

Attachment 1

Manufactured Treatment Device (MTD) Registration

- 1. Manufactured Treatment Device Name:** BioPod™ Biofilter System with StormMix™ Media
- 2. Company Name:** Oldcastle Precast, Inc., DBA Oldcastle Infrastructure
Mailing Address: 5331 SW Macadam Avenue, Suite 376
City: Portland
State: OR
Zip: 97239
- 3. Contact Name (to whom questions should be addressed):** Joanna Ogintz, PE
Mailing Address: 5331 SW Macadam Avenue, Suite 376
City: Portland
State: OR
Zip: 97239
Phone number: 707-387-5633 or 800-579-8819
Fax number:
E-mail address: joanna.ogintz@oldcastle.com
Web address: <http://www.oldcastlestormwater.com>

4. Technology

Specific size/capacity of MTD assessed (include units): The BioPod is a stormwater biofiltration treatment system that uses StormMix media, an engineered high flow rate media, to allow for a more compact configuration. The BioPod can be specified with the following configuration options:

- BioPod Tree – shallow tree box filter with tree grate access and tree or shrubs;
- BioPod Planter – shallow planter box filter with shrubs, grasses and an open top;
- BioPod Surface – shallow surface filter with no vegetation and a pedestrian-friendly cover; or
- BioPod Underground – deeper underground filter with no vegetation and access risers, covers and subsurface inlet pipe.

All BioPod configurations are available in precast concrete vaults, ranging in size from 4' x 4' up to 8' x 16' inside dimensions. The available sizes vary depending on the desired configuration. The size of the unit is matched to the water quality flow rate from the site. The BioPod is typically provided with an integrated high-flow bypass assembly for internal bypass configuration but can also be designed for separate external bypass. An overview of the BioPod can be found in Appendix A. A summary of model sizes and treatment flow capacities is included in Table 1. Example drawings of the different configurations can be found in Appendix B.

Range of drainage areas served by MTD (acres): Units are designed on a project by project basis to serve any size of drainage area, depending on water quality flow rate.

Include sizing chart or describe sizing criteria: A summary of model sizes and treatment flow capacities is included in Table 1. This recommended sizing is based on the New

Jersey Department of Environmental Protection (NJDEP) certification of the BioPod at a TSS removal rate of 80% and reflects a hydraulic loading rate of 1.8 gpm/ft² (173 inches per hour).

Intended application: on-line or offline: The BioPod can be either configured with an integrated high-flow bypass or with an external bypass by diverting high-flows down the gutter line to a separate bypass structure such as inlet, pond or swale. The peak flow capacity of the internal bypass is 2 cfs for all sizes.

Media used (if applicable): The BioPod biofiltration system is provided with the following horizontal layers and typical depths, from top down:

- Ponding depth – 6 inches to pond water on the surface;
- Mulch – 2 inches of mulch to provide screening and gross solid retention;
- StormMix media – 18 inches of media for primary treatment; and
- Drain rock – 6 inches of drain rock with perforated underdrain with outlet orifice control.

The StormMix biofiltration media consists of an aggregate, an additive and an organic component to provide the primary treatment functions of sorption, biological uptake and retention of sediments.

Table 1. Summary of BioPod Model Sizes, Surface Area and Treatment Flowrates.

BioPod Summary Table				
	Internal Bypass		External Bypass	
Model Size	BioPod Surface Area (ft²)	Treatment Flowrate (cfs)	BioPod Surface Area (ft²)	Treatment Flowrate (cfs)
4' x 4'	12.9	0.05	16.0	0.06
4' x 6'	20.9	0.08	24.0	0.10
4.5' x 8.5'	35.1	0.14	38.3	0.15
4' x 12' *	44.9	0.18	48.0	0.19
4' x 16' *	60.9	0.24	64.0	0.26
4' x 20' *	76.9	0.31	80.0	0.32
6' x 6'	32.9	0.13	36.0	0.14
6' x 8'	44.9	0.18	48.0	0.19
6' x 12'	68.9	0.28	72.0	0.29
8' x 16'	124.9	0.50	128.0	0.51

* These model sizes only available in Planter configuration

5. Warranty Information (describe, or provide web address):

Oldcastle warrants its products to be free from defects in material and workmanship for a period of five years from the date of original purchase.

6. Treatment Type

- Hydrodynamic Structure
- Filtering Structure
- Manufactured Bioretention System
Provide Infiltration Rate (in/hr): 173 in/hr equal to 1.8 gpm/ft²
- Other (describe):

7. Water Quality Treatment Mechanisms (check all that apply)

- Sedimentation/settling
- Infiltration
- Filtration (specify filter media) – StormMix biofiltration media
- Adsorption/cation exchange
- Chelating/precipitation
- Chemical treatment
- Biological uptake
- Other (describe):

8. Performance Testing and Certification (check all that apply):

Performance Claim (include removal efficiencies for treated pollutants, flow criteria, drainage area):

After an extensive field investigation, the BioPod received a General Use Level Designation (GULD) from the Washington Department of Ecology (Ecology) for Basic (Total Suspended Solids, or TSS), Phosphorus and Enhanced (Metals) Treatment in July 2018. The BioPod demonstrated removals of 84% of TSS, 64% of total phosphorus, 35% of dissolved copper, and 71% of dissolved zinc.

In addition, the New Jersey Corporation for Advanced Technology (NJCAT) has verified that the performance of the BioPod met the requirements and expectations of the New Jersey Department of Environmental Protection (NJDEP) Filtration Protocol. Based on laboratory testing, the NJDEP certifies the use of the BioPod at a TSS removal rate of 80%.

The combination of field and laboratory testing demonstrates that the BioPod consistently removes greater than 80% of TSS as well as an average of 64% of total phosphorus, clearly meeting the performance expectations for Virginia.

Specific size/capacity of MTD assessed:

For the field investigation in Washington, a 4' x 6' BioPod with a design flow rate of 0.074 cfs (33.2 gpm) was installed at the Lake Union Ship Canal Test Facility.

For the lab investigation for New Jersey, a full-scale 4' x 6' BioPod with a maximum treatment flow rate of 0.084 cfs (37.6 gpm) was evaluated according to the NJDEP Protocol for Filtration MTDs.

Has the MTD been "approved" by an established granting agency, e.g. New Jersey Department of Environmental Protection (NJDEP) , Washington State Department of Ecology, etc.

No

Yes; For each approval, indicate (1) the granting agency, (2) use level if awarded (3) the protocol version under which performance testing occurred (if applicable), and (4) the date of award, and attach award letter.

The BioPod has been certified by NJDEP for use as an 80% TSS removal stormwater manufactured treatment device in the State of New Jersey (<http://www.nj.gov/dep/stormwater/treatment.html>). The BioPod was tested at Good Harbour Laboratories in Mississauga, Ontario and the test set-up, execution, and results were verified by the New Jersey Corporation for Advanced Technology (NJCAT) program and summarized in a verification report posted on the NJCAT website (<http://www.njcat.org/verification-process/technology-verification-database.html>). The testing was performed under the protocol "New Jersey Department of Environmental Protection Laboratory Protocol to Assess Total Suspended Solids Removal by a Filtration Manufactured Treatment Device" published January 25, 2013. The certification was issued by NJDEP on May 25, 2018. The NJCAT Verification Report and NJDEP certification letter can be found in Appendix C.

The BioPod has also received a General Use Level Designation (GULD) from the Washington Department of Ecology (Ecology) for Basic (TSS), Phosphorus, and Enhanced (Dissolved Zinc and Copper) Treatment. The BioPod was field tested at the Lake Union Ship Canal Test Facility in Seattle, Washington according to the Technology Assessment Protocol – Ecology (TAPE). Based on the field testing, the GULD was issued by Ecology in July 2018 (Appendix D). The summary and analysis of field testing data can be found in the Post-GULD Monitoring Report included in Appendix E. Appendices have been removed to reduce file size but are available upon request. Phosphorus treatment analysis is included on page 15 of the Post-GULD report.

Was an established testing protocol followed?

No

Yes, (1) Provide name of testing protocol followed, (2) list any protocol deviations:

The laboratory testing of the BioPod was performed under the protocol "New Jersey Department of Environmental Protection Laboratory Protocol to Assess Total Suspended Solids Removal by a Filtration Manufactured Treatment Device" published January 25, 2013, with no deviations.

The field testing of the BioPod was performed under the Technology Assessment Protocol – Ecology (TAPE) (2011) with no deviations.

Provide the information below and provide a performance report (attach report):

For lab tests:

- i. **Summarize the specific settings for each test run (flow rates, run times, loading rates) and performance for each run:**

In accordance with the NJDEP filtration protocol, removal efficiency testing was performed on a full-scale BioPod to determine the ability of the BioPod to remove the

specified test sediment at the targeted Maximum Treatment Flow Rate (MTFR). Additional testing information can be found in the NJCAT Technology Verification report in Appendix C.

ii. If a synthetic sediment product was used, include information about the particle size distribution of the test material:

The sediment mix used for testing was a mixture of commercially available sediments that met the particle size distribution requirements of the NJDEP protocol. The removal efficiency test sediment ($d_{50} = 69 \mu\text{m}$) was shown to be slightly finer than the sediment blend required ($d_{50} = 75 \mu\text{m}$) and thus treatment results may be considered conservative.

iii. If less than full-scale setup was tested, describe the ratio of that tested to the full-scale MTD:

N/A

For field tests:

i. Provide the address, average annual rainfall and characterized rainfall pattern, and the average annual number of storms for the field-test location:

The BioPod was tested at the Lake Union Ship Canal Test Facility in Seattle, Washington. Average annual rainfall in Seattle is approximately 37 inches and is characterized as an SCS Type IA rainfall distribution.

ii. Provide the total contributing drainage area for the test site, percent of impervious area in the drainage area, and percentages of land uses within the drainage area (acres):

The BioPod was tested at the Lake Union Ship Canal Test Facility (SCTF) in Seattle, Washington. The drainage area contributing to the site is approximately 31.6 acres, with 22.7 acres of pavement and 8.9 acres of roadside landscaping and includes runoff from the Interstate 5 northbound, southbound, express lanes and on- and off-ramps. The SCTF allows for simultaneous testing of up to four stormwater treatment technologies by diverting stormwater flow through a series of flow splitters.

iii. Describe pretreatment, bypass conditions, or other special circumstances at the test site:

The BioPod tested at the SCTF was a standard configuration with integrated high-flow bypass and no additional pretreatment or special circumstances.

iv. Provide the number of storms monitored and describe the monitored storm events (amount of precipitation, duration, etc.):

At the SCTF, data was collected for 17 storm events, from January 2017 through April 2018. The sampled storm events met the TAPE guidelines for minimum precipitation depth, minimum antecedent dry period, minimum storm duration, and minimum storm intensity.

v. **Describe whether or not monitoring examined seasonal variation in MTD performance:**

Seasonal variation in the BioPod performance was not specifically examined.

vi. **If particle size distribution was determined for monitored runoff and/or sediment collected by the MTD, provide this information:**

Particle size distribution results were provided as part of the evaluation of the BioPod. The average d_{50} of the influent water at the test site was 28 microns, demonstrating that the suspended solids in the stormwater are mostly comprised of silt-sized particles.

9. MTD History:

How long has this specific model/design been on the market?

The BioPod system has been available on the market since 2018.

List no more than three locations where the assessed model size(s) has/have been installed in Virginia. If applicable, provide permitting authority. If known, provide latitude & longitude:

None currently installed in Virginia

List no more than three locations where the assessed model size(s) has/have been installed outside of Virginia. If applicable, provide permitting authority. If known, provide latitude & longitude:

Project Name: Waterstone Townhouses
Project Location: Hillsborough, North Carolina
Size of System(s): BioPod Tree 6' x 6' and BioPod Tree 6' x 8'
Expected Installation Date: August 2018

Project Name: City of Southlake
Project Location: Southlake, Texas
Size of System(s): BioPod Planter 4' x 8'
Expected Installation Date: August 2018

10. Maintenance:

What is the generic inspection and maintenance plan/procedure? (attach necessary documents):

Oldcastle recommends inspection of the BioPod twice per year, after chemical spills, and after major storm events. Depending on the conditions observed, maintenance may be recommended. If the structure or grates or covers are damaged, if the inlet or contour rack are obstructed, or if accumulation of trash and debris or sediment exceeds recommended guidelines, maintenance should be scheduled. Maintenance typically involves using a vacuum truck to remove trash and debris from the inlet and bioretention chamber. If the sediment load is light or medium but there is evident erosion, mulch redistribution with a rake is recommended. If the sediment load is heavy, remove and replace the mulch layer.

Since pollutant transport and deposition vary from site to site, a site-specific maintenance frequency should be established during the first two to three years of operation. Please refer to the “BioPod Inspection and Maintenance Guide” in Appendix F for more detailed information.

Is there a maintenance track record/history that can be documented?

No, no track record.

Yes, track record exists; (provide maintenance track record, location, and sizing of three to five MTDs installed in Virginia [preferred] or elsewhere):

The BioPod is a new product with state-of-the-art biofiltration media. The field and lab studies performed in Washington and New Jersey (respectively) and the subsequent regulatory approvals have demonstrated that the BioPod clearly meets their expectations for system longevity.

Ongoing maintenance of the BioPod is the responsibility of the property owner. Oldcastle can provide the BioPod Inspection and Maintenance Guide to offer guidance on the inspection and maintenance process and how to track maintenance that was performed

Recognizing that maintenance is an integral function of the MTD, provide the following: amount of runoff treated, the water quality of the runoff, and what is the expected maintenance frequency for this MTD in Virginia, per year?

Oldcastle recommends routine inspection of the BioPod every six months. Recommended maintenance frequency is typically dictated by the conditions of the site. Refer to the BioPod Inspection and Maintenance Guide for more information.

Total life expectancy of MTD when properly operated in Virginia and, if relevant, life expectancy of media:

The accepted design life of the concrete components of the BioPod is 50 years. The accepted design life of the stainless steel internal components and hardware is at least 25 years.

For media or amendments functioning based on cation exchange or adsorption, how long will the media last before breakthrough (indicator capacity is nearly reached) occurs?

No breakthrough testing has been performed to date.

For media or amendments functioning based on cation exchange or adsorption, how has the longevity of the media or amendments been quantified prior to breakthrough (attach necessary performance data or documents)?

No breakthrough testing has been performed to date.

Is the maintenance procedure and/or are materials/components proprietary?

Yes, proprietary – Maintenance procedures are not proprietary, but the StormMix media is a proprietary biofiltration media. Maintenance providers can acquire the StormMix media from Oldcastle directly.

No, not proprietary

Appendices

Appendix A	BioPod Overview
Appendix B	BioPod Drawings
Appendix C	NJDEP Certification Letter and NJCAT Verification Report
Appendix D	General Use Level Designation from Ecology
Appendix E	Post-GULD Monitoring Report
Appendix F	BioPod Inspection and Maintenance Guide