**ENGINEERING AND ENVIRONMENTAL SERVICES**

***Stormwater Division***

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**BIORETENTION AREA DESIGN SUMMARY**

Stormwater Management Construction Plan Review:

A complete Stormwater management construction plan submittal includes a design summary for each Stormwater BMP, design calculations, plans and specifications showing BMP, inlet and outlet structure details.

1. **PROJECT INFORMATION**

For projects with multiple SCMs, specify which SCM this worksheet applies to:

Project Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Phase: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

PIN: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Case #: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Legal Name of Owner: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Owner Contact: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Phone: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Owner Address: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Design Contact Person: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Phone: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

|  |  |
| --- | --- |
| Drainage area | ac |
| Impervious area | ac |
| Design runoff | cfs |
| Design treatment volume | ft3 |

*(on-site drainage to the SCM)*

*(on-site impervious area draining to the SCM)*

1. **GENERAL MINIMUM DESIGN CRITERIA FOR ALL SCMs** *(Revised 1/3/2017)*

**GENERAL MDC 1: SIZING**

|  |  |  |
| --- | --- | --- |
| Design storm depth |  | ft |
| Design runoff volume | | ft3 |

*(One year, 24 hour storm event)*

*(Minimum calculation of entire drainage area)***GENERAL MDC 2: CONTAMINATED SOILS**

|  |  |
| --- | --- |
| Contaminated soils within footprint? | Y / N |

*(Brownfield location?)*

**GENERAL MDC 3: SIDE SLOPES**

|  |  |
| --- | --- |
| Maximum vegetated side slopes | : 1 |

*(Maximum 3:1 vegetated slopes)*

**GENERAL MDC 4: EROSION PROTECTION**

|  |  |
| --- | --- |
| 10 year storm outlet discharge | cfs |

*(Must be non-erosive)*

**GENERAL MDC 5: EXCESS FLOW**

|  |  |  |
| --- | --- | --- |
| Emergency outlet elevation |  | ft |
| Emergency spillway width | | ft |
| Emergency spillway side slopes |  | : 1 |
| Emergency spillway slope |  | % |

**GENERAL MDC 6: DEWATERING**

|  |  |  |
| --- | --- | --- |
| Dewatering method |  |  |
| Drawdown orifice size | | in |

*(If applicable)*

**GENERAL MDC 7: CLEAN OUT AFTER CONSTRUCTION**

|  |
| --- |
| Every SCM impacted by sediment and erosion control during the construction phase shall be cleaned out and converted to its approved design state |
| In addition, installed SCM’s should be inspected and cleaned after each heavy rainfall |

**GENERAL MDC 8: MAINTENANCE ACCESS**

|  |  |  |
| --- | --- | --- |
| Maintenance access width |  | ft |
| Side slopes within maintenance access | | : 1 |
| Access extend to public right of way |  | Y / N |

*(Minimum width of 25 feet)*

*(Maximum 3:1)*

**GENERAL MDC 9: EASEMENTS**

|  |  |
| --- | --- |
| All SCMs and associated maintenance accesses located in permanent recorded easement? (shown and labeled in easement) | Y / N |
| Maintenance access width around SCM | ft |

*(Does not include single family residential lots)*

*(Minimum width of 10 feet)*

**GENERAL MDC 10: SINGLE FAMILY RESIDENTIAL LOTS**

|  |
| --- |
| Plats for residential lots that contain an SCM shall include:   1. The specific location of the SCM on the lot 2. A typical detail for the SCM to be used 3. A note that the SCM on the property has been required to meet stormwater regulations and that the property owner may be subject to enforcement actions if the SCM is removed, relocated, or altered without prior approval |

**GENERAL MDC 11: OPERATION AND MAINTENANCE AGREEMENT**

|  |  |
| --- | --- |
| Acknowledgement that the association shall continuously operate and maintain the stormwater control and management facilities |  |
| Establishment of an escrow account which can be spent solely for sediment removal, structural, biological or vegetative replacement, major repair, or construction of the SCM |  |

**(*Check box when completed*)**

**GENERAL MDC 12: OPERATION AND MAINTENANCE PLAN**

|  |  |
| --- | --- |
| Specify all operation and maintenance work necessary for the function of all SCM components |  |
| Specify methods to be used to maintain or restore the SCMs to design specifications in the event of failure |  |
| O&M plan shall be signed by the owner and notarized |  |

**(*Check box when completed*)**

1. **BIORETENTION MINIMUM DESIGN CRITERIA** *(Revised 1/19/18)*

**BIORETENTION MDC 1: SEPARATION FROM THE SHWT**

|  |  |  |
| --- | --- | --- |
| SHWT elevation |  | ft |
| Bottom elevation of media | | ft |
| SHWT separation |  | ft |

*(Determined through soil tests)*

*(SHWT elevation minus bottom elev.)*

**BIORETENTION MDC 2: MAXIMUM PONDING DEPTH FOR DESIGN VOLUME**

|  |  |  |
| --- | --- | --- |
| Planting soil top elevation |  | ft |
| Design volume ponding elevation | | ft |
| Design volume ponding depth |  | in |
| Required treatment volume |  | ft3 |
| Required surface area |  | ft2 |

*(Elevation of top of soil)*

*(Maximum elevation of design storm)*

*(Maximum 12 inches)*

*(Required volume divided by ponding depth)*

**BIORETENTION MDC 3: PEAK ATTENUATION VOLUME**

|  |  |  |
| --- | --- | --- |
| Peak attenuation volume depth |  | in |
| Peak attenuation outlet elevation | | ft |

*(Max. 24” above planting surface elev.)*

*(Max. 18” above planting surface elev.)*

**BIORETENTION MDC 4: UNDERDRAIN**

|  |  |  |
| --- | --- | --- |
| Internal Water Storage included? |  | Y / N |
| Top elevation of IWS | | ft |
| IWS and planting surface separation |  | in |
| In-situ soil infiltration rate |  | in/hr |

*(Min. 18 inches below planting surface)*

*(Min. 18 inches)*

*(Min. 2 in/hr to exclude underdrain)*

**BIORETENTION MDC 5: MEDIA DEPTH**

|  |  |  |
| --- | --- | --- |
| Does cell have shrubs or trees? |  | Y / N |
| Media depth | | ft |
| IWS and planting surface separation |  | ft |

*(Min. depth 36” with trees and shrubs)*

*(Min. depth 24” with no IWS, 30” with IWS and no trees and shrubs)*

**BIORETENTION MDC 6: MEDIA MIX**

|  |  |  |
| --- | --- | --- |
| Medium to coarse washed sand |  | % |
| Fines (silt and clay) | | % |
| Organic matter |  | % |
| Volume of total media |  | ft3 |

*(75 to 85 percent required)*

*(8 to 15 percent required)*

*(5 to 10 percent required)*

**BIORETENTION MDC 7: MEDIA P-INDEX**

|  |  |
| --- | --- |
| Phosphorous Index |  |

*(Less than 30 in NSW waters, less than 50 elsewhere)*

**BIORETENTION MDC 8: MECHANICAL COMPACTION**

|  |
| --- |
| The media shall not be mechanically compacted |

*(Water it or walk on it as it is placed)*

**BIORETENTION MDC 9: MAINTENANCE OF MEDIA**

|  |
| --- |
| Bioretention cell shall be maintained in manner that results in drawdown of at least 1” per hour at the planting surface |

**BIORETENTION MDC 10: PLANTING PLAN**

|  |  |  |
| --- | --- | --- |
| Sod used? |  | Y / N |
| Planned percent plant coverage at five years after planting? |  | % |
| Planned coverage with tree or shrub canopy at five years after planting? | | % |

*(Must be non-clumping, deep rooted)*

*(Minimum 75%, for bioretention cells with veg. other than sod)*

*(Maximum 50%)*

1. **BIORETENTION DESIGN CHARACTERISTICS**

Size of cell area \_\_\_\_\_\_\_\_\_\_ ft2

Inflow sheet flow velocity \_\_\_\_\_\_\_\_\_\_ fps

Mulch layer top elevation \_\_\_\_\_\_\_\_\_\_ ft

Media top elevation \_\_\_\_\_\_\_\_\_\_ ft

Bottom elevation of cell \_\_\_\_\_\_\_\_\_\_ ft

Perforated Pipe length \_\_\_\_\_\_\_\_\_\_ ft

Space between pipe runs \_\_\_\_\_\_\_\_\_\_ ft

Longitudinal slope \_\_\_\_\_\_\_\_\_\_ ft/ft

Diameter of pipe \_\_\_\_\_\_\_\_\_\_ ft

**Emergency Spillway Information**

Emergency Outlet Elev. \_\_\_\_\_\_\_\_\_\_ ft (invert of emergency overflow weir)

Emergency Spillway width \_\_\_\_\_ ft side slopes \_\_\_:1 slope \_\_\_\_\_\_%

1. **REQUIRED ITEMS CHECKLIST**

The following checklist outlines design requirements. Initial in the space provided to indicate the following design requirements have been met and supporting documentation is attached.

**Applicant’s Initials**

\_\_\_\_\_\_\_\_\_\_a. The lowest point of the bioretention cell shall be a minimum of 2 feet above the SHWT. This separation is to ensure that the media does not become saturated and unable to function effectively.

\_\_\_\_\_\_\_\_\_\_ b. The maximum ponding depth for design volume shall be 12 inches above the planting surface.

\_\_\_\_\_\_\_\_\_\_ c. The surface area of the bioretention cell is equal to the required treatment volume divided by the ponding depth.

\_\_\_\_\_\_\_\_\_\_ d. Plan specifies how all slopes draining to the bioretention area will be stabilized. Note that the slopes must be stabilized before the installation of the underdrain system.

\_\_\_\_\_\_\_\_\_\_ e. An underdrain with internal water storage (set to minimum of 18 inches below planting surface) shall be installed unless it is demonstrated that the in-situ infiltration rate is two inches per hour or greater immediately prior to the initial placement of the media.

\_\_\_\_\_\_\_\_\_\_ f. The cell depth of (a) all cells with trees and shrubs is 36 inches to accommodate plant roots; (b) all cells without trees and shrubs with no internal water storage is 24 inches, or with internal storage is 30 inches.

\_\_\_\_\_\_\_\_\_\_ g. Runoff from landscaped areas and other non-impervious areas has been directed away from the bioretention area to the maximum extent practical.

\_\_\_\_\_\_\_\_\_\_ h. Construction sequencing shall be considered and a note added to the plan that states: “All sediment and erosion control practices shall be in place and the slopes draining to the bioretention area shall be stabilized before construction of the bioretention area begins.”

\_\_\_\_\_\_\_\_\_\_ i. No side slopes draining to bioretention area greater than 3:1 (promote sheet flow through the grass filter strip.)

\_\_\_\_\_\_\_\_\_\_ j. Riprap outlet protection, if provided, reduces flow to non-erosive velocities (provide calculations).

\_\_\_\_\_\_\_\_\_\_ k. A recorded drainage easement is provided for each cell including access to the nearest right-of-way and is graded per Section 8.3, Stormwater Control Facilities.

\_\_\_\_\_\_\_\_\_\_ l. A plan view of the bioretention area with grading shown is provided.

\_\_\_\_\_\_\_\_\_\_ m. A profile through the bioretention area and emergency spillway is provided.

\_\_\_\_\_\_\_\_\_\_ n. Geotextile fabric is placed at the bottom of the excavated cell to prevent soil from migrating into the underdrain system.

\_\_\_\_\_\_\_\_\_\_ o. The underdrain system is wrapped in a gravel jacket and a geotextile fabric is placed between the bottom of the sand bed or planting soil and the top of the gravel jacket.

\_\_\_\_\_\_\_\_\_\_ p. The pipe for the underdrain system shall be perforated Schedule 40 PVC.

\_\_\_\_\_\_\_\_\_\_ q. The underdrain system shall connect to the outflow system at a point at least 1 foot inside the bioretention cell wall.

\_\_\_\_\_\_\_\_\_\_ r. A non-perforated Sch. 40 PVC piping system is connected to the underdrain piping and extends to the surface of the planting soil for cleanouts with screw on cleanout.

\_\_\_\_\_\_\_\_\_\_ s. Cleanouts are to be provided at the beginning of each pipe run and at all intersections.

\_\_\_\_\_\_\_\_\_\_ t. A planting soil mixture specification and a soil characteristics table are provided.

\_\_\_\_\_\_\_\_\_\_ u. The hydraulic conductivity for the planting mixture is to be 1-inch to 2-inches per hour.

\_\_\_\_\_\_\_\_\_\_ v. Mulch layer specification is provided; mulch is to be a 2 to 4-inch layer of triple shredded mulch with re-application rate specified.

\_\_\_\_\_\_\_\_\_\_ w. Soil with a P index of less than or equal to 30 in NSW waters, less than 50 elsewhere, specified on plan.

\_\_\_\_\_\_\_\_\_\_ x. A bioretention area landscape plan is provided including the preparation of the planting pit, fertilization, installation of the plant material, type and number of plantings (note that there shall be a minimum of three species of trees and three species of shrubs selected to ensure diversity, their planting locations, Operation and Maintenance checklist for owner.

\_\_\_\_\_\_\_\_\_\_ y. Note on plans: “The media shall not be mechanically compacted.”

**NOTE: Executed Stormwater Facility Operations and Maintenance Permit Agreement and payment of surety are required prior to Stormwater Permit issuance.**