

09/22/2021

DRAINAGE REPORT

FOR

Johnny Rodrigues

Rodriguez Commercial Site

AT

4203 78th ST SW
Mukilteo, WA. 98275
Tax No. 00611600009300

BY

BRL Services LLC

September 15, 2021

BRL



9-15-2021

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Executive Summary

Johnny Rodriguez owner and applicant proposes to develop approximately 4.57-acre site located at 4203 78th ST SW, Mukilteo, WA 98275 into a Commercial building site and associated site amenities. The development will be completed in accordance with City of Mukilteo Code.

The site is comprised of 1 existing, tax parcel (00611600009300). A wetland has been located along the western property boundary and extends offsite to the north and west. The parcel will be cleared and graded for commercial building and parking lot. The site is directly accessed from 78th ST SW, a minor collector road.

The surrounding adjacent land use to the north, east, and west primarily commercial properties located to the south across 78th Street Southwest and a Church has been built to the west.

The owner was issued a stop work order (Stop Work Order - 4203 78th St SW, CC-2020-051) for clearing and placing gravel on a surveyed area of 29,927 sf. This plan and report address the City of Mukilteo's concerns of this none permitted onsite work.

This site will provide 2.1 acres of storage yard and a mobile 10 ft x 30 ft job shack within the paved area of the site. Impervious surface is subject to the requirements of the City of Mukilteo and the Washington State Department of Ecology's 2012 Stormwater Management Manual for Western Washington, as amended in 2014 (2014 SWMMWW) and 2019. This report is intended as satisfying the Minimum Requirements 1 through 9 for the City of Mukilteo.

Minimum Requirement #1: Stormwater Site Plan Preparation

See attached Drainage, C-SWPPP and Construction Site Plan Set as prepared by BRL Services LLC dated 9/14/2021.

The project is for the construction of a construction storage site. Less than 2.8 acre of land disturbance will be required for this development. No existing structures have been found on site an existing drainfield records however has been determined. The soils found onsite are Alderwood Gravelly sandy loam and Alderwood-Urban land complex as identified in the Snohomish County Soil Map. See attached.

The following is a breakdown of impervious surfaces:

Pre-developed Pervious

Forested Moderate	4.57 ac
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Proposed Development Impervious

Asphalt / parking	2.10 ac
Driveway	0.12 ac

Frontage Improvements

Sidewalks	0.05 ac
Road to center line	0.14 ac

Pond	0.09ac
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Proposed Development Pervious

Landscaping	0.21 ac
Undeveloped Forest	1.86 ac

Total = 4.57 ac

Minimum Requirement #2: Construction Stormwater Pollution Prevention

For additional information see the SWPPP prepared for the Washington State Department of Ecology Prepared by BRL Services LLC Brian R Lindsay (CESCL).

C- SWPPs Elements #1-13 are required.

1. Clearing limits will be marked with high visibility fence.
2. Construction entrance will utilize the existing driveway accesses.
3. There is a minor potential for soil erosion since the adjacent property is downstream of the site. The intent is to install a silt-fencing and provide ground cover for all denuded areas.
4. Sediment controls will be shown on the plan and consists of the gravel construction driveway entrance, silt fences, straw wattles and replanting grass/lawn on all disturbed areas and CB protection to structures downstream of site entrances.
5. Soil stabilization notes will be added to the plans.
6. The site has minor slopes to protect. The intent is to install a silt-fencing and provide ground cover and or temporary plastic sheeting for all stockpile areas.
7. See #4 above.
8. The downstream storm system will be protected by providing downspouts at roof locations and bioretention areas within the landscape areas. During construction CB protection will be provided at the existing downstream Catch Basins.
9. Standard construction notes will be added to the plans; there does not appear to be a problem with controlling pollutants; On-site pollutant management from construction activities will take place.
10. Dewatering issues are anticipated; however dewatering measures will take place as needed and directed by the onsite Geotech.
11. Standard construction plans and erosion control notes will be added to the plan. These notes require maintaining the BMPs.
12. The project will not be phased; seasonal work limitations or clearing/grading restrictions might be deemed necessary pending weather conditions.

13. Protect all Bioretention areas from sedimentation through installation and maintenance of erosion and sediment control BMPs on portions of the site that drain into the Bioretention. Restore the BMPs to their fully functioning condition if they accumulate sediment during construction. Restoring the BMP must include removal of sediment and any sediment-laden Bioretention soils and replacing the removed soils with soils meeting 2014 Stormwater Management Manual for Western Washington Volume II - Chapter 3 - Page 253 the design specification. Prevent compacting Bioretention areas 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. Do not allow muddy construction equipment on the base material or pavement. Do not allow sediment-laden runoff onto permeable pavements. Keep all heavy equipment off existing soils under LID facilities that have been excavated to final grade to retain the infiltration rate of the soils.

Note: For Additional information See the attached City of Mukilteo Construction Erosion and Sedimentation Control Plan BMP.

Requirement #3- Source Control of Pollution

This project will be short in duration for construction. There are no pollutants on-site that water must not come in contact with, except for sedimentation due to soil erosion. The site includes pavement with vehicles which cause pollutants to run with stormwater into receiving bodies of water. This project is a “commercial development”, source control of pollution is required. An Emergency Spill Response Kit (See attached). will be provided on site to control minor liquid spills during and after construction to avoid pavement and vehicle which cause pollutants to run into stormwater. Construction disturbance areas situated along the perimeter of the parking / driveway areas will use silt fencing and or straw wattles to provide water quality for vehicles that might cause pollutants to run with stormwater into receiving bodies of water. All disturbed areas will also have soil amendments per BMP T5.13 Post-Construction Soil Quality and depth. For asphalt areas contributing runoff to the proposed Retention/Detention Pond.

Requirement #4-Preservation of Natural Drainage Systems and Outfall

The project will maintain and preserve the existing sheet flow along the northeast corner of the site flowing overland to Japanese Gulch.

UPSTREAM DRAINAGE

The site has no upstream drainage onto the development area of the property as the land slopes away from the property.

DOWNSTREAM DRAINAGE

This property sheet flows to Japanese Gulch drainage system approximately 250 ft east of the northeast site's boundary. No impacts to the downstream drainage system are anticipated with the development of the Johnny Rodriguez site.

Requirement #5-Onsite Stormwater Management

Per Chapter 13.40 Stormwater Management of the City of Mukilteo Surface Water Management Comprehensive Plan and the Washington State Department of Ecology's 2012 Stormwater Management Manual for Western Washington, as amended in 2014 & 2019 (2014 & 2019 SWMMWW).

List #2: On-site Stormwater Management BMPs for Projects Triggering Minimum Requirements #1 through #9

For each surface, consider the BMPs in the order listed for that type of surface. Use the first BMP that is considered feasible. No other On-site Stormwater is required.

Lawn and landscaped areas: Feasibility Analysis.

1. Post-Construction Soil Quality and Depth in accordance with BMP T5.13: Post-Construction Soil Quality and Depth (p.911). Is **Feasible**, on site soils will be amended to meet this criterion. On-site topsoil will be stockpiled on-site for backfill upon completion of construction.

Roofs: N/A

Proposed BMP's

BMP T5.13: Post-Construction Soil Quality and Depth

BMP T5.18: Reverse Slope Sidewalks

BMP T5.11: Concentrated Flow Dispersion (P905)

BMP T5.12: Sheet Flow Dispersion (P908)

Other Hard Surfaces: Note: A Detention Pond has been provided to attenuate the developed flow runoff to a forested predeveloped flow rate. See the WWHM12 analysis attached to this report.

1. Full Dispersion in accordance with BMP T5.30: Full Dispersion (p.939) Due to site configuration, existing onsite soils and depth to ground water Full dispersion is **not feasible**.
2. Permeable pavement in accordance with BMP T5.15: Permeable Pavements (p.917) Due to existing onsite soils and depth to ground water Permeable Pavement is **not feasible**.
3. Biofiltration swale BMP's (BMP T7.30: Bioretention Cells, Swales, and Planter Boxes (p.959)) that have a minimum horizontally projected surface area below the overflow which is at least 5% of the total surface area draining to it. Bioretention is **feasible**.

4. Sheet Flow Dispersion in accordance with BMP T5.12: Sheet Flow Dispersion (p.908), or Concentrated Flow Dispersion in accordance with BMP T5.11: Concentrated flows from parking areas that will not be removed will receive soil per BMP T5.13 as noted on plan. **not Feasible.**

Minimum Requirement #6-Runoff Treatment

A Biofiltration swale BMP's has been provided for runoff treatment together with a dead storage sediment area per City and DOE requirements.

All disturbed areas will require Post-Construction Soil Quality and Depth in accordance with BMP T5.13. On-site topsoil will be stockpiled on-site for backfill upon completion of construction.

- Topsoil is sandy loam, loamy sand or loam texture (USDA texture triangle).
- Maximum clay content < 5%.
- pH range 5.5 to 6.5.
- Uniform mix free of stones, stumps, roots or other similar material > 2 inches.
- Clean sand (0.02 to 0.04 inches) meeting AASHTO M-6 or ASTM C-33.

Compaction:

- Place soil in lifts of 8 inches.
- If compaction occurs at bottom of facility during excavation, rip to a minimum 12 inches and till 2 to 3 inches of sand into base before backfilling.
- If final grading of soil mix cannot be accomplished by hand, use light, low ground-contact pressure equipment.

Minimum Requirement #7-Flow Control

The proposed Detention Pond with flow control restrictor will attenuate runoff flows to pre-developed forested conditions.

This project conforms to the City of Mukilteo and the Stormwater Management Manual for Western Washington.

See the Attached WWHM2012 Project report for additional information.

Minimum Requirement #8- Wetlands Protection

The Wetland/Ditch areas that was identified on site will be provided with a Silt fencing will be placed up slope of swale for siltation protection.

Minimum Requirement #9- Operation and Maintenance

OPERATION AND MAINTENANCE

Maintenance of the detention pond and conveyance system should be on a yearly basis. Pipes and yard /or catch basins that have more than 2 inches of sediment should be cleaned regularly. For additional information see the attached Operation and Maintenance Manual.

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

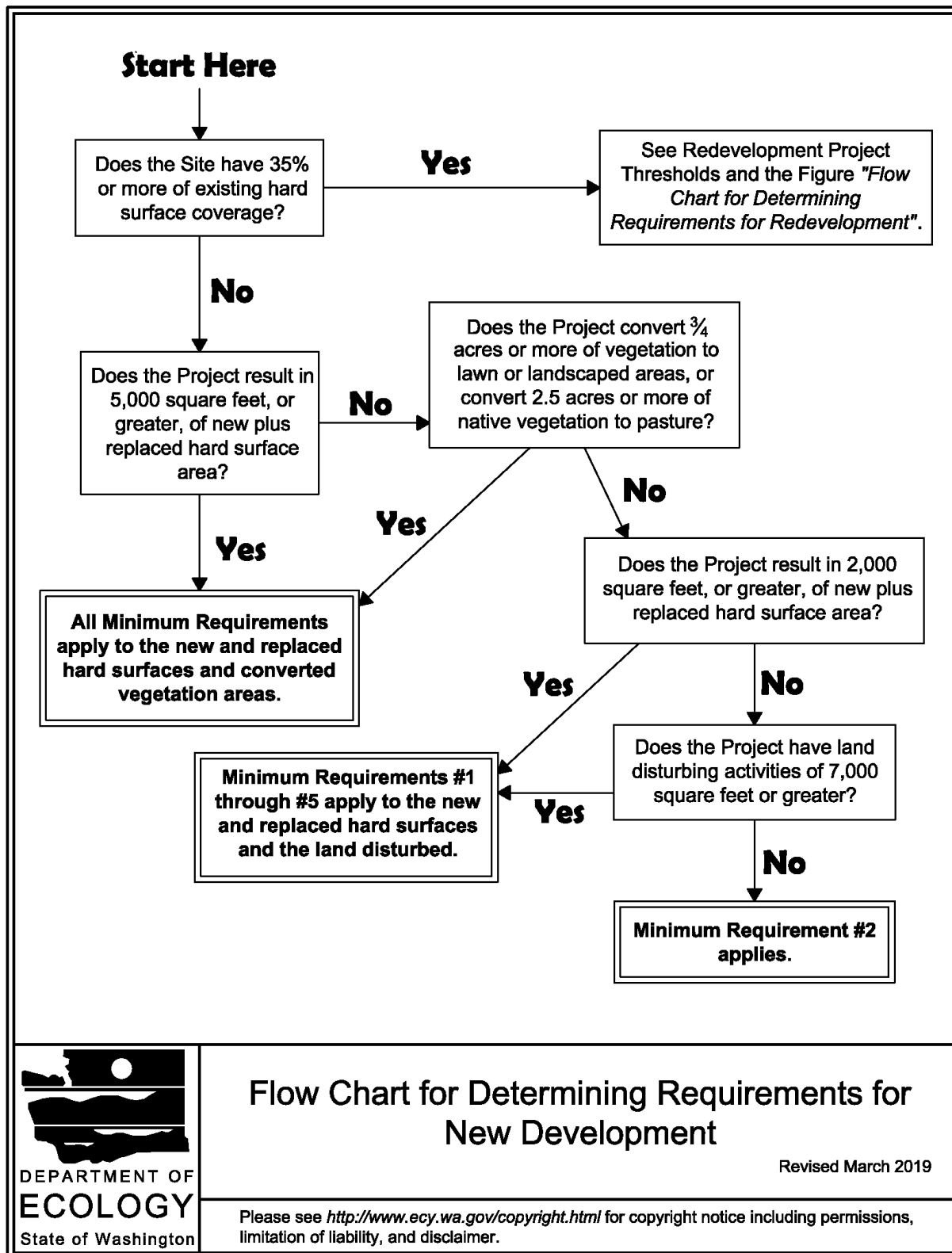


Figure I-3.3: Flow Chart for Determining MR #5 Requirements

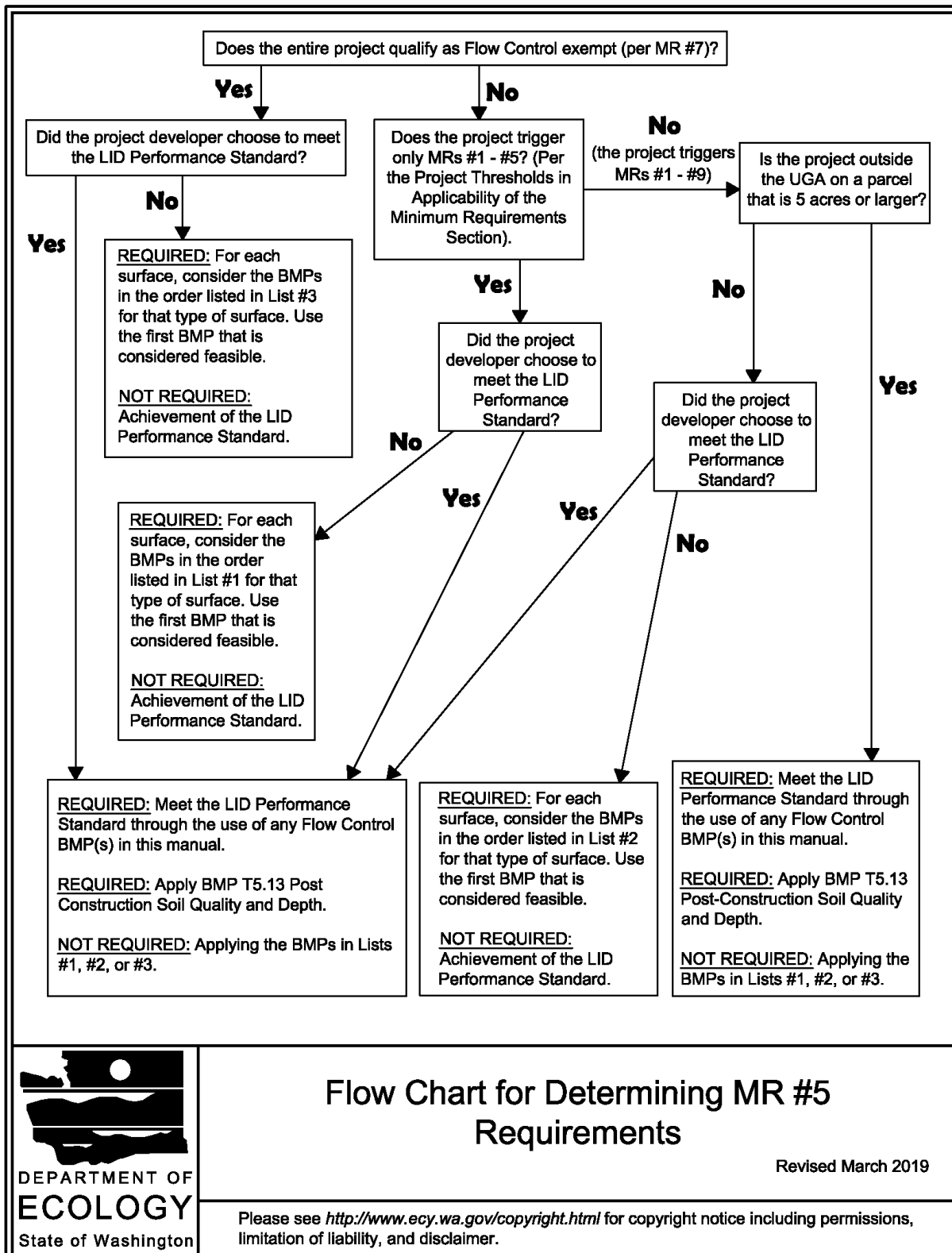


Table I-3.2: The List Approach for MR5 Compliance

List #1 (For MR #1 - #5 Projects That Are Not Flow Control Exempt)	List #2 (For MR #1 - #9 Projects That Are Not Flow Control Exempt)	List #3 (For Flow Control Exempt Pro- jects)
Surface Type: Lawn and Landscaped Areas		
BMP T5.13: Post-Construction Soil Quality and Depth	BMP T5.13: Post-Construction Soil Quality and Depth	BMP T5.13: Post-Construction Soil Quality and Depth
Surface Type: Roofs		
1. BMP T5.30: Full Dis- persion or BMP T5.10A: Downspout Full Infiltration	1. BMP T5.30: Full Dis- persion or BMP T5.10A: Downspout Full Infiltration	1. BMP T5.10A: Downspout Full Infiltration
2. BMP T5.14: Rain Gardens or BMP T7.30: Bioretention	2. BMP T7.30: Bioretention	2. BMP T5.10B: Downspout Dispersion Systems
3. BMP T5.10B: Downspout Dispersion Systems	3. BMP T5.10B: Downspout Dispersion Systems	3. BMP T5.10C: Perforated Stub-out Connections
4. BMP T5.10C: Perforated Stub-out Connections	4. BMP T5.10C: Perforated Stub-out Connections	
Surface Type: Other Hard Surfaces		
1. BMP T5.30: Full Dis- persion	1. BMP T5.30: Full Dis- persion	BMP T5.12: Sheet Flow Dis- persion or BMP T5.11: Concentrated Flow Dispersion
2. BMP T5.15: Permeable Pavements or BMP T5.14: Rain Gardens or BMP T7.30: Bioretention	2. BMP T5.15: Permeable Pavements	
3. BMP T5.12: Sheet Flow Dispersion or BMP T5.11: Concentrated Flow Dispersion	3. BMP T7.30: Bioretention 4. BMP T5.12: Sheet Flow Dispersion or BMP T5.11: Concentrated Flow Dispersion	
Notes for using the List Approach:		
1. Size BMP T5.14: Rain Gardens and BMP T7.30: Bioretention used in the List Approach to have a minimum horizontal projected surface area below the overflow which is at least 5% of the area drain-		

Figure I-3.5: Flow Chart for Determining Wetland Protection Level Requirements

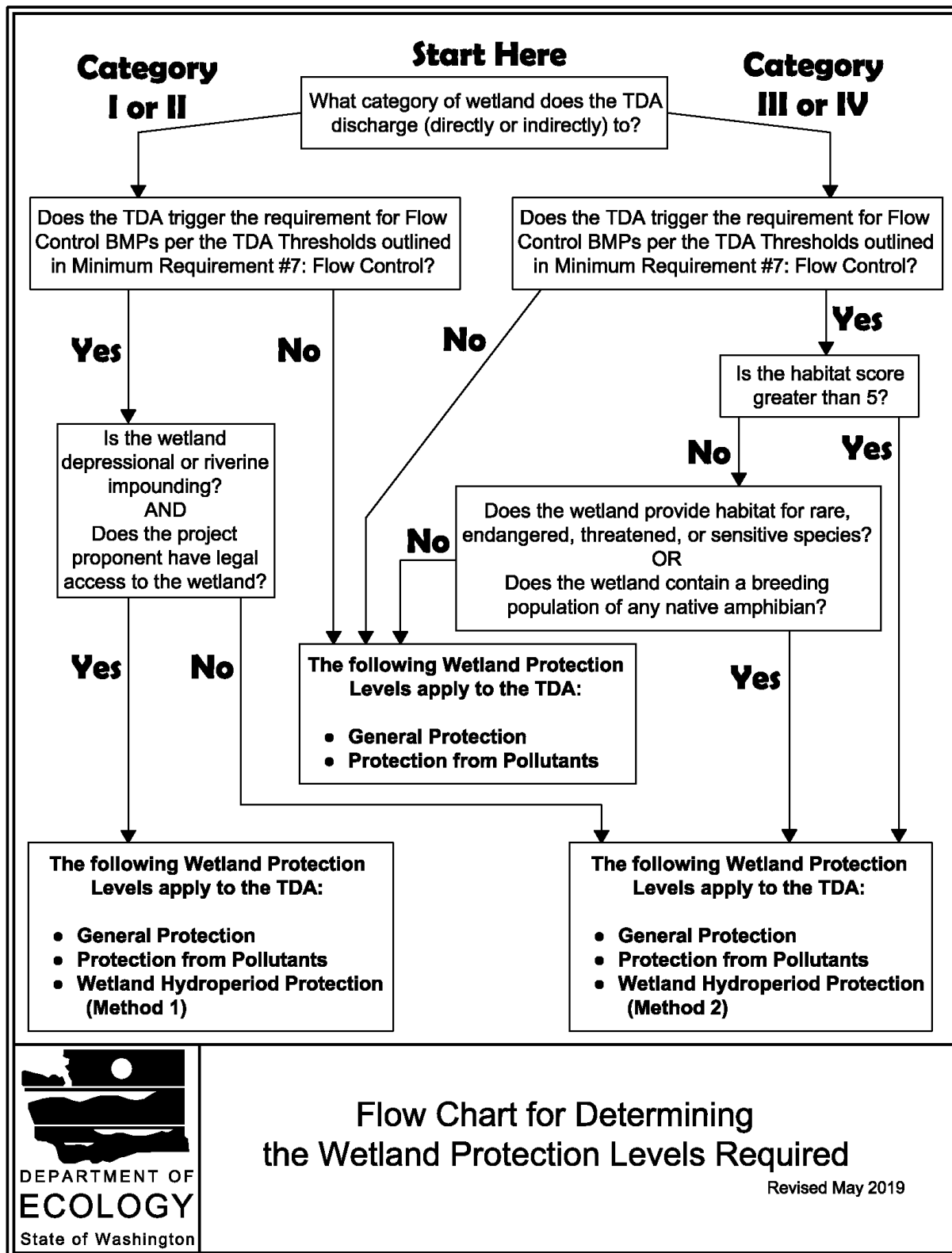
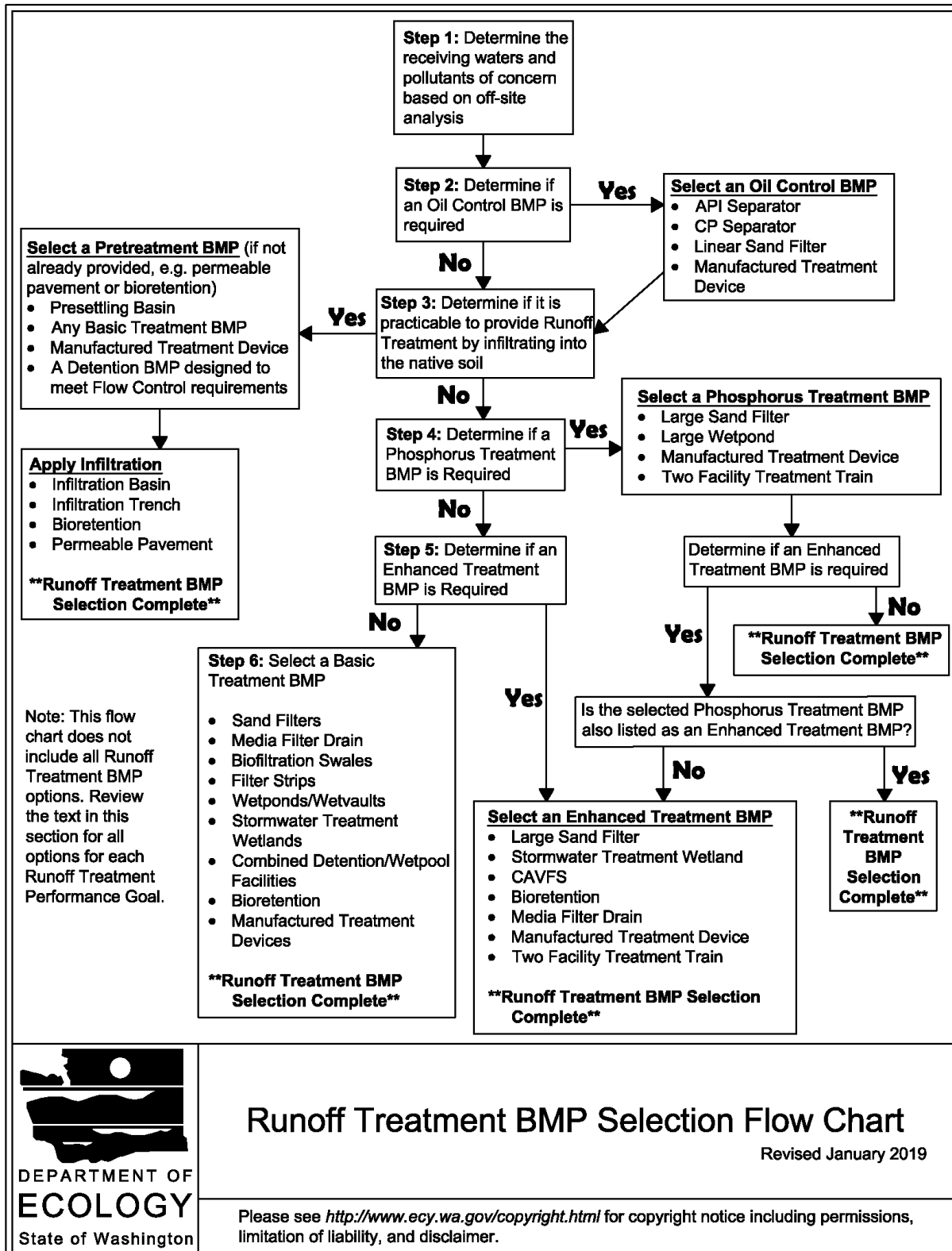


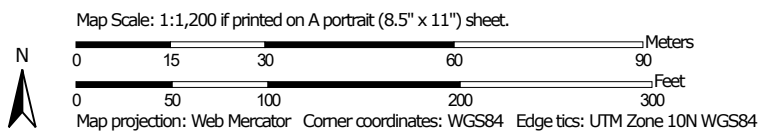
Figure III-1.1: Runoff Treatment BMP Selection Flow Chart



Soil Map—Snohomish County Area, Washington (Rodrigues)



Soil Map may not be valid at this scale.



**Natural Resources
Conservation Service**

Web Soil Survey
National Cooperative Soil Survey

9/15/2021
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Soil Map—Snohomish County Area, Washington
(Rodrigues)

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: Snohomish County Area, Washington

Survey Area Data: Version 22, 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: Sep 2, 2018—Sep 25, 2018

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
1	Alderwood gravelly sandy loam, 0 to 8 percent slopes	3.8	73.4%
6	Alderwood-Urban land complex, 8 to 15 percent slopes	1.4	26.6%
Totals for Area of Interest		5.2	100.0%

Appendix A

OPERATION & MAINTENANCE MANUAL

SECTION III

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OPERATION & MAINTENANCE MANUAL

CATCH BASINS/MANHOLES

Maintenance Component	Defect	Conditions When Maintenance is Needed	Desired Conditions
General	Trash & debris (Includes Sediment)	Trash or debris of more than $\frac{1}{2}$ ft ³ which is located immediately in front of the catch basin opening or is blocking capacity of the basin by more than 10%.	No trash or debris located immediately in front of catch basin opening.
		Trash or debris (in the basin) that exceeds $\frac{1}{3}$ of its height.	Inlet and outlet pipes free of trash or debris.
		Dead animals or vegetation that could generate odors that could cause complaints or dangerous gases (i.e. methane).	No dead animals or vegetation present within the catch basin.
		Deposits of garbage exceeding 1 ft ³ in volume.	No condition present which would attract or support the breeding of insects or rodents.
	Structure Damage to Frame and/or top slab	Corner of frame extends more than $\frac{3}{4}$ " past curb face into the street (if applicable).	Frame is even with curb.
		Top slab has holes larger than 2 in ² or cracks wider than $\frac{1}{4}$ " (intent is to make sure all material is running into basin).	Top slab is free of holes & cracks.
		Frame not sitting flush on top slab; i.e. separation of more than $\frac{3}{4}$ " of the frame from the top slab.	Frame is sitting flush on top slab.
	Cracks in Basin Walls/ Bottom	Cracks wider than $\frac{1}{2}$ " and longer than 3 ft, any evidence of soil particles entering catch basin through cracks, or maintenance person judges that structure is unsound.	Basin replaced or repaired to design standards.
		Cracks wider than $\frac{1}{2}$ " and longer than 1 ft at the joint of any inlet/outlet pipe or any evidence of soil particles entering catch basin through cracks.	No cracks more than $\frac{1}{4}$ " wide at the joint of inlet/outlet pipe.
	Sediment/Mis-alignment	Basin has settled more than 1" or has rotated more than 2" out of alignment.	Basin replaced or repaired to design standards.
	Fire Hazard	Presence of chemicals such as natural gas, oil, and/or gasoline.	No flammable chemicals present.
	Vegetation	Vegetation growing across & blocking more than 10% of the basin opening.	No Vegetation blocking opening to basin.
		Vegetation growing in inlet/outlet pipe joints that is more than 6" tall and less than 6" apart.	No vegetation or root growth present.
	Pollution	Non-flammable chemicals of more than $\frac{1}{2}$ ft ³ per 3 ft of basin length.	No pollution present other than surface film.

OPERATION & MAINTENANCE MANUAL

CATCH BASINS/MANHOLEs

Maintenance Component	Defect	Conditions When Maintenance is Needed	Desired Conditions
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 Working	Mechanism cannot be opened by 1 maint. person with proper tools. Bolts into frame have less than 1/2" of thread.	Mechanism opens with proper tools.
	Cover Difficult to Remove	1 Maint. person cannot remove lid after applying 80 lbs of lift; intent is to keep cover from sealing off access to maintenance personnel.	Cover can be removed by 1 maint. person.
Ladder	Ladder rungs Unsafe	Ladder is unsafe due to missing rungs, misalignment, rust, cracks, or sharp edges.	Ladder meets design standards & allows maint. personnel safe access.
Metal Grates (if applicable)		Grate with opening wider than 7/8"	Grate meets design standards.
	Trash & Debris	Trash & debris that is blocking more than 20% of grate surface.	Grate is free of trash & debris.
	Damaged or Missing	Grate missing or broken member(s) of the grate.	Grate is in place & meets design standards.

OPERATION & MAINTENANCE MANUAL

CONVEYANCE SYSTEMS (PIPES, DITCHES, & SWALES)

Maintenance Component	Defect	Conditions When Maintenance is Needed	Desired Conditions
Pipes	Sediment & Debris	Accumulated sediment that exceeds 20% of the pipe.	Pipe cleaned of all sediment & debris.
	Vegetation	Vegetation that reduces free movement of water through pipes.	All vegetation removed so water flows freely through pipe.
	Damaged	Protective coating is damaged; rust is causing more than 50% deterioration to any part of the pipe.	Pipe repaired or replaced.
		Any dent that decreases the cross sectional area of the pipe by more than 20%.	Pipe repaired or replaced.
Open Ditches	Trash & Debris	Trash & debris exceeds 1 ft ³ per 1,000 ft of ditch and slopes.	Trash and debris cleared from ditches.
	Sediment	Accumulated sediment that exceeds 20% of the design depth.	Ditch cleaned/flushed of all sediment and debris so that it matches design.
	Vegetation	Vegetation that reduces free movement of water through ditches.	Water flow freely through ditches.
	Erosion Damage to Slopes	See "Ponds" standard.	See "Ponds" standard.
	Rock Lining out of place or Missing (if Applicable)	Maintenance person can see native soil beneath the rock lining.	Replace rocks to design standards.
Swales	Trash & Debris	See above for ditches	See above for ditches.
	Sediment buildup	See above for ditches	Vegetation may need to be replanted after cleaning.
Catch Basins		See "Catch Basins" standard.	See "Catch Basins" standard.
Debris Barriers (e.g. Trash Rack)	Sediment & Debris	Accumulated sediment/debris that exceeds 20% the inlet opening.	Debris barrier is free of sediment & debris.
	Vegetation	Vegetation obstructs more than 20% of the inlet opening.	Debris barrier is free of obstructing vegetation.

OPERATION & MAINTENANCE MANUAL

Bio-Retention Areas (SWALE)

Maintenance Component	Defect	Conditions When Maintenance is Needed	Desired Conditions
Bio-Retention swale	Sediment Accumulation on Grass Layer	Sediment depth exceeds 2".	No sediment deposits on grass layer of the bio-swale, which would impede filtration of runoff.
	Vegetation	When the grass becomes excessively tall (greater than 10"); when nuisances weeds and other vegetation starts to take over.	Vegetation is mowed or nuisance vegetation is eradicated, such that flow is not impeded. Grass should be mowed to a height between 4 & 9 inches.
	Inlet/Outlet Pipe	Inlet/outlet pipe clogged with sediment/debris.	No clogging or blockage in the inlet or outlet piping.
	Trash & Debris Accumulation	Trash and debris accumulated in the bio-swale.	Trash and debris removed from bio-swale.
	Erosion/Scouring	Where the bio-swale has eroded or scoured the bottom due to flow channelization or higher flows.	Bio-swales should be re-graded and re-seeded to specification, to eliminate channeled flow. Overseeded when bare spots are evident.

OPERATION & MAINTENANCE MANUAL

WET PONDS

Maintenance Component	Defect	Conditions When Maintenance is Needed	Desired Conditions
Wetpond	Vegetation	Vegetation such as grass and weeds need to be mowed when it starts to impede aesthetics of pond. Mowing is generally required when height exceeds 18". Mowed vegetation should be removed from areas where it could enter the pond, either when the pond level rises, or by rainfall runoff.	Vegetation should be mowed to 4-5" in height. Trees and bushes should be removed where they are interfering with pond maintenance activities.
	Trash & Debris	Accumulation that exceeds 1 ft ³ per 1000 ft ² of pond area.	Trash & debris removed from pond.
	Sediment Accumulation in Pond Bottom	Sediment accumulations in pond bottom that exceeds the depth of sediment zone plus 6", usually the first cell.	Removal of sediment from pond bottom.
	Oil Sheen on Water	Prevalent and visible oil sheen.	Removal of oils from pond surface.
	Erosion	Erosion of the pond's side slopes and/or scouring of the pond bottom, that exceeds 6", or where continued erosion is prevalent.	Slopes should be stabilized by using proper erosion control measures, and repair methods.
	Settlement of Pond Dike/Berm	Any part of these components that has settled 4" or lower than the design elevation, or inspector determines dike/berm is unsound.	Dike/berm is repaired to specifications.
	Rock Window	Rock window is clogged with sediment.	Window is free of sediment and debris.
	Overflow Spillway	Rock is missing and soil is exposed at top of spillway or outside slope.	Replace rocks to specifications.

OPERATION & MAINTENANCE MANUAL

DETENTION PONDS

Maintenance Component	Defect	Conditions When Maintenance is Needed	Desired Conditions
General	Trash & Debris	Any trash and debris which exceeds 1 ft ³ per 1,000 ft ² (this is about equal to the amount of trash it would take to fill up one standard size office garbage can). In general, there should be no visual evidence of dumping.	Trash and debris cleared from site.
	Poisonous Vegetation	Any poisonous or nuisance vegetation which may constitute a hazard to maint. personnel.	No danger of poisonous vegetation where maint. personnel or the public might normally be.
	Pollution	Oil, gasoline, or other contaminants of 1 gal or more of any amount found that could: 1) cause damage to plant, animal, or marine life 2) constitute a fire hazard; or 3) be flushed downstream during rain storms.	No contaminants present other than a surface film.
	Un-mowed Grass/ Ground Cover	If facility is located in private residential area, mowing is needed when grass exceeds 18" in height. In other areas, the general policy is to make the pond match the adjacent ground cover and terrain as long as there is no interference with the function of the facility.	When mowing is needed, grass/ground cover should be mowed to 2" in height. Mowing of selected higher use areas rather than the entire slope may be acceptable for some situations.
	Vegetation is not growing	For grassy ponds, grass cover is sparse & weedy or is overgrown. For wetland ponds, plants are spars or invasive species are present.	For grassy ponds, selectively thatch, aerate, & reseed ponds. Grass cutting unnecessary unless dictated by aesthetics. For wetland ponds, hand plant nursery grown wetland plants in bare areas. Pond bottoms should have uniform dense coverage of desired plant species.
	Rodent Holes	Any evidence of rodent holes if facility is acting as a dam or berm, or evidence of water piping through dam or berm via rodent holes.	Rodents destroyed and the dam or berm repaired.
	Insects	When insects such as wasps and hornets interfere with maint. activities.	Insects destroyed or removed from site.
Side slopes of Pond	Tree Growth	Tree growth does not allow maintenance access or interferes with maintenance activity (i.e. slope mowing, silt removal, vactoring, or equipment movements). If trees are not interfering with access, leave trees alone.	No trees are to be allowed in detention ponds.
	Erosion	Eroded damage over 2" deep where cause of damage is still present or where there is potential for continued erosion.	Slopes should be stabilized by using appropriate erosion control measure(s); e.g., rock reinforcement, planting of grass, compaction.

OPERATION & MAINTENANCE MANUAL

DETENTION PONDS

Maintenance Component	Defect	Conditions When Maintenance is Needed	Desired Conditions
Storage Area	Sediment	Accumulated sediment that exceeds 10% of the designed pond depth.	Sediment cleaned out to designed pond shape and depth; pond reseeded if necessary to control erosion.
Pond Dikes	Settlement	Any part of dike which has settled 4" lower than the design elevation.	Dike should be built back to the design elevation.
Emergency/ Overflow Spillway	Rock Missing	Only one later of rock exists above native soil in area 5 ft ² or larger, or any exposure of native soil at the top of out flow path of spillway. Rip-rap on inside slopes need not be replaced.	Replace rocks to design standards.

OPERATIONS & MAINTENANCE

CONTROL STRUCTURE/FLOW RESTRICTOR

Maintenance Component	Defect	Conditions When Maintenance is Needed	Desired Conditions
General	Trash & Debris (Includes Sediment)	Distance between debris build-up & bottom of orifice plate is less than 1-1/2 feet.	All trash, debris, & sediment is removed.
	Structural Damage	Structure is not securely attached to manhole wall & outlet pipe structure should support at least 1,000 lbs of up or down force.	Structure firmly attached to wall & outlet pipe.
		Structure is not in upright position (allow up to 10% from plumb)	Structure in correct position.
		Connections to outlet pipe are not water tight and show signs of rust.	connections to outlet pipe are water tight; structure repaired or replaced and functions as designed.
		Any holes-other than by design-in	Structure has no holes the structure other than by design.
Cleanout Gate	Damaged or Missing	Cleanout gat is not water tight or is missing	Gate is water tight and functions as designed.
		Gate can not be moved up and down by one maintenance person.	Gate moves up and down easily & is water tight.
		Chain lading to gate is missing or damaged.	Gate is repaired or replaced to meet design standards.
		Gate s rusted over 50% of its surface area.	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” standards.	See “Closed Detention Systems” standards.
Catch Basin		See “Catch Basins/Manhole” standards.	See “Catch Basins” standards.

OPERATIONS & MAINTENANCE

ENERGY DISSIPATERS

Maintenance Component	Defect	Conditions When Maintenance is Needed	Desired Conditions
Rock Pad	Missing or moved rock	Only one layer of rock exists above native soil in area 5 ft ² or larger, or any exposure of native soil.	Replace rocks to design standard.
Rock-filled trench for pond discharge	Missing or moved rock	Trench is not full of rock.	Add large rock (± 30 lbs each) so that rock is visible above edge of trench.
Dispersion trench	Pipe Plugged with sediment	Accumulated sediment that exceeds 20% of the design depth.	Pipe cleaned/flushed.
	Perforations plugged	Over ½ of perforations in pipe are plugged with debris and sediment.	Clean or replace perforated pipe.
	Not discharging water properly	Visual evidence of water discharging at concentrated points along trench (normal condition is a “sheet flow” of water along trench). Intent is to prevent erosion damage.	Pipe must be replaced or trench must be redesigned/rebuilt to standards.
	Water flows out top of “distributor” catch basin	Maintenance person observes water flowing out during any storm less than the design storm or it is causing or appears likely to cause damage.	Facility must be rebuilt or redesigned to standards. Pipe is probably plugged or damaged and needs replacement.
	Receiving area over-saturated	Water in receiving area is causing or has potential of causing landslide.	Stabilize slope with grass or other vegetation, or rock if condition is severe. Contact a professional engineer for evaluation.

OPERATIONS & MAINTENANCE

GATES

Maintenance Component	Defect	Conditions When Maintenance is Needed	Desired Conditions
General	Damaged or missing components	Gate is broken, jammed, or missing.	Pond has a functioning gate to allow entry of people and maintenance equipment such as mowers and backhoe.
		Broken or missing hinges such that gate cannot be easily opened and closed by a maintenance person.	Hinges intact and lubed. Gate is working freely.
		Gate is out of plumb more than 6" and more than 1 ft out of design alignment.	Gate is aligned and vertical.
		Missing stretcher bands and ties.	Stretcher bar, bands, and ties in place.

OPERATIONS & MAINTENANCE

ACCESS ROADS/EASMENTS

Maintenance Component	Defect	Conditions When Maintenance is Needed	Desired Conditions
General	Blocked Roadway	Debris which could damage vehicle tires (glass or metal).	Roadway free of debris which could damage tires.
		Any obstructions which reduce clearance above road surface to less than 14 ft.	Roadway overhead clear to 14 ft high.
		Any obstructions restricting the access to less than 15 ft width.	Obstruction removed to allow at least 15 ft wide access.
Road Surface	Settlement, potholes, mush spots, ruts	When any surface irregularity exceeds 6" in depth and 6 ft ² . In general, any surface defect which hinders or prevents maintenance access	Road surface uniformly smooth with no evidence of settlement, potholes, mush spots, or ruts. Occasionally application of additional gravel or pitrun rock will be needed.
	Vegetation in road surface	Woody growth that could block vehicular access. Excessive weed cover.	Remove woody growth at early stage to prevent vehicular blockage. Cut back weeds if they begin to encroach on road surface.
Shoulders & Ditches	Erosion damage	Erosion within 1 ft of the roadway more than 8" wide and 6" deep.	Shoulder free of erosion and matching the surrounding road.

OPERATIONS & MAINTENANCE

FENCING/SHRUBBERY SCREEN/OTHER LANDSCAPING

Maintenance Component	Defect	Conditions When Maintenance is Needed	Desired Conditions
General	Missing or broken/dead shrubbery	Any defect in the fence or screen that permits easy entry to a facility.	Fence is mended or shrubs replaced to form a solid barrier to entry.
	Erosion	Erosion has resulted in an opening under a fence that allows entry by people or pets.	replace soil under fence so that no opening exceeds 4" in height.
	Unruly vegetation	Shrubbery is growing out of control or is infested with weeds.	Shrubbery is trimmed and weeded to provide appealing aesthetics. Do not use chemicals to control weeds.
Wire Fences	Damaged parts	Posts out of plumb more than 6".	Posts plumb to within 1-1/2" of plumb.
		top rails bent more than 6".	Top rail free of bends greater than 1".
		Any part of fence (including posts, top rails, and fabric) more than 1 ft out of design alignment.	Fence is aligned and meets design standards.
		Missing or loose tension wire.	Tension wire in place and holding fabric.
	Deteriorated paint or protective coating	Missing or lose barbed wire that is sagging more than 2-1/2" between posts.	Barbed wire in place with less than 3/4" sag between posts.
		Extension arm missing, broken, or bent out of shape more than 1-1/2".	Extension arm in place with no bends larger than 3/4".
		Part or parts that have a rusting or scaling condition that has affected structural adequacy.	Structurally adequate posts or parts with a uniform protective coating.
	Openings in fabric	Openings in fabric are such that an 8" diameter ball could fit through.	No openings in fabric.