CONTROLLED DEMONSTRATION
WASTEWATER SYSTEM APPROVAL

CONTROLLED DEMONSTRATION NO: CDWS-2002-1-R2

ISSUED TO: James Bell
Bio-Microbics, Inc.
8450 Cole Pkwy.
Shawnee, KS. 66227
800-753-FAST (3278); Fax: 913-422-0808
www.biomicrobiics.com

FOR: Bio-Microbics, Inc. FAST® wastewater treatment systems
     MicroFast Models 0.5, 0.75, 0.9, 1.5 and 3.0
     High Strength Fast Models 1.0, 1.5, 3.0, 4.5, 9.0

APPROVAL DATE: February 24, 2009

In accordance with General Statute 130A-343 and 15A NCAC 18A .1969 a proposal by Bio-Microbics, Inc., for approval of subsurface wastewater systems utilizing the MicroFAST and High Strength FAST systems has been reviewed, and these systems have been found to meet the standards of a controlled demonstration system when all of the following conditions are met:

A. GENERAL

1. Scope of this Controlled Demonstration Approval:
   a. Use, design and construction requirements for the specified models of MicroFAST to meet TS-I or TS-II effluent and High Strength FAST pretreatment systems to meet NSF-40 or better effluent quality standards pursuant to Rule 15A NCAC 18A .1970.
   b. Special operation, maintenance and monitoring of these Bio-Microbics FAST pretreatment systems and associated subsurface systems to ensure the treatment performance standards shall continue to be met.
   c. Proposal for evaluation of this Controlled Demonstration system.

2. This Controlled Demonstration approval is applicable to wastewater systems utilizing MicroFAST and High Strength FAST pretreatment systems that have a design flow not exceeding 3,000 gallons per day.
3. The MicroFAST systems are approved to treat domestic wastewater. High Strength FAST systems are approved to treat wastewater from food service facilities or other commercial establishment generating similar high strength wastewater.
4. Influent waste strength to the Bio-Microbics, Inc. MicroFAST treatment system shall not exceed domestic septic tank quality effluent standards pursuant to Rule 15A NCAC 18A.1970(b). In addition the following requirements shall be met:

- The permit applicant shall verify that the system influent has sufficient alkalinity to allow for the proper amount of nitrification removal when nitrogen performance standards for TS-I or TS-II must be met.
- The blower must remain on at all times unless otherwise recommended by Bio-Microbics, Inc.
- The influent to the MicroFAST treatment system shall not have a pH or toxins that significantly inhibit microbial growth. (Please see the company’s Owner’s Manual for a list of prohibited products.)

5. Design flow and influent BOD and TSS limits must be established on case-by-case basis for projects using High Strength FAST systems, depending upon the facility served and desired effluent limitations. A North Carolina Professional Engineer shall design the system and Bio-Microbics shall certify the design of each project using a High Strength FAST system. A set of support design calculations shall be provided for each system.

6. This controlled demonstration is initially limited to 50 systems with design flows of up to 3,000 gallons per day.

7. FAST pretreatment systems may be used for applications that have a design daily flow exceeding 3,000 gallons per day if designed by a P.E. licensed to practice in NC and approved by the State on a case-by-case basis. Design shall be in accordance with the Large Systems State Review/Approval Process (Rule 15A NCAC 18A .1938).

B. ADVANCED TREATMENT PERFORMANCE STANDARDS (TS-I AND TS-II)

MicroFAST and High Strength FAST have been approved for NSF-40, TS-I and TS-II. Refer to Rule .1970(a) Table VII – Effluent Quality Standards for Advanced Pretreatment Systems for treatment performance levels.

C. SITING CRITERIA

Approved Controlled Demonstration systems may be installed on sites that are suitable for a conventional wastewater system and that have a repair area of sufficient size to allow for the installation of a conventional, modified, or alternative wastewater system, an approved Innovative wastewater system, or an accepted wastewater system if the Controlled Demonstration wastewater system fails to perform properly. Other sites may be used for the initial installation of a Controlled Demonstration system that meet the criteria for a modified, alternative, approved innovative or accepted wastewater system, when the Manufacturer agrees to provide such a system if the Controlled Demonstration system were to fail to perform properly.
Approved Controlled Demonstration systems may not be installed as a repair to an existing malfunctioning system on sites that do not have any additional area for repair. Exceptions to the repair area requirement are as set forth in Rule .1969(f)(3) and (4).

The MicroFAST pretreatment systems and associated drainfields shall be sited and sized in accordance with Rule .1970 for a TS-I or TS-II system.

D. DESIGN CRITERIA

1. A MicroFAST system designed for flows of up to 1,500 gpd shall utilize models of Residential Wastewater Treatment Systems (RWTS’s) that have been preapproved by the State in addition to meeting the requirements listed below. For MicroFAST systems designed for flows greater than 1,500 gpd, and for High Strength Fast units, a state-approved septic tank shall be used sized in accordance with .1952(b).

2. Tables 1 and 2 provide the minimum unit sizing required for the FAST or High Strength FAST unit based on design flow and full time or seasonal use.

Table 1 – Sizing for Full Time Residential Installations

<table>
<thead>
<tr>
<th>System Model</th>
<th>Design Flow Limit</th>
<th>Settling Zone Size (gallons)</th>
<th>Treatment Zone Size (gallons)</th>
<th>Total Tank Size (gallons)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MicroFAST 0.5</td>
<td>500 gpd</td>
<td>500</td>
<td>750</td>
<td>1250</td>
</tr>
<tr>
<td>MicroFAST 0.75</td>
<td>750 gpd</td>
<td>500</td>
<td>1000</td>
<td>1500</td>
</tr>
<tr>
<td>MicroFAST 0.9</td>
<td>900 gpd</td>
<td>725</td>
<td>1250</td>
<td>1975</td>
</tr>
<tr>
<td>MicroFAST 1.5</td>
<td>1500 gpd</td>
<td>1075</td>
<td>1875</td>
<td>2950</td>
</tr>
<tr>
<td>MicroFAST 3.0*</td>
<td>3000 gpd</td>
<td>2145</td>
<td>3750</td>
<td>5895</td>
</tr>
<tr>
<td>High Strength FAST 1.0*</td>
<td>Design flow and influent BOD and TSS limits must be established on a case-by-case basis, depending upon the facility served and the desired effluent limitations. A North Carolina Professional Engineer shall design and Bio-Microbics shall certify the design of each project. A set of support design calculations shall be provided for each system.</td>
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<tr>
<td>High Strength FAST 1.5*</td>
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<tr>
<td>High Strength FAST 3.0*</td>
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<tr>
<td>High Strength FAST 4.5*</td>
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<td></td>
</tr>
<tr>
<td>High Strength FAST 9.0*</td>
<td></td>
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</tr>
</tbody>
</table>

* See Number 6 in Design Criteria
Table 2 – Sizing for Seasonal Use Residential Installations

<table>
<thead>
<tr>
<th>System Model</th>
<th>Design Flow Limit</th>
<th>Settling Zone Size (gallons)</th>
<th>Treatment Zone Size (gallons)</th>
<th>Total Tank Size (gallons)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MicroFAST 0.75</td>
<td>500 gpd</td>
<td>500</td>
<td>1000</td>
<td>1500</td>
</tr>
<tr>
<td>MicroFAST 0.9</td>
<td>750 gpd</td>
<td>725</td>
<td>1250</td>
<td>1975</td>
</tr>
<tr>
<td>MicroFAST 1.5</td>
<td>9000 gpd</td>
<td>1075</td>
<td>1875</td>
<td>2950</td>
</tr>
<tr>
<td>MicroFAST 3.0*</td>
<td>1500 gpd</td>
<td>2145</td>
<td>3750</td>
<td>5895</td>
</tr>
<tr>
<td>MicroFAST 4.5*</td>
<td>3000 gpd</td>
<td>See Note 1</td>
<td>4220</td>
<td>See Note 1</td>
</tr>
<tr>
<td>High Strength FAST 1.0*</td>
<td>Design flow and influent BOD and TSS limits must be established on a case-by-case basis, depending upon the facility served and the desired effluent limitations. A North Carolina Professional Engineer shall design and Bio-Microbics shall certify the design of each project. A set of support design calculations shall be provided for each system.</td>
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<td></td>
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</tr>
<tr>
<td>High Strength FAST 1.5*</td>
<td>Note 1: The MicroFAST 4.5 is installed in a separate tank from the Settling Zone tank. The size of the Settling Zone tank should be in accordance with State and Local rules.</td>
<td></td>
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</tr>
<tr>
<td>High Strength FAST 3.0*</td>
<td>* See Number 6 in Design Criteria</td>
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<td></td>
</tr>
<tr>
<td>High Strength FAST 9.0*</td>
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</tr>
</tbody>
</table>

3. Grease traps or grease interceptors in accordance with .1955(k) shall also be used prior to High Strength Fast units.

4. The FAST systems gravity discharge to the dispersal component (pump tank, gravity drain field, etc.).

5. MicroFAST systems designed for flows of domestic wastewater, up to 1,500 gallons per day, shall be designed by a Bio-Microbics certified designer or a North Carolina Professional Engineer.

6. MicroFAST systems designed for flows over 1,500 and less than 3,000 gallons per day and all High Strength Fast units shall be designed on a case-by-case basis by a North Carolina Professional Engineer. A design certification shall be provided from the manufacturer (Bio-Microbics) verifying acceptance of the engineer's design criteria, plans and component specifications. The company shall provide this certification in writing to the applicant for submittal with the site application.

7. For any project utilizing a FAST system that is suspended from the lid of a tank, the tank design must be specifically approved by the State of North Carolina. This applies to each tank manufacturer, and each model FAST system to be used.

8. For any Bio-Microbics FAST pretreatment system to be installed under traffic areas, a North Carolina professional engineer, in consultation with Bio-Microbics corporate staff, shall design the containment vessels and access openings. The State shall review and approve these plans and specifications.

9. A vent for the FAST unit must be provided at the treatment unit.
10. All Bio-Microbics FAST wastewater pretreatment systems installed on Group I (sandy) soils must use a blower inlet filter that prevents sand grains from entering the blower. This shall be supplied by Bio-Microbics, or an alternate product used that is approved by Bio-Microbics.

11. A State approved septic tank sized at a minimum of twenty-five percent of the capacity required in §1952 (b) shall be provided after the FAST unit. A State-approved effluent filter sized for the daily design flow shall be placed in this septic tank.

12. An ultraviolet (UV) disinfection unit “The Disinfector” or other UV system approved by the State shall be provided after the effluent filter whenever TS-II standards are required to be met.

13. An example of the pretreatment layout is provided in Attachment A.

E. INSTALLATION AND TESTING PROCEDURES

1. A preconstruction conference shall be required and shall be attended by the system designer, Bio-Microbics or its designated manufacturer's representative, Bio-Microbics certified installer, and local health department (LHD), prior to beginning construction of the FAST Treatment System and associated ground absorption system.

2. The FAST System shall be located in compliance with the horizontal setback requirements of Rule .1950(a), and shall be located to prevent surface/subsurface water inflow/infiltration. The drainfield horizontal setbacks are in accordance with Rule .1970 for a TS-I or TS-II system.

3. All Bio-Microbics FAST systems shall be installed according to directions provided in the Bio-Microbics “Installation Manual”. Tankage and instructions found on Bio-Microbics CAD drawings of each system shall be used. Additionally, all Bio-Microbics FAST systems and components used with, but not manufactured by Bio-Microbics, shall be installed in accordance with all applicable regulations.

4. All individuals/companies installing Bio-Microbics FAST systems shall be in possession of all necessary permits and licenses before starting any portion of an installation.

5. Watertightness of the tanks and any dosing tanks shall be demonstrated by a 24-hour leakage test conducted at the installation site or by an approved vacuum testing method. A water level change of 1/2 inch or more over 24 hours, or visual observation of leakage shall be cause for failure of the watertightness test. Initial water level shall be to 2 inches above the riser/adapter seam.

6. A Bio-Microbics, Inc. certified system operator shall startup the FAST unit for each installation and shall provide an acceptance letter to the LHD and to Bio-Microbics, Inc. or their representative prior to issuance of the operation permit.

7. Specified site preparation steps and construction specifications for the ground absorption system shall be strictly adhered to, including specified depth of trenches in relation to site limiting conditions.
8. Each Bio-Microbics control panel shall have a label as shown in Attachment B.

9. Prior to Operation Permit issuance, the final Health Department construction inspection shall include at least the following:

- check positive airflow out of the vent by placing a bag on the vent and observing it filling
- assure the blower is no more than 100 feet from the FAST system
- observe the water tightness testing
- test the blower and UV system alarms
- inspect the blower outlet pipe to ensure that the first twelve inches is galvanized steel pipe
- assure all vents are installed
- observe hydraulics of the overall system
- confirm control panel set for continuous blower operation
- record all time clock settings

F. OPERATION, MAINTENANCE AND TESTING


2. All Bio-Microbics FAST pretreatment systems require an operation and maintenance agreement between the system owner and Bio-Microbics, Inc, or its authorized representative, as per Rule .1970. The system shall be inspected by a certified Subsurface Operator who is also a certified Grade II biological wastewater treatment plant operator. The certified operator shall be either an employee of Bio-Microbics, Inc, or authorized in writing by Bio-Microbics, Inc to operate and maintain the system.

3. FAST pretreatment systems shall be classified at a minimum as a Type V(a) system according to Table V(a) of Rule .1961(b).

4. High Strength FAST units shall have a minimum frequency inspection of monthly.

5. All FAST pretreatment systems shall be operated and maintained according to the latest version of Bio-Microbics, Inc, O&M manual.

6. At each FAST pretreatment system inspection the Operator in Responsible Charge (ORC) shall, at a minimum, observe, monitor, and record the following:

   a. Check FAST system blower for proper operation; note any unusual sounds or physical appearance.
   b. Clean out steel inlet air filter attached to the blower and service as needed. The steel inlet air filter shall be replaced every two years.
   c. Check alarm to make sure it works and is undamaged. The alarming function can be checked by turning the blower breaker switch off. The alarm will sound after a 10-second delay.
   d. Make a visual inspection looking down the inspection port to the FAST reaction chamber to confirm that the water at the surface of the unit is churning vigorously. At the same time
check the water level to confirm that there is approximately 2 in. over the media with the blower turned off. Also check the wastewater level in the other tanks.

e. Visually inspect the clarity of effluent coming from the FAST system. It should appear to be clear and free of fine suspended solids.

f. During each inspection, check sludge levels in the initial settling tank and post treatment settling tank (effluent filter tank). The initial settling tank shall be pumped out at 1/3 of liquid depth. The post treatment settling tank shall be pumped out at 6 inches of sludge depth. When either settling tank is pumped out, also pump out any sludge that has accumulated under the FAST system.

g. The effluent filter should only be inspected when the post-treatment settling tank is pumped out. Perform all other routine inspections and service as outlined in the Bio-Microbics Service Manual.

h. Check wastewater levels in the tanks.

i. Check watertightness of tanks, risers and pipe connections at tanks.

j. Observe operation of pumps, floats, valves, electrical controls and alarms.

k. Verify pumping frequency from pump impulse counters and elapsed run time meters.
l. Record the pump cycle and run time meters and any water meter readings.

7. At least once per year the ORC shall, at a minimum, measure and report to the health department:

   a. sludge and scum levels in the pre and post settling tanks,
   b. drainfield pump delivery rate (drawdown test), and
   c. drainfield dosing volume and measure or calculate average pump run time.

8. The ORC shall also conduct other additional observations, measurements, monitoring, and maintenance activities as specified in the Operation Permit and as recommended by the manufacturer.

9. Sampling and Testing

   a. All sampling shall be done in accordance with Rule .1970(n).
   b. All systems shall be tested for effluent CBOD₅, TSS, NH₄-N, and fecal coliform bacteria. Influent shall be tested for BOD₅ and TKN. TS-II system effluent shall be additionally tested for TN.
   c. Influent samples shall be taken at the outlet end of the septic tank prior to the FAST unit. The sample should be taken from 12 inches below the bottom of the effluent filter/tee.
   d. Effluent samples shall be taken from an approved sampling port immediately following the FAST pretreatment unit or FAST UV system (for TS-II). The testing protocol shall follow the Bio-Microbics Testing Protocol for FAST Wastewater Treatment Systems (see Attachment C). Sampling ports may include pump tank free fall of effluent.
   e. Each system shall incorporate a system for effluent flow monitoring into its design. A separate dialer panel from the standard Bio-Microbics panel will record and 7-day and 30-day flow readings on a web based database that the operator will be able to access. The separate dialer panel can be used for pressure manifold and LPP systems. Where effluent flows are by gravity, the method of flow measurement will be done on a case-by-case basis with approval by the State.
10. Notification and Performance of Maintenance and Repairs

a. The ORC shall alert Bio-Microbics and the system owner in a timely fashion of needed maintenance or repair activities including, but not limited to, landscaping, tank sealing, tank pumping, pipe or control system repairs, and adjustment of any other system component.

b. The septic tank will be pumped as needed upon recommendation of the ORC and in accordance with the Bio-Microbics Treatment System Operation and Maintenance Manual. However, at a minimum, the septic tank will be pumped whenever the solids level exceeds 25% of the tank’s total liquid working capacity or the scum layer is more than 4 inches thick.

c. The ORC shall notify the system owner, Bio-Microbics, Inc, and the local health department whenever the pump delivery rate efficient or average pump run times are not within 25% of initial measurements conducted prior to system start-up. System troubleshooting and needed maintenance shall be provided to maintain the pump delivery rate and average pump run time within 25% of initial measurements conducted during system startup.

11. Reporting

a. The ORC shall provide a completed written report to Bio-Microbics, Inc, the system owner, and the local health department within 30 days after each required visit. At a minimum this report shall specify:
   1. the date and time of inspection,
   2. system operating conditions observed according to F.5 above,
   3. system operating conditions measured according to F.6 and F.7 above,
   4. results from any laboratory analysis of any effluent samples,
   5. maintenance activities performed since the last inspection report,
   6. an assessment of overall system performance,
   7. a list of any improvements or maintenance needed, and
   8. a determination of whether the system is malfunctioning, and the specific nature of the malfunction.

b. Proposal for Evaluation and Reporting
   1. The manufacturer shall maintain a contract for evaluation of the performance of the controlled demonstration wastewater system with an independent third party laboratory, consultant, or other entity that has expertise in the evaluation of wastewater system and that is approved by the Department. The third party shall review the site-specific sampling and flow-monitoring protocol, collect and analyze the ORC inspection reports, sampling and monitoring data, and prepare Semi-Annual Reports summarizing all data for all the sites. These reports are due by January 31 and July 31 of each year, and shall include all data gathered through December 31 and June 30 of the previous six-month period, respectively. These reports shall provide information to the Department based upon the monitoring data and observations made from the Controlled Demonstration systems installed pursuant to this Approval. This should include an assessment of system performance in relation to the established treatment performance standards; an assessment of physical and chemical properties of the materials used to construct the system, in terms of strength, durability, and chemical resistance to loads and conditions experienced; recommended areas of applicability for the system; and any conditions and limitations related to the use of the system.
   2. Upon completion of the research and testing protocol, and prior to completing any application
by Bio-Microbics, Inc, to the State for reclassification of the FAST Pretreatment System as an Innovative System, and within a maximum of five years of the effective date of the first Controlled Demonstration System Operation Permit (CDSOP) issued pursuant to this approval, the approved third party shall prepare a Final Report to the State that includes the results from all of the systems installed during the Controlled Demonstration, including sampling results, flow-monitoring information, ORC reports, etc., and provide recommendations on future use of the system. The Final Report shall be in electronic format and may be published on the On-Site Water Protection Section’s website without confidentiality. The contents of the interim and final reports shall not be altered from the original document without approval from Bio-Microbics, Inc.

(3) A minimum of 50 data points is required, including data from a minimum of 15 sites, with a minimum of two data sets per site collected over at least a 12-month period.

(4) For coastal resort communities, the two samples shall take place between June 1 and September 8 of each year. The samples must be taken at least six weeks apart.

(5) Other seasonal homes shall be sampled during the times of greatest use.

(6) A copy of the sample results will be provided from the laboratory directly to the On-Site Water Protection Section.

(7) The State of North Carolina and Bio-Microbics, Inc, agree that any systems that are out of compliance due to owner intervention, i.e. excessive flows, chemical disposal, or high strength waste, etc., shall not be considered in the Controlled Demonstration approval and any test results from those systems shall not be held against Bio-Microbics, Inc.

12. Effluent Quality, System and Site Compliance. Compliance of each site and the system shall be in accordance with requirements set forth in Rule .1970. Consideration shall be given for the system to be reclassified as an approved Innovative system when the requirements of Rule .1969(g)(2) for “Fast Track” approval and system compliance requirements of Rule .1970(o)(2) have been met.

G. RESPONSIBILITIES AND PERMITTING PROCEDURES

1. Prior to the installation of a FAST Treatment System at a site, the lot owner or lot owner’s agent shall notify the local health department of their proposed use of such a system. The local health department shall issue an Improvement Permit or Authorization to Construct or amend a previously issued Improvement Permit or Authorization to Construct allowing for the use of up to 50 of the proposed Controlled Demonstration Systems upon a finding that all provisions of this Approval and all other applicable rules shall be met. Use of the proposed Controlled Demonstration System and any conditions shall be described in the Improvement Permit and Authorization to Construct or amended Improvement Permit and Authorization to Construct, as well as described on the Operation Permit to be issued upon the acceptable completion of the system installation. Notification of the issuance of all permits/Authorizations by the local health department pursuant to this Controlled Demonstration Approval shall be submitted to the On-Site Water Protection Section.

2. Prior to the issuance of the Improvement Permit, the site shall be evaluated by a Licensed Soil Scientist and a written, sealed report provided to the local health department, as required pursuant to Rule .1970. The local health department may request the assistance of their Regional Soil Specialist in evaluating this report prior to Improvement Permit issuance.
3. When a special site evaluation is required pursuant to Rule .1970(p)(1), the report shall contain the information as specified in Rule .1970(p)(2).

4. Design responsibility: Prior to the issuance of an Authorization to Construct for a Bio-Microbics FAST Treatment System, a submission prepared by a Bio-Microbics certified designer or North Carolina Professional Engineer, and a Licensed Soil Scientist, as applicable, shall be submitted for review and approval by the local health department. Approval shall be contingent upon the following:

   a. Site-specific design for the pretreatment system including the FAST unit with approved tankage, final septic tank with effluent filter, UV “The Disinfector” system or other State approved UV system, and sampling point.
   b. Site-specific soils report is provided as applicable.
   c. The drainfield dosing tank and drainfield layout may be completed by either the local health department or the Certified Designer/Professional Engineer.
   d. All design submittals shall be accompanied by a letter from Bio-Microbics or its representative.

5. It is recommended that local authorized environmental health practitioners attend a design training session offered by the manufacturer or its approved representative prior to permitting the system. Also, at the request of the local health department, a Section Engineer will review the design.

6. The Bio-Microbics authorized installer must certify in writing that the system was installed in accordance with the approved design prior to Operation Permit issuance. A professional engineer must certify in writing that a system required to be designed by an engineer was installed in accordance with the approved plans and specifications prior to Operation Permit issuance. For sites required to be evaluated by a Licensed Soil Scientist or Professional Geologist (see Section I.2, above), the health department may specify as a condition on the Improvement Permit and Authorization to Construct that a Licensed Soil Scientist or Professional Geologist oversee critical phases of the drainfield installation and certify in writing that the installation was in accordance with their specified site/installation requirements prior to the Operation Permit issuance.

7. The operator shall be present during initial system commissioning. The ORC must be certified both as a Subsurface Operator and a Grade II Biological Wastewater Treatment Operator and an authorized by Bio-Microbics as an approved Treatment System Operator.

H. REPAIR OF SYSTEMS

The provisions of 15A NCAC 18A .1961 (c) shall govern the use of the Bio-Microbics Pretreatment System for repairs to existing malfunctioning wastewater systems.

Approved By: ________________________________ Date: ______________
Label is 4.75” long by 1.5” tall.

NON-TYPICAL SEPTIC SYSTEM
FAST
CONTROLLED DEMONSTRATION.
GRADE II WW OPERATOR REQUIRED.