

CLUSTER SYSTEMS FOR PASSIVE COMMUNITY TREATMENT WITH DE-NITRIFICATION

CASE STUDY: Blodgett Landing Community Treatment Plant

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As technology improves, “cluster” or “STEP” systems are becoming an increasingly popular solution to accommodate the sanitary needs of growing populations worldwide. These community systems are designed to treat the wastewater from sections of a city, town, village, sub-division, resort area, camp, or other groups of homes and businesses. This strategy offers lower capital investment and on-going costs than municipal treatment systems. These systems provide a higher level of water quality protection, support the local water supplies, can easily accommodate growth, require less infrastructure, and make it easy to employ water reuse techniques. With the incorporation of passive technology, communities are achieving these benefits with very little energy consumption, maintenance, chemicals, or additives, resulting in significantly reduced upfront and operational costs.

CASE STUDY: Blodgett Landing Community Treatment Plant

The Blodgett Landing Treatment Plant is a 50,000 GPD facility that provides passive advanced treatment and dispersal with de-nitrification. The town of Newbury, New Hampshire decided to upgrade and expand their wastewater treatment facility in 2010. There were many problems that needed to be solved, but the most difficult was finding a solution within their limited budget that exceeded treatment levels while being easy to operate and maintain. The engineering firm selected Presby Environmental’s Enviro-Septic® technology due to its minimal upfront and ongoing costs as well as its proven treatment levels. As of August 11, 2014, this system is achieving the following treatment levels: **BOD = 6 mg/L, TSS = 5.04 mg/L, TN 7.14 mg/L, TKN = 0.89 mg/L, Fecal Coliform = 3,632 MPN/100ml** (see Table 1). The town of Newbury was very impressed with the effectiveness of the system, stating:

“Since it was installed in 2011, the system has consistently exceeded the required effluent treatment levels. The upfront cost saving of this technology along with its ability to perform with minimal ongoing cost and maintenance makes it truly exceptional in the world of large-flow wastewater treatment.”

~Plant Manager, Tim Mulder

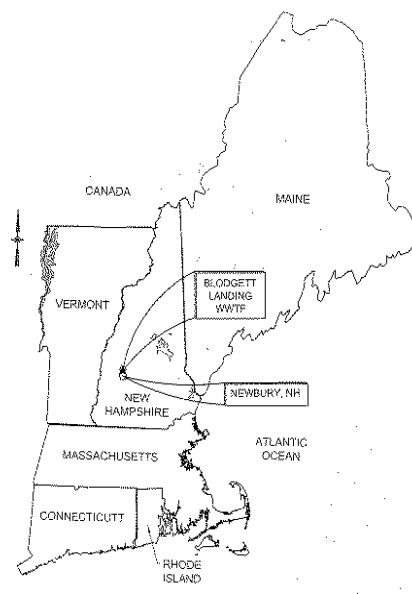


Figure 1

The Blodgett Landing Treatment Plant is in the southwestern part of New Hampshire, as seen in Figure 1. This part of the state is known for its state parks, beautiful lakes, and outdoor recreation. In 2001, the town of Newbury started detecting elevated nitrogen levels within the effluent and ground water; it was at that time they decided to upgrade the Treatment Plant. This initial upgrade included lining the original sand filters so they could catch the effluent and pump it into a recycling tank. 50% of that effluent was recirculated to the Imhoff tank where the organic material aided in reducing the nitrogen and ammonia. Unfortunately, they still had issues with attaining treatment in the winter months as well as other long term problems. In 2010, they decided on a permanent solution. The town identified the following four major issues: First, they had issues with winter operation. They would routinely have parts of the system freeze, hindering its operation. Second, the cold weather was also affecting the treatment levels. Third, increased de-nitrification requirements. Finally, with a growing community, the system was not large enough to deal with the increased capacity. This left the town with a unique set of problems and a difficult decision to make.

After investigating many options, the town ultimately choose Presby Environmental's Enviro-Septic® Technology for their treatment needs. The Enviro-Septic® System is a passive wastewater treatment system that is tested and proven to remove up to 99% of wastewater contaminants such as BOD, TSS, TN, TKN, and Fecal Coliform. Enviro-Septic® uses patented fabrics and fibers to naturally establish multiple bacterial treatment environments throughout the system that break down and digest wastewater contaminants without the use of electricity or additives. Enviro-Septic® Systems have proven effective in cold weather which makes them ideal for this location. The warm effluent combined with the biological process that takes place within the pipe generates enough heat to keep the system from freezing. With systems in Africa, Europe, Southeast Asia, Canada, Mexico, and the US, the system is time-proven in both cold and warm climates. The Blodgett Landing Treatment Plant is designed as a re-circulating system with the patented Multi-Level™ configuration handling flows ranging from 2,500-88,000GPD.

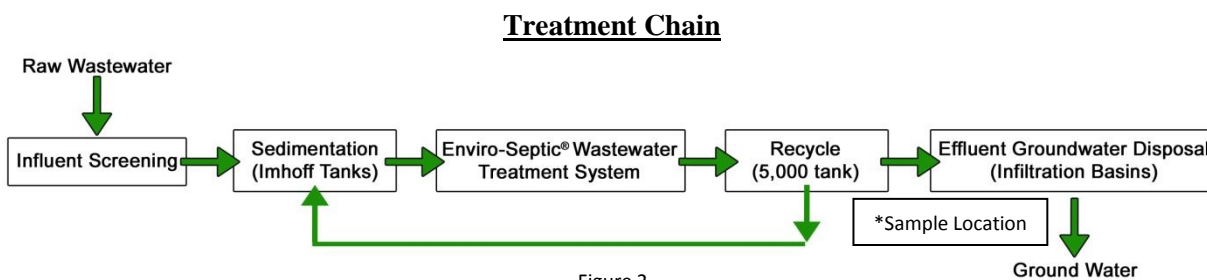


Figure 2

After the wastewater is received, it goes through an initial screening and then proceeds to one of two Imhoff tanks where sedimentation and separation occurs. After the Imhoff tank, the effluent then proceeds to an equalization tank before it is dispersed to one of the four passive Enviro-Septic® treatment beds. (See Figure 3 at the end of this paper for the treatment bed specifications.)

Each treatment bed measures approximately 90 feet long by 50 feet wide. The beds consist of 48 rows of pipe that are each 86 feet long. That means there is approximately 4,100 feet of pipe per bed or roughly 16,400 feet for the entire system. At 50,000 GPD the 16,400 feet of Enviro-Septic® pipe treats roughly 3 gallons per linear foot per day. With an impressive 25 sq ft of surface area per linear foot of Enviro-Septic®, you have over 400,000 ft² or over 9 acres of bacterial surface area in this system. A large amount of bacterial surface combined with sufficient oxygen and other patented features allows for the high levels

of treatment. These treatment beds are lined to capture the treated effluent. Once captured, the treated effluent is then pumped into a recycling tank. 75% of the treated effluent is then sent back through the Imhoff tanks via recirculation pumps and the rest is dosed into the dispersal area. As the treated effluent that is sent back to the Imhoff tanks goes anaerobic, the organic material present acts as a carbon donor in the denitrification process. Additional denitrification then takes place in the anoxic zone of the Imhoff tank. Figure 4 at the conclusion of this paper shows a diagram of the system's layout.

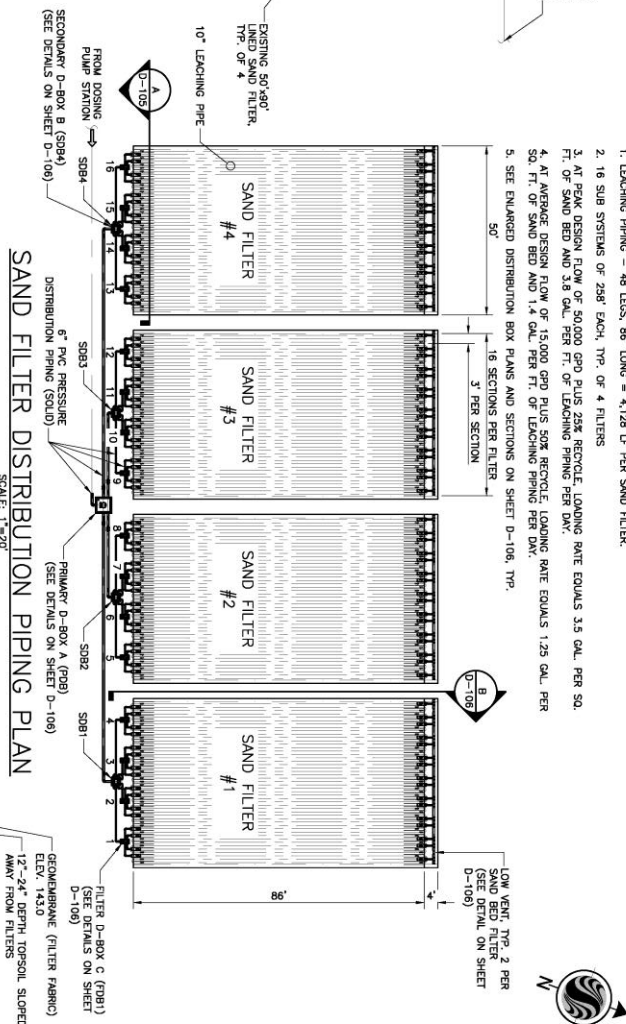
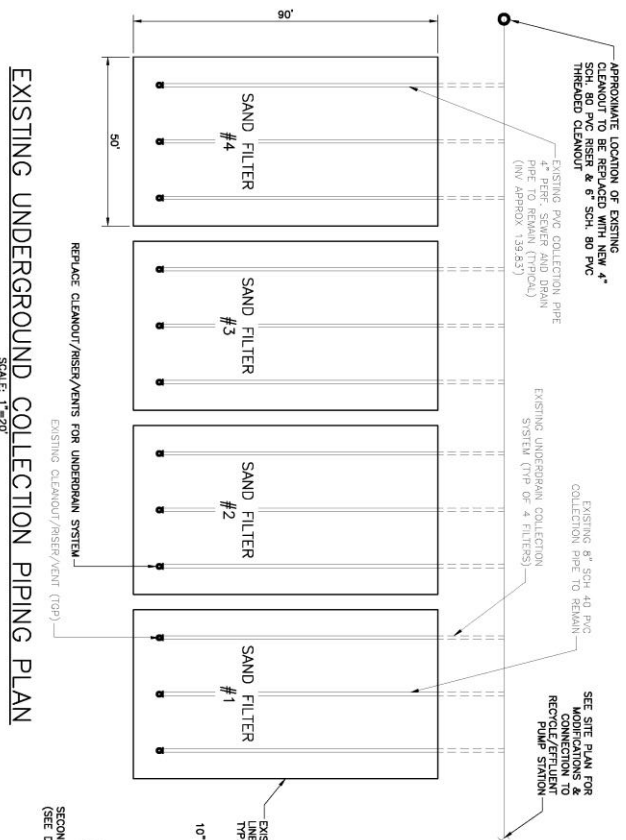
One of the main reasons why the Blodgett Landing Treatment Plant was upgraded was to increase the level of treatment. At first, the town of Newbury thought it was going to be too expensive to meet the treatment levels set by the state of New Hampshire. That is because most municipalities employ a mechanical treatment process that can be costly and requires routine maintenance and replacement parts. There is a movement in the large flow industry to find a passive treatment process that can provide the treatment levels required by regulators. The Enviro-Septic® Technology is being adopted globally as an affordable option that has minimal upkeep and maintenance. The following test results are averages of samples taken at the re-circulation chamber.

Testing Parameters	BOD	TSS	TN	TKN	Fecal Coliform
Test Results	6.0 mg/L	5.04 mg/L	7.14 mg/L	0.89 mg/L	3,632 MPN/100ml

Table 1

*Samples taken at re-circulation tank

The town of Newbury has been very pleased with the performance and operation of this system. Plant Manager Tim Mulder said, “[Enviro-Septic®] is truly exceptional in the world of large-flow wastewater treatment.” With minimal ongoing costs this system will save the town a lot of money over the next few decades, while proving the highest level of environmental protection. This project is a great example of how decentralized treatment systems can provide a passive, affordable, and reliable solution for residential, commercial and community use.



NOTES:

1. LEACHING PIPING - 48 LESS, 86" LONG = 4,128 LF PER SAND FILTER.
2. 16 SUB SYSTEMS OF 258' EACH, TYP. OF 4 FILTERS.
3. AT PEAK DESIGN FLOW OF 50,000 GPD PLUS 25% RECYCLE, LOADING RATE EQUALS 3.5 GAL. PER SQ. FT. OF SAND BED AND 3.8 GAL. PER FT. OF LEACHING PIPING PER DAY.
4. AT AVERAGE DESIGN FLOW OF 15,000 GPD PLUS 50% RECYCLE, LOADING RATE EQUALS 1.25 GAL. PER SQ. FT. OF SAND BED AND 1.4 GAL. PER FT. OF LEACHING PIPING PER DAY.
5. SEE ENLARGED DISTRIBUTION BOX PLANS AND SECTIONS ON SHEET D-106, TYP.

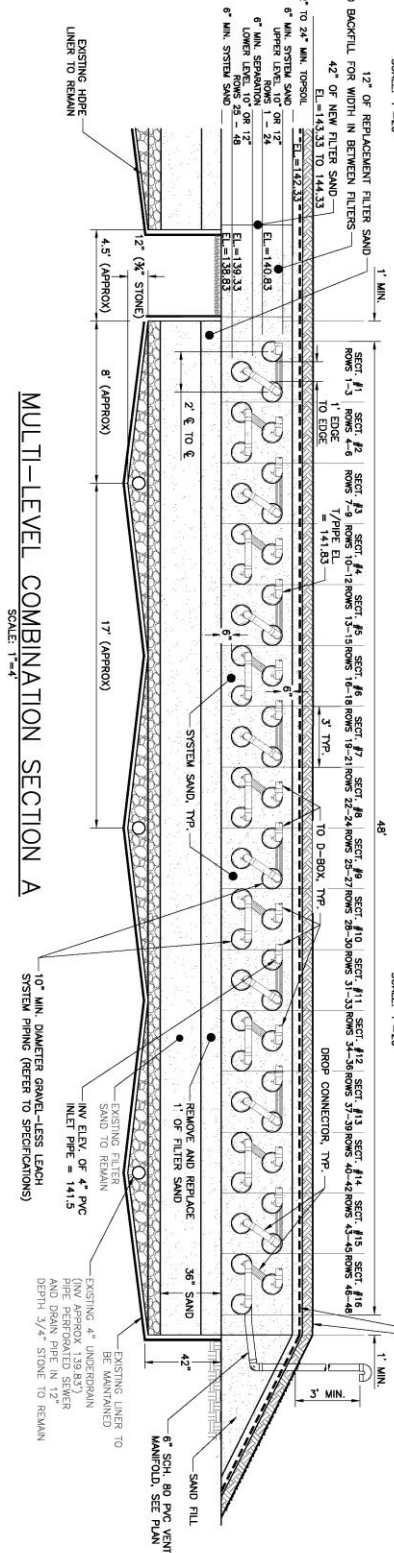
EXISTING UNDERGROUND COLLECTION PIPING PLAN

SCALE: 1"=20'

SAND FILTER DISTRIBUTION PIPING PLAN

SCALE: 1"=20'

Figure 3



MULTI-LEVEL COMBINATION SECTION A

SCALE: 1"=4'