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 2011-01-R1

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For: Clearstream Subsurface Drip Dispersal System

Approval Date: May 9, 2011
May 30, 2014 Modifications to Approved Components

In accordance with General Statute 130A-343, 15A NCAC 18A .1969, an application by Wayne Peyton, Clearstream Wastewater Systems, Inc., for modification to their Clearstream subsurface drip wastewater system has been reviewed and found to meet the standards of a controlled demonstration system when the following conditions are met:

I. General

A. Scope of this Controlled Demonstration Approval
   1. Use, design, and installation requirements for the Clearstream subsurface drip wastewater dispersal system.
   2. Operation, maintenance and monitoring requirements for the Clearstream subsurface drip wastewater systems to ensure the dispersal performance standards shall be met.
   3. Proposal for evaluation of this Controlled Demonstration system.

B. The purpose of this Controlled Demonstration approval is to evaluate the field performance of certain unique aspects of the Clearstream subsurface drip system when compared to other approved drip systems. These include:
   1. Location of the headworks in the effluent dosing tank riser;
   2. Use of Geoflow tubing with Classic non-pressure compensating drip emitters; and
   3. Continuous filter flushing and field flushing.

C. Influent to the Clearstream treatment and dispersal system as permitted with this approval shall not exceed domestic septic tank quality effluent standards pursuant to Rule 15A NCAC 18A .1970(b).

D. This Controlled Demonstration is limited to 50 Clearstream subsurface drip systems with design flows of up to 1,500 gallons per day. Only systems installed after the effective date of this Approval are to be included under this Controlled Demonstration. However, existing systems that are modified to comply with all design criteria in this approval may then be considered, on a case-by-case basis, for inclusion by the Department.

E. The intent of this Controlled Demonstration is to gain field experience sufficient to qualify this system for Innovative Approval pursuant to Rule .1969(g). This shall include at a minimum data collected over at least a 12-month period from at least 15 operational systems. Sites shall be representative of multiple soil and topographic conditions, which typically occur in at least two of the three physiographic regions of the State.

F. Use of Clearstream subsurface drip systems that have a design flow exceeding 1,500 gallons per day shall be designed by a professional engineer and will be considered for approval after review by the Department on a case-by-case basis in accordance with the Large Systems State Review/Approval Process (Rule 15A NCAC 18A .1938).

G. System siting, sizing and horizontal setbacks shall be in accordance with this Approval. Where there are conflicts between the requirements of this Approval and the June 1, 2006 version of Rule .1970, the requirements of this Approval shall be applicable.

H. An example of the typical Clearstream advanced pretreatment and subsurface drip system layout is shown in Attachment A.

II. System Description

A. Collection system	Conventional gravity, pressure sewer fed by grinder pumps or individual septic tank effluent pumping units
B. Pretreatment	Approved Clearstream Residential Wastewater Treatment System (RWTS) meeting at least NSF-40 standards, or approved Clearstream TS-I or TS-I with denitrification/disinfection (ND) advanced wastewater pretreatment system
C. Filtration	Automatic, appropriately sized self-cleaning stainless steel effluent screen filter, or approved equal, capable of screening particles larger than or equal to 100 microns
D. Manifold	Common line (Schedule 40 PVC) to connect all the driplines in a single field or zone at the start of the field or zone (supply end) and the distal ends of the driplines (flush end)
E. Air vent	Air vacuum breaker(s) installed at the high point(s) of each drip field to allow air to be rapidly evacuated from the tubing during pressurization and to keep soil from being aspirated into the drip emitters due to back siphoning or back pressure after the pumps shut off
F. Dripline	Geoflow's Wasteflow Classic non-pressure-compensating emitters with nominal flow rate of 1.0 gallons per hour spaced uniformly in the tubing on 12-inch or 24-inch centers. The tubing consists of three layers: the inside layer is an anti-bacterial protector; the middle layer is black; and the outside layer is black with a purple-stripe for easy identification. The emitters are impregnated with Treflan® to inhibit root intrusion. All dripline delivered to a site shall bear manufacturer labeling specifying emitter type and spacing.
G. Drip lateral	Entire length of dripline, from the connection to the supply manifold to the connection to the return manifold.
H. Drip run	Single section, on contour, of a drip lateral between manifolds, a manifold and a loop, or between two loops. Multiple parallel drip runs may be used within a single drip lateral
I. System controls	Control/software package controlling all functions, including system dosing and

		filter flushing, audible/visible alarms, flow monitoring, self-diagnostics, and telemetry
J.	Documentation	Current schematics, drawings and manuals must be filed with NCDENR for all major components utilized under this approval, for posting on the On-Site Water Protection Branch webpage

III. Siting Criteria

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 per the standards of this Controlled Demonstration approval and 15A NCAC 18A .1900 et seq. Exceptions to the repair area requirement are as set forth in Rule .1969(f)(3) and (4).

The Clearstream subsurface drip system may be utilized when one or more of the conditions set forth in Sections III.A through III.P of the approval are met, as applicable. Summary tables of siting criteria, including when a special site evaluation (Section V) is required, are included in Appendix A.

A. An aerobic subsurface drip system may be utilized on sites that meet one of the following criteria:
   1. Sites classified suitable or provisionally suitable in accordance with Rules .1939-.1948;
   2. Sites reclassified to be provisionally suitable in accordance with Rules .1956(1), (2), (4), (5) or (6a); or
   3. Sites meeting the criteria for low pressure pipe (LPP) systems in accordance with Rule .1957(a)(2).
   4. A special site evaluation pursuant to Section V shall only be required if needed to justify the proposed long term acceptance rate (LTAR) as set forth in Section IV.

B. Required vertical separation requirements shall be measured from the trench bottom or point of application, whichever is deeper.

C. The minimum vertical separation distance to rock or tidal water for subsurface drip system shall be 12 inches, regardless of treatment.

D. A minimum of six inches of soil cover shall be maintained over driplines.

E. Minimum required soil cover shall be uniform over the entire drip dispersal field or zone.

F. This requirement for at least six inches of cover may be met by the addition of up to six inches, after settling, of SUITABLE Group II or III soil material over the subsurface drip field. If cover material is required and the slope is over 30 percent, a slope stabilization plan must be provided by an appropriately licensed individual.

G. Driplines shall be installed at least one inch into naturally occurring soil. The drip installation shall otherwise be considered a fill system.

H. A subsurface drip system receiving effluent treated to the NSF-40 standard, or a more stringent standard, may be utilized on sites where there is at least 18 inches of useable naturally occurring soil above an UNSUITABLE soil horizon, rock, or soil wetness condition. The minimum vertical separation distance between the trench bottom or point of application, whichever is deeper, and any UNSUITABLE soil horizon, rock, or soil wetness condition shall be 12 inches.

I. A special site evaluation, pursuant to Section V of this Approval, shall be required whenever Group IV soils are encountered within 18 inches of the naturally occurring soil surface or within 12 inches of the trench bottom or point of application, whichever is deeper, and the LTAR pursuant to Section IV.B is proposed to exceed 0.10 gpd/ft^2 for NSF-40 effluent, or 0.12 gpd/ft^2 for TS-I effluent.

J. A drip system receiving aerobic effluent treated to TS-I may be utilized on sites where there is at least 15 inches of useable naturally occurring soil above an UNSUITABLE soil horizon, rock, or soil wetness condition.
   1. The minimum vertical separation distance between the trench bottom or point of application, whichever is deeper, and an UNSUITABLE soil horizon or soil wetness condition shall be nine inches for TS-I effluent.
   2. A special site evaluation, pursuant to Section V of this Approval, shall be required whenever there is less than 18 inches of useable naturally occurring soil above an UNSUITABLE soil horizon, rock, or soil wetness condition.

K. A drip system receiving aerobic effluent treated to at least the NSF-40 standard may be utilized when a groundwater lowering system (existing or proposed) is used to meet the vertical separation requirements to a soil wetness condition. In order to use a groundwater lowering system:
   1. When only Group I or Group II soils with SUITABLE structure and clay mineralogy are present within 36 inches of the naturally occurring soil surface the system may receive effluent treated to the NSF-40 standard. A special site evaluation is required when the local health department (LHD) or regional soil scientist (RSS) requires such an evaluation to determine the effectiveness of the groundwater lowering system.
   2. When there are Group III soils present at any depth above the invert elevation of the highest point of the drainage system or within 36 inches of the naturally occurring soil surface, whichever is deeper, effluent shall be treated to TS-I or a more stringent standard. A special site evaluation, pursuant to Section V of this Approval shall be required.
   3. No groundwater lowering drainage of Group IV soils is allowed, regardless of treatment level.
   4. On new fill sites [Rule .1957(b)(1)], when all or part of the dripline is to be installed in approved fill, effluent shall be treated to the TS-I standard when used in conjunction with a groundwater lowering system. A special site evaluation, pursuant to Section V of this Approval shall be required.
   5. When a groundwater lowering system is used, the minimum vertical separation from the trench bottom or point of application, whichever is deeper, to the projected (drained) soil wetness condition shall be 12 inches.

L. An aerobic subsurface drip system receiving effluent treated to at least the NSF-40 standard may be utilized on new fill sites [Rule .1957(b)(1)], when all or part of the dripline is to be installed in approved fill material, when there is at least 18 inches of useable naturally occurring soil above an UNSUITABLE soil horizon or rock and at least 12 inches above a naturally occurring soil wetness condition.
   1. The minimum vertical separation distance between the trench bottom or point of application, whichever is deeper, and any UNSUITABLE soil horizon or rock shall be 18 inches and any soil wetness condition shall be 12 inches.
   2. Except as provided for herein, all requirements for new fill sites and systems of Rule 1957(b)(1) are applicable to drip systems in fill.

M. An aerobic subsurface drip system receiving effluent treated to TS-I may be utilized on new fill sites [Rule .1957(b)(1)], when all or part of the drip tubing is to be installed in approved fill material, when there is at least 12 inches of useable naturally occurring soil above an UNSUITABLE soil horizon or rock and at least 12 inches above a naturally occurring soil wetness condition.
   1. The minimum vertical separation distance between the trench bottom or point of application, whichever is deeper, and any UNSUITABLE soil horizon or rock shall be 12 inches and any soil wetness condition shall be nine inches.
   2. A special site evaluation, pursuant to Section V of this Approval, shall be required.
   3. Except as provided for herein, all requirements for new fill sites and systems of Rule 1957(b)(1) are applicable to drip systems in fill.

N. An aerobic subsurface drip system may be utilized on sites meeting the criteria for existing fill, in accordance with Rule .1957(b)(2), when all or part of the dripline is to be installed in approved fill material.
   1. For an aerobic drip system receiving effluent treated to the NSF-40 standard, the minimum vertical

separation distance between the trench bottom or point of application, whichever is deeper, and any UNSUITABLE soil horizon, rock, or soil wetness condition shall be 18 inches

2. For an aerobic drip system meeting TS-I standards, the minimum vertical separation distance between the trench bottom or point of application, whichever is deeper, and any UNSUITABLE soil horizon, rock, or soil wetness condition shall be 12 inches
3. Except as provided for herein, all requirements for existing fill sites and systems of Rule 1957(b)(2) are applicable to all drip systems in existing fill.

O. The minimum horizontal setback requirements of Rule .1970 shall be met for systems receiving effluent meeting the NSF-40 or TS-I standard, as applicable.

P. For drip systems used on sites where there is at least 18 inches of naturally occurring soil to an UNSUITABLE soil horizon, rock, or soil wetness condition, the horizontal setback reductions of Rule .1970 for NSF-40 or TS-I, as applicable, may be concurrently taken with LTARs as allowed in Section IV.F of this Approval.

Q. A special site evaluation, including a hydraulic assessment, shall be provided to the LHD on behalf of the owner, when required pursuant to Section V of this Approval.

IV. System Sizing

A. The LTAR shall be based on the most hydraulically limiting, naturally occurring soil horizon within 18 inches of the naturally occurring soil surface or to a depth of 12 inches below the trench bottom or point of application, whichever is deeper.

B. The following table shall be used in determining the LTAR for the Clearstream subsurface drip system.

Soil Group	LTAR (area basis) (gpd/ft^2) Advanced Pretreatment Standard	
	NSF-40	TS-I
I.	1.0-0.6	1.2-0.8
II.	0.6-0.4	0.8-0.5
III.	0.4-0.15	0.6-0.2
IV.	0.15-0.05	0.2-0.05

C. For aerobic drip systems in new fill [Rule .1957(b)(1)] receiving effluent treated to the NSF-40 standard, the LTAR shall not exceed 0.6 gpd/ft^2 for Group I, 0.4 gpd/ft^2 for Group II, 0.15 gpd/ft^2 for Group III, or 0.05 gpd/ft^2 for Group IV soils, respectively. Soil group is based on the most hydraulically limiting, naturally occurring soil horizon within 18 inches of the naturally occurring soil surface or 12 inches below the trench bottom or point of application, whichever is deeper.

D. For aerobic drip systems in new fill [Rule .1957(b)(1)] receiving effluent treated to the TS-I standard, the LTAR shall not exceed 1.0 gpd/ft^2 for Group I, 0.5 gpd/ft^2 for Group II, 0.2 gpd/ft^2 for Group III, or 0.07 gpd/ft^2 for Group IV, respectively. Soil group is based on the most hydraulically limiting, naturally occurring soil horizon within 18 inches of the naturally occurring soil surface or 12 inches below the trench bottom or point of application, whichever is deeper. An LTAR above 0.05 gpd/ft^2 in Group IV soil must be supported by a special site evaluation and hydraulic assessment, pursuant to Section V of this Approval.

E. For aerobic drip systems in existing fill [Rule .1957(b)(2)] receiving effluent treated to NSF-40 or TS-I, the LTAR shall not exceed 0.8 gpd/ft^2 (NSF-40) and 1.0 gpd/ft^2 (TS-I)

F. When any reductions are taken in horizontal setbacks pursuant to the use of an NSF-40 or TS-I system pursuant to Rule .1970 of this Approval, on sites where there is at least 18 inches of naturally occurring soil

to an UNSUITABLE soil horizon, rock, or soil wetness condition, any one of the following LTAR allowances may apply:

1. The LTAR may be determined pursuant to Section IV.B when the only horizontal reductions taken are reduced setbacks to drainage devices.
2. When effluent is treated to NSF-40, or a more stringent standard, the LTAR in gallons per day per square foot shall not exceed the lowest LTAR for the applicable soil group for Soil Groups I, II and III, pursuant to Section IV.B, and 0.10 gpd/ft^2 for Soil Group IV.

G. For subsurface drip systems receiving effluent treated to TS-I on sites with less than 18 inches of naturally occurring soil to any UNSUITABLE soil horizon, rock, or soil wetness condition, the LTAR shall not shall not exceed the lowest LTAR for the applicable soil group for Groups I, II and III, pursuant to Section IV.B, and 0.10 gpd/ft^2 for Group IV, and a special site evaluation must be provided pursuant to Section V of this Approval.

H. The following table shall be used in determining the LTAR for Clearstream subsurface drip systems installed in saprolite pursuant to Rule .1956(6). The LTAR shall be based on the most hydraulically limiting, naturally occurring saprolite to a depth of 24 inches below the trench bottom or point of application, whichever is deeper.

Saprolite Group	LTAR (area basis) (gpd/ft^2)		
	Texture	Advanced Pretreatment Standard	
		NSF-40	TS-I
I	Sand	0.5-0.4	0.6-0.4
	Loamy sand	0.4-0.3	0.5-0.3
II	Sandy loam	0.35-0.25	0.4-0.25
	Loam	0.25-0.2	0.3-0.2
III	Silt loam	0.1-0.05	0.15-0.05
	Sandy clay loam	0.1-0.05	0.15-0.05

I. In calculating the minimum number of square feet for the drainfield, the daily design sewage flow shall be divided by the LTAR determined from the appropriate table above.

J. In calculating the minimum length of drip tubing to be used, the total square footage of drainfield as derived in Section IV.I shall be divided by two feet, unless additional linear footage is determined to be needed pursuant in Section IV.K of this approval or at the recommendation of the designer as soil and site conditions allow.

K. The required total linear footage of drip tubing shall not be less than 0.5 x Q for Group I, 0.83 x Q for Group II, 1.25 x Q for Group III, or 3.33 x Q for Group IV Soils (Q = daily design flow). This shall not affect the total area required for the system based on Section IV.I above.

L. Sections of tubing without emitters (blank tubing) required to meet site-specific conditions shall not count towards the minimum length of tubing needed when laying out the system or when calculating the linear footage of dripline needed (see Section VI.I).

V. Special Site Evaluation

A special site evaluation for an aerobic drip system shall be provided to the LHD on behalf of the owner, containing information required by Rule .1970(p)(2), as applicable, including a hydraulic assessment, to justify use of the proposed LTAR and system layout when any of the following conditions are applicable:

A. Group IV soils are encountered within 18 inches of the naturally occurring soil surface or within 12 inches of the trench bottom or point of application, whichever is deeper, and the LTAR, pursuant to Section IV.B,

is proposed to exceed 0.10 gpd/ft^2 for NSF-40 effluent and 0.12 gpd/ft^2 for TS-I effluent.

B. The dripline is to be installed within the naturally occurring soil, and there is less than 18 inches of naturally occurring soil to an UNSUITABLE soil horizon, soil wetness condition, or rock.

C. An existing or proposed groundwater lowering system is used to meet soil depth and vertical separation requirements to a soil wetness condition and
   1. There are Group III or IV soils present within 36 inches of the naturally occurring soil surface,
   2. There are Group III soils present at any depth above the invert elevation of the highest point of the drainage system, or
   3. When the LHD or RSS requires such an evaluation to determine the projected effectiveness of the groundwater lowering system.

   The evaluation shall include site-specific determination of saturated hydraulic conductivities and other critical site factors, and the proper application of appropriate drainage models and assessment tools.

D. To verify a proposed LTAR that exceeds the LTAR assigned by the EHS/LHD, pursuant to Section IV.B or Section IV.H of this Approval.

E. Aerobic drip meeting NSF-40 standards is proposed, and the LTAR is proposed to exceed 0.8 gpd/ft^2 for Group I, 0.5 gpd/ft^2 for Group II, 0.25 gpd/ft^2 for Group III or 0.1 gpd/ft^2 for Group IV soils.

F. Aerobic drip meeting TS-I standards is proposed, and the LTAR is proposed to exceed 1.0 gpd/ft^2 for Group I, 0.6 gpd/ft^2 for Group II, 0.3 gpd/ft^2 for Group III or 0.12 gpd/ft^2 for Group IV soils.

G. Aerobic drip meeting TS-I is proposed in new fill, and:
   1. A groundwater lowering drainage system (existing or proposed) is also used to meet soil depth and vertical separation requirements to a soil wetness condition; or
   2. Group IV soils are encountered within 18 inches of the naturally occurring soil surface and the LTAR is proposed to exceed 0.05 gpd/ft^2; or
   3. There is less than 18 inches of naturally occurring soil to an UNSUITABLE soil horizon or rock.

H. When required in Rule .1970 unless otherwise specified in this Approval.

I. The daily design flow for the design unit exceeds 1,500 gpd.

J. When any of the conditions listed below are met, the hydraulic assessment of the special site evaluation shall include one or more of the following: a lateral flow, linear loading, groundwater mounding, or water balance analysis.
   1. The LHD or RSS determines that the combination of soil conditions, site topography and landscape position, daily design flow, system layout and proposed stormwater appurtenances creates the potential for hydraulic overloading of a site.
   2. The daily design flow is greater than 720 gpd and there is less than 18 inches of naturally occurring soil to an UNSUITABLE soil horizon, soil wetness condition, or rock.
   3. The dripline is to be installed within the naturally occurring soil and there is 15 inches or less of naturally occurring soil to an UNSUITABLE soil horizon, soil wetness condition, or rock.

In conjunction with the information required to be included by Rule .1970(p)(2), the report is to communicate to the designer site specific details of the delineated area and include a preliminary system layout and design that complies with the requirements of this Approval. The report shall identify, comment on, and offer recommendations to address, as necessary, site specific conditions such as soil quality, slope, landscape position, stoniness, vegetation, surface drainage, site preparation, depth of installation, etc. that may, in the judgment of the evaluator, effect the design and /or field installation.

VI. Design Criteria

A. The Clearstream pretreatment and Clearstream subsurface drip systems shall be designed in compliance with this Approval and Rule .1970.

B. The Clearstream subsurface drip system shall be preceded by a Clearstream Pretreatment system designed in accordance with the Clearstream RWTS Approval to meet the NSF-40 Class I Treatment Standard or the Clearstream Controlled Demonstration Approval (CDWS 2009-02) designed to meet at least the TS-I treatment standard, as applicable.

C. Dosing tank
   1. The dosing system shall meet the design and construction criteria of Rules .1952-.1954.
   2. The dosing tank shall be a separate approved pump tank with a minimum liquid capacity not less than the total liquid capacity of the septic tank that would be required for this system in accordance with Rule .1952, unless approved pursuant to Section VI.C.3 of this Approval.
   3. If the dosing tank is not separate it must be designed by an engineer or be an integral part of the approved advanced pretreatment system. The system designer must verify the following.
      a. The pretreatment system approval specifically includes the proposed integral dosing tank, where applicable.
      b. The drip dosing pump can be feasibly installed, repaired and maintained in the pretreatment system effluent dosing compartment.
      c. The level control float and alarm requirements of Section VI.C and the pump requirements of Section VI.E of this approval shall be met.
      d. All applicable pump submergence, dosing volume, flow equalization and emergency storage capacity requirements of the system are met, without interfering with the performance of the advanced pretreatment system.
      e. Normal operating levels will not result in effluent backing up into a part of any pretreatment component designed for free gravity-flow drainage.
   4. Minimum emergency storage capacity requirement may be reduced to eight hours when a telemetry system is provided, whereby the Operator in Responsible Charge (ORC) shall be notified immediately of alarm conditions (high water, power outage, or malfunction of pump circuit). The telemetry system shall include automatically rechargeable battery backup power supply when the design flow exceeds 600 gpd.
   5. Level control floats in the dosing tank shall be adjustable and replaceable from the ground surface without requiring entrance into the tank.
   6. The Rule requirement for a separate high water alarm that is audible and visible by system users shall be met, in conjunction with any required self monitoring features of the Clearstream system.

D. Anti-buoyancy calculations shall be provided and necessary provisions to counter buoyant forces shall be specified by the system designed for plastic/fiberglass tanks.

E. Pumps shall include effluent rated turbine pump(s) manufactured by Clearstream Wastewater Systems, Inc., or approved equal. Pump and controls shall be easily accessible, adjustable and replaceable from the ground surface without requiring entrance into the tank by the ORC for routine operation, maintenance, monitoring and servicing.

F. Filters
   1. Self-cleaning screen filter(s) that screen particles larger than or equal to that recommended by the tube manufacturer, typically 100 microns shall be used. Self-cleaning process shall be automatic and continuous. Clearstream Model 1100 Spin Filter/Pump Assembly with 3/4- inch screen filter or Model 2100 with 1-inch screen filter, or approved equal, shall be used.
   2. Filter flushing residuals shall be continuously pumped into the upstream end of the pretreatment system, with provisions made to minimize disturbance of any solids in the pretreatment tank or settling chamber (where applicable).

3. The size and number of filter(s) shall be at least adequate to operate at flow rates during start-up and continuous irrigation/flushing cycles that are within the filter manufacturer's specified acceptable operating range.

G. Pump Tank Riser

In all cases, a riser shall be provided for the pump tank. The spin filter assembly with pressure gauge and pump flow control valve, the field return control valve with pressure gauge, and the pump discharge pipe disconnect are to be located within the riser. Valving, pump disconnect and control float access shall be above the top of the tank and within 12-inches of the top of the riser. The pump discharge pipe shall be directed downwards after the disconnect and exit the tank or riser through a pre-manufactured boot or fitting at least 18-inches below finished grade.

H. Clearstream Processing and Control Unit

1. The Clearstream drip controls shall be integral with the Clearstream Pretreatment System Control Panel, or approved equal specified by Clearstream Wastewater Systems, Inc.
2. Controls shall:
   a. Provide for delivery of equal designer-specified preprogrammed volumes of effluent (adjustable) to each equally-sized field zone at designer-specified time intervals (flow equalization); and
   b. Monitor pump cycles and run times (for each pump) and flow (with totalizing flow meter, or equal) in the effluent supply line to the drip field zone(s) and flow (with totalizing flow meter, or equal) in the return header.
3. Controls and float levels shall be synchronized to assure the minimum dose is available prior to initiating a dosing cycle to a zone or subfield.
4. Minimum dose volume per zone shall be five times the liquid capacity of the drip laterals plus the liquid capacity of the supply and return manifold lines which drain between doses.
5. Any special equipment to monitor system performance shall either be provided with the system, or determined to be in the possession of the manufacturer-authorized ORC prior to system approval.
6. Duplex pump dosing system shall be provided whenever the daily design flow rate exceeds 1,000 gallons per day.
7. Floats and controls shall minimally be set up and provide for the following functions:
   a. The off (redundant off) float is set to provide at least the minimum level of effluent required to keep the pump submerged based on recommendations by the pump manufacturer and Clearstream Wastewater Systems, Inc. The purpose of the off float is to help ensure that the pump shuts off prior to the system being pumped dry.
   b. The time enable (on) float is set to initiate the pump cycle which will last until the present "on" cycle times out (set to deliver the desired dose volume). The float shall be set sufficiently above the redundant "off" level so that one dose volume to a single drip dispersal zone is available, and the effluent level in the tank remains above the deactivation (off) float level at the end of each pump system. The cycle "off" time begins to time out at the start of each does event.
   c. The high water alarm float is set to provide the minimum required emergency storage capacity for the system, which shall be at least 24 hours or as otherwise approved pursuant to Rule .1952(c)(1)(D) or per Section VI.C.4, above.
8. A telemetry system shall be provided for all systems. The ORC shall be notified immediately of alarm conditions (high water, aerator and power outage to or malfunction of blower/pump circuits). Telemetry system shall be as manufactured by RMSYS, Inc., or State-approved equal specified by Clearstream Wastewater Systems, Inc. This system shall enable the daily, 7-day and 30-day monitoring requirements of Rule .1970 to be met.
9. 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, as required to meet Rule .1970 requirements. The Clearstream 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.
10. Floats, pump and control circuits, and the control panel shall meet the requirements of Rule .1952(c).

Panel and control equipment shall include lightning protection, be protected from unauthorized access, and remain accessible at all times to the ORC. The bottom of the panel shall be at least 36-inches above the ground surface.

I. Clearstream Subsurface Drip System Field Design (See Section IX for designer responsibilities)
   1. The field network shall utilize 1/2-inch (0.64 inch OD, 0.55 inch ID) nominal size Geoflow WASTEFLOW CLASSIC low density polyethylene tubing with turbulent flow non-pressure compensating emitters.
   2. The drip emitter flow passage shall be 0.053 inches x 0.053 inches.
   3. The tubing shall consist of three layers: the inside layer shall incorporate a bactericide protection; the middle layer shall be black; and the outside layer shall be black with a distinct purple stripe for easy identification.
   4. Treflan® root intrusion inhibitor shall be bound into the emitters. Manufacturer guarantees roots shall be effectively inhibited by this product for a minimum period of ten years.
   5. Emitters shall be spaced uniformly along the dripline on a maximum of 24 inch centers. The turbulent flow emitters shall be molded from virgin polyethylene resin and have a nominal discharge rate of 1.3 gallons per hour at 20 psi.
   6. Each field zone shall adhere to the following conditions.
      a. Individual drip laterals shall be no longer than 150 feet in total length between supply and return manifolds.
      b. There shall be no more than a 10 percent variation in line length between the length of any individual lateral and the mean length of laterals within the zone.
      c. The zone shall contain no more than 10 laterals and no more than 900 total feet of tubing.
      d. The maximum elevation difference (lowest to highest lateral) shall not exceed five feet.
   7. When the length of dripline exceeds 900 total linear feet in a system, two to eight equal-sized (± 5 percent) separately and automatically dosed zones shall be provided.
   8. The minimum zone size and linear feet of tubing in each zone shall also adhere to the manufacturer's recommendations. The linear feet of tubing may be maximized utilizing reduced tube spacing as the site and this Controlled Demonstration Approval permit, without necessarily requiring an increase in the area requirement as calculated in Section IV.I. Also refer to subparagraphs pertaining to "Blanking," below for further guidance on options and constraints associated with system size and layout in the field.
   9. Individual drip lines shall be designed and installed level, following the naturally occurring ground contour. A maximum variance of + or - two inches off dead level within any linear segment may be allowed. A "linear segment" refers to any contiguous segment of drip line containing drip emitters between fittings.
   10. Individual drip lines shall be designed and installed on at least two foot centers, unless approved to be spaced uniformly on less than 2 foot centers to handle site-specific situations or for short segments as needed to avoid field obstructions, without reducing total area requirements.
      a. In no case shall tube spacing be less than 12 inches on center.
      b. In order to keep all laterals on-contour, lines or portions of lines may be installed on greater than 2 foot centers, requiring additional total application area.
      c. Short segments installed on less than 2 foot centers as needed to avoid field obstructions shall account for less than 5 percent of the total linear feet of emitter/tubing within any zone.
   11. Solvent welded heavy duty nonperforated flexible PVC pipe shall be used to connect the supply and return manifolds with the driplines, or to connect common driplines installed at varying depths or locations (e.g.: in stepdowns or to connect looped drip line segments). The connection lines shall be made to the driplines by solvent welded Geoflow compression adapters or Geoflow lock-slip fittings, or approved equal provided by Clearstream Wastewater Systems, Inc.
   12. Connection lines shall be conveyed over compacted earthen dams constructed at least 2 inches higher than the maximum elevation of each dripline served, to retain effluent in the lines at the end of each dose cycle.
   13. Blanking describes interior watertight sections of tubing without any drip emitters, which may be installed where unfavorable site conditions are encountered along a drip lateral or drip run, such as

rocks, shell fragments (> 35%), trees, large roots, or large tree stumps as identified by the system designer, soil scientist, installer or LHD.

14. Short sections of blanking tubing may also be used where minimum horizontal separation requirements between adjacent drip tubing runs as specified in Section VI.I.10 of this Approval cannot be met.
15. Sections of blank tubing shall not be included in meeting the minimum linear footage requirement calculated for the zone containing the blanking section.
16. No more than 10-percent of the total lateral length in a zone shall be compromised of blanking sections.
17. Blanking tubing shall be either:
    a. Blank Geoflow HDPE tubing of the same material, specifications and inside diameter as the connecting drip tubing; or
    b. Non-perforated Flexible PVC.
18. Non-perforated flexible PVC shall be used whenever the blanking section passes through an area having excessive abrasion hazards due to number or condition of rocks or an area where uniform bedding cannot be effectively insured.
19. Blanking sections shall also meet the following conditions:
    a. Connection lines shall be made to the driplines (with emitters) by solvent welded Geoflow compression adapters or Geoflow Lock-slip fittings, or approved equal provided by Clearstream Wastewater Systems, Inc.
    b. Blanking sections and connections shall be provided by the drip system manufacturer.
    c. Blanking sections shall be installed in hand-shaped trenches with a minimum of two inches of clean suitable soil on all sides, free of organic material, to protect the entire length of tubing from abrasion or damage from contact with rocks, roots, voids or other obstructions.
    d. All direction changes shall be gentle, sweeping bends which eliminate any danger of kinking, pinching or collapse of the tubing.
    e. Where possible, blanking sections shall be installed level and at the same elevation as the dripper line being blanked. Where the blanking tubing trench floor elevation must vary from the dripper trench floor elevation due to specific obstructions, the blanking section shall go upslope in elevation around the obstruction, rather than downslope, with a single, sweeping high point rather than being installed up and down in elevation in a manner which will retain water in the step down.
    f. The dripper tubing trench floor at both ends of any given section of blanking shall be maintained at the same elevation or the blanked section be constructed as a contour dam, preventing flow at pump cut off from the upper portion to the lower portion.
    g. A minimum of six inches of soil cover shall be maintained over blanking sections with care taken to provide proper surface drainage without creating areas of concentrated run-off. Less cover (a minimum of three inches) may be considered when utilizing flexible PVC if necessary to allow the drip line to be installed at the specified depth.
    h. At least a single blanking section is to be used whenever a lateral must be installed where the horizontal separation between adjacent sections of dripper tubing shall be less than the minimum spacing as set forth in Section VI.I.10. This portion of the blank section shall be backfilled with well compacted, low permeability, clay.
    i. When lateral segments must be installed closer than 12 inches apart, both segments shall be blanked and those sections backfilled with hand-compacted clayey material.
    j. Locations and lengths of blanking sections shall be noted on the record drawings for the project.

J. The hydraulic design shall be based on achieving the following conditions.
    1. No more than a 10 percent variation in flow between any individual emitters and the mean emitter flow rate anywhere within a separately dosed zone, including any effluent redistribution due to drain back.
    2. When the slope exceeds eight percent, 10 psi check valves shall be used in the supply and return manifolds, or other acceptable means identified to minimize disproportionate amount of drainage into the lowest area of the zone.
    3. Maintenance of velocities of at least 1.0 foot per second in the supply line from the dosing tank to the beginning of the drip field during every dosing/flushing cycle.
    4. Minimum pressure of 10 psi and a maximum of 30 psi in the driplines during normal dosing/flushing

cycles.

5. Flushing velocities of at least two feet per second at the distal end of each dripline during the beginning of each dosing/forward flushing cycle, and at least one foot per second after steady-state conditions have been reached during the dosing/flush cycle. Dripline flushing shall be automatic and continuous forward flushing during each dosing cycle.
6. The hydraulic design shall include written documentation that minimum scour velocities and pressure restrictions will be maintained, including project specific calculations, computer simulations as necessary, or verification of adherence to pre-approved design criteria. Hydraulic calculations are to take into account sections of blanking, where applicable.
7. Field appurtenances include:
   a. An air/vacuum relief valve at the high point(s)/outlet of each zone;
   b. An isolation valve and check valve at the outlet in the return line from each zone return header (when there are more than one zone);
   c. K-Rain valve (Clearstream Model #P4524, or approved equal) in valve box located at field high-point so as to drain between doses, to split flow between two to eight equal-sized field zones, as applicable, with manual shut-off valve on inlet end (to allow valve to be manually cycled during start-up and maintenance inspections);
   d. Pressure sustaining valves where needed;
   e. Cleanout at each end of the supply and return manifolds with pressure monitoring fittings at the field inlet and outlet points;
   f. A 0-100 psi gauge (with ball valve for adjusting pressure) on outflow through the spin filter assembly;
   g. A 0-100 psi guage (with ball valve for adjusting pressure) on return flow to pump tank; and
   h. Flow meters on the field supply line and return flow line.
8. The ORC must be able to service all valves and air vents and check pressures without effluent discharging from the network in preparation for these maintenance/testing procedures. Valves, pressure monitoring fittings, and cleanouts shall be provided with protective vaults or boxes that are decay resistant, ultraviolet rated, large enough for easy access, and that extend at least to finished grade (shall be accessible at all times).

VII. Installation and Testing

A. A preconstruction conference shall be required prior to beginning any site modifications or construction of the Clearstream subsurface drip system and associated pretreatment system components. The conference shall be attended by the Clearstream authorized system designer, the Clearstream authorized installer, and LHD. The licensed soil scientist and registered professional engineer shall also be present, as applicable.

B. It shall be the responsibility of the system designer to specify equipment to be used, and site-specific procedures to be followed, including blanking provisions.

C. All Clearstream advanced pretreatment and drip systems shall be installed according to directions provided by the manufacturer in the "Installation Manual" and instructions found on Clearstream Wastewater Systems, Inc CAD drawings and specifications for each system. Additionally, all Clearstream Wastewater Systems, Inc 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 or repairing Clearstream advanced pretreatment and Clearstream drip systems shall be in possession of all necessary permits, licenses and authorizations before starting any portion of an installation.

E. Watertightness of the pretreatment tanks and dosing tank shall be demonstrated by either a 24-hour water leakage test or a vacuum test conducted at the installation site. Test shall be run after tank installation with risers/ and inlet/outlet pipes in place, but before the tanks are covered (backfilled). A water level change of 1/2 inch or more, within a 24" 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" above the riser/adapter seam. For the

vacuum test, a vacuum of five (5) inches of mercury shall be pulled on the tanks and held for two minutes, without a loss of greater than 0.5 inches of mercury.

F. The preservation of the original structure of the soil in the drainfield and repair areas is essential to maintaining the absorptive capacity of the soil. No activity other than the construction of the system is permitted within these areas before, during, and after installation of the system.

G. The drainfield area shall be prepared in a manner that minimizes site disturbance.
   1. No equipment shall cross the field areas during rainfall events, or when the soil moisture content of the fields is above field capacity (too wet to plow).
   2. Only equipment light enough to not compact the soil shall be used to remove trees, roots, and rocks, with hand incorporation of select fill material used to eliminate weak spots where roots or boulders must be removed.
   3. Fill material and final cover shall be in accordance with Rule .1957(b)(1)(F). In some instances, final cover material may be approved to be added after dripline installation.
   4. Field shall be prepared as needed to enable the final cover to be established and maintained prior to dripline installation.
   5. The selection, transportation, and incorporation procedures of fill or cover must be carefully reviewed and concurred with by the system designer, soil evaluator, and LHD prior to and during installation.

H. Drip laterals shall be staked out by use of an engineer's or laser level and tape prior to permitting. At least every fourth drip run or adjacent dripline shall be field staked. However, staking shall be more frequent if needed, as determined by the system designer or LHD, to assure conformation with natural contours and design requirements for sizing, location and separations. Maximum dripline depth shall be in accordance with permit conditions.

I. Dripline shall be installed in accordance with designer's and manufacturer's recommendations for each site. A vibratory plow, static plow, trencher, or rock-saw is most typically used, or the system is installed by hand. Soil moisture must be dry enough so that soil compaction or smearing will not occur. The system shall not to be constructed during periods of wet weather when the soil is sufficiently wet at the depth of installation to exceed its plastic limit. The plastic limit is exceeded when the soil can be rolled between the palms of the hands to produce a roll (wire) 1/8 inch in diameter (>1.5-inch length) without breaking and crumbling. Questions about site workability shall be reviewed with the system designer, soil evaluator, and LHD prior to proceeding.

J. Leaf litter and debris shall be removed prior to the installation of dripline, where applicable. When a trencher is used or trenches are hand dug, the trench bottoms shall be hand cleaned of roots, debris and litter, and the dripline shall be secured to the center of the trench bottom prior to backfilling.

K. Minimum soil cover over drip tubing shall be six inches, to finished grade. Cover material shall be free of rocks, debris, construction and demolition (C+D) waste, hazardous or contaminated waste, or material with concentrations or layers containing more than 35 percent by volume of shell fragments or more than 10 percent by volume of fibrous organics.

L. Minimum depth of valves in protective vaults or boxes shall be at least 12-18 inches below finished grade (as needed to be below normal frost depth), with the exception of the K-Rain alternating valve, which must be installed shallow at the high point in the field, and located so as to drain between doses. Protective vaults or boxes shall be decay resistant, ultra-violet rated, large enough for easy access, and extend at least to finished grade and shall be accessible at all times.

M. Air vents shall be installed in a valve box so that the entire valve is below finished grade. The outlet of the valve must be above the installation depth of the dripline.

N. Extreme care must be taken during and after system installation to assure no extraneous debris enters the tankage, supply lines, and dripline network. Supply lines and manifolds shall be flushed out prior to system startup.

O. Designer's and manufacturer's recommendations shall be followed for system startup. All leaks in pipe network or from emitters exhibiting excessive emission rates, as evidenced by wet spots during dosing cycles comparable to normal operating conditions, shall be repaired.

P. Dosing and flushing flow rate must be independently measured (note that normal operation is to dose and flush simultaneously and continuously). Pressure must be measured at the lowest point in the supply manifold to verify need for a pressure sustaining valve and its effectiveness, if valve is present. Flushing pressure at the ends of each zone supply and return manifold shall be measured and determined to be in accordance with design criteria.

Q. Fields shall be finished graded to shed surface water and in a manner which facilitates inspection, operation, maintenance, and repair as well as turf management with standard mowing equipment (if applicable). Provisions shall be made to establish and maintain a vegetative cover (e.g., grass) to prevent erosion and allow mowing with standard equipment and to allow for effective system inspection.

R. Other methods of site stabilization may be proposed, such as in woodland sites. Equivalent provisions for finished grading to shed surface water and as needed to facilitate inspection, operation, maintenance, and repair apply. Establishment of a permanent vegetative cover on a wooded site is not necessary if the site is otherwise effectively stabilized from erosion after construction until a protective litter cover is naturally reestablished. Site-specific procedures should be reviewed by the system designer, soil evaluator and LHD. To facilitate inspection and maintenance, new woody vegetation must be prevented from becoming established over driplines and appurtenances.

S. All mechanical components, pumps, pump cycling, filters, flushing, high water alarm and telemetry systems, as applicable, must be Clearstream-approved and demonstrated to be fully operable in accordance with their design.

S. Prior to Operation Permit issuance, the final LHD construction inspection shall include at least the following:
   1. Testing the controls and alarm settings.
   2. Recording all pump model numbers and time clock settings.
   3. Confirming that all are release vents are installed in the correct location.
   4. Checking the dosing and return flushing flows, measuring and recording the pressures at the inlet to the supply manifold and outlet from the return manifold in the field, and measuring and recording pressures at the supply line and return line gauges in the pump tank riser.
   5. Confirming that the riser hatches have tamperproof bolts and/or riser lock ring.

T. Each Clearstream Wastewater Systems, Inc control panel shall have a label affixed as shown in Attachment B.

U. Prior to the issuance of an Operation Permit, the manufacturer or manufacturer's representative shall provide an acceptance letter to the LHD verifying satisfactory installation and operation measures.

VIII. Operation, Maintenance, Monitoring and Reporting

A. System classification, management entity, inspection/maintenance and reporting frequency requirements shall be in accordance with Rules .1961 and .1970. The Clearstream subsurface drip system (with Clearstream advanced pretreatment system) is classified at a minimum as a Type Vc system according to Table V(a) of Rule .1961(b).

B. Under this Controlled Demonstration Approval, the minimum frequency of inspection for each system by the Certified Operator shall be quarterly.

C. During the first operational inspection after system start-up, a Clearstream Wastewater Systems, Inc. representative will meet with the ORC and the property owner to explain the system and answer any questions.

D. In the event any system is found to be out of compliance, Clearstream Wastewater Systems, Inc. will assist in the development of an action plan to bring the system back into compliance.

E. The ORC shall provide monitoring reports to the LHD which include a log of all malfunction incidences/notifications, maintenance activities and wastewater volume delivered to each zone between each required monitoring period.

F. At each Clearstream subsurface drip system inspection the ORC, at a minimum, shall observe, monitor, and record:
   1. Watertightness of tank(s), risers, and conduit pass throughs in and out of risers,
   2. Operation of controller, RMSYS, Inc. from NSF International, discharge dumps, and probes or floats,
   3. Observe and record the flows on the water meters to determine the output to and return from each field zone in gallons per minute,
   4. Visual observations of the dripfield(s), which shall include walking the fields during a field dosing event to determine whether any wet spots occur and their locations,
   5. The condition of the filter screen(s), and
   6. The dosing flow rate to each zone, including recording flow meter readings, pump run times, and cycle counts.

G. Field dosing and flushing flow rates and pressure head measurements during flushing at the inlet and outlet of each field zone shall be taken at least twice per year.

H. The ORC shall be telemetrically notified of high water, power outage, and aerator malfunction alarms.

I. The ORC shall also conduct other additional observations, measurements, monitoring, and maintenance activities as specified in the Operation Permit and as recommended by Clearstream, or as otherwise required for the Clearstream subsurface drip system.

J. All Clearstream subsurface drip systems shall be operated and maintained according to the latest version of Clearstream Wastewater Systems, Inc O&M manual.

K. Notification and Performance of Maintenance and Repairs
   1. The ORC shall alert Clearstream Wastewater Systems, Inc and the system owner in a timely fashion of needed maintenance or repair activities including, but not limited to, landscaping, pipe or control system repairs, 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 or average pump run time are not within 25% of initial measurements conducted prior to system startup. 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.

L. See separate Clearstream RWTS approval and Controlled Demonstration Approval (CDWS 2009-02) for pretreatment system inspection, sampling and maintenance requirements by the ORC.

M. Reporting
   1. The ORC shall provide a completed written report to Clearstream Wastewater Systems, Inc, the system owner, and the LHD within 30 days after each required visit. At a minimum this report shall specify:
      a. The date and time of inspection,

b. System operating conditions observed and measured according to Sections VIII.F, G, and I,
c. Maintenance activities performed since the last inspection report,
d. An assessment of overall system performance,
e. A list of any improvements or maintenance needed; and,
f. A determination of whether the system is malfunctioning, and the specific nature of the malfunction.

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 system and that is proposed by the Clearstream Wastewater Systems, Inc. and approved by the Department. The third party shall review site-specific system monitoring protocol, collect and analyze the ORC inspection reports 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:
      i. An assessment of system hydraulic performance in relation to the established performance criteria;
      ii. An assessment of effectiveness of spin filter and field flushing continuous operation;
      iii. Assessment of performance and serviceability of filter, valves, and pressure gauges in the pump tank riser;
      iv. Recommended areas of applicability for the system; and
      v. Any conditions and limitations related to the use of the system.
   b. Upon completion of the research and testing protocol, and prior to completing any application by Clearstream Wastewater Systems, Inc, to the State for reclassification of the Clearstream Wastewater Systems, Inc subsurface drip 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:
      i. Prepare a Final Report to the State that includes the results from all of the systems installed during the Controlled Demonstration, including flow-monitoring information, ORC reports, etc., and provide recommendations on future use of the system; and
      ii. Provide the interim and final Repots in electronic format suitable for posting 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 Clearstream Wastewater Systems, Inc.
   c. The research and testing protocol that has been agreed to is as follows:
      i. Monitoring of hydraulic pressure conditions during various operating conditions, including monitoring at Schrader valves and/or gauges located at the filter, beginning of each supply manifold, end of each return manifold, and at return discharge line. Flow rates and pressures during dosing/flushing shall be recorded at system start-up, after one month of system operation, and at least quarterly thereafter, and compared with design parameters.
      ii. Inspection of filter screen to ensure proper cleaning by forward flush/scour system on at least a quarterly basis. Adequacy of filter cleaning shall be verified and/or changed.
      iii. Evaluation of the effectiveness of maintenance and inspection of headworks components in the pump tank riser.
      iv. Record and verify from system control data that cycles, frequency, dose time and flows are within design limits.

IX. Responsibilities and Permitting Procedures

A. Prior to the installation of a Clearstream subsurface drip system at a site, the owner or owner's agent shall notify the LHD of their proposed use of such a system. The LHD shall issue an Improvement Permit and a Construction Authorization or amend a previously issued Construction Authorization allowing for the use

of a Clearstream subsurface drip system. Up to 50 Clearstream subsurface drip systems can be installed statewide upon a finding that all the provisions of this Approval and all other applicable rules are met.

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 as specified in the Improvement Permit and Construction Authorization. Notification of the issuance of all Improvement Permits, Construction Authorizations and Operation Permits prior to issuance by the LHD, pursuant to this Controlled Demonstration Approval, shall be submitted to the On-Site Water Protection Branch. The State shall notify the manufacturer and LHD if the proposed use is found to be inconsistent with the approved testing program or other conditions of this approval.

C. Clearstream Wastewater Systems, Inc., is responsible for providing training necessary to its authorized representatives, including authorized designers, installers and operators, about all specific design, installation and operation requirements of this Controlled Demonstration Approval, including but not limited to:
   1. Site and layout limitations,
   2. Proper location and installation of K-Rain valve,
   3. Location of headworks up into the riser,
   4. Installation of flow meters and pressure monitoring points at inlet to supply manifold and outlet from return manifold,
   5. Use of flex-PVC at manifold connections and end-loops,
   6. Method of determining 7-day and 10-day flows, and
   7. Proper start-up set-up, measurement and operational performance verification

D. The Clearstream subsurface drip system shall be designed by one of the following: a Clearstream Wastewater Systems, Inc certified designer or a North Carolina Professional Engineer.

E. The Clearstream subsurface drip system shall be designed by a North Carolina Professional Engineer when the daily design flow exceeds 600 gallons per day, when duplex pumps are required in accordance with Section VI.H.6, or whenever the complexity of the system dictates non-standard design as determined by the LHD or the manufacturer.

F. Prior to the issuance of a Construction Authorization for a Clearstream subsurface drip 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 specified in "Requirements for Submittals of Soil Reports and Pretreatment and/or Dispersal System Designs". Systems designed by an authorized designer shall include a review letter from the manufacturer along with a submittal checklist signed by the manufacturer for each system.

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 LHD, a Regional Engineer will review the design.

H. The system shall be installed by a NCOWCICB-certified Level IV Installer authorized in writing by the manufacturer to install the system. The installer shall coordinate the installation with the authorized designer and manufacturer's field representative.

I. For sites required to be evaluated by a Licensed Soil Scientist or Professional Geologist, the LHD shall specify as a condition on the Improvement Permit and Construction Authorization that a Licensed Soil Scientist or Professional Geologist oversee critical phases of the ground absorption system installation and certify in writing that the installation was in accordance with their specified site/installation requirements prior to the Operation Permit issuance, based upon their field inspection of the system.

J. The Clearstream authorized installer and authorized designer must certify in writing that the system was

installed in accordance with the approved plans and specifications prior to Operation Permit issuance.

K. A 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.

L. The ORC shall be present during initial system commissioning. The ORC shall be certified as a NC Subsurface Operator, a Grade II biological wastewater treatment plant operator, and an authorized Clearstream Wastewater Systems, Inc, Treatment System Operator.

L. Prior to issuance of an Operation Permit a contract for operation and maintenance shall be executed between the system owner and an ORC as required in accordance with Rule .1961(b), who has been trained and certified in writing by Clearstream to operate and maintain Clearstream subsurface drip systems.

M. Clearstream Wastewater Systems, Inc. shall provide lists of manufacturer's authorized designers, installers and operators to the State and applicable LHD. The Manufacturer shall also provide notice of all scheduled manufacturer-authorized training programs for individuals seeking authorization, or on-going training.

X. Repair of Systems

The provisions of 15A NCAC 18A .1961(l) shall govern the use of the Clearstream Wastewater Systems, Inc. subsurface drip system for repairs to existing malfunctioning wastewater systems.

Approved By: _____ Date: _____

Appendix A

In the Tables "SWC" means "Soil Wetness Condition" and "USC" means an "UNSUITABLE Soil Condition," other than a SWC and NOSS means "naturally occurring soil surface"

Table A-1 - Siting criteria for drip systems where dripline is installed below the elevation of the naturally occurring soil surface (NOSS)

<table>
<tr><td>Criteria or requirement</td><td>Treated to NSF 40 or more stringent</td><td>Treated to TS-I</td></tr>
<tr><td>Minimum useable soil depth below NOSS to USC or SWC</td><td>18 inches</td><td>15 inches</td></tr>
<tr><td>Minimum vertical separation between the trench bottom or point of application, whichever is deeper, and USC or SWC</td><td>12 inches</td><td>9 inches
(12 inches to rock or tidal water)</td></tr>
<tr><td>Allowance to meet 6 inch cover requirement</td><td colspan="2">Addition of up to 6 inches suitable Group II or III soil material, after settling</td></tr>
<tr><td>Special site evaluation not required, unless specifically required below</td><td colspan="2">18 inches or more of useable soil</td></tr>
<tr><td rowspan="8">Special site evaluation required (Section V)</td><td>Group IV within 18 inches of NOSS and LTAR >.10</td><td>Group IV within 18 inches of NOSS and LTAR >0.12</td></tr>
<tr><td colspan="2">Proposed LTAR exceeds LTAR assigned by EHS/LHD per Section IV.B</td></tr>
<tr><td></td><td>Groundwater lowering system used and any Group III soil above invert elevation of drain or any Group III or IV soil within 36 inches of NOSS</td></tr>
<tr><td colspan="2">Groundwater lowering system used and LHD or RSS determines evaluation needed</td></tr>
<tr><td colspan="2">Daily Design Flow exceeds 1,500 gallons per day</td></tr>
<tr><td></td><td>Less than 18 inches from NOSS to USC or SWC</td></tr>
<tr><td>LTAR:
>0.8 (Group I)
>0.5 (Group II)
>0.25 (Group III);
>0.10 (Group IV)</td><td>LTAR:
>1.0 (Group I)
>0.6 (Group II)
>0.3 (Group III)
>0.12 (Group IV)</td></tr>
</table>

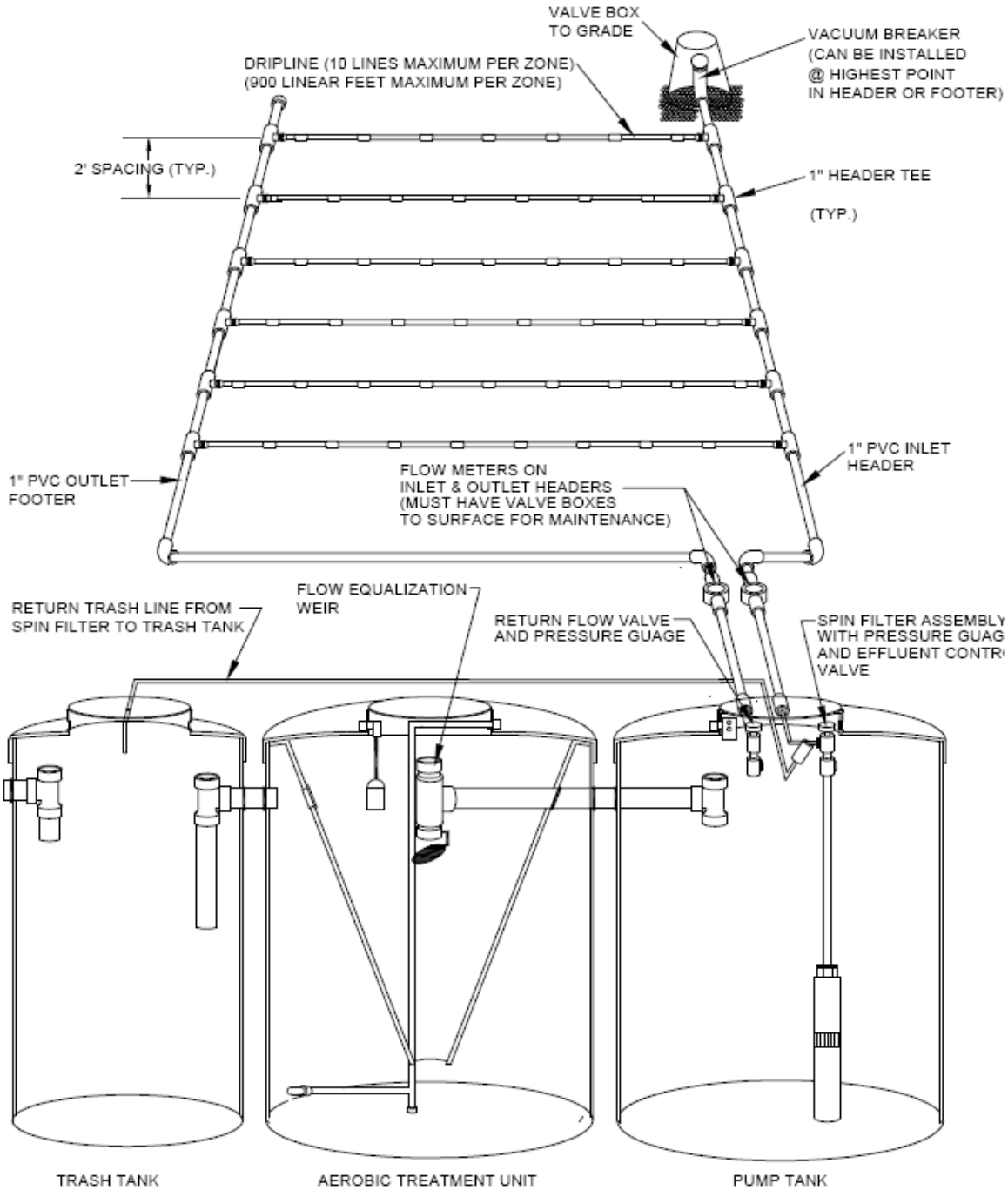
Table A-2-Siting criteria for aerobic drip systems on new fill sites, when all or part of the dripline is to be installed in approved fill material

Criteria or requirement	Treated to NSF-40 or more stringent	Treated to TS-I
Minimum useable soil depth below NOSS to USC or SWC	18 inches to USC 12 inches to SWC	12 inches to USC 12 inches to SWC
Minimum vertical separation between the trench bottom or point of application, whichever is deeper, and USC or SWC	18 inches to USC 12 inches to SWC	12 inches to USC 9 inches to SWC
Special site evaluation not required, unless specifically required below	18 inches or more of useable soil	
Special site evaluation required (Section V)		<18 inches to USC
		Group IV soil within 18 inches of NOSS and LTAR >0.05
		Groundwater lowering system is used with fill
		<18 inches to USC
	Daily Design Flow Exceeds 1,500 gallons per day	

Table A-3-Siting criteria for drip systems on existing fill sites, when all or part of the drip tubing is to be installed in approved fill material

Criteria or requirement	Treated to NSF 40 or more stringent	Treated to TS-I
Minimum depth Group I fill/soil below existing fill surface to USC or SWC	24 inches	
Minimum vertical separation between the trench bottom or point of application, whichever is deeper, and USC or SWC	18 inches	12 inches

Attachment A



TYPICAL DRIPFIELD LAYOUT

Attachment B

NON-TYPICAL SEPTIC SYSTEM
CLEARSTREAM SYSTEMS
CONTROLLED DEMONSTRATION
SUBSURFACE WW OPERATOR NAME
AND CONTACT INFORMATION