RECOMMENDED DESIGN CONSIDERATIONS FOR

PREVENTING COMMON LPP PROBLEMS

(OSWS/DEH/NCDEHNR - 2/95, rev. 3/96; addendum to "Design of Large Low-Pressure Pipe Distribution Systems in North Carolina", Marinshaw, 1988)

DESIGN COMPONENT	REQUIRED	RECOMMENDED
Lateral Line Diameter	1-inch, minimum.	1- 1/4-inch. - 1 -1/2-inch, maximum.
Trench Width	8 inches, minimum.	12 inches, minimum. 18 inches, recommended when site conditions allow. Protect trench with geotextile fabric (see below).
Washed Gravel Classification	#3, 4, 5, 57 or 6 of ASTM D-448	#5 of ASTM D-448
Orifice Size	5/32-inch for 2/3 of holes, minimum. 1/8-inch, absolute min. for 1/3 of holes.	5/32 -inch, minimum. 3/16-inch, minimum, for food services Protect orifices by sleeving or shielding (see below)

OTHER RECOMMENDATIONS

1. *Sleeve laterals in 3- or 4-inch conventional nitrification line perforated tubing.* Reduces the effects of rock shadowing and root intrusion and enables easy removal or replacement of the LPP laterals, if necessary. (See Figures 1 and 3)

2. *Following item 1, drill all orifices facing upwards, except for a hole 1/3 of the way from the beginning and end of each line which should face down.* Having the orifices face up: helps bleed air out of the system better during pressurization; ensures no shadowing of these orifices by rock, roots, or perforated pipe corrugations; helps breaks the air block better after pump shut off, reducing siphonage from laterals to the supply manifold, which, in turn, may reduce the overloading of the lower laterals; and allows less opportunity for hole clogging by solids and bioslime. Having the two holes on each line face down allows effluent to drain after pumps shut off which: prevents anaerobic conditions inside the laterals; prevents standing water inside the laterals which could

possibly attract plant, grass, and tree roots; and prevents freezing of the laterals (though typically not a problem in southeastern climates). (See Figure 3)

3. *Use one 90-degree bend for lateral turn-ups, not one or two 45-degree bends.* This will facilitate accurate measurement of operating pressure head in the laterals. Using one or two 45-degree bends for constructing the manifold cleanouts, however, would be warranted. (See Figure 3)

4. *Use geotextile fabric over the trench, at the gravel - backfill interface.* Prevents the infiltration of small soil particles into the trench voids. (See Figures 1 and 3)

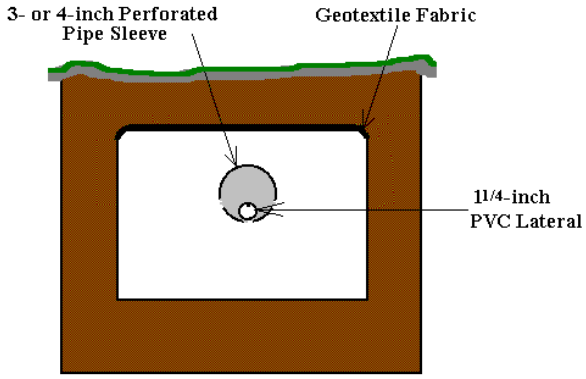

FIGURE 1: Cross-Sectional, Profile Detail of Recommended LPP Trench

5. *For LPP laterals, tee off of the manifold directly using, for example, a 3" x 3" x 1-*

1/4" tee, rather than "bushing-down", (ie. using a 3" x 3" x 3" tee with reducing fittings to 1-1/4"). This results in a hydraulically smoother transition and allows less opportunity for irreversible solids accumulation. (See Figure 2)

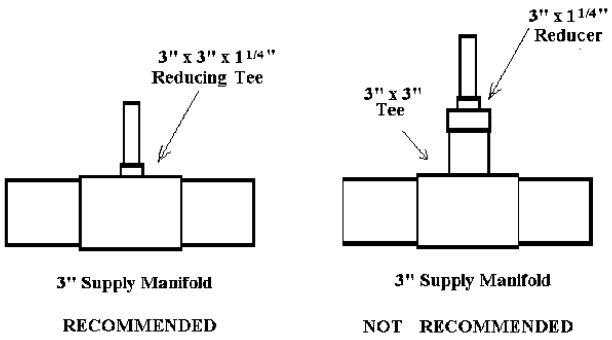

FIGURE 2: Side, Profile Detail of Recommended Supply Manifold-to-Lateral Connection.

6. *Elbow the manifold-to-lateral connection over the earthen dam, particularly on sloping sites.* This reduces effluent drain-back through the manifold or along the manifold trench. (See Figure 3)

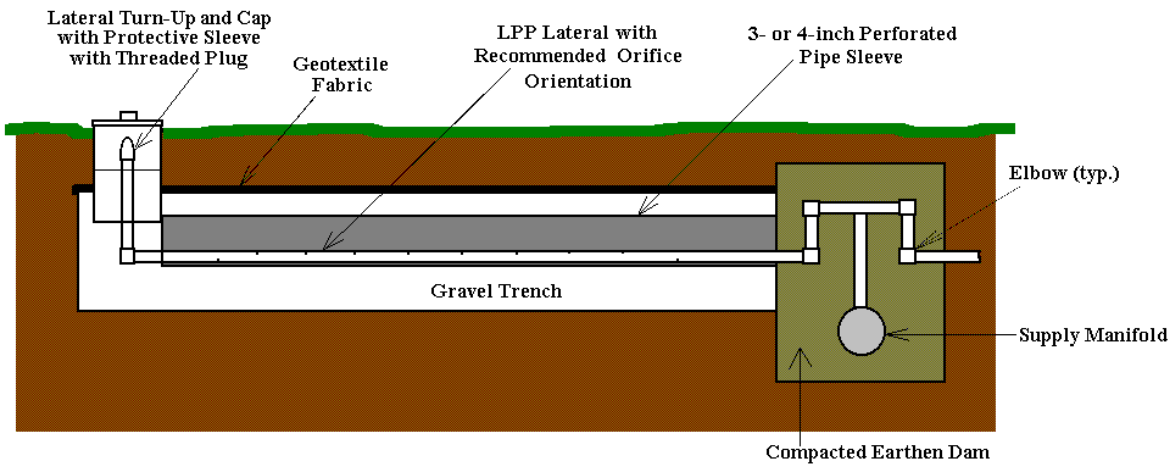

FIGURE 3: Side, Profile Detail of Recommended LPP Trench, including Cross-Section of Recommended Manifold-to-Lateral Connection.

7. *Provide two cleanouts on each supply manifold for LPP systems on sloping sites; one at the beginning (typically, the bottom) and one at the end (typically, the top) of the line.* Facilitates cleaning out the manifold after blowing out the LPP laterals, without reintroducing solids into the LPP laterals.

8. *Use the smallest pressure-adjustment gate valves which do not cause the total dynamic head of the system to exceed that which can be adequately handled by a reasonably-sized pump. This is typically achieved using gate valves which are one nominal size smaller than the effluent supply line or manifold (whichever is smaller).* The use of smaller valves allows for more precise pressure head adjustment. There will typically also be a net cost savings associated with the use of a smaller valve.

In fields served by multiple manifolds, place all pressure-adjustment gate valves in a common area for easy adjustment by one individual.

9. *Design/configure system to prevent or offset the hydraulic overloading of the lower laterals.* Overloading of lower LPP laterals is anticipated because: the lowest laterals fill up with effluent first and drain last, and they will receive effluent stored in the manifold and, perhaps, upper LPP laterals after dosing. Additionally, lateral, subsurface movement of water through the drainfield may

occur, potentially contributing to the overloading of the lower laterals. There are several ways to alleviate these problems, including item number 6, listed above, as well as the following:

A. *Design the system to "overload" the upper laterals during dosing. This can be accomplished by varying the orifice spacing and/or orifice size among the LPP laterals.*

B. *Incorporate a drainback mechanism to return effluent to the pump tank between doses.*

C. *Configure fields to make maximum use of slope width (along contour), thereby reducing the number of lines installed at different elevations.*

D. *Use check valves to keep effluent dosed to the upper subfields from draining to the lower subfield laterals.*

E. *Split flow to the subfields or laterals using a pressure manifold above the highest lateral, to prevent redistribution of effluent to the lower subfields or laterals.*

10. *Use effluent filter(s) for the outlet of the septic tank.* The use of effluent filters prevents the carry-over of solids to the LPP fields, which may result in orifice clogging and premature failure of the LPP system. Other forms of pretreatment should also improve LPP performance.

11. *Provide an elapsed time meter and cycle counter for each pump in the control panel.* Knowing the pump run time, number of pump cycles and pump tank drawdown or dose volume allows the operator and/or inspector to monitor delivery rates to an LPP network for comparison with design delivery rates. As orifices in the LPP network become clogged, delivery rates will decrease thereby alerting personnel that further inspection and maintenance, or perhaps, repair of the system is in order.

12. *Utilize lower long term application rates (LTARs) for LPP system design.* More conservative sizing of LPP systems should decrease the potential for hydraulic overload of the trench infiltrative surface. Recommended LTARs are as follows:

Soil Group	**Recommended LTAR**
I	0.50-0.35
II	0.35-0.20
III	0.20-0.10
IV	0.10-0.04