TECHNO-GRAM
004-2018
REVISED

SUBJECT: Geotechnical Requirements for Stormwater Management (SWM) Devices

PURPOSE: To clarify and adjust geotechnical requirements for SWM devices. Specifically:

- Define requirements for clearance between groundwater table and SWM devices
- Define when infiltration testing is required
- Define/adjust the maximum permissible boring offsite to various SWM devices

SCOPE: This revised Technogram replaces and/or updates the requirements identified in the Prince George's County Stormwater Management Design Manual, adding Table 9-1 "Structural BMP Geotechnical Determination" and revising Table 10-1 "ESD Geotechnical Determination".

Effective immediately, the attached Tables 9-1 and 10-1 shall be used to determine the requirements for geotechnical analysis and soil borings for various SWM devices. Table 9-1 applies to structural devices; and, Table 10-1 applies to Environmental Site Design (ESD) devices.

Attachments

APPROVED BY:

for **Melinda Bolling, Director**

July 25, 2019

Table 9-1 Geotechnical Requirements for Structural BMP

Structure ① (reference # from SWM Design Manual)	Major Requirement	Minimum Frequency of full Borings, Test-Pits, or other approved method ②	Boring Offset from Structure	Min. GWT Depth below Structure
SWM Pond (9.7.1.22)	MD-378	3 to 6 full borings per SCD Manual Pg. II-7, III-16, and III-17	No Offset from structure	N/A
Underground Attenuation Facility (9.7.2.4)	Investigate soils to at least 5 ft below invert	Two full borings per structure. More if needed to determine the Bearing Capacity, existing fill limits, ... etc.	No Offset from structure	GWT below invert or watertight design
Bio-Retention Pond (9.7.3.3)	Chapter 3 of MDE Manual	One per control structure	No Offset from structure	4 ft below bottom of pond
Infiltration Trenches (9.7.4.4)	Infiltration Test + Appendix 9-12 SWM Des. Manual	One per 50 linear feet of trench	No Offset from structure	4 ft below bottom of trench
Proprietary Devices (9.8.2.4)	Must be MDE-approved	One full boring per device. More than one if required by Manufacturer	Per Manufacturer	Per Manufacturer

① Structures should NOT be in Marlboro Clay, Christiana Complex or unsuitable fill. They shall outfall below layers of such materials or in non-ephemeral, existing creeks.
If there is no alternative to placing structure on such soils, justification and mitigation must be submitted for DPIE's approval. If approved, specific restrictions will apply

② Full: Boring, Test Pit or approved method that covers all tests identified by Geotech Industry standard practice including seasonal high groundwater tests & blowcounts
Only soil reports that are 7 year old or newer shall be used to determine the groundwater (GWT) seasonal high elevations, soil properties, and soil hydrologic groups.

Revised July 25, 2019

Table 10-1 Geotechnical Determination for ESD Devices

Device (reference# from SWM Design Manual) ①	Hydrologic Soil Group ②	Infiltration Test? ③	Minimum frequency of high Groundwater (GWT) Tests or full Borings ③	Max. Boring Offset ④	Min. GWT Depth from ESD Device
Green Roof (10.6.2.2)	N/A	N/A	N/A	N/A	N/A
Rainwater Harvest'g. (10.6.2.2)	N/A	N/A	N/A	N/A	N/A
Reinforced Turf (10.6.2.2)	N/A	N/A	N/A	N/A	N/A
Non/Rooftop Runoff Disconnection (10.6.2.2)	Not for D soils	N/A	N/A	N/A	N/A
Sheetflow to Cnsrv. Area (10.6.2.2)	N/A	N/A	N/A	N/A	N/A
Infiltration Berms (10.6.2.2)	A, B & C preferred	N/A	N/A	N/A	N/A
Permeable Pavement (10.6.2.2)	A, B or C	Yes. 1 per boring if > 10,000 sq.ft.	One full **Boring** per 2500 sq. ft. of the total area of the permeable pavement	No Offset	4 ft below the pavement subbase stone
Submerged Gravel Wetland (10.8.2.2)	C or D	Geotech Engnr. recommends suitable testing	One full **Boring** at control structure. Per **MD 378** if size triggers small-pond standard	No Offset	1 ft below bottom of device or less
Landscaping Infiltr'n. (10.8.3.2)	A or B	If DA imper-vious > 50%	One **GWT Test**	No Offset	4 ft below bottom
Dry Wells (10.8.5.2)	A or B	Geotech Engnr. recommends suitable testing	One full **Boring**	60 ft	4 ft below bottom
Micro Bio Retention (10.8.6.2)	All, with req'd. underdrain	Not w/ reqd. underdrain	One **GWT Test**	50 ft	4 ft below bottom
Rain Gardens (10.8.7.2)	A and B **or** amended C or D	Not w/ reqd. underdrain	One **GWT Test**	50 ft	2 ft below underdrain
Bio Swales (10.8.8.2)	All, with req'd. underdrain	Not w/ reqd. underdrain	One **GWT Test** per 100 linear feet of swale	50 ft	2 ft below underdrain
Wet Swales (10.8.8.2)	C, D, or any soil if GWT is high	No	One **GWT Test** per 100 linear feet of swale	50 ft	At swale invert or higher
Dry Grass Swales (10.8.8.2)	A, B or C	No	One **GWT Test** per 100 linear feet of swale	50 ft	4 ft below swale invert
Enhanced Filters (10.8.9.2)	N/A	Yes	One full **Boring**	No Offset	4 ft below bottom

① Devices should NOT be in Marlboro Clay, Christiana Complex or unsuitable fill. They shall outfall below such materials' bottom or in non-ephemeral, existing creek. If there is no alternative to placing a device on such soils, justification must be submitted in writing for DPIE's approval. If approved, specific restrictions will apply.

② Hydrologic soil groups shall be determined based on 1- Soils Report 2- Soil Conservation District (SCD) Pond Safety Manual latest edition or 3- Web soil survey, in this order If the device's bottom is 6 ft or deeper below existing grades or if the site is not virgin, only soil reports that are 7 years old or newer shall be used for this determination.

③ Requirements for infiltration testing and borings are listed in Appendix 9-12. Full boring includes GWT & other tests identified by the Geotech Industry standard practice.

④ Offset of soil boring from ESD device location is allowed if the ground surface elevation of the boring is comparable to the ground elevation of the device.

DEPARTMENT OF PERMITTING, INSPECTIONS AND ENFORCEMENT

TECHNO-GRAM
004-2018

SUBJECT: Geotechnical requirements for Stormwater Management (SWM) Devices

PURPOSE: To clarify and adjust Geotechnical requirements for SWM Devices. Specifically:

- Defines requirements for clearance between groundwater table and SWM devices
- Defines when infiltration testing is required for SWM devices
- Defines/adjusts the maximum permissible boring offsite to various SWM devices, to reduce and make more economical the use of soil borings to analyze SWM devices

SCOPE: This Technogram replaces and/or updates the requirements identified in the Prince George's County Stormwater Management Design Manual, adding Table 9-1 "Structural BMP Geotechnical Determination" and revising Table 10-1 "ESD Geotechnical Determination.

Effective immediately, the attached Table 9-1 and Table 10-1 shall be used to determine the requirements for geotechnical analysis and soil borings for various SWM devices. Table 9-1 applies to structural devices and Table 10-1 applies to Environmental Site Design ESD devices.

APPROVED BY:

Haitham A. Hijazi, Director

October 5, 2018

Table 9-1 Geotechnical Requirements for Structural BMP

Structure ① (reference # from SWM Design Manual)	Major Requirement	Minimum Frequency of full Borings, Test-Pits, or other approved method ②	Boring Offset from Structure	Min. GWT Depth below Structure
SWM Pond (9.7.1.22)	MD-378	3 to 6 full borings per SCD Manual Pg. II-7, III-16, and III-17	No Offset from structure	N/A
Underground Attenuation Facility (9.7.2.4)	Investigate soils to at least 5 ft below invert	Two full borings per structure. More if needed to determine the Bearing Capacity, existing fill limits, ... etc.	No Offset from structure	GWT below invert or watertight design
Bio-Retention Pond (9.7.3.3)	Chapter 3 of MDE Manual	One per control structure	No Offset from structure	4 ft below bottom of pond
Infiltration Trenches (9.7.4.4)	Infiltration Test + Appendix 9-12 SWM Des. Manual	One per 50 linear feet of trench	No Offset from structure	4 ft below bottom of trench
Proprietary Devices (9.8.2.4)	Must be MDE-approved	One full boring per device. More than one if required by Manufacturer	Per Manufacturer	Per Manufacturer

① Structures should NOT be in Marlboro Clay, Christiana Complex or unsuitable fill. They shall outfall below layers of such materials or in non-ephemeral, existing creeks. If there is no alternative to placing structure on such soils, justification and mitigation must be submitted for DPIE's approval. If approved, specific restrictions will apply

② Full: Boring, Test Pit or approved method that covers all tests identified by Geotech Industry standard practice including seasonal high groundwater tests & blowcounts

Only soil reports that are 7 year old or newer shall be used to determine the groundwater (GWT) seasonal high elevations, soil properties, and soil hydrologic groups.

Table 10-1 Geotechnical Determination for ESD Devices

Device (reference# from SWM Design Manual) ①	Hydrologic Soil Group ②	Infiltration Test ③	Minimum frequency of high Groundwater (GWT) Tests or full Borings ③	Max. Boring Offset ④	Min. GWT Depth from ESD Device
Green Roof (10.6.2.2)	N/A	N/A	N/A	N/A	N/A
Rainwater Harvest'g. (10.6.2.2)	N/A	N/A	N/A	N/A	N/A
Reinforced Turf (10.6.2.2)	N/A	N/A	N/A	N/A	N/A
Non/Rooftop Runoff Disconnection (10.6.2.2)	Not for D soils	N/A	N/A	N/A	N/A
Sheetflow to Cnsrv. Area (10.6.2.2)	N/A	N/A	N/A	N/A	N/A
Infiltration Berms (10.6.2.2)	A, B & C preferred	N/A	N/A	N/A	N/A
Permeable Pavement (10.6.2.2)	A, B or C	Yes. 1 per boring if > 10,000 sq.ft	One full Boring per 2500 sq. ft. of the total area of the permeable pavement	No Offset	4 ft below the pavement subbase stone
Submerged Gravel Wetland (10.8.2.2)	C or D	Yes. 1 test per boring	One full Boring at control structure. Per MD 378 if size triggers small-pond standard	No Offset	Must be within the gravel layer
Landscaping Infiltr'n. (10.8.3.2)	A or B	If DA imper-vious > 50%	One GWT Test	No Offset	4 ft below bottom
Dry Wells (10.8.5.2)	A or B	Geotech. Engr. recommends soils suitable for dry wells	One full Boring	60 ft	4 ft below bottom
Micro Bio Retention (10.8.6.2)	All, with req'd. underdrain	Not w/ reqd. underdrain	One GWT Test	50 ft	4 ft below bottom
Rain Gardens (10.8.7.2)	A and B or amended C or D	Not w/ reqd. underdrain	One GWT Test	50 ft	2 ft below underdrain
Bio Swales (10.8.8.2)	All, with req'd. underdrain	Not w/ reqd. underdrain	One GWT Test per 100 linear feet of swale	50 ft	2 ft below underdrain
Wet Swales (10.8.8.2)	C, D, or any soil if GWT is high	No	One GWT Test per 100 linear feet of swale	50 ft	At swale invert or higher
Dry Grass Swales (10.8.8.2)	A, B or C	No	One GWT Test per 100 linear feet of swale	50 ft	4 ft below swale invert
Enhanced Filters (10.8.9.2)	N/A	Yes	One full Boring	No Offset	4 ft below bottom

① Devices should NOT be in Marlboro Clay, Christiana Complex or unsuitable fill. They shall outfall below such materials' bottom or in non-ephemeral, existing creek. If there is no alternative to placing a device on such soils, justification must be submitted in writing for DPIE's approval. If approved, specific restrictions will apply.

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