CHAPTER 4

Storm Water Management

A. Introduction

This chapter outlines standards for the design and construction of storm water management facilities. These facilities require special design considerations to provide safe and efficient runoff management, in accordance with the City's storm water control ordinance, Oak Creek's Storm Water Management Master Plan, Oak Creek's WPDES NR 216 permit, Wisconsin Administrative Code Chapter NR 151 and the Milwaukee Metropolitan Sewerage District's storm water rules.

B. Requirements

1. Storm water quantity - Land development or redevelopment activities subject to Oak Creek's Storm Water Management Ordinance shall establish on-site management practices to:

   a. Development or redevelopment that increase impervious surface by 0.5 acres or more are required to limit the runoff leaving the site to a release rate of less than the following:
      (1) 0.40 cfs/acre for the 100-year recurrence interval and
      (2) 0.15 cfs/acre for the 2-year recurrence interval

   b. If redevelopment will disturb an area larger than 2 acres and creates less than 0.5 acres of impervious surface, the runoff release rate shall be reduced by the amount listed in the following table for the one (1) percent probability event (100-year recurrence interval) and the fifty (50) percent probability event (2-year recurrence interval):

Area Disturbed by Demolition or Redevelopment	Reduction to the Existing Runoff Release Rate as of October 25, 2010
2 acres to 3.5 acres	10%
3.5 acres to 5 acres	15%
Greater than 5 acres	20%

   e. Development or redevelopment that increase impervious surface by an area equal to or greater than 5,000 square feet but less than 21,780 square feet are required to provide green infrastructure on site with a detention volume equal to one-half inch multiplied by the area of net new impervious surface.

2. Storm water quality (Total Suspended Solids)- Land development or redevelopment activities subject to Oak Creek's Storm Water Management Ordinance shall design, install and maintain BMPs to control the following from post construction sites:

   a. BMPs shall be designed in accordance with the following TSS reduction standards table. The design shall be based on an average annual rainfall as compared to no runoff management controls.

TSS Reduction Standards	
Development Type	**TSS Reduction**
New Development	80%
In-fill Development	80%
Redevelopment	40% of load from parking areas and roads

b. Storm water discharges shall be pre-treated prior to infiltration to prolong the life of the infiltration practice and to prevent discharge of storm water pollutants at concentrations that will result in exceedances of groundwater preventive action limits or enforcement standards established by the Department of Natural Resources in NR 140 Wisconsin Administrative Code.

3. Rainfall depth and distribution - unless prior authorization is given by the City Engineer, the following rainfall data shall be used in hydrologic calculation to meet the storm water quantity requirements:

   a. The most recent rainfall depths identified by Southeastern Wisconsin Regional Planning Commission. The 24-hour depths from NOAA Atlas 14 are as follows:

      - 1-year 2.34 inches
      - 2-year 2.64 inches
      - 5-year 3.20 inches
      - 10-year 3.73 inches
      - 25-year 4.56 inches
      - 50-year 5.28 inches
      - 100-year 6.06 inches
      - 500-year 8.17 inches

   b. The NRCS MSE3 24-hour storm rainfall distribution shall be used.

4. All hydrologic and hydraulic calculations shall be based on the principles of the SCS curve method document entitled "Urban Hydrology for Small Watersheds" (Technical Report 55) published by Natural Resources Conservation Service (NRCS), United States Department of Agriculture, June 1992, or other methods acceptable to the City Engineer.

5. Infiltration – Post development runoff shall be infiltrated in accordance with Section 13.106(i) of the Oak Creek Municipal Code.

   a. BMPs shall be designed, installed and maintained to infiltrate runoff in accordance with the following table:

Development Type	**Post Development Infiltration Volume**	**Maximum Area of Post Developed Site**
Low (<40% connected imperviousness) Parks, cemeteries, low density residential	90%	1%
Medium (40-80% connected imperviousness) Medium and High density residential, multi-family, industrial and institutional developments and office parks	75%	2%
High (>80% connected imperviousness) Commercial strip malls, shopping centers and downtowns	60%	2%

   b. Pre-developed conditions shall reflect a good level of land management for the appropriate land covers and not exceed the following:

	Hydrologic Soil Group			
	A	B	C	D
CN Woods	30	55	70	77
CN Grassland	39	61	71	78
CN Cropland	55	69	78	83

c. When the infiltration rate of the soil measured at the proposed bottom of the infiltration system is less than 0.6 inches/hour using a scientifically credible field test method or where the least permeable soil horizon to 5 feet below the proposed bottom using the USDA method of soils analysis is sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay or clay, the decision to infiltrate is optional.

d. Pretreatment is required prior to infiltrating runoff from parking lots, driveways or roads. Typical options may include oil and grease separators, sedimentation basins, swales or filter strips.

e. Where infiltration rates limit or restrict infiltration practices, the infiltration performance standards shall be met to the maximum extent practicable. The impervious surface area shall not exceed 70% of the site.

6. Protective areas – Protective areas shall be established in accordance with Section 13.106(j) of the Oak Creek Municipal Code.

a. Wetland boundary delineation shall be in accordance with NR 103.08(1m), Wis. Adm. Code. Determinations of the extent of the protective area adjacent to wetlands shall be made on the basis of the sensitivity and runoff susceptibility of the wetland in accordance with NR103.03, Wis. Adm. Code.

b. Protective areas shall be shown on the subdivision plat or Certified Survey Map for developments involving land divisions.

c. Protective area provisions
   (1) Impervious surfaces shall be kept out of the protective area to the maximum extent practicable with an absolute minimum 10 foot setback without impervious surface. This includes but is not limited to houses, buildings, accessory structures, decks, driveways, patios, sidewalks, pools, retaining walls, stockpiles and storm sewers and laterals that do not drain into a BMP.
   (2) Adequate sod or self-sustaining vegetative cover of 70% or greater shall be established and maintained where land disturbing construction activity occurs within a protective area. The storm water management plan shall contain a written site-specific explanation for any parts of the protective area that are disturbed during construction.
   (3) BMPs, utilities, fences, trees and shrubs are permissible in protective areas.

7. Green Infrastucture provisions

a. Detention volumes shall be determined using the following procedures, by order of preference:
   (1) Project-specific modeling,
   (2) A calculating tool available at www. Freshcoastguardians.com or subsequent locations identified by the MMSD, or
   (3) The following table:

Green Infrastructure	Unit Detention Volume
Bioswale	7.5 gallons per square foot
Cistern	Capacity of cistern
Constructed wetlands	8.3 gallons per square foot
Green roof	1.0 gallons per square foot
Native landscaping	0.4 gallons per square foot
Porous pavement	3.0 gallons per square foot
Rain garden	4.4 gallons per square foot
Rain barrel	Capacity of barrel
Tree	25 gallons per tree

(4) Green infrastructure shall be constructed according to the technical standards identified in Section C.1 below.
(5) The new impervious surface or an equivalent impervious area shall drain to the green infrastructure installed

8. Swale treatment for transportation facilities shall be in accordance with Section 13.106(m) of the Oak Creek Municipal Code. The minimum longitudinal slope shall be 1%.

9. Fueling and vehicle maintenance areas – BMPs shall be designed, installed and maintained to reduce petroleum within runoff to the maximum extent practicable such that the runoff entering waters of the state contains no visible petroleum sheen. A combination of the following BMPs may be used: oil and grease separators, canopies, petroleum spill cleanup materials or any other structural or non-structural method of preventing or treating petroleum in runoff.

C. Standards

1. Technical standards approved by the City of Oak Creek or identified, developed or disseminated by the Wisconsin Department of Natural Resources under subchapter V of chapter NR 151 of the Wisconsin Administrative Code shall be used in designing water quality and infiltration components of storm water management practices. The technical standards can be referenced at the following website: http://dnr.wi.gov/topic/stormwater/standards/postconst_standards.html, or subsequent locations identified by the DNR.

2. **Floodplains**

a. Dikes and flood walls shall not be used to facilitate new development in the floodplain. New development in floodplains shall only be on engineered fill. Where dikes or flood walls are used to protect human life in existing development, the minimum dike or flood wall top elevation shall be determined using whichever of the following produces the highest profile:
(1) The 100-year recurrence interval flood profile plus 3’ of freeboard.
(2) The 500-year recurrence interval flood profile.

b. Reduced regulatory flood protection elevations and accompanying reduced floodway or floodplain areas resulting from any proposed dikes, floodwalls, storage ponds, or channel modifications shall not become effective for the purposes of land use regulation until the storage facilities are actually constructed, operative, and approved.

c. Any loss of flood storage from the floodplain due to filling shall be compensated at a ratio of not less than 1.1:1. All compensatory storage must be hydraulically equivalent for the 10-year and 100-year recurrence interval flood discharge.

3. **Miscellaneous**

a. Storm water management practices outlet structures.

(1) Outlet structures shall be 3 (three) inches in diameter or larger.
(2) Outlet structures 6 (six) inches or smaller shall be protected from clogging due to ice formation or trash build-up by incorporating hoods, trash racks or submerged outlets into the design.

b. Interior side slopes of storm water management facilities shall be 4:1 or flatter.

c. Existing and proposed right-of-way shall not be used or considered as a detention facility or to supplement a detention facility.

d. Existing and proposed parking facilities may be used as part of detention facility provided that the inundation depth does not exceed 6 (six) inches at any point over the paved surface.

e. A corridor at least 20-feet wide shall be provided for access to storm water management practices. The access corridor may be provided by easement, outlot or right-of-way. The slope on the access corridor shall not exceed 10% in any direction and shall be free of obstructions.

f. Detention basins designed as part of a development creating more than one parcel shall be placed in an outlot.

g. The bottoms of all dry detention basins shall have a minimum 1% slope, and a low flow pilot channel or underdrain incorporated into the design.

4. **Submittal Requirements**

a. Storm Water Management Permit
(1) Completed storm water management permit application and applicable fee.
(2) Storm water management report stamped by a Professional Engineer (pdf format).
(3) Site and drainage map (pdf format).
(4) One copy of the Soil and Site Evaluation Report (pdf format).
(5) One complete set of civil drawings (pdf format).
(6) Erosion control plan, soil loss calculations and schedule (pdf format).
(7) Signed maintenance agreement.

b. Green infrastructure Permit
(1) Completed green infrastructure permit application and applicable fee.
(2) Site and drainage map showing the new impervious surface, green infrastructure and tributary area (pdf format).
(3) Calculations showing the detention volume needed and the retention volume provided.
(4) A maintenance plan.

5. **Operation and Maintenance** - An operation and maintenance plan shall be developed that is consistent with the purposes of the practices incorporated, its intended life, safety requirements and the criteria for its design. The plan shall address the responsible party for operation, maintenance, and documentation of the plan. The plan shall also include details on inspecting sediment depths, frequency of sediment removal, inlet and outlet maintenance, keeping embankments clear of woody vegetation, keeping the practice clean from trash and debris, mowing and providing access to perform the operation and maintenance activities. At a minimum, storm water management facilities shall be maintained to the standards outlined in the following tables:

DETENTION BASIN MAINTENANCE STANDARDS

Maintenance Component	Defect	Conditions When Maintenance Is Needed	Results Expected When Maintenance Is Performed
Side Slopes and Embankments	Trash & Debris	Any visual evidence of dumping, trash or debris.	Trash and debris cleared from site.
	Unmowed vegetation/ Ground Cover	If facility is located in a platted subdivision, multi-family apartment complex, planned development or a mobile home district, mowing is needed when vegetation exceeds 6 inches in height. In all other areas, mowing is needed when vegetation exceeds one foot in height. Mowed vegetation should be removed from areas where it could enter the pond, either when the pond level rises or by rainfall runoff.	When mowing is needed, grass/ground cover should be mowed to 2 inches in height. Trees and bushes should be removed where they interfere with pond maintenance activities; that is, at the inlet, outlet and near engineered structures.
	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.
	Tree Growth	Tree growth does not allow maintenance access or interferes with maintenance activity (i.e., slope mowing, silt removal or equipment movements).	Trees do not hinder maintenance activities.
	Erosion	Eroded damage over 2 inches 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 measures; e.g., rock rip-rap, planting of grass, erosion mat, compaction.
Inlet/ Outlet Structures	Debris and Sediment	Sediment and/or debris clogging more than 10% of the structure opening.	No clogging or blockage in the inlet and outlet structures.
	Damaged Pipe	Rust is causing more than 50% deterioration to any part of metal pipes, cracks in plastic pipe or cracks or exposed rebar in concrete pipes.	Pipe repaired or replaced.
		Any dent that decreases the cross section area of pipe by more than 10% or retards the flowage of water.	Pipe repaired or replaced.
	Erosion/Scouring	Eroded or scoured bottom at inlet or outlet pipes; undermining of structure or end section.	Area should be stabilized by using appropriately sized rock rip-rap.
	Damaged or Missing Orifice Plate	Control device is not working properly due to missing, out of place, or bent orifice plate.	Plate is in place and works as designed.
	Orifice Plate Obstructions	Any trash, debris, sediment, or vegetation blocking the plate.	Plate is free of all obstructions and works as designed.
Trash Racks/Hoods	Trash and Debris	Trash or debris that is plugging more than 20% of the openings in the barrier.	Barrier clear to receive capacity flow.
	Damaged/ Missing Bars or Hood.	Bars or hood 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 in place according to design.
		Bars are loose and rust is causing 50% deterioration to any part of barrier.	Repair or replace barrier to design standards.
Pool Area	Sediment Accumulation in Pond Bottom	Sediment accumulations in pond bottom that exceeds the design sediment depth.	Sediment cleaned out to designed pond shape and depth; pond reseeded if necessary to control erosion.
	Water Level	Water level does not drain down to normal designed pool elevation.	Check outlet structure and downstream conveyance system for obstructions.
	Oil Sheen on Water	Prevalent and visible oil sheen.	Remove oil from water by use of oil-absorbent pads or by vactor truck. Refer problem to locate source and correct.
Emergency Overflow/Spillway and Dikes	Settlements	Any part of these components that has settled 4-inches lower than the design elevation, or inspector determines dike/ berm is unsound.	Dike should be built back to the design elevation and repaired to specifications.
	Rock Missing	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 emergency spillway.	Replace rocks to design standards.

RAIN GARDEN MAINTENANCE STANDARDS

Maintenance Component	Defect	Conditions When Maintenance Is Needed	Results Expected When Maintenance Is Performed
Side Slopes and Embankments	Trash & Debris	Any visual evidence of dumping, trash or debris.	Trash and debris cleared from site.
	Unmowed vegetation/ Ground Cover	If facility is located in a platted subdivision, multi-family apartment complex, planned development or a mobile home district, mowing the exterior perimeter of he garden and adjacent slopes is needed when vegetation exceeds 6 inches in height. In all other areas, mowing is needed when vegetation exceeds one foot in height.	When mowing is needed, grass/ground cover should be mowed to 2 inches in height. Trees and bushes should be removed where they interfere with maintenance activities or provide too much shade to the garden.
	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.
	Erosion	Eroded damage over 2 inches 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 measures; e.g., rock rip-rap, planting of grass, erosion mat.
Inlet/ Outlet Pipe	Debris and Sediment	Trash, debris, sediment or vegetation blocking or clogging more than 10% of the pipe opening.	No clogging or blockage in the inlet and outlet/overflow piping.
	Damaged	Rust is causing more than 50% deterioration to any part of metal pipes, cracks in plastic pipe or cracks or exposed rebar in concrete pipes.	Pipe repaired or replaced.
		Any dent that decreases the cross section area of pipe by more than 10% or retards the flowage of water.	Pipe repaired or replaced.
	Erosion/Scouring	Eroded or scoured bottom at inlet or outlet pipes; undermining of structure or end section.	Area should be stabilized by using appropriately sized rock rip-rap.
Garden/Ponding Area	Sediment Accumulation	Sediment depth exceeds 2-inches.	Remove sediment deposits and restore landscaping as necessary.
	Level/Flow Spreader	Flow spreader uneven or clogged so that flows are not uniformly distributed through the entire width.	Level the spreader and clean so that flows are spread evenly over entire flow width.
	Weeds	Weed growth in garden.	Weeds removed by hand. Uniform layer (3") of shredded woods chips placed over exposed soil until plants fill out garden.
	Dead Plants	Annually each spring when new growth is 3"-5" tall. Individual dead or diseased plants.	Dead stalks and seed heads from previous seasons growth are cut and removed. Remove and replace plants.
	Thinning Plants	Plants become crowded or begin to decline or die in the center of a clump.	Plant growth is improved by removing or dividing plants in spring before they are 4" tall.
	Standing Water	When water stands in the garden between storms and does not drain freely.	Sediment or debris blockages are removed. Check underdrain cleanouts, outlet pipes and downstream conveyance system for obstructions. Loosen bare soil areas and add a layer of shredded wood chips or compost to prevent the surface from sealing.
	Drought	Rainfall less than an inch per week when the garden is being established. Extended periods of drought after the garden is established.	Garden is watered twice per week until plants are established. Garden is watered about one inch per week.
	Leaves	Leaves collect in the bottom of the garden in excess of 4" deep.	Leaves are removed in fall or spring. A 2"-4" layer of shredded leaves is okay provided they do not clog or go down the outlet pipe.

BIORETENTION/BIOINFILTRATION MAINTENANCE STANDARDS

Maintenance Component	Defect	Conditions When Maintenance Is Needed	Results Expected When Maintenance Is Performed
Side Slopes, Embankments and surface overflow	Trash & Debris	Any visual evidence of dumping, trash or debris.	Trash and debris cleared from site.
	Unmowed vegetation/ Ground Cover	If facility is located in a platted subdivision, multi-family apartment complex, planned development or a mobile home district, mowing the exterior perimeter of the garden and adjacent slopes is needed when vegetation exceeds 6 inches in height. In all other areas, mowing is needed when vegetation exceeds one foot in height.	When mowing is needed, grass/ground cover should be mowed to 2 inches in height. Trees and bushes should be removed where they interfere with maintenance activities or provide too much shade to the garden.
	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.
	Erosion	Eroded damage over 2 inches 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 measures; e.g., rock rip-rap, planting of grass, erosion mat.
Pretreatment Area and Flow Entrance	Sediment accumulation in pretreatment areas	Sediment depth exceeds 2-inches.	Sediment removed and vegetation reestablished.
	Level/Flow Spreader	Flow spreader uneven or clogged so that flows are not uniformly distributed through the entire width.	Level the spreader and clean so that flows are spread evenly over entire width.
Inlet/ Outlet Structure	Debris and Sediment	Inlet/outlet areas clogged with sediment and/or debris.	Remove material so that there is no clogging or blockage in the inlet and outlet area.
	Damaged	Any dent that decreases the cross section area of pipe by more than 10% or retards the flowage of water.	Pipe repaired or replaced.
	Erosion/Scouring	Eroded or scoured bottom at inlet or outlet structure; undermining of structure or end section.	Area should be stabilized by using appropriately sized rock rip-rap.
Infiltration/ Ponding Area	Vegetation/Weeds	When grass becomes excessively tall; when nuisance weeds and other vegetation starts to take over.	Mow vegetation or remove nuisance vegetation so that flow is not impeded.
	Dead Plants	Annually each spring when new growth is 3”-5” tall. Individual dead or diseased plants.	Dead stalks and seed heads from previous seasons growth are cut and removed. Remove and replace plants.
	Thinning Plants	Plants become crowded or begin to decline or die in the center of a clump.	Plant growth is improved by removing or dividing plants in spring before they are 4” tall.
	Standing Water	When water stands between storms and does not drain freely.	Any of the following may apply: remove sediment or trash blockages, remove clogged check dams, add underdrain.
	Leaves	Leaves collect in the bottom of the garden in excess of 4” deep.	Leaves are removed in fall or spring. A 2”-4” layer of shredded leaves is okay provided they do not clog or go down the outlet pipe.

PERMEABLE PAVEMENT MAINTENANCE STANDARDS

Maintenance Component	Defect	Conditions When Maintenance Is Needed	Results Expected When Maintenance Is Performed
Pavement Surface	Pavement Condition	Check surface for settlement, deformation or cracking	Repair any settlement, deformations or cracking that are significant enough to adversely impact the water quality function or the system.
	Permeable Surface Clogged	Sediment accumulation or evidence of water ponding on pavement surface	Remove sediment and clean pavement surface with regenerative air or vacuum sweeper at least twice each year. Permeable pavers/blocks with joints that are filled with aggregate – replenish the joint aggregate in accordance with industry recommendations. Porous asphalt and pervious concrete – repairs may be done with conventional impervious materials if repair areas do not exceed 10% of original permeable surface and repair areas run on to adjacent permeable areas.
	Run-on Areas	Excessive sediment depositing on pavement surface	Stabilize and provide adequate ground cover on all areas draining to permeable pavement.
Subgrade	Adequate Infiltration	Inspect observation wells within 72 hours after a rain event of 0.5 inches or greater for adequate infiltration into the soil subgrade.	No standing water in subgrade.
	Outfalls and Underdrains	Outfall drainage blocked, restricted or eroded	Outfalls and underdrains freely drain during and after rainfall events.

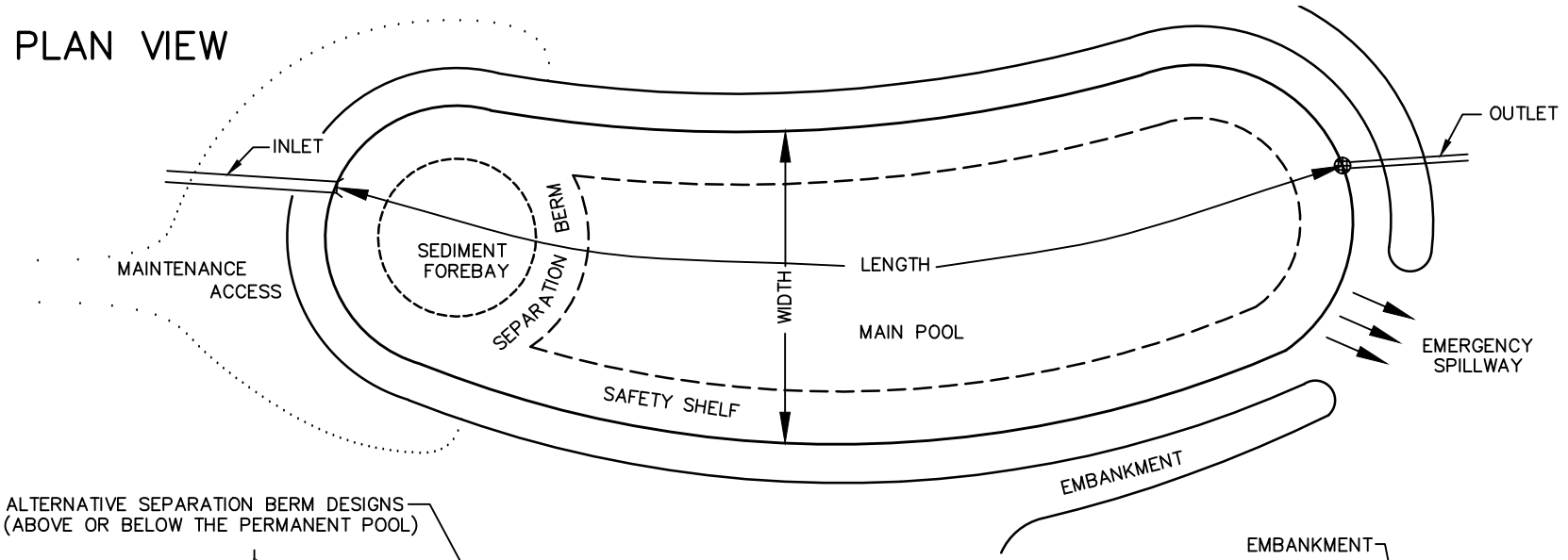
The following activities shall be prohibited from occurring on the permeable pavement surface:

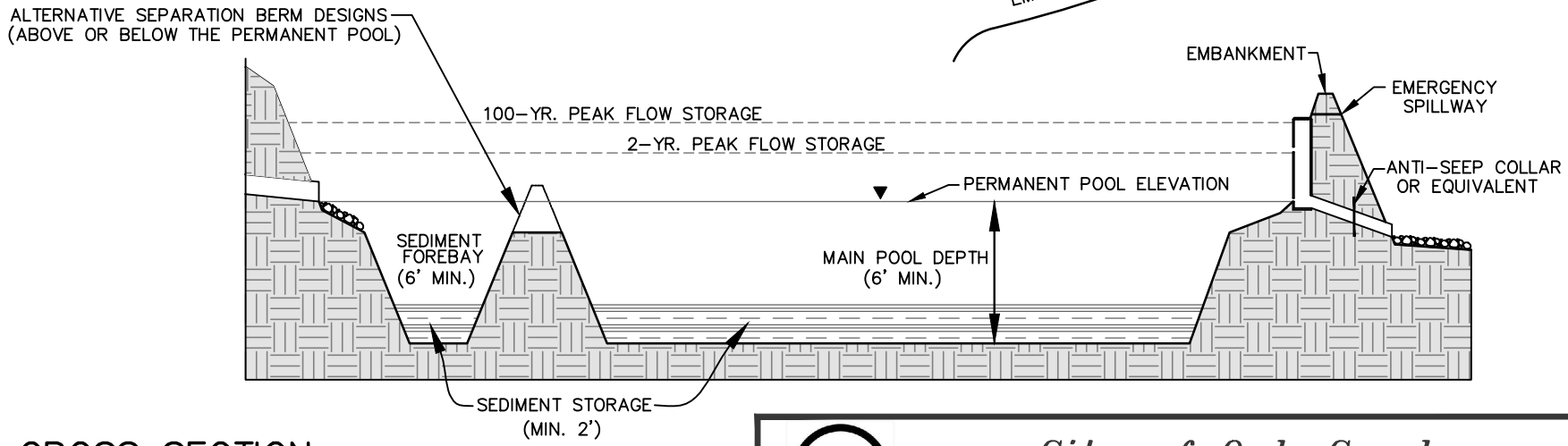
- Temporary or permanent stockpiling of soil or other material that can potentially cause or contribute to clogging.
- Application of seal coating.
- Application of sand for deicing.

OIL AND SEDIMENT SEPARATOR MAINTENANCE STANDARDS

Maintenance Component	Defect	Conditions When Maintenance Is Needed	Results Expected When Maintenance Is Performed
Wet vault/tank	Trash & Debris accumulation	Trash and debris accumulated in vault, pipe or inlet/outlet, (includes floatables and nonfloatables).	Remove trash and debris from vault.
	Sediment Accumulation in Vault/tank	Sediment accumulation in vault bottom exceeds 8-inches in depth.	Remove sediment from vault.
	Damaged Pipes	Inlet/ outlet piping damaged or broken and in need of repair.	Pipe repaired and/ or replaced.
	Joints Between Tank Sections	Any crack allowing material to be transported into facility.	All joints between tank sections are sealed.
	Vault/tank Structure Damaged	Vault: Cracks wider than 1/4-inch and any evidence of soil particles entering the structure through the cracks, or maintenance/ inspection personnel determines that the vault is not structurally sound.	Repair cracks wider than 1/4-inch at the joint of the inlet/ outlet pipe. Make repairs so that vault is structurally sound.
	Baffles	Baffles corroding, cracking, warping and/ or showing signs of failure as determined by maintenance/ inspection staff.	Repair or replace baffles to specifications.
	Oil Accumulation	Oil accumulation that exceeds 1-inch at the water surface or inspection/cleanout port.	Extract oil from vault by vactoring methods. Clean coalescing plates by thoroughly rinsing and flushing. Should be no visible oil depth on water.
Manhole	Cover Not in Place	Cover is missing or only partially in place. Any open manhole requires maintenance.	Manhole is closed.
	Cover Difficult to Remove	One maintenance person cannot remove lid after applying 80 pounds of lift. Intent is to keep cover from sealing off access to maintenance.	Cover can be removed and reinstalled by one maintenance person.
	Access Ladder Damage	Ladder is corroded or deteriorated, not functioning properly, missing rungs, has cracks and/ or misaligned. Confined space warning sign missing.	Ladder replaced or repaired to specifications, and is safe to use as determined by inspection personnel. Replace sign warning of confined space entry requirements.

PLAN VIEW

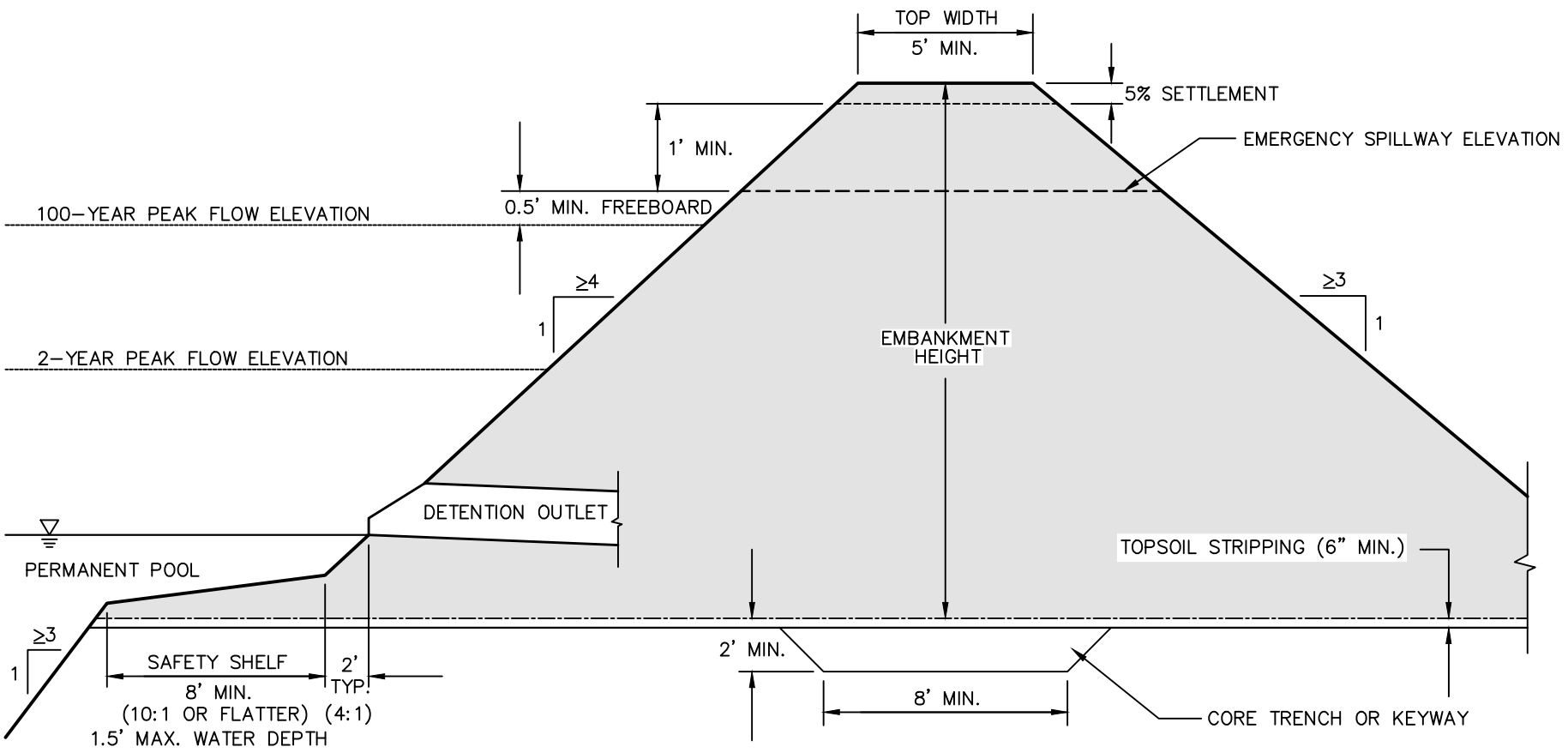




CROSS SECTION

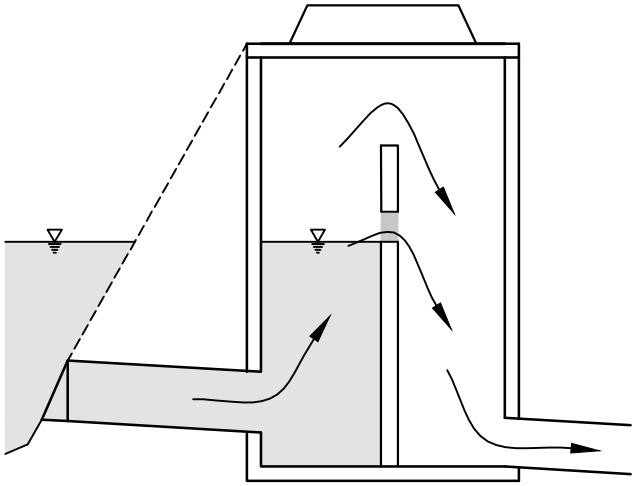
City of Oak Creek
Engineering Department

Drawn By: PJB	Scale: N.T.S.
Appv. By: MCS	Date: 1/19/17 (Revised)
CONCEPTUAL WET DETENTION BASIN	ST-28

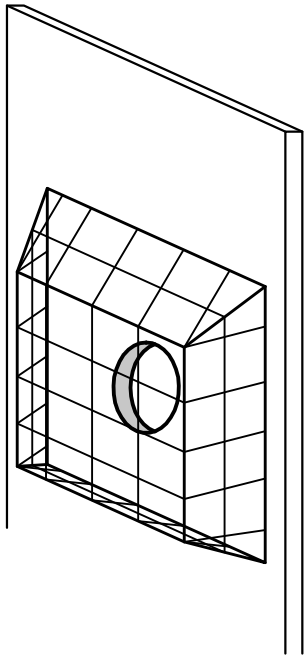


City of Oak Creek
Department of Public Works

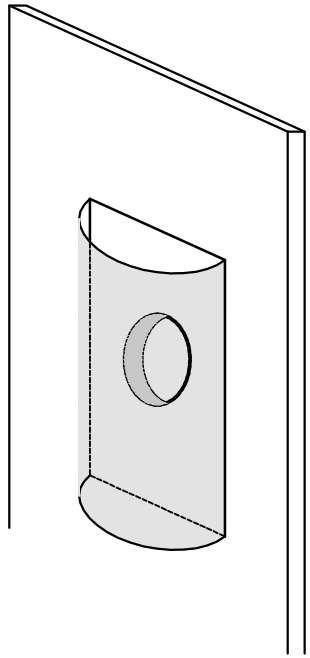
Drawn By: PJB	Scale: N.T.S.
Appv. By: MCS	Date: 1/20/17
WET DETENTION BASIN CROSS SECTION	ST-29



SUBMERGED OUTLET*



TRASH RACK*



HOOD/SHIELD*

*DETAILS OF DESIGN (MATERIALS, SIZE, SPACING, GAGE, MOUNTING HARDWARE, ETC.) NEED TO BE SPECIFIED ON PLAN DETAILS.

City of Oak Creek
Engineering Department

Drawn By: PJB	Scale: N.T.S.
Appv. By: MCS	Date: 1/19/17 (Revised)
NON-CLOGGING OUTLET DESIGNS	ST-30