INDIANA DEPARTMENT OF TRANSPORTATION

Stormwater Post-Construction Best Management Practice Operations and Maintenance Manual

For

Infiltration Basins

&

Infiltration Swales

Infiltration Overview

Infiltration basins and infiltration swales (infiltration practices) shall be utilized as a Stormwater Post-Construction Best Management Practice (PCBMP) to treat stormwater collected from INDOT project sites after construction is completed. An infiltration practice is a structural practice that collects run-off and allows it to percolate through underlying soil. Turf grasses will typically be planted if an infiltration practice is located within 30 feet of the edge of pavement, but native grasses should be planted if one is more than 30 feet from the edge of pavement.

Inspections

All infiltration practices shall be inspected at a minimum one time per 5-year INDOT Stormwater permit cycle. Values below are typical indicators for the need of maintenance for the structure. Inspections will use the form attached in Appendix A as an inspection checklist to note the following:

- Vegetation – cover should be approximately 90% of infiltration practice
    - barren areas
    - dead plants which are preventing vegetative growth
    - presence of invasive plants or weeds
    - presence of woody vegetation
- Erosion and scour
    - erosion in infiltration practice bottom or on embankments
    - scour at inflow or outflow points
    - channelization of flow in infiltration practice
- Trash and debris – infiltration practice should be free of trash
    - presence of trash or debris in infiltration practice
    - inspector shall remove trash if possible
        - refer to material disposal section
- Excessive ponding
    - stagnant water in infiltration practice or water present in practice more than 72 hours after a rainfall event
- Inflow – if present, should be able to convey flow
    - pipe is clogged
    - pipe is collapsed
- Outflow – if present, should be able to convey flow
    - pipe is clogged
    - pipe is collapsed
- Sediment buildup
    - sediment buildup is blocking, channelizing, or reducing designed infiltration capacity of the infiltration practice or is blocking outflow structure
        - refer to material disposal section

Initial inspections should place particular focus on ensuring the vegetation has established as designed. Issues identified during inspection shall require maintenance as soon as possible, per noted rating condition.

Maintenance

All infiltration practices shall be mowed once yearly during the typical INDOT mowing and vegetation management cycle for their associated road and shall be performed in a manner which directs clippings out of the infiltration practices. Any excessive clippings in an infiltration practice shall be removed and disposed of according to the Materials Disposal section below. Additionally, maintenance shall be performed on an as needed or directed basis from inspection observations. Typical corrective actions consist of:

- Vegetation
    - reseed barren areas to bring vegetative coverage to 90% (seed mixtures provided in Appendix B)
        - use a snake and turtle safe erosion protection blanket as seed cover and protection
    - clear dead vegetation that is preventing plant growth, if necessary, reseed cleared areas until cover has again reached 90%
        - remove all cut grasses and vegetation from PCBMP structure
        - use a snake and turtle safe erosion protection blanket as seed cover and protection
    - remove invasive plants identified during inspection
    - remove woody vegetation identified during inspection
        - if spraying of woody vegetation is required, all applications of herbicide spray shall meet all local, state, and federal regulations
        - all herbicide sprayers shall be licensed by the Office of the Indiana State Chemist
- Erosion and scour
    - regrade erosion, rills, or gullying found in infiltration practice bottom or on banks and reseed until cover has again reached 90%
        - use a snake and turtle safe erosion protection blanket as seed cover and protection
    - fill in scour hole and replace/install protection around inlet or outlet
    - fill in channelized section of infiltration practice bottom and reseed until cover has again reached 90%
        - use a snake and turtle safe erosion protection blanket as seed cover and protection
    - care must be used when using fill for erosion mitigation to keep infiltration capacity as designed
- Trash and debris
    - remove any trash or debris remaining in infiltration practice after inspection
        - dispose of all materials per material disposal section
- Ponding
    - drain any areas of stagnant water in infiltration practice, clear drowned vegetation, regrade depressions to get them even with rest of channel, reseed to 90% vegetative coverage
        - use a snake and turtle safe erosion protection blanket as seed cover and protection

- Inflow
    - unclog pipe by removing debris
    - repair or replace collapsed pipe
- Outflow
    - unclog pipe by removing debris
    - repair or replace collapsed pipe
- Sediment buildup
    - remove excess sediment and the top two inches of clogged soil
        - removed soil shall be replaced with fresh soil, reseed to 90% vegetative coverage
        - use a snake and turtle safe erosion protection blanket as seed cover and protection
        - dispose of all materials per material disposal section

As well as issues related to the inspection criteria, maintenance will be required to address any problem which does not fall into these categories that threatens the functionality of the infiltration practice as a stormwater treatment device.

Material Disposal

All materials removed from maintenance and/or operation activities shall be disposed of according to all local, state, and federal requirements. If material observed in PCBMPs exhibits odor (petroleum, gas, oil), color, or other physical features that may indicate non-stormwater origins, do not remove this material, and contact the INDOT Stormwater Team for further investigation, identification, and proper disposal.

APPENDIX A – INSPECTION FORMS

INDIANA DEPARTMENT OF TRANSPORTATION

INSPECTION & MAINTENANCE
POST-CONSTRUCTION STORMWATER MEASURE

Structure Type	Infiltration Basin	Asset ID	
Design Criteria		Location	Coordinates, Driving Directions
This infiltration basin was designed to remove Total Suspended Solids (TSS) from stormwater runoff but may also serve as a peak flow mitigation measure. This basin should fully drain within 72 hours of a rainfall event and should remain dry between rainfall events. Stormwater should infiltrate into the underlying soil.			

Information

Is this inspection being conducted within 72 hours of a rainfall event?	☐ Yes	☐ No
Is the dry basin holding water?	☐ Yes	☐ No
Is an overflow catch basin or embankment present?	☐ Yes	☐ No
Is there land use upstream with high probability of pollutants?	☐ Yes	☐ No
Is there land use upstream with high probability of sediment or debris?	☐ Yes	☐ No
Can the unit be accessed directly from INDOT right-of-way?	☐ Yes	☐ No
Will traffic control be required for maintenance?	☐ Yes	☐ No
Is forebay present?	☐ Yes	☐ No
Is the basin vegetated?	☐ Yes	☐ No

Inspection Criteria

Maintenance Issues: **Description:**

If vegetated, is cover approximately 90%?	☐ Yes	☐ No	_____.
Is there evidence of erosion/scouring present?	☐ Yes	☐ No	_____.
Is the basin free of any invasive/unwanted species?	☐ Yes	☐ No	_____.
Are in/outflow points blocked by debris or vegetation?	☐ Yes	☐ No	_____.
Is woody vegetation present in basin or on embankments?	☐ Yes	☐ No	_____.
Are there areas of standing/stagnant water?	☐ Yes	☐ No	_____.
Is there a sheen or odor present?	☐ Yes	☐ No	_____.
Are any animal burrows or nests present?	☐ Yes	☐ No	_____.
Is evidence of litter, dumping, or illicit discharge present?	☐ Yes	☐ No	_____.
Is excessive sediment present within the basin or forebay?	☐ Yes	☐ No	Depth: _____ inches

Structural Issues:

Is there structural damage to the inflow/outflow structures?	☐ Yes	☐ No	
Is there adequate scour protection at the outlet?	☐ Yes	☐ No	
Is there adequate scour protection at the inlet?	☐ Yes	☐ No	
Is there structural damage to the emergency overflow/embankments?	☐ Yes	☐ No	☐ N/A
Is there geotextile fabric exposed?	☐ Yes	☐ No	☐ N/A

Comments:

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Last Inspected		Current Inspection	

INSPECTION & MAINTENANCE
POST-CONSTRUCTION STORMWATER MEASURE

Structure Type	Infiltration Basin	Asset ID	

Typical Corrective Actions

- **Vegetation – re-establish as needed so that cover is approximately 90%**
- **Erosion and scour – re-grade as needed, install erosion protection if required**
- **Trash and debris buildup – remove trash and debris as needed**
- **Excessive ponding – re-grade as needed to drain excessive ponded or stagnant water**
- **Inflow and outflow points and/or structures – repair structures and remove debris or blockage as needed**
- **Sediment buildup – should be ≤ 25% of original design volume – remove sediment as needed**

Maintenance Recommendations

INDIANA DEPARTMENT OF TRANSPORTATION

INSPECTION & MAINTENANCE
POST-CONSTRUCTION STORMWATER MEASURE

Structure Type	Infiltration Basin	Asset ID	

Plans and Plan Cross Section(s)

INDIANA DEPARTMENT OF TRANSPORTATION

INSPECTION & MAINTENANCE
POST-CONSTRUCTION STORMWATER MEASURE

Structure Type	Infiltration Basin	Asset ID	

Photographs & Maps

INSPECTED BY	APPROVED BY
Printed Name/Title	Printed Name/Title

INDIANA DEPARTMENT OF TRANSPORTATION

INSPECTION & MAINTENANCE
POST-CONSTRUCTION STORMWATER MEASURE

Structure Type	Infiltration Swale	Asset ID	
Design Criteria		Location	Coordinates, Driving Directions
This Swale was designed to remove Total Suspended Solids (TSS) from stormwater runoff and was designed to be dry between rainfall events. Stormwater should infiltrate into the underlying soil.			

Information

Is this inspection being conducted within 72 hours of a rainfall event?	☐ Yes	☐ No
Is the swale holding water?	☐ Yes	☐ No
Is an overflow catch basin or embankment present?	☐ Yes	☐ No
Is there land use upstream with high probability of pollutants?	☐ Yes	☐ No
Is there land use upstream with high probability of sediment or debris?	☐ Yes	☐ No
Can the unit be accessed directly from INDOT right-of-way?	☐ Yes	☐ No
Will traffic control be required for maintenance?	☐ Yes	☐ No
Is forebay present?	☐ Yes	☐ No
Is the basin vegetated?	☐ Yes	☐ No

Inspection Criteria

Maintenance Issues:			Description:
If vegetated, is cover approximately 90%?	☐ Yes	☐ No	_____.
Is there evidence of erosion/scouring present?	☐ Yes	☐ No	_____.
Is the swale free of any invasive/unwanted species?	☐ Yes	☐ No	_____.
Are in/outflow points blocked by debris or vegetation?	☐ Yes	☐ No	_____.
Is woody vegetation present in swale or on embankments?	☐ Yes	☐ No	_____.
Are there areas of standing/stagnant water?	☐ Yes	☐ No	_____.
Is there a sheen or odor present?	☐ Yes	☐ No	_____.
Are any animal burrows or nests present?	☐ Yes	☐ No	_____.
Is evidence of litter, dumping, or illicit discharge present?	☐ Yes	☐ No	_____.
Is excessive sediment present within the swale or forebay?	☐ Yes	☐ No	Depth: _____ inches

Structural Issues:			
Is there structural damage to the inflow/outflow structures?	☐ Yes	☐ No	
Is there adequate scour protection at the outlet?	☐ Yes	☐ No	
Is there adequate scour protection at the inlet?	☐ Yes	☐ No	
Is there structural damage to the emergency overflow/embankments?	☐ Yes	☐ No	☐ N/A
Is there geotextile fabric exposed?	☐ Yes	☐ No	☐ N/A

Comments:

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Last Inspected		Current Inspection	

INSPECTION & MAINTENANCE
POST-CONSTRUCTION STORMWATER MEASURE

Structure Type	Infiltration Basin	Asset ID	

Typical Corrective Actions

- **Vegetation – re-establish as needed so that cover is approximately 90%**
- **Erosion and scour – re-grade as needed, install erosion protection if required**
- **Trash and debris buildup – remove trash and debris as needed**
- **Excessive ponding – re-grade as needed to drain excessive ponded or stagnant water**
- **Inflow and outflow points and/or structures – repair structures and remove debris or blockage as needed**
- **Sediment buildup – should be ≤ 25% of original design volume – remove sediment as needed**

Maintenance Recommendations

INDIANA DEPARTMENT OF TRANSPORTATION

INSPECTION & MAINTENANCE
POST-CONSTRUCTION STORMWATER MEASURE

Structure Type	Infiltration Basin	Asset ID	

Plans and Plan Cross Section(s)

INDIANA DEPARTMENT OF TRANSPORTATION

INSPECTION & MAINTENANCE
POST-CONSTRUCTION STORMWATER MEASURE

Structure Type	Infiltration Basin	Asset ID	

Photographs & Maps

INSPECTED BY	APPROVED BY
Printed Name/Title	Printed Name/Title

APPENDIX B – SEED MIXES

NATIVE GRASS SEED MIX

Common Name	Botanical Name	Pure Live Seeds (Oz/Acre)
Common Milkweed	*Asclepias syriaca*	2
Frank's Sedge	*Carex frankii*	6
Spreading Oval Sedge	*Carex normalis*	6
Bottlebrush Sedge	*Carex lurida*	6
Awl-fruited Sedge	*Carex stipata*	6
Fox Sedge	*Carex vulpinoidea*	8
Common Rush	*Juncus effusus*	2
Canada Wild Rye	*Elymus canadensis*	36
Virginia Wild Rye	*Elymus virginicus*	36
Stiff Goldenrod	*Oligoneuron rigidum*	1
Switch Grass	*Panicunm virgatum*	4
Little Bluestem	*Schizachyrium scoparium*	96
Woolgrass	*Scirpus cyperinus*	2
Reddish Bulrush	*Scirpus pendulus*	4
Prairie Cord Grass	*Spartina pectinata*	2
Common Spiderwort	*Tradescantia ohiensis*	6
	Total	223

TURF GRASS SEED MIXES

(a) Seed Mixture R

This seed mixture shall be applied at the rate of 202.5 lb/ac consisting of 100 lb/ac of low endophyte Tall Fescue, 50 lb/ac of turf type Perennial Ryegrass, 50 lb/ac of Creeping Red Fescue, and 2.5 lb/ac of White Dutch Clover. Seed used in this mixture shall be drought tolerant. Fertilizer and mulching material, where specified or directed, shall be applied in accordance with 621.05.

(b) Seed Mixture U

This seed mixture shall be applied at the rate of 196.5 lb/ac consisting of 100 lb/ac of a 4-way blend of turf type Tall Fescue, 50 lb/ac Creeping Red Fescue, 45 lb/ac Perennial Ryegrass, and 1.5 lb/ac White Dutch Clover. Fertilizer and mulching material, where specified or directed, shall be applied in accordance with 621.05.