STORMWATER STANDARD OPERATING PROCEDURE			
Bioretention Basin Inspections			WESTMINSTER
Stormwater Coordinator Signature:		Revision:	1.0
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Applies to: Post-Construction			Page 1 of 6

PURPOSE

The purpose of this Standard Operation Procedure (SOP) is to describe the Stormwater Management for:

Bioretention Basin Inspections: During Construction

The City of Westminster Stormwater Program's objective is to limit the amount of pollutant discharge to waterways and provide a safe and healthy environment.

Below are procedures pertaining to general inspection requirements for bioretention basin facilities **during construction.** Note: Some facilities may vary and will be reviewed on a case-by-case basis. Note: Some facilities may not include all of the components in this SOP.

Formal Inspections require a site visit and documentation to verify the construction. **Informal Inspections** do not require a site visit but do require documentation and verbal consent.

PROCEDURE

1. Pre-Construction (Formal Inspection)

- A pre-construction meeting is required between the city inspector and the general contractor's foreman and other relevant personnel to discuss important aspects of bioretention basin installation as well as the phases that require inspection.

- Prior to excavation, the perimeter must be staked and dimensions must be verified to match the design specifications.

2. Excavation (Informal Inspection)

- If an impermeable liner will not be used:

1. Check the compaction of subgrade during construction to ensure even distribution and infiltration of stormwater throughout the storage layer. The contractor must limit heavy machinery in the infiltration surface area. Alternatively, low ground pressure equipment in the excavated area can be used. If equipment must travel over the excavated area,

the bottom of the cell must be "ripped" to a depth of 8 to 12 inches after excavating to the appropriate depth.

2. The cell must be flat and level.
3. Construction fencing is required to deter unnecessary construction traffic in the area of the facility.
4. The infiltration rate of 1.0 inches/hour or greater must be verified at the surface of the subgrade prior to installation of reservoir layer. The contractor must conduct infiltration tests adhering to ASTM D3385 or equivalent. If the infiltration rates are less than 1.0 inches/hour, notify the design engineer for review and do not allow the contractor to proceed. A signed and sealed verification must be provided to the review engineer and inspector.

- If underdrain(s) will be installed, the bottom of the cell must be sloped toward the underdrain(s).

- The contractor, project manager, or design engineer is required to send a grading survey of the basin to verify grades and volume of the facility.

- Immediately following excavation, temporary control measures must be placed around the basin to prevent runoff from entering the cell. These control measures can be removed once the upstream catchment and slopes are deemed stable by the City.

3. Inlet (Formal Inspection)

- Runoff from upstream catchment must drain to the inlet(s) unimpeded.

- Runoff must be able to flow into the facility even when sediment deposits are present at the entrance. The design must call for a 1 to 3 inch vertical drop at the inlet depending on the design.

- Concrete must be poured and reinforced correctly with no signs of cracking or settling.

4. Forebay/Energy Dissipation (Formal Inspection if applicable)

- The forebay material must match the accepted construction drawings

- The forebay must drain completely into the filter area of the facility (verify there is at least a 2 inch drop from the forebay to the filter media when installed).

- Any energy dissipation materials such as riprap must meet the design specifications and installed according to design. If the design calls out riprap on top of the filter media, fabric between the riprap and filter media is required to reduce settling.

5. Outlet Structure/Overflow Elevation (Informal Inspection)

- The outlet overflow elevation must be installed in accordance with design drawings.

- The distance between the overflow invert and the top of the filter media is equal to or greater than the designed (Water Quality Capture Volume (WQCV depth), usually captured in the grading survey.

6. Impermeable Liner (Formal Inspection)

- The liner material must meet the design specifications (at least 30 mil thick) and must be thermally welded. An air test must be conducted to verify seams are secure and the liner has no tears.

- Prior to backfilling, ensure enough slack is provided to prevent tearing during placement of any material. Ensure liner is properly attached to a concrete perimeter wall or trenched in accordance with the design specifications. If the liner will be attached after backfilling, it must be inspected after backfilling has occurred.

7. Underdrain System (Formal Inspection)

- Underdrain(s) must meet design specifications, particularly with regard to the size, number and location of the slots (visual inspection).

- Underdrain(s) shall NOT be wrapped in geotextile fabric (or a sock) as this will clog the system.

  The filter material placed around the underdrain must meet design gradation specifications. A material ticket is required to be available for the inspector and review engineer (typically CDOT Class C material).

- Placement of cleanout(s) for each underdrain lateral must match design specifications

- Cleanouts must be **solid** pipe. The facility will not function as designed if they are perforated or slotted.

- Cleanout cover installations are watertight.

- Orifice plate installation must match design specifications and the placement of gasket material between the structure and orifice plate (depending on the design) must be verified.

- The invert elevation of the underdrain connection to the outlet structure must match design specifications.

- The underdrain system must be sitting on the cell bottom.

8. Filter Media (Formal Inspection)

- The filter media meets material design specifications. A material ticket that is signed/stamped by the design engineer is required. Also, the media must be well mixed to ensure a homogenous section.

- Media filter installation depth meets design specifications and the surface is relatively flat to ensure an even distribution of runoff over the entire area.

9. Containment Wall (Formal Inspection if Applicable)

- The containment wall is continuous and level so runoff can pond evenly throughout the bioretention basin.

- The concrete was poured and reinforced in accordance with the approved design specifications.

- The containment wall and other perimeter protections guard the entirety of the facility from potential vehicle traffic/parking.

10. Final Landscaping (Formal Inspection)

- Any sod for final landscaping must be “sand-grown”, not “clay grown” (or conventional). Material tickets must be signed/stamped by the consulting engineer and sent to the City’s review engineer and bioretention facility inspector.

- Any mulch (rock or wood) placed in the biofiltration area must be evenly distributed on top of the filter media, and drainage must be unimpeded from the inlet or forebay into the facility. Shredded wood mulch must be placed in such a way to avoid displacement from incoming or ponding runoff.

- Plantings and vegetation must meet landscaping design specifications.

- Placement of weed barrier on top of the filter media is prohibited. Weed barriers reduce infiltration rates and create standing water issues.

- Temporary and/or permanent irrigation is installed in accordance with the landscape design specifications to ensure establishment of plantings and vegetation.

11. Close Out (Formal Inspection)

- Construction in the upstream catchment must be complete and landscaped areas stable prior to the removal of temporary control measures.

- All of the facility components are in accordance with the design specifications and do not show any signs of damage/settling. A Porous Landscape Detention Inspection Report must be completed and signed by the project manager/superintendent.

- Coordinate with the City's Engineering Inspector to verify that all components of the facility are in accordance with the accepted design prior to releasing the project into warranty.

12. Employee Training

- The pre-construction meeting serves as an opportunity to inform operators of the City requirements, including city inspection processes, enforcement procedures, and pollutant sources such as trash.

- The City trains applicable employees who perform activities from this written procedure. Information regarding city processes and how to avoid and report spills is presented during this training.

13. Records

The following records may be used to document activities performed:

- Records of employee training with sign-in sheet and topics covered
- Porous Landscape Detention Inspection Reports

All inspection records will be kept in eTrakIT or Laserfiche for a period no less than 5 years after the project is accepted by the City.