25.50 n

XI. EXAMPLE WORKSHEET

A. SITE CONDITIONS

Evaluate the site and soils report for the following:

- Surface water movement.
- Measure elevations and distances on the site so that slope, contours and available areas can be determined.
- Description of several soil profiles where the component will be located.
- Determine the limiting conditions such as bedrock, high groundwater level, soil permeability, and set backs.

Slope - _6_ %

Occupancy – One or Two-Family Dwelling, # of bedrooms _3_.

Public Facility - _0_ Daily wastewater flow

Depth to limiting factor - _25_ inches

In situ soil application rate used - _0.3_ gal/ft²/day

BOD_5 value of effluent applied to component - _180_ mg/L

TSS value of effluent applied to component - _50_ mg/L

Type of distribution cell - _x_ Aggregate or __ Leaching chamber

B. DESIGN WASTEWATER FLOW (DWF)

One or Two-family Dwelling.

DWF = 150 gal/day/bedroom x # of bedrooms

= 150 gal/day/bedroom x _3_ # of bedrooms

= 450 gal/day

Public Facilities.

DWF = Sum of each wastewater flow per source per day x 1.5

= _________ gal/day x 1.5

= _________ gal/day

C. DESIGN OF THE DISTRIBUTION CELL

1. Size the Distribution cell

   a. Infiltration rate of fill material: 1.0 gal/ft²/day

   b. Bottom area of distribution cell = Design wastewater flow ÷ ≤ 1.0 gal/ft²/day if BOD_5 or TSS > 30 mg/L or ≤ 2.0 gal/ft²/day if BOD_5 or TSS ≤ 30 mg/L

   = 450 gal/day ÷ 1.0 gal/ft²/day

   = 450 ft²

2. Distribution cell Configuration

   a. Distribution cell width (A) = _7_ feet (≤ 10 ft.)

   b. Distribution cell length (B) = Bottom area of distribution cell ÷ Width of distribution cell

   B = 450 ft² (Distribution cell area) ÷ 7 ft(A)

   B = 64.29 or 65 ft

   c. Check distribution cell length (B)

   Design Wastewater Flow ÷ Cell length (B) ≤ Maximum Linear Loading Rate

   450 gal/day ÷ 65 feet = 6.92 gal/ft (Linear Loading Rate)

   Max. Linear Loading Rate ≤ 4.5 gal/ft/day if Soil infiltration Rate ≤ 0.3 gal/ft²/day

   Is the linear loading rate ≤ what is allowed? ___ yes _x_ no If no, then the length and/or width of the distribution cell must be changed so it does.

   Distribution cell length (B) = Design Wastewater Flow ÷ Maximum Linear Loading Rate

   Distribution cell length (B) = 450 gal/day ÷ 4.5 gal/ft/day

   Distribution cell length (B) = 100 ft

   Distribution cell width (A) = 450 ft² (Distribution cell area) ÷ 100 ft(B)

   Distribution cell width (A) = 4.5 ft²

D. DESIGN OF ENTIRE FILL

1. Fill Depth
   a. Fill depth below distribution cell (At least 6 inches if the in situ soil beneath the tilled area requires a minimum depth of 36 inches or less for treatment of fecal coliform. At least 12 inches if the in situ soil beneath the tilled area requires a depth greater than 36 inches for treatment of fecal coliform.)

      1) Depth at up slope edge of distribution cell (D) = distance required by Table 83.440-3 - distance in inches to limiting factor

      D = 36 inches - 24 inches

      D = 12 inches (≥ 6 or 12 inches; but not greater than 36 inches)

      2) Depth at down slope edge of distribution cell (E)

      E = Depth at up slope edge of distribution cell (D) + (% natural slope expressed as a decimal x distribution cell width (A))

      E = D + (% natural slope expressed as decimal x A)

      E = 12 inches + (0.06 x 4.5 feet x 12 inches/ft)

      E = 15.24 or 15.25 inches

   b. Distribution cell Depth for Aggregate Distribution cell.

      Distribution cell depth (F) for aggregate distribution cell = amount of aggregate below distribution laterals (6 inches min.) + nominal outside diameter of largest lateral + amount of aggregate over distribution laterals (2 inches min.).

      F = 6 (≥6) inches + 1.5 inches + 2 (≥2) inches

      F = 9.5 inches

   c. Distribution cell depth (F) for distribution cell with leaching chambers = total height of leaching chamber.

      F = _______ inches

   d. Cover material

      1) Depth at distribution cell center (H) ≥ 12 inches

      2) Depth at distribution cell edges (G) ≥ 6 inches

2. Fill length

a. End slope width (K)= Total fill at center of distribution cell x horizontal gradient of side slope

K = {([(D + E) ÷ 2] + F + H) x horizontal gradient of side slope} ÷ 12 inches/foot

K = {([(12 inches + 15.25 inches) ÷ 2] + 9.5 inches + 12 inches) x 3 } ÷ 12 inches/ft

K = 8.41 or 8.5 ft

b. Fill length (L) = Distribution cell length + (2 x end slope width)

L = B + 2K

L = 100 ft + (2 x 8.5 ft)

L = 117 feet

3. Fill width

a. Up slope width (J) = Fill depth at up slope edge of distribution cell (D + F + G) x Horizontal gradient of side slope x Slope correction factor {100 ÷ [100 + (gradient of side slope x % of slope or value from Table 5)]}

J = (D + F + G) x horizontal gradient of side slope x Slope correction factor 100 ÷ [100 + (gradient of side slope x % of slope or value from Table 5)]}

J = (12 in + 9.5 in + 9 in) ÷ 12 in/ft x 3 x 100 ÷ [100 + (3 x 6)]

J = 30.5 in ÷ 12 in/ft x 3 x 100 ÷ 118

J = 6.46 or 6.5 feet

b. Down slope width (I) = Fill depth at down slope edge of distribution cell (E + F + G) x Horizontal gradient of side slope x Down slope correction factor {100 ÷ [100 - (gradient of side slope x % of slope or value from Table 5)]}

I = (E + F + G) x Horizontal gradient of side slope x Down slope correction factor {100 ÷ [100 - (gradient of side slope x % of slope or value from Table 5)]}

I = (15.25 in + 9.5 in + 9 in) ÷ 12 in/ft x 3 x 100 ÷ [100 - (3 x 6)]

I = 33.75 in ÷ 12 in/ft x 3 x 100 ÷ 82

I = 10.29 or 10.33 feet

c. Fill width (W) = Up slope width (J) + Distribution cell width (A) + Down slope width (I)

W = J + A + I

W = 6.5 ft + 4.5 ft + 10.33 ft

W = 21.33 feet

4. Check the basal area

a. Basal area required = Daily wastewater flow ÷ infiltration rate of in situ soil

= 450 gal/day ÷ 0.3 gal/ft^2/day

= 1500 ft^2

b. Basal area available

1) Sloping site = Cell length x (Distribution cell width + Down slope width)

= B x (A + I)

= 100 ft x (4.5 ft + 10.33 ft)

= 100 ft x 14.83 ft

= 1483 ft^2

2) Level site = Fill length x Fill width

= L x W

= ______ ft x ______ ft

= _______ ft^2

c. Is available basal area sufficient? ___ yes _x_ no

Basal area required < Basal area available

1500 ft^2 < 1483 ft^2

The available basal area must be increased by 17 ft^2. This can be accomplished by increasing the down slope width (I) by 0.27ft. making it 10.5ft.

b. Basal area available

1) Sloping site = Cell length x (Distribution cell width + Down slope width)

= B x (A + I)

= 100 ft x (4.5 ft + 10.5 ft)

= 100 ft x 14.50 ft

= 1500 ft^2

5. Determine the location of observation pipes along the length of distribution cell.

Distance from end of distribution cell to end observation pipes = B ÷ 6

Distance from end of distribution cell to end observation pipes = 100 ft. ÷ 6

Distance from end of distribution cell to end observation pipes = 16.6 ft.

XII. PLAN SUBMITTAL AND INSTALLATION INSPECTION

A. Plan Submittal

In order to install a system correctly, it is important to develop plans that will be used to install the system correctly the first time. The following checklist may be used when preparing plans for review. The checklist is intended to be a general guide. Conformance to the list is not a guarantee of plan approval. Additional information may be needed or requested to address unusual or unique characteristics of a particular project. Contact the reviewing agent for specific plan submittal requirements, which the agency may require that are different than the list included in this manual.

General Submittal Information

- Photocopies of soil reports forms, plans, and other documents are acceptable. However, an original signature is required on certain documents.
- Submittal of additional information requested during plan review or and questions concerning a specific plan must be referenced to the Plan Identification indicator assigned to that plan by the reviewing agency.
- Plans or documents must be permanent copies or originals.

Forms and Fees

- Application form for submittal, provided by reviewing agency along with proper fees set by reviewing agent.
- Application for Development of Floodplain, if any portion of the system is in a floodplain.

Soils Information

- Complete Soils and Site Evaluation Report (form # SBD-8330) for each backhoe pit described; signed and dated by a certified soil tester, with license number.
- Separate sheet showing the location of all borings. The location of all borings and backhoe pits must be able to be identified on the plot plan.

Documentation

- Architects, engineers or designers must sign, seal and date each page of the submittal or provide an index page, which is signed, sealed and dated.
- Master Plumbers must sign, date and include their license number on each page of the submittal or provide an index page, which is signed, sealed and dated.
- Three completed sets of plans and specifications (clear, permanent and legible); submittals must be on paper measuring at least 8-1/2 by 11 inches.

Plot Plan

- Dimensioned plans or plans drawn to scale (scale indicated on plans) with parcel size or all property boundaries clearly marked.
- Slope directions and percent in system area.
- Benchmark and north arrow.
- Setbacks indicated as per appropriate code.

- Two-foot contours to 25ft. on all sides of the system area or include elevations at all four corners of proposed system.
- Location information; legal description of parcel must be noted.
- Location of any nearby existing system.

Plan View

- Dimensions for distribution cell(s).
- Location of permanent markers and observation pipes.
- Dimensions for fill for mound.
- Pipe lateral layout, which must include the number of laterals, pipe material, diameter and length; and number, location and size of orifices.
- Manifold/force main locations, with materials, length and diameter of each.

Cross Section of System

- Include tilling requirement, depth and size of aggregate, percent slope, side slope, and cover material.
- Lateral elevation, position of observation pipes, dimensions and depths of aggregate, and type of cover material such as geotextile fabric, and depth, if applicable.

System Sizing

- For One and two-family dwellings, the number of bedrooms must be included.
- For public buildings, the sizing calculations must be included.

Tank And Pump / Siphon Information

- All construction details for site-constructed tanks.
- Size and manufacturer information for prefabricated tanks.
- Notation of pump or siphon model, pump performance curve, friction loss for force main and calculation for total dynamic head.
- Cross section of tank / chamber to include storage volumes; connections for piping, vents, and electricity; pump "off" setting; dosing cycle and volume; and location of vent and manhole.
- Cross section of two compartments tanks or tanks installed in a series must include information listed above.

B. Inspections.

Inspection shall be made in accordance with ch. 145.20, Wis. Stats and s. Comm 83.26, Wis. Adm. Code. The inspection form on the following two pages may be used. The inspection of the system installation and/or plans is to verify that the system at least conforms to specifications listed in Tables 1 - 3 of this manual.

POWTS INSPECTION REPORT

(ATTACH TO PERMIT)

GENERAL INFORMATION

Permit Holder's Name	☐ City ☐ Village ☐ Town of	County	Sanitary Permit No.
State Plan ID No.	Tax Parcel No.	Property Address if Available	

TANK INFORMATION			**SETBACKS**				
TYPE	MANUFACTURER	CAPACITY	P/L	WELL	BLDG.	VENT TO AIR INTAKE	ROAD
SEPTIC							
DOSING							
AERATION							
HOLDING							

PUMP / SIPHON INFORMATION

Manufacturer:	Model No.	Demand in GPM	Vert. Lift

FORCE MAIN INFORMATION			**FRICTION LOSS**		
Length	Diameter	Dist. To Well	Component Head	TDH - As Built	TDH - Design

SOIL ABSORPTION COMPONENT

TYPE OF COMPONENT			COVER MATERIAL			
Cell Width	Cell Length	Cell Diameter	Cell Depth	Horizontal Separation	Liquid Depth	No. of Cells

LEACHING CHAMBER OR UNIT	Manufacturer	Model No.	

SETBACK INFO.	Property Line	Bldg.	Well	Lake/Stream

DISTRIBUTION COMPONENT / Elevation data on back of form

Header / Manifold		Distribution Pipe(s)			Hole size	Hole Spacing	Obsv. Tubes Inst. & No.
Length	Dia.	Length	Dia.	Spacing			

SOIL COVER

Depth over center of cell:	Depth over edge of cell:	Depth of Cover material	Seeded / Sodded	Mulched

DEVIATIONS FROM APPROVED PLAN

DATE OF INST. DIRECTIVE:	DATE OF ENFORCEMENT ORDER:
DATE OF REFERRAL TO LEGAL COUNSEL:	

COMMENTS (Persons present, discrepancies, etc.)

COMPONENTS NOT INSPECTED

Plan Revision Required ☐ Yes ☐ No	Date:	Signature of Inspector:	Cert. Number

Sketch on other side

ELEVATION DATA

Point	Back sight	Height of instrument	Foresight	Elevation	Comments
Bench mark					
Bldg. sewer					
Tank inlet					
Tank outlet					
Tank inlet					
Tank outlet					
Dose tank inlet					
Bottom of dose tank					
Dist. lateral 1					
System elev. 1					
Dist. lateral 2					
System elev. 2					
Dist. lateral 3					
System elev. 3					
Grade elev. 1					
Grade elev. 2					
Grade elev. 3					

SKETCH OF COMPONENT & ADDITIONAL COMMENTS

DRIP-LINE EFFLUENT DISPERSAL COMPONENT MANUAL

FOR

PRIVATE ONSITE WASTEWATER TREATMENT SYSTEMS

State of Wisconsin

Department of Commerce
Division of Safety and Buildings

SBD-10657-P (N.6/99)

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I. INTRODUCTION AND SPECIFICATIONS

This Private Onsite Wastewater Treatment System (POWTS) component manual provides design, construction, inspection, operation and maintenance specifications for a drip line effluent disposal component. Final effluent characteristics shall comply with s. Comm 83.43 (8) and 83.44 (2), Wis. Adm. Code when inputs are within the range specified in Tables 1 to 3. Violations of this manual constitute a violation of ch. Comm 83 and 84, Wis. Admin. Code. The design provides equal distribution of effluent from a dose tank to a soil treatment component. To ensure equal distribution is achieved, specifications in Tables 1, 2, and 3 must be met.

Note: Detailed plans and specifications must be reviewed and approved by the governing unit having authority over the plan for the installation. Also, a Sanitary Permit must be obtained from the department or governmental unit having jurisdiction. See Section XII for more details.

Table 1

INFLUENT FLOWS AND LOADS	
Design Wastewater flow (DWF)	≤ 5000 gal/day
Monthly average value of Fats, Oil and Grease (FOG)	≤ 30 mg/L
Monthly average value of five day Biochemical Oxygen demand (BOD_5)	≤ 220 mg/L or ≤ 30 mg/L
Monthly average value of Total Suspended Solids (TSS)	≤ 150 mg/L or ≤ 30 mg/L
Velocity of flush dose	≥ 2 ft./sec. at distal end of longest lateral
Volume of a single dose	Minimum dose volume per zone shall be six times the liquid capacity of the drip laterals plus the liquid capacity of the supply and return manifold lines (which drain between doses) accounting for instantaneous loading and drain back
Volume of a flush dose	≥ Twice the void volume of all pressurized piping
Flush dose frequency	Flushing of system laterals and filters shall be in accordance with drip line manufacturer's recommendations
DWF from one- or two-family dwellings	≥ 150 gal/day/bedroom
DWF from public facilities	≥ 150% DWF per Table 4 or s. Comm 83.43 (6), Wis. Adm. Code
Wastewater particle size to drip line filter	≤ 1/8 inch

Table 1 **INFLUENT FLOWS AND LOADS** (continued)	
Wastewater particle size to drip line distribution piping network	≤ 100 micron
Distribution field area per emitter for drip line distribution network	4 ft^2

Table 2

SIZE AND ORIENTATION	
Area of distribution field	≥ DWF ÷ SLR for the most restrictive soil horizon within 12" below the infiltrate surface.
Linear loading rate for components with in situ soils having a SLR of ≤ 0.3 gal/ft^2/day within 12 inches infiltrative surface	≤ 4.5 gal/ft
Lateral Spacing	2 feet on center
Depth of cover over system laterals	≥ 6 inches to final grade

Table 3

OTHER SPECIFICATIONS	
Slope of original grade	≤ 25 % in area of distribution field
Vertical separation between distribution field and limiting factor	Equal to depth required by s. Comm 83 Table 83.44-3, Wis. Adm. Code
Check valve installation	Each lateral over 200 ft. long or elevation difference between high and low point of lateral ≥ 5ft.
Clean Outs	Clean outs shall be provided at the end of each supply and return manifold
Piping material	In conformance to Ch. Comm.84, Wis. Admin. Code.
Horizontal separation between cells	≥ 2 feet.
Bottom of distribution field for drip lines	≥ 6" of final grade
Capacity of Dose Chamber	≥ 2/3 DWF above pump on level and 1/3 DWF above high level alarm
Cover material	Soil that will promote plant growth
Stabilization	Cover material shall be stabilized.

Table 3 **OTHER SPECIFICATIONS** (continued)	
Frost Protection	All mechanical parts of the POWTs system shall be protected from frost by insulation or bury of sufficient depth as to prevent freezing.
Controls	Shall be installed to monitor flow events, variations in flow, and flush cycles for each zone, provide for automatic flushing, and pump run times
Installation inspection	In accordance with ch. Comm 83, Wis. Adm. Code and this manual
Drip line and emitters	Through plumbing product approval per ch. Comm. 84, Wis. Admin. Code. Drip lines must have a means in which to inhibit the accumulation of slime and bacterial growth. Emitters must have means of preventing root intrusion.
Pump	Rated by pump manufacture as an effluent or sewage pump
Dose tank	Meets requirements of chs. Comm 83 and 84, Wis. Admin. Code
Pump controls	Controls and float levels shall be synchronized to assure the minimum dose is available prior to initiating a dosing cycle to a zone and meet requirements of chs. Comm 83 and 84, Wis. Admin., Code
Electrical equipment and wiring	Meet requirements of ch. Comm 16 and 83, Wis. Admin. Code
Access to pump	Means of removing pump by not entering dose tank must be provided
Alarm or warning system	Meets requirements of ch. Comm 83, Wis. Admin. Code
Sewage treatment tank	Meet requirements of chs. Comm 83 and 84, Wis. Admin., Code
Sewage tank apparatus	Meet requirements of chs. Comm 83 and 84, Wis. Admin., Code
Management	In accordance with ch. Comm 83, Wis. Adm. Code and this manual

Table 4 Public Facility Wastewater Flows		
Source	**Unit**	**Estimated Wastewater Flow (gpd)**
Apartment or Condominium	Bedroom	100
Assembly hall (no kitchen)	Person (10 sq. ft./person)	1.3
Bar or cocktail lounge (no meals served)	Patron (10 sq. ft./patron)	4
Bar or cocktail lounge* (w/meals - all paper service)	Patron (10 sq. ft./patron)	8
Beauty salon	Station	90
Bowling alley	Bowling lane	80
Bowling alley (with bar)	Bowling lane	150
Camp, day and night	Person	25
Camp, day use only (no meals served)	Person	10
Campground or Camping Resort	Space, with sewer connection and/or service building	30
Campground sanitary dump station	Camping unit or RV served	25
Catch basin	Basin	65
Church (no kitchen)	Person	2
Church* (with kitchen)	Person	5
Dance hall	Person (10 sq. ft./person)	2
Day care facility (no meals prepared)	Child	12
Day care facility* (with meal preparation)	Child	16
Dining hall* (kitchen waste only without dishwasher and/or food waste grinder)	Meal served	2
Dining hall* (toilet and kitchen waste without dishwasher and/or food waste grinder)	Meal served	5
Dining hall* (toilet and kitchen waste with dishwasher and/or food waste grinder)	Meal served	7
Drive-in restaurant* (all paper service with inside seating)	Patron seating space	10
Drive-in restaurant* (all paper service without inside seating)	Vehicle space	10
Drive-in theater	Vehicle space	3
Employees (total all shifts)	Employee	13
Floor drain (not discharging to catch basin)	Drain	25
Gas station / convenience store	Patron (minimum 500 patrons)	3
Gas station (with service bay) Patron Service bay	 Patron Service bay	 3 50
Hospital*	Bed space	135
Hotel, motel or tourist rooming house	Room	65
Medical office building Doctors, nurses, medical staff Office personnel Patients	 Person Person Person	 50 13 6.5
Migrant labor camp (central bathhouse)	Employee	20

* = May be high strength waste

Table 4 **Public Facility Wastewater Flows** (continued)		
Source	**Unit**	**Estimated Wastewater Flow (gpd)**
Mobile Home (Manufactured home) (served by its own POWTS)	Bedroom	100
Mobile home park	Mobile home site	200
Nursing, Rest Home, Community Based Residential Facility	Bed space	65
Outdoor sport facilities (toilet waste only)	Patron	3.5
Parks (toilets waste only)	Patron (75 patrons/acre)	3.5
Parks (toilets and showers)	Patron (75 patrons/acre)	6.5
Public shower facility	Shower taken	10
Restaurant*, 24-hr. (dishwasher and/or food waste grinder only)	Patron seating space	4
Restaurant*, 24-hr. (kitchen waste only without dishwasher and/or food waste grinder)	Patron seating space	12
Restaurant, 24-hr. (toilet waste)	Patron seating space	28
Restaurant*, 24-hr. (toilet and kitchen waste without dishwasher and/or food waste grinder)	Patron seating space	40
Restaurant*, 24-hr. (toilet and kitchen waste with dishwasher and/or food waste grinder)	Patron seating space	44
Restaurant* (dishwasher and/or food waste grinder only)	Patron seating space	2
Restaurant* (kitchen waste only without dishwasher and/or food waste grinder)	Patron seating space	6
Restaurant (toilet waste)	Patron seating space	14
Restaurant* (toilet and kitchen waste without dishwasher and/or food waste grinder)	Patron seating space	20
Restaurant* (toilet and kitchen waste with dishwasher and/or food waste grinder)	Patron seating space	22
Retail store	Patron (70% of total retail area ÷ 30 sq. ft. per patron)	1
School* (with meals and showers)	Classroom (25 students/classroom)	500
School* (with meals or showers)	Classroom (25 students/classroom)	400
School (without meals or showers)	Classroom (25 students/classroom)	300
Self-service laundry (toilet waste only)	Clothes washer	33
Self-service laundry (with only residential clothes washers)	Clothes washer	200
Swimming pool bathhouse	Patron	6.5

* = May be high strength waste

Table 5
Maximum Soil Application Rates
Based Upon Morphological Soil Evaluations

Soil Textures	Soil Structure	Maximum Monthly Average BOD_5>30mg/L220mg/L TSS>30 mg/L≤150 mg/L (gallons / ft^2 / day)	Maximum Monthly Average BOD_5≤30mg/L TSS≤30 mg/L (gallons / ft^2 / day)
Course sand or coarser	N/A	0.4	1.6
Loamy coarse sand	N/A	0.3	1.4
Sand	N/A	0.3	1.2
Loamy sand	Weak to strong	0.3	1.2
Loamy sand	Massive	0.2	0.7
Fine sand	Moderate to strong	0.3	0.9
Fine sand	Massive or weak	0.2	0.6
Loamy fine sand	Moderate to strong	0.3	0.9
Loamy fine sand	Massive or weak	0.2	0.6
Very fine sand	N/A	0.2	0.6
Loamy very fine sand	N/A	0.2	0.6
Sandy loam	Moderate to strong	0.2	0.9
Sandy loam	Weak, weak platy	0.2	0.6
Sandy loam	Massive	0.1	0.5
Loam	Moderate to strong	0.2	0.8
Loam	Weak, weak platy	0.2	0.6
Loam	Massive	0.1	0.5
Silt loam	Moderate to strong	0.2	0.8
Silt loam	Weak, weak platy	0.1	0.3
Silt loam	Massive	0.0	0.2

Table 5 Maximum Soil Application Rates Based Upon Morphological Soil Evaluations (continued)			
Soil Textures	**Soil Structure**	**Maximum Monthly Average** BOD_5>30mg/L≤220mg/L TSS>30 mg/L≤150 mg/L (gallons / ft^2 / day)	 BOD_5≤30mg/L TSS≤30 mg/L (gallons / ft^2 / day)
Sandy clay loam	Moderate to strong	0.2	0.6
Sandy clay loam	Weak, weak platy	0.1	0.3
Sandy clay loam	Massive	0.0	0.0
Clay loam	Moderate to strong	0.2	0.6
Clay loam	Weak, weak platy	0.1	0.3
Clay loam	Massive	0.0	0.0
Silty clay loam	Moderate to strong	0.2	0.6
Silty clay loam	Weak, weak platy	0.1	0.3
Silty clay loam	Massive	0.0	0.0
Sandy clay	Moderate to strong	0.1	0.3
Sandy clay	Massive to weak	0.0	0.0
Clay	Moderate to strong	0.1	0.3
Clay	Massive to weak	0.0	0.0
Silty clay	Moderate to strong	0.1	0.3
Silty clay	Massive to weak	0.0	0.0

Note: > Means greater than ≤ means equal to or less than
N/A means not applicable

II. DEFINITIONS.

Definitions not found in this section are located in ch. Comm 81 of the Wisconsin Administrative Code or the terms use the standard dictionary definition.

A. "Distribution Field" - The area occupied by the drip line laterals that distributes effluent onto an in situ soil distribution area or fill material placed on a well tilled in situ soil area.

B. "Flush line" means a pipe connected to drip line laterals used to carry effluent back to septic or pretreatment tank (building sewer pipe or directly into tank if by means that will not upset contents of tank).

C. "Non-pressure compensating emitter" means a device located at each orifice within the drip line pipe, which does not regulates the rate of flow so that the effluent is discharged at a flow rate which is controlled by the hydraulic pressures in the drip line.

D. "Pressure compensating emitter" means a device located at each orifice within the drip line pipe, which regulates the rate of flow so that the effluent is discharged at the same rate of flow through variable hydraulic pressures in the drip line.

E. "Primary Waste Water Treatment" means method used to receive and treat sewage so as to separate solids from liquids and produce a clarified effluent.

F. "Sewage Tank Apparatus" means any device which is used in conjunction with a sewage treatment tank or dosing chamber which is not an integral part of the tank or chamber.

G. "Site plan" means a scaled or completely dimensioned drawing, drafted by hand or computer aided technology, presented in a permanent form that shows the relative locations of setback encumbrances to a regulated object. The site plan also includes a reference to north, the size of the parcel, on which the regulated object is placed, and permanent vertical and horizontal reference point or benchmark.

H. "Surge capacity" means a volume in a tank above the normal working level, which stores above average discharge of wastewater from the facility.

H. "Vacuum relief valve" means a valve that allows air to enter distribution field when negative pressure exists.

III. DESCRIPTION AND PRINCIPLES OF OPERATION.

POWTS drip line effluent dispersal components require primary wastewater treatment prior to receiving effluent at the dose chamber. After primary treatment the wastewater stream enters the dosing chamber. Pump and dosing controls are required to operate the dosing cycles and alarm systems. The wastewater stream is discharged or suctioned from the dosing chamber to filters that are located prior to the force main discharging to the distribution field. The wastewater stream shall be treated so as to remove solids $\geq$ 1/8" in size prior to entering the drip line filter. All primary treatment methods, dosing chambers and sewage treatment apparatus used are subject to approval under ch. Comm 83 and 84, Wis. Adm. Code, and local jurisdictions.

The filters that receive the discharged wastewater stream from the dosing chamber must be designed to prevent solids $\geq$ 100 microns in size from entering into the drip line effluent dispersal component. The filters shall be flushed no less than the minimum frequency required by the drip line manufacturer. A return discharge line shall be connected to the filters to carry the flushed filter effluent back to the primary treatment tank. The return discharge line shall be pitched at a minimum of 1/8 inch per foot. The discharge line may be connected to the return manifold line from the distribution field or directly connected to the building sewer at a distance of $\geq$ 4 ft from the primary treatment tank..

A second pipe connection is made to the filter discharge. This pipe is the force main which discharges the wastewater stream to the supply manifold. The supply manifold shall be installed at the highest elevation in the distribution field or within each zone. The discharge pipe, force main, return manifold pipe, supply and return manifolds shall be constructed of approved materials in accordance with ch. Comm 84, Wis. Admin. Code.

After receiving the wastewater flow from the force main the supply manifold discharges the wastewater stream to the drip line laterals through pressure rated pipe and fittings which are connected to the supply manifold and to the drip line laterals. The pressure rated pipe and fittings must be able to withstand the pressures to which the piping will be subjected too. The pressurized pipe and fittings shall be able to withstand deformation when covered by backfill materials. The pressure rated piping shall extend from the supply manifold into the distribution field ≥ 1 ft. prior to connecting to the drip line lateral. The drip line laterals shall not to be connected directly to the supply manifold.

The drip line laterals consist of tubing installed in parallel lines within one or more zones. The tubing incorporates evenly spaced emitters inside each tube. Emitter spacing is set at two feet. Emitters can be pressure compensating to give an even flow through a range of pressures or can be non-pressure compensating with pressures controlled by pump selection, pressure compensating valves or by some other means within the system design.

At the distal end of the drip line laterals connecting to a return manifold are again made with pressure rated pipe and fittings able to withstand the pressures to which the piping will be subjected too. The pressurized pipe and fittings shall be able to withstand deformation when covered by backfill materials. The pressure rated piping shall extend from the return manifold into the distribution field ≥ 1 ft. prior to connecting to the drip line lateral. The drip line laterals shall not to be connected directly to the return manifold. The return manifold shall be installed at a lower elevation than the supply manifold. The drip line's distal end is connected to return manifold to allow periodic line flushing. The drip line laterals shall be flushed no less than the minimum frequency required by the drip line manufacturer.

The wastewater stream flushed from the laterals is collected in the return manifold. From the return manifold a return manifold discharge pipe is connected to the building sewer. The return manifold discharge pipe shall be pitched at a minimum of 1/8 inch per foot. The return manifold line shall be connected to the building sewer at a distance of ≥ 4 ft from the primary treatment tank.

By using Table 5 to determine soil loading rates and soil will not reach saturated conditions. Physical entrapment, increased retention time, and conversion of pollutants in the wastewater are important treatment objectives accomplished under unsaturated soil conditions. The design criteria should be to load the system by applying water for only a total of 2 hours per day out of the available 24 hours. By applying doses in intervals several times per day, within 6" to 10" of the soil surface, wastewater effluent will also be taken up by the soil root zone and dissipated through evapo-transpiration during the growing season.

Drip line systems can be adversely affected by extended biological growth around the emitters because of the small orifice size of each emitter. The amount of flow each emitter is allowed to discharge per dose is dependent upon the influent concentrations of BOD_5 and TSS. Drip line systems are designed to distribute effluent frequently, and the greater the number of dosing cycles used the less chance the soil distribution system will become saturated.

The slow flow discharge from the emitters allows effluent to move along the emitter line as well as through the soil. The biological growth at the infiltrate surface will be affected by the organic content of the effluent at the infiltrate surface. An effluent of less than 30 mg/l of TSS and BOD_5 will contribute less of an organic load to the infiltrative surface area than will septic tank effluent with concentrations of up to 220 mg/L of BOD_5 and TSS of up to 150 mg/L. Loading rates for systems receiving effluent with concentrations at 30 mg/l of TSS and BOD_5 or less will be greater than the loading rates which use effluent with concentrations of up to 220 mg/L of BOD_5 and TSS of up to 150 mg/L.

IV. SOIL AND SITE REQUIREMENTS

Every drip line design is ultimately matched to the given soil and site.

The design approach presented in this manual is based on criteria that all applied wastewater is successfully transported away from the system, that it will not affect subsequent wastewater additions, and that the effluent is ultimately treated.

A. Minimum Soil Depth Requirements - The minimum soil factors required for successful drip line system performance is listed in the introduction and specification section of this package.

Soil evaluations must be in accordance with ch. Comm 85 of the Wis. Adm. Code. In addition, soil loading rates must be in accordance table 5 of this manual.

B. Other Site Considerations -

1. Slopes - The slope on which a drip line design can be installed may not be greater than 25%. All drip line laterals shall be installed on the contour. Non-pressure compensating emitters in drip lines are not to be installed in areas where the laterals would be installed having elevation differences in the distribution field exceeding 6 feet.

2. Drip line systems - In open areas, exposure to sun and wind increases the assistance of evaporation and transpiration in the dispersal of the wastewater.

3. Sites with trees and large boulders - Generally, sites with large trees, numerous smaller trees or large boulders are less desirable for installing a POWTs system because of difficulty in preparing the surface. This is because rock fragments, tree roots, stumps and boulders occupying the distribution area reduce the amount of soil available for proper treatment. A drip line system may still be installed even when the best site for the system contains these limitations. This is because the laterals can be installed with a limited amount of construction and around the obstructions such as large trees or boulders. It is also possible to overcome the restrictions presented by increased rock fragments by increasing dose cycles and increasing the area of the distribution field.

4. Setback distances - The setbacks specified in ch. Comm 83, Wis. Adm. Code for soil subsurface treatment/dispersal components apply to drip line systems. The edge of the distribution field is two feet from the centerline of the drip line lateral.

5. Drainage requirements - Depressions, gullies, drainage and erosion areas must be avoided to prevent overloading by surface runoff. Surface water must be intercepted and diverted away from all components of the drip line system. Site modification may be necessary to accomplish this.

V. COVER MATERIAL

A. Cover material - The cover material, when needed is of such quality and is placed so that it will encourage the growth of plants. Sands are not recommended, as they drain rapidly and allow more infiltration of precipitation into the distribution field. Also, clays are not recommended as they can restrict oxygen transfer. Often, excavated soil from the site can be used. Seeding or other means must be done to prevent erosion of the distribution field area.

VI. DESIGN

Influent Quality

The area needed for the distribution field is determined by the soil loading rates in table 5, the DWF and the quality of effluent provided to the drip line effluent component. The first step needed in determining the design of the drip line distribution field is to determine the type of primary wastewater treatment that will be used. The more extensive the primary wastewater treatment the less area will be needed for the distribution field. Approximately four times as much area is required for a distribution field when the primary wastewater treatment used is a septic tank. Septic tanks effluent contains contaminate loads of <30 mg/L FOG, TSS and BOD_5 that contributes to the build up of growth around the pipe and emitters more so than effluent from other primary treatment methods that have contaminate loads belowe $\geq$30 mg/L FOG, TSS and BOD_5 Regardless of the primary treatment system chosen, it must remove solids $\geq$ one eighth inch in size before discharging to filters installed ahead of the force main.

Step A: Dosing Chamber

1. Design Wastewater Flow (DWF) Calculations

Determine DWF for a system:

For One and two-family dwellings calculate DWF for one and two family dwellings use :

DWF = 150 gallons/day/bedroom

For Public Facilities calculate DWF for public facilities use:

DWF = Sum of each wastewater flow per source per day (from Table 4) x 1.5

2 Determining volume of Dosing Chamber

Choose the type of dosing chamber you are going to use. There are two types of dosing chambers. The first type is a pump chamber that has a submerged pump in the chamber. The second type is a pump chamber that has a pump located outside the dose chamber that suctions effluent. All dosing chambers must receive plumbing product approval in accordance with Ch. Comm. 84, Wis. Adm. Code.

Determine the size of the dose chamber that will be needed. The dosing chamber must have a surge capacity equal to 2/3 Daily Waste Flow (DWF) above the pump "ON" switch and a reserve capacity of 1/3 the DWF above the high water alarm. This is added to the volume below the pump "on" switch. The volume below the "on" switch will be determined by the number of inches from the bottom of the tank to the pump on switch and the volume of the tank in inches per gallon.

Volume =2/3 DWF + 1/3 DWF + (inches below pump on switch x chamber vol. (gal/in))

Note: Pump selection and filter size depends on total dynamic head and flow rates in gallon per minute. Because we have not calculated these yet, the pump sizing is covered in Step D.

Step B: Design of the Distribution field(s)

1. Determine the soil loading rate (SLR) for the site.

The soil loading rate equals the most restrictive soil application rate of the soil horizon within 12" below the infiltrate surface of the distribution field. Use Table 5 to determine the soil loading rate.

2. Determine the effective area of the distribution field(s).

The effective area of the distribution field is calculated by dividing design wastewater flow (DWF) by the soil loading rate (SLR).

*Area of the distribution field(s) = DWF ÷ SLR

3. Determine the length of drip line laterals needed.

Drip line laterals shall be spaced no closer than two feet on center. With this required spacing for laterals, the length of the drip line laterals can be determined by dividing the distribution area needed by the lateral spacing.

*Area of Distribution field(s) (ft^2) ÷ Lateral spacing (2 ft) = Drip line lateral (ft.)

Lateral line length may not exceed the manufacture's maximum lengths allowed for design pressure being used.

4. Determine number of emitters needed.

For this manual emitter spacing is set at two feet for determining the number of emitters needed. To determine the number of emitters needed divide the drip line lateral length needed by a two-foot spacing.

Drip line lateral length (ft.) ÷ emitter spacing (ft) = Number of emitters

5. Pressure compensating or non-pressure compensating drip lines.

Before the total flow for the system design can be determined the type of emitter used in the drip line laterals must be determined. Pressure compensating emitters will give a constant flow rate over a range of pressures. Non-pressure compensating emitter flow will vary dependent upon the pressure supplied.

Pressure compensating emitters are used where elevation differences within the area of the dispersal cell(s) ≥ 6 ft. Pressure compensating emitters have the same amount of friction loss as do non-pressure compensating emitters, but the flow rates for non-compensating emitters are affected more by the variations in the pressure supplied than are the pressure compensating emitters.

Step C Determine Total Flow For System.

The Minimum dose volume per zone shall be six times the liquid capacity of the drip laterals plus the liquid capacity of the supply and return manifold lines if the manifolds drain between doses.

1. Determine the dose volume to system **using non-compensating emitters**

Determine the number of times the system is to be dosed. Divide the DWF by the number of doses to determine the number of gallons needed per dose.

DWF ÷ Number of Doses = Volume per Dose.

Next divide the volume needed per dose by the number of emitters from Step B, 4. This will give the amount each emitter must discharge per dose.

Volume per Dose (gal.) ÷ # of emitters = Needed Emitter Flow Per Dose (gal)

The flow rates in Table 6 are for emitters at different pressures given in gallons per hour. If the manufacturer of non-compensating emitters has flow rates which differ from those shown in Table 6 they can be used as long as the manufacturers flow rates are submitted with the plan.

Non-compensating emitter drip lines need between 10 and 45 psi. Typically, flow rates per emitter will be determined base on the pressure available. Table 6 shows the flow rates that each emitter will have at varying pressures. Flow rates from the emitters are allowed a variance of ± 10%.

Table 6

Non-Pressure Compensating for ½" diameter drip lines

***Flow Rate vs. Pressure Loss**

Pressure Psi	Flow Rate Gal./Hr. (GPH)
10.0	0.93
12.5	1.00
15.0	1.13
17.5	1.18
20.0	1.30
22.5	1.41
25.0	1.47
27.5	1.51
30.0	1.63
32.5	1.70
35.0	1.76
37.5	1.79
40.0	1.82
42.5	1.86
45.0	1.89

*** Flow rates vary ± %5**

Select an emitter with a GPH that meets the needs of the design. To determine the flow per minute, divide flow in GPH by sixty minutes per hour.

Flow in GPH ÷ 60 min/hour = GPM per emitter.

The volume of the dose per cycle will determine how long the dosing cycles are for each cell based on the amount of flow per emitter. The minimum system pressure needed will be the minimum pressure needed to supply the longest lateral within the system with a minimum velocity of 2 feet per second at the distal end of the longest drip line lateral for each zone or in the drainage field.

2. <u>Determine the Dose Volume to System **Using Compensating Emitters**</u>

Determine the number of times the system is to be dosed. Divide the DWF by the number of doses to determine the number of gallons needed per dose.

DWF ÷ Number of Doses = Volume per Dose.

Next divide the volume needed per dose by the number of emitters from Step B, 4. This will give the amount each emitter must discharge per dose.

Volume per Dose (gal.) ÷ # of emitters = Needed Emitter Flow Per Dose (gal)

Compensating emitter drip lines have minimum and maximum pressures for which the drip line emitters are designed to operate properly. The emitters will generate consistent flow rates through the range of pressures specified by the manufacturer of the drip line. The flow rates and pressure ranges must be within the drip line manufacturer's recommendations. The flow rates and pressure ranges must within manufacture recommendations when designing the system. Flow rates from the emitters are allowed a variance of $\pm$ 10%. Select an emitter with a GPH that meets the needs of the design. To determine the flow per minute divide flow in GPH by sixty minute per hour.

Flow in GPH ÷ 60 min/hour = GPM per emitter.

The volume of the dose per cycle will determine how long the dosing cycles are for each cell based on the amount of flow per emitter. The minimum system pressure needed will be the minimum pressure needed to supply the longest lateral within the system with a minimum velocity of 2 feet per second at distal end of the longest drip lateral of each zone or the drainage field.

3. Supply Manifold sizing

Determine the number of drip line laterals needed for your distribution fields. Determine the length of each zone in the distribution field. Calculate the length of drip line needed, not exceeding the maximum distance allowed by manufacturer for each lateral, in each zone. If the length of lateral line is exceeded, the length must be shortened and lateral(s) added. For sites with soils having a SLR of ≤ 0.3 gal. / ft^2 / day within 12 inches of the infiltrative surface be sure not to exceed a linear loading rate of 4.5 gal/ft.

As part of the required maintenance for the systems, flushing of each drip line lateral is needed to remove solids from the drip line laterals so that emitters are not plugged. The frequency of flushing will be per recommendations of the drip line component manufacturer.

The supply manifold must supply the distal end of the longest lateral for the distribution field or zone with a minimum velocity of 2 feet per second at the distal end of the longest lateral within each zone or in the distribution field.

Using the number of gallons needed per dose from Step C, 1, determine the gallons per minute needed for each dose. This may be different for each zone. Select a manifold pipe size from table 7 that will supply the gallons needed at a minimum velocity of 2 feet per second to the distal end of the longest lateral in the distribution field or in each zone given the number of gallons per minute.

Table 7

FRICTION LOSS (FOOT/100 FEET) IN PLASTIC PIPE[a]

Flow in GPM	Nominal Pipe Size 3/4	1	1-1/4	1-1/2	2	3	4	6
1								
2								
3	3.24							
4	5.52							
5	8.34							
6	11.68	2.88						
7	15.53	3.83						
8	19.89	4.91						
9	24.73	6.10						
10	30.05	7.41	2.50					
11	35.84	8.84	2.99					
12	42.10	10.39	3.51					
13	48.82	12.04	4.07					
14	56.00	13.81	4.66	1.92				
15	63.62	15.69	5.30	2.18				
16	71.69	17.68	5.97	2.46				
17	80.20	19.78	6.68	2.75				
18		21.99	7.42	3.06				
19		24.30	8.21	3.38				
20		26.72	9.02	3.72				
25		40.38	13.63	5.62	1.39			
30		56.57	19.10	7.87	1.94			
35			25.41	10.46	2.58			
40			32.53	13.40	3.30			
45			40.45	16.66	4.11			
50			49.15	20.24	4.99			
60				28.36	7.00	0.97		
70				37.72	9.31	1.29		
80					11.91	1.66		
90					14.81	2.06		
100					18.00	2.50	0.62	
125					27.20	3.78	0.93	
150						5.30	1.31	
175						7.05	1.74	
200						9.02	2.23	
250						13.64	3.36	0.47
300							4.71	0.66
350							6.27	0.87

Velocities in this area Are below 2 feet per second

Velocities in this area Exceed 10 feet per second, which is Too great for Various flow rates and Pipe diameter

Note a: Table is based on – Hazen-Williams formula: $h = 0.002082L \times (100/C)^{1.85} \times (GPM^{1.85} \div d^{4.8655})$

Where: h = feet of head

L = Length in feet GPM = gallons per minute

C = Friction factor from Hazen-Williams (145 for plastic pipe)

d = Nominal pipe size

Note b: Velocities in gray areas exceed 5 feet per second and should be selected with caution.

4. Manifold Volume

After determining the size of the manifold to use, calculate the void volume for the supply manifold. The void volume of the supply manifold must be added to the dose volume to give the Total System Flow. Select the size manifold used from table 8 and multiply by the total length of manifold used.

Supply Manifold Length x Gallons/Foot = Total gallons for supply manifold

Table 8
VOID VOLUME FOR VARIOUS DIAMETER PIPES BASED ON NOMINAL I.D.[a]

Nominal Pipe Size	Gallons per Foot
¾	0.023
1	0.041
1-1/4	0.064
1-1/2	0.092
2	0.163
3	0.367
4	0.65
6	1.469

Note: a: Table is based on - πr^2 x 12"/ft ÷ 231 cu.in./cu.ft.
Where: r = nominal pipe size in inches

5. Force Main Volume

Select from Table 7 a force main pipe size that will be able to deliver a velocity of 2 feet per second at the distal end of the longest lateral in each zone or drainage field. The force main will need to first supply the supply manifold feeding the laterals. Once the size of the force main is selected, determine the volume of the force main by taking the void volume from table 8 and multiply the amount per gallon per foot by the length of the force main.

Force Main Length (ft) x Volume in (gal/foot) = Volume of Force Main in Gallons

6. Total Flow Requirement of System Per Dose

The total system flow will be the number of gallons needed to supply an individual zone when the distribution field is separated into more than one zone and each zone is dosed independently. The total system flow will be the number of gallons needed to supply each zone in a distribution field when all zones are of the same size and dosed at one time. Add to the dose volume for the zone or zones the volume of the supply manifold, force main, and suction line (if used.). The total system flow per dose will be then be:

(a) For Dosing chambers using a pump **inside** the chamber

Manifold (gal)+ Force Main (gal) + Dose (gal) = Total Flow per Dose (gal)

(b) For Dosing chambers using a pump **outside** the chamber

Manifold (gal)+ Force Main (gal) + Dose (gal) =

Total Flow per Dose (gal)

7. Return Manifold

The return manifold would be sized at the same size as the supply manifolds. The return manifolds are to be buried so as to drain by gravity to the return flush line and to be protected from freezing.

8. Return Flush Main

The return flush line is to be pitched a minimum of 1/8 inch per foot back to building sewer line. This connection to the building sewer must be ≥ 4 feet from the primary treatment tank so as to minimize disturbance in the primary wastewater treatment tank.

Step D Pump Sizing

To determine the pump size needed for your system, the friction and head losses must be determined. For friction and head loss it will need to be determined what the following losses are:

1. Suction Line (if pump outside of the dosing chamber is used)
2. Suction Lift (if pump outside of the dosing chamber is used)
3. Force Main
4. Supply Manifold
5. Pump, Filter, System Appurtenances and Pipe Fittings
6. Elevation Changes
7. Drip line lateral

1. Suction Line Friction Loss

Use the friction loss values found in Table 7 for the size pipe and GPM needed per dose. Divide the length of pipe used by 100 and multiply this times the friction loss value at the given GPM. Knowing GPM and Size pipe for Suction Line

(Suction Pipe Length (ft) ÷100) x Friction Loss Factor From Table 7
= Suction Line Friction Loss (ft)

2. Force Main Friction Loss

Use the friction loss values found in Table 7 for the size pipe and GPM needed per dose. Divide the length of pipe used by 100 and multiply this times the friction loss value at the given GPM. Knowing GPM and size pipe for Force Main:

Force Main Friction Loss (ft) = (Force Main Length (ft) ÷100) x Friction Loss Table 7

3. Supply Manifold

The supply manifold used to supply the lateral flushing dose to the lateral lines need to be large enough to supply the longest lateral in each zone or in the distribution field area with a minimum of velocity of 2 feet per second at the distal end. Use the friction loss values found in Table 7 for the size pipe and GPM needed per dose. Divide the length of pipe used by 100 and multiply this times the friction loss value at the given GPM.

(Manifold Length (ft) ÷100) x Friction Loss Factor From Table 7
= Supply Manifold Friction Loss (ft)

((Manifold Length (ft) x 2) ÷100) x Friction Loss Factor From Table 7
= Manifold Friction Loss (ft)

4. Filter, System Appurtenances Loss and Pipe Fittings

The friction losses through filter, system appurtenances and pipe fittings will be per manufacturer's specifications. These specifications must be taken into account when determining the total head loss for the system. System appurtenances include, but are not limited to, flow control valves, vacuum relief valves, water meters and pressure regulators.

5. Elevation Head Loss

Changes in elevation contribute to the total losses that need to be considered. To determine the amount of head loss, subtract the pump elevation from the elevation of the highest point in the distribution field.

Distribution field Highest Elevation (ft) - Pump Elevation = Head Loss (ft)

6. Drip Line Lateral Friction Loss

Friction losses for the drip line laterals are to be supplied by the manufacturer of the drip line. Take the longest drip lateral line in each zone or in the distribution field. Calculate the manifold supply pressure needed to supply a velocity of 2 feet per second at the distal end of the longest drip lateral of each zone or the drainage field.

This pressure is the minimum pressure needed to maintain drip line lateral operation as it is for the longest drip line lateral.

7. Total Friction Loss For System

To calculate the total friction loss for the system, per dose, sum up all of the combined friction losses. For friction loss 1 psi = 2.31 ft.

Suction Line (where used)	________ Ft.
Force Main	________ Ft.
Supply Manifold	________ Ft.
Filter, System Appurtenances and Pipe Fittings	________ Ft.
Elevation Changes	________ Ft.
Drip line lateral	________ Ft.
Required Distal End Head	0.1 Ft
Total Head Loss =	________ Ft

The size of pump needed for the system will be determined by the pressure and flow rate required to operate the system or by the pressure and flow rate required to flush the filter, **which ever is greater**.

VII. SITE PREPARATION AND CONSTRUCTION

Procedures used in the construction of a drip line effluent component are just as critical as the design of the component. A good design with poor construction results in component failure. It is emphasized that the soil only be worked when the moisture content is low to avoid compaction and smearing. Consequently, installations are to be made only when the soil is dry enough to prevent compaction and smearing of the infiltrative surface. The construction plan to be followed includes:

A. Equipment - Proper equipment includes tractors or other equipment that will not compact the infiltrate surface. No equipment shall cross the field areas during rainfall events, or when the site is above field capacity or water is standing over the site. Minimize traffic on infiltrate surface and avoid equipment traffic on or over infiltrate surface.

B. Sanitary Permit - Prior to the construction of the component, a sanitary permit, obtained for the installation must be posted in a clearly visible location on the site. Arrangements for inspection(s) must also be made with the department or governmental unit issuing the sanitary permit.

C. Construction Procedures

1. Check the moisture content and condition of the soil. If the soil at the infiltrate surface can be rolled into a 1/4-inch wire, the site is too wet, smearing and compaction will result, thus reducing the infiltrate capacity of the soil. If the site is too wet, do not proceed until it dries out. If the soil at or below the infiltrate surface is frozen, do not proceed.

   If soil moisture content and condition of soil allow, distribution field area shall be prepared in a manner, which minimizes site disturbance. The distribution field site should be cleared of all obstructions prior to bringing materials on site. The lateral lines can be directed around trees or bushes, which are desirable. The site shall be prepared as needed to enable a grass cover to be established and maintained prior to drip line lateral installation.

2. Set up a construction level, engineers or laser level and tape to assure conformation with natural contours and design requirements for sizing, location and separations to determine all relative elevations in relationship to the system benchmark.

3. It is suggested that the four-corners of the distribution field or of each zone within the distribution field be marked. The top two corners should be at the same elevation and the bottom two corners should be at a lower elevation. Because of freezing conditions the bottom drip line must be higher than the force main connection at the dozing chamber and the return flushing line connection to the building sewer. Reference stakes offset from the corner stakes are recommended in case corner stakes are disturbed during

construction. Lay out the distribution area(s) on the site so that the distribution field runs parallel with the land surface contours and is within the designated area.

4. It is recommended that the drip line laterals be staked out by use of a construction level, engineer's or laser level to assure conformation with natural contours, design requirements for sizing, location and separations.

VIII. INSTALLATION, OPERATION, MAINTENANCE AND PERFORMANCE MONITORING

A. Installation - The primary treatment tank(s) and dosing chamber should be installed such that the force main, filter and system flush return pipes can drain by gravity. This is important in that the return pipes must connect to the building sewer ≥ 4 feet upstream of the primary treatment tank. The dosing chamber shall be filled and water made available to determine systems function properly after installation.

1. Electrical Connections - Make sure all system electrical components are connected, to the system control panel, dose chamber pump, and alarms. Controls and float levels shall be set to assure the minimum dose is available prior to initiating a dosing cycle to the distribution fields or zone.

2. Control Panel -The designer must determine which type of control panel is applicable for the specific site. The control panel must be able to;

- monitor the volume per flow event (by use of a water meter or equivalent);
- provide for automatic flushing of filters and drip laterals with filtered effluent, initiated by a timer and/or a preset pressure differential across the filters;
- deliver designer-specified volumes of effluent to each field zone (adjustable and variable between zones) at designer-specified time intervals;
- monitor alarm conditions (high water, power outage);
- monitor flow variance indication when flow is + or - 20% of design;
- monitor pump run times, and
- monitor numbers and times of filter and field flushing cycles.

The system controls shall operate automatically so as to flush the filters and drip laterals as least as often as recommended by the drip line manufacturer.

Controls and float levels shall be synchronized to assure the minimum dose is available prior to initiating a dosing cycle to a zone. Minimum dose volume per zone shall be six times the liquid capacity of the drip laterals plus the liquid capacity of the supply and return manifold lines (which drain between doses). Minimum flushing volume per zone shall be two times the liquid capacity of the drip laterals plus the liquid capacity of supply and return and manifold lines (which drain between doses.)

3. Pump and Filter - The pump whether contained within the dosing chamber or located outside of the dosing chamber must be installed in accordance with manufacturer's

recommendations. If located outside of the dosing chamber, insulation to protect the pump from freezing shall be installed.

Provisions shall be made to remover solids ≥ 1/8" from the wastewater stream prior to reaching the drip line filter. A filter capable of removing solids ≥100 microns in size must be installed in accordance with manufacturer's recommendations. All supply lines and flush lines for the filter must be installed at a minimum 1/8" per foot from the filter so as to drain by gravity. The filter must be flushed at least as often as required by the drip line manufacturer.

Note: Never leave the drip line or PVC lines with open ends during the construction process. Close all exposed ends until permanent connections are made. Care must be taken to keep all construction debris from entering force mains, manifolds and drip line.

4. Force Main and Supply Manifold - Install the force main and supply manifold as per design specifications. The supply manifold is connected to the force main and shall be installed at the highest elevation of the distribution field or zone for field flushing purposes.

5. Drip line laterals - Drip line laterals shall be installed in accordance with manufacturer's recommendations for each site. The drip lines are not to be connected directly to the supply or return manifolds. Each drip line lateral shall be connected to a pressure rated pipe and fittings that can be deformed by back filling and connect to the supply or return manifold. The pressure rated pipe must extend ≥ 1 ft into the distribution field before connecting to the drip line laterals. A vibratory plow, static plow, or trencher is most typically used and soil moisture must be dry enough so that soil compaction will not occur. Hand placement of drip line laterals may be needed to go around trees or other obstructions left in the distribution field.

   Lay drip line laterals in trenches without kinks, or rocks or debris in direct contact. For laterals which contain loops prior to connection to the return flush manifold make the loop connection at the end of the drip line using a flexible pressure rated pipe assembly or rigid pipe assembly with two 90°elbows. Individual drip lines shall be designed and installed level, following the naturally occurring ground contour ≥ 6" below final grade.

   Extreme care must be taken during system installation to assure no extraneous debris enters the tank, supply lines, and drip line network. All open pipe connections in shall be closed so that debris does not enter these pipes during construction.

6. Install Return Manifold and Flush Line - Install return manifold so that it can be connected to pressure rated pipe and fittings at the end of the drip line laterals. Be sure that the return manifold is installed at lower elevation than the supply manifold. Connect the manifold to the return flush line. The return flush line shall connect to the building sewer ≥ 4 feet of the primary treatment tank so as not disturb the contents of the primary

wastewater treatment tank. The flush line shall drain be pitched at ≥ 1/8" per foot so that it will drain by gravity.

7. System Flush - Flush force main, supply manifold, drip line laterals, return manifold and return flush line to remove any soil, pipe shavings or other debris. Check for leaks at all exposed pipe joint. If leaks are found, repair the leaks and re-flush checking repairs.

8. System Appurtenance Installation - Field appurtenances including check valves, air relief valves, solenoid valves, flow monitoring sensors or counters, water meters and pressure regulators must be installed in accordance with approved system design and manufacturer's recommendations. When the manufacturer's recommendations are in conflict with approved plans, the approved plans will take precedence. At least one air release valve shall be installed at the high point of each distribution field or zone within a distribution field. Check valves, solenoid valves, pressure regulators; water meters and pressure monitoring fittings shall be installed per approved plans and drip line manufacturer's recommendations. Protect all appurtenances from freezing. A method of access shall be provided so appurtenances can be repaired. After installation, all mechanical components, pumps, pump cycling, filters, flushing sensors, high water alarms, water meters, event counters, telemetry systems (where installed) and other appurtenances are demonstrated to be fully operable in accordance with their design.

The drip line manufacturer's recommendations shall be followed for system startup. The design dosing pressures shall be checked to assure that the system is providing the design pressure to the distribution field or to each zone. The longest drip line lateral within each zone shall be checked to assure that a velocity of 2 ft. per second is provided at the distal end of the lateral. After the system has been inspected to assure all design criteria has been met, backfill of the system and its components may begin.

Fields shall be finish graded to shed surface water. Provisions shall be made to establish and maintain a vegetative cover.

B. Operation, Maintenance and Performance Monitoring

1. The system owner is responsible for the operation and maintenance of the drip line effluent component. The county, department or POWTS service contractor may make periodic inspections of the all parts of system.

The owner or owner's agent is required to submit necessary maintenance reports to the appropriate jurisdiction and/or the department.

2. Design approval and site inspections before, during and after construction are to be done by the county or other appropriate jurisdictions in accordance with this manual and ch. Comm 83, Wis. Adm. Code.

3. Routine and preventative maintenance aspects:

a. Primary treatment tanks and dosing chambers are to be inspected routinely and maintained when necessary or as specified in accordance with their approvals.

b. Inspections of the drip line effluent component are required at least twice every year. Inspections will include checking:

- the system to ensure flush and alarm systems are functioning properly;
- dose volumes registered on the water meter are acceptable in accordance with the system design dose; and
- wet or damp spots do not appear on the surface of the distribution field.

c. Vehicle traffic, except for lawn maintenance equipment, is not permitted on the drip line effluent component.

4. User's Manual: A user's manual is to accompany the component. The manual is to contain the following as a minimum:

a. Diagrams of all components and their location. This should include the location of the reserve area, if one is provided.

- Names and phone numbers of local health authority and component manufacturer or POWTS service contractor to be contacted in the event of component failure or malfunction.
- Information on the periodic maintenance of the component, including electrical/mechanical components.
- What activities can or cannot occur on the reserve area, if one is provided.
- Note that the dose chamber may fill due to flow continuing during pump malfunction or power outages. One large dose when the power comes on or when the pump is repaired may cause the drip line effluent component to have problems. In this situation, the pump chamber should be pumped by a licensed pumper before pump cycling begins or other measures shall be used to dose the conventional soil distribution component with only the proper amount of influent. This may include manual operation of the pump controls until such time the pump chamber has reached its normal level.

5. Performance monitoring must be performed on components installed under this manual.

a. The frequency of monitoring must be:

- At least twice every year following installation , and
- At time of a problem, complaint, or failure.

b. The minimum criteria addressed in performance monitoring of all system components are:

- Type of use,
- Age of component,
- Type of component,
- Nuisance factors, such as odors or user complaints,
- Mechanical malfunction within the component including problems with valves or other mechanical or plumbing components,
- Material fatigue or failure, including durability or corrosion as related to construction or structural design,
- Neglect or improper use, such as overloading the design rate, poor maintenance of vegetative cover, inappropriate cover over the component, or inappropriate activity over the component,
- Pretreatment component maintenance, including dosing frequency, structural integrity, groundwater intrusion or improper sizing,
- Pump chamber maintenance, including improper maintenance, infiltration, structural problems, or improper sizing,
- Ponding in distribution field, prior to the pump cycle, is evidence of development of a clogging mat or reduced infiltration rates.
- Pump malfunction including dosing volume problems, breakdown, burnout, or cycling problems, and
- Overflow/seepage problems, as shown by evident or confirmed sewage effluent, including backup.

6. Reports are to be submitted in accordance to ch. Comm 83, Wis. Adm. Code.

IX References

1. Innovative Wastewater system Approval No: IWWA-93-1R, "Perc Rite" Subsurface Wastewater Drip System, issued to Wastwater Systems, Inc., 4386 Lilburn Industril Way, Lilburn, GA, 30247 February 9, 1996, North Carolina Department of Environment, Health, and Natural Resources, Division of Environmental Health, Onsite Wastewater Section.

2. Converse, J.C., 1999. Drip Distribution of Domestic Wastwater. Small Scale Waste Management Project, University of Wisconsin-Madison, 1525 Observatory Drive, Madison, WI 53706

3. Lilburn Industrial Way. Lilburn, GA 30247 Perc-Rite, August 1994. Design Guidelines and Manual. Wastewater Systems, Inc. 4386

4. Geoflow Inc. 1996. Design and Installation Manual for On-Site Effluent Disposal of Wastewater -Systems larger than 1,000 Gallons. 307 - O W. Tremont Avenue, Charlotte, NC 28203

5. Geoflow Inc. 1996. Design and Installation Manual Subsurface Drip Systems Applied to Secondary Treated On-Site Effluent Disposal of Flows Less Than 1000 GPD. 307 - O W. Tremont Avenue, Charlotte, NC 28203

6. Gustafson, D. and Anderson, J.L.. Individual Sewage Treatment Systems Fact Sheet Series, Drip Irrigation. Department of Biosystems and Agricultural Engineering, University of Minnesota. 213 BioAgEng Building, 1390 Eckles Avenue, St. Paul, MN 55108-6005

7. Wisconsin Administrative Code, 1999. In-Ground Soil Distribution Component Manual For Private Onsite Wastewater Treatment Systems. Pub. No. SBD-10567-P (R.2/99). Wisconsin Department of Commerce, Safety and Buildings Division, 201 West Washington Avenue, Madison, WI 53707

8. Wisconsin Administrative Code, 1998. Single Pass Sand Filter Component Manual For Private Onsite Wastewater Treatment Systems. Pub. No. SBD-10595-P (N.5/98). Wisconsin Department of Commerce, Safety and Buildings Division, 201 West Washington Avenue, Madison, WI 53707

9. Development of Alternative On-Site Treatment Systems for Wastewater Treatment: A Demonstration Project for Northern Minnesota. Pub. No. NRRI/TR-97/10 501 Natural Resources Research Institute, University of Minnesota, Duluth, 5013 Miller Trunk Highway, Duluth, MN 55811

X. DRIP LINE WORKSHEET

A. SITE CONDITIONS

1. Evaluate the site and soils report for the following:

- Water movement by examining the soil profiles.
- Measure elevations and distances on the site so that slope, contours and available areas can be determined.
- Description of several soil profiles where the system will be located.
- Determine the limiting conditions such as bedrock, high groundwater level, soil permeability, and setbacks.

Slope - ____%

Occupancy: One- or Two-family Dwelling, # of bedrooms - ____

Public Facility ____(using table 4 x 1.5)

Depth to limiting factor - _____inches

In situ soil application rate used - _____ $gal/ft^2/day$

2. Design wastewater flow (DWF)

<u>One or Two-family Dwelling.</u>

DWF = 150 gal/bedroom x # of bedrooms

= 150 gal/bedroom x _____# of bedrooms

= ___________ gal/day

<u>Public Facilities.</u>

DWF = Sum of each wastewater flow per source per day x 1.5

= _________ gal/day x 1.5

= _________ gal/day

B. Distribution Field Sizing

1. Determine the Soil loading rate (SLR) for the site.

From Table 5 in this manual, select the effluent application rate for the most restrictive soil horizon within 12" below the infiltrate surface of the distribution field. Depending on the level of treatment of the effluent, the effluent application rate selected from Table 5 will be the soil loading rate (SLR) for the site.

SLR = _____ gpd/ft^2

2. Determine the distribution field area.

Calculate the distribution field area by dividing the daily design wastewater flow (DWF) by the soil loading rate (SLR).

Distribution field area = DWF ÷ SLR

Distribution field area = _____ gpd ÷ _____ gpd/ft^2

Distribution field area = _____ ft^2

3. Determine the total length of drip line lateral needed.

The width for spacing between drip line laterals is 2 feet apart on center. Knowing this as the width between laterals, determine the length of laterals that will be needed.

Calculate the total length of drip line needed for the system by dividing the distribution field area by 2 feet.

Total Length of Drip Line Lateral Needed = Distribution Field Area ÷2 feet

The maximum length of a drip line lateral that can be installed in a distribution field drainage field or zone shall not be greater than the drip line manufacturer maximum length requirement. Knowing the area available and the maximum lengths allowed will determine the number of drip laterals needed.

The linear loading rate for components with in situ-soil having a soil application rate of $\leq$ 0.3 gal/ft^2/day within 12 inches below the infiltrative surface area of the distribution field or zone can not exceed $\leq$ 4.5 gal/ft.

Total Length of Drip Line lateral = _____ ft

4. Determine the number of emitters needed.

Emitter spacing is set at two feet apart. Knowing this, calculate the number of emitters needed by dividing the total length of drip line lateral needed by 2.

Number of emitters needed = Total length of drip line laterals needed ÷ 2

5. Determine dose volume needed per emitter

Dose volume per emitter is determined by the quotient of the DWF divided by number of doses per day and dividing this by the number of emitters needed.

Dose volume per emitter = (DWF ÷ ____ doses per day) ÷ number of emitters

Emitter flow is given in gallons per hour from most manufacturers. Divide the Emitter flow by 1 hour/60 minutes to get the emitter flow per minute.

Emitter Flow Per Minute = Emitter Flow Per Dose ÷1 hour/ 60 minutes

The emitter flow volumes vary dependant upon the drip line lateral manufacturer and whether non-pressure compensating or pressure compensating emitters are used. Non-compensating emitters have flow rates that depend upon the pressure available in the lateral line. Pressure compensating emitters will have a predetermined flow through a range of pressures.

XI. EXAMPLE WORKSHEET DRIP LINE EFFLUENT COMPONENT

A. SITE CONDITIONS

Evaluate the site and soils report for the following:

- Surface water movement.
- Measure elevations and distances on site to determine slope, contours and available areas.
- Description of several soil profiles where the system will be located.
- Determine the limiting conditions such as bedrock, high groundwater level, soil permeability, and setbacks.

Slope - 2 %

Occupancy: One- or Two-family Dwelling, # of bedrooms - 3

Public facility ____

Depth to limiting factor - 60 inches

In situ soil application rate within 12" below infiltrate surface used - 0.8 gal/ft^2/day

B. DESIGN WASTEWATER FLOW (DWF)

One- or Two-family Dwelling.

DWF = 150 gal/day/bedroom x # of bedrooms

= 150 gal/day/bedroom x 3 # of bedrooms

= 450 gal/day

Public Facility.

DWF = Sum of each wastewater flow per source per day x 1.5

= ________ gal/day x 1.5

= ________ gal/day

C. DISTRIBUTION FIELD AREA

1. Determine the soil loading rate (SLR) for the site.

From Table 5 of this manual,.select the effluent application rate for the most restrictive soil horizon within 12" below the infiltrate surface. The effluent application rate selected from Table 5 of this manual is the soil loading rate (SLR) for the site.

SLR = 0.8 gpd/ft^2

2. Determine the distribution field area.

Calculate area by dividing the DWF by the soil loading rate (SLR).

Distribution field area = DWF ÷ SLR

Distribution field area = 450 GPI ÷ 0.8 GPI/ft^2

Distribution field area = 563 ft^2

3. Determine total length of drip line lateral needed.

Total Length of Lateral = 563 ft^2 Distribution field area ft^2 ÷ 2 ft Lateral Spacing

Total Length of Lateral = 282 ft.

1. Determine number of emitters needed

Number of Emitters Needed = 282 ft Total Length of Lateral ÷ 2 ft Emitter Spacing

Number of Emitters Needed = 141 Emitters (always round up)

2. Distribution field area in size. Selecting a dosing frequency of 12 time per day:

Dose Volume = 450 gpd DWF ÷ 18 Doses/day (12/ doses/day is minimum)

Dose Volume = 25 gallons per dose

Dose Volume Flow Rate per Emitter = 25 gallons per dose ÷141 Number of Emitters

Dose Volume Flow Rate per Emitter = 0.17 gallons per dose per emitter

Emitter flow rates are given in gallons per hour. To determine the flow rates needed per emitter divide the emitter flow rate from the manufacturer of the drip line by 1hour/60 min.

The manufacturer will state the flow that an emitter discharges. Given an emitter flow rate of 1.13 gallons per hour divide the flow rate by 1 hour/60 minutes.

Emitter Flow rate in GPM = 1.13 gallons per hour ÷ 1 hour/ 60 minutes

Emitter Flow rate in GPM = 0.019 gallons per minute

Multiply the number of emitter by the gallons per minute per emitter. This will give the volume per dose per minute of time of each dose.

Total Volume of dose per minute = 0.019 gallons per minute/emitter x 141 Emitters

Total Volume of dose per minute = 8.9 gallons per minute

Using a single dose volume of 25 gallons per dose, dose time would be:

Dose time = 25 gallons per dose ÷ 8.9 gallon per minute

Dose time = 2.8 minutes per dose

XII PLAN SUBMITTAL AND INSTALLATION INSPECTION

A. Plan Submittal

In order to install a system correctly, it is important to develop plans that will be used to install the system correctly the first time. The following checklist may be used when preparing plans for review. The checklist is intended to be a general guide. Conformance to the list is not a guarantee of plan approval. Additional information may be needed or requested to address unusual or unique characteristics of a particular project. Contact the reviewing agent for specific plan submittal requirements, which the agency may require that are different than the list included in this manual.

General Submittal Information

- Photocopies of soil reports forms, plans, and other documents are acceptable. However, an original signature is required on certain documents.
- Submittal of additional information requested during plan review and questions concerning a specific plan must be referenced to the plan identification indicator assigned to that plan by the reviewing agency.
- Plans or documents must be permanent copies or originals.

Forms and Fees

- Application form for submittal, provided by reviewing agency along with proper fees set by reviewing agent.
- Onsite verification report signed by the county or appropriated state official.

Soils information

- Complete Soils and Site Evaluation Report (form # SBD-8330) for each backhoe pit described; signed and dated by a certified soil tester, with current customre I.D. nubmer.
- Separate sheet showing the location of all borings. The location of all borings and backhoe pits must be able to be identified on the plot plan.

Documentation

- Architects, engineers or designers must sign, seal and date each page of the submittal or provide an index page, which is signed, sealed and dated.
- Master Plumbers must sign, date and include their license number on each page of the submittal or proved an index page, which is signed, sealed and dated.
- Three completed sets of plans and specifications (clear, permanent and legible); submittals must be on paper measuring at least 8-1/2 by 11 inches.

Plot Plan

- Dimensioned plans or plans drawn to scale (scale indicated on plans) with parcel size or all property boundaries clearly marked.
- Slope directions and percent in system area.
- Benchmark and north arrow.
- Setbacks indicated as per appropriate code.
- Two-foot contours to 25 ft. either sided of system area or include elevations at all four-corners of proposed system.
- Location information; legal description of parcel must be noted.
- Location of any nearby existing system or well.

Plan View

- Dimensions for distribution field(s).
- Pipe lateral layout, number of laterals and location of and number of clean outs.
- Manifold and force main locations
- Flush return lines from filter and system and distance from primary treatment tank to building sewer flush line connection
- length and diameter of all pipes except laterals.

Cross Section of System

- Lateral, manifold, and flush line elevation
- Type of cover material and depth
- Minimum and maximum depths of piping below original and final grades.

System Sizing

- For one- and two-family dwellings the number of bedrooms must be included.
- For public buildings, the sizing calculations must be included.
- Volume of all pressurized pipes

Tank and Pump

- All construction details for site-constructed tanks.
- Size and manufacturer information for prefabricated tanks.
- Notation of pump model, pump performance curve, friction loss for force main and calculation for total dynamic head.

- Cross-section of dosing chamber including storage volumes; connections for piping, and electricity; pump "off" setting; dosing cycle and volume; and location of vent and manhole.
- Cross-section of primary treatment tank(s).

MATERIAL SPECIFICATIONS

- Provide from manufacturer of drip line:
  1. drip line manufacturer name, model and size of pipe material;
  2. flow rate per emitter;
  3. type of drip line used (compensating or non-compensating);
  4. filter and field flush cycles required;
  5. maximum allowed length for a single lateral; and
  6. number and spacing of emitters.
- Provide from manufacturer of pressurized pipe connecting supply and return manifolds to drip line pipe;
  1. manufacturer name, model and size of pipe and fitting material;
  2. pressure rating for pipe;
  3. description of the joint connection to a manifold and drip line lateral; and
  4. list of standards to which the pipe conforms
- Provide from manufacturer system filters
  1. manufacturer name, model and size of particles the filter will remove;
  2. pressure rating for filter; and
  3. means in which the filter will be protected from freezing.

B. <u>Inspections</u>

Inspection shall be made in accordance with ch. 145.20, Wis. Stats. and s. Comm 83.26, Wis. Adm. Code. The inspection form on the following two pages may be used. The inspection of the system installation and/or plans is to verify that the system at least conforms to specifications listed in Tables 1 - 3 of this manual.

POWTS INSPECTION REPORT

(ATTACH TO PERMIT)

GENERAL INFORMATION

Permit Holder's Name	☐ City ☐ Village ☐ Town of	County	Sanitary Permit No.
State Plan ID No.	Tax Parcel No.	Property Address if Available	

TANK INFORMATION			**SETBACKS**				
TYPE	MANUFACTURER	CAPACITY	P/L	WELL	BLDG.	VENT TO AIR INTAKE	ROAD
SEPTIC							
DOSING							
AERATION							

PUMP INFORMATION

Manufacturer:	Model No.	Demand in GPM	Vert. Lift

FORCE MAIN INFORMATION			**FRICTION LOSS**		
Length	Diameter	Dist. To Well	Component Head	TDH - As Built	TDH - Design

SOIL DISTRIBUTION COMPONENT

TYPE OF COMPONENT				COVER MATERIAL		
Cell Width	Cell Length	Cell Diameter	Cell Depth	Horizontal Separation	Liquid Depth	No. of Cells

SETBACK INFO.	Property Line	Bldg.	Well	Lake/Stream	Flush Connection to Building Sewer Distance to tank

DISTRIBUTION COMPONENT / Elevation data on back of form

Supply Manifold		Return Manifold		Distribution Pipe(s)			Emitter Spacing
Length	Dia.	Length	Dia	Length	Dia.	Spacing	

SOIL COVER

Depth over center of cell:	Depth over edge of cell:	Depth of Cover material	Seeded / Sodded	Mulched

DEVIATIONS FROM APPROVED PLAN

DATE OF INST. DIRECTIVE:	DATE OF ENFORCEMENT ORDER:
DATE OF REFERRAL TO LEGAL COUNSEL:	

COMMENTS (Persons present, discrepancies, etc.)

COMPONENTS NOT INSPECTED

Plan Revision Required ☐ Yes ☐ No	Date:	Signature of Inspector:	Cert. Number

Sketch on other side

ELEVATION DATA

Point	Back sight	Height of instrument	Foresight	Elevation	Comments
Bench mark					
Bldg. sewer					
Tank inlet					
Tank outlet					
Tank inlet					
Tank outlet					
Dose chamber inlet					
Bottom of dose chamber					
Dist. Longest lateral zone 1					
System elev. 1					
Dist. Longest lateral zone 2					
System elev. 2					
Dist. Longest lateral zone 3					
System elev. 3					
Grade elev. 1					
Grade elev. 2					
Grade elev. 3					

SKETCH OF COMPONENT & ADDITIONAL COMMENTS