INDIANA DEPARTMENT OF TRANSPORTATION

Stormwater Post-Construction Best Management Practice Operations and Maintenance Manual

For

Vegetated Filter Strips

Vegetated Filter Strip Overview

Vegetated filter strips are typically designed in series with another wet or dry Post-Construction Best Management Practice (PCBMP) in order to treat stormwater collected from INDOT project sites after construction is completed. Filter strips are vegetated, uniformly graded areas that receive sheet flow. Filter strips generally have mild slopes and can be planted with turf grass or native grasses. Turf grasses will typically be planted if a filter strip is located within 30 feet of the edge of pavement, but native grasses should be planted if a filter strip is more than 30 feet from the edge of pavement. Trees will not be intentionally planted on vegetated filter strips but will be allowed to remain if present as long as they are not within the clear zone.

Inspections

All vegetated filter strips shall be inspected at a minimum one time per 5-year INDOT Stormwater permit cycle when designed as part of a PCBMP treatment system. 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 filter strip design area
    - barren areas
    - dead plants which are preventing vegetative growth
    - presence of invasive plants or weeds
    - presence of woody vegetation within the clear zone
- Erosion and scour
    - erosion in filter strip
    - presence of any concentrated flow areas
- Trash and debris – filter strip should be free of trash
    - presence of trash or debris
    - inspector shall remove trash if possible
        - refer to material disposal section
- Ponding
    - any areas of ponding water in filter strip
- Level spreader – if present, should redistribute flows to be sheet flow
    - any cracks or other damage to device

Initial inspection should place a particular focus on ensuring the vegetation has established as designed. Issues identified during initial inspections shall require maintenance as soon as possible.

Maintenance

All vegetated filter strips 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 away from the vegetated filter strips. Any excessive clippings in a vegetated filter strip area 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%
        - 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 located within the clear zone
        - if spraying of woody vegetation is required; application 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
    - fill and regrade eroded areas
    - where concentrated flow is observed, utilize appropriate techniques to redirect concentrated flow to sheet flow within the filter strip design area.
- Trash and debris
    - remove any trash or debris remaining in filter strip after inspection
        - dispose of all materials according to material disposal section
- Ponding
    - bring the ponding area back to designed filter strip grade, reseed to again reach 90% vegetative coverage
        - use a snake and turtle safe erosion protection blanket as seed cover and protection
- Level spreader
    - repair cracks or other damage, or replace damaged portions of level spreader

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 filter strip 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, etc.), 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 FORM

INDIANA DEPARTMENT OF TRANSPORTATION

INSPECTION & MAINTENANCE
POST-CONSTRUCTION STORMWATER MEASURE

Structure Type	Native Grass Filter Strip	Asset ID	
Design Criteria		Location	Coordinates, Driving Directions
This filter strip was designed to remove Total Suspended Solids (TSS) from stormwater runoff. Native grass height should be at least 2.5 feet for adequate TSS removal. Stormwater should travel as sheet flow across the filter strip.			

Information

Is this inspection being conducted within 72 hours of a rainfall event?	☐ Yes	☐ No
Is the filter strip holding water?	☐ Yes	☐ No
Is there land use upstream with high probability of pollutants?	☐ 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 a level spreader present?	☐ Yes	☐ No

Inspection Criteria

Maintenance Issues:			Description:
Is vegetative cover approximately 90%?	☐ Yes	☐ No	_____.
Is there evidence of erosion/scouring present?	☐ Yes	☐ No	_____.
Is the filter strip free of any invasive/unwanted species?	☐ Yes	☐ No	_____.
Are in/outflow points blocked by debris or vegetation?	☐ Yes	☐ No	_____.
Are there areas of ponding or concentrated flow?	☐ 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	_____.

Structural Issues:

If there is a level spreader, are there any cracks or other damage?	☐ Yes	☐ No	☐ N/A

Comments:

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Last Inspected		Current Inspection	

INSPECTION & MAINTENANCE
POST-CONSTRUCTION STORMWATER MEASURE

Structure Type	Native Grass Filter Strip	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**
- **Ponding or concentrated flow - regrade as needed so that stormwater travels as sheet flow across the filter strip**
- **Inflow and outflow points and/or structures – repair structures and remove debris or blockage as needed**

Maintenance Recommendations

INDIANA DEPARTMENT OF TRANSPORTATION

INSPECTION & MAINTENANCE
POST-CONSTRUCTION STORMWATER MEASURE

Structure Type	Native Grass Filter Strip	Asset ID	

Plans and Plan Cross Section(s)

INDIANA DEPARTMENT OF TRANSPORTATION

INSPECTION & MAINTENANCE
POST-CONSTRUCTION STORMWATER MEASURE

Structure Type	Native Grass Filter Strip	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	Turf Grass Filter Strip	Asset ID	
Design Criteria		Location	Coordinates, Driving Directions
This filter strip was designed to remove Total Suspended Solids (TSS) from stormwater runoff. Turf grass height should be at least 6 inches for adequate TSS removal. Stormwater should travel as sheet flow across the filter strip.			

Information

Is this inspection being conducted within 72 hours of a rainfall event?	☐ Yes	☐ No
Is the filter strip holding water?	☐ Yes	☐ No
Is there land use upstream with high probability of pollutants?	☐ 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 a level spreader present?	☐ Yes	☐ No

Inspection Criteria

Maintenance Issues: **Description:**

Is vegetative cover approximately 90%?	☐ Yes	☐ No	_____.
Is there evidence of erosion/scouring present?	☐ Yes	☐ No	_____.
Is the filter strip free of any invasive/unwanted species?	☐ Yes	☐ No	_____.
Are in/outflow points blocked by debris or vegetation?	☐ Yes	☐ No	_____.
Is there a sheen or odor present?	☐ Yes	☐ No	_____.
Are any animal burrows or nests present?	☐ Yes	☐ No	_____.
Are there areas of ponding or concentrated flow?	☐ Yes	☐ No	_____.
Is evidence of litter, dumping, or illicit discharge present?	☐ Yes	☐ No	_____

Structural Issues:

If there is a level spreader, are there any large cracks or other damage? ☐ Yes ☐ No ☐ N/A

Comments:

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Last Inspected		Current Inspection	

INSPECTION & MAINTENANCE
POST-CONSTRUCTION STORMWATER MEASURE

Structure Type	Turf Grass Filter Strip	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**
- **Ponding or concentrated flow - regrade as needed so that stormwater travels as sheet flow across the filter strip**
- **Inflow and outflow points and/or structures – repair structures and remove debris or blockage as needed**

Maintenance Recommendations

INDIANA DEPARTMENT OF TRANSPORTATION

INSPECTION & MAINTENANCE
POST-CONSTRUCTION STORMWATER MEASURE

Structure Type	Turf Grass Filter Strip	Asset ID	

Plans and Plan Cross Section(s)

INDIANA DEPARTMENT OF TRANSPORTATION

INSPECTION & MAINTENANCE
POST-CONSTRUCTION STORMWATER MEASURE

Structure Type	Turf Grass Filter Strip	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.