slab is free of holes and cracks. Frame is sit-

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

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
	Working	frame have less than 1/2 inch of thread.	proper tools.
	Cover Difficult to Remove	One maintenance person cannot remove lid after applying normal lifting pressure. (Intent is keep cover from sealing off access to maintenance.)	Cover can be removed by one maintenance person.
Ladder	Ladder Rungs Unsafe	Ladder is unsafe due to missing rungs, not securely attached to basin wall, misalignment, rust, cracks, or sharp edges.	Ladder meets design standards and allows maintenance person safe access.
Metal Grates (If Applicable)	Grate opening Unsafe	Grate with opening wider than 7/8 inch.	Grate opening meets design standards.
	Trash and Debris	Trash and debris that is blocking more than 20% of grate surface inletting capacity.	Grate free of trash and debris.
	Damaged or Missing.	Grate missing or broken member(s) of the grate.	Grate is in place and meets design standards.

Table V-4.5.2(6) Maintenance Standards - Debris Barriers (e.g., Trash Racks)

Maintenance Components	Defect	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
General	Trash and Debris	Trash or debris that is plugging more than 20% of the openings in the barrier.	Barrier cleared to design flow capacity.
Metal	Damaged/ Missing	Bars are bent out of shape more than 3 inches.	Bars in place with no bends more than 3/4

Table V-4.5.2(17) Maintenance Standards - Coalescing Plate Oil/Water Separators (continued)

Maintenance Component	Defect	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
		Cracks wider than 1/2-inch at the joint of any inlet/outlet pipe or evidence of soil particles entering through the cracks.	inlet/outlet pipe.
	Access Ladder Damaged	Ladder is corroded or deteriorated, not functioning properly, not securely attached to structure wall, missing rungs, cracks, and misaligned.	Ladder replaced or repaired and meets specifications, and is safe to use as determined by inspection personnel.

Table V-4.5.2(18) Maintenance Standards - Catch Basin Inserts

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