Commonwealth of Massachusetts
Executive Office of Energy & Environmental Affairs

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**REVISION OF APPROVAL FOR REMEDIAL USE**
Pursuant to Title 5, 310 CMR 15.00

Name and Address of Applicant:

Busse Green Technologies Inc.
1101 South Euclid Avenue
Oak Park, IL 60304

Trade name of technology and models: BUSSE-MF, Models: MF-250, MF-500, MF-750, MF-1000, MF-1500, MF-2000 (hereinafter called the "System"). Schematic Drawings illustrating each System, a design and installation manual, an owner's manual, an operation and maintenance manual, and an inspection checklist are part of this Approval.

Transmittal Number: X227577
Date of Issuance: December 4, 2009
Revision date: November 05, 2012

**Authority for Issuance**

Pursuant to Title 5 of the State Environmental Code, 310 CMR 15.000, the Department of Environmental, Protection hereby issues this Approval for Remedial Use to: Busse Green Technologies Inc., 1101 South Euclid Avenue, Oak Park, IL 60304 (hereinafter "the Company"), approving the System described herein for Remedial Use in the Commonwealth of Massachusetts. The sale, design, installation, and use of the System are conditioned on compliance by the Company, the Designer, the Installer, the Service Contractor, and the System Owner with the terms and conditions set forth below. Any noncompliance with the terms or conditions of this Approval constitutes a violation of 310 CMR 15.000.

November 05, 2012

David Ferris, Director
Wastewater Management Program
Bureau of Resource Protection

Date

## Technology Description

The System is a Secondary Treatment Unit (STU. The Busse MF system uses an activated sludge process and a membrane process (biological-filtration) to treat sanitary wastewater. The system models are based on their design flows and include for this approval: MF-250, MF-500, MF-750, MF-1000, MF-1500, and MF-2000. Schematics are available on Mass DEP website. The model MF-500 system includes two 264 gallon balance tanks equipped with a screened airlift pump system that pumps effluent to the two membrane reactor (MBR) tanks. Settled and aerated wastewater is discharged from the second balance tank to two 264 gallon membrane reactor (MBR) tanks, which house a total of 24 half height Kubota flat sheet membranes. Each tank contains 12 flat sheet membranes. The Kubota membrane unit consists of two sections: the lower section contains air piping and the upper section containing the membrane panels. The membrane panels consist of an ABS support covered with a felt spacing material and a chlorinated polyethylene membrane. The membrane material has a nominal pore size in the range of 0.1 to 0.4 µm. Membrane units are submerged in activated sludge, aerated by coarse and fine bubble systems. Activated sludge recirculation from the MBR tanks back to balance tank #2 assists in maintaining optimum mixed liquor suspended solids or MLSS concentration in the MBR tanks. The aeration provided in the MBR tanks provides a cross flow of liquid over the surface of the membrane panels, preventing membrane fouling, and providing the oxygen necessary for the microbial degradation of the organic matter and micro-organisms within the wastewater. The membrane units are positioned to act as a flume to direct the liquid flow over the membrane panels, providing mixing and oxygen transfer. The liquid head pressure above the membranes drives the permeate from the mixed liquor through the physical barrier of the membrane. The permeate liquid then flows via a manifold through the tank wall for final disposal. The treated system effluent is conveyed to a distribution box for gravity discharge to a soil absorption system (SAS) or drip dispersal system constructed in accordance with 310 CMR 15.100 – 15.279.

The MBR tanks also may include suspended bags containing marble tiles to maintain proper pH range and sufficient alkalinity in the wastewater for nitrification.

Membranes are typically exchanged for a clean membrane approximately every six to 12 months. The membrane is removed from the unit, a clean membrane installed and dirty membrane removed from the site to be chemically cleaned by the Service Contractor.

Influent equalization for system model MF-500 occurs in Balance Tanks 1 and 2. Single or multiple system tanks can be also be used in combinations to serve various sized facilities in accordance with the Company's design criteria. This allows the system to be sized based on average flow rather than peak flow. An airlift pump is installed in each balancing tank to ensure the maximum flow discharged to the MBR tanks does not exceed the design capacity of the unit.

Typical system tank configurations for residential systems are as follows:

| Bedrooms | System Layout |
|---|---|
| Three Bedroom, Four Bedroom | Two Balancing Tanks and Two MBR Tanks |
| Five Bedroom | Three Balancing Tanks and Three MBR Tanks |
| Six Bedroom | Four Balancing Tanks and Four MBR Tanks |
| Models MF-1000, MF-1500, MF-2000 | To be reviewed/determined by Company |

Also as an option, the system may include use of an existing septic tank for additional influent equalization. See schematics of the system models, which are part of this Approval.

To allow for proper system function during prolonged periods without inflow, control software with device timers provides for automatic switching of the unit to energy saving mode, controlling aeration and preventing anaerobic conditions.

The control system utilizes a proprietary software program to control the operation of the airlift pumps, level controls, aerators and sludge return pumps. It also allows for remote operation and control of the system.

## Conditions of Approval

The term "System" refers to the STU in combination with the other components of an on-site treatment and disposal system that may be required to serve a facility in accordance with 310 CMR 15.000.

The term "Approval" refers to the technology-specific Special Conditions, the conditions applicable to all STU's with Remedial Use Approval, the General Conditions of 310 CMR 15.287, and any Attachments.

For Secondary Treatment Units that have been issued Remedial Use Approval for the upgrade or replacement of an existing failed or nonconforming system., the Department authorizes reductions in the effective leaching area (310 CMR 15.242), the depth to groundwater (310 CMR 15.212), and/or the depth of naturally occurring pervious material (310 CMR 15.240(1)) subject to the conditions that apply to all Secondary Treatment Units Approved for Remedial Use and subject to the Special Conditions applicable to the Technology.

## Special Conditions

1. The System is Secondary Treatment Unit Approved for Remedial Use. In addition to the Special Conditions contained in this Approval, the System shall comply with all the "Standard Conditions for Secondary Treatment Units Approved for Remedial Use", except where stated otherwise in these Special Conditions.

2. The System is approved for facilities where the local approving authority finds that:

   a) the design flow is less than 2,000 gpd;

b) there is no increase in the actual or proposed design flow;

c) the System is for the upgrade of a failed, failing or nonconforming system; and

d) a conventional system with a reserve area, designed in accordance with the standards of 310 CMR 15.100 through 15.255, cannot feasibly be built on-site.

3. The system shall be installed in series between the building sanitary wastewater plumbing and a soil absorption system of a standard Title 5 system constructed in accordance with 310 CMR 15.100 – 15.279, subject to the provisions of this Approval. The System may be installed either inside a dwelling or occupied structure (limited to 6 systems) or in its own enclosure separate from any dwelling.

4. System use and installation is limited as follows:

   a) Systems located in a separate structure, purpose-built for enclosure of System and detached from any dwelling, is not limited in number of installations. System size is limited to 2,000 gallons per day (gpd) or less.

   b) System installations located in dwellings or occupied structures are limited to a maximum of six (6) Systems. System size is limited to 2,000 gallons per day (gpd) or less. Prior to issuance of a Disposal System Construction Permit, approval for the installation must be obtained from the local Plumbing Inspector.

5. The requirements in 310 CMR 15.223(1) 'Septic Tanks' and 310 CMR 15.224 'Multiple Compartment Tanks' do not apply to the System, unless the system design incorporates a separate existing or new septic tank.

   The record drawings, on file with the local approving authority, shall clearly indicate an area for a septic tank meeting the requirements of Title 5 and the drawings shall indicate that the area is for the sole purpose of installing a Title 5 septic tank in the future, if necessary. The System Owner shall not construct any permanent buildings or structures or disturb the site in any manner that would prevent the installation of a Title 5 septic tank in the future

6. Installation of the system within the building or dwelling shall be maintained at a minimum of 35 degree F and provide sufficient access to all system tanks as required for regular maintenance by the Service Contractor.

7. The control panel shall provide the Service Contractor with information to manage incoming alarms 24 hours per day through automatic notification using either telephone or wireless.

8. Prior to the submission of an application for a DSCP, for all nonresidential Systems and Systems with design flows of 660 gpd or greater, the Company shall submit to the Designer and the System Owner, a certification by the Company or its authorized agent that the design conforms to the Approval and all Company requirements and that the proposed use of the System is consistent with the Technology's capabilities. The authorized agent of the

Company responsible for the design review shall have received technical training in the Company's products.

9. Upon submission of an application for a Disposal System Construction Permit (DSCP), the Designer shall provide to the local Approving Authority, for any proposed non-residential System or any residential System with a design flow of 660 gpd or greater, certification by the Company as specified in Paragraph 8.