LONE PINE MEDICAL FACILITY

Chehalis, WA

Final Drainage and Erosion Control Report

Fuller Designs Project No. 2119

July 12, 2021

Prepared by:

1101 Kresky Ave, Centralia, WA 98531

360.807.4420

FINAL DRAINAGE AND EROSION CONTROL REPORT

LONE PINE MEDICAL FACILITY

51 SW 13th Street
Chehalis, WA 98532

Project Information

Prepared for: Lone Pine Medical Facility
Contact: Floyd & Elisabeth Smith
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Chehalis, WA 98532
(360) 200-2139

Reviewing Agency

Jurisdiction: City of Chehalis
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References

2019 Stormwater Management Manual for Western Washington (SWMMWW)

Project Engineer

Prepared by: Fuller Designs, Inc.
1101 Kresky Ave
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(360) 807-4420

Contact: Aaron Fuller, PE

"*I hereby certify that this Final Drainage and Erosion Control Report for the Lone Pine Medical Facility Project has been prepared by me or under my supervision and meets minimum standards of City of Chehalis and normal standards of engineering practice. I hereby acknowledge and agree that the jurisdiction does not and will not assume liability for the sufficiency, suitability, or performance of drainage facilities designed by me.*"

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FINAL DRAINAGE AND EROSION CONTROL REPORT

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SECTION 1 – PROPOSED PROJECT DESCRIPTION

Site Address:	51 SW 13th Street, ChehalisWA 98532
Parcel Number(s):	005411-006-000, 005411-005-001, and 005411-002-000
Total Site Area:	0.62 Acres
Zoning:	CO – Commercial Office/Mixed Use
Sec, Twn, Rge:	Section 32, Township 14N, Range 2W, W.M.

Proposed Improvements:
The site, located in Chehalis, Washington, will consist of a new 5200 square foot building for a Medical Center, associated parking, landscaping, utility connections and frontage improvements.

Stormwater runoff from the proposed impervious areas will be collected on-site. The runoff will be appropriately treated and detained prior to discharge to the existing storm system in 13th street.
The lot will be served by:

City of Chehalis	Water
City of Chehalis	Sewer
Lewis County PUD	Electricity
CenturyLink & Comcast	Telecommunications
Lemay	Refuse & Recycling

The project utilities and improvements will be built in one phase. The proposed construction schedule would start in the Fall of 2021 and be complete by the Spring of 2022.

SECTION 2 – EXISTING CONDITIONS DESCRIPTION

The approximately 0.62-acre Project consists of three parcels, 005411-006-000, 005411-005-001, and 005411-002-000. Subject site has approximately 3% slope. All 3 parcels contain existing vegetation consistent with residential lawn. A singular large pine tree is located on parcel 005411006000 . The adjacent properties include a single-family residential home to the southwest. Behind the site is a 16' Alley. Northwest of the adjacent property is a commercial lot with 13th Street Market/Texaco Gas Station.

Soils in the area are mapped as Lacamas Silt Loam and listed as hydrological soil group C/D. However, a soil survey and texture analysis of the site indicated this area comprises of a coarse, well graded sand-like soil than what has previously been mapped. A sieve test concluded the soil is well-graded sand with approximately 10.8 fines.

The soil survey consisted of 2 test pits dug on the project site. The soil horizon was consistent with a final dig depth of 10-feet below the current grade. Pockets of blocky

cemented sand with fines were observed throughout the test pits (see pictures in section 4). There was no active water present however the soil was moist at both test pits bottom. The long term infiltration rate was estimated through the grain size analysis method to be 1.06 inches per hour(see sieve analysis in section 7).

SECTION 3 – OFF-SITE ANALYSIS REPORTS

The areas immediately adjacent to the proposed project properties are:

- Northwest – 16' Alley
- Southeast – 13th Street
- Northeast –Commercial Parcel
- Southwest – Residential Single-Family Home

The area immediately adjacent to the proposed property being developed is comprised of City street on the southeastern side of the project site. Commercial businesses are located on the northeastern side. And single family and multi-family residential housing is located to the northwest and southwest sides of the property, separated by an alley on the northwestern property line. The site does receive a small amount of offsite runoff from approximately 120-foot-long by 80-foot-wide vegetated fill slope generated by the adjacent commercial property fill slopes to the northeast. This runoff will be picked up and directed to the existing City storm system located at the southeast end of the property.

The proposed project plans to maintain the natural drainage paths by releasing stormwater to the existing city drainage system in the southwest of the project site as it currently does. This area has not been flagged as a possible stormwater problem area.

A downstream analysis shows mitigated runoff discharging to a city catchbasin in 13th street right of way. This city system then pipes runoff to the southwest where it eventually crosses 13th street and discharges to the wetland adjacent to the Greenhill Detention Center more than ¼ mile from the project site.

SECTION 4 – APPLICABLE MINIMUM REQUIREMENTS

The minimum requirements for stormwater development and redevelopment sites are listed in Volume I Chapter 3 of the 2019 Washington State Department of Ecology (WSDOE) Stormwater Management Manual for Western Washington (SWMMWW). Not all the minimum requirements of this section apply to all projects. The determination of applicable minimum requirements is based on Section 3.3 of the WSDOE SWMMWW.

Based on the thresholds given in Figures 3.1 and 3.2 of the WSDOE SWMMWW, the proposed Project is a redevelopment that will create more than 5000 square feet of new impervious surface and, therefore, must address all minimum requirements. These requirements, as they apply to the Project, are discussed in more detail below.

Minimum Requirement #1 – Preparation of Drainage Control Plans

A Stormwater Site Plan has been prepared (see Erosion Control and Drainage Plans).

Minimum Requirement #2 – Construction Stormwater Pollution Prevention Plan

A Construction Stormwater Pollution Prevention Plan (SWPPP) has been prepared (see Section 6).

Minimum Requirement #3 – Source Control of Pollution

All known, available, and reasonable source control BMPs shall be applied to the Project to limit pollutants from encountering stormwater. Project-specific construction BMPs will be provided during construction (see Section 6 – Project Specific BMPs).

Minimum Requirement #4 – Preservation of Natural Drainage Systems and Outfalls

Stormwater leaving the site will be either dispersed toward natural drainages or directed toward the south western catch basin where runoff currently goes. The same discharge points will be used in both pre and post development.

Minimum Requirement #5 – On-site Stormwater Management

This Project is inside the UGA and is on a site smaller than five acres. While List #2 from section 3.1 in volume 1 can be used, the developer has chosen to meet the LID requirements through standard flow control and treatment as described in section 6 and 7.

The proposed BMPs are as follows:

Lawn and Landscape Areas:

- All disturbed areas not covered with a hard surface, and all new lawn and landscape areas will contain soils meeting the Post-Construction Soil Quality and Depth (BMP T5.13) requirements.

Roof Areas:

- Roof surfaces will be connected directly to the stormwater detention pipes to minimize contact with pollutants.

Other Hard Surface Areas:

- Due to the project site's size, and existing grade, LID BMPs, such as dispersion and bioretention, are not considered practical or feasible for the Project. Stormwater runoff from the new paved and gravel areas will pass through the filtration facility described in Minimum Requirement #6 and infiltration facility, as described in Minimum Requirement #7. These treatments will satisfy this Minimum Requirement, On-site Stormwater Management. The landowner may consider using pervious asphalt concrete in

connection with BMP T5.15. However, credits toward this BMP were not taken.

Minimum Requirement #6 – Runoff Treatment

This project proposes to create more than 5000 square feet of pollution-generating hard surface (PGHS) and is subject to this minimum requirement.

Road and other gravel surfaces will be routed through a Contech StormFilter system to remove suspended solids and then routed into an underground detention pipe system. Treatment flow rates were established by using the WWHM12 continuous inflow modeling software. The required treatment flowrate is roughly 16gpm and peak flowrate the system could see during the 100yr storm event is roughly 127gpm. The storm filter system was sized to handle the full treatment flowrate and bypass the higher storm events. Each storm filter can treat 12.5gpm of runoff. A system using 2 storm filters was chosen. Flows higher than 25gpm will be bypassed directly into the detention facility. The roof was removed from the treatment flow rate calculation since treatment was bypassed.

Minimum Requirement #7 – Flow Control

The development pre and post runoff rates were compared based on existing and proposed land coverage types using the WWHM2012 continuous inflow model. Stormwater from this site will be routed to the onsite underground detention pipe. This pipe is 2’ diameter, perforated, and the volume is 3494 cf of storage. This storage includes 690 linear feet of pipe (2160 cu ft) and 1334 cu ft of washed drained rock at 33% capacity which is adequate detention volume per WWHM12 calculations shown in section 5.

Per SWMMWW Volume III Chapter 5, Section 5.4, the site's design infiltration rate was verified through an on-site test pit. The test pit was dug to a depth of 10-feet and indicated a soil comprised of cemented and well-graded sand rather than Lacamas Silt Loam, as identified in the USDA web soil survey, Figure 1.

Figure 1 (Left): Wet soil sample from the Lone Pine Medical Facility Project indicates cemented well graded sand rather than Lacamas Silt Loam, Figure 2 (Right): Separated dry soil sample from Lone Pine Medical Facility Project to show soil grain size analysis.

Minimum Requirement #8 – Wetlands Protection

The thresholds identified in Minimum Requirement #6 – Runoff Treatment, and Minimum Requirement #7 – Flow Control are used to determine the applicability of this requirement to discharges to wetlands. Since Minimum Requirements #6 and #7 are properly mitigated, Minimum Requirement #8 is considered satisfied. Furthermore there are no wetlands on this project site.

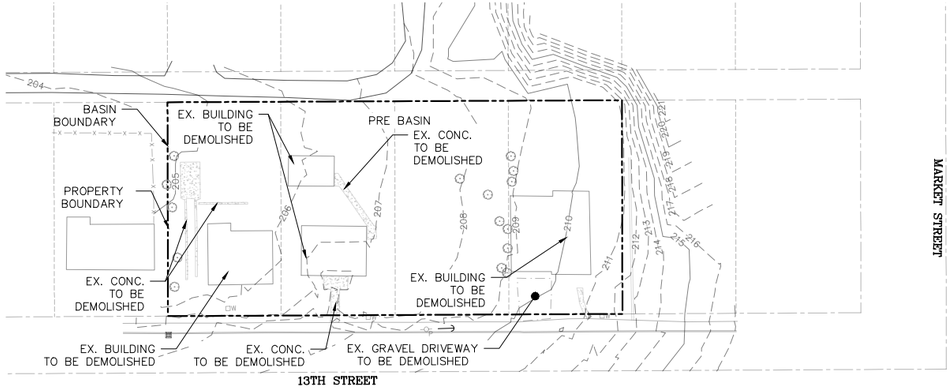
Minimum Requirement #9 – Operation and Maintenance

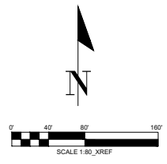
Maintenance of storm drainage facilities (the Contech Stormwater Management StormFilter) and onsite detention pipe networkwill be the landowner's responsibility, whose property the individual structure is located. All designed improvements are within the private property boundary and will be the responsibility of the property owner. Drainage from right-of-way improvements will be the responsibility of the City of Chehalis. A storm drainage operation and maintenance plan is included in Appendix A of this report. If required by the City of Chehalis, a performance bond or security can be obtained before final approval.

SECTION 5 – PERMANENT STORMWATER CALCULATIONS

Flow control, treatment, and LID calculations for this project were prepared for the project using WWHM12 runoff modeling software and standards from the 2019 SWMMWW. A pre/post basin flow control analysis, basin map, and water quality analysis have been provided in the next few pages.

SECTION 32 TOWNSHIP 14N RANGE 02W W.M.



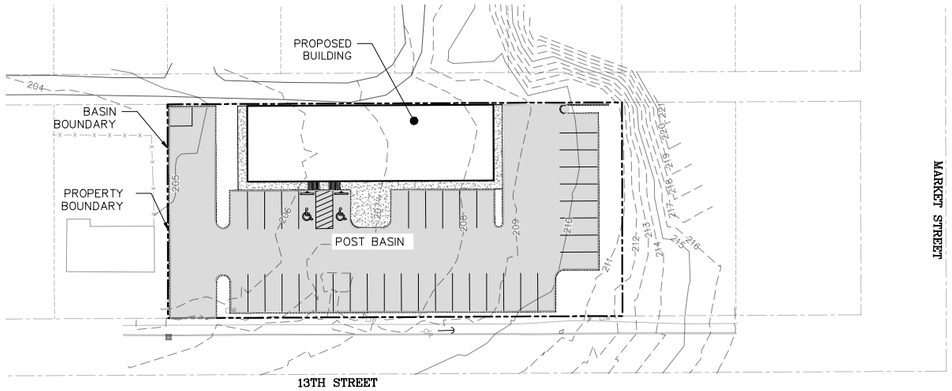


PRE DEVELOPED CONDITION:

BASIN

(EL) EX LAWN AREA = 21969 SF
(EG1) EX GRAVEL AREA = 378 SF
(EB) EX BUILDING (TO BE DEMO) = 4055 SF
(EC) EX CONCRETE (TO BE DEMO) = 678 SF

TOTAL AREA = 27080 SF = 0.62 ACRE



POST DEVELOPED CONDITION:

BASIN

(EG2) EX GRAVEL AREA = 0 SF
(PA) PROPOSED ASPHALT DRIVEWAY/PARKING LOT = 18,269 SF
(PL) PROPOSED LAWN AREA = 8811 SF
(PB) PROPOSED BUILDING = 5200 SF

NEW IMPERVIOUS = (PA+PB+EG2−EG1−EB−EC) 18,358 SF
UNDISTURBED = REMAINING LOT AREA

TOTAL AREA = 27080 SF = 0.62 ACRE

DRAWING TITLE: BASIN MAP - PRE AND POST DEVELOPED
SCALE: 1:80.0001
DATE: 7/12/21
DRAWN: TY
CHECKED: AF
PROJECT NAME: SMITH'S MEDICAL CENTER

FULLER DESIGNS
1101 KRESKY AVE
CENTRALIA, WA 98531
(360) 807-4420

REV:	DESCRIPTION:	DATE:
0	---	---

BSN SMC

WWHM2012

PROJECT REPORT

General Model Information

Project Name:	Lone Pine Medical Facility
Site Name:	Lone Pine Medical Facility
Site Address:	51 SW 13th st
City:	Chehalis
Report Date:	6/9/2021
Gage:	Olympia
Data Start:	1955/10/01
Data End:	2008/09/30
Timestep:	15 Minute
Precip Scale:	0.800
Version Date:	2019/09/13
Version:	4.2.17

POC Thresholds

Low Flow Threshold for POC1:	50 Percent of the 2 Year
High Flow Threshold for POC1:	50 Year

Landuse Basin Data

Predeveloped Land Use

Basin 1

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
C, Lawn, Flat	0.504
Pervious Total	0.504

Impervious Land Use	acre
ROOF TOPS FLAT	0.093
DRIVEWAYS FLAT	0.009
SIDEWALKS FLAT	0.016
Impervious Total	0.118
Basin Total	0.622

Element Flows To:

Surface	Interflow	Groundwater

Basin used for water quality only.

Basin 1 No Roof

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
C, Lawn, Flat	0.082
Pervious Total	0.082

Impervious Land Use	acre
PARKING FLAT	0.419
Impervious Total	0.419
Basin Total	0.501

Element Flows To:

Surface	Interflow	Groundwater

Mitigated Land Use

Basin 1

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
C, Lawn, Flat	0.082
Pervious Total	0.082

Impervious Land Use	acre
ROOF TOPS FLAT	0.119
PARKING FLAT	0.419
Impervious Total	0.538
Basin Total	0.62

Element Flows To:

Surface	Interflow	Groundwater
Trapezoidal Pond 1	Trapezoidal Pond 1	

Basin used for water quality only.

Basin 1 No Roof

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
C, Lawn, Flat	0.082
Pervious Total	0.082

Impervious Land Use	acre
PARKING FLAT	0.419
Impervious Total	0.419
Basin Total	0.501

Element Flows To:

Surface	Interflow	Groundwater

Routing Elements
Predeveloped Routing

Mitigated Routing

Trapezoidal Pond 1

Bottom Length:	34.00 ft.	
Bottom Width:	34.00 ft.	
Depth:	4 ft.	
Volume at riser head:	0.0802 acre-feet.	3494 cu. ft.
Infiltration On		
Infiltration rate:	1	
Infiltration safety factor:	1	
Wetted surface area On		
Total Volume Infiltrated (ac-ft.):		58.214
Total Volume Through Riser (ac-ft.):		26.141
Total Volume Through Facility (ac-ft.):		84.355
Percent Infiltrated:		69.01
Total Precip Applied to Facility:		0
Total Evap From Facility:		0.655
Side slope 1:	0 To 1	
Side slope 2:	0 To 1	
Side slope 3:	0 To 1	
Side slope 4:	0 To 1	
Discharge Structure		
Riser Height:	3 ft.	
Riser Diameter:	18 in.	
Orifice 1 Diameter:	1.25 in.	Elevation:0 ft.
Orifice 2 Diameter:	1.5 in.	Elevation:2 ft.
Orifice 3 Diameter:	0.9375 in	Elevation:2.75 ft.
Element Flows To:		
Outlet 1	Outlet 2	

Pond Hydraulic Table

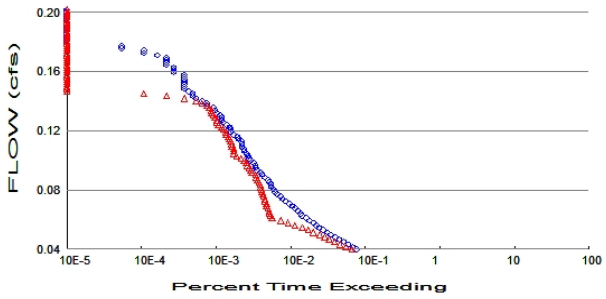
Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.026	0.000	0.000	0.000
0.0444	0.026	0.001	0.008	0.026
0.0889	0.026	0.002	0.012	0.026
0.1333	0.026	0.003	0.015	0.026
0.1778	0.026	0.004	0.017	0.026
0.2222	0.026	0.005	0.020	0.026
0.2667	0.026	0.007	0.021	0.026
0.3111	0.026	0.008	0.023	0.026
0.3556	0.026	0.009	0.025	0.026
0.4000	0.026	0.010	0.026	0.026
0.4444	0.026	0.011	0.028	0.026
0.4889	0.026	0.013	0.029	0.026
0.5333	0.026	0.014	0.031	0.026
0.5778	0.026	0.015	0.032	0.026
0.6222	0.026	0.016	0.033	0.026
0.6667	0.026	0.017	0.034	0.026
0.7111	0.026	0.018	0.035	0.026
0.7556	0.026	0.020	0.036	0.026
0.8000	0.026	0.021	0.037	0.026
0.8444	0.026	0.022	0.039	0.026
0.8889	0.026	0.023	0.040	0.026
0.9333	0.026	0.024	0.041	0.026
0.9778	0.026	0.025	0.041	0.026

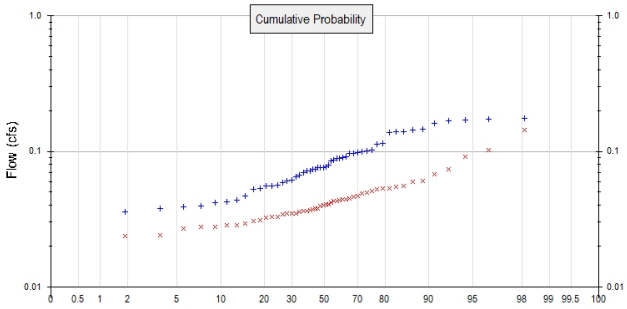
1.0222	0.026	0.027	0.042	0.026
1.0667	0.026	0.028	0.043	0.026
1.1111	0.026	0.029	0.044	0.026
1.1556	0.026	0.030	0.045	0.026
1.2000	0.026	0.031	0.046	0.026
1.2444	0.026	0.033	0.047	0.026
1.2889	0.026	0.034	0.048	0.026
1.3333	0.026	0.035	0.049	0.026
1.3778	0.026	0.036	0.049	0.026
1.4222	0.026	0.037	0.050	0.026
1.4667	0.026	0.038	0.051	0.026
1.5111	0.026	0.040	0.052	0.026
1.5556	0.026	0.041	0.052	0.026
1.6000	0.026	0.042	0.053	0.026
1.6444	0.026	0.043	0.054	0.026
1.6889	0.026	0.044	0.055	0.026
1.7333	0.026	0.046	0.055	0.026
1.7778	0.026	0.047	0.056	0.026
1.8222	0.026	0.048	0.057	0.026
1.8667	0.026	0.049	0.057	0.026
1.9111	0.026	0.050	0.058	0.026
1.9556	0.026	0.051	0.059	0.026
2.0000	0.026	0.053	0.060	0.026
2.0444	0.026	0.054	0.073	0.026
2.0889	0.026	0.055	0.079	0.026
2.1333	0.026	0.056	0.084	0.026
2.1778	0.026	0.057	0.088	0.026
2.2222	0.026	0.059	0.092	0.026
2.2667	0.026	0.060	0.095	0.026
2.3111	0.026	0.061	0.098	0.026
2.3556	0.026	0.062	0.101	0.026
2.4000	0.026	0.063	0.104	0.026
2.4444	0.026	0.064	0.107	0.026
2.4889	0.026	0.066	0.109	0.026
2.5333	0.026	0.067	0.112	0.026
2.5778	0.026	0.068	0.114	0.026
2.6222	0.026	0.069	0.116	0.026
2.6667	0.026	0.070	0.119	0.026
2.7111	0.026	0.071	0.121	0.026
2.7556	0.026	0.073	0.125	0.026
2.8000	0.026	0.074	0.130	0.026
2.8444	0.026	0.075	0.134	0.026
2.8889	0.026	0.076	0.138	0.026
2.9333	0.026	0.077	0.141	0.026
2.9778	0.026	0.079	0.144	0.026
3.0222	0.026	0.080	0.200	0.026
3.0667	0.026	0.081	0.424	0.026
3.1111	0.026	0.082	0.741	0.026
3.1556	0.026	0.083	1.126	0.026
3.2000	0.026	0.084	1.563	0.026
3.2444	0.026	0.086	2.038	0.026
3.2889	0.026	0.087	2.538	0.026
3.3333	0.026	0.088	3.048	0.026
3.3778	0.026	0.089	3.554	0.026
3.4222	0.026	0.090	4.042	0.026
3.4667	0.026	0.092	4.499	0.026
3.5111	0.026	0.093	4.912	0.026
3.5556	0.026	0.094	5.274	0.026

3.6000	0.026	0.095	5.580	0.026
3.6444	0.026	0.096	5.831	0.026
3.6889	0.026	0.097	6.032	0.026
3.7333	0.026	0.099	6.200	0.026
3.7778	0.026	0.100	6.437	0.026
3.8222	0.026	0.101	6.616	0.026
3.8667	0.026	0.102	6.789	0.026
3.9111	0.026	0.103	6.958	0.026
3.9556	0.026	0.105	7.123	0.026
4.0000	0.026	0.106	7.284	0.026
4.0444	0.026	0.107	7.442	0.026

Analysis Results

POC 1





\+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 0.504
Total Impervious Area: 0.118

Mitigated Landuse Totals for POC #1
Total Pervious Area: 0.082
Total Impervious Area: 0.538

Flow Frequency Method: Log Pearson Type III 17B

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	**Flow(cfs)**
2 year	0.078633
5 year	0.114868
10 year	0.140034
25 year	0.172974
50 year	0.198266
100 year	0.22416

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	**Flow(cfs)**
2 year	0.040105
5 year	0.055453
10 year	0.067102
25 year	0.083618
50 year	0.097298
100 year	0.112219

Annual Peaks

Annual Peaks for Predeveloped and Mitigated. POC #1

Year	**Predeveloped**	**Mitigated**
1956	0.072	0.038
1957	0.144	0.059
1958	0.056	0.028
1959	0.072	0.037
1960	0.096	0.049
1961	0.069	0.031
1962	0.038	0.027
1963	0.170	0.068
1964	0.088	0.037
1965	0.077	0.041

1966	0.052	0.028
1967	0.060	0.044
1968	0.047	0.036
1969	0.044	0.023
1970	0.055	0.035
1971	0.061	0.042
1972	0.112	0.051
1973	0.053	0.036
1974	0.085	0.033
1975	0.140	0.029
1976	0.098	0.038
1977	0.090	0.031
1978	0.101	0.044
1979	0.140	0.041
1980	0.067	0.039
1981	0.138	0.044
1982	0.091	0.043
1983	0.103	0.055
1984	0.073	0.040
1985	0.042	0.035
1986	0.089	0.055
1987	0.176	0.053
1988	0.043	0.034
1989	0.076	0.032
1990	0.162	0.091
1991	0.169	0.102
1992	0.056	0.036
1993	0.035	0.024
1994	0.036	0.028
1995	0.059	0.053
1996	0.097	0.049
1997	0.074	0.035
1998	0.114	0.045
1999	0.087	0.046
2000	0.099	0.047
2001	0.039	0.028
2002	0.076	0.074
2003	0.040	0.024
2004	0.080	0.052
2005	0.065	0.033
2006	0.076	0.043
2007	0.146	0.060
2008	0.174	0.144

Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	Predeveloped	Mitigated
1	0.1764	0.1442
2	0.1740	0.1020
3	0.1699	0.0910
4	0.1685	0.0736
5	0.1621	0.0682
6	0.1457	0.0604
7	0.1445	0.0594
8	0.1403	0.0553
9	0.1400	0.0550
10	0.1381	0.0533
11	0.1138	0.0529

12	0.1123	0.0523
13	0.1029	0.0507
14	0.1008	0.0494
15	0.0992	0.0489
16	0.0979	0.0469
17	0.0971	0.0459
18	0.0962	0.0452
19	0.0908	0.0444
20	0.0905	0.0441
21	0.0886	0.0436
22	0.0884	0.0432
23	0.0866	0.0428
24	0.0850	0.0416
25	0.0797	0.0409
26	0.0770	0.0407
27	0.0761	0.0401
28	0.0761	0.0395
29	0.0756	0.0378
30	0.0740	0.0376
31	0.0733	0.0372
32	0.0716	0.0366
33	0.0715	0.0362
34	0.0694	0.0362
35	0.0666	0.0356
36	0.0650	0.0350
37	0.0612	0.0347
38	0.0605	0.0347
39	0.0589	0.0341
40	0.0564	0.0327
41	0.0557	0.0327
42	0.0555	0.0323
43	0.0533	0.0310
44	0.0524	0.0306
45	0.0472	0.0295
46	0.0436	0.0285
47	0.0425	0.0284
48	0.0418	0.0279
49	0.0396	0.0276
50	0.0387	0.0271
51	0.0381	0.0241
52	0.0360	0.0238
53	0.0348	0.0230

Duration Flows

The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0393	1426	1229	86	Pass
0.0409	1254	1026	81	Pass
0.0425	1095	853	77	Pass
0.0441	954	718	75	Pass
0.0457	827	607	73	Pass
0.0473	735	531	72	Pass
0.0489	644	456	70	Pass
0.0506	577	373	64	Pass
0.0522	503	318	63	Pass
0.0538	446	265	59	Pass
0.0554	411	210	51	Pass
0.0570	373	172	46	Pass
0.0586	332	137	41	Pass
0.0602	298	105	35	Pass
0.0618	264	99	37	Pass
0.0634	250	95	38	Pass
0.0650	232	95	40	Pass
0.0666	213	92	43	Pass
0.0682	194	88	45	Pass
0.0698	177	88	49	Pass
0.0714	158	85	53	Pass
0.0730	146	84	57	Pass
0.0746	136	80	58	Pass
0.0762	122	78	63	Pass
0.0778	115	77	66	Pass
0.0795	110	76	69	Pass
0.0811	103	73	70	Pass
0.0827	101	72	71	Pass
0.0843	96	70	72	Pass
0.0859	92	67	72	Pass
0.0875	84	64	76	Pass
0.0891	77	63	81	Pass
0.0907	73	56	76	Pass
0.0923	65	54	83	Pass
0.0939	64	52	81	Pass
0.0955	62	49	79	Pass
0.0971	59	47	79	Pass
0.0987	53	44	83	Pass
0.1003	52	40	76	Pass
0.1019	50	35	70	Pass
0.1035	48	32	66	Pass
0.1051	44	32	72	Pass
0.1067	43	32	74	Pass
0.1084	41	30	73	Pass
0.1100	41	30	73	Pass
0.1116	40	29	72	Pass
0.1132	37	28	75	Pass
0.1148	36	27	75	Pass
0.1164	32	25	78	Pass
0.1180	29	25	86	Pass
0.1196	29	23	79	Pass
0.1212	28	22	78	Pass
0.1228	26	20	76	Pass

0.1244	23	19	82	Pass
0.1260	22	19	86	Pass
0.1276	22	18	81	Pass
0.1292	21	17	80	Pass
0.1308	19	16	84	Pass
0.1324	18	16	88	Pass
0.1340	17	15	88	Pass
0.1356	14	14	100	Pass
0.1373	14	12	85	Pass
0.1389	12	10	83	Pass
0.1405	10	7	70	Pass
0.1421	9	4	44	Pass
0.1437	9	2	22	Pass
0.1453	8	0	0	Pass
0.1469	7	0	0	Pass
0.1485	7	0	0	Pass
0.1501	7	0	0	Pass
0.1517	7	0	0	Pass
0.1533	7	0	0	Pass
0.1549	7	0	0	Pass
0.1565	7	0	0	Pass
0.1581	5	0	0	Pass
0.1597	5	0	0	Pass
0.1613	5	0	0	Pass
0.1629	4	0	0	Pass
0.1645	4	0	0	Pass
0.1662	4	0	0	Pass
0.1678	4	0	0	Pass
0.1694	3	0	0	Pass
0.1710	2	0	0	Pass
0.1726	2	0	0	Pass
0.1742	1	0	0	Pass
0.1758	1	0	0	Pass
0.1774	0	0	0	Pass
0.1790	0	0	0	Pass
0.1806	0	0	0	Pass
0.1822	0	0	0	Pass
0.1838	0	0	0	Pass
0.1854	0	0	0	Pass
0.1870	0	0	0	Pass
0.1886	0	0	0	Pass
0.1902	0	0	0	Pass
0.1918	0	0	0	Pass
0.1934	0	0	0	Pass
0.1951	0	0	0	Pass
0.1967	0	0	0	Pass
0.1983	0	0	0	Pass

LID Report

LID Technique	Used for Treatment ?	Total Volume Needs Treatment (ac-ft)	Volume Through Facility (ac-ft)	Infiltration Volume (ac-ft)	Cumulative Volume Infiltration Credit	Percent Volume Infiltrated	Water Quality	Percent Water Quality Treated	Comment
Trapezoidal Pond 1 POC	☐	76.76			☐	69.01			
Total Volume Infiltrated		76.76	0.00	0.00		69.01	0.00	0%	No Treat. Credit
Compliance with LID Standard 8% of 2-yr to 50% of 2-yr									Duration Analysis Result = Passed

Water Quality

Water Quality BMP Flow and Volume for POC #2

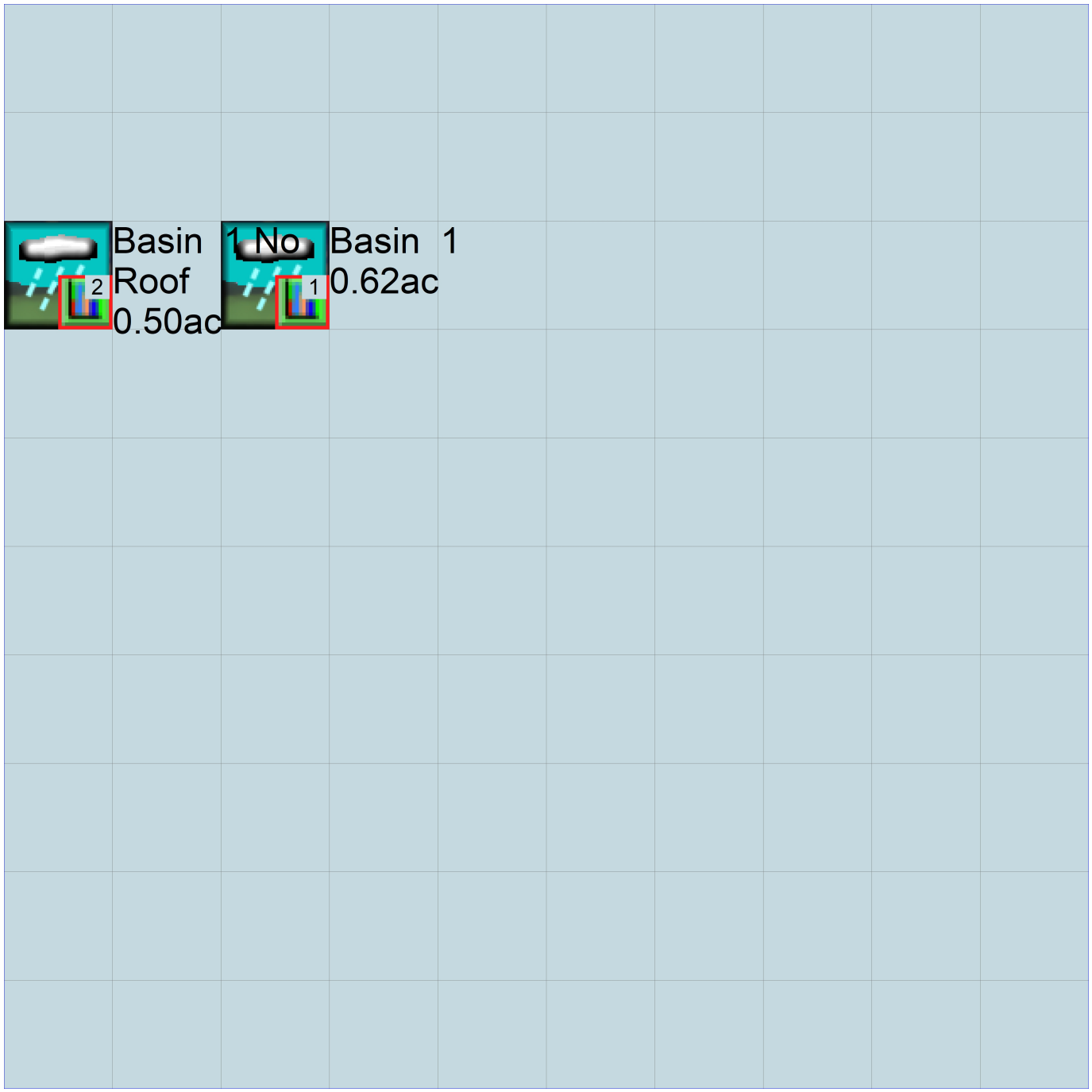
On-line facility volume:	0.0571 acre-feet
On-line facility target flow:	0.0621 cfs.
Adjusted for 15 min:	0.0621 cfs.
Off-line facility target flow:	0.0351 cfs.
Adjusted for 15 min:	0.0351 cfs.

POC 2 IS BASED ON ROOF RUNOFF BYPASSING TREATMENT POC IS NOT EVALUATED FOR FLOW CONTROL

CONTECH STRUCTURE HAS INTERNAL WEIR MAKING IT AN OFFLINE FACILITY
0.0351 CFS = 15.76 GPM
2 CARTRIDGE SYTEM CAPABLE OF TREATING 25 GPM WAS CHOSEN

Appendix

Predeveloped Schematic



Mitigated Schematic

SECTION 6 – CONSTRUCTION SWPPP

This Project is required to prepare a construction Storm Water Pollution Prevention Plan per Minimum Requirement #2 and prepared under Volume II Chapter 3 of the SWMMWW.

This drainage and erosion control report is intended to supplement the construction SWPPP by utilizing other sections of this report to cover the required narrative elements. The construction and erosion control plans supplied for the Project are to act as the required drawing component of the construction SWPPP.

Project Specific BMPs

Intended Project Specific BMPs which should be used during construction include but are not limited to:

- BMP C105: Stabilized Construction Entrance / Exit
- BMP C120: Temporary and Permanent Seeding
- BMP C123: Plastic Covering
- BMP C125: Topsoiling / Composting
- BMP C140: Dust Control
- BMP C150: Material on Hand
- BMP C151: Concrete Handling
- BMP C152: Sawcutting and Surface Pollution Prevention
- BMP C153: Material Delivery, Storage and Containment
- BMP C154: Concrete Washout Area
- BMP C160: Certified Erosion and Sediment Control Lead
- BMP C162: Scheduling
- BMP C220: Inlet Protection
- BMP C233: Silt Fence

CONSTRUCTION STORMWATER POLLUTION PREVENTION PLAN (SWPPP)

FOR

Lone Pine Medical Facility

51 SW 13th Street

Chehalis, WA

Prepared by:

FULLER DESIGNS

1101 Kresky Ave
Centralia, WA 98531
(360) 807-4420

General Requirements

Clearing and grading activities for the Project shall be permitted only to the approved site development plan. These clearing and grading areas were established to preserve sensitive areas, buffers, native growth protection easements, and tree retention areas. These areas are delineated on the site plans and shall be marked on the development site.

The SWPPP shall be implemented beginning with initial land disturbance and until final stabilization. Sediment and Erosion Control BMPs shall be consistent with the BMPs contained in Chapters 3, Volume II of the 2019 Washington State Department of Ecology (WSDOE) Stormwater Management Manual for Western Washington (SWMMWW).

Seasonal Work Limitations - From October 15 through April 1, clearing, grading, and other soil disturbing activities shall only be permitted if shown to the satisfaction of the local permitting authority that silt-laden runoff will be prevented from leaving the site through a combination of the following:

- Site conditions, including existing vegetative coverage, slope, soil type, and proximity to receiving waters
- Limitations on activities and the extent of disturbed areas
- Proposed erosion and sediment control measures

Project Requirements - Construction SWPPP Elements

In most cases, all the following elements shall apply and be implemented throughout project construction. Self-contained sites (discharges only to groundwater) must comply with all elements except for Element 3: Control Flow Rates.

Element 1: Preserve Vegetation/Mark Clearing Limits

- Before beginning land-disturbing activities, including clearing and grading, clearly mark all clearing limits, sensitive areas, and their buffers, and trees that are to be preserved within the construction area.
- Retain the duff layer, native topsoil, and natural vegetation in an undisturbed state to the maximum degree practicable.

Element 2: Establish Construction Access

- Limit construction vehicle access and exit to one route, if possible.
- Stabilize access points with a pad of quarry spalls, crushed rock, or other equivalent BMPs to minimize sediment tracking onto public roads.
- Locate wheel wash or tire baths on-site if the stabilized construction entrance is not effective in preventing tracking sediment onto roads.
- If sediment is tracked off-site, clean the affected roadway thoroughly at the end of each day, or more frequently if necessary (for example, during wet weather). Remove the sediment from roads by shoveling, sweeping, or pick up and transport the sediment to a controlled sediment disposal area.

- Conduct street washing only after the sediment is removed following the above procedure.
- Control street wash wastewater by pumping back on-site or otherwise preventing it from discharging into systems tributary to the State's waters.

Element 3: Control Flow Rates

- Protect properties and waterways downstream of development sites from erosion and the associated discharge of turbid waters due to increases in the velocity and peak volumetric flow rate of stormwater runoff from the project site.
- Where necessary to comply with the bullet above, construct stormwater retention or detention facilities as one of the first grading steps. Assure that detention facilities function properly before constructing site improvements (e.g., impervious surfaces).
- If permanent infiltration ponds are used for flow control during construction, protect these facilities from siltation during the construction phase.

Element 4: Install Sediment Controls

- Design, install, and maintain adequate erosion controls, and sediment controls to minimize pollutants' discharge.
- Construct sediment control BMPs (sediment ponds, traps, filters, etc.) as one of the first grading steps. These BMPs shall be functional before other land-disturbing activities take place.
- Minimize sediment discharges from the site. The design, installation, and maintenance of erosion and sediment controls must address factors such as the amount, frequency, intensity and duration of precipitation, the nature of resulting stormwater runoff, and soil characteristics, including the range of soil particle sizes expected to be present on the site.
- Before the runoff leaves a construction site or before the discharge to an infiltration facility, direct stormwater runoff from the disturbed areas through a sediment pond or other appropriate sediment removal BMP. Runoff from fully stabilized areas may be discharged without a sediment removal BMP but must meet the flow control performance standard in Element #3, bullet #1.
- Locate BMPs intended to trap sediment on-site to avoid interference with juvenile salmonids' movement attempting to enter off-channel areas or drainages.
- Where feasible, design outlet structures that withdraw impounded stormwater from the surface avoid discharging sediment that is still suspended lower in the water column.

Element 5: Stabilize Soils

- Stabilize exposed and unworked soils by application of effective BMPs that prevent erosion. Applicable BMPs include but are not limited to: temporary and permanent seeding, sodding, mulching, plastic covering, erosion control fabrics and matting, soil application of polyacrylamide (PAM), the early application of gravel base early on areas to be paved, and dust control.
- Control stormwater volume and velocity within the site to minimize soil erosion.
- Control stormwater discharges, including peak flow rates and total stormwater volume, to minimize erosion at outlets and minimize downstream channel and stream bank erosion.
- Soils must not remain exposed and unworked for more than the time periods set forth below to prevent erosion:

    - During the dry season (April 2 – October 14): 7 days
    - During the wet season (October 15 - April 1): 2 days
    - Note that projects performing work under an NPDES Construction Stormwater General Permit issued by Ecology will have more restrictive time periods.
- Stabilize soils at the end of the shift before a holiday or weekend, if needed, based on the weather forecast.
- Stabilize soil stockpiles from erosion, protected with sediment trapping measures, and where possible, be located away from storm drain inlets, waterways, and drainage channels.
- Minimize the amount of soil exposed during construction activity.
- Minimize the disturbance of steep slopes.
- Minimize soil compaction and, unless infeasible, preserve topsoil.

Element 6: Protect Slopes

- Design and construct cut-and-fill slopes in a manner to minimize erosion. Applicable practices include, but are not limited to, reducing the continuous length of a slope with terracing and diversions, reducing slope steepness, and roughening sloped surfaces (for example, track walking).
- Divert off-site stormwater (run-on) or groundwater away from slopes and disturbed areas with interceptor dikes, pipes, and/or swales. Off-site stormwater should be managed separately from stormwater generated on the site.
- At the top of slopes, collect drainage in pipe slope drains or protected channels to prevent erosion.
- Place excavated material on the uphill side of trenches, consistent with safety and space considerations.
- Place check dams at regular intervals within constructed channels that are cut down a slope.

Element 7: Protect Drain Inlets

- Protect all storm drain inlets made operable during construction so that stormwater runoff shall not enter the conveyance system without first being filtered or treated to remove sediment.
- Clean or remove and replace inlet protection devices when sediment has filled one-third of the available storage (unless the product manufacturer specifies a different standard).

Element 8: Stabilize Channels and Outlets

- Design, construct and stabilize all on-site conveyance channels.
- Provide stabilization, including armoring material, adequate to prevent erosion of outlets, adjacent stream banks, slopes, and downstream reaches at the outlets of all conveyance systems.

Element 9: Control Pollutants

- Design, install, implement, and maintain effective pollution prevention measures to minimize the discharge of pollutants.
- Handle and dispose of all pollutants, including waste materials and demolition debris that occur on-site in a manner that does not contaminate stormwater.

- Provide cover, containment, and protection from vandalism for all chemicals, liquid products, petroleum products, and other materials that have the potential to pose a threat to human health or the environment. On-site fueling tanks must include secondary containment. Secondary containment means placing tanks or containers within an impervious structure capable of containing 110% of the largest tank's volume within the containment structure. Double-walled tanks do not require additional secondary containment.
- Conduct maintenance, fueling, and repair of heavy equipment and vehicles using spill prevention and control measures. Clean contaminated surfaces immediately following any spill incident.
- To prevent discharge to surface water, discharge the wheel wash or tire bath wastewater to a separate on-site treatment system such as closed-loop recirculation or upland application, or the sanitary sewer, with local sewer district approval.
- Apply fertilizers and pesticides in a manner and at application rates that will not result in a chemical loss to stormwater runoff. Follow manufacturers' label requirements for application rates and procedures.
- Use BMPs to prevent contamination of stormwater runoff by pH modifying sources. The sources for this contamination include, but are not limited to: bulk cement, cement kiln dust, fly ash, new concrete washing and curing waters, waste streams generated from concrete grinding and sawing, exposed aggregate processes, dewatering concrete vaults, concrete pumping, and mixer washout waters.
- Adjust the pH of stormwater if necessary, to prevent violations of water quality standards.
- Assure that washout of concrete trucks is performed off-site or in designated concrete washout areas only. Do not wash out concrete trucks onto the ground or into storm drains, open ditches, streets, or streams. Do not dump excess concrete on-site, except in designated concrete washout areas. Concrete spillage or concrete discharge to surface waters of the State is prohibited.
- Obtain written approval from Ecology before using a chemical treatment other than CO2 or dry ice to adjust pH.

Element 10: Control De-Watering

- Discharge foundation, vault, and trench dewatering water, which has similar characteristics to stormwater runoff at the site, into a controlled conveyance system before discharge to a sediment trap or sediment pond.
- Discharge clean, non-turbid dewatering water, such as well-point groundwater, to systems tributary to, or directly into surface waters of the State, as specified in Element #8, provided the dewatering flow does not cause erosion or flooding of receiving waters. Do not route clean dewatering water through stormwater sediment ponds. Note that "surface waters of the State" may exist on a construction site as well as off-site; for example, a creek running through a site.
- Handle highly turbid or otherwise contaminated dewatering water separately from stormwater.
- Other treatment or disposal options may include:
    - Infiltration

- Transport off-site in a vehicle, such as a vacuum flush truck, for legal disposal in a manner that does not pollute state waters
- Ecology-approved on-site chemical treatment or other suitable treatment technologies
- Sanitary or combined sewer discharge with local sewer district approval if there is no other option
- Use of a sedimentation bag that discharges to a ditch or swale for small volumes of localized dewatering

Element 11: Maintain BMPs

- Maintain and repair all temporary and permanent erosion and sediment control BMPs as needed to assure continued performance of their intended function following BMP specifications.
- Remove all temporary erosion and sediment control BMPs within 30 days after achieving final site stabilization or after the temporary BMPs are no longer needed.

Element 12: Manage the Project

- Phase development projects to the maximum degree practicable and consider seasonal work limitations.
- Inspection and monitoring – Inspect, maintain, and repair all BMPs as needed to ensure continued performance of their intended function. Projects regulated under the Construction Stormwater General Permit must conduct site inspections and monitoring in accordance with Special Condition S4 of the Construction Stormwater General Permit.
- Maintaining an updated construction SWPPP – Maintain, update, and implement the SWPPP.
- Projects that disturb one or more acres must have site inspections conducted by a Certified Erosion and Sediment Control Lead (CESCL). Project sites disturbing less than one acre may have a CESCL or a person without CESCL certification conduct inspections. By initiating construction, the SWPPP must identify the CESCL or inspector, who must always be present on-site or on-call.
- The CESCL or inspector (project sites less than one acre) must have the skills to assess the:
    - Site conditions and construction activities that could impact the quality of stormwater
    - Effectiveness of erosion and sediment control measures used to control the quality of stormwater discharges
- The CESCL or inspector must examine stormwater visually for the presence of suspended sediment, turbidity, discoloration, and oil sheen. They must evaluate the effectiveness of BMPs and determine if it is necessary to install, maintain, or repair BMPs to improve the quality of stormwater discharges.
- Based on the results of the inspection, construction site operators must correct the problems identified by:
    - Reviewing the SWPPP for compliance with the 13 construction SWPPP elements and making appropriate revisions within seven (7) calendar days of the inspection.
- Immediately begin the process of fully implementing and maintaining appropriate source control and/or treatment BMPs as soon as possible, addressing the problems not later than

within ten (10) days of the inspection. If the installation of necessary treatment BMPs is not feasible within ten (10) days, the construction site operator may request an extension within the initial 10day response period.

- Documenting BMP implementation and maintenance in the site logbook (sites larger than one acre).
- The CESCL or inspector must inspect all areas disturbed by construction activities, all BMPs, and all stormwater discharge points at least once every calendar week and within 24 hours of any discharge from the site. (For purposes of this condition, individual discharge events that last more than one day do not require daily inspections. For example, if a stormwater pond discharges continuously over the course of a week, only one inspection is required that week.) The CESCL or inspector may reduce the inspection frequency for temporary stabilized, static sites to once every calendar month.

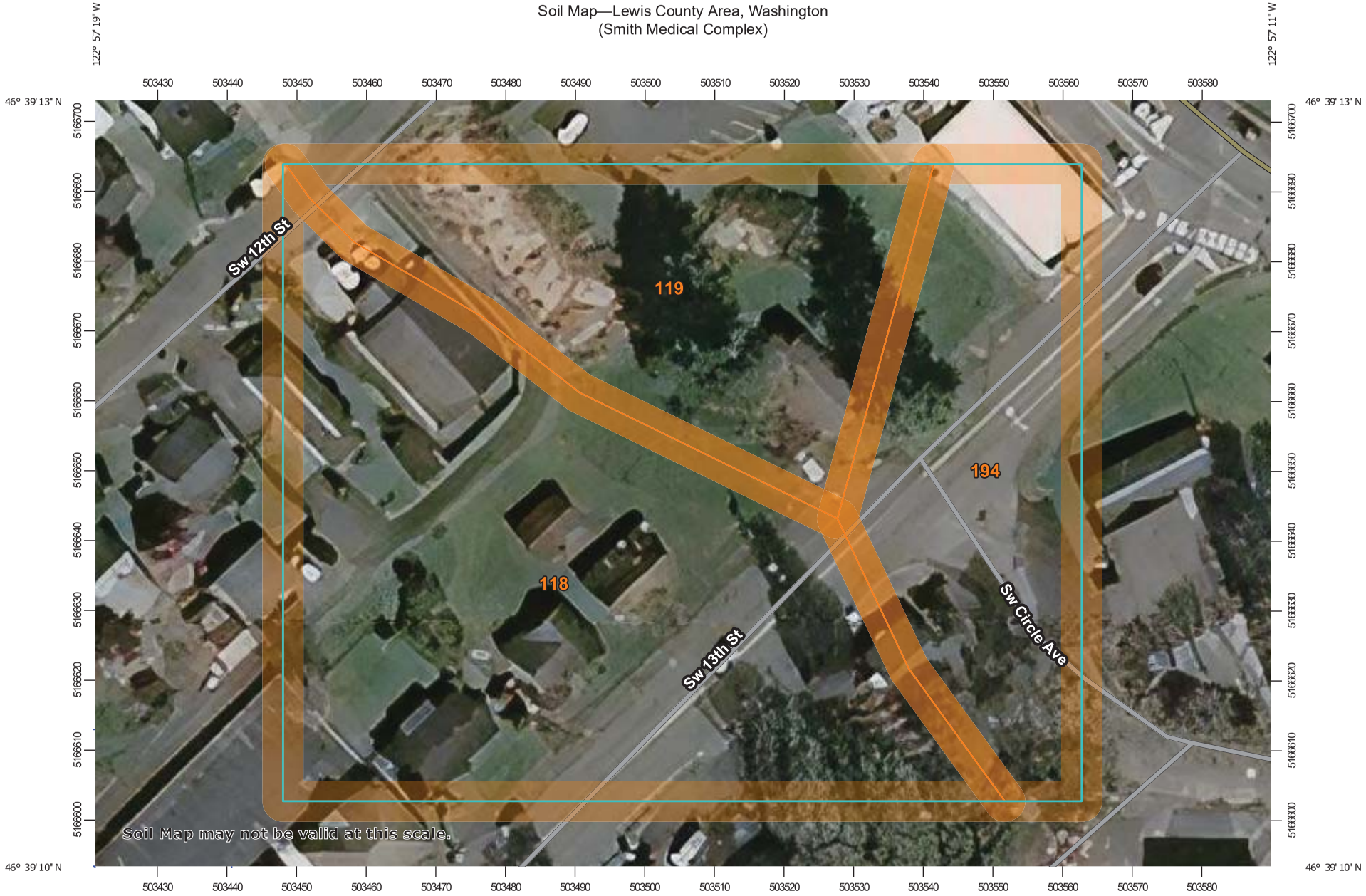
Element 13: Protect Low Impact Development BMPs

- Protect all Bioretention and Rain Garden BMPs from sedimentation through installation and maintenance of erosion and sediment control BMPs on portions of the site that drain into the Bioretention and/or Rain Garden BMPs. Restore the BMPs to their fully functioning condition if they accumulate sediment during construction. Restoring the BMP must include removing sediment and any sediment-laden Bioretention/rain garden soils and replacing the removed soils with soils meeting the design specification.
- Prevent compacting Bioretention and rain garden BMPs by excluding construction equipment and foot traffic. Protect completed lawn and landscaped areas from compaction due to construction equipment.
- Control erosion and avoid introducing sediment from surrounding land uses onto permeable pavements. Do not allow muddy construction equipment on the base material or pavement. Do not allow sediment-laden runoff onto permeable pavements or base materials.
- Pavement fouled with sediments or no longer passing an initial infiltration test must be cleaned using procedures in accordance with this manual or the manufacturer's procedures.
- Keep all heavy equipment off existing soils under LID facilities excavated to final grade to retain the soils' infiltration rate.

SECTION 7 – SPECIAL REPORTS AND STUDIES

A soil survey was performed using the United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) Web Soil Survey (WSS). This site is completely covered with cemented and well-graded sand rather than Lacamas Silt Loam type soil, as identified in the USDA web soil survey. A copy of this soil survey and soil description are contained in the next few pages. A more recent soil evaluation was completed on this site, refer to the sieve analysis along with soil descriptions.

Soil Map—Lewis County Area, Washington
(Smith Medical Complex)



Map Scale: 1:772 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 10 20 40 60

Feet
0 35 70 140 210

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 10N WGS84

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: Lewis County Area, Washington
Survey Area Data: Version 20, Jun 4, 2020

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

Date(s) aerial images were photographed: Mar 30, 2019—May 10, 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
118	Lacamas silt loam, 0 to 3 percent slopes	1.3	51.7%
119	Lacamas silt loam, 3 to 8 percent slopes	0.7	25.2%
194	Scamman silty clay loam, 5 to 15 percent slopes	0.6	23.1%
Totals for Area of Interest		**2.6**	**100.0%**

Lewis County Area, Washington

118—Lacamas silt loam, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 2h8l
Elevation: 250 to 1,200 feet
Mean annual precipitation: 40 to 70 inches
Mean annual air temperature: 48 to 50 degrees F
Frost-free period: 125 to 200 days
Farmland classification: Prime farmland if drained

Map Unit Composition

Lacamas, drained, and similar soils: 60 percent
Lacamas, undrained, and similar soils: 30 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Lacamas, Drained

Setting

Landform: Terraces, flood plains

Typical profile

H1 - 0 to 7 inches: silt loam
H2 - 7 to 17 inches: silt loam
H3 - 17 to 27 inches: silty clay
H4 - 27 to 60 inches: clay

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 in/hr)
Depth to water table: About 12 to 18 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Moderate (about 6.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4w
Hydrologic Soil Group: C/D
Forage suitability group: Seasonally Wet Soils (G002XV202WA)
Other vegetative classification: Seasonally Wet Soils (G002XV202WA)
Hydric soil rating: Yes

Description of Lacamas, Undrained

Setting

Landform: Flood plains, terraces

Typical profile

H1 - 0 to 7 inches: silt loam
H2 - 7 to 17 inches: silt loam
H3 - 17 to 27 inches: silty clay
H4 - 27 to 60 inches: clay

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Very poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 in/hr)
Depth to water table: About 0 to 6 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Moderate (about 6.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 5w
Hydrologic Soil Group: C/D
Forage suitability group: Seasonally Wet Soils (G002XV202WA)
Other vegetative classification: Seasonally Wet Soils (G002XV202WA)
Hydric soil rating: Yes

Minor Components

Klaber

Percent of map unit: 5 percent
Landform: Depressions
Hydric soil rating: Yes

Prather

Percent of map unit: 3 percent
Hydric soil rating: No

Scamman

Percent of map unit: 2 percent
Landform: Terraces
Hydric soil rating: Yes

Data Source Information

Soil Survey Area: Lewis County Area, Washington
Survey Area Data: Version 20, Jun 4, 2020

Sieve Analysis Data Sheet

ASTM D422-63(2007)

Project Name:	13 Street Medical Complex	**Tested By:**	N/A	**Date:**	5/20/2021
Location:	Chehalis, WA	**Checked By:**	N/A	**Date:**	5/20/2021
Boring No:	1	**Test Number:**	1		
Sample Depth:	10'	**Gnd Elev.:**	n/a		

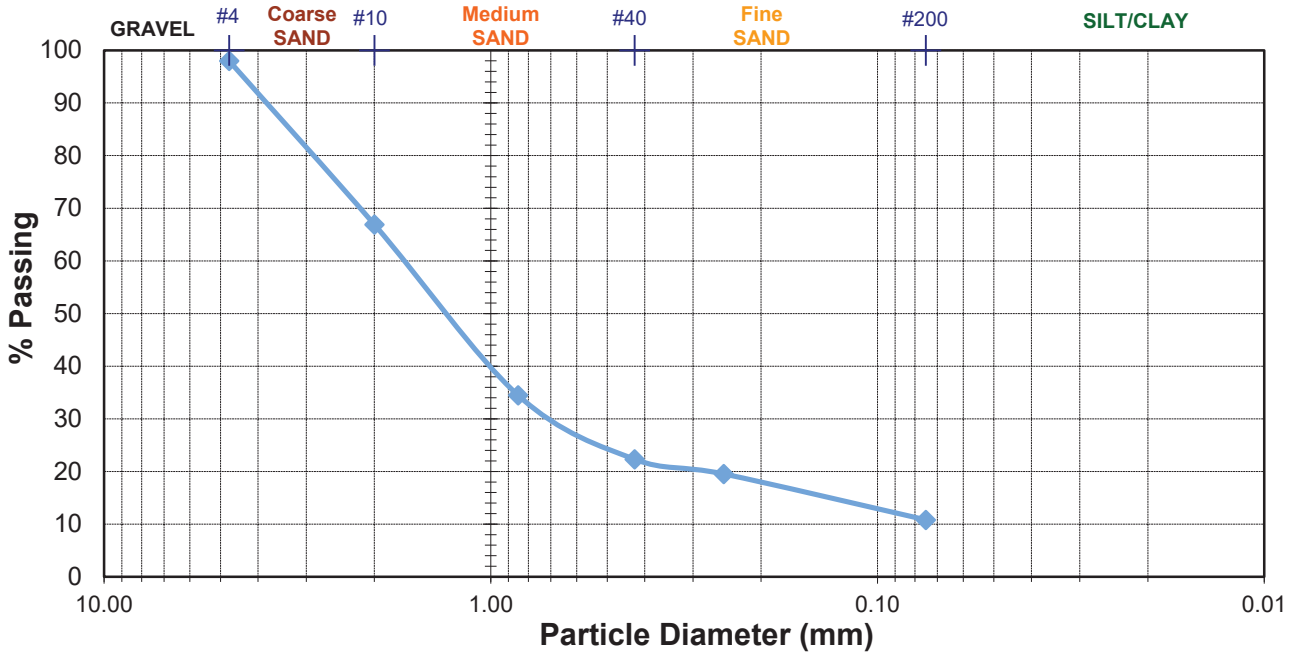
USCS Soil Classification: SW

Notes: Medium sand

Weight of Container (g): 165.3 **Weight of Container & Soil (g):** 555.4

Weight of Dry Sample (g): 390.1

Sieve Number	Diameter (mm)	Mass of Sieve (g)	Mass of Sieve & Soil (g)	Soil Retained (g)	Soil Retained (%)	Soil Passing (%)
#4	4.75	485.9	493.7	7.8	2.0	98.0
#10	2.00	452.9	574.2	121.3	31.1	66.9
#20	0.85	383.1	509.6	126.5	32.4	34.5
#40	0.43	346.8	394.2	47.4	12.2	22.3
#60	0.25	329.2	340.1	10.9	2.8	19.5
#200	0.075	315	349	34.0	8.7	10.8
Pan		348	390.2	42.2	10.8	0.0
			TOTAL:	390.1	100.0	



Grain Size Distribution Curve Results:

% Gravel:	2.0	**D_{10}:**	0.075	**Short-K_{sat}:**	29.79
% Sand:	87.2	**D_{30}:**	0.7	**Long-K_{sat}:**	1.06
% Fines:	10.8	**D_{60}:**	1.7		
		D_{90}:	3.9		
		fines	0.108		

Saturation Correction Factors

CF_v:	0.3		
CF_t:	0.4		
CF_m:	0.9	cemented factor	0.3
CF_T:	0.04		

SECTION 8 – OPERATION AND MAINTENANCE MANUAL

The following pages contain maintenance needs for most of the components that are part of the drainage system and components that you may not have. Let us know if any components are missing from these pages. Ignore the requirements that do not apply to your system. You should plan to complete a checklist for all system components on the following schedule

- Monthly from November through April
- Once in late summer (preferably September)
- After any major storm (use 1" of precipitation in 24 hours) for any items marked "S"

Using photocopies of these pages, check off the items you looked for after each inspection. Add comments on issues found and actions taken. Keep these records in your files. These files will be needed to write your annual report if required. Some items may not need reviewed time an inspection is done. Use the suggested frequency at the left of each item as a guideline for your inspection.

You may call the jurisdiction for technical assistance. Please do not hesitate to call, especially if you are unsure whether a situation you have discovered may be a developing issue.

CONTECH®
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OPERATION AND MAINTENANCE

CatchBasin StormFilter™

Important: These guidelines should be used as a part of your site stormwater plan.

Overview

The CatchBasin StormFilter™ (CBSF) consists of a multi-chamber steel, concrete, or plastic catch basin unit. The steel CBSF is offered both as a standard and as a deep unit for additional internal overflow and sediment capacity.

The CBSF is installed flush with the finished grade and is applicable for both constrained lot and retrofit applications. Steel and concrete units can accept surface and piped influent for roof leaders or similar applications.

The steel, concrete and plastic CBSF units have capacities of 4, 8 and 2 cartridges, respectively. Internal overflow capacity varies by system type from 0.5 cfs for the plastic, 1.3 cfs for the concrete and 1.0 or 1.8 cfs for the steel unit.

Design Operation

The CBSF is installed as the primary receiver of runoff, similar to a standard, grated catch basin. The steel and concrete CBSF units have an H-20 rated, traffic bearing lid that allows the filter to be installed in parking lots, and for all practical purposes, takes up no land area. Plastic units can be used in landscaped areas or other non-traffic-bearing applications.

The steel CBSF consists of a sumped inlet chamber and cartridge chamber(s). Runoff enters the sumped inlet chamber either by sheet flow from a paved surface or from an inlet pipe discharging directly to the unit vault. The inlet chamber is equipped with an internal baffle, which traps debris and floating oil and grease, and an overflow weir. While in the inlet chamber, heavier solids are allowed to settle into the deep sump, while lighter solids and soluble pollutants are directed into the cartridge chamber through a port between the baffle and the overflow weir.

The concrete and plastic units operate similarly minus the presence of the inlet chamber or deep sump.

Once in the cartridge chamber, polluted water ponds and percolates horizontally through the media in the filter cartridges. Treated water collects in the cartridge's center tube from where it is directed to the outlet chamber and discharged to the outlet pipe on the downstream side of the overflow weir.

When influent flows exceed the water quality design value, excess water spills over the overflow weir, bypassing the cartridge bay, and discharges to the outlet pipe.

Applications

The CBSF is particularly useful where small flows are being treated or for sites that have little available hydraulic head. The unit is ideal for applications in which standard catch basins are to be used. Both water quality and catchment issues can be resolved with the use of the CBSF.

Retro-Fit

The retrofit market has many possible applications for the CBSF. The CBSF can be installed by replacing an existing catch basin without having to "chase the grade," thus reducing the high cost of re piping the storm system.

CatchBasin StormFilter™

Maintenance Guidelines

Maintenance procedures for typical catch basins can be applied to the CatchBasin StormFilter (CBSF). The filter cartridges contained in the CBSF are easily removed and replaced during maintenance activities according to the following guidelines.

1. Establish a safe working area as per typical catch basin service activity.
2. Remove steel grate and diamond plate cover (weight 100 lbs. each) or plastic grating.
3. Turn cartridge(s) approximately ¼ turn counter-clockwise to disconnect from pipe manifold.
4. Remove cartridge(s) from catch basin by hand or with appropriate hoisting equipment.
5. Remove accumulated sediment via vactor truck from all interior chambers.
6. Rinse interior of both bays and vactor remaining water and sediment.
7. Install fresh cartridge(s), by rotating ¼ turn clockwise, taking care not to damage cartridge connectors.
8. Replace cover(s).
9. Dispose of accumulated debris and spent media in accordance with local regulations.
10. Return used, empty cartridges to Contech for refurbishing.

Media may be removed from the filter cartridges using the vactor truck before the cartridges are removed from the catch basin structure once the top cap and hood are removed. The vactor truck must be equipped with a hose capable of reaching areas of restricted clearance.

Empty cartridges can be easily removed from the catch basin structure by hand. Empty cartridges should be reassembled and returned to Contech as appropriate.

Refurbished cartridges are available from Contech on an exchange basis. Contact the maintenance department of Contech at 513-645-7770 for more information.

Onsite maintenance is estimated at 26 minutes once setup for a single cartridge unit. Add approximately 5 minutes for each additional cartridge.

Mosquito Abatement

In certain areas of the United States, mosquito abatement is desirable to reduce the incidence of vectors.

In BMPs with standing water, which could provide mosquito breeding habitat, certain abatement measures can be taken.

1. Periodic observation of the standing water to determine if the facility is harboring mosquito larvae.
2. Regular catch basin maintenance.
3. Use of larvicides containing Bacillus thuringiensis israelensis (BTI). BTI is a bacterium toxic to mosquito and black fly larvae.

In some cases, the presence of petroleum hydrocarbons may interrupt the mosquito growth cycle.

Using Larvicides in the CatchBasin StormFilter

Larvicides should be used according to manufacturer's recommendations.

Two widely available products are Mosquito Dunks and Summit B.t.i. Briquets. For more information, visit https://www.amvac.com/products/summit-bti-briquets.

The larvicide must be in contact with the permanent pool. The larvicide should also be fastened to the CatchBasin StormFilter to prevent displacement by high flows. A magnet can be used with a steel catch basin.

For more information on mosquito abatement in stormwater BMPs, refer to the following: https://anrcatalog.ucanr.edu/pdf/8125.pdf.

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StormFilter Inspection and Maintenance Procedures

The Stormwater Management StormFilter®

Maintenance Guidelines

The primary purpose of the Stormwater Management StormFilter® is to filter and prevent pollutants from entering our waterways. Like any effective filtration system, periodically these pollutants must be removed to restore the StormFilter to its full efficiency and effectiveness.

Maintenance requirements and frequency are dependent on the pollutant load characteristics of each site. Maintenance activities may be required in the event of a chemical spill or due to excessive sediment loading from site erosion or extreme storms. It is a good practice to inspect the system after major storm events.

Maintenance Procedures

Although there are many effective maintenance options, we believe the following procedure to be efficient, using common equipment and existing maintenance protocols. The following two-step procedure is recommended::

1. **Inspection**
   - Inspection of the vault interior to determine the need for maintenance.
2. **Maintenance**
   - Cartridge replacement
   - Sediment removal

Inspection and Maintenance Timing

At least one scheduled inspection should take place per year with maintenance following as warranted.

First, an inspection should be done before the winter season. During the inspection the need for maintenance should be determined and, if disposal during maintenance will be required, samples of the accumulated sediments and media should be obtained.

Second, if warranted, a maintenance (replacement of the filter cartridges and removal of accumulated sediments) should be performed during periods of dry weather.

In addition to these two activities, it is important to check the condition of the StormFilter unit after major storms for potential damage caused by high flows and for high sediment accumulation that may be caused by localized erosion in the drainage area. It may be necessary to adjust the inspection/ maintenance schedule depending on the actual operating conditions encountered by the system. In general, inspection activities can be conducted at any time, and maintenance should occur, if warranted, during dryer months in late summer to early fall.

Maintenance Frequency

The primary factor for determining frequency of maintenance for the StormFilter is sediment loading.

A properly functioning system will remove solids from water by trapping particulates in the porous structure of the filter media inside the cartridges. The flow through the system will naturally decrease as more and more particulates are trapped. Eventually the flow through the cartridges will be low enough to require replacement. It may be possible to extend the usable span of the cartridges by removing sediment from upstream trapping devices on a routine as-needed basis, in order to prevent material from being re-suspended and discharged to the StormFilter treatment system.

The average maintenance lifecycle is approximately 1-5 years. Site conditions greatly influence maintenance requirements. StormFilter units located in areas with erosion or active construction may need to be inspected and maintained more often than those with fully stabilized surface conditions.

Regulatory requirements or a chemical spill can shift maintenance timing as well. The maintenance frequency may be adjusted as additional monitoring information becomes available during the inspection program. Areas that develop known problems should be inspected more frequently than areas that demonstrate no problems, particularly after major storms. Ultimately, inspection and maintenance activities should be scheduled based on the historic records and characteristics of an individual StormFilter system or site. It is recommended that the site owner develop a database to properly manage StormFilter inspection and maintenance programs..

Inspection Procedures

The primary goal of an inspection is to assess the condition of the cartridges relative to the level of visual sediment loading as it relates to decreased treatment capacity. It may be desirable to conduct this inspection during a storm to observe the relative flow through the filter cartridges. If the submerged cartridges are severely plugged, then typically large amounts of sediments will be present and very little flow will be discharged from the drainage pipes. If this is the case, then maintenance is warranted and the cartridges need to be replaced.

Warning: In the case of a spill, the worker should abort inspection activities until the proper guidance is obtained. Notify the local hazard control agency and Contech Engineered Solutions immediately.

To conduct an inspection:

Important: Inspection should be performed by a person who is familiar with the operation and configuration of the StormFilter treatment unit and the unit's role, relative to detention or retention facilities onsite.

1. If applicable, set up safety equipment to protect and notify surrounding vehicle and pedestrian traffic.
2. Visually inspect the external condition of the unit and take notes concerning defects/problems.
3. Open the access portals to the vault and allow the system vent.
4. Without entering the vault, visually inspect the inside of the unit, and note accumulations of liquids and solids.
5. Be sure to record the level of sediment build-up on the floor of the vault, in the forebay, and on top of the cartridges. If flow is occurring, note the flow of water per drainage pipe. Record all observations. Digital pictures are valuable for historical documentation.
6. Close and fasten the access portals.
7. Remove safety equipment.
8. If appropriate, make notes about the local drainage area relative to ongoing construction, erosion problems, or high loading of other materials to the system.
9. Discuss conditions that suggest maintenance and make decision as to whether or not maintenance is needed.

Maintenance Decision Tree

The need for maintenance is typically based on results of the inspection. The following Maintenance Decision Tree should be used as a general guide. (Other factors, such as Regulatory Requirements, may need to be considered).

Please note Stormwater Management StormFilter devices installed downstream of, or integrated within, a stormwater storage facility typically have different operational parameters (i.e. draindown time). In these cases, the inspector must understand the relationship between the retention/detention facility and the treatment system by evaluating site specific civil engineering plans, or contacting the engineer of record, and make adjustments to the below guidance as necessary. Sediment deposition depths and patterns within the StormFilter are likely to be quite different compared to systems without upstream storage and therefore shouldn't be used exclusively to evaluate a need for maintenance.

1. Sediment loading on the vault floor.
   a. If >4" of accumulated sediment, maintenance is required.
2. Sediment loading on top of the cartridge.
   a. If >1/4" of accumulation, maintenance is required.
3. Submerged cartridges.
   a. If >4" of static water above cartridge bottom for more than 24 hours after end of rain event, maintenance is required. (Catch basins have standing water in the cartridge bay.)
4. Plugged media.
   a. While not required in all cases, inspection of the media within the cartridge may provide valuable additional information.
   b. If pore space between media granules is absent, maintenance is required.
5. Bypass condition.
   a. If inspection is conducted during an average rain fall event and StormFilter remains in bypass condition (water over the internal outlet baffle wall or submerged cartridges), maintenance is required.
6. Hazardous material release.
   a. If hazardous material release (automotive fluids or other) is reported, maintenance is required.
7. Pronounced scum line.
   a. If pronounced scum line (say ≥ 1/4" thick) is present above top cap, maintenance is required.

Maintenance

Depending on the configuration of the particular system, maintenance personnel will be required to enter the vault to perform the maintenance.

Important: If vault entry is required, OSHA rules for confined space entry must be followed.

Filter cartridge replacement should occur during dry weather. It may be necessary to plug the filter inlet pipe if base flows is occurring.

Replacement cartridges can be delivered to the site or customers facility. Information concerning how to obtain the replacement cartridges is available from Contech Engineered Solutions.

Warning: In the case of a spill, the maintenance personnel should abort maintenance activities until the proper guidance is obtained. Notify the local hazard control agency and Contech Engineered Solutions immediately.

To conduct cartridge replacement and sediment removal maintenance:

1. If applicable, set up safety equipment to protect maintenance personnel and pedestrians from site hazards.
2. Visually inspect the external condition of the unit and take notes concerning defects/problems.
3. Open the doors (access portals) to the vault and allow the system to vent.
4. Without entering the vault, give the inside of the unit, including components, a general condition inspection.
5. Make notes about the external and internal condition of the vault. Give particular attention to recording the level of sediment build-up on the floor of the vault, in the forebay, and on top of the internal components.
6. Using appropriate equipment offload the replacement cartridges (up to 150 lbs. each) and set aside.
7. Remove used cartridges from the vault using one of the following methods:

Method 1:

A. This activity will require that maintenance personnel enter the vault to remove the cartridges from the under drain manifold and place them under the vault opening for lifting (removal). Disconnect each filter cartridge from the underdrain connector by rotating counterclockwise 1/4 of a turn. Roll the loose cartridge, on edge, to a convenient spot beneath the vault access.

   Using appropriate hoisting equipment, attach a cable from the boom, crane, or tripod to the loose cartridge. Contact Contech Engineered Solutions for suggested attachment devices.

B. Remove the used cartridges (up to 250 lbs. each) from the vault.

Important: Care must be used to avoid damaging the cartridges during removal and installation. The cost of repairing components damaged during maintenance will be the responsibility of the owner.

C. Set the used cartridge aside or load onto the hauling truck.

D. Continue steps a through c until all cartridges have been removed.

Method 2:

A. This activity will require that maintenance personnel enter the vault to remove the cartridges from the under drain manifold and place them under the vault opening for lifting (removal). Disconnect each filter cartridge from the underdrain connector by rotating counterclockwise 1/4 of a turn. Roll the loose cartridge, on edge, to a convenient spot beneath the vault access.

B. Unscrew the cartridge cap.

C. Remove the cartridge hood and float.

D. At location under structure access, tip the cartridge on its side.

E. Empty the cartridge onto the vault floor. Reassemble the empty cartridge.

F. Set the empty, used cartridge aside or load onto the hauling truck.

G. Continue steps a through e until all cartridges have been removed.

8. Remove accumulated sediment from the floor of the vault and from the forebay. This can most effectively be accomplished by use of a vacuum truck.
9. Once the sediments are removed, assess the condition of the vault and the condition of the connectors.
10. Using the vacuum truck boom, crane, or tripod, lower and install the new cartridges. Once again, take care not to damage connections.
11. Close and fasten the door.
12. Remove safety equipment.
13. Finally, dispose of the accumulated materials in accordance with applicable regulations. Make arrangements to return the used **empty** cartridges to Contech Engineered Solutions.

Material Disposal

The accumulated sediment found in stormwater treatment and conveyance systems must be handled and disposed of in accordance with regulatory protocols. It is possible for sediments to contain measurable concentrations of heavy metals and organic chemicals (such as pesticides and petroleum products). Areas with the greatest potential for high pollutant loading include industrial areas and heavily traveled roads.

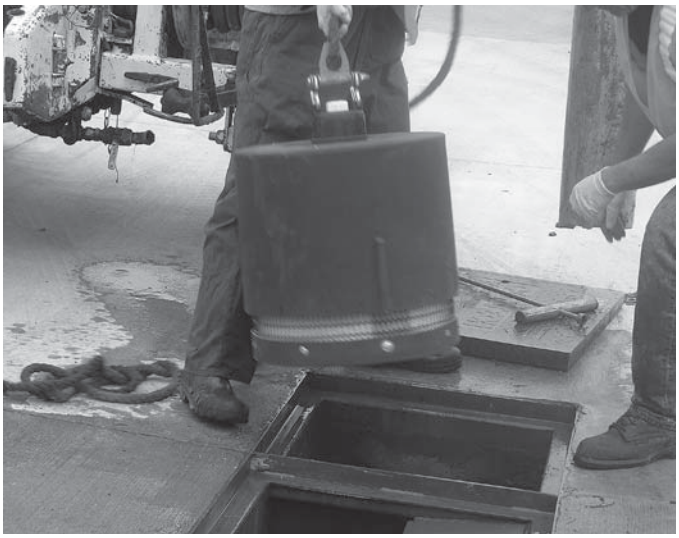
Sediments and water must be disposed of in accordance with all applicable waste disposal regulations. When scheduling maintenance, consideration must be made for the disposal of solid and liquid wastes. This typically requires coordination with a local landfill for solid waste disposal. For liquid waste disposal a number of options are available including a municipal vacuum truck decant facility, local waste water treatment plant or on-site treatment and discharge.

Related Maintenance Activities - Performed on an as-needed basis

StormFilter units are often just one of many structures in a more comprehensive stormwater drainage and treatment system.

In order for maintenance of the StormFilter to be successful, it is imperative that all other components be properly maintained. The maintenance/repair of upstream facilities should be carried out prior to StormFilter maintenance activities.

In addition to considering upstream facilities, it is also important to correct any problems identified in the drainage area. Drainage area concerns may include: erosion problems, heavy oil loading, and discharges of inappropriate materials.



Inspection Report

Date: _____ Personnel: _____

Location: _____ System Size: _____ Months in Service: _____

System Type: Vault ☐ Cast-In-Place ☐ Linear Catch Basin ☐ Manhole ☐ Other: _____

Sediment Thickness in Forebay: _____ Date: _____

Sediment Depth on Vault Floor: _____

Sediment Depth on Cartridge Top(s): _____

Structural Damage: _____

Estimated Flow from Drainage Pipes (if available): _____

Cartridges Submerged: Yes ☐ No ☐ Depth of Standing Water: _____

StormFilter Maintenance Activities (check off if done and give description)

☐ Trash and Debris Removal: _____

☐ Minor Structural Repairs: _____

☐ Drainage Area Report _____

Excessive Oil Loading: Yes ☐ No ☐ Source: _____

Sediment Accumulation on Pavement: Yes ☐ No ☐ Source: _____

Erosion of Landscaped Areas: Yes ☐ No ☐ Source: _____

Items Needing Further Work: _____

Owners should contact the local public works department and inquire about how the department disposes of their street waste residuals.

Other Comments:

_____

_____

_____

_____

_____

_____

_____

_____

Review the condition reports from the previous inspection visits.

StormFilter Maintenance Report

Date: _____ Personnel: _____

Location: _____ System Size: _____

System Type: Vault ☐ Cast-In-Place ☐ Linear Catch Basin ☐ Manhole ☐ Other: _____

List Safety Procedures and Equipment Used: _____

_____

_____

System Observations

Months in Service: _____

Oil in Forebay (if present): Yes ☐ No ☐

Sediment Depth in Forebay (if present): _____

Sediment Depth on Vault Floor: _____

Sediment Depth on Cartridge Top(s): _____

Structural Damage: _____

Drainage Area Report

Excessive Oil Loading: Yes ☐ No ☐ Source: _____

Sediment Accumulation on Pavement: Yes ☐ No ☐ Source: _____

Erosion of Landscaped Areas: Yes ☐ No ☐ Source: _____

StormFilter Cartridge Replacement Maintenance Activities

Remove Trash and Debris: Yes ☐ No ☐ Details: _____

Replace Cartridges: Yes ☐ No ☐ Details: _____

Sediment Removed: Yes ☐ No ☐ Details: _____

Quantity of Sediment Removed (estimate?):

Minor Structural Repairs: Yes ☐ No ☐ Details: _____

Residuals (debris, sediment) Disposal Methods: _____

Notes:

_____

_____

_____

_____

_____

_____

_____

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Support

- Drawings and specifications are available at www.conteches.com.
- Site-specific design support is available from our engineers.

Table V-A.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.

Table V-A.3: Maintenance Standards - Closed Detention Systems (Tanks/Vaults) (continued)

Maintenance Component	Defect	Conditions When Maintenance is Needed	Results Expected When Maintenance is Performed
Manhole	Cover Not in Place	Cover is missing or only partially in place. Any open manhole requires maintenance.	Manhole is closed.
	Locking Mechanism Not Working	Mechanism cannot be opened by one maintenance person with proper tools. Bolts into frame have less than 1/2 inch of thread (may not apply to self-locking lids).	Mechanism opens with proper tools.
	Cover Difficult to Remove	One maintenance person cannot remove lid after applying normal lifting pressure. Intent is to keep cover from sealing off access to maintenance.	Cover can be removed and reinstalled by one maintenance person.
	Ladder Rungs Unsafe	Ladder is unsafe due to missing rungs, misalignment, not securely attached to structure wall, rust, or cracks.	Ladder meets design standards. Allows maintenance person safe access.
Catch Basins	See Table V-A.5: Maintenance Standards - Catch Basins	See Table V-A.5: Maintenance Standards - Catch Basins	See Table V-A.5: Maintenance Standards - Catch Basins

Table V-A.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 are not watertight and show signs of rust. Any holes - other than designed holes - in the structure.	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 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 Table V-A.3: Maintenance Standards - Closed Detention Systems (Tanks/Vaults)	See Table V-A.3: Maintenance Standards - Closed Detention Systems (Tanks/Vaults)	See Table V-A.3: Maintenance Standards - Closed Detention Systems (Tanks/Vaults)
Catch Basin	See Table V-A.5: Maintenance Standards - Catch Basins	See Table V-A.5: Maintenance Standards - Catch Basins	See Table V-A.5: Maintenance Standards - Catch Basins

Table V-A.5: Maintenance Standards - Catch Basins

Maintenance Component	Defect	Conditions When Maintenance is Needed	Results Expected When Maintenance is performed
General	Trash & Debris	Trash or debris which is located immediately in front of the catch basin opening or is blocking inletting capacity of the basin by more than 10%. 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. Trash or debris in any inlet or outlet pipe blocking more than 1/3 of its height. Dead animals or vegetation that could generate odors that could cause complaints or dangerous gases (e.g., methane).	No Trash or debris located immediately in front of catch basin or on grate opening. No trash or debris in the catch basin. Inlet and outlet pipes free of trash or debris. No dead animals or vegetation present within the catch basin.
	Sediment	Sediment (in the basin) that exceeds 60 percent of the sump depth as measured from the bottom of basin to invert of the lowest pipe into or out of the basin, but in no case less than a minimum of 6 inches clearance from the sediment surface to the invert of the lowest pipe.	No sediment in the catch basin
	Structure Damage to Frame and/or Top Slab	Top slab has holes larger than 2 square inches or cracks wider than 1/4 inch. (Intent is to make sure no material is running into basin). 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	Top slab is free of holes and cracks. Frame is sitting flush on the riser rings or top slab and firmly attached.
	Fractures or Cracks in Basin Walls/ Bottom	Maintenance person judges that structure is unsound. 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 regrouted and secure at basin wall.
	Settlement/ Misalignment	If failure of basin has created a safety, function, or design problem.	Basin replaced or repaired to design standards.
	Vegetation	Vegetation growing across and blocking more than 10% of the basin opening. 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 Table V-A.1: Maintenance Standards - Detention Ponds	No pollution present.
Catch Basin Cover	Cover Not in Place	Cover is missing or only partially in place. Any open catch basin requires maintenance.	Cover/grate is in place, meets design standards, and is secured
	Locking Mechanism Not Working	Mechanism cannot be opened by one maintenance person with proper tools. Bolts into frame have less than 1/2 inch of thread.	Mechanism opens with proper tools.
	Cover Difficult to Remove	One maintenance person cannot remove lid after applying normal lifting pressure. (Intent is keep cover from sealing off access to maintenance.)	Cover can be removed by one maintenance person.
Ladder	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, meets the design standards, and is installed and aligned with the flow path.

Table V-A.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.	Bars are bent out of shape more than 3 inches. Bars are missing or entire barrier missing. Bars are loose and rust is causing 50% deterioration to any part of barrier.	Bars in place with no bends more than 3/4 inch. Bars in place according to design. Barrier replaced or repaired to design standards.
	Inlet/Outlet Pipe	Debris barrier missing or not attached to pipe	Barrier firmly attached to pipe