INDIANA DEPARTMENT OF TRANSPORTATION

Stormwater Post-Construction Best Management Practice Operations and Maintenance Manual

For

Dry Turf Grass Swales

&

Dry Native Grass Swales

Dry Grass Swale Overview

Dry turf and dry native grass (dry grass) swales shall be utilized as a Stormwater Post-Construction Best Management Practice (PCBMP) to treat stormwater collected from INDOT project sites after construction is completed. Dry grass swales consist of broad, shallow, channels planted with grass which fully drain within 72 hours after a rainfall event. Turf grasses will typically be planted in the swale if it is located within 30 feet of the edge of pavement. Native grasses should be planted in the swale if it is located more than 30 feet of the edge of pavement

Inspections

All dry grass swales 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 swale
    - barren areas
    - matted vegetation which is preventing vegetative growth
    - presence of invasive plants or weeds
    - presence of woody vegetation
    - turf grasses have an expected height of approximately 12 inches tall and native grasses have an expected height of approximately 3 feet tall
- Erosion and scour
    - erosion in swale or on embankments
    - scour at inflow or outflow points
    - channelization of flow occurring in swale
- Trash and debris – swale should be free of trash
    - presence of trash or debris in swale
    - inspector shall remove trash if possible
        - refer to material disposal section
- Excessive ponding
    - stagnant water in swale or water present in swale more than 72 hours after a rainfall event
- Check Dam
    - rock is missing or damaged
- Sediment buildup
    - sediment buildup is blocking, channelizing, or reducing designed retention time of the swale or is blocking outflow structure
        - refer to material disposal section

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

Maintenance

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; 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
    - vegetation shall be cut to 4-6 inches of height if observed to be greater than expected height for turf grass or native grass
- Erosion and scour
    - fill in erosion or rills found in swale bottom or on banks and reseed to bring cover to 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 swale bottom and reseed until cover has again reached 90%
        - use a snake and turtle safe erosion protection blanket as seed cover and protection
- Trash and debris
    - remove any trash or debris remaining in swale after inspection
        - dispose of all materials per material disposal section
- Excessive ponding
    - clear any dead vegetation, fill depressions level to the existing channel, reseed to maintain 90% vegetative coverage
        - use a snake and turtle safe erosion protection blanket as seed cover and protection
- Check dam
    - replace missing or damaged rock
- Sediment buildup
    - remove excess sediment and the top two inches of soil. Replace removed soil with fresh soil, and reseed to bring cover to 90%
        - 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 dry grass swale 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 FORMS

INDIANA DEPARTMENT OF TRANSPORTATION

INSPECTION & MAINTENANCE
POST-CONSTRUCTION STORMWATER MEASURE

Structure Type	Turf Grass Dry Swale	Asset ID	
Design Criteria		Location	Coordinates, Driving Directions
This swale was designed to remove Total Suspended Solids (TSS) from stormwater runoff. Turf grass height should be at least 6 inches for adequate TSS removal. This swale was designed to be dry between rainfall events.			

Information

Is this inspection being conducted within 72 hours of a rainfall event?	☐ Yes	☐ No
Is the dry swale holding water?	☐ Yes	☐ No
Are there check dams present?	☐ Yes	☐ No
Is there land use upstream with high probability of pollutants?	☐ Yes	☐ No
Can the swale be accessed directly from INDOT right-of-way?	☐ Yes	☐ No
Will traffic control be required for maintenance?	☐ 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 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 any areas of standing or 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?	☐ Yes	☐ No	Depth: _____ inches

Structural Issues:			
If there are check dams, do they match the designed dimensions?	☐ Yes	☐ No	☐ N/A
If there are check dams, has the riprap washed downstream?	☐ Yes	☐ No	☐ N/A

Comments:

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Last Inspected		Current Inspection	

INSPECTION & MAINTENANCE
POST-CONSTRUCTION STORMWATER MEASURE

Structure Type	Turf Grass Dry Swale	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 - regrade 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**
- **Check dams - replace riprap if needed**

Maintenance Recommendations

INDIANA DEPARTMENT OF TRANSPORTATION

INSPECTION & MAINTENANCE
POST-CONSTRUCTION STORMWATER MEASURE

Structure Type	Turf Grass Dry Swale	Asset ID	

Plans and Plan Cross Section(s)

INDIANA DEPARTMENT OF TRANSPORTATION

INSPECTION & MAINTENANCE
POST-CONSTRUCTION STORMWATER MEASURE

Structure Type	Turf Grass Dry Swale	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	Native Grass Dry Swale	Asset ID	
Design Criteria		Location	Coordinates, Driving Directions
This swale 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. This swale was designed to be dry between rainfall events.			

Information

Is this inspection being conducted within 72 hours of a rainfall event?	☐ Yes	☐ No
Is the dry swale holding water?	☐ Yes	☐ No
Are there check dams present?	☐ Yes	☐ No
Is there land use upstream with high probability of pollutants?	☐ Yes	☐ No
Can the swale be accessed directly from INDOT right-of-way?	☐ Yes	☐ No
Will traffic control be required for maintenance?	☐ 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 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 any areas of standing or 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?	☐ Yes	☐ No	Depth: _____ inches

Structural Issues:

If there are check dams, do they match the designed dimensions	☐ Yes	☐ No	☐ N/A

Comments:

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Last Inspected		Current Inspection	

INSPECTION & MAINTENANCE
POST-CONSTRUCTION STORMWATER MEASURE

Structure Type	Native Grass Dry Swale	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 - regrade as needed to drain excessive ponded or stagnated 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**
- **Check dams - replace riprap if needed**

Maintenance Recommendations

INDIANA DEPARTMENT OF TRANSPORTATION

INSPECTION & MAINTENANCE
POST-CONSTRUCTION STORMWATER MEASURE

Structure Type	Native Grass Dry Swale	Asset ID	

Plans and Plan Cross Section(s)

INDIANA DEPARTMENT OF TRANSPORTATION

INSPECTION & MAINTENANCE
POST-CONSTRUCTION STORMWATER MEASURE

Structure Type	Native Grass Dry Swale	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.