Standard Drip Irrigation Onsite System

for the

Boy Scouts of America

October 27, 2003

PREPARED BY:

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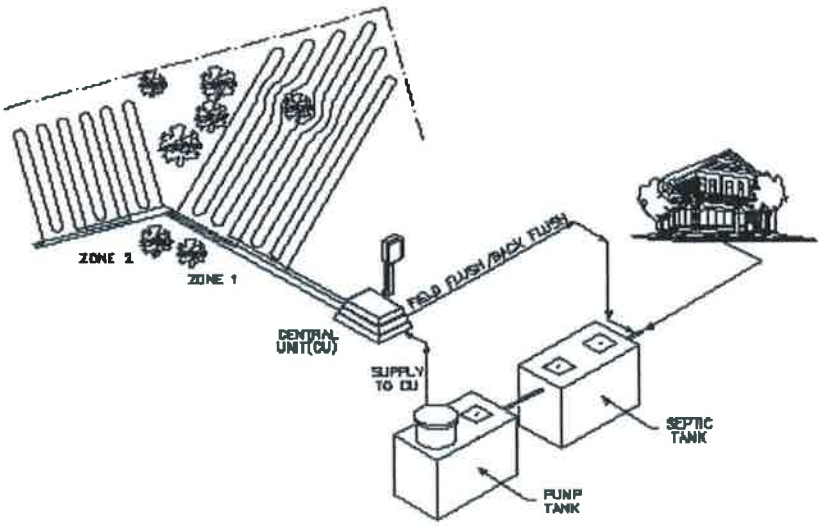
1.0 INTRODUCTION

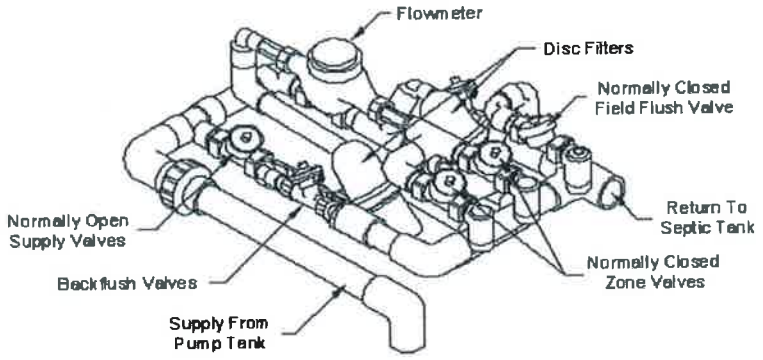
North American Wetland Engineering P.A. (NAWE) was retained by the Boy Scouts of America (BSA) to develop a simple drip irrigation system suitable for onsite wastewater treatment at Scout camps across the United States. Drip irrigation systems are easy to install, utilize odd-shaped areas well, and can be configured around trees and other site features. Similar drip irrigation systems are already in use at Philmont Scout Ranch.

Figure 1.1 Conventional Drip Irrigation System



Conventional drip irrigation systems use a headworks unit consisting of solenoid valves and filters combined with a control panel capable of operating all of the valves sequentially. These headworks units allow one pump to sequentially pressure dose and flush multiple drip zones.

Figure 1.2 Conventional Drip Irrigation Headworks (not recommended for Boy Scout use)

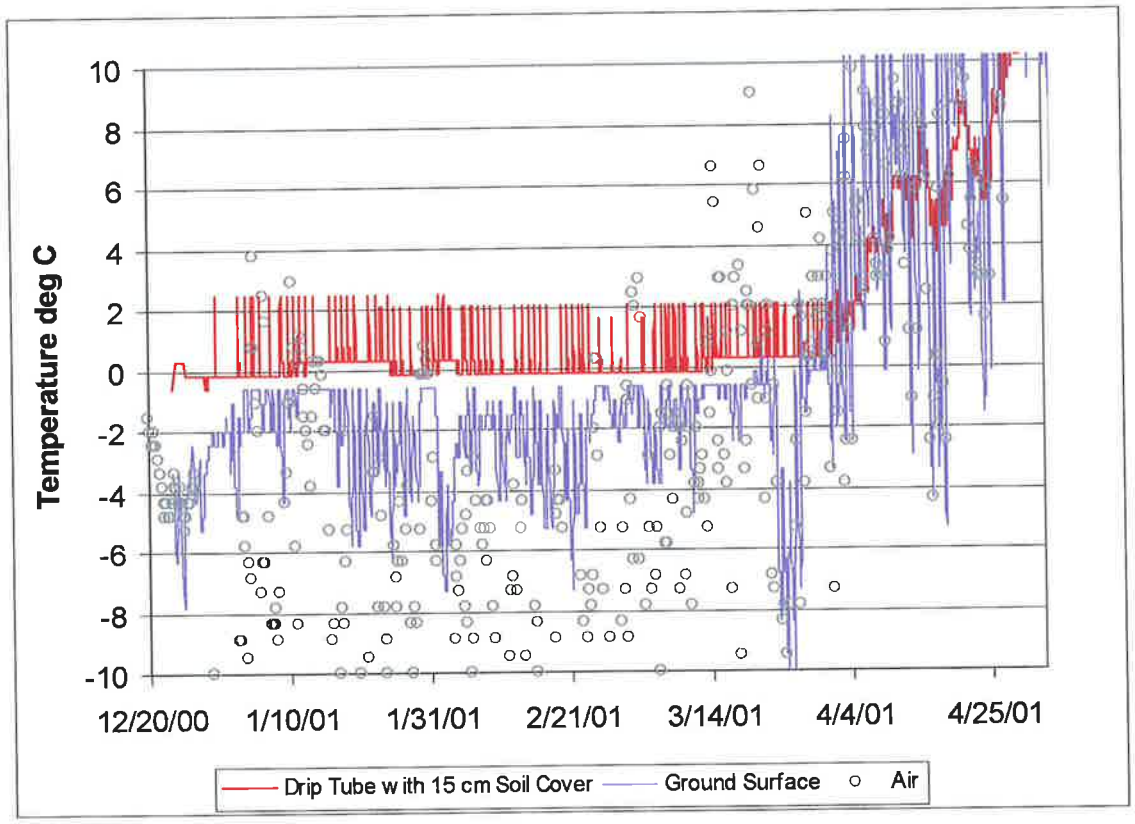


These systems are complicated. Given the remote location of these systems on Scout camps, the availability of readily available replacement parts is problematic. Complex control sequences are difficult to set up and troubleshoot, imposing added time demands on maintenance staff that are already spread too thin.

1.1 WINTER CONDITIONS

Operation of drip irrigation systems in freezing environments creates additional demands. Research in Minnesota has shown that except when the drip system is being dosed, temperatures at the emitter tubing will be below freezing. This means that drip systems designed to operate year-round in cold climates must be designed to drain back between dosing events, since stagnant water will freeze and plug the system.

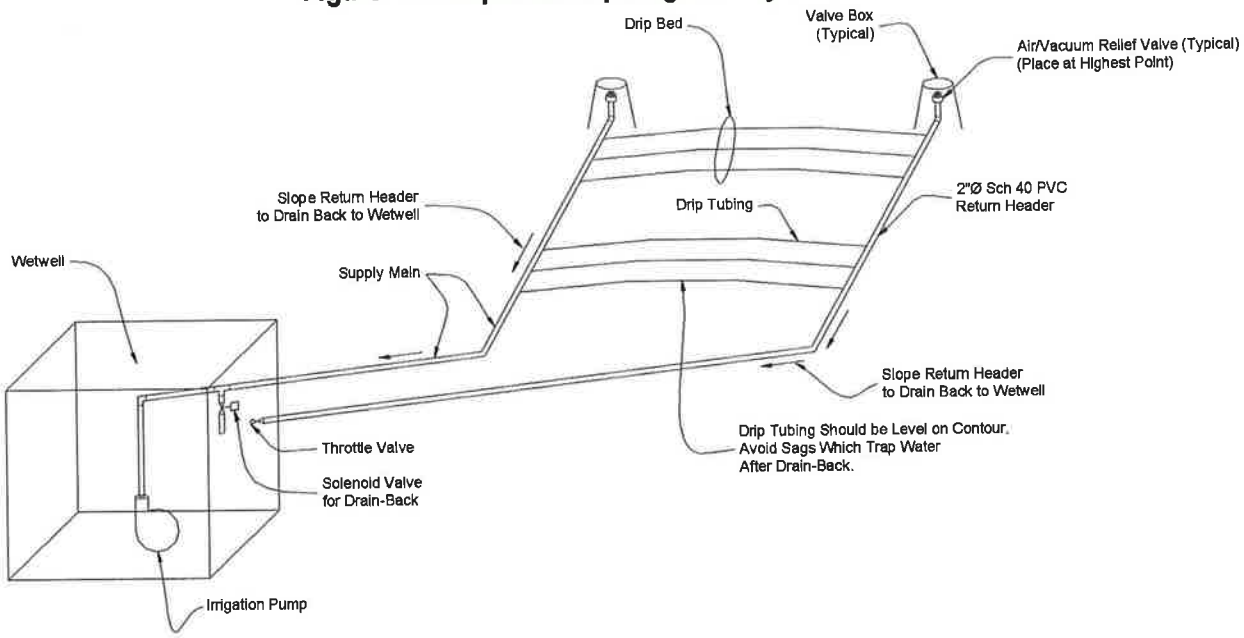
Figure 1.3 Winter Temperatures for Drip Irrigation System at Columbus Elementary School, Forest Lake Minnesota



Systems that do not operate in the winter must either drain back or be blown out with compressed air. This is especially true for headworks units, which are very susceptible to freezing damage.

Experience with cold-climate operation of drip irrigation systems in Minnesota and other states has lead to the development of a simplified drip irrigation system that does not require a headworks unit:

Figure 1.4 Simplified Drip Irrigation System



1.2 THEORY OF OPERATION – SIMPLIFIED DRIP SYSTEM

When the irrigation pump is energized (either by a float switch for an on-demand system or a timer switch for time-based dosing) the motor operated drain-back valve closes. Water is pumped into the drip irrigation zone via the supply main and flows through the emitter lines to the return header. Water in the return header flows back to the pump tank.

By partially opening or closing the throttle valve on the return header (a manual operation), only part of the flow is allowed to return back to the tank. This sets a back pressure in the drip irrigation zone. The back pressure forces the air out of the system and closes the air/vacuum relief valves at the end of the supply main and return header pipes. One the air/vacuum relief valves close, the water pressure builds up and forces water out the drip irrigation emitters. Typically, the field pressure is measured at the air release valve farthest away from the drip tank once a month during the operating season. The field pressure can be adjusted up or down by manually adjusting the throttle valve so that less flow (higher field pressure) or more flow (lower field pressure). Typically, the field pressure is set between 20 and 30 pounds per square inch (psi).

While the zone is being dosed, approximately 25 gallons per minute (gpm) is pumped out to the zone and about 5 gpm is returned back to the pump tank. The other 20 gpm is lost through the drip emitters. This forward flow (continuous flush) of the drip zone helps push any sediment back to the pump tank and prevents stagnant water from sitting in the drip tubing, which could freeze during winter operation.

There is a screen filter on the pump outlet. This screen filter cleans itself by a spinning action. The blowdown is directed to a threaded drain at the bottom of the filter housing. In a conventional headworks system, a solenoid valve is used to open the blowdown during a discrete flushing phase of the dosing cycle. In the cold-climate system, a ball valve is screwed on to the blowdown outlet. The ball valve is manually cracked open to create a continuous flushing of the screen filter. The blowdown discharge drains back into the pump tank. The blowdown valve has to be cracked open for cleaning of the screen filter to occur.

When the pump shuts off (after a predetermined time for time-based dosing or when the float switch drops on an on-demand system), the control panel directs the motor-operated drain back valve to open. Water then begins to flow back through the supply main, which is sloped to drain back to the pump tank. Water can also flow back through the partially-open through the return header, which is also sloped back to the pump tank.

The supply main and return header pipes are lower than the drip emitter lines, so that water in the emitter lines will drain to either the supply main or return header pipes. To prevent a vacuum from forming during drain-back (which could suck soil particles into the emitters), the air/vacuum relief valves open, allowing air to enter the system, promoting rapid drain back of the water. Water can stand in the screen filter housing, which could freeze and crack the housing if not drained. However, if the blowdown valve is cracked open (as it should be) this allows the water in the screen filter housing to drain once the pump is off.

To prevent freezing in winter operation, a properly operating system should completely drain back in approximately 5 minutes.

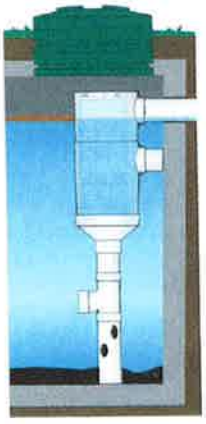
2.0 OPERATION AND MAINTENANCE PROCEDURES

2.1 SEPTIC TANKS – Concrete septic tanks remove settleable and floatable solids from the wastewater before it flows to the drip irrigation pump tank. The outlet of the septic tank should contain a set of effluent brush filters.

Recommended Maintenance – An annual inspection of the baffles is needed to make sure they are intact and properly working. The scum and sludge depth inside the tank should be measured annually. The tanks will need to be pumped by a licensed septic pumper every one to three years (continuous operation) or when sludge buildup is within 1 foot of the bottom of the baffle outlet.

2.2 SEPTIC TANK EFFLUENT FILTER – In the outlet of the last septic tank in each series are the septic tank effluent brush filters. The filters prevent large solids from exiting the tank and flowing into the constructed wetland.

Recommended Maintenance - Semi-annual cleaning of the filter is required. Cleaning is accomplished by removing the filter from its canister in the tank and washing off any debris. This is best accomplished with a high-pressure washer using tap water. No chemicals or soaps should be needed. The brush filters should be cleaned over the first set of septic tanks so that sloughed solids will fall back into the septic tank. Once cleaned, the brush filters should be reset into the filter housing. Alternatively, new filters can be purchased to replace the existing brush filters. Additional filters can be ordered through GAG Sim/Tech at 888-999-3290.

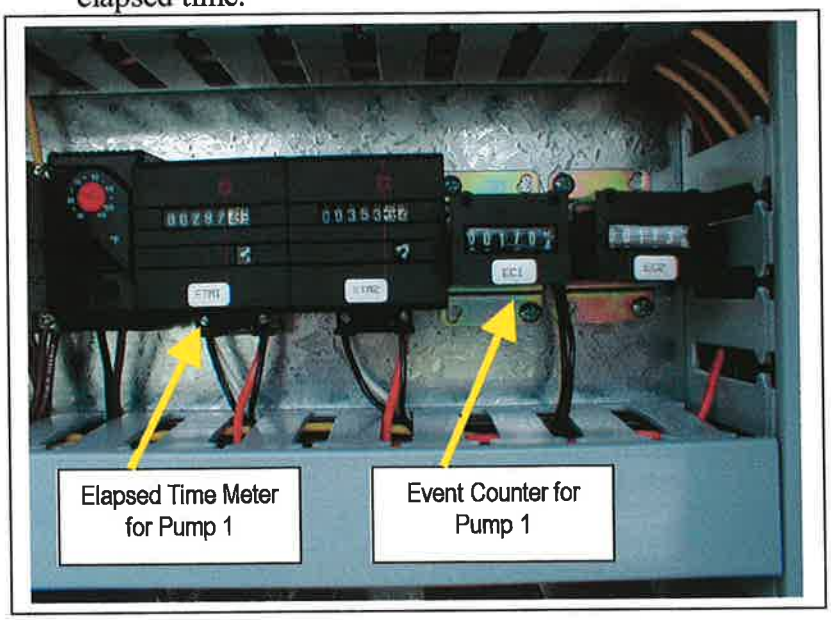


2.3 DRIP IRRIGATION PUMPS AND CONTROL PANEL – There is one pump for each drip irrigation zone. When activated, each pump discharges water to the appropriate drip irrigation zone.

The control panel is a lockable, weather-tight enclosure. Inside the front door there are counters, lights and switches.

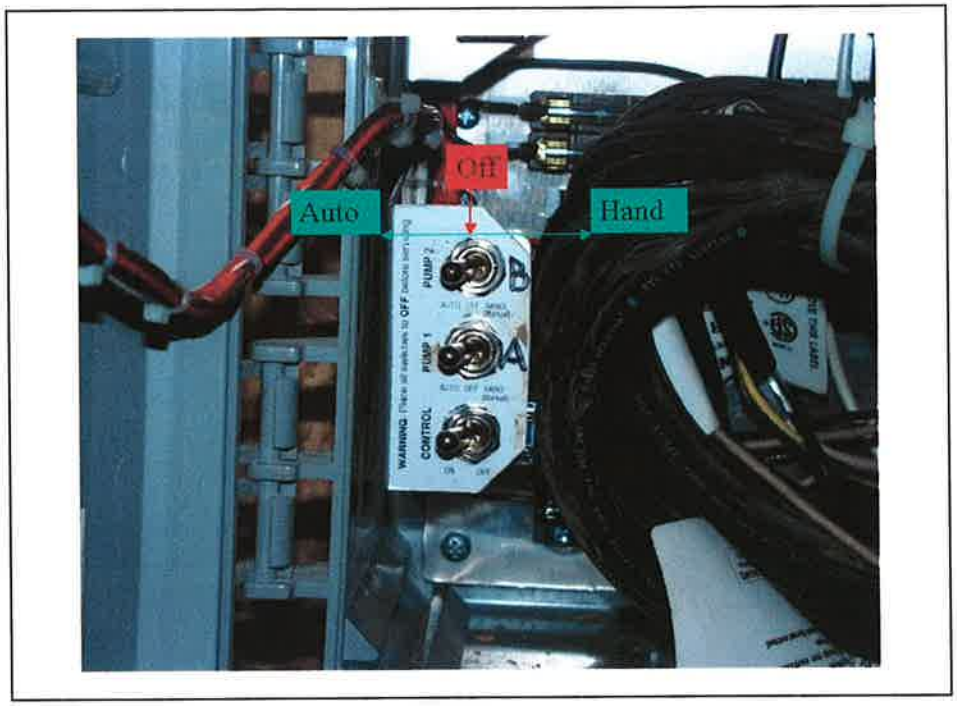
For each pump there is:

1. **Event Counter** - This device records the number of pump cycles.
2. **Elapsed Time Meter** – This device records the pump run elapsed time.



3. **Run Light** – The light is on when the pump is running.
4. **HOA switch** -
   a. **Hand** (or Manual)- In this setting the pumps should run. If the pump does not run, check the circuit breaker to make sure power is available. If the pump still does not run, contact an electrician to determine the nature of the problem.
   b. **Off** - In this setting, the pumps should be off.
   c. **Auto** - In this setting, the pumps are controlled by either the timers (time-based dosing) or the float switches (on-demand dosing). If time-based dosing is used, the timer has adjustable dials and unit settings to

set the duration of the pump cycling. (Example: 5 minutes off and 12 minutes on) When the pumps are in **Auto**, the cycle starts in the "off" period. Thus, if the operator has set the timer to 5 minutes off, the pumps will start in five minutes.



Addition devices in panel:

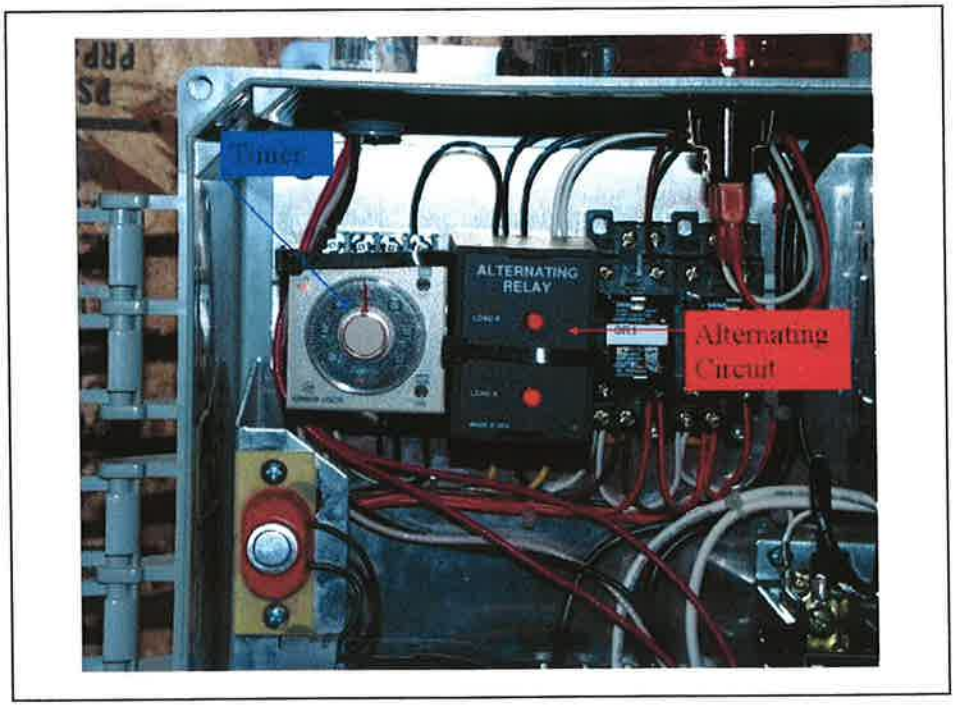
1. **High Water Level Alarm Test** – Pushing the button should test light and alarm on top of panel.
2. **Low Level Light** – Light is illuminated when the low water level float is engaged (pumps will not run in 'auto' with low water in tank).
3. **High Water Level Light** – Light is illuminated when the high water level float is engaged.

Located inside the control panel are small electrical devices used to control the systems pumping functions.

1. **Starters** – Magnetic starters are used to initiate the electrical current to the specified pump. The starters are rated for at least 25% more power than the pump will require for initial start up and

have thermal magnetic circuit breakers, which will shut down if the power pull exceeds the 25%.

2. **Timers** – (***Only used for time-based dosing systems***) The timers in the control panel operate how long the pumps run in the on and off mode. The timers need to be set-up initially based upon the anticipated amount of time it takes to pressurize the drip irrigation lines and to dispose of a certain amount of water. Each zone can be set up with a different on and off time because the pipe runs from the manhole to the drip irrigation zones are different. The Operator is able to measure the amount of time it takes to pressurize the drip irrigation lines by observing when the air release valves "seat". When this occurs, the drip irrigation system begins to discharge water to the zone. Set the timers to discharge water equally with the amount of time per zone in accordance with the size of each drip irrigation zone (some zones may be smaller than others and/or closer to the pump tank).
3. **Alternating Circuit** – (***Only used for systems with more than one pump***). These devices automatically switch operation between two or more pumps. Since there is one pump per zone, multi-zoned drip systems will have more than one pump.



4. **Heater** – A condensation heater is installed to prevent the build-up of moisture within the panel and to ensure the panel does not

freeze. The thermostat should be set to approximately 50 degrees F.

If power problems arise the starters should be inspected to ensure the devices are operating properly

SYSTEM SAFETY DEVICES

1. **Low Level Cutoff** – If the water level in the drip irrigation tank gets too low, the low-level float switch will prevent the pumps from running dry. The pumps will not start again (regardless of the timer switch setting) until there is adequate water in the drip irrigation tank.

2. **High Water Level Alarm** – If the water level in the drip irrigation tank gets too high, a float switch will trigger an alarm light located on the exterior of the panel.

Recommended Maintenance –During the operating season, pumps should be tested weekly in the **Hand, Off** and **Auto** positions. Amp draws and voltage checks of each pump should be completed on a monthly basis. If the amp draw of any pump drops 15-20%, this indicates that the pump either has an obstruction in the impellor or other problem. The Operator should take the pump out of service and see if it is obstructed.

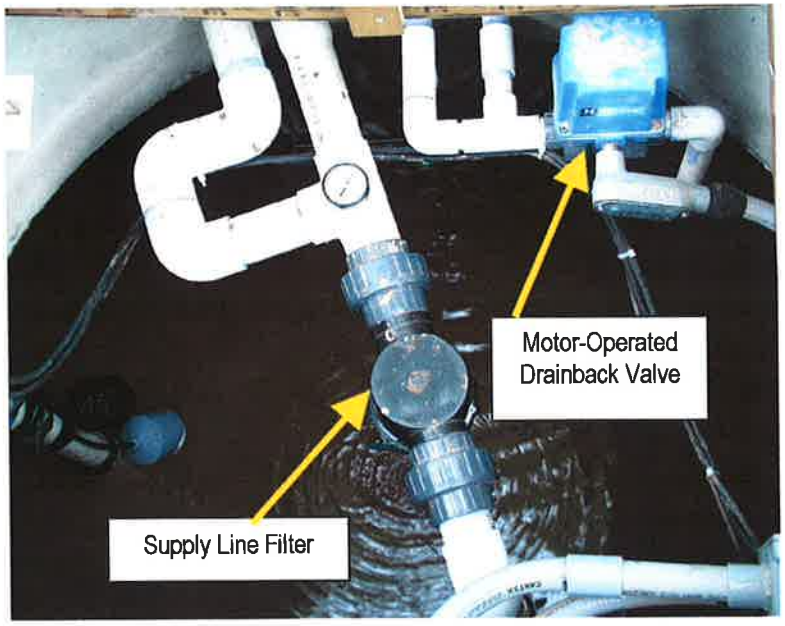
Basic Trouble Shooting- If the high water level alarm light is on, set all pumps to **Hand Position.** If the pumps do not run in **Hand**, check to see if the breakers are tripped and if the pumps are getting power. If the pumps do not run or are not getting power, contact an electrician.

2.4 SUPPLY LINE FILTER – The supply line screen filter is designed to capture debris, which may cause clogging in the drip irrigation system.

Recommended Maintenance – The filter housing should be unscrewed and the stainless steel filter element removed and cleaned quarterly. This schedule may be extended if minimal clogging is encountered. A spare filter element and "spinner" (if spin-clean filters are installed) is recommended for each filter to facilitate cleaning. The filter housing has a small ball valve at the bottom. This valve must be cracked open during the winter operation so that water in the filter housing can drain when the pump is off. Otherwise, this water could freeze and crack the housing.

2.5 DRAINBACK VALVE (MOTOR ACTUATED BALL VALVE) - The ¼ turn, motor actuated ball valve will open and close in relation to the pump. When the pump is on the valve is closed, when the pump is off the valve will open to aid in drain back.

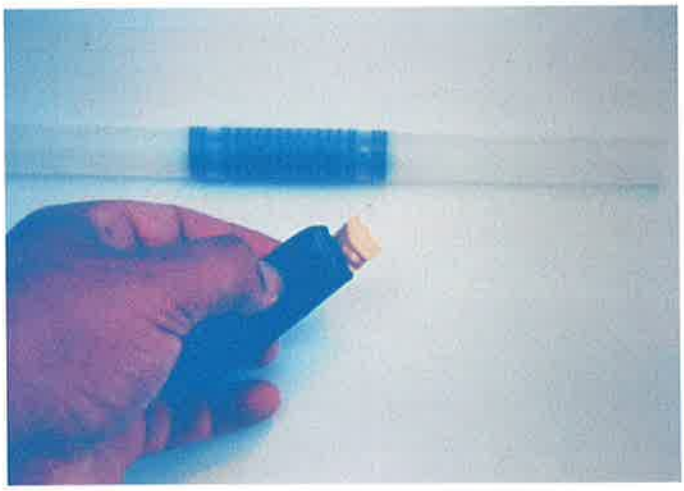
Recommended Maintenance – The drainback valve should be checked once a month with the pumps on and off to ensure the valve is operating correctly. When checking the valve, the pumps must be left off for at least 15 seconds before starting the next pump. This is to ensure back pressure on the valve is low enough to allow the next pump to operate properly.



2.6 HEADER PIPES - The header pipes in each of the zones consists of 2-inch Schedule 40 PVC. Header pipes carry the water from the pump tank to the drip emitter tubes. If a header pipe breaks, a large amount of water will surface in the drip field.

Recommended Maintenance- Weekly inspection of the drip irrigation area is recommended to make sure no water is surfacing or ponding.

2.7 DRIP LINES - The drip line is made from ½-inch polyethylene tubing and has an emitter placed every 24 inches. The drip irrigation tubing is Wasteflow pressure compensating, as manufactured by Geoflow, Inc. (1-800-828-3388)



Recommended Maintenance- Weekly inspection of the drip irrigation area is recommended to make sure no water is surfacing or ponding. If water is bubbling to the surface the line should be excavated and inspected for breaks or failed connections. Spotting may occur in the initial operation of the field until vegetation is established. If a break occurs in the line, it can be repaired with a compression coupler. These should be kept on-hand by the operator of the system. Fittings are available from Geoflow Inc. as well as some local plumbing supply houses. Inspection of the drip irrigation zones shall be performed monthly with the pressure set between 20-30 psi. The pressure needs to be regulated every time the Supply Line Filter (Section 2.2) is cleaned.

2.8 AIR RELIEF VALVES - Air relief valves are installed at the highest elevation of each drip zone. They are located in valve boxes at the corner of each drip field. The relief valve allows the release of air from the drip irrigation lines when the pump is activated. The air relief also protects the system from sucking fines back into the drip lines by back siphoning or backpressure when the pump de-activates. During winter months, ice in a valve may cause the valve ball from seating properly. This problem is evident by a puddle and subsequent icing within the air relief box. In this case the valve should be cleaned and re-insulated. If freezing problems persist, place straw bales over the valves or add additional insulation.

Recommended Maintenance – The air relief valves should be checked monthly to ensure no water is surfacing or ponding.

2.9 AIR RELIEF BOXES - Air relief valve boxes are used to house the air relief valve and insulate the valve to prevent freezing.

Recommended Maintenance – An annual visual inspection of the valve boxes should be done to make sure the structural integrity is intact. Prior to winter, visual inspections should be done to ensure the boxes are properly insulated. During the winter months when snow is covering the valve boxes no inspection shall be done. This is to ensure the snow layer is properly acting as an insulation blanket.

2.10 RETURN LINES – The header pipes in each of the zones consists of 2-inch Schedule 40 PVC and is connected with emitter tubing to the opposite end of the supply header. The purpose of the return line is to allow a flushing flow to be maintained through the emitter tubes. The return lines are also used to assist in drain back and in setting the pressure in the drip zones.

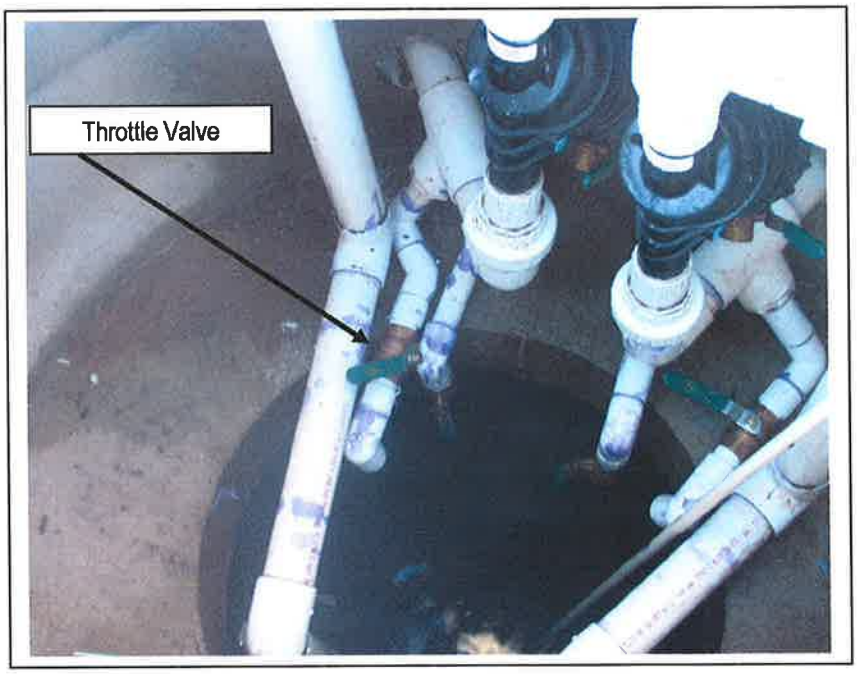
Recommended Maintenance - Because the return line valves are partially open, they allow water to drain back through the return lines. In order to maintain a clean system, annual flushing of the entire manifold system is recommended. To flush the system fully open the drip zone pressure throttle valve and run water through the system for ten minutes. Reset the pressure in the field to a recommended 20 to 32 psi after flushing. 0

To set the pressure in the field:

1. Install a pressure gauge on the appropriate drainback relief valve.

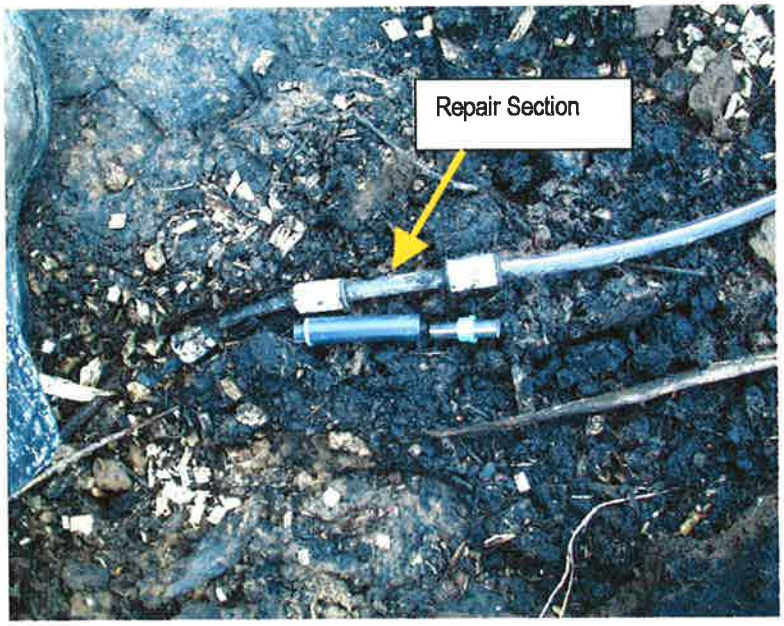
2. Start the corresponding pump.
3. After return water is flowing, open or close the return line throttle valve to achieve desired pressure.

2.11 RETURN LINE THROTTLE VALVE (MANUAL VALVE) - Two return line valves are installed in the drip irrigation lift station. The valves are located on each return line. These valves can be throttled by adjusting the opening of the ball valve. This controls the amount of pressure inside the drip irrigation zones. The valves should be slightly open in order to pressurize the drip beds while providing adequate drain-back when the pump is activated.



Recommended Maintenance - In order to maintain a clean system, annual flushing of the entire manifold system is recommended. To flush the system, fully open the drip zone pressure throttle valve and run water through the system for ten minutes. Reset the pressure in the field to a recommended 20 to 25 psi. The field pressure should be checked quarterly.

2.12 GOPHER CONTROL - Gopher control is recommended within the drip irrigation zones. Rodents may damage the drip lines through burrowing or chewing drip lines. Have rodent control on-hand in the event of burrowing animals living in or near the drip irrigation lines.



SECTION 02542

DRIP IRRIGATION DISPOSAL SYSTEM

PART 1 – GENERAL

1.0 SECTION INCLUDES

A. Scope of Work

B. Products / Materials

C. Drip Irrigation System Field Installation

1.1 REFERENCES

A. ASTM D: 1785 – Polyvinyl Chloride (PVC) Plastic Pipe, Schedules 40, 80 and 120

B. ASTM D: 2241 – PVC Plastic Pipe (SDR-PR)

1.2 SCOPE OF WORK

A. In general, the drip irrigation system will include

1. One or more drip irrigation zones with distribution headers, drip tubing and return lines.

2. One pre-cast concrete drip irrigation lift station with drip irrigation pumps.

B. The CONTRACTOR shall furnish all labor, materials, tools and skill for the completion of the site work, as shown on the Plans and as described in these Specifications.

C. The omission of express reference to any parts for or reasonably incidental to, the complete installation shall not be construed as releasing the CONTRACTOR from furnishing such parts.

D. Inspection of site: Before submitting a proposal of the work contemplated, each bidder shall examine the site and familiarize themselves with all existing conditions and limitations. No extra

compensation will be allowed because of the CONTRACTOR's misunderstanding as to the amount of work involved or their lack of knowledge of any existing condition.

1.3 SUBMITTALS

A. Submittals are required on the following items:

1. Drip irrigation pumps. See Section 11313.
2. Drip emitter tubing.
3. Motor-operated drain back valves.
4. Discharge filters.
5. Air relief valves.
6. Valve boxes.
7. System layout diagram.

1.4 QUALITY ASSURANCE

A. Installer: Must be firms with not less than 2 years of successful installation experience of subsurface drip irrigation systems for wastewater disposal similar to this project.

B. Installer must have all applicable state licenses for construction of septic systems.

1.5 PROJECT/SITE CONDITIONS

A. Install work in locations shown on Plans, unless prevented by project conditions.

B. Verify that field measurements are as shown on drawings.

C. System Layout Diagram: Show site topography, drip irrigation zones, supply main elevations, return line elevations, location of air relief valves, drainback slopes on supply and return lines, elevation of emitter tubing, lengths of flexible PVC connector needed and elevations where pipes enter drip irrigation tank. Sketch to be made based on field measurements

as determined by the CONTRACTOR. Note any discrepancies between Plans and the system layout diagram as prepared by the CONTRACTOR.

PART 2 – PRODUCTS / MATERIALS

2.1 PIPE AND FITTINGS

A. Supply Main:

1. Schedule 40 PVC pipe and fittings.

2. Size as listed on Plans; minimum size is 2-inch.

B. Return Pipe

1. 2-inch Schedule 40 PVC pipe and fittings.

C. Flexible PVC

1. ¾-inch flexible PVC, capable of being solvent-welded to Sch 40 PVC fittings.

2. Use to connect drip emitter tubing to the supply main and return lines and indicated on the Plans.

D. Pipe inside Pump Tanks

1. Schedule 80 PVC pipe & fittings.

2.2 DRIP EMITTER TUBING

A. Manufacturer: Tubing shall be manufactured by Geoflow, Inc. or ENGINEER approved equivalent.

B. Tubing shall be extruded from linear low density polyethylene with a nominal ½-inch diameter (0.55" ID x 0.63" OD). The wall thickness of the tube shall not be less than 0.045-inches.

C. The inside wall of the tube shall be impregnated with –10,10' oxybisphenoxarsine to inhibit bacterial growth.

D. There shall be pressure compensating emitters inserted every 12 inches inside the tube. The pressure compensating emitters shall have a nominal flow capacity of 0.5 gallons per hour (gph) per emitter.

E. The emitters shall be impregnated with Treflan to inhibit root penetration for a minimum period of 10 years, which period shall be guaranteed by the manufacturer.

F. The tubing shall be identified as being used for a non-potable purpose by means of two purple stripes permanently incorporated into the outside wall of the tube.

2.3 INSULATION

A. Pipe Insulation

1. Rigid, extruded polystyrene board insulation, closed cell. Thermal resistance R-5, Thickness 2 – inches, compressive strength 25psi minimum.

B. Insulation Beads

1. Perlite insulation beads or approved equivalent.

2.4 AIR VENT & VACUM RELIEF VALVE

A. Ball-type valve, 3/4" MPT, seal from 5psi to 110 psi.

B. Manufacturer: Geoflow Inc. or approved equivalent.

2.5 VALVE BOX

A. Plastic rectangular body 21"x15"x12"; Green plastic non-hinged lid with hold-down screws.

B. Manufacturer: Carson-Brooks or approved equivalent.

2.6 RETURN LINE THROTTLE VALVE

A. ¾ -inch boiler drain valve, brass body, MPT threads.

2.7 DRIP IRRIGATION PUMPS

A. See Specification Section 11313, Drip Irrigation Pumps.

2.8 FILTERS

A. Spin-Clean with 150-mesh filter element.

B. Plastic body with drain, removable housing to clean filter element.

C. Size as noted on the Plans.

D. Include any special wrenches or tools needed to disassemble filters.

E. Install ball valve on filter drain.

F. Manufacturers: Geoflow Inc., or approved equivalent.

2.9 DRAINBACK VALVE

A. Valve

1. 2-inch True-Union PVC Ball Valve

2. PTFE seats with elastomeric backing cushions.

3. Provide socket and threaded ends connectors for each valve

4. Asahi America Type 21 or approved Equivalent.

B. Actuator

1. 120VAC Nema 4, non-reversing motor, five-second-cycle time.

2. Valve and actuator to be shipped mounted and tested.

3. Asahi America Series 94 "Quarter Master" or approved equivalent.

2.10 Tracer wire

A. 8-gauge multi-strand THHW wire.

B. Connectors: Epoxy capsule connectors, 3M DBY-6 or ENGINEER approval equivalent.

PART 3 – EXECUTION

3.01 INSTALLATION – DRIP IRRIGATION SYSTEM

A. Site Preparation

1. Ensure area utilities have been located per local code requirements.

2. Complete site clearing.

B. Drip Irrigation Supply Main and Return Piping

1. All materials should be on hand prior to opening trenches. Header pipes and return lines can be preassembled, with tees to facilitate placement of trenches. Tees will be placed 24" on center.

2. Supply line and header pipe shall be installed at a 0.5 percent slope towards the tank to provide drainback.

3. Supply lines shall be located on the low side of the drip zone. Install air relief valves at the high end of the supply main and return pipe.

4. Install tracer wire over all supply mains and return pipes. Bring tracer wire to the surface at drip tank and all valve boxes.

5. Return lines shall have the air relief valve installed at the highest point.

6. All connections and fittings of the PVC piping shall be sealed as to the specifications of the manufacturer. Clear debris and foreign matter out of the pipe prior to sealing.

7. CONTRACTOR will replace pipe broken or damaged during placement at no cost to OWNER.

8. The piping within the drip irrigation pump tank shall be installed so that piping valves and filters can easily be accessed for maintenance and repairs.

C. Drip Tubing

1. Drip tubing shall be installed on the contour (level) if more than a 1 percent slope is present.

2. Install tubing with oscillating or vibratory plow on sand, sandy loam or loam soils. Consult with OWNER prior to installing tubing on clay or clay loam soils. Alternative installation methods, such as a chain trencher, may be needed to avoid smearing of clay or clay loam soils.

3. Install tubing at a constant depth as indicated on the Plans. Use laser equipment to maintain constant elevation.

4. Fill in low depression areas with Topsoil as directed by the OWNER.

5. Connect flexible PVC tubing to drip emitter tubing using Lock-Slip fittings as supplied by Geoflow Inc. or approved equivalent.

6. Emitter tubing runs between supply mains and return pipes use continuous lengths of tubing. There shall be a maximum of one tubing coupler in each emitter tube run. Couplers shall be lock-slip fittings as supplied by Geoflow Inc. or approved equivalent.

7. CONTRACTOR shall take special care not to over-tension emitter tube during installation. Areas where tubing has been over-tensioned in the opinion of the OWNER shall be exposed and inspected.

8. Provide at least 3 inches of slack tubing at all couplers and fittings.

9. Place one cup of powdered bentonite at connection between flexible PVC tubing and drip emitter tubing.

10. The bentonite or approved equivalent shall meet the following requirements:

    a. Low permeability, laboratory test range from $1x10^{-7}$ to $1x10^{-8}$ cm/sec.

    b. Cannot produce heat during mixing or curing.

    c. Will not flow through highly permeable soils.

D. Valve Box

1. Installation of the valve box shall be done in accordance with manufacturer's specifications.

2. Place double layer of 2" Styrofoam directly below box.

3. Place insulation beads in a plastic bag inside valve box.

3.02 START UP

A. Confirm the following items with the OWNER.

1. Proper rotation and operation of the drip irrigation pumps.

2. Proper operation of controls and alarms.

3. Correct elevation of float switches.

4. Operation of drain-back valves and motor actuators.

5. Drain back of supply and return pipes.
   a. Pour one pint of liquid dye down each pipe from air relief valve.

B. Leak Testing

1. Close return valves and over pressure drip zone(s).

2. Check field pressure at air relief valves on the return line.

3. Continue pumping into field for 24 hours.
   a. Water shall be supplied by CONTRACTOR.

4. Inspect field for leaks. Repair any damaged tube, pipe or fittings.

C. Field Pressure

1. Set field pressure by throttling return valve for each drip zone(s).

2. Check field pressure at air relief valve on return line.

3. Confirm field pressure settings with OWNER.

3.03 SEEDING

A. Seed drip irrigation fields in accordance with OWNER requirements.

1. Apply straw or hay mulch over drip field(s).

2. Minimum mulch thickness shall be 6 inches.

3.04 WARRANTY

A. CONTRACTOR shall provide a 12-month warranty on all material, equipment and controls. Warranty shall start on day of SUBSTANTIAL COMPLETION.

B. CONTRACTOR shall provide pump trucks, steaming, ground thawing or any other services necessary to keep the OWNER's facilities in operation.

END OF SECTION

SECTION 11313

DRIP IRRIGATION PUMPS

PART 1 - GENERAL

1.1 Section includes

A. High Head Filtered Effluent Pumps.

B. Related Sections include the following:

1. Section 02542 – Drip Irrigation Systems.

1.2 SUBMITTALS

A. Product Data: Include performance curves, furnished specialties and accessories for each type and size of pump indicated.

B. Shop Drawings: Show layout and connections for pumps. Include setting drawings with templates, directions for installing foundation and anchor bolts and other anchorages.

1. Wiring Diagrams: Detail wiring for power, signal and control systems and differentiate between manufacturer-installed and field-installed wiring.

C. Maintenance Data: For each type and size of pump specified to include in maintenance manuals specified in Division 1.

D. Manufacturer's Installation Guides.

1.3 QUALITY ASSURANCE

A. Product Options: Drawings indicate size, profiles, connections and dimensional requirements of pumps and are based on specific manufacturer types and models indicated. Other manufacturers' pumps with equal performance characteristics may be considered.

B. Electrical Components, Devices and Accessories shall be listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction.

1.4 DELIVERY, STORAGE and HANDLING

A. Retain shipping flange protective covers and protective coatings during storage.

B. Protect bearings and couplings against damage.

C. Comply with pump manufacturer's rigging instructions for handling.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. High Head Filtered Effluent Pump(s):

a. Myers - Ashland, Ohio

b. Aeromotor

c. Red Jacket

d. Approved equivalent

2.2 SEWAGE EFFLUENT PUMPS

A. Description: Factory-assembled and tested high head filtered effluent pump units complying with UL 778. Include motor, operating controls and construction for permanent installation.

B. Duty Point:

Motor Size	Total Dynamic Head	Flow
½ HP	100 feet	15 gpm
1 HP	100 feet	30 gpm

C. Furnish and install submersible pumps. . The motor shall be an integral part of the unit. The motor shall be connected for operation on a 230 volt,

single phase, 60 Hertz electrical supply service. Each pump motor shall be equipped with 30 feet of power and control cable sized in accordance with NEC and ICEA standards. The cable shall have P-MSHA approval or FM approval for use in Class I, Division I, Groups C & D locations.

D. The pump(s) shall be of the submersible type with an integral motor and pumping unit capable of handling filtered effluent. The pump must be able to pass a 1/16 inch spherical solid.

E. Pump Shell

1. The pumps shell shall be constructed of 300 series stainless steel.

F. Shaft and Coupling

1. The shaft and coupling shall be constructed of 300 series stainless steel.

G. Impeller

1. The impeller shall have a stainless steel wear ring.

H. Suction Bowl

1. The suction bowl shall be chemically resistant reinforced nylon or lead free brass.

I. Discharge Bowl

1. The discharge bowl shall be corrosion resistant reinforced polycarbonate or lead free brass.

J. Built-in Check valve

1. The pump shall have a built in check valve that shall be corrosion resistant.

2.3 Motor

A. Single speed, with grease-lubricated ball bearings and non-overloading through full range of pump performance curves.

B. Hermetically sealed, capacitor-start type; with built-in overload protection; and three-conductor waterproof power cable of length required, with grounding plug and cable-sealing assembly for connection at pump

C. The motor shall be capable of sustaining four equally spaced starts per hour.

D. Finish: Manufacturer's standard paint applied to factory-assembled and tested units before shipping.

E. Manufacturer's Preparation for Shipping: Clean flanges and exposed machined metal surfaces and treat with anticorrosion compound after assembling and testing. Protect flanges, pipe openings and nozzles with wooden flange covers or with screwed-in plugs.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine roughing-in of plumbing piping systems to verify actual locations of piping connections before pump installation.

3.02 INSTALLATION

A. Install pumps according to manufacturer's written instructions.

B. Install pumps and arrange to provide access for maintenance.

3.03 CONNECTIONS

A. Coordinate piping installation and specialty arrangement requirements with schematics on Plans.

B. Plans indicate general arrangement of piping and specialties. The following are specific connection requirements:

1. Install discharge pipe sizes equal to or greater than diameter of pump nozzles and connect to sanitary drainage piping.

2. Install swing check valve and gate or ball valve on each automatic, packaged pump discharge.

C. Install electrical connections for power, controls and devices.

D. Electrical power and control components, wiring and connections are specified in Division 16 Sections.

E. Ground equipment.

1. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

F. Pump Controls: Set pump controls for automatic start, stop operation as required for system application. Specify liquid levels to start and stop pumps and energize alarms to suit design requirements.

3.04 COMMISSIONING

A. Final Checks before Starting: Perform the following preventive maintenance operations:

1. Lubricate bearings.

2. Disconnect couplings and check motors for proper direction of rotation.

3. Verify that each pump is free to rotate by hand. Do not operate pump if it is bound or drags, until cause of trouble is determined and corrected.

4. Verify that pump controls are correct for required application.

B. Starting procedure for pumps with shutoff power not exceeding safe motor power is as follows:

1. Start motors.

2. Open discharge valves slowly.

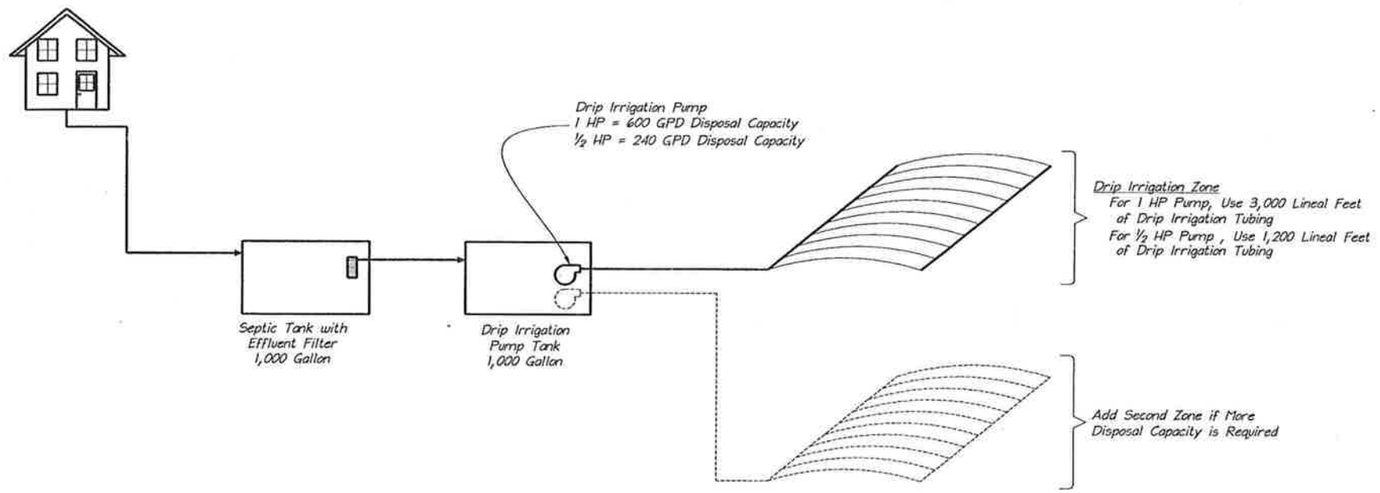
3. Check general mechanical operation of pumps and motors.

C. Comply with the requirements of Section 01750 – Starting of Systems, for general start-up procedures.

3.05 WARRANTY

A. CONTRACTOR shall provide a 12-month warranty on all materials, equipment and controls. Warranty shall start on date of Substantial Completion.

END OF SECTION



Wastewater Schematic

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Rev	Date	Description
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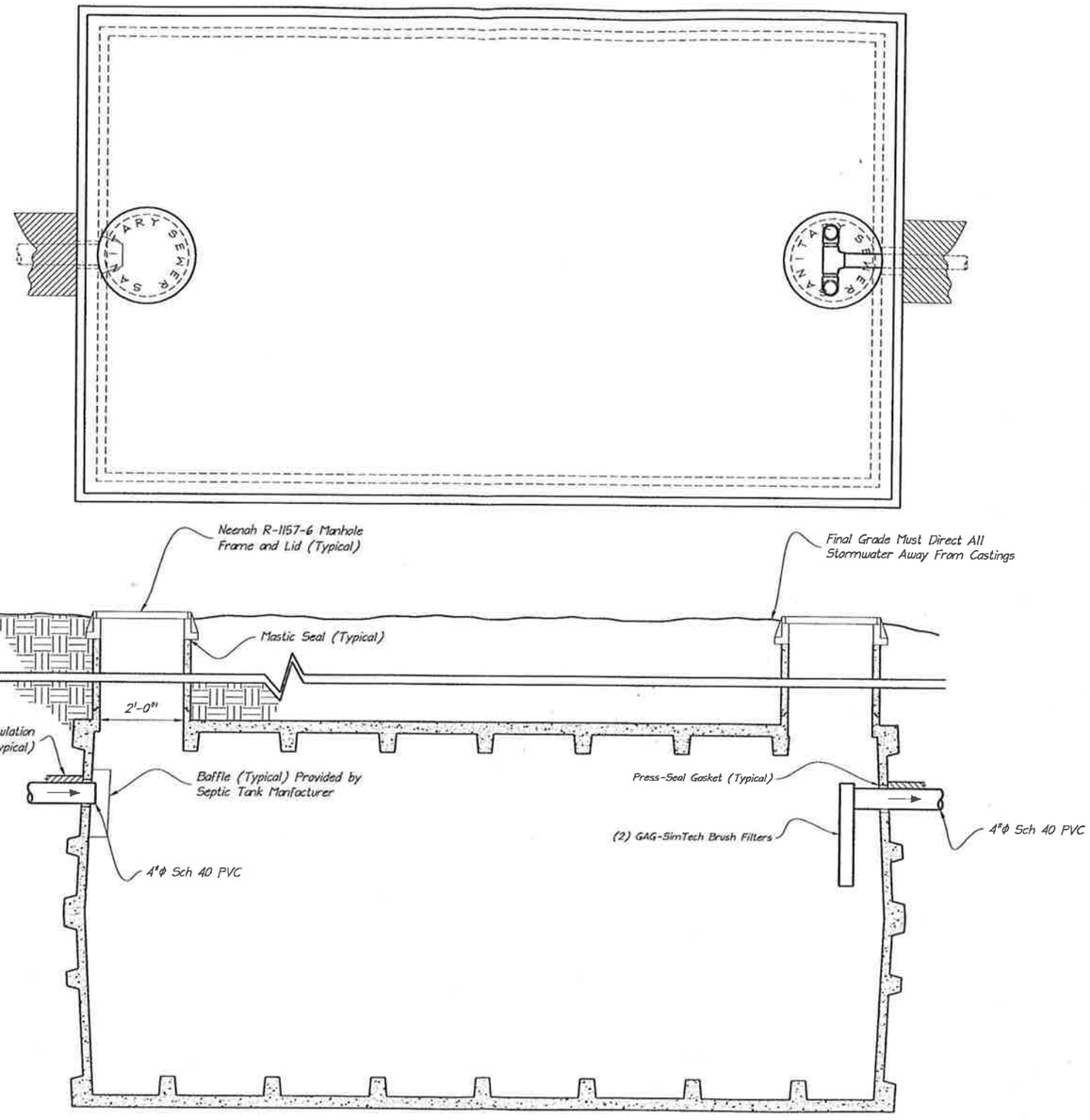
Boy Scouts of America

Drip Irrigation Schematic

C-1

1127-01-01.dwg



Septic Tank

Scale: none

North American Wetland Engineering, P. A.

Rev	Date	Description
0	11/7/03	Issue for Review

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Septic Tank - Standard Details

C-2

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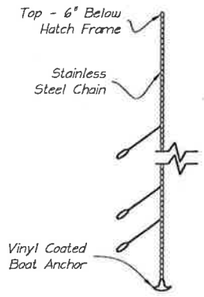
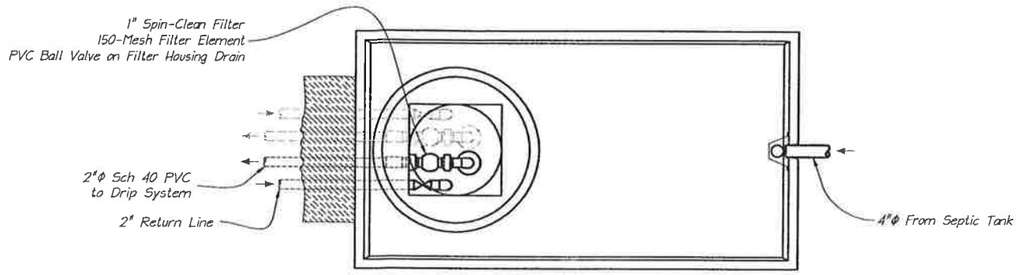


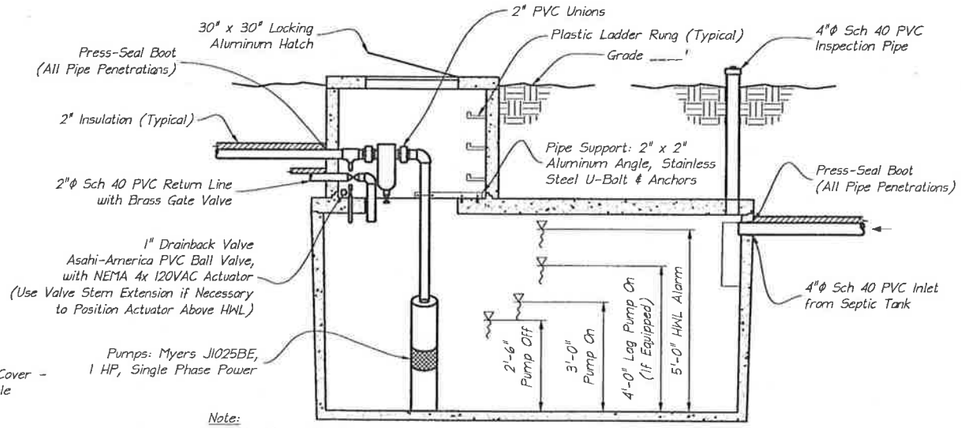
Float Tree Detail

Scale: none



Drip Irrigation Lift Station Plan View

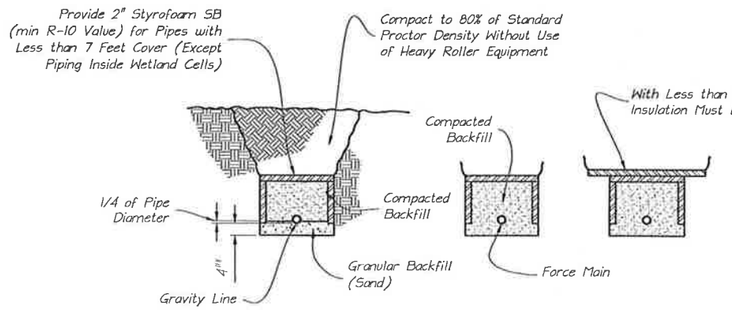
Scale: 1/2" = 1'-0"



Drip Irrigation Lift Station

Scale: 1/2" = 1'-0"

Note: Penetration locations may vary, see site plan for correct orientation.



Typical Trench Section

Scale: 1/2" = 1'-0"

PANEL SPECIFICATION - DRIP IRRIGATION PUMPS, FLOAT ACTIVATED

Furnish and install locally mounted automatic pump control panel with the following features:

- Service Voltage: 240 volt single-phase, 3 wire. Contractor to confirm service voltage prior to placing control panel order.
- Service Disconnect Switch: Contractor to furnish and install a 30 amp service disconnect switch to disconnect the electrical service prior to the control panel.
- Control panel shall be fully compatible with the pumps provided.
- UL 508 listed and labeled.
- NEMA 4X enclosure, thermoplastic or fiberglass.
- Stainless steel mounting hardware with stainless steel fasteners. Panel shall have a stainless steel lockable latch on the front.
- Marine-grade aluminum or galvanized steel back panel for mounting all internal components.
- Main thermal-magnetic circuit breaker to disconnect incoming AC power.
- Rated 10,000 AIC RMS Symmetrical, minimum.
- Control voltage shall be 120 volt AC. In cases where the service voltage is other than 120/240 volt single phase 3-wire, provide control power transformers with a control fuse and on/off switch.
- For single phase power, provide magnetic starters with definite-purpose 2-pole contactors rated at least 25% greater than motor full load current and thermal magnetic circuit breakers.
- Terminal blocks shall be provided for terminating all external field wiring to the control panel (GE type EB-25 or equivalent).
- Provide condensation heater (strip type or forced-air if panel greater than 28" X 20") with adjustable thermostat and circuit breaker.
- Each pump shall have a "Green" run light and hand-off auto switch and be permanently labeled as to function. Pilot lights shall be Allen Bradley type 800E or equivalent.
- Provide elapsed time meters and cycle counters for each pump.
- "Amber" pilot lights (Allen Bradley type 800E or equivalent) shall be provided to indicate float circuit operations and shall be permanently labeled as to function.
- Provide power/control and level control cables of adequate length without splicing, UL listed for submersible applications.
- Float switches shall be non-mercury-type, UL 508, pipe-clamp style.
- Provide separate float switch for high water level alarm.
- Provide "Red" external alarm light on top of panel.
- Panel manufacturer to provide appropriate circuit diagrams and a sequence of operation for the control panel.
- If more than one pump is required, provide alternating circuits to change pump lead-lag status for both pumps after each pump cycle.
- Provide control relays to power open drainback valves when pump shuts off.

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Freezing Environment Drip Irrigation Pump Station

C-3

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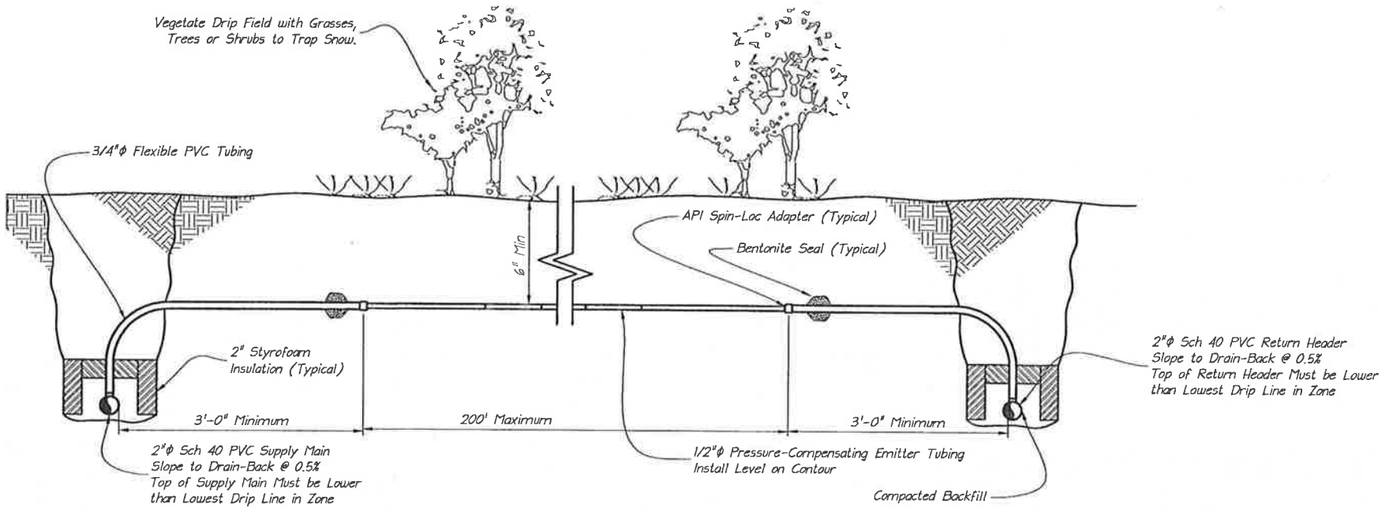
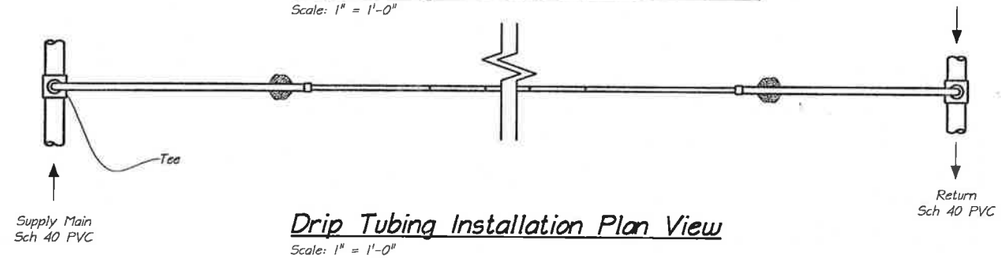


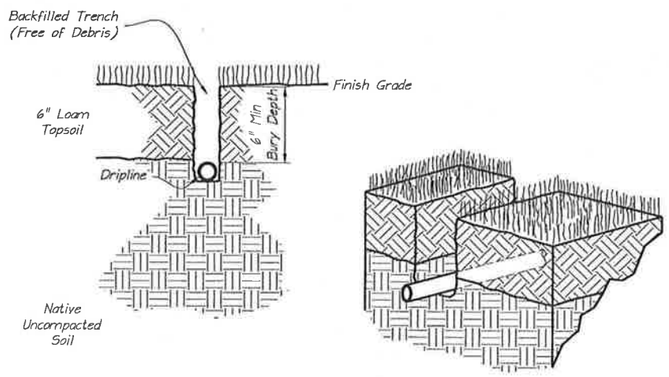
Drip Tubing Installation Section View

Scale: 1" = 1'-0"

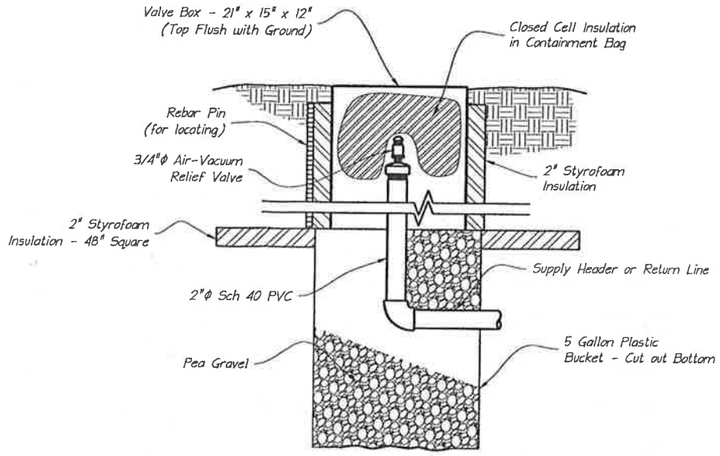


Drip Tubing Installation Plan View

Scale: 1" = 1'-0"

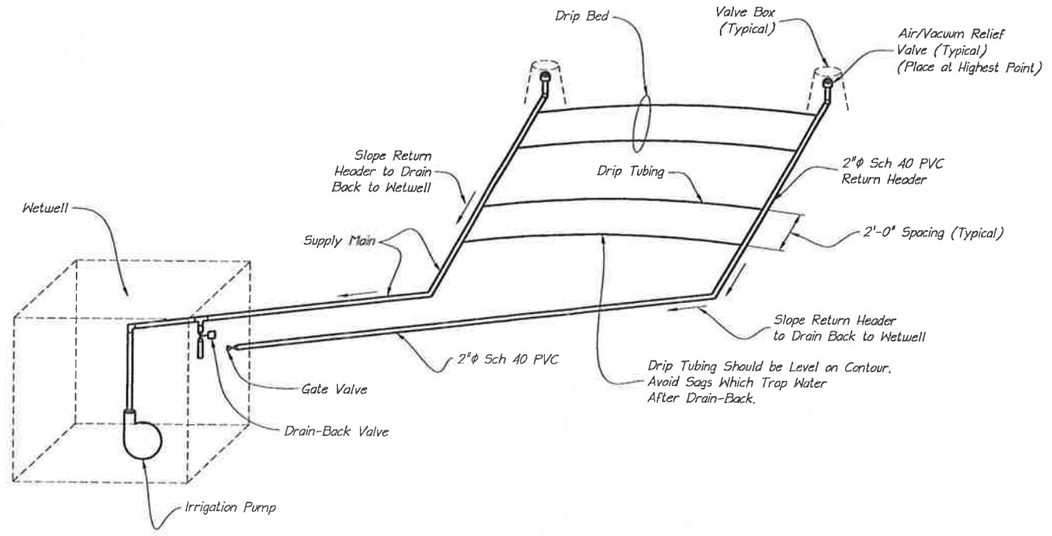


Dripline Trench



Air-Vacuum Relief Valve

Scale: 1" = 1'-0"



Subsurface Drip Irrigation Drain-Back Drip Zone Schematic

Scale: None

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Freezing Environment Drip Irrigation Details

C-4

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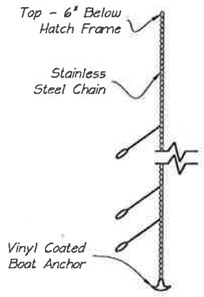
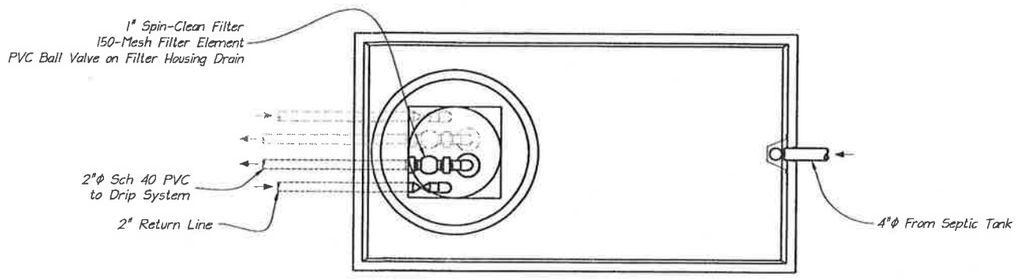


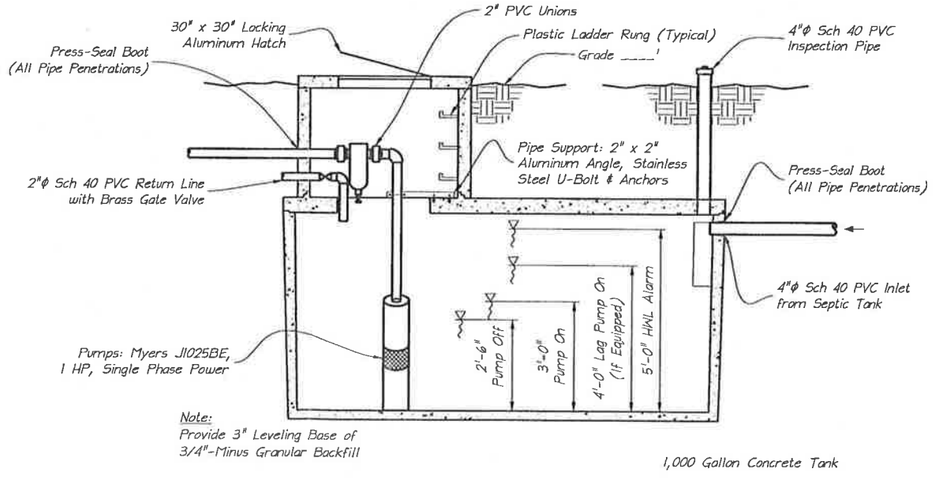
Float Tree Detail

Scale: none



Drip Irrigation Lift Station Plan View

Scale: 1/2" = 1'-0"



Drip Irrigation Lift Station

Scale: 1/2" = 1'-0"

Note: Penetration locations may vary, see site plan for correct orientation.

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- Main thermal-magnetic circuit breaker to disconnect incoming AC power.
- Rated 10,000 AIC RMS Symmetrical, minimum.
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- Float switches shall be non-mercury-type, UL 508, pipe-clamp style.
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- If more than one pump is required, provide alternating circuits to change pump lead-lag status for both pumps after each pump cycle.

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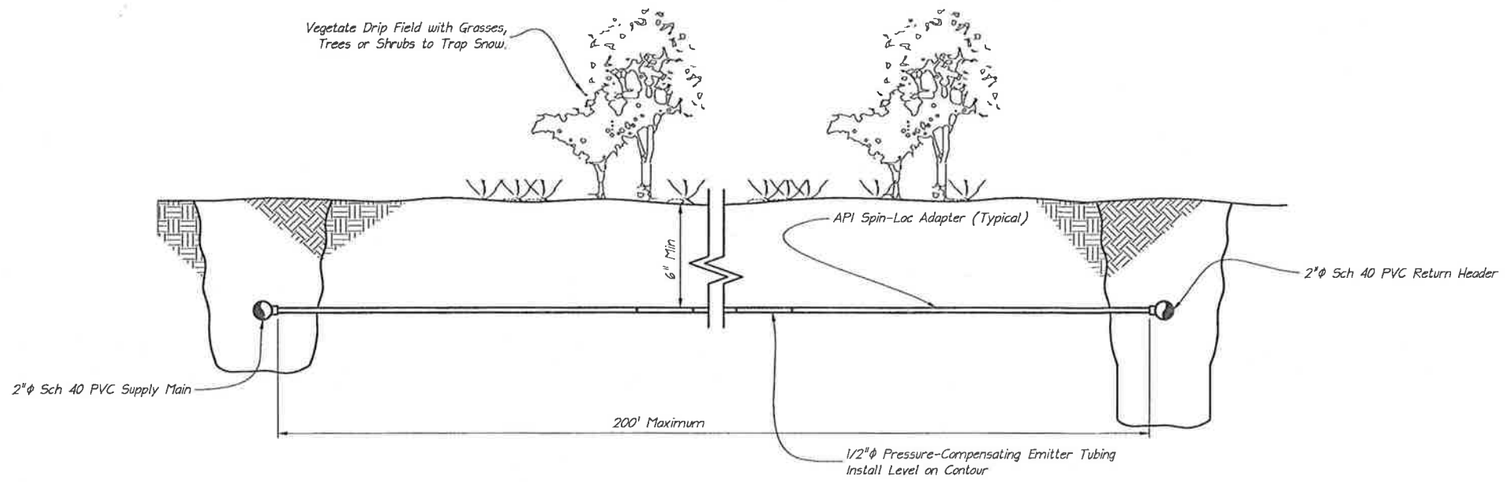
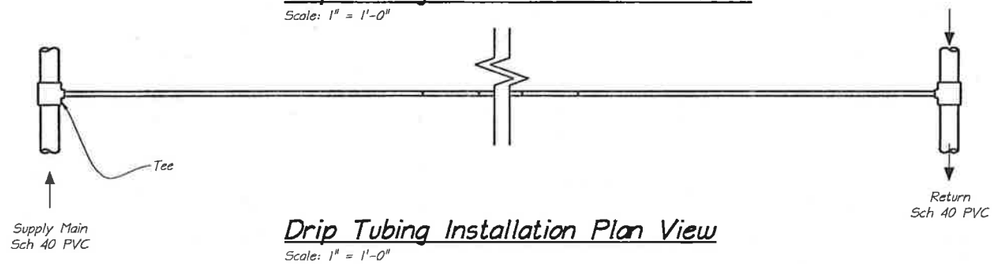


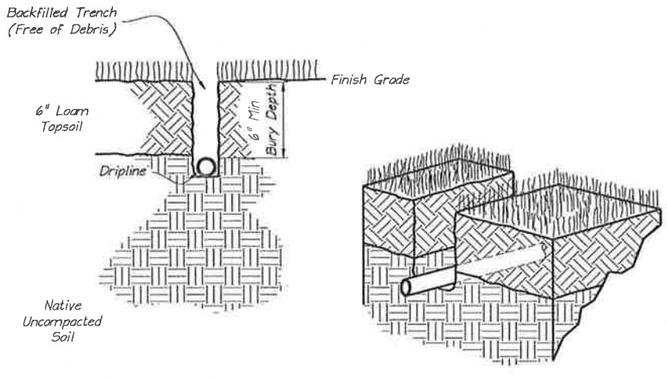
Drip Tubing Installation Section View

Scale: 1" = 1'-0"

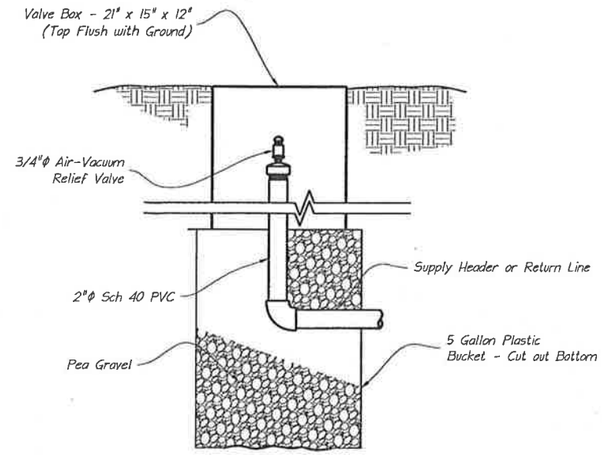


Drip Tubing Installation Plan View

Scale: 1" = 1'-0"

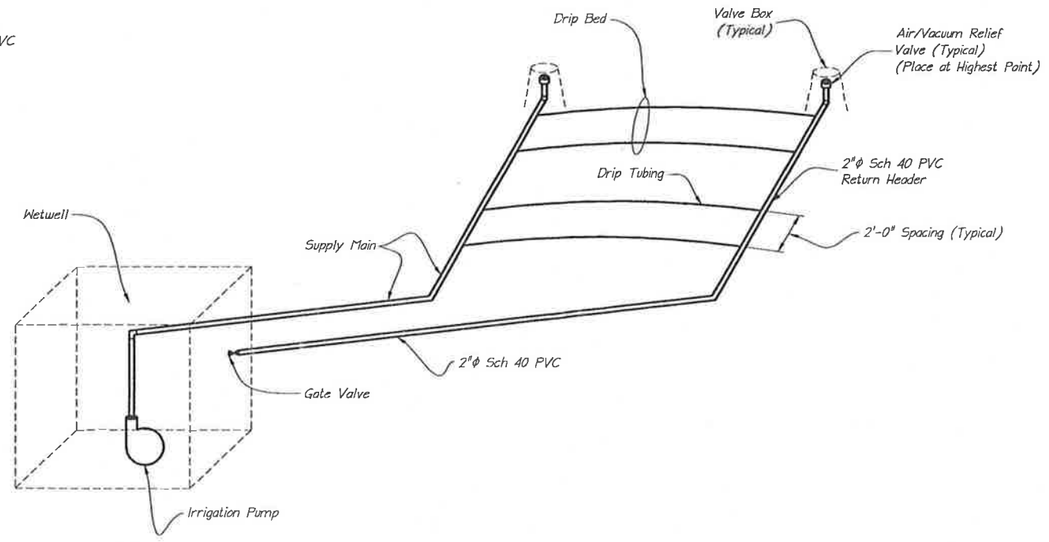


Dripline Trench



Air-Vacuum Relief Valve

Scale: 1" = 1'-0"



Subsurface Drip Irrigation Drain-Back Drip Zone Schematic

Scale: None

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	0	11/7/03	Issue for Review			1127-01-06.dwg
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