



CITY OF PORTLAND
ENVIRONMENTAL SERVICES



1120 SW Fifth Avenue, Room 1000, Portland, Oregon 97204 ■ Nick Fish, Commissioner ■ Michael Jordan, Director

June 21, 2016

Zachariha J. Kent
Director of Engineering
Bio Clean Environmental Services, Inc.
398 Via El Centro
Oceanside, CA 92058

RE: Approval of Modular Wetland Systems - Linear (MWS-Linear)

Dear Mr. Kent,

The City of Portland approves the Modular Wetland Systems - Liner under criteria laid out in the Manufactured Stormwater Treatment Technology submittal guidelines of the 2014 Stormwater Management Manual (SWMM), Appendix B, effective June 21, 2016 for a period of three (3) years.

Based upon findings from Portland State University, our third-party reviewer of water quality monitoring and performance data, and subsequent information received as part of a formal appeal made under SWMM Appendix D.7, the MWS-Linear has been deemed to meet the pollution reduction requirements of the 2014 SWMM. The third-party review findings were forwarded under separate cover June 1st.

As we update the online list of [Approved Manufactured Stormwater Treatment Technologies](#) to include the Modular Wetland Systems - Liner, we will also link to the approval conditions.

If you do not agree with the final outcome or conditions of the evaluation process, you are welcome to appeal under the provisions of the SWMM set forth in [Appendix D.7 of the 2014 SWMM](#).

Thank you,

Henry Stevens
Stormwater Management Manual

Valerie Joachim
Engineering Services Support

cc: Peter Evans, Modular Wetlands
Will Harris, Modular Wetlands



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June 2016

Stormwater Management Manual Approved Manufactured Stormwater Treatment Technology

Modular Wetland Systems Linear Stormwater Treatment System Approval: June 21, 2016 through June 21, 2019

City of Portland Decision:

The Modular Wetland Systems Linear Stormwater Treatment System (MSW Linear) meets the City of Portland pollution reduction requirements as per the 2014 Stormwater Management Manual (SWMM) under the criteria laid out in Appendix B: Submission Guidelines for Manufactured Stormwater Treatment Technologies.

Background:

As part of the application process, Modular Wetland Systems (MWS) submitted the Washington State Department of Ecology (DOE) Technology Assessment Protocol (TAPE) Technology Evaluation Report, including all appendices and performance monitoring data.

MWS gave a technical presentation to City staff, Portland State University students and faculty, and the public on November 3, 2015. The presentation was followed by a technical interview with the City of Portland review committee to discuss water quality performance, maintenance and overall use in the public right-of-way.

The City of Portland contracted with Portland State University's Department of Civil and Environmental Engineering (PSU) to provide third-party review of the submitted water quality performance data.

Additional information is available online for this system, including:

- **Modular Wetland System** website: <http://www.modularwetlands.com/stormwater-products/mws-linear/>
- [DOE General Use Level Designation \(GULD\)](#) for Basic (TSS), Enhanced, and Phosphorous, Treatment for the MWS-L.

Conditions of Use:

1. All configuration options for the MWS-Linear are approved for pollution reduction. Selection of a specific configuration is the responsibility of the project designer.
2. Use of MWS-Linear does not exempt a project or site from required flow control requirements, operations and maintenance requirements, or other applicable requirements of the SWMM.
3. For use in the public right-of-way, the following conditions must be met:
 - Units must meet City of Portland street design requirements, including but not limited to H-20 vehicle load rating, non-slip surface, and American with Disabilities Act tolerances specific to surface grates or vault lids.
 - The Operations and Maintenance Plan for the two-year establishment period must address irrigation or watering, plant replacement, and inspection frequencies.
 - The following Zone 8 or Northwest region plants are allowed:
 - Bluestem, Turkey Foot Bluestem - *Andropogon gerardii*
 - Bluestem, Lindheimer's / Seacoast Bluestem - *Schizachyrium scoparium*
 - Canna, Canna Tropicana, Canna Lilly - *Canna X generalis*
 - Cape Lily, Powell's Crinum Lily - *Crinum X powellii*
 - Daylily - *Hemerocallis hybrids*
 - Gaura, White "Whirling Butterflies" - *Gaura lindheimeri*
 - Grass, Vetiver - *Vetiveria zizanioides* (L.)
 - Heavenly Bamboo, Dwarf - *Nandina domestica* "Nana"
 - Heavenly Bamboo, Moon Bay - *Nandina domestica* "Moon Bay"
 - Indiangrass, Yellow Indiangrass - *Sorghastrum nutans*
 - Iris, African / Fortnight Lily / Morea Iris - *Dietes iridioides*
 - Joe Pye Weed, Queen-of-the-Meadow - *Eupatorium fistulosum*
 - Lavender - *Lavandula* L.
 - Lily, Lily-of-the-Nile / African Lily / African Blue Lily - *Agapanthus spp*
 - Muhlygrass, Lindheimer's / Blue - *Muhlenbergia lindheimeri*
 - Muhlygrass, Gulf / Mist Grass / Hairawn Muhly - *Muhlenbergia capillaris*
 - Oregon Grape, Creeping - *Mahonia repens*
 - Oregon Grape, Cascade - *Mahonia nervosa*
 - Purple Coneflower - *Echinacea purpurea*
 - Society Garlic, Pink Agapanthus - *Tulbaghia violacea*
 - Rose Champion, Mullein Pink, Dusty Miller - *Lychnis coronaria*
 - Rush, Japanese Sweet Flag - *Acorus gramineus*
 - Rush, Spreading - *Juncus patens*
 - Rye, Giant Wild - *Leymus condensatus*
 - Sage, Russian - *Perovskia atriplicifolia*
 - Sea Oats - *Chasmanthium paniculatum* / *Uniola paniculata*
 - Sedge, Umbrella Plant - *Cyperus involucratus*
 - Sedge, Brome Hummock - *Carex bromoides*
 - Sedge, Slough - *Carex obnupta*
 - Spiraea, Japanese - *Spiraea japonica*
 - Spiraea, Birchleaf - *Spiraea betulifolia*
 - Spiraea, Mountain - *Spiraea densiflora*

4. MWS-trained providers must be utilized for activation, inspection and maintenance of installed systems.

Project Designer Responsibilities:

1. Ensuring that the conditions of use are met.
2. Ensuring that the project meets all applicable requirements of the Stormwater Management Manual, such as the Stormwater Infiltration and Discharge Hierarchy, in order to use MWS-Linear.
3. Ensuring that the design and installation of the units are appropriate for the project goals, site conditions, long-term maintenance requirements, and any other site-specific design requirements on private property or for use in the public right-of-way.
4. Sizing units to meet the current Stormwater Management Manual presumptive design approach and pollution reduction requirements. The pollution reduction capacity is flow-based and assumes a treatment flow intensity of 0.19 inches per hour and a 0.90 runoff coefficient using the Rational Method with a treatment rate of 1 gpm/square foot. The treatment capacity for MWS-Linear units are provided in Table 1.

Table 1. MWS Linear Sizing to Meet City of Portland Pollution Reduction Requirements		
Unit size (ft)	Treatment Capacity (cfs)	Maximum Drainage Area (acres)
4 x 4	0.051	0.31
4 x 6	0.071	0.42
4 x 8	0.112	0.66
4 x 13	0.139	0.82
4 x 15	0.170	0.99
4 x 17	0.200	1.17
4 x 19	0.230	1.35
4 x 21	0.261	1.52
6 x 8	0.142	.083
8 x 8	0.224	1.31
8 x 12	0.336	1.97
8 x 16	0.448	2.62
8 x 20	0.561	3.28
8 x 24	0.673	3.93

5. Each site plan must undergo MWS review before the City of Portland can approve the unit(s) for site installation. A letter that certifies that the project has been designed to manufacturer’s specification must be submitted to BES prior to the appropriate design milestone. For public improvements, including public works permits, the letter must be submitted to BES prior to 60% plan review. For installation on private property, the letter must be submitted prior to building permit plan approval. The project designer is highly encouraged to work with MWS prior to the appropriate review milestone in order to maximize placement and performance of the unit(s).

6. If the project designer wants to use plants in public facilities not approved under the Conditions of Use, the project designer is required to get written approval from the City of Portland Environmental Services Revegetation Program and MWS prior to 90% plan review.
7. If the project designer wishes to vary from these conditions of approval, the project designer must use the Performance Design Approach.

Approval Conditions:

1. BES may at any time suspend or revoke approval if the performance of the technology does not meet performance criteria, or if the performance criteria change due to the local, state, or federal pollution reduction standards.
2. This approval expires on **June 21, 2019**, three years from the approval date. If no changes to the MWS-Linear have occurred (such as, but not limited to, dimensional changes to the physical device, changes to the filtration media, changes to maintenance requirements, or changes in expected performance or device design criteria), the approval can be renewed as per the guidelines in effect at the time of renewal. If any changes, updates, or revisions have occurred to the MWS-Linear, the applicant must obtain DOE TAPE GULD certification and re-apply following submission guidelines in effect at the time of application.