

**NORTH CAROLINA DEPARTMENT OF HEALTH AND HUMAN SERVICES  
DIVISION OF PUBLIC HEALTH  
ENVIRONMENTAL HEALTH SECTION  
ON-SITE WATER PROTECTION BRANCH**

**CONTROLLED DEMONSTRATION  
WASTEWATER SYSTEM APPROVAL**

CONTROLLED DEMONSTRATION NO: CDWS-2009-02-R1

Issued To: Kevin Sherman  
Clearstream Wastewater Systems, Inc.  
PO Box 7568  
Beaumont, Texas 77726  
409-755-1500; Fax: 409-755-6500  
www.cleastreampsystems.com

For: Clearstream advanced wastewater pretreatment system  
N Models, NC Models, NU Models, NC2 Models, NC3 Models, D Models, DC  
Models, DU Models, DD Models, DDC Models, DA Models, DCA Models, DUA  
Models, DDA Models, and DDAC Models

Approval Date: February 19, 2009  
May 30, 2014 Expansion of approved models and other modifications

In accordance with North Carolina General Statute 130A-343 and 15A NCAC 18A .1969 and .1970, a proposal by Clearstream Wastewater Systems, Inc., for approval of subsurface systems utilizing the Clearstream advanced wastewater pretreatment units has been reviewed and the system has been found to meet the standards of a Controlled Demonstration system when all of the following conditions are met:

I. General

A. Scope of this Controlled Demonstration Approval

1. Clearstream advanced wastewater pretreatment units are designed, installed, operated and maintained to meet TS-I effluent standards in accordance with Rule 15A NCAC 18A .1970. Refer to Rule .1970(a) Table VII – Effluent Quality Standards for Advanced Pretreatment Systems for treatment performance levels.
2. Obtain field performance data from modified Clearstream advanced wastewater pretreatment systems intended to meet TS-II effluent quality standards.
3. Proposal for evaluation of this Controlled Demonstration system.

B. This Controlled Demonstration Approval is only applicable to systems that have a design flow not exceeding 1,500 gallons per day.

C. Influent waste strength to a Clearstream advanced wastewater pretreatment system shall not exceed domestic septic tank quality effluent standards pursuant to Rule .1970(b).

D. Approval is limited to 175 TS-I systems and 25 TS-I-denitrification/disinfection systems (D and DA Models). The intent of this Controlled Demonstration is to gain field experience sufficient to

qualify this system for Innovative Approval as a TS-I system, pursuant to Rule .1969(g), which requires sampling sufficient to gain at least 50 data points, including data from a minimum of 15 sites, with a minimum of 2 data sets per site collected over at least a 12-month period.

- E. Data from the modified Clearstream systems designed for denitrification and disinfection may also be used to qualify this system for Controlled Demonstration or Innovative Approval as a TS-II system.
- F. TS-I denitrification/disinfection systems (D and DA Models) are intended to meet TS-II effluent standards, although under this Controlled Demonstration approval they can only be used at sites that can be approved for NSF-40 or TS-I treatment standards.
- G. Prior to the approval of any individual TS-I denitrification/ disinfection system (D and DA Models) under this controlled demonstration approval, the manufacturer of all proposed tanks must be identified and tank construction details must be State-approved, as typically required for generically approved Residential Wastewater Treatment Units (RWTS).
- H. Use of Clearstream advanced pretreatment systems that have a design flow exceeding 1,500 gallons per day will be considered for approval after review by the State on a case-by-case basis, in accordance with the Large Systems State Review/Approval Process (Rule 15A NCAC 18A .1938).

## II. System Description

The Clearstream advanced wastewater pretreatment system consists of a pretreatment chamber (separate or integral unit), an aeration chamber, and an internal clarification chamber in the aeration chamber outlet. For systems designed for denitrification (D Models), a flow restrictor with flow control valve and spin filter shall be mounted on an effluent pump discharge pipe which returns an adjustable portion of the treated effluent to the settling tank. For TS-I denitrification/disinfection systems (DA Models) an airlift assembly shall be mounted in the clarification chamber of the ATU which returns an adjustable portion of the treated effluent to the settling tank during the night time low influent flow period. For disinfection purposes, the D or DA Models are installed with a Clearstream Model 122 Tablet Chlorinator or Model CS100 LC Liquid Chlorinator or Manufacturer-specified UV system.

## III. Siting Criteria

- A. Sites may be used for the initial installation of a Controlled Demonstration system when they meet the requirements of this Section and the criteria for a conventional, modified, alternative, approved innovative or accepted wastewater system. The site shall have a repair area of sufficient size to install such a system and the Manufacturer agrees to provide another approved system if the Controlled Demonstration system fails to perform properly. Exceptions to the repair area requirement are as set forth in Rule .1969(f)(3) and (4).
- B. Controlled Demonstration pretreatment systems may also be used as a repair to an existing malfunctioning system when there are no other approved or accepted repair options.
- C. The Clearstream advanced pretreatment system and associated drainfield shall be sited and sized

in accordance with Rule .1970 for an NSF-40 or TS-I system. Siting requirements for subsurface drip systems receiving effluent treated to the NSF-40 or TS-I standard shall comply with the applicable subsurface drip system approval.

#### IV. System Sizing

The system sizing criteria shall be based upon the long term acceptance rate specified in the appropriate portion of the rules or Innovative and Experimental approval for the type of ground absorption system to be used.

#### V. Special Site Evaluation

A special site evaluation may be required based on the proposed ground absorption system. Refer to manufacturer specific drip approvals and Rule .1970(p).

#### VI. Design Criteria

- A. A Clearstream advanced pretreatment system shall utilize models of Clearstream RWTS that have been approved by the State in accordance with Rule .1957(c), in addition to meeting the requirements listed below.
- B. The Clearstream advanced pretreatment system requires a settling tank that is either an integral chamber of the tank or a separate State approved prefabricated tank. The system model number and the settling tank sizing are specified in Table 1, below.

Table 1		
Design Flow (gallons per day)	Clearstream Model Number	Minimum Required Settling Tank Size
500	500-N, 500-NC, 500-D, 500-DC, 500-DA, 500-DCA	250, Separate
600	600-N, 600-NC, 600-D, 600-DC, 600-DA, 600-DCA	300, Separate
600	600-NU, 600-DU, 600-DUA	300, Integral
600	600-NC3	400, Integral
750	750-N, 750-NC, 750-D, 750-DC, 750-DA, 750-DCA	375, Separate
1,000	1000-N, 1000-NC, 1000-D, 1000-DC, 1000-DD, 1000- DDC, 1000-DA, 1000-DCA	500, Separate
1,500	1500-N, 1500-NC, 1500-NCD, 1500-D, 1500-DC, 1500-DCD, 1500-DA, 1500-DCA, 1500-DDAC	750, Separate

- C. Effluent from Clearstream advanced pretreatment systems may be conveyed to a gravity distribution nitrification field or to a dosing tank. Effluent from a dosing tank may be distributed

to a pressure-dosed nitrification field or through pressure dispersal. Dosing and construction criteria of Rules .1952 through .1954 to the approved dispersal component (gravity drainfield, LPP, drip tube network, etc.) shall be met.

- D. Clearstream advanced pretreatment systems shall be designed by a Clearstream-certified designer or North Carolina Professional Engineer. A Professional Engineer shall complete buoyancy calculations and make appropriate design modifications as needed on sites where a soil wetness condition is present within five feet of the top of the ground surface.
- E. For TS-I denitrification/disinfection systems (D Models), a flow restrictor with flow control valve and spin filter shall be mounted on an effluent pump discharge pipe which returns an adjustable portion of the treated effluent to the settling tank. For TS-I denitrification/disinfection systems (DA Models) an airlift assembly shall be mounted in the clarification chamber of the ATU which returns an adjustable portion of the treated effluent to the settling tank during the night time low influent flow period. For disinfection, a Clearstream Model 122 Tablet Chlorinator or Model CS100 LC Liquid Chlorinator, or a manufacturer-specified and state-approved UV system shall be used.
- F. An example of the pretreatment layout is provided in Attachment A.
- G. Each Clearstream model shall incorporate into its design a method for influent and effluent sampling and flow monitoring. Influent samples shall be taken from the outlet tee of the settling tank.
  - 1. Effluent samples shall be taken from a spigot or sampling port that is placed on the discharge line from the final dosing tank, after the flow restrictor (when present).
  - 2. Sample collection shall not commence until at least 30 seconds of continuous discharge through the sample tap has transpired.
  - 3. Flow monitoring shall include a determination of the 7-day and 30-day flow for the corresponding time period preceding any inspection, based upon field measurement.
- H. The Clearstream advanced pretreatment system control panel shall have a RMS308C autodialer, or approved equal specified by Clearstream Wastewater Systems, Inc., which shall data-log all effluent dosing events. With the autodialer, the readings shall be stored in the master unit in the control panel for 30 days and then sent automatically via the autodialer to the main server for storage and retrieval. Alternately, the flow monitoring data-logging capability may be provided by the manufacturer of a proprietary ground absorption system, if applicable.
- I. The drainfield dosing tank shall be either a state-approved pump tank or an integral pump tank approved in conjunction with one of Clearstream's pre-approved manufacturer-specific North Carolina RWTS approvals. The system designer shall verify all applicable pump submergence, dosing volume, flow equalization and emergency storage capacity requirements of the system shall be met without interfering with the performance of the advanced pretreatment system.
- J. Control panels for drainfield dosing pumps shall meet the requirements of Rule .1952. The panel shall be provided by Clearstream Wastewater Systems, Inc. and be integral to the RWTS panel, unless the drainfield panel is provided the manufacturer of another separate state-approved distribution system other than Clearstream. If so, the other manufacturer's panel shall meet these same monitoring requirements, and its alternate use for this purpose concurred with by

Clearstream Wastewater Systems, Inc and the system designer.

- K. The Clearstream advanced pretreatment system tanks shall not be placed in driveways, parking areas, or areas subject to vehicular traffic.

## VII. Installation and Testing

- A. A preconstruction conference is required to be attended by the system designer, engineer (if required), Clearstream manufacturer's representative, Clearstream certified installer, and local health department (LHD) prior to beginning construction of a Clearstream advanced pretreatment system and associated soil absorption system.
- B. The Clearstream advanced pretreatment system shall be located in compliance with the horizontal setback requirements of Rule .1950(a) and Rule .1970 and shall be located to prevent surface/subsurface water inflow/infiltration. The drainfield horizontal setbacks are in accordance with Rule .1970, as appropriate for an NSF-40 or TS-I system.
- C. All Clearstream advanced pretreatment systems shall be installed according to directions provided by the manufacturer in their installation manual and instructions found on Clearstream drawings and specifications for each system. Additionally, all Clearstream advanced pretreatment systems and components used with, but not manufactured by Clearstream Wastewater Systems, Inc., shall be installed in accordance with all applicable regulations and manufacturer instructions.
- D. All individuals/companies installing Clearstream advanced pretreatment systems shall be in possession of all necessary permits and licenses before starting any portion of an installation. The company/individual must be a Level IV installer and Clearstream Wastewater Systems, Inc, certified.
- E. Watertightness of the tanks shall be demonstrated by a 24-hour leakage test conducted at the installation site or by an approved vacuum testing method prior to backfilling. A water level change of 1/2 inch or more within a 24-inch riser 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/adaptor seam.
- F. The Clearstream manufacturer's representative and engineer or designer of record shall start-up the Clearstream advanced pretreatment system for each installation and provide installation and start-up acceptance letters to the LHD prior to issuance of the operation permit.
- G. Specified site preparation steps and construction specifications for the soil absorption system shall be strictly adhered to, including specified depth of trenches in relation to site limiting conditions, cover material specifications (if needed), trench installation method, etc.
- H. Each Clearstream advanced pretreatment system Control Panel shall have a label affixed as shown in Attachment B.
- I. Prior to Operation Permit issuance, the engineer or designer of record and the manufacturer's representative shall conduct an inspection/start-up of all associated system components, including

the items identified below. The LHD and ORC will attend and observe the inspection/start-up. The inspection/start-up shall include the following:

1. Observation of the watertightness/vacuum testing.
2. Observation of the operation of the Clearstream disinfection system.
3. Verify the location of sampling ports, accessibility of all equipment and tank compartments, and flow monitoring method.
4. Verify the integrity of access/inspection port risers and lids.
5. Record the model of the aerator and any integral pump.
6. Record all timer clock settings.
7. Observe the operator checking the aerator air delivery rate using the Clearstream air flow meter.

#### VIII. Operation, Maintenance, Monitoring, and Reporting

- A. Clearstream advanced pretreatment systems shall be classified as a Type Vc system in accordance with Table Va of Rule .1961(b). Management and inspection shall be in accordance with Rule .1961 and Rule .1970, including requirements of the Water Pollution Control System Operators Certification Commission. The minimum inspection frequency is quarterly.
- B. All Clearstream advanced pretreatment systems require an operation and maintenance agreement between the system owner and Clearstream Wastewater Systems, Inc. or its authorized representative in accordance with Rule.1970. The system shall be inspected by a certified subsurface operator who is also a certified Grade II biological wastewater treatment operator. The certified operator shall be either an employee of Clearstream Wastewater Systems, Inc., or authorized in writing by Clearstream Wastewater Systems, Inc. to operate and maintain the system. The operator shall have proper equipment and training to access and program the control panels on site, as applicable.
- C. All Clearstream advanced pretreatment systems shall be operated and maintained according to the latest version of Clearstream's O&M manual.
- D. At each Clearstream advanced pretreatment system inspection, the operator in responsible charge (ORC) shall, at a minimum, observe, monitor, and record the following:
  1. Wastewater levels in all the tanks.
  2. Sludge and scum levels in all the tanks.
  3. Clean air filter and verify clear intakes on effluent pump(s), if applicable.
  4. Operation of aerator, noting any unusual sounds or appearance.
  5. Visual inspection of aeration chamber to confirm that air distribution throughout the chamber.
  6. Settleable solids levels in the aeration tank.
  7. Watertightness of tanks, risers, and pipe connections at the tanks.
  8. Operation of blower, controller, RMSYS Telemetry Device, discharge pumps, and probes or floats.
  9. Pumping frequency from pump impulse counters and elapsed run time meters.
  10. Drainfield pump delivery rate (drawdown test), determination of the average pump runtime, and drainfield dosing volume.
  11. Back pressure from controller.
  12. Record of alarms since last visit and troubleshoot any alarm codes.
  13. Seven and 30 day average gallons/day, including maximum.

14. Any structural damage, accessibility issues, adequate ventilation, excess odors, insect infestations, vegetative growth over the drainfield, or surfacing of effluent on the drainfield area.
  15. Sample of Clearstream advanced pretreatment system effluent collected from the sampling point to check for effluent clarity and odor, and a sample of influent, as required.
- E. 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.
- F. Sampling and Testing
1. All sampling shall be done in accordance with Rule .1970(n)(3) and (5).
  2. Influent samples shall be taken from beneath the access opening over the settling chamber, from within the outlet tee. The sample shall be taken from the clear zone beneath any scum layer using a sludge judge or similar device.
  3. Clearstream advanced pretreatment system effluent samples shall be taken from an approved sampling port, as described above (and see detail in Attachment). The sampling port shall be located immediately following the drainfield dosing pump and filter, when present. The approved sampling port shall include a ½-inch tap with ball valve in the discharge line inside the pump tank riser. To obtain the sample, the ball valve shall be fully open with the pump running for at least 30 seconds before taking the grab sample. These samples shall be taken at least quarterly for at least a 12 month period or until Innovative Approval for the system is granted by the State.
  4. All systems shall be tested for effluent CBOD<sub>5</sub>, TSS, NH<sub>3</sub>-N, and fecal coliform bacteria. Influent shall be tested for BOD<sub>5</sub> and TKN. The manufacturer may choose for TS-I denitrification/disinfection system effluent to be additionally tested for TN.
  5. Flow monitoring shall include a determination of the 7-day and 30-day flow for the corresponding time period preceding each ORC inspection/sample collection. Flows shall be determined by using the data-logger or elapsed time meter data in the effluent pumping station control panel, or in the ground absorption system control panel, where applicable.
- G. Notification and Performance of Maintenance and Repairs
1. The ORC shall alert Clearstream Wastewater Systems, Inc, the LHD, 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, blower/filter replacement, and adjustments to any other system component.
  2. The ORC shall notify the system owner, Clearstream Wastewater Systems, Inc. and the LHD whenever the pump delivery rate efficiency and/or average pump run time are not within 25% of initial measurements conducted prior to system startup.
  3. 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.
  4. The settling tank and/or aeration tank will be pumped as needed upon recommendation of the ORC and in accordance with the Clearstream Wastewater Systems, Inc. O&M 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.
  5. The tanks shall be pumped by a properly permitted septage management firm, and the septage handled in accordance with 15A NCAC 13B .0800.

6. The ORC shall notify the LHD and system owner in writing whenever repairs are indicated. Notification of the need for repairs to the Local Health Department shall be made within 48 hours. All maintenance activities shall also be recorded in the ORC reports provided to the local health department.

#### H. Reporting

1. The ORC shall provide a completed written report to the LHD, system owner, and Clearstream Wastewater Systems, Inc. within 30 days of each inspection. At a minimum this report shall specify:
  - a. The date and time of inspection,
  - b. System operating conditions observed according to VI.E,
  - c. System operating conditions measured according to VI.E and VI.F,
  - d. Results from any laboratory analysis of any influent and effluent samples,
  - e. Maintenance activities performed since the last inspection report,
  - f. An assessment of overall system performance,
  - g. A list of any improvements or maintenance needed,
  - h. A determination of whether the system is malfunctioning, and the specific nature of the malfunction, and
  - i. Any changes made in system settings, based on recommendations of the manufacturer.
2. Proposal for Evaluation and Reporting
  - a. 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 systems and that is approved by the Department (and/or an approved alternate). 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 interim Semi-Annual reports, summarizing all data for the sites. This report is due by January 31 and July 31, 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 system use.
  - b. Upon completion of the research and testing protocol, the approved third party evaluator shall prepare a final report to the Department that includes the results from all the systems installed during the controlled demonstration, including sampling results, flow-monitoring information, ORC reports, etc., and provides recommendations on future use of the system. The interim and final reports shall be provided in electronic format suitable for posting on the On-Site Water Protection Section's website. The contents of this report shall not be altered from the original document without approval from Clearstream Wastewater Systems, Inc.
  - c. The research and testing protocol that has been agreed to is as follows:
    - All systems will be sampled quarterly.
    - 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.



- 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.
  - Other seasonal homes shall be sampled during the projected times of greatest use.
  - A copy of the sample results will be provided directly from the laboratory to the On-Site Water Protection Section.
  - The State of North Carolina and Clearstream Wastewater Systems, 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.
- d. Compliance of each site and the system shall be in accordance with the requirements of Rule .1970.

#### IX. Responsibilities and Permitting

- A. Prior to the installation of a Clearstream advanced pretreatment system at a site, the owner or owner's agent shall fill out an application at the LHD for the proposed use of this system. The LHD shall issue an Improvement Permit or Construction Authorization or amend a previously issued Improvement Permit or Construction Authorization allowing for the use of up to 175 TS-I systems and 25 TS-I denitrification/disinfection systems.
- B. The Improvement Permit and Construction Authorization shall contain all conditions the site approval is based upon, including the proposed use of the Controlled Demonstration system. The operation permit will include all conditions specified in the Improvement Permit and Construction Authorization. The On-Site Water Protection Branch shall be notified of all permits issued for a Controlled Demonstration system.
- C. When a special site evaluation is required pursuant to Rule .1970(p)(1) or a drip approval, an evaluation and written, sealed report from a Licensed Soil Scientist regarding the site shall be provided to the LHD. The report shall contain the information as specified in Rule .1970(p)(2) and "Requirements for Submittals of Soil Reports and Pretreatment and/or Dispersal System Designs". The LHD may request the assistance of their Regional Soil Scientist in evaluating this report prior to permit issuance.
- D. The Clearstream advanced pretreatment system shall be designed by one of the following: a Clearstream Wastewater Systems, Inc. authorized designer or a North Carolina Professional Engineer.
- E. Prior to the issuance of a Construction Authorization for a Clearstream advanced pretreatment system, a design submittal prepared by an authorized designer or North Carolina Professional Engineer shall be submitted for review and approval by the LHD. The design submittal shall include the information required in "Requirements for Submittals of Soil Reports and Pretreatment and/or Dispersal System Designs".
- F. A North Carolina Professional Engineer is required for all systems with a design flow greater than 1,000 gallons/day. All design submittals shall be accompanied by a design certification from Clearstream Wastewater Systems, Inc.
- G. It is recommended that local authorized environmental health practitioners attend a design

training session offered by the manufacturer prior to permitting the system. Also, at the request of the local health department, a Regional Engineer will review the design.

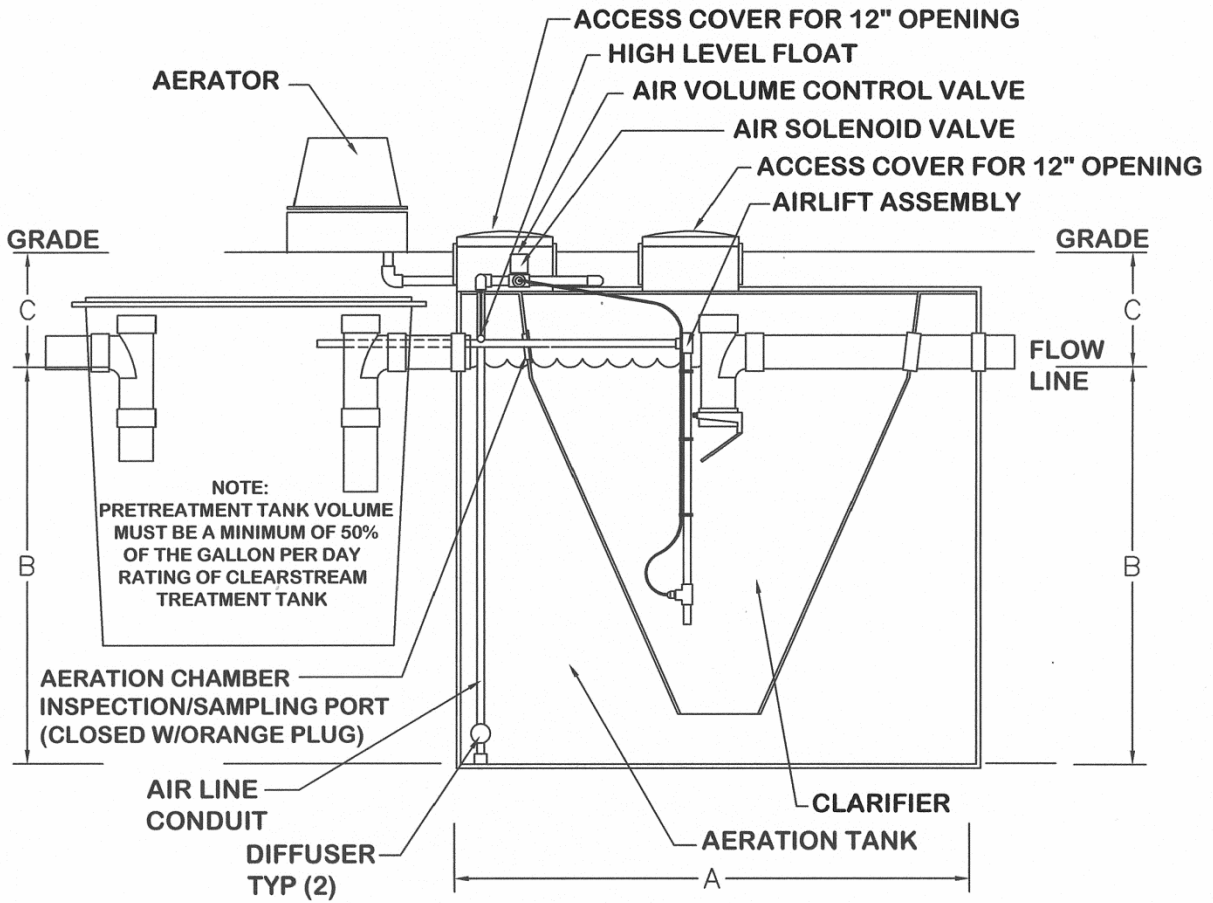
- H. A Clearstream Wastewater Systems, Inc. manufacturer's representative shall certify in writing that the Clearstream advanced pretreatment system was installed in accordance with the approved design prior to Operation Permit issuance.
- I. A North Carolina Professional Engineer shall certify in writing 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.
- J. For sites required to be evaluated by a Licensed Soil Scientist or Professional Geologist, the LHD may specify as a condition on the Improvement Permit and Construction Authorization 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.
- K. The ORC shall be present during the final inspection of the system prior to the issuance of the operation permit. The ORC must be certified as a Subsurface Operator, a Grade II biological wastewater treatment plant operator, and an authorized Clearstream Wastewater Systems, Inc. treatment system operator.

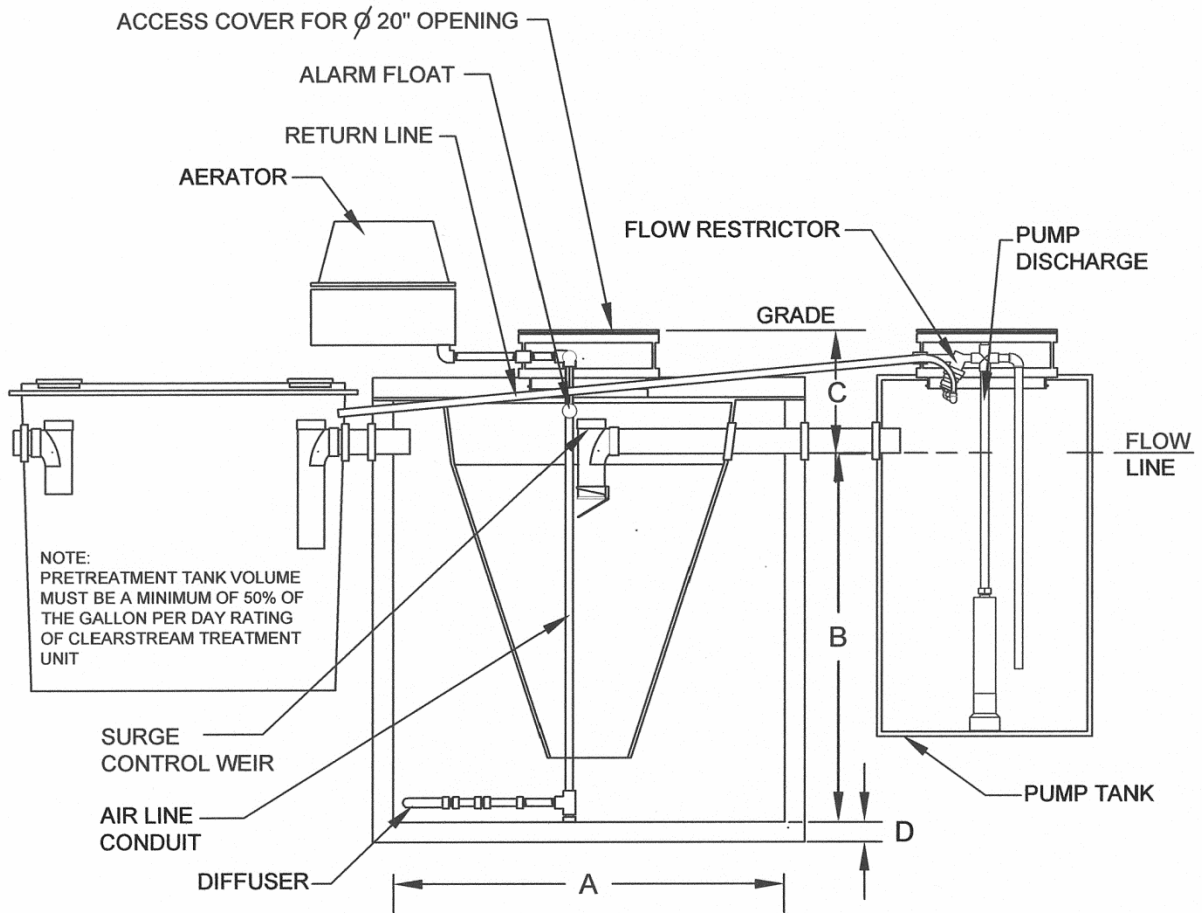
X. Repair of Systems

The provisions of 15A NCAC 18A .1961 (c) shall govern the use of the Clearstream advanced pretreatment systems for repairs to existing malfunctioning wastewater systems.

Approved By: \_\_\_\_\_ Date: \_\_\_\_\_

**Attachment A**  
**Model DA and D Drawings**





**Attachment B**

Label is 4.75" long by 1.5" tall.

**NON-TYPICAL SEPTIC SYSTEM  
CLEARSTREAM SYSTEMS  
CONTROLLED DEMONSTRATION  
SUBSURFACE WW OPERATOR NAME AND CONTACT  
INFORMATION  
NON-TYPICAL SEPTIC SYSTEM  
CLEARSTREAM CONTROLLED DEMONSTRATION.  
GRADE II WW OPERATOR REQUIRED.  
ANY PROBLEMS, CONTACT HEALTH DEPT AT**