





9.5 MANUFACTURED TREATMENT DEVICES (GI)

Manufactured treatment devices (MTDs) are proprietary stormwater treatment systems used to address the stormwater runoff quality impacts of land development and rely upon a variety of mechanisms to remove pollutants from stormwater runoff. There are two types of MTDs currently certified by the Department: hydrodynamic sedimentation (HDS) devices and filtration devices. Most of these devices are not approved for use as a green infrastructure BMP (See *Chapter 11.3: Manufactured Treatment Devices (Non-GI)*) because they do not manage stormwater close to its source either by infiltration into subsoil, treatment by vegetation or soil or storage for reuse. A subset of MTDs rely upon specialized technology and incorporate an engineered, high-flow rate filter media to remove stormwater pollutants, allowing for a smaller footprint than conventional bioretention systems. Some of the designs include one or more plants within the unit to form a plant/soil/microbe complex for the purpose of pollutant removal. Only such specialized MTDs meet the definition of green infrastructure. Currently, MTDs approved for use as green infrastructure BMPs have a total suspended solids (TSS) removal rate of 80%. The individual certifications may be found in the table labeled *Green Infrastructure (GI) MTDs* posted online at: <https://dep.nj.gov/stormwater/stormwater-manufactured-treatment-devices/>. Take note that there are additional MTDs listed on the website, but those that are not considered GI are listed in a separate table, and this chapter does not apply to them.

N.J.A.C. 7:8 Stormwater Management Rules – Applicable Design and Performance Standards		
	Green Infrastructure	Yes
	Stormwater Runoff Quantity	Not Allowed
	Groundwater Recharge	Not Allowed
	Stormwater Runoff Quality	80% TSS

Introduction

When selecting a GI MTD for a particular site, the peak flow rate of the Water Quality Design Storm (WQDS), the contributory drainage area and the physical size limits of the MTD installation area must be known in advance. A GI MTD must be sized in accordance with its published verification report and have a Department-issued certification letter in order to be accepted for use to meet the green infrastructure requirement specified in N.J.A.C. 7:8-5.3. A GI MTD must have a maintenance plan and must be reflected in a deed notice recorded in the county clerk's office to prevent alteration or removal.

Applications



Pursuant to N.J.A.C. 7:8-5.2(a)(2), the minimum design and performance standards for groundwater recharge, stormwater runoff quality and stormwater runoff quantity at N.J.A.C. 7:8-5.4, 5.5 and 5.6 shall be met by incorporating green infrastructure in accordance with N.J.A.C. 7:8-5.3.



The total suspended solids (TSS) removal rate for GI MTDs is 80% pursuant to New Jersey Center for Advanced Technology (NJCAT) verification and NJDEP certification of each device. To merit the NJDEP certified TSS removal rate, a GI MTD must be sized in accordance with its published verification report and have a Department-issued certification letter in order to be accepted for use to meet the green infrastructure requirement specified in N.J.A.C. 7:8-5.3. The current GI MTD certifications with sizing information can be found on the Department's stormwater website at:

<https://dep.nj.gov/stormwater/stormwater-manufactured-treatment-devices/>.

Note that this certification list is subject to change. As technologies evolve, additional GI MTDs may become certified and get added to the list. Conversely, existing certifications may expire and be removed from the list. Therefore, it is important to check the website regularly when considering using an MTD in any type of site design.

Design Criteria

Basic Requirements

Presented below are general design criteria for GI MTDs; however, each GI MTD has additional design criteria based on the type of device and the model. All of the following design criteria must be incorporated into the design in order to receive the certified TSS removal rate. For a full list of design criteria for a specific GI MTD, refer to the certification documents on the Department's website listed above.

Contributory Drainage Area

- Pursuant to N.J.A.C. 7:8-5.3(b), the maximum contributory drainage area is 2.5 acres. For more information on specific limitations, refer the certification letter for that specific MTD.

Flow Rate

- All GI MTDs must be selected based on the peak flow rate of the Water Quality Design Storm (WQDS) for the entire contributory drainage area to the MTD, subject to the above-stated maximum contributory drainage area limitation.
- When calculating the flow rate using Natural Resource Conservation Service (NRCS) methodology, the DelMarVa unit hydrograph may not be used. The standard unit hydrograph with a peak rate factor of 484 must be used in this calculation.

- When calculating the time of concentration, the travel time for sheet flow must use the depth of rainfall generated by the projected 2-year storm as defined and determined pursuant to N.J.A.C. 7:8-5.7(d).
- Future connections to a system that includes a GI MTD are prohibited if the proposed maximum stormwater runoff quality treatment flow rate of the existing MTD would be exceeded.

Configuration

A GI MTD must be installed in the field using the same configuration under which it was tested for NJCAT verification. NJDEP certified GI MTDs can be found online at the link published in the Applications section on the preceding page, and NJCAT verification reports can be found online at:

<http://www.njcat.org/verification-process/technology-verification-database.html>.

The configuration used in the verification testing can be found in the NJCAT verification documents.

Structural

- The minimum separation from the seasonal high water table (SHWT), where required, is dependent upon the GI MTD that is chosen.
- All devices subject to vehicular loading must be designed for at least HS-20 traffic loading at the surface.
- All joints and connections must be watertight.
- If present, the manhole cover, or other approved permanent marker, must clearly indicate that it is a pollutant-trapping device.

Safety

All GI MTDs must be designed to safely convey overflows to down-gradient drainage systems. The design of the overflow structure must be sufficient to provide safe, stable discharge of stormwater runoff in the event of an overflow. Safe and stable discharge minimizes the possibility of adverse impacts, including erosion and flooding in down-gradient areas. Therefore, discharge in the event of an overflow must be consistent with the Standards for Off-Site Stability found in the *Standards for Soil Erosion and Sediment Control* in New Jersey.

Outflow

Blind connections to down-gradient facilities are prohibited. Any connection to down-gradient stormwater management facilities must include access points such as inspections ports and manholes, for visual inspection and maintenance, as appropriate, to prevent blockage of flow and ensure operation as intended. All entrance points must adhere to all Federal, State, County and municipal safety standards such as those for confined space entry.

Tailwater

The effects of tailwater must be considered based upon the GI MTD manufacturer's recommendations.

Access Requirements

An access roadway must be included in the design to facilitate monitoring and maintenance. If the access roadway is constructed of impervious material, take note that it may be subject to the stormwater runoff quality, quantity and groundwater recharge requirements at N.J.A.C. 7:8-5.4, 5.5 and 5.6.

Sizing a GI MTD

The example below illustrates how to size a GI MTD to treat the stormwater runoff generated by the impervious cover in the contributory drainage area that is produced by the Water Quality Design Storm (WQDS). The Stormwater Management rules (“the Rules”) at N.J.A.C. 7:8-5.7 specify that only the NRCS methodology may be used. For more information, see *Chapter 5: Stormwater Management Quantity and Quality Standards and Computations* in this manual.

Example 1:

A site expansion project includes the construction of an additional building which will require a 1 acre vehicular parking lot and accompanying access driveway. More than one-quarter acre of regulated motor vehicle impervious surface is proposed; therefore, the stormwater runoff quality standards of N.J.A.C. 7:8-5.2(a) apply to this site. To address the 80% TSS removal rating requirement, a GI MTD is proposed. Design a GI MTD that will treat the stormwater runoff quality flow for this stormwater system. Assume the stormwater runoff quantity control and groundwater recharge requirements will be met by another stormwater management practice placed down-gradient of the GI MTD.

The following parameters apply for a site located in Mercer County:

Area =	0.25 ac
Slope =	5%
CN Value =	98 (100% Impervious)
Projected 2-year storm rainfall depth	3.84 inches
Hydraulically most distant point to the inlet of MTD	110 ft

Step 1: Calculate Time of Concentration

The calculation of the time of concentration follows the steps in Example 5-1. As stated previously, the rainfall depth for the 2-year storm, P_2 , used in the sheet flow calculation shall be that of the projected 2-year storm. The maximum sheet flow length calculated by McCuen-Speiss limitation is 909 ft, which is greater than 100 ft. Therefore, 100 ft is used for the sheet flow length. The shallow concentrated flow length is 10 ft. The total time of concentration is 0.8 minutes.

Step 2: Calculate the WQDS Peak Flow Rate

When calculating the peak flow rate using NRCS methodology for an MTD, the SCS Standard DUH, which is with a peak rate factor of 484, must be used. Using the NRCS methodology with the time of concentration calculated in *Step 1*, the WQDS peak flow rate is 0.77 cfs.

Step 3: Select a GI MTD by evaluating the model in accordance with the NJDEP Certification Letter

The Department's MTD web page found online at:

<https://dep.nj.gov/stormwater/stormwater-manufactured-treatment-devices/>

contains a table with a column indicating the GI MTDs so marked are certified at the time of publication of this chapter for use as a GI BMP. Clicking on the word *certification* in the appropriate cell of the table will open the certification letter for that MTD, which includes either an example on how to size the GI MTD or a table with model numbers and allowable flow rates for each model. The information presented in the certification letter must be used to size the GI MTD.

The selection of a model of a specific MTD listed on the Department's MTD web page shall be based on the maximum allowable drainage area evaluation method and the maximum treatment flow rate (MTFR) evaluation method in the certification letter. The model of the MTD to be used is the highest minimum configuration determined by the two methods.

In this case, if a specific model of the MTD has a maximum allowable drainage area greater than 0.25 acres, but the MTFR of the specific model is less than 0.77 cfs, another model that has a higher MTFR greater than 0.77 cfs shall be selected.

Considerations

If a GI MTD is being considered for an outfall retrofit, it is essential to calculate the current WQDS stormwater runoff flow rate based on the entire contributory inflow drainage area at the outfall before selecting the GI MTD.

Additionally, the annual cost of components may be a deciding factor in the selection process when considered over the life cycle of a GI MTD unit. For more information on components which require periodic replacement, refer to the Operations and Maintenance Manual for the GI MTD being evaluated for suitability.

Maintenance

Regular and effective maintenance is crucial to ensure effective GI MTD performance; in addition, maintenance plans are required for all stormwater management facilities associated with a major development. There are a number of required elements in all maintenance plans, pursuant to N.J.A.C. 7:8-5.8; these are discussed in more detail in *Chapter 8: Maintenance of Stormwater Management Measures*. Furthermore, maintenance activities are required through various regulations, including the New Jersey Pollutant Discharge Elimination System (NJPDES) rules, N.J.A.C. 7:14A. Specific maintenance requirements for MTDs are presented below; these requirements must be included in a green infrastructure MTD's maintenance plan. Detailed inspection and maintenance logs must be maintained.

General Maintenance

- All structural components must be inspected, at least once annually, for cracking, subsidence, spalling, erosion and deterioration.
- Components expected to receive and/or trap debris and sediment must be inspected for clogging at least twice annually, **or more frequently if specified in the MTD Operations and Maintenance Manual**, as well as after every storm exceeding 1 inch of rainfall.
- During inspections, the MTD must be examined for standing water. If standing water is present in the MTD, and standing water is not a component of the MTD design, corrective action must be taken and the maintenance manual must be revised to prevent similar failures in the future.
- Sediment removal should take place when all runoff has drained from the MTD.
- Disposal of debris, trash, sediment and other waste material must be done at suitable disposal/recycling sites and in compliance with all applicable local, state and federal waste regulations.
- The maintenance plan must indicate the maximum allowable level of oil, sediment and debris accumulation. These levels must be monitored during inspections to ensure that removal of these materials is performed when necessary.
- In addition to the requirements for maintenance listed above, maintenance in accordance with the MTD manufacturer's recommendations must be included in the maintenance manual and performed as indicated.
- A detailed, written log of all preventative and corrective maintenance performed on the MTD must be kept, including a record of all inspections and copies of maintenance-related work orders. Additional maintenance guidance can be found at:

<https://dep.nj.gov/stormwater/maintenance-guidance/>.

Vegetated Areas

- When using a GI MTD with vegetation, bi-weekly inspections are required when establishing/restoring vegetation.
- A minimum of one inspection during the growing season and one inspection during the non-growing season is required to ensure the health, density and diversity of the vegetation.
- Mowing/trimming of vegetation must be performed on a regular schedule based on specific site conditions; perimeter grass should be mowed at least once a month during growing season.
- Vegetative cover must be maintained at 85%; damage must be addressed through replanting in accordance with the original specifications.
- Vegetated areas must be inspected at least once annually for erosion, scour and unwanted growth; any unwanted growth should be removed with minimum disruption to the remaining vegetation.
- All use of fertilizers, pesticides, mechanical treatments and other means to ensure optimum vegetation health must not compromise the intended purpose of the MTD.

References

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