

**Stormwater Facilities
Puget Sound Energy
Operational Training Center
325 Todd Road NW
Puyallup, Washington**
Tax Parcel Numbers:
04202-11030

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May 2024

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Operation & Maintenance Guidance

Operation and Maintenance

The property owner shall maintain, operate, and repair the stormwater facilities in compliance with the requirements of the City of Puyallup Stormwater requirements, the current edition of the Department of Ecology Stormwater Management Manual (DOE Manual). This maintenance plan shall be followed for conducting maintenance for the private systems to ensure that facilities are adequately maintained and operated. Pollution should be controlled at the source to the maximum extent possible. Other specific maintenance responsibilities are discussed below.

Stormwater discharges from the private stormwater management systems flow to municipal drainage systems operated by the City of Puyallup, giving the City jurisdiction to inspect the private system for compliance with maintenance requirements.

Maintenance Frequency

Stormwater facilities shall be inspected at least twice per year and shall be cleared of debris, sediment and vegetation when they affect the functioning and/or design capacity of the facility. Preferably, inspections will occur in spring (April) and fall (October). In addition, the Modular Wetland System (MWS) treatment facility has specific recommendations from the manufacturer for maintenance.

Maintenance Equipment

- Vactor truck
- Flush wash truck
- Submersible trash pump and hose to reach vault
- Shovels, rakes, buckets, and other typical landscaping tools

Maintenance Responsibilities

Facility	Responsibility
Storm Drains / Conveyance Systems	Property Owner (private)
Bioretention Cells	Property Owner (private)
Stormwater Detention Systems	Property Owner (private)
Downspouts & Footing Drains	Property Owner (private)

City of Puyallup may, at their exclusive discretion, unilaterally assume storm water facilities operations and maintenance responsibilities at the expense of the Property Owner if they determine that the responsible entity is not inspecting, operating, maintaining, and/or repairing the stormwater facilities per this plan.

Operational Source Control BMPs

Operational Source Control BMPs are non-structural practices that prevent or reduce pollutants from entering stormwater. They include formation of a pollution prevention team, good housekeeping practices, preventive maintenance procedures, spill prevention and cleanup, employee training, inspections of pollution sources, and recordkeeping. The following BMPs must be implemented.

- Assign one or more individuals to be responsible for stormwater pollution control. The Property Owner shall appoint a person as Facility Manager that shall be responsible for managing and implementing this plan. The Property Owner may hire a contractor or management company to act as Facility Manager.
- Promptly contain and cleanup solid and liquid pollutant leaks and spills including oils, solvents, fuels and dust. The Facility Manager will contact the regulatory agencies regarding spill response activities.
- Clean oils, debris, sludge, etc, from all systems regularly. All pavements and storm drain systems shall be inspected for these pollutants in accordance with the Maintenance Schedule.
- Inspect and clean treatment systems, conveyance systems, and catch basins as needed.
- Do not conduct outside spraying, grit blasting, or sanding activities.

- Educate residents in identifying pollutant sources and in understanding pollutant control measures, spill response procedures, and environmentally acceptable material handling practices. The Property Owner shall provide residents will information regarding pollutant control measures and spill response procedures annually.
- Maintain a Maintenance Log (see Exhibit 1) and keep such record for three years. The log should include: scope of the inspection, the personnel conducting the inspection, the date of the inspection, major observations relating to the implementation of the maintenance plan, and actions taken to correct BMP inadequacies.
- Conduct inspections in accordance with the Operation and Maintenance Log no less than twice annually.

Structural Source Control BMPs

Structural Source Control BMPs are physical, structural, or mechanical devices or facilities that are intended to prevent pollutants from entering stormwater.

- Maintain the stormwater facilities as per the original design and in proper working order.
- Make changes to the system only when approved by a qualified individual.

Agency Notification Contact Reference List

Agency & Responsibility	Phone Contacts
Fire Department <ul style="list-style-type: none"> ▪ Fire Fighting ▪ Emergency medical response ▪ Community evaluation 	911
Police Department <ul style="list-style-type: none"> ▪ Police authority 	911
Hospital <ul style="list-style-type: none"> ▪ Emergency medical treatment 	911
Washington State Department of Ecology Toxics Cleanup Program <ul style="list-style-type: none"> ▪ Reporting spills to soils 	(360) 407-7170
National Response Center <ul style="list-style-type: none"> ▪ Reporting spills to water 	(800) 424-8802
Washington State Emergency Management Division <ul style="list-style-type: none"> ▪ Reporting spills to water 	(800) 258-5990
City of Puyallup <ul style="list-style-type: none"> • Public Works 	(253) 841-5505

Operation and Maintenance Tasks

Detention Ponds

Control Structure/Flow Restrictor

Catch Basins

Debris Barriers

Energy Dissipators

Baffle Oil/Water Separators

Coalescing Plate Oil/Water Separators

Catch Basin Inserts

Bioretention Facilities

Oil Stop Valve

Trench Drain

Grounds

Disposal of Trash Debris and Sediment

Grounds

Maintenance Component	Defect	Conditions When Maintenance is Needed	Results Expected When Maintenance is Performed
General	Weeds (Nonpoisonous)	Weeds growing in more than 20% of the landscaped area (trees and shrubs only).	Weeds present in less than 5% of the landscaped area.
	Safety Hazard	Any presence of poison ivy or other poisonous vegetation.	No poisonous vegetation present in landscaped area.
	Trash or Litter	Paper, cans, bottles, totaling more than 1 cubic foot within a landscaped area (trees and shrubs only) of 1,000 square feet.	Area clear of litter.
Trees and Shrubs	Damaged	Limbs or parts of trees or shrubs that are split or broken which affect more than 25% of the total foliage of the tree or shrub.	Trees and shrubs with less than 5% of total foliage with split or broken limbs.
		Trees or shrubs that have been blown down or knocked over.	Tree or shrub in place free of injury.
		Trees or shrubs which are not adequately supported or are leaning over, causing exposure of the roots.	Tree or shrub in place and adequately supported; remove any dead or diseased trees.

Grounds Operations & Maintenance Notes:

Grounds shall be inspected a minimum of semi-annually and increased as necessary in the growing season.

Appendix V-A: BMP Maintenance Tables

Ecology intends the facility-specific maintenance standards contained in this section to be conditions for determining if maintenance actions are required as identified through inspection. Recognizing that Permittees have limited maintenance funds and time, Ecology does not require that a Permittee perform all these maintenance activities on all their stormwater BMPs. We leave the determination of importance of each maintenance activity and its priority within the stormwater program to the Permittee. We do expect, however, that sufficient maintenance will occur to ensure that the BMPs continue to operate as designed to protect ground and surface waters.

Ecology doesn't intend that these measures identify the facility's required condition at all times between inspections. In other words, exceedance of these conditions at any time between inspections and/or maintenance does not automatically constitute a violation of these standards. However, based upon inspection observations, the Permittee shall adjust inspection and maintenance schedules to minimize the length of time that a facility is in a condition that requires a maintenance action.

Table V-A.1: Maintenance Standards - Detention Ponds

Maintenance Component	Defect	Conditions When Maintenance Is Needed	Results Expected When Maintenance Is Performed
General	Trash & Debris	Any trash and debris which exceed 1 cubic feet per 1,000 square feet. In general, there should be no visual evidence of dumping. If less than threshold all trash and debris will be removed as part of next scheduled maintenance.	Trash and debris cleared from site
	Poisonous Vegetation and noxious weeds	Any poisonous or nuisance vegetation which may constitute a hazard to maintenance personnel or the public. Any evidence of noxious weeds as defined by State or local regulations. (Apply requirements of adopted IPM policies for the use of herbicides).	No danger of poisonous vegetation where maintenance personnel or the public might normally be. (Coordinate with local health department) Complete eradication of noxious weeds may not be possible. Compliance with State or local eradication policies required
	Contaminants and Pollution	Any evidence of oil, gasoline, contaminants or other pollutants (Coordinate removal/cleanup with local water quality response agency).	No contaminants or pollutants present.
	Rodent Holes	Any evidence of rodent holes if facility is acting as a dam or berm, or any evidence of water piping through dam or berm via rodent holes.	Rodents destroyed and dam or berm repaired. (Coordinate with local health department; coordinate with Ecology Dam Safety Office if pond exceeds 10 acre-feet.)
	Beaver Dams	Dam results in change or function of the facility.	Facility is returned to design function. (Coordinate trapping of beavers and removal of dams with appropriate permitting agencies)
	Insects	When insects such as wasps and hornets interfere with maintenance activities.	Insects destroyed or removed from site. Apply insecticides in compliance with adopted IPM policies
	Tree Growth and Hazard Trees	Tree growth does not allow maintenance and inspection access or interferes with maintenance activity (i.e., slope mowing, silt removal, vactoring, or equipment movements). If trees are not interfering with access or maintenance, do not remove If dead, diseased, or dying trees are identified (Use a certified Arborist to determine health of tree or removal requirements)	Trees do not hinder maintenance activities. Harvested trees should be recycled into mulch or other beneficial uses (e.g., alders for firewood). Remove hazard Trees
Side Slopes of Pond	Erosion Eroded damage over 2 inches deep where cause of damage is still present or where there is potential for continued erosion. Any erosion observed on a compacted berm embankment.	Slopes should be stabilized using appropriate erosion control measure(s); e.g., rock reinforcement, planting of grass, compaction. If erosion is occurring on compacted berms a licensed engineer in the state of Washington should be consulted to resolve source of erosion.	
Storage Area	Sediment Accumulated sediment that exceeds 10% of the designed pond depth unless otherwise specified or affects inletting or outletting condition of the facility.	Sediment cleaned out to designed pond shape and depth; pond reseeded if necessary to control erosion.	

Table V-A.1: Maintenance Standards - Detention Ponds (continued)

Maintenance Component	Defect	Conditions When Maintenance Is Needed	Results Expected When Maintenance Is Performed
	Liner (if Applicable)	Liner is visible and has more than three 1/4-inch holes in it.	Liner repaired or replaced. Liner is fully covered.
Ponds Berms (Dikes)	Settlements	Any part of berm which has settled 4 inches lower than the design elevation If settlement is apparent, measure berm to determine amount of settlement Settling can be an indication of more severe problems with the berm or outlet works. A licensed engineer in the state of Washington should be consulted to determine the source of the settlement.	Dike is built back to the design elevation.
	Piping	Discernable water flow through pond berm. Ongoing erosion with potential for erosion to continue. (Recommend a Geotechnical engineer be called in to inspect and evaluate condition and recommend repair of condition.)	Piping eliminated. Erosion potential resolved.
Emergency Overflow/Spillway and Berms over 4 feet in height	Tree Growth	Tree growth on emergency spillways creates blockage problems and may cause failure of the berm due to uncontrolled overtopping. Tree growth on berms over 4 feet in height may lead to piping through the berm which could lead to failure of the berm.	Trees should be removed. If root system is small (base less than 4 inches) the root system may be left in place. Otherwise the roots should be removed and the berm restored. A licensed engineer in the state of Washington should be consulted for proper berm/spillway restoration.
	Piping	Discernable water flow through pond berm. Ongoing erosion with potential for erosion to continue. (Recommend a Geotechnical engineer be called in to inspect and evaluate condition and recommend repair of condition.)	Piping eliminated. Erosion potential resolved.
Emergency Overflow/Spillway	Emergency Overflow/Spillway	Only one layer of rock exists above native soil in area five square feet 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.)	Rocks and pad depth are restored to design standards.
	Erosion	See "Side Slopes of Pond"	

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 regouted and secure at basin wall.
	Settlement/ Mis-alignment	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 in place with no bends more than 3/4 inch.
		Bars are missing or entire barrier missing. Bars are loose and rust is causing 50% deterioration to any part of barrier.	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

Table V-A.7: Maintenance Standards - Energy Dissipators

Maintenance Components	Defect	Conditions When Maintenance is Needed	Results Expected When Maintenance is Performed
External:			
Rock Pad	Missing or Moved Rock	Only one layer of rock exists above native soil in area five square feet or larger, or any exposure of native soil.	Rock pad replaced to design standards.
	Erosion	Soil erosion in or adjacent to rock pad.	Rock pad replaced to design standards.
Dispersion Trench	Pipe Plugged with Sediment	Accumulated sediment that exceeds 20% of the design depth.	Pipe cleaned/flushed so that it matches design.
	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.	Trench redesigned or rebuilt to standards.
	Perforations Plugged.	Over 1/2 of perforations in pipe are plugged with debris and sediment.	Perforated pipe cleaned or replaced.
	Water Flows Out Top of "Distributor" Catch Basin.	Maintenance person observes or receives credible report of water flowing out during any storm less than the design storm or its causing or appears likely to cause damage.	Facility rebuilt or redesigned to standards.
	Receiving Area Over-Saturated	Water in receiving area is causing or has potential of causing landslide problems.	No danger of landslides.
Internal:			
Manhole/Chamber	Worn or Damaged Post, Baffles, Side of Chamber	Structure dissipating flow deteriorates to 1/2 of original size or any concentrated worn spot exceeding one square foot which would make structure unsound.	Structure replaced to design standards.
	Other Defects	See Table V-A.5: Maintenance Standards - Catch Basins	See Table V-A.5: Maintenance Standards - Catch Basins

Table V-A.16: Maintenance Standards - Baffle Oil/Water Separators (API Type)

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

Table V-A.17: Maintenance Standards - Coalescing Plate Oil/Water Separators

Maintenance Component	Defect	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
General	Monitoring	Inspection of discharge water for obvious signs of poor water quality.	Effluent discharge from vault should be clear with no thick visible sheen.
	Sediment Accumulation	Sediment depth in bottom of vault exceeds 6-inches in depth and/or visible signs of sediment on plates.	No sediment deposits on vault bottom and plate media, which would impede flow through the vault and reduce separation efficiency.
	Trash and Debris Accumulation	Trash and debris accumulated in vault, or pipe inlet/outlet, floatables and non-floatables.	Trash and debris removed from vault, and inlet/outlet piping.
	Oil Accumulation	Oil accumulation that exceeds 1-inch at the water surface.	Oil is extracted from vault using vactoring methods. Coalescing plates are cleaned by thoroughly rinsing and flushing. Should be no visible oil depth on water.
	Damaged Coalescing Plates	Plate media broken, deformed, cracked and/or showing signs of failure.	A portion of the media pack or the entire plate pack is replaced depending on severity of failure.
	Damaged Pipes	Inlet or outlet piping damaged or broken and in need of repair.	Pipe repaired and or replaced.
	Baffles	Baffles corroding, cracking, warping and/or showing signs of failure as determined by maintenance/inspection person.	Baffles repaired or replaced to specifications.
	Vault Structure Damage - Includes Cracks in Walls, Bottom, Damage to Frame and/or Top Slab	Cracks wider than 1/2-inch or evidence of soil particles entering the structure through the cracks, or maintenance/inspection personnel determine that the vault is not structurally sound. Cracks wider than 1/2-inch at the joint of any inlet/outlet pipe or evidence of soil particles entering through the cracks.	Vault replaced or repairs made so that vault meets design specifications and is structurally sound. Vault repaired so that no cracks exist wider than 1/4-inch at the joint of the inlet/outlet pipe.
	Access Ladder Damaged	Ladder is corroded or deteriorated, not functioning properly, not securely attached to structure wall, missing rungs, cracks, and misaligned.	Ladder replaced or repaired and meets specifications, and is safe to use as determined by inspection personnel.

Table V-A.18: Maintenance Standards - Catch Basin Inserts

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

Table V-A.21: Maintenance Standards - Bioretention Facilities

Maintenance Component	Recommended Frequency ^a		Condition when Maintenance is Needed (Standards)	Action Needed (Procedures)
	Inspection	Routine Maintenance		
Facility Footprint				
Earthen side slopes and berms	B, S		Erosion (gullies/ rills) greater than 2 inches deep around inlets, outlet, and alongside slopes	<ul style="list-style-type: none"> Eliminate cause of erosion and stabilize damaged area (regrade, rock, vegetation, erosion control matting) For deep channels or cuts (over 3 inches in ponding depth), temporary erosion control measures should be put in place until permanent repairs can be made. Properly designed, constructed and established facilities with appropriate flow velocities should not have erosion problems except perhaps in extreme events. If erosion problems persist, the following should be reassessed: (1) flow volumes from contributing areas and bioretention facility sizing; (2) flow velocities and gradients within the facility; and (3) flow dissipation and erosion protection strategies at the facility inlet.
	A		Erosion of sides causes slope to become a hazard	Take actions to eliminate the hazard and stabilize slopes
	A, S		Settlement greater than 3 inches (relative to undisturbed sections of berm)	Restore to design height
	A, S		Downstream face of berm wet, seeps or leaks evident	Plug any holes and compact berm (may require consultation with engineer, particularly for larger berms)
	A		Any evidence of rodent holes or water piping in berm	<ul style="list-style-type: none"> Eradicate rodents (see "Pest control") Fill holes and compact (may require consultation with engineer, particularly for larger berms)
Concrete sidewalls	A		Cracks or failure of concrete sidewalls	<ul style="list-style-type: none"> Repair/ seal cracks Replace if repair is insufficient
Rockery sidewalls	A		Rockery side walls are insecure	Stabilize rockery sidewalls (may require consultation with engineer, particularly for walls 4 feet or greater in height)
Facility area		All maintenance visits (at least biannually)	Trash and debris present	Clean out trash and debris
Facility bottom area	A, S		Accumulated sediment to extent that infiltration rate is reduced (see "Ponded water") or surface storage capacity significantly impacted	<ul style="list-style-type: none"> Remove excess sediment Replace any vegetation damaged or destroyed by sediment accumulation and removal Mulch newly planted vegetation Identify and control the sediment source (if feasible) If accumulated sediment is recurrent, consider adding presettlement or installing berms to create a forebay at the inlet
		During/after fall leaf drop	Accumulated leaves in facility	Remove leaves if there is a risk to clogging outlet structure or water flow is impeded
Low permeability check dams and weirs	A, S		Sediment, vegetation, or debris accumulated at or blocking (or having the potential to block) check dam, flow control weir or orifice	Clear the blockage
	A, S		Erosion and/or undercutting present	Repair and take preventative measures to prevent future erosion and/or undercutting
	A		Grade board or top of weir damaged or not level	Restore to level position

Table V-A.21: Maintenance Standards - Bioretention Facilities (continued)

Maintenance Component	Recommended Frequency ^a		Condition when Maintenance is Needed (Standards)	Action Needed (Procedures)
	Inspection	Routine Maintenance		
Ponded water	B, S		Excessive ponding water: Water overflows during storms smaller than the design event or ponded water remains in the basin 48 hours or longer after the end of a storm.	<p>Determine cause and resolve in the following order:</p> <ol style="list-style-type: none"> 1. Confirm leaf or debris buildup in the bottom of the facility is not impeding infiltration. If necessary, remove leaf litter/debris. 2. Ensure that underdrain (if present) is not clogged. If necessary, clear underdrain. 3. Check for other water inputs (e.g., groundwater, illicit connections). 4. Verify that the facility is sized appropriately for the contributing area. Confirm that the contributing area has not increased. If steps #1-4 do not solve the problem, the bioretention soil is likely clogged by sediment accumulation at the surface or has become overly compacted. Dig a small hole to observe soil profile and identify compaction depth or clogging front to help determine the soil depth to be removed or otherwise rehabilitated (e.g., tilled). Consultation with an engineer is recommended.
Bioretention soil mix	As needed		Bioretention soil mix protection is needed when performing maintenance requiring entrance into the facility footprint	<ul style="list-style-type: none"> • Minimize all loading in the facility footprint (foot traffic and other loads) to the degree feasible in order to prevent compaction of bioretention soils. • Never drive equipment or apply heavy loads in facility footprint. • Because the risk of compaction is higher during saturated soil conditions, any type of loading in the cell (including foot traffic) should be minimized during wet conditions. • Consider measures to distribute loading if heavy foot traffic is required or equipment must be placed in facility. As an example, boards may be placed across soil to distribute loads and minimize compaction. • If compaction occurs, soil must be loosened or otherwise rehabilitated to original design state.
Inlets/Outlets/Pipes				
Splash block inlet	A		Water is not being directed properly to the facility and away from the inlet structure	Reconfigure/ repair blocks to direct water to facility and away from structure
Curb cut inlet/outlet	M during the wet season and before severe storm is forecasted	Weekly during fall leaf drop	Accumulated leaves at curb cuts	Clear leaves (particularly important for key inlets and low points along long, linear facilities)
Pipe inlet/outlet	A		Pipe is damaged	Repair/ replace
	W		Pipe is clogged	Remove roots or debris
	A, S		Sediment, debris, trash, or mulch reducing capacity of inlet/outlet	<ul style="list-style-type: none"> • Clear the blockage • Identify the source of the blockage and take actions to prevent future blockages
		Weekly during fall leaf drop	Accumulated leaves at inlets/outlets	Clear leaves (particularly important for key inlets and low points along long, linear facilities)
		A	Maintain access for inspections	<ul style="list-style-type: none"> • Clear vegetation (transplant vegetation when possible) within 1 foot of inlets and outlets, maintain access pathways • Consultation with a landscape architect is recommended for removal, transplant, or substitution of plants

Table V-A.21: Maintenance Standards - Bioretention Facilities (continued)

Maintenance Component	Recommended Frequency ^a		Condition when Maintenance is Needed (Standards)	Action Needed (Procedures)
	Inspection	Routine Maintenance		
Erosion control at inlet	A		Concentrated flows are causing erosion	Maintain a cover of rock or cobbles or other erosion protection measure (e.g., matting) to protect the ground where concentrated water enters the facility (e.g., a pipe, curb cut or swale)
Trash rack	S		Trash or other debris present on trash rack	Remove/dispose
	A		Bar screen damaged or missing	Repair/replace
Overflow	A, S		Capacity reduced by sediment or debris	Remove sediment or debris/dispose
Underdrain pipe	Clean pipe as needed	Clean orifice at least biannually (may need more frequent cleaning during wet season)	<ul style="list-style-type: none"> Plant roots, sediment or debris reducing capacity of underdrain Prolonged surface ponding (see "Ponded water") 	<ul style="list-style-type: none"> Jet clean or rotary cut debris/roots from underdrain(s) If underdrains are equipped with a flow restrictor (e.g., orifice) to attenuate flows, the orifice must be cleaned regularly.
Vegetation				
Facility bottom area and upland slope vegetation	Fall and Spring		Vegetation survival rate falls below 75% within first two years of establishment (unless project O&M manual or record drawing stipulates more or less than 75% survival rate).	<ul style="list-style-type: none"> Determine cause of poor vegetation growth and correct condition Replant as necessary to obtain 75% survival rate or greater. Refer to original planting plan, or approved jurisdictional species list for appropriate plant replacements (See Appendix 3 - Bioretention Plant List, in the <i>LID Technical Guidance Manual for Puget Sound</i>, (Hinman and Wulkan, 2012)). Confirm that plant selection is appropriate for site growing conditions Consultation with a landscape architect is recommended for removal, transplant, or substitution of plants
Vegetation (general)	As needed		Presence of diseased plants and plant material	<ul style="list-style-type: none"> Remove any diseased plants or plant parts and dispose of in an approved location (e.g., commercial landfill) to avoid risk of spreading the disease to other plants Disinfect gardening tools after pruning to prevent the spread of disease See the <i>Pacific Northwest Plant Disease Management Handbook</i> (Pscheidt and Ocamb, 2016) for information on disease recognition and for additional resources Replant as necessary according to recommendations provided for "facility bottom area and upland slope vegetation".
Trees and shrubs		All pruning seasons (timing varies by species)	Pruning as needed	<ul style="list-style-type: none"> Prune trees and shrubs in a manner appropriate for each species. Pruning should be performed by landscape professionals familiar with proper pruning techniques All pruning of mature trees should be performed by or under the direct guidance of an ISA certified arborist
	A		Large trees and shrubs interfere with operation of the facility or access for maintenance	<ul style="list-style-type: none"> Prune trees and shrubs using most current ANSI A300 standards and ISA BMPs. Remove trees and shrubs, if necessary.
	Fall and Spring		Standing dead vegetation is present	<ul style="list-style-type: none"> Remove standing dead vegetation Replace dead vegetation within 30 days of reported dead and dying plants (as practical depending on weather/planting season) If vegetation replacement is not feasible within 30 days, and absence of vegetation may result in erosion problems, temporary erosion control measures should be put in place immediately. Determine cause of dead vegetation and address issue, if possible

Table V-A.21: Maintenance Standards - Bioretention Facilities (continued)

Maintenance Component	Recommended Frequency ^a		Condition when Maintenance is Needed (Standards)	Action Needed (Procedures)
	Inspection	Routine Maintenance		
				<ul style="list-style-type: none"> If specific plants have a high mortality rate, assess the cause and replace with appropriate species. Consultation with a landscape architect is recommended.
	Fall and Spring		Planting beneath mature trees	<ul style="list-style-type: none"> When working around and below mature trees, follow the most current ANSI A300 standards and ISA BMPs to the extent practicable (e.g., take care to minimize any damage to tree roots and avoid compaction of soil). Planting of small shrubs or groundcovers beneath mature trees may be desirable in some cases; such plantings should use mainly plants that come as bulbs, bare root or in 4-inch pots; plants should be in no larger than 1-gallon containers.
	Fall and Spring		Presence of or need for stakes and guys (tree growth, maturation, and support needs)	<ul style="list-style-type: none"> Verify location of facility liners and underdrain (if any) prior to stake installation in order to prevent liner puncture or pipe damage Monitor tree support systems: Repair and adjust as needed to provide support and prevent damage to tree. Remove tree supports (stakes, guys, etc.) after one growing season or maximum of 1 year. Backfill stake holes after removal.
Trees and shrubs adjacent to vehicle travel areas (or areas where visibility needs to be maintained)	A		Vegetation causes some visibility (line of sight) or driver safety issues	<ul style="list-style-type: none"> Maintain appropriate height for sight clearance When continued, regular pruning (more than one time/ growing season) is required to maintain visual sight lines for safety or clearance along a walk or drive, consider relocating the plant to a more appropriate location. Remove or transplant if continual safety hazard Consultation with a landscape architect is recommended for removal, transplant, or substitution of plants
Flowering plants		A	Dead or spent flowers present	Remove spent flowers (deadhead)
Perennials		Fall	Spent plants	Cut back dying or dead and fallen foliage and stems
Emergent vegetation		Spring	Vegetation compromises conveyance	Hand rake sedges and rushes with a small rake or fingers to remove dead foliage before new growth emerges in spring or earlier only if the foliage is blocking water flow (sedges and rushes do not respond well to pruning)
Ornamental grasses (perennial)		Winter and Spring	Dead material from previous year's growing cycle or dead collapsed foliage	<ul style="list-style-type: none"> Leave dry foliage for winter interest Hand rake with a small rake or fingers to remove dead foliage back to within several inches from the soil before new growth emerges in spring or earlier if the foliage collapses and is blocking water flow
Ornamental grasses (evergreen)		Fall and Spring	Dead growth present in spring	<ul style="list-style-type: none"> Hand rake with a small rake or fingers to remove dead growth before new growth emerges in spring Clean, rake, and comb grasses when they become too tall Cut back to ground or thin every 2-3 years as needed
Noxious weeds		M (March - October, preceding seed dispersal)	Listed noxious vegetation is present (refer to current county noxious weed list)	<ul style="list-style-type: none"> By law, class A & B noxious weeds must be removed, bagged and disposed as garbage immediately Reasonable attempts must be made to remove and dispose of class C noxious weeds It is strongly encouraged that herbicides and pesticides not be used in order to protect water quality; use of herbicides and pesticides may be prohibited in some jurisdictions Apply mulch after weed removal (see "Mulch")
Weeds		M (March - October,	Weeds are present	<ul style="list-style-type: none"> Remove weeds with their roots manually with pincer-type weeding tools, flame weeders, or hot water weeders as

Table V-A.21: Maintenance Standards - Bioretention Facilities (continued)

Maintenance Component	Recommended Frequency ^a		Condition when Maintenance is Needed (Standards)	Action Needed (Procedures)
	Inspection	Routine Maintenance		
		preceding seed dispersal)		appropriate <ul style="list-style-type: none"> Follow IPM protocols for weed management (see "Additional Maintenance Resources" section for more information on IPM protocols)
Excessive vegetation		Once in early to mid- May and once in early- to mid-September	Low-lying vegetation growing beyond facility edge onto sidewalks, paths, or street edge poses pedestrian safety hazard or may clog adjacent permeable pavement surfaces due to associated leaf litter, mulch, and soil	<ul style="list-style-type: none"> Edge or trim groundcovers and shrubs at facility edge Avoid mechanical blade-type edger and do not use edger or trimmer within 2 feet of tree trunks While some clippings can be left in the facility to replenish organic material in the soil, excessive leaf litter can cause surface soil clogging
	As needed		Excessive vegetation density inhibits stormwater flow beyond design ponding or becomes a hazard for pedestrian and vehicular circulation and safety	<ul style="list-style-type: none"> Determine whether pruning or other routine maintenance is adequate to maintain proper plant density and aesthetics Determine if planting type should be replaced to avoid ongoing maintenance issues (an aggressive grower under perfect growing conditions should be transplanted to a location where it will not impact flow) Remove plants that are weak, broken or not true to form; replace in-kind Thin grass or plants impacting facility function without leaving visual holes or bare soil areas Consultation with a landscape architect is recommended for removal, transplant, or substitution of plants
	As needed		Vegetation blocking curb cuts, causing excessive sediment buildup and flow bypass	Remove vegetation and sediment buildup
Mulch				
Mulch		Following weeding	Bare spots (without mulch cover) are present or mulch depth less than 2 inches	<ul style="list-style-type: none"> Supplement mulch with hand tools to a depth of 2 to 3 inches Replenish mulch per O&M manual. Often coarse compost is used in the bottom of the facility and arborist wood chips are used on side slopes and rim (above typical water levels) Keep all mulch away from woody stems
Watering				
Irrigation system (if any)		Based on manufacturer's instructions	Irrigation system present	Follow manufacturer's instructions for O&M
	A		Sprinklers or drip irrigation not directed/located to properly water plants	Redirect sprinklers or move drip irrigation to desired areas
Summer watering (first year)		Once every 1-2 weeks or as needed during prolonged dry periods	Trees, shrubs and groundcovers in first year of establishment period	<ul style="list-style-type: none"> 10 to 15 gallons per tree 3 to 5 gallons per shrub 2 gallons water per square foot for groundcover areas Water deeply, but infrequently, so that the top 6 to 12 inches of the root zone is moist Use soaker hoses or spot water with a shower type wand when irrigation system is not present <ul style="list-style-type: none"> Pulse water to enhance soil absorption, when feasible

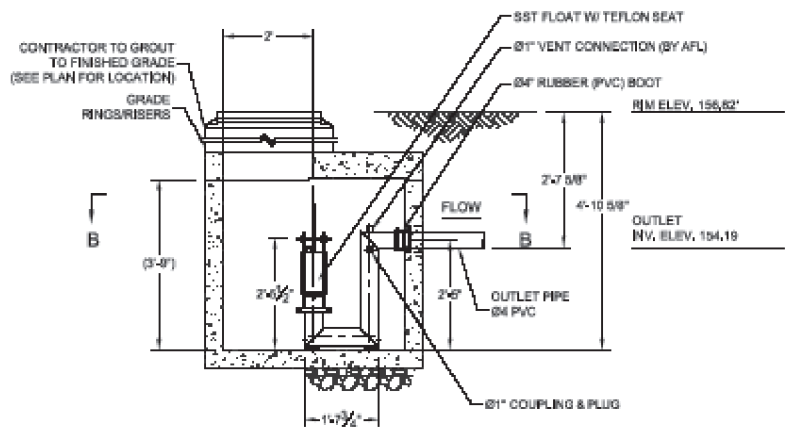
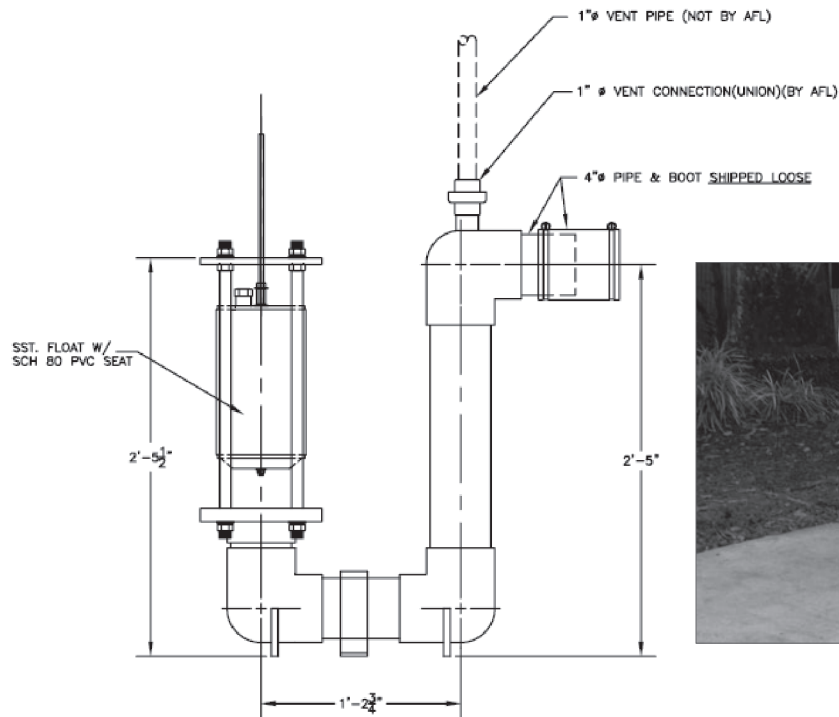
Table V-A.21: Maintenance Standards - Bioretention Facilities (continued)

Maintenance Component	Recommended Frequency ^a		Condition when Maintenance is Needed (Standards)	Action Needed (Procedures)
	Inspection	Routine Maintenance		
				<ul style="list-style-type: none"> ○ Pre-moisten soil to break surface tension of dry or hydrophobic soils/mulch, followed by several more passes. With this method, each pass increases soil absorption and allows more water to infiltrate prior to runoff • Add a tree bag or slow-release watering device (e.g., bucket with a perforated bottom) for watering newly installed trees when irrigation system is not present
Summer watering (second and third years)		Once every 2-4 weeks or as needed during prolonged dry periods	Trees, shrubs and groundcovers in second or third year of establishment period	<ul style="list-style-type: none"> • 10 to 15 gallons per tree • 3 to 5 gallons per shrub • 2 gallons water per square foot for groundcover areas • Water deeply, but infrequently, so that the top 6 to 12 inches of the root zone is moist • Use soaker hoses or spot water with a shower type wand when irrigation system is not present <ul style="list-style-type: none"> ○ Pulse water to enhance soil absorption, when feasible ○ Pre-moisten soil to break surface tension of dry or hydrophobic soils/mulch, followed by several more passes. With this method, each pass increases soil absorption and allows more water to infiltrate prior to runoff
Summer watering (after establishment)		As needed	Established vegetation (after 3 years)	<ul style="list-style-type: none"> • Plants are typically selected to be drought tolerant and not require regular watering after establishment; however, trees may take up to 5 years of watering to become fully established • Identify trigger mechanisms for drought-stress (e.g., leaf wilt, leaf senescence, etc.) of different species and water immediately after initial signs of stress appear • Water during drought conditions or more often if necessary to maintain plant cover
Pest Control				
Mosquitoes	B, S		Standing water remains for more than 3 days after the end of a storm	<ul style="list-style-type: none"> • Identify the cause of the standing water and take appropriate actions to address the problem (see "Ponded water") • To facilitate maintenance, manually remove standing water and direct to the storm drainage system (if runoff is from non pollution-generating surfaces) or sanitary sewer system (if runoff is from pollution-generating surfaces) after getting approval from sanitary sewer authority. • Use of pesticides or <i>Bacillus thuringiensis israelensis</i> (Bti) may be considered only as a temporary measure while addressing the standing water cause. If overflow to a surface water will occur within 2 weeks after pesticide use, apply for coverage under the Aquatic Mosquito Control NPDES General Permit.
Nuisance animals	As needed		Nuisance animals causing erosion, damaging plants, or depositing large volumes of feces	<ul style="list-style-type: none"> • Reduce site conditions that attract nuisance species where possible (e.g., plant shrubs and tall grasses to reduce open areas for geese, etc.) • Place predator decoys • Follow IPM protocols for specific nuisance animal issues (see "Additional Maintenance Resources" section for more information on IPM protocols) • Remove pet waste regularly • For public and right-of-way sites consider adding garbage cans with dog bags for picking up pet waste.
Insect pests	Every site visit associated with		Signs of pests, such as wilting leaves, chewed leaves and bark, spotting or other indicators	<ul style="list-style-type: none"> • Reduce hiding places for pests by removing diseased and dead plants • For infestations, follow IPM protocols (see "Additional Maintenance Resources" section for more information on IPM

Table V-A.21: Maintenance Standards - Bioretention Facilities (continued)

Maintenance Component	Recommended Frequency ^a		Condition when Maintenance is Needed (Standards)	Action Needed (Procedures)
	Inspection	Routine Maintenance		
	vegetation management			protocols)
<p>Note that the inspection and routine maintenance frequencies listed above are recommended by Ecology. They do not supersede or replace the municipal stormwater permit requirements for inspection frequency required of municipal stormwater permittees for "stormwater treatment and flow control BMPs/facilities".</p> <p>^a Frequency: A = Annually; B = Biannually (twice per year); M = Monthly; W = At least one visit should occur during the wet season (for debris/clog related maintenance, this inspection/maintenance visit should occur in the early fall, after deciduous trees have lost their leaves); S = Perform inspections after major storm events (24-hour storm event with a 10-year or greater recurrence interval).</p> <p>IPM - Integrated Pest Management ISA - International Society of Arboriculture</p>				

Oil Stop Valve Guide Operation, Installation and Maintenance



SECTION A-A

Principle of Operation

The valve operates on a buoyancy principle. The ballasted float, which is the only moving part, is weighted for a specified gravity of 0.95. In the water, the float will float and keep the valve open. An accumulation of oil around the float will decrease the buoyant force on the float, causing it to float lower in the liquid. As the oil accumulation increases, the float will sink lower and finally close the valve when the oil level is approximately 3" (76 mm) to 4" (101 mm) above the bottom of the float.

OSV Operation

The AFL Oil Stop Valve (OSV) by Contech is designed for easy, efficient operation in confining oil spills to the premises. It is used in oil/water gravity differential separators, coalescing type separators and oil manholes to prevent the entry of oil into the effluent.

Features of the valve include:

1. Dependable gravity operation
2. Corrosion-resistant construction
3. Only one moving part
4. Outlet vent connection (siphon breaker)

The valve is available in a variety of sizes to meet a wide range of flow conditions. The valve is supplied as a stand alone device and can be used in tandem with a Contech VortClarex® coalescing media separator.

On a case by case basis, valve can be fabricated with a "weep hole" which facilitates reopening of the valves after closure due to oil spill. The week hole equalizes the pressures in the valve and will pass a minimal amount of oil/water mixture. This option is only added upon the Engineer's written request.

Hydraulic Capacities

A minimum recommended water level, sufficient to completely submerge the float housing, is required for proper operation of the OSV. Operation at less than the minimum recommended water level will reduce the capacity of the OSV.

The recommended operating flow rate versus its associated head loss is shown in Figure 1, 2 and 3. For the valve to operate properly at required flow(s), the valve discharge pipe centerline must be below the liquid level at a distance equal to (or greater than) the associated head loss. Table 1 indicates the peak flow capacity of each valve size and model.

WARNING: IF THE VALVE IS OPERATED AT GREATER THAN DESIGN OR RECOMMENDED FLOWS IT MAY SHUT OFF AUTOMATICALLY, WHICH MAY NECESSITATE THAT THE VALVE BE REOPENED MANUALLY.

AFL-OSV Model	Discharge Elbow Material	Valve Size	Valve Size	Max. Outlet Pipe Size	Max. Outlet	Max. Capacity gpm	Max. Capacity lps
OSV-4	PVC	4"	101 mm	4"	101 mm	160	10
OSV-6	PVC	6"	150 mm	6"	150 mm	360	23
OSV-8	PVC	8"	200 mm	8"	200 mm	600	39
OSV-4SS	Stainless Steel	4"	101 mm	4"	101 mm	160	10
OSV-6SS	Stainless Steel	6"	150 mm	6"	150 mm	360	23
OSV-8SS	Stainless Steel	8"	200 mm	8"	200 mm	600	39
OSV-10SS	Stainless Steel	10"	250 mm	10"	250 mm	900	57
OSV-12SS	Stainless Steel	12"	300 mm	12"	300 mm	1400	88
OSV-4SST	Stainless Steel	4"	101 mm	4"	101 mm	160	10
OSV-6SST	Stainless Steel	6"	150 mm	6"	150 mm	360	23
OSV-8SST	Stainless Steel	8"	200 mm	8"	200 mm	600	39
OSV-10SST	Stainless Steel	10"	101 mm	10"	101 mm	900	57
OSV-12SST	Stainless Steel	12"	150 mm	12"	150 mm	1400	88

SS = Stainless Steel
 SST = Stainless steel extended and is used when designing for fire protection
 This feature includes an extended pipe through the outlet of the structure, so there is no connection inside the valve structure to melt and fail.

Table 1. Contech AFL-OSV Model Sizes and Peak Flow Capacity

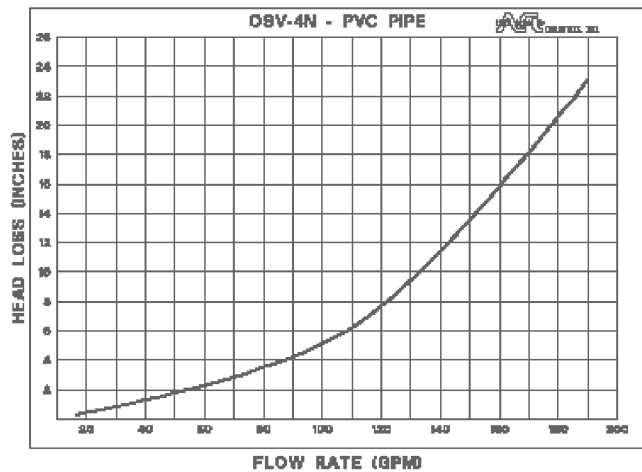


Figure 1. OSV-4 inch

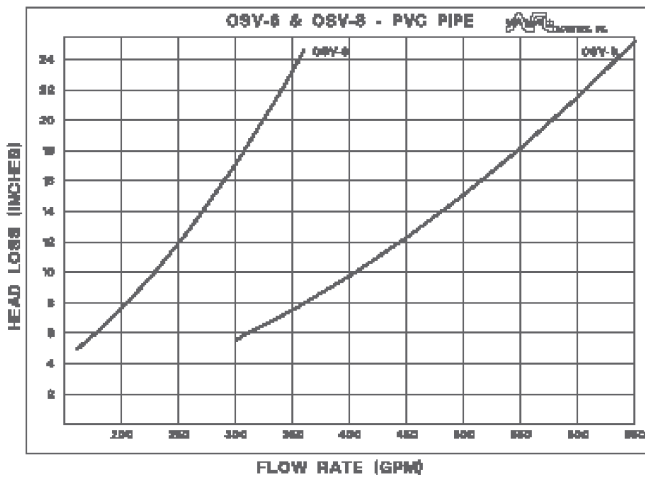


Figure 2. OSV-6 and OSV-8 inch

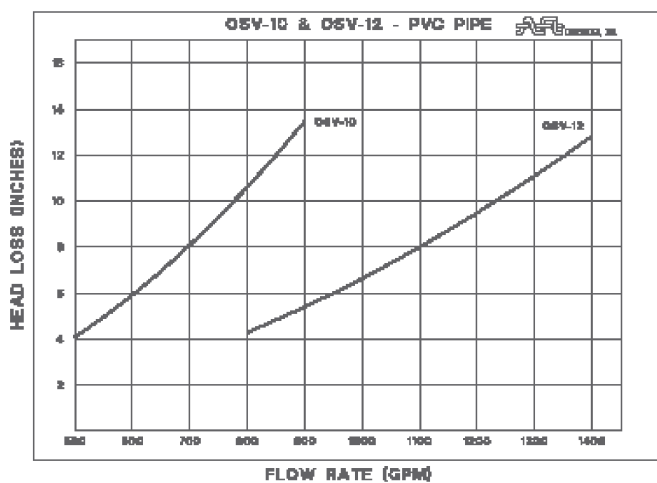


Figure 3. OSV-10 and OSV-12 inch

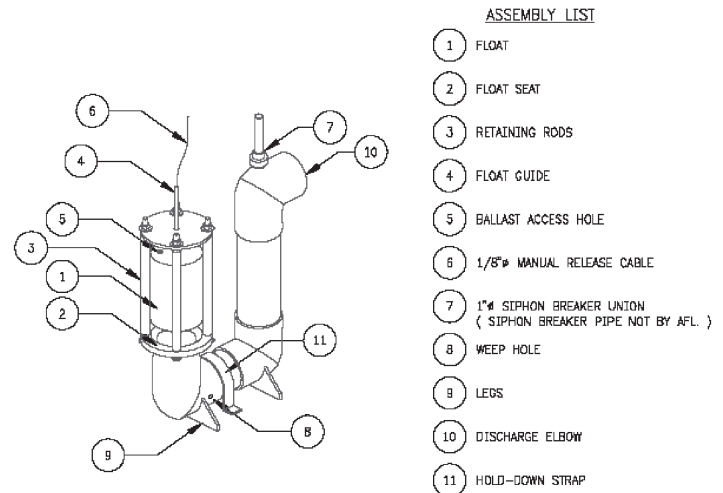
Installation

- Unit must be installed utilizing a crane, backhoe, fork truck, or similar equipment due to the size and weight (approximately 300-425 pounds [136-193 Kg]).
- Pick up unit slowly using the supplied lifting cable harness.
- Unit will tip to the outlet pipe side. This is the desired angle to prevent excess pressure on the float cage.
- Lower unit into manhole.
- Remove lifting harness for use on next valve.
- Remove rubber boot. (To be installed outside of sump)
- Reposition valve to allow outlet pipe of valve to extend through manhole plus 4" (101 mm). Make sure valve top plate is level in both directions.
- Grout outlet pipe in place.
- Install anchors using the (4) 5/8" (16 mm) diameter holes provided in the support angles at the bottom of the valve.
- Attach the stainless steel float guide cable to the under side of concrete lid within reach of the manhole cover. This will allow the manual opening of the valve.
- Install 1" (25 mm) 76 vent/siphon leaving approximately 1" (25 mm) gap between pipe and underside of lid.

- Fill manhole with clean water to outlet invert. The 3/8" (9.5 mm) guide rod should be approximately 8" (200 mm) above the cage top plate.
- Push down gently on guide rod, release pressure from rod and allow float to rise. Upon rising, unit is ready for operation.
- Step #12 is used periodically to insure float operation. If float remains closed, gently pull on lift cable to break seat suction.

NOTE: DO NOT ATTEMPT TO OPEN VALVE WHEN SUMP IS EMPTY OF WATER. WATER LEVEL MUST BE AT INVERT OF OUTLET TO LIFT.

NOTE: IF FLOAT DID NOT OPEN, FILL VENT PIPE WITH WATER TO EQUALIZE PRESSURE ON THE VALVE FLOAT.



OSV discharge pipe (not shown here and plain end connections) to be supplied by others. The contractor, at his discretion, may solvent glue to the valve discharge elbow, or select other suitable means for connecting OSV discharge elbow to outlet pipe.

A. Plain End Connections

Valves with plain end connection can be connected with PVC coupling and two stainless steel worm drive hose clamps. Slide the coupling on valve discharge elbow and install the clamps by sliding them on the coupling. Line up the valve discharge elbow with outlet pipe, leave 1/4" gap (6 mm) between pipe ends, and slide this coupling and clamp on the outlet pipe. Do not tighten the hose clamps at this time.

B. Flanged End Connections

Line up the flange bolt holes, insert a gasket and bolt flanges. Do not tighten bolts at this time.

ATTENTION: FLANGES SUPPLIED WITH THE VALVES ARE FLAT FACE; MAKE SURE THE MATING FLANGE IS OF THE SAME DESIGN. USE OF RAISED FLANGES WILL BREAK THE PVC FLANGES.

C. Anchorage

OSV valves are supplied with hold down straps, which are designed to secure the valves to the concrete. After the valve has been lined up with outlet nozzle, install the strap on the valve body and use the two holes as a template for locating the anchor bolts.

Remove straps and drill in anchors.

Replace the strap and bolt down the strap.

D. Siphon Breaker

Siphon breaker connection is located on the valve discharge elbow and is furnished with a union to facilitate installation of siphon breaker pipe.

In order to calculate siphon breaker pipe length, determine the maximum liquid level in the sump/tank at a spill condition, subtract elevation of the top of the OSV discharge pipe from maximum liquid level and add 1'-6" (450 mm). After the length of the pipe has been cut, attach the pipe to the union using PVC solvent cement. Install the siphon breaker pipe on the valve and support it as required. Ideally, the top of the pipe should be as close to grade as possible.

ATTENTION: IMPROPER SIPHON PIPE ELEVATION WILL RESULT IN OIL DISCHARGE THROUGH THE SIPHON BREAKER DURING SPILL CONDITION.

Maintenance

1. Remove solids from bottom of sump as required. Six (6") [150 mm] of build up maximum.
2. With water level in sump at outlet invert, gently push guide rod downwards approximately 6" (150 mm). This will allow float to come in contact with the bottom flange.
3. Release guide rod. The rod should rise up to the original position. If this procedure was successful the valve is in proper working order.
4. Occasionally the float will stay seated on the bottom flange when pushed down. Simply pull upwards on the stainless steel cable attached to the guide rod. This will break the suction and allow the float to rise. If when attempting to push the guide rod downwards and it appears to be stuck, pull up on stainless steel cable to raise the float again approximately 6" [150 mm]. If the float rises, release cable. If the float sinks it is inoperable and must be replaced.
5. This procedure should be performed at least yearly.

ATTENTION: UPON VALVE CLOSURE DUE TO A SPILL, THE OIL COLLECTED IN THE SUMP, TANK OR OIL SEPARATOR, MUST BE EVACUATED FROM THE VALVE CHAMBER AND DISPOSED OF PROPERLY. AFTER THE OIL HAS BEEN REMOVED, FILL CHAMBER WITH CLEAN WATER AND RE-OPEN THE VALVE BY LIFTING THE FLOAT BY PULLING ON LIFT CABLE. THE SAME PROCEDURE MUST BE USED DURING PROCESS START UP.

Support

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

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SECTION 02723

AFL-OSV by Contech SPECIFICATIONS

PART 2.0 Oil Stop Valves

A. Manufacturers

1. Contech Engineered Solutions: Model AFL-OSV-4SST with slave valve (stainless steel) or approved equal installed inside prefabricated manhole.

B. General

1. Description: Fabricated control valve designed to control oil spills. Valve assembly shall consist of a base, guides, inlet housing, float and outlet connection. Valve shall be designed to operate on specific gravity differential principle.
2. Float Weight: Ballasted for 0.95 specific gravity
3. Flow: 160 GPM (10 lps) Gravity (Maximum)
4. Inlet Pipe Size: 12" (300 mm) Diameter
5. Vents: 1" (25 mm) SS threaded coupling located on top of discharge pipe. Vent pipe to extend above maximum oil level to be supplied by Contractor. Material to be galvanized pipe.
6. Coupling: 1" (25 mm) SST threaded coupling and plug located on side of discharge pipe.
7. Outlet connection to 12" (300 mm) Diameter plain end pipe. Contractor to supply connection flexible connector and clamps.

C. Materials of Construction

1. Base, Housing and Outlet Piping. 304L SST
2. Float: SST with Teflon Seat
3. Float Guides: Type 304 Stainless Steel sleeves

D. Design Requirements

1. Pressure Rating: Atmospheric
2. Temperature: Ambient with 450 °F (232 °C) maximum

PART 2.10 Slave Valve

A. General

1. Application: Oil spill prevention
2. Model Number: SV-S.S/PVC
3. Description: Fabricated to reopen oil stop valve in the event of water loss caused by leakage or evaporation, etc.)
4. Float Weight: Ballasted for 0.95 specific gravity

B. Materials of Construction

Base, Housing, and Piping: SS

Float: PVC

Float Guides: Type 304 Stainless Steel

Pressure Rating: Atmospheric

Temperature: Ambient with 130 °F (54 °C) maximum

C. Principle of Operation

1. The slave valve is added to an oil stop valve to allow the main float to reopen. Due to the lack of water the main float will close. When additional rain enters the sump, the slave valve float will open and allow water to enter the oil stop valve body. As the water level rises the main float will open due to water pressure pushing up against the bottom of the main float. In the event of an oil spill, the slave valve float and the main float will close containing the spill.

Trench Drain Maintenance

Property owner will own, operate, and maintain trench drains. Operation and maintenance of the trench drains will be incorporated into the annual stormwater training. Inspection and maintenance activities will be performed by the Facility Manager.

Inspections

All components of the trench drain will be inspected twice per year to ensure optimal performance. Inspections to include the following procedures:

- Examine trench drains and monitor for debris and sediment accumulation.
- Examine trench drain components including frame, grate and concrete edge for damage.

Monitoring observations and records to be recorded in log book.

When Maintenance is Needed

Accumulated dirt and sediment will need to be cleaned out of the trench drain. When sediment accumulation exceeds one inch, or begins to impact performance, the structure will be scraped and /or pressure washed and the solids and/or washwater to be vacuumed out or containerized.

If trench drain components are damaged repairs will need to be performed. Broken parts are to be replaced immediately. Cracked or chipped concrete to be patched.

Disposal of Trash Debris and Sediment

Trash and Debris

Small amounts of trash and debris can be put into your solid waste container. Large amounts may require hiring a vendor to dispose of the material. If using a vendor, ensure that the vendor properly disposes of waste.

Sediment

1. Clean sediment may be used as landscape material or sent to yard waste recyclers.
2. Sediment that does not appear to be heavily contaminated with oil or grease can be double-bagged and put into your solid waste container. Material that appears to be heavily contaminated must be disposed of by a qualified vendor.

Annual Stormwater Maintenance Log

Component	Comments/Defects/Action Taken	Action By	Action Date

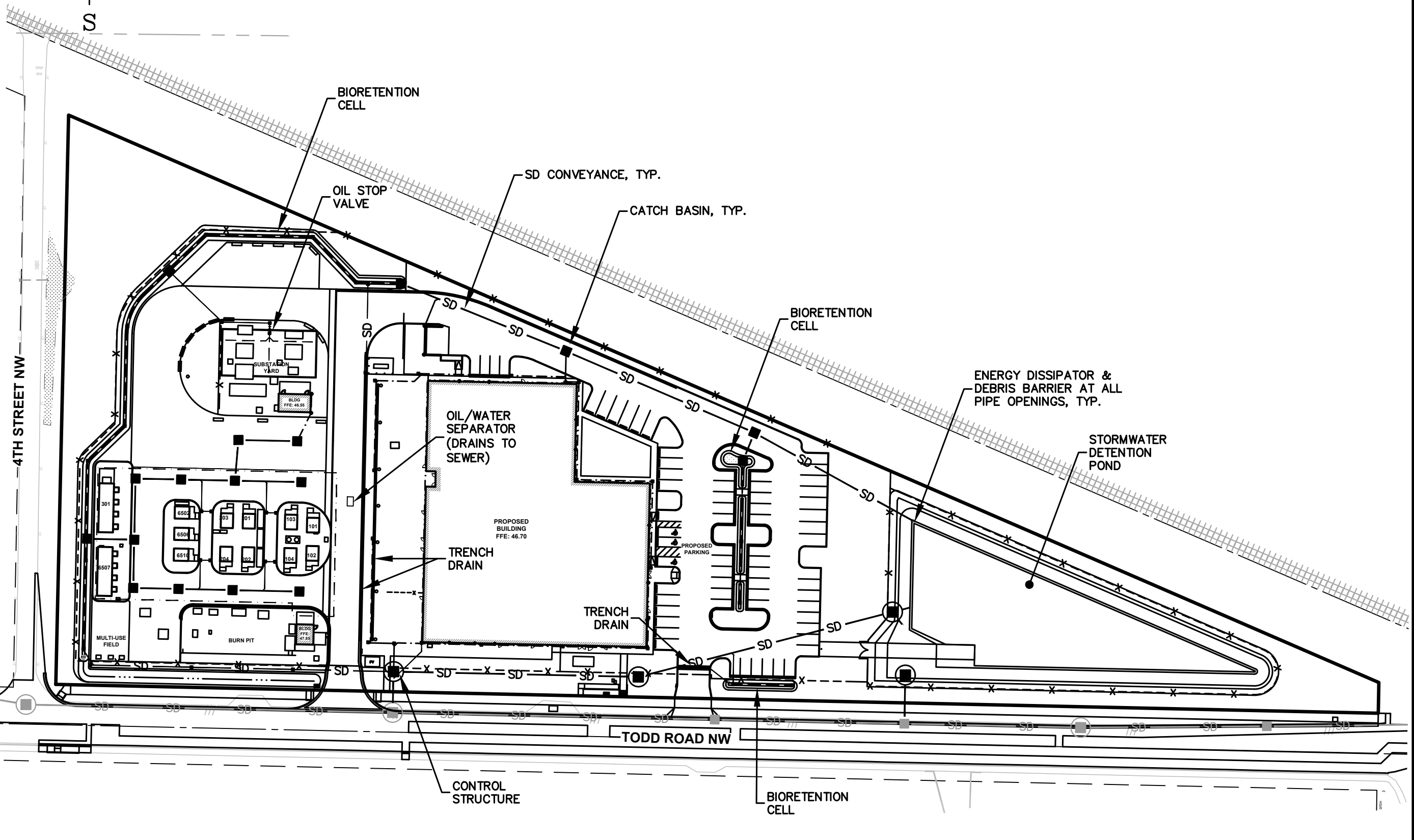
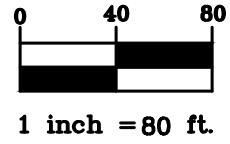
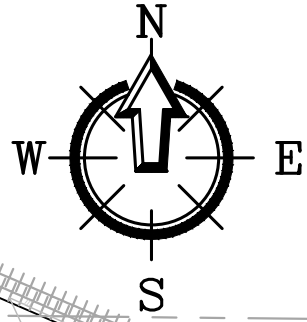
Inspection Conducted By: _____

Date of Inspection: _____

Additional Comments: _____

Stormwater Facilities Exhibits

Stormwater Facilities Overall Site Plan



SHEET CONTENTS

**STORMWATER FACILITIES OVERALL
SITE PLAN**

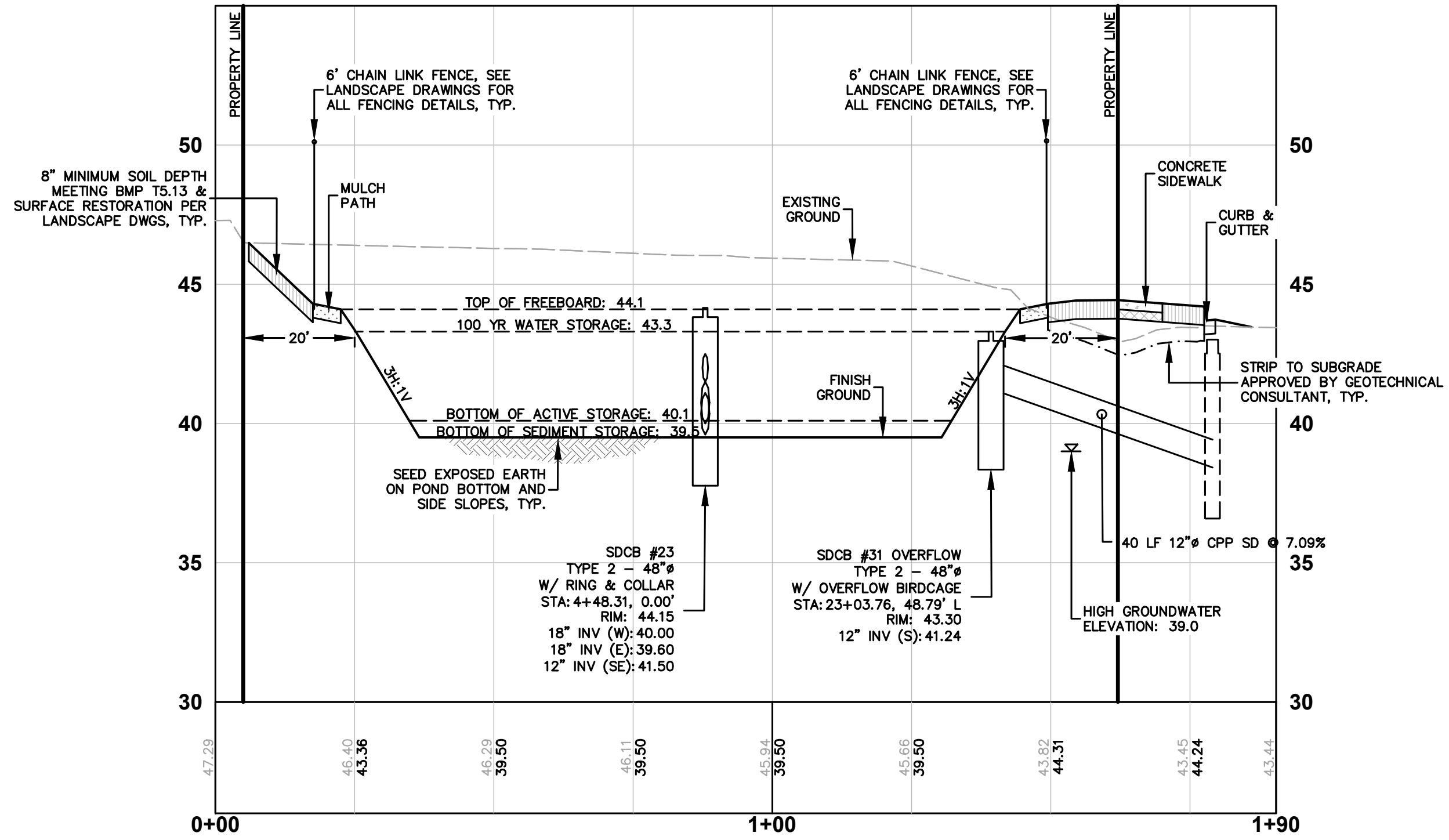
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**FREELAND
& ASSOCIATES**

JOB #	22219	DATE	May 2024
DRAWING #	22219SP28.DWG	SHEET NAME	OM1

Stormwater Facilities Exhibits




DATE	May 2024
JOB #	22219
DRAWING #	22219SP28.DWG
SHEET NAME	OM2

SHEET CONTENTS

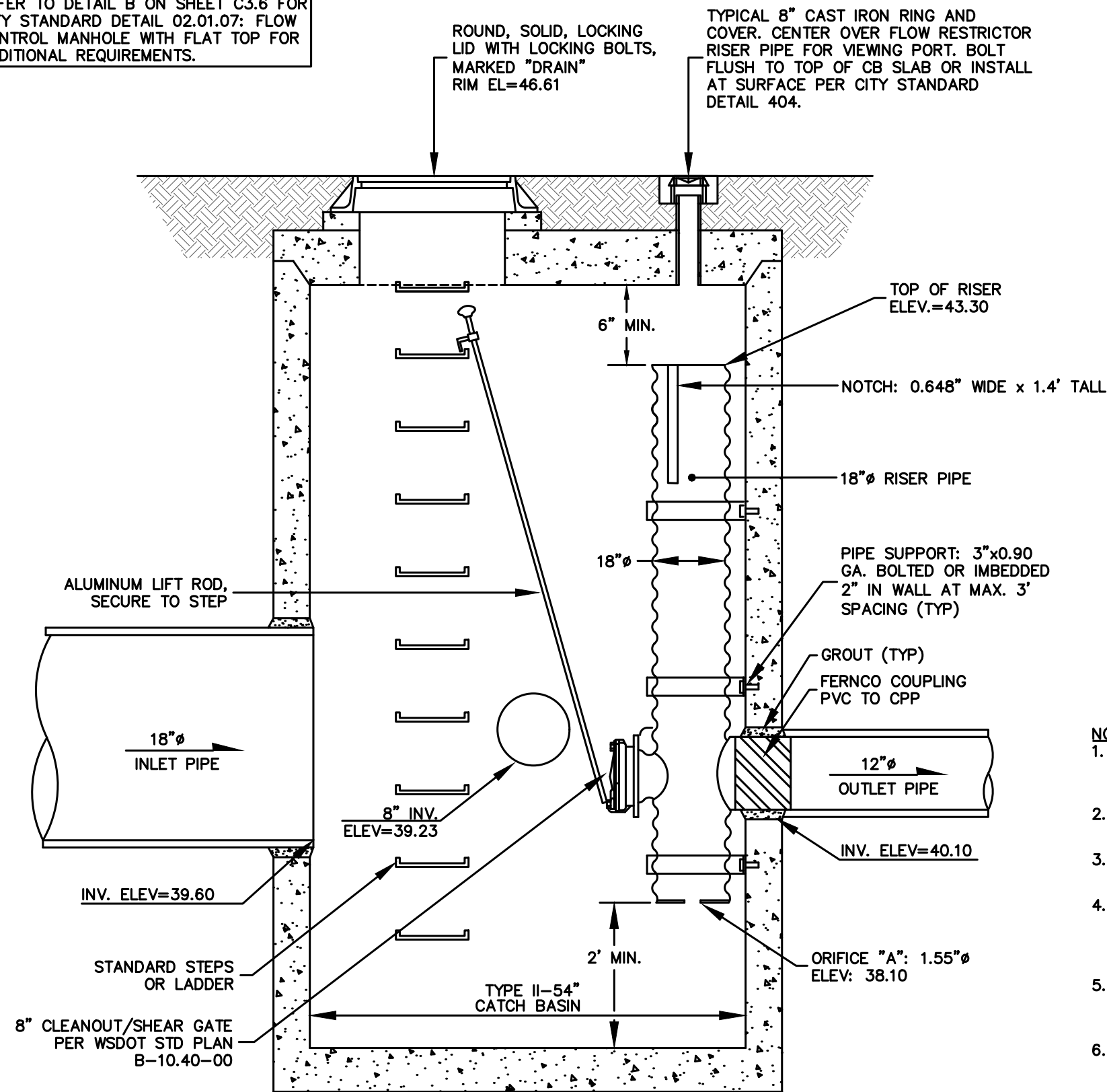
DETENTION POND

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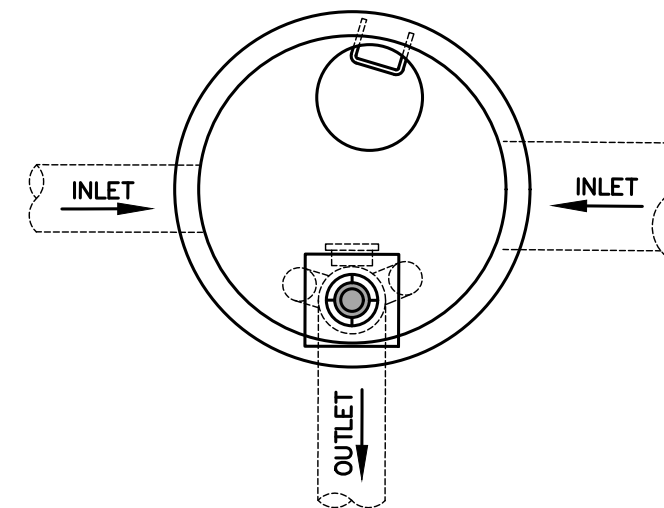
FREELAND
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REFER TO DETAIL B ON SHEET C3.6 FOR CITY STANDARD DETAIL 02.01.07: FLOW CONTROL MANHOLE WITH FLAT TOP FOR ADDITIONAL REQUIREMENTS.



STRUCTURE SECTION VIEW



STRUCTURE PLAN VIEW

NOTES:

1. ALL ORIFICES TO BE FABRICATED BY SHOP DRILLING HOLES OF APPROPRIATE DIAMETER IN METAL PLATE, AND WELDING IT INTO PLACE AT THE BOTTOM OF THE MAIN RISER AND THE TWO ELBOWS.
2. PIPE SUPPORT BRACKETS AND THE RESTRICTOR/SEPARATOR SHALL BE OF THE SAME MATERIAL, AND BE ANCHORED AT 3' MAXIMUM SPACING.
3. ALL METAL PARTS SHALL BE CORROSION RESISTANT. ALL GALVANIZED STEEL PARTS SHALL BE ASPHALT TREATMENT 1 COATED.
4. THE RESTRICTOR/SEPARATOR STANDPIPE SHALL BE FABRICATED FROM 0.060" ALUMINUM, 0.064" ALUMINIZED STEEL, OR 0.064" GALVANIZED STEEL, IN ACCORDANCE WITH AASHTO M36, M196, M197 AND M274. GALVANIZED STEEL SHALL BE ASPHALT TREATMENT 1 COATED.
5. IF A METAL OUTLET PIPE CONNECTS TO A CEMENT CONCRETE PIPE, THE OUTLET PIPE SHALL HAVE A SMOOTH OUTSIDE DIAMETER EQUAL TO THE INSIDE DIAMETER OF THE CONCRETE PIPE LESS 1/4".
6. THE FRAME AND LADDER (OR STEPS) SHALL OFFSET SO THAT:
 - A. THE CLEANOUT GATE IS VISIBLE FROM THE TOP.
 - B. THE CLIMB DOWN CLEAR SPACE OF 2 FEET IS BETWEEN THE RISER AND CLEANOUT GATE.
 - C. THE FRAME IS CLEAR OF THE CURB. (IF APPLICABLE)
7. LOCATE ELBOW RESTRICTOR(S) AS NECESSARY TO PROVIDE 2' MINIMUM CLEARANCE BETWEEN ELBOW AND INLET PIPES OR LADDER.
8. LOCATE ADDITIONAL LADDER RUNGS IN STRUCTURES USED AS ACCESS TO TANKS OR VAULTS TO ALLOW ACCESS WHEN CATCH BASIN IS FILLED WITH WATER.

SHEET CONTENTS

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F R E E L A N D
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CONTROL STRUCTURE

JOB # 22219

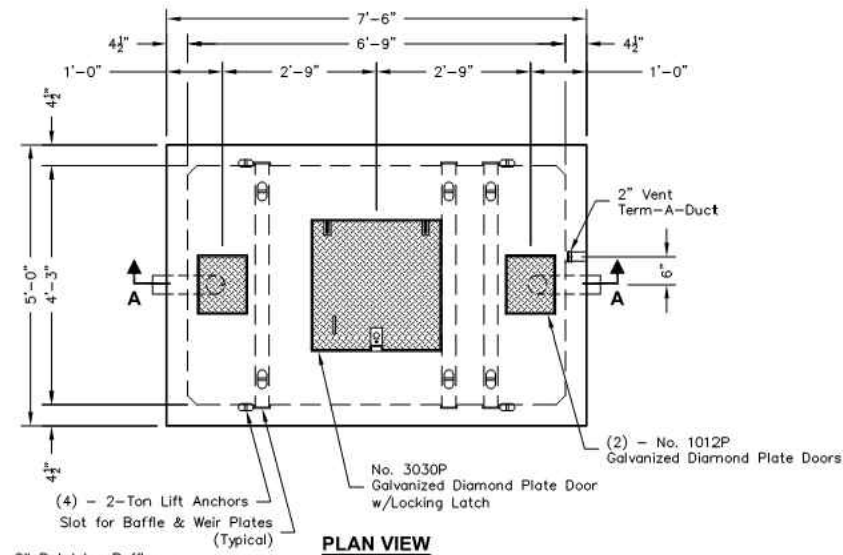
DRAWING # 22219SP28.DWG

DATE May 2024

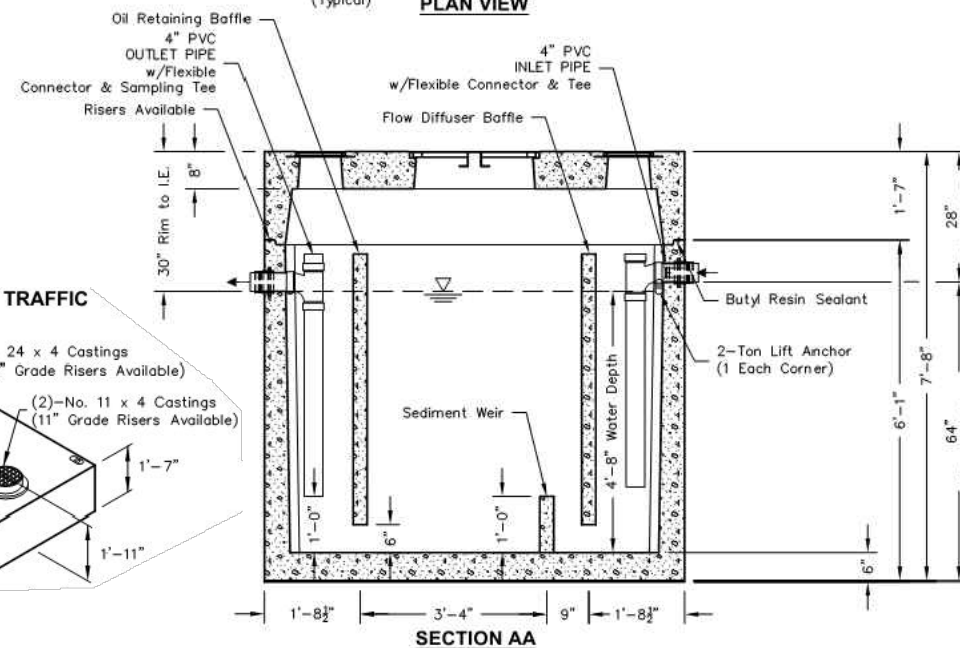
SHEET NAME

OM3

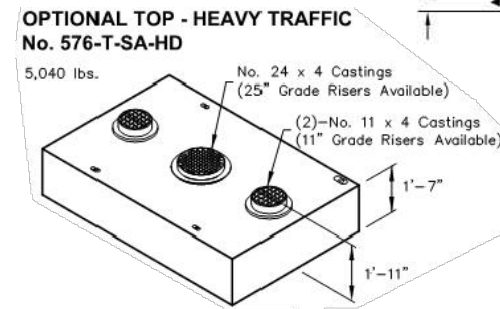
576-SA-1000



PLAN VIEW



SECTION AA



- Notes:
- Designed in accordance with ASTM C 890 for AASHTO HS20-44 vehicle loading
 - Flow Rate 67 GPM based on 15 min. retention time.
 - Manufacturer's recommendations:
 - 1.) Ventilate each end to open atmosphere.
 - 2.) Prior to "Start Up" of System, fill with clean water to bottom of outlet pipe (approx. one foot deep). For best results, fill to flow line.
 - 3.) Follow Regular Inspection, Cleaning, & Maintenance Schedule (See Clean Out & Maintenance).



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576-SA-1000

File Name: 020-576SA-1000
Issue Date: 2016
oldcastleprecast.com/wilsonville

576-SA-1000
OIL / WATER SEPARATOR
1000 GALLON - API STYLE

SHEET CONTENTS

OIL/WATER SEPARATOR

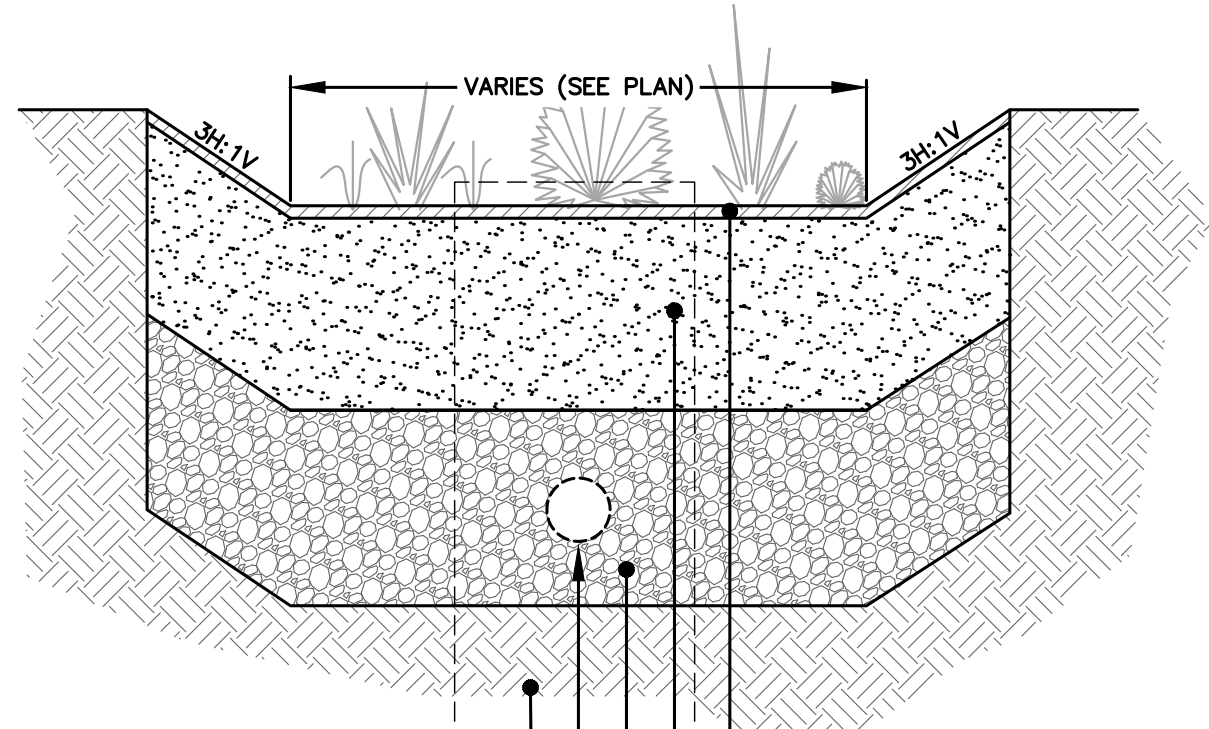
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NOT TO SCALE



OVERFLOW STORM DRAIN
CATCH BASIN TYPE 1

UNDISTURBED, UNCOMPACTED
NATIVE SUBGRADE

PERFORATED UNDERDRAIN
BIORETENTION CELL #1 & #3: 6" ϕ
BIORETENTION CELL #2: 8" ϕ

3" WOOD CHIP MULCH

18" MIN BIORETENTION SOIL MIX.
SEE BIORETENTION SOIL MIX DETAIL
ON THIS SHEET FOR SPECIFICATIONS.

TYPE 26 MINERAL AGGREGATE (GRAVEL BACKFILL
FOR DRAINS) PER SPECIFICATIONS ON THIS SHEET.
AGGREGATE SHALL BE EXTENDED A MINIMUM OF 6"
BELOW PERFORATED PIPE.

SHEET CONTENTS

BIORETENTION CELL

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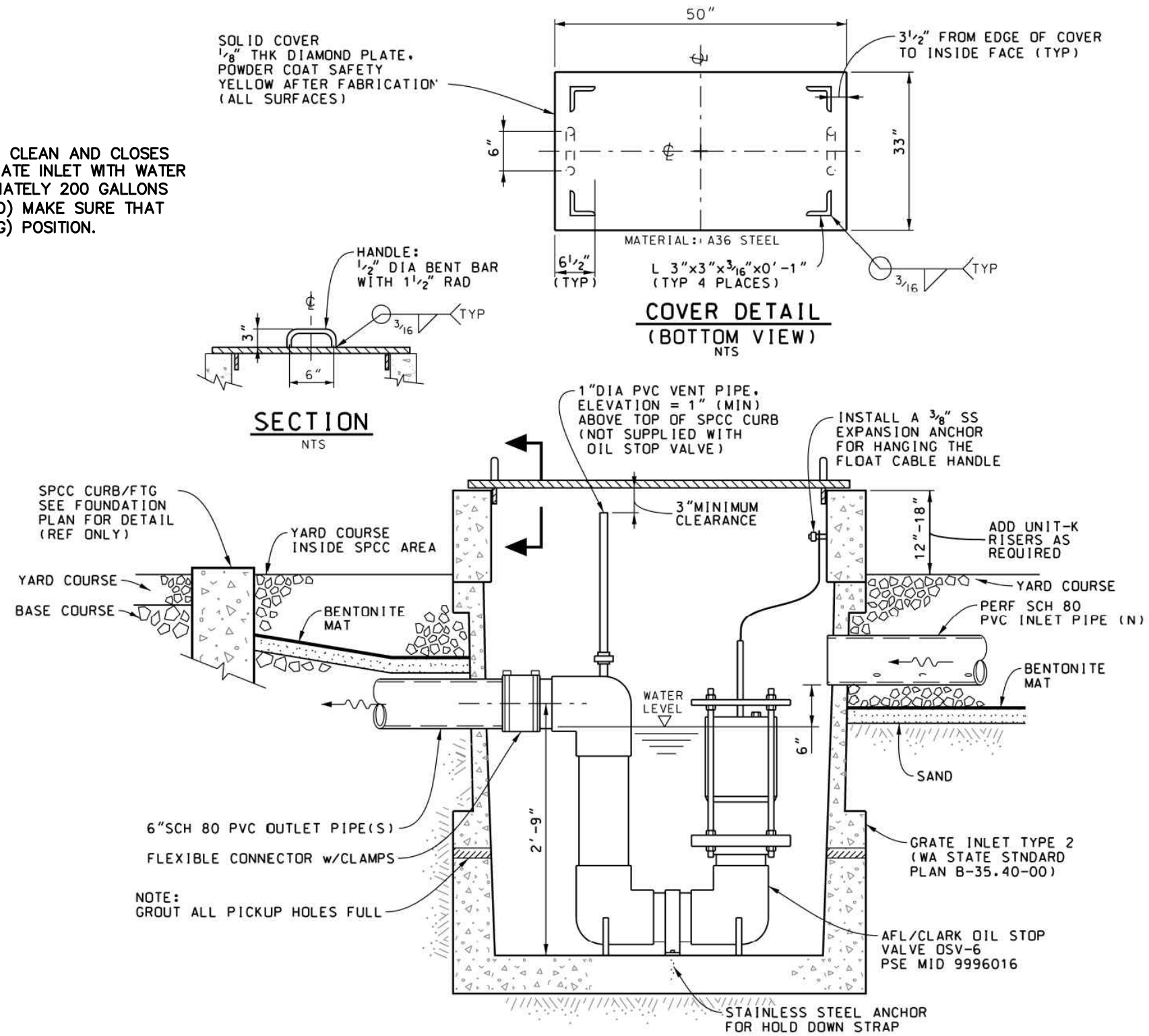
JOB #
22219

DRAWING #
22219SP28.DWG

DATE
May 2024

SHEET NAME
OM5

NOTE
VERIFY THAT VALVE SEAT IS CLEAN AND CLOSES PROPERLY THEN CHARGE GRATE INLET WITH WATER TO LEVEL SHOWN (APPROXIMATELY 200 GALLONS OF WATER WILL BE REQUIRED) MAKE SURE THAT VALVE IS IN OPEN (FLOATING) POSITION.



DATE	May 2024
JOB #	22219
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SHEET NAME	OM6

SHEET CONTENTS

OIL STOP VALVE (OSV)

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F R E E L A N D
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Z886-FGF

5.50 [140] WIDE REVEAL TRENCH DRAIN SYSTEM WITH DUCTILE IRON FRAME AND SLOTTED GRATE

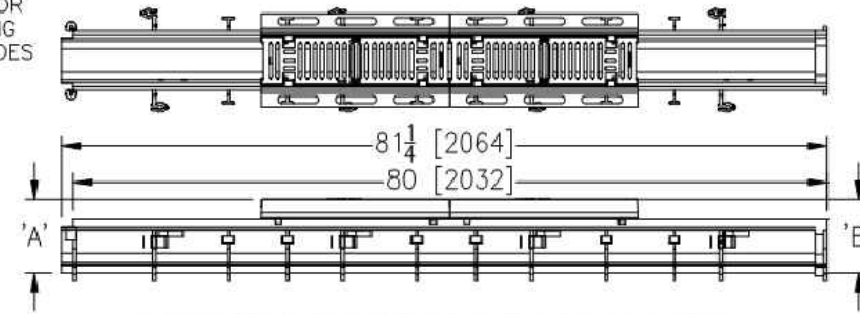
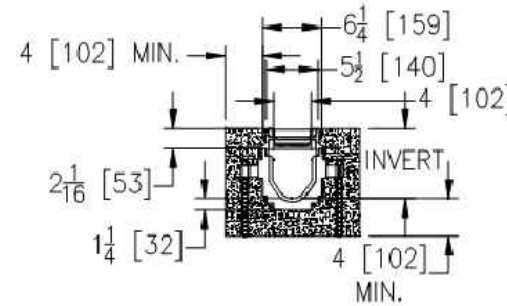
SPECIFICATION SHEET

TAG

NOT TO SCALE

Dimensional Data (inches and [mm]) are Subject to Manufacturing Tolerances and Change Without Notice

SPECIFYING ENGINEER IS RESPONSIBLE FOR CONCRETE ENCASEMENT AND REINFORCING BASED UPON APPLICATION AND LOCAL CODES



NOTE: + Actual Channel length is 81 1/4 [2064] to allow for overlap.

ENGINEERING SPECIFICATION: Zurn Z886-FGF Channels shall be 80 [2032] long, 5.50 [140] wide reveal and have a 4 [102] throat. Modular channel sections shall be made of 0% water absorbent High Density Polyethylene (HDPE). Shall have a positive mechanical connection between channel sections that will not separate during the installation and shall mechanically lock into the concrete surround a minimum of every 10 [254]. Channels shall weigh less than 2.31 lbs. [1.05kg] per linear foot, have a smooth, 1.5 [38] radiused self cleaning bottom with a Manning's coefficient of 0.009 and 0.75% or neutral 0% built in slope. Channels shall have rebar clips standard to secure trench in its final location. Shall be provided with standard FGF grates that lock into the concrete surround during installation and is intended for dynamic traffic loadings. Zurn 5.5 [140] wide reveal Class F Grate and Frame Ductile Iron slotted grate conforming to ASTM specification A536-84, Grade 80-55-06. The ductile iron grate is rated class F per the DIN EN1433 top load classifications. Supplied in 20 [508] nominal lengths with 0.5 [13] wide slots, and 2.8 [71] bearing depth. Grate has an open area of 21.00 sq. in per ft. [44,450 sq. mm per meter].

PREFIX OPTIONS (Check/specify appropriate options)
 Z Six-foot, Eight-inch High Density Polyethylene (HDPE)*

SUFFIX OPTIONS (Check/specify appropriate options)

Outlet Adapters Add/Each

- E1 Closed End Cap
- E2 2 [51] No-Hub End Outlet
- E3 3 [76] No-Hub End Outlet
- E4 4 [102] No-Hub End Outlet
- E6 6 [152] No-Hub End Outlet
- U2 2 [51] No-Hub Bottom Outlet
- U3 3 [76] No-Hub Bottom Outlet
- U4 4 [102] No-Hub Bottom Outlet
- U6 6 [152] No-Hub Bottom Outlet

Frame Options

- SW Sidewall Extensions - 9" [229] High
- SW2 Sidewall Extensions - 18" [457] High

Grate Options (Load Classifications are per DIN EN1433)

- GFG Galvanized Ductile Iron Frame and Slotted Grate - Class F

Miscellaneous Options

- JC Joint Connector

MADE in the U.S.A. (Load Classifications are per DIN EN1433)

- FGF-USA Ductile Iron Frame and Slotted Grate - Class F
- GFG-USA Galvanized Ductile Iron Frame and Slotted Grate - Class F

Trench No.	'A' Shallow Inv.	'B' Deep Inv.	Flow		
			(cfs)	(gpm)	(lps)
8601	5.59 [142]	6.19 [157]	0.21	93	6
8602	6.19 [157]	6.79 [172]	0.27	122	8
8603	6.79 [172]	7.39 [188]	0.34	152	10
8603N	7.39 [188]	7.39 [188]	-	-	-
8604	7.39 [188]	7.99 [203]	0.41	183	12
8605	7.99 [203]	8.59 [218]	0.48	214	13
8606	8.59 [218]	9.19 [233]	0.55	245	15
8606N	9.19 [233]	9.19 [233]	-	-	-
8607	9.19 [233]	9.79 [249]	0.62	276	17
8608	9.79 [249]	10.39 [264]	0.69	308	19
8609	10.39 [264]	10.99 [279]	0.76	339	21
8610	10.99 [279]	11.59 [294]	0.83	371	23
8611	11.59 [294]	12.19 [310]	0.90	403	25
8612	12.19 [310]	12.79 [325]	0.97	435	27
8612N	12.79 [325]	12.79 [325]	-	-	-
8613	12.79 [325]	13.39 [340]	1.04	467	29
8614	13.39 [340]	13.99 [355]	1.11	498	31
8615	13.99 [355]	14.59 [471]	1.18	530	33

*REGULARLY FURNISHED UNLESS OTHERWISE SPECIFIED

REV. C DATE: 8/24/10 C.N. NO. 111590
 DWG. NO. 82534 PRODUCT NO. Z886-FGF

ZURN INDUSTRIES, LLC ♦ SPECIFICATION DRAINAGE OPERATION ♦ 1801 Pittsburgh Ave. ♦ Erie, PA 16514
 Phone: 814/455-0921 ♦ Fax: 814/454-7929 ♦ World Wide Web: www.zurn.com
 In Canada: ZURN INDUSTRIES LIMITED ♦ 3544 Nashua Drive ♦ Mississauga, Ontario L4V1L2 ♦ Phone: 905/405-8272 Fax: 905/405-1292

SHEET CONTENTS

TRENCH DRAIN

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DATE

May 2024

JOB #

22219

DRAWING #

22219SP28.DWG

SHEET NAME

OM7

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

Purpose and Definition

Naturally occurring (undisturbed) soil and vegetation provide important stormwater functions including: water infiltration; nutrient, sediment, and pollutant adsorption; sediment and pollutant biofiltration; water interflow storage and transmission; and pollutant decomposition. These functions are largely lost when development strips away native soil and vegetation and replaces it with minimal topsoil and sod. Not only are these important stormwater functions lost, but such landscapes themselves become pollution generating pervious surfaces due to increased use of pesticides, fertilizers and other landscaping and household/industrial chemicals, the concentration of pet wastes, and pollutants that accompany roadside litter.

Establishing soil quality and depth regains greater stormwater functions in the post development landscape, provides increased treatment of pollutants and sediments that result from development and habitation, and minimizes the need for some landscaping chemicals, thus reducing pollution through prevention.

Applications and Limitations

Establishing a minimum soil quality and depth is not the same as preservation of naturally occurring soil and vegetation. However, establishing a minimum soil quality and depth will provide improved on-site management of stormwater flow and water quality.

Soil organic matter can be attained through numerous materials such as compost, composted woody material, biosolids, and forest product residuals. It is important that the materials used to meet the soil quality and depth BMP be appropriate and beneficial to the plant cover to be established. Likewise, it is important that imported topsoils improve soil conditions and do not have an excessive percent of clay fines.

This BMP can be considered infeasible on till soil slopes greater than 33 percent.

Design Guidelines

- Soil retention. Retain, in an undisturbed state, the duff layer and native topsoil to the maximum extent practicable. In any areas requiring grading remove and stockpile the duff layer and topsoil on site in a designated, controlled area, not adjacent to public resources and critical areas, to be reapplied to other portions of the site where feasible.
- Soil quality. All areas subject to clearing and grading that have not been covered by impervious surface, incorporated into a drainage facility or engineered as structural fill or slope shall, at project completion, demonstrate the following:
 1. A topsoil layer with a minimum organic matter content of 10% dry weight in planting beds, and 5% organic matter content in turf areas, and a pH from 6.0 to 8.0 or matching the pH of the undisturbed soil. The topsoil layer shall have a minimum depth of

Volume V – Runoff Treatment BMPs – December 2014

5-8

eight inches except where tree roots limit the depth of incorporation of amendments needed to meet the criteria. Subsoils below the topsoil layer should be scarified at least 4 inches with some incorporation of the upper material to avoid stratified layers, where feasible.

2. Mulch planting beds with 2 inches of organic material
3. Use compost and other materials that meet these organic content requirements:
 - a. The organic content for “pre-approved” amendment rates can be met only using compost meeting the compost specification for Bioretention (BMP T7.30), with the exception that the compost may have up to 35% biosolids or manure.

The compost must also have an organic matter content of 40% to 65%, and a carbon to nitrogen ratio below 25:1.

The carbon to nitrogen ratio may be as high as 35:1 for plantings composed entirely of plants native to the Puget Sound Lowlands region.
 - b. Calculated amendment rates may be met through use of composted material meeting (a.) above; or other organic materials amended to meet the carbon to nitrogen ratio requirements, and not exceeding the contaminant limits identified in Table 220-B, Testing Parameters, in WAC 173-350-220.

The resulting soil should be conducive to the type of vegetation to be established.

- Implementation Options: The soil quality design guidelines listed above can be met by using one of the methods listed below:
 1. Leave undisturbed native vegetation and soil, and protect from compaction during construction.
 2. Amend existing site topsoil or subsoil either at default “pre-approved” rates, or at custom calculated rates based on tests of the soil and amendment.
 3. Stockpile existing topsoil during grading, and replace it prior to planting. Stockpiled topsoil must also be amended if needed to meet the organic matter or depth requirements, either at a default “pre-approved” rate or at a custom calculated rate.
 4. Import topsoil mix of sufficient organic content and depth to meet the requirements.

More than one method may be used on different portions of the same site. Soil that already meets the depth and organic matter quality standards, and is not compacted, does not need to be amended.

Planning/Permitting/Inspection/Verification Guidelines & Procedures

- Local governments are encouraged to adopt guidelines and procedures similar to those recommended in *Guidelines and Resources For Implementing Soil Quality and Depth BMP T5.13 in WDOE Stormwater Management Manual for Western Washington*. This document is available at: http://www.soilsforsalmon.org/pdf/Soil_BMP_Manual.pdf

Maintenance

- Establish soil quality and depth toward the end of construction and once established, protect from compaction, such as from large machinery use, and from erosion.
- Plant vegetation and mulch the amended soil area after installation.
- Leave plant debris or its equivalent on the soil surface to replenish organic matter.
- Reduce and adjust, where possible, the use of irrigation, fertilizers, herbicides and pesticides, rather than continuing to implement formerly established practices.

Runoff Model Representation

Areas meeting the design guidelines may be entered into approved runoff models as “Pasture” rather than “Lawn.”

Flow reduction credits can be taken in runoff modeling when BMP T5.13 is used as part of a dispersion design under the conditions described in:

[BMP T5.10B Downspout Dispersion](#)

[BMP T5.11 Concentrated Flow Dispersion](#)

[BMP T5.12 Sheet Flow Dispersion](#)

[BMP T5.18 Reverse Slope Sidewalks](#)

[BMP T5.30 Full Dispersion](#) (for public road projects)

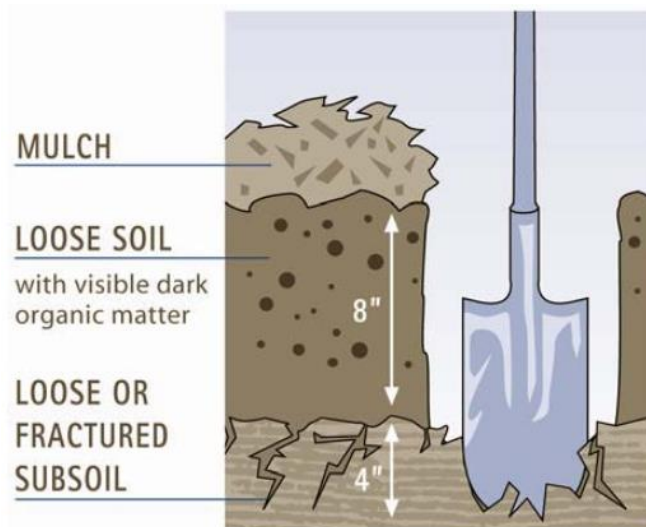


Figure 5.3.3 – Planting bed Cross-Section

(Reprinted from *Guidelines and Resources For Implementing Soil Quality and Depth BMP T5.13 in WDOE Stormwater Management Manual for Western Washington*, 2010, Washington Organic Recycling Council)