CIVIL ENGINEERING
WATER RESOURCES
ENVIRONMENTAL
SURVEYING
LANDSCAPE ARCHITECTURE

SEPTIC SYSTEM RISK ASSESSMENT & DESIGN ALTERNATIVES REPORT

Musconetcong Watershed,
Morris, Sussex, Warren, and Hunterdon Counties
New Jersey

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EXECUTIVE SUMMARY

The Musconetcong Watershed drains to the Musconetcong River, and its lakes and tributaries. The river, which runs through northwest New Jersey, outlets into the Delaware River. The watershed is within the New Jersey Highlands region, which is an essential source of drinking water for half of the residents of the state (NJDEP, 2022). Portions of the river itself, are federally protected by the Wild and Scenic Rivers Act and areas along the river with historical and archaeological significance have been registered in the State and National Registers of Historic Places (National Wild and Scenic Rivers System, 2023).

A majority of the properties within the Musconetcong Watershed are managed by conventional septic systems, rather than sewers and wastewater treatment plants. However, conventional septic systems can fail to meet public health and water quality requirements as a result of improper planning, faulty design, inappropriate technology, poor installation or operation, and inadequate maintenance (USEPA, 2002). The cost to the homeowner to fix a septic system prior to selling their house can range from $40,000 to $80,000.

We mapped and evaluated both natural and manmade features throughout the watershed to assess existing conditions that may inform future decision-making regarding septic system use. Site analysis can inform recommendations regarding septic system use – particularly where water resources are vulnerable to the impacts of traditional septic systems.

Due to their potential environmental risks, septic systems are regulated at multiple levels of government. The United States Environmental Protection Agency (EPA) provides general design guidance and often defers to specific state requirements from a regulatory perspective. The Department of Environmental Protection (NJDEP) regulates most elements of design, installation, and maintenance of septic systems in New Jersey. County Health Departments review and approve smaller residential systems and some municipalities have specific ordinances regulating septic systems.

To reduce contaminant leaching into the surrounding environment, we explored alternatives to conventional septic system designs as well as advanced treatment options. Design alternatives are provided as options for sites with specific environmental constraints that cannot maintain an efficient conventional system. Example Design alternatives include:

- Aerobic treatment systems
- Peat biofilters
- Drip dispersal/distribution
- Mund systems
- Recirculating sand filter systems
- Evapotranspiration systems
- Constructed wetland systems
- Cluster/community systems

Advanced pretreatment systems may be required for new construction or alteration of existing, malfunctioning systems. They can also be used to reduce potential impacts in areas of exceptional resource value or areas adjacent to sensitive ecosystems. Example pretreatment systems include:

- Bioclere technology
- Amphidrome technology
- SeptiTech technology
- FAST technology
- BioBarrier Technology
- Cromaglass technology
- HOOT ANR technology
- Busse Green MBR technology

We summarize multiple Federal, State, and Local funding opportunities that could be pursued to improve septic systems and avoid water quality impairment within the Musconetcong Watershed, and describe example funding programs from neighboring states (DE, NY, PA). Existing funding sources include funding available through:

- EPA's Section 319 Nonpoint Source Management Program
- EPA Environmental Finance Center Network,
- USDA Single Family Housing Direct Home Loans
- USDA Single Family Housing Repair Loans and Grants Program
- USDA Rural Decentralized Water Systems Grant Program
- EPA's Clean Water and Drinking Water State Revolving Fund programs administered by the state of New Jersey
- NJDEP's Water Quality Restoration Grants for Nonpoint Source Pollution
- Open Space Institute's Delaware River Watershed Protection Fund.

Finally, we present questions for future consideration, the answers to which will help guide the Musconetcong Watershed Association's efforts to address septic system challenges within the watershed. Some of the key questions include:

Sewer system extensions:

- Are the areas delineated as high risk for septic systems within the one-mile radius of existing sewer service areas?
- How much additional infrastructure would be required to capture the high-risk properties and include them in the sewer service area?
- Are the existing wastewater treatment plants at treatment capacity? If not, how many additional properties could route effluent flow for treatment?
- Are there environmental constraints that would prevent a sewer extension in high-risk areas?

Guidance and regulations:

- Are there opportunities to influence state regulations or municipal codes?
- Are there upcoming planning efforts that present an opportunity for sharing updated guidance for residential septic systems (e.g., river management plans)?

Pilot programs:

- Can MWA seek funding to pilot pretreatment system installations and monitor their efficiency?

This report is supplemented by a Geodatabase prepared for Musconetcong Watershed Association in April 2023.

INTRODUCTION

The US EPA estimates that onsite wastewater treatment systems collect, treat, and release about 4 billion gallons of treated effluent per day from approximately 26 million homes, businesses, and recreation facilities nationwide. Onsite wastewater treatment systems are recognized as a viable, low-cost, long-term, decentralized approach to wastewater treatment if they are planned, designed, installed, operated, and maintained properly. However, in recent years, there has been a peak in interest to determine the impacts that onsite systems have on ground water and surface water quality, with a focus on the need to optimize the systems' performance. According to state and tribal agencies, failing onsite septic systems currently constitute the third most common source of ground water contamination which can be attributed to inappropriate siting or design, as well as inadequate long-term maintenance (USEPA, 2022).

To eliminate the risk of public health crises or environmental contamination, it is important to perform an extensive existing conditions evaluation to determine the natural constraints of the site, understand onsite septic system design and potential alternative technologies available, meet all federal, state, and local requirements, and implement regular system maintenance to avoid future malfunctions.

Conventional Septic Systems

A conventional septic system is comprised of three major components; a septic tank, an effluent distribution system, and an absorption field as seen in Figure 1. A septic tank is a watertight container that has baffles at the inlet and outlet to ensure proper flow patterns. Typical septic tanks are designed to hold a minimum of 1,000 gallons of sewage; however, the size of the tank may vary depending on the number of bedrooms it is servicing. The septic tank is used to separate solids from the liquid which will be broken down by microorganisms that are naturally present in wastewater. The separated solids collect on the bottom of the tank and should be pumped out periodically to avoid clogging the rest of the system. Effluent filters are also used on the tank outlets to prevent solids from flowing to the next component.

The effluent flow from the septic tank is transported to the distribution system. The effluent distribution system is used to separate the septic tank effluent evenly into a network of distribution lines that make up the absorption field. The effluent trickles out of the absorption field laterals through perforations and is treated through physical, chemical, and biological processes within the soil. The soil is a natural buffer to treat the wastewater before it reaches subsurface groundwater. However, even after treatment, wastewater can still contain excess nutrients such as nitrogen and phosphorus, which may pollute nearby waterways and groundwater supplies. Therefore, though generally safe for humans, the conventional septic system can contribute to water pollution even if the system is working properly. (NJDEP, 2023)

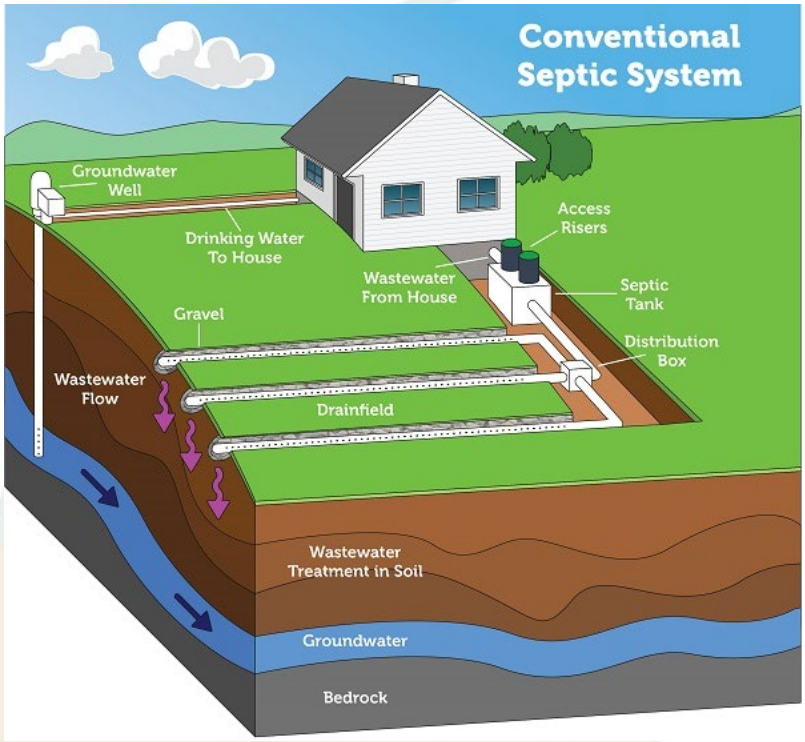

Figure 1. Conventional Septic System Diagram (Source: USEPA, 2022)

Septic Systems Relationship to Water Quality

As mentioned, septic systems have the ability to impact local drinking water wells and surface water bodies based on their design, installation, maintenance, and use. The most concerning problems related to malfunctioning septic systems involve contamination of surface waters and groundwater with disease-causing pathogens and nitrates. Discharge of excess nutrients into local waterways can present issues with sensitive fauna as well as promote vegetation growth in the form of algal blooms (USEPA, 2022).

Impacts on Drinking Water

Septic systems service properties that often receive drinking water from private wells. If a septic system is malfunctioning or located too close to a drinking water well, there is a risk that contaminants such as pathogens, chemicals, or nutrients from the wastewater can seep into the drinking water (USEPA, 2022). This scenario is depicted in Figure 2. The EPA estimates that 168,000 viral illnesses and 34,000 bacterial illnesses occur each year as a result of consumption of drinking water from systems that rely on improperly treated ground water (USEPA, 2022) To avoid contamination, New Jersey has implemented Well Head Protection Areas (WHPA) to ensure protection of public community water supply wells.

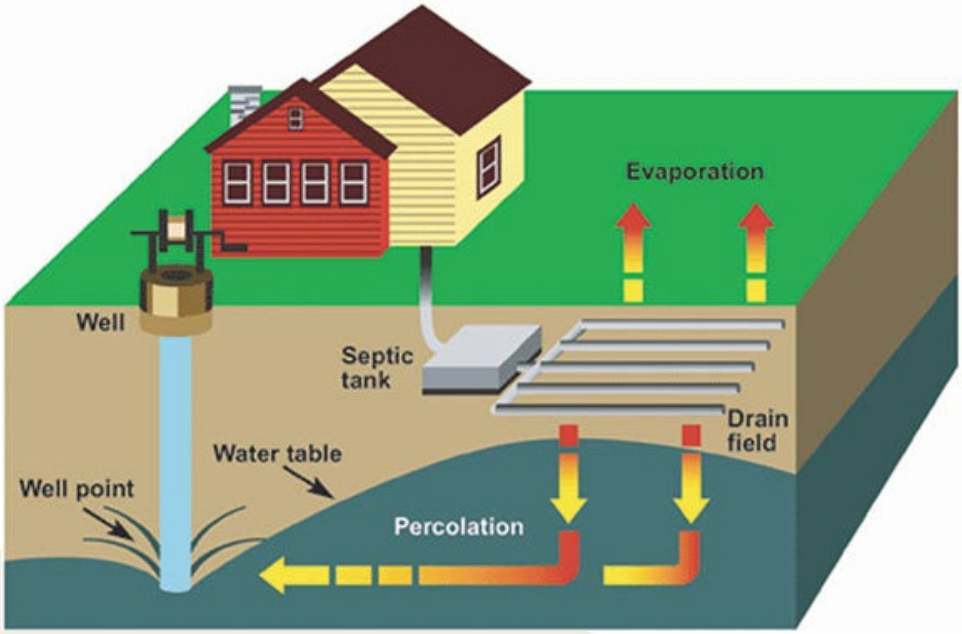

Figure 2. Groundwater Contamination from Septic Tanks (Source: Research Gate by Bakenaz A. Zeidan)

Impacts on Surface Water

Septic systems can also contaminate adjacent surface waters with pathogens, such as *E. coli*, chemicals, and nutrients like nitrogen and phosphorus. Pathogens in recreational waters can cause illness, beach closures, and hazards to humans, pets, and the aquatic wildlife. The EPA identified the discharge of partially treated sewage from malfunctioning onsite systems as a principal or contributing source of degradation in 32% of all harvest-limited shellfish growing areas (USEPA, 2002).

Excess nutrients can trigger an abundance of blue-green algae or cyanobacteria which lead to harmful algal blooms. The overgrowth of algae consumes dissolved oxygen in the water body while blocking the sunlight from subsurface vegetation. As the algae die and decompose, it leaves the waterbody in an anoxic state which can kill fish and other aquatic organisms. Freshwater rivers, lakes, and ponds are more sensitive to phosphorus contamination, while coastal waters are more sensitive to excess nitrogen. The cumulative impact of failing septic systems that are in high density and close proximity to waterways in environmentally sensitive areas should be addressed at a regional or watershed level (USEPA, 2022).

EXISTING CONDITIONS

The Musconetcong River is approximately 42.5 miles long and drains 157.6 mi^2 of watershed area to the Delaware River. The river falls within the Upper Delaware Region and is designated as Watershed Management Area #1 (WMA1). Additional major tributaries within WMA1 include the Pohatcong Creek, Pequest River, Paulinskill River, and Flatbrook River. The watershed lies within the New Jersey Highlands region and contains a variety of natural features such as limestone geology, forested ridges, and rolling agricultural land. The waterway is known for its trout fishery, including brown and brook species, which act as key indicators of river water quality due to their sensitivity to pollution and change in habitat (Musconetcong Advisory Committee, 2003). Additionally, portions of the river are federally protected by the Wild and Scenic River Act and areas along the river with historical and archaeological significance have been registered in the State and National Registers of Historic Places (National Wild and Scenic Rivers System, 2023).

The Musconetcong River's watershed spans twenty-seven (27) municipalities and creates a boundary through four (4) counties within northwest New Jersey; Warren, Hunterdon, Morris, and Sussex. The municipalities that are wholly or partially within the Musconetcong Watershed are shown in Figure 3 and delineated in Table 1 below.

Table 1. Musconetcong Watershed Municipalities

Hunterdon County	Morris County	Sussex County	Warren County
Alexandria Township	Jefferson Township	Byram Township	Allamuchy Township
Bethlehem Township	Mt. Arlington Borough	Green Township	Franklin Township
Bloomsbury Borough	Mount Olive Township	Hopatcong Borough	Greenwich Township
Glen Gardner Borough	Netcong Borough	Sparta Township	Hackettstown Town
Hampton Borough	Roxbury Township	Stanhope Borough	Independence Township
Holland Township	Washington Township		Mansfield Township
Lebanon Township			Pohatcong Township
			Washington Borough
			Washington Township

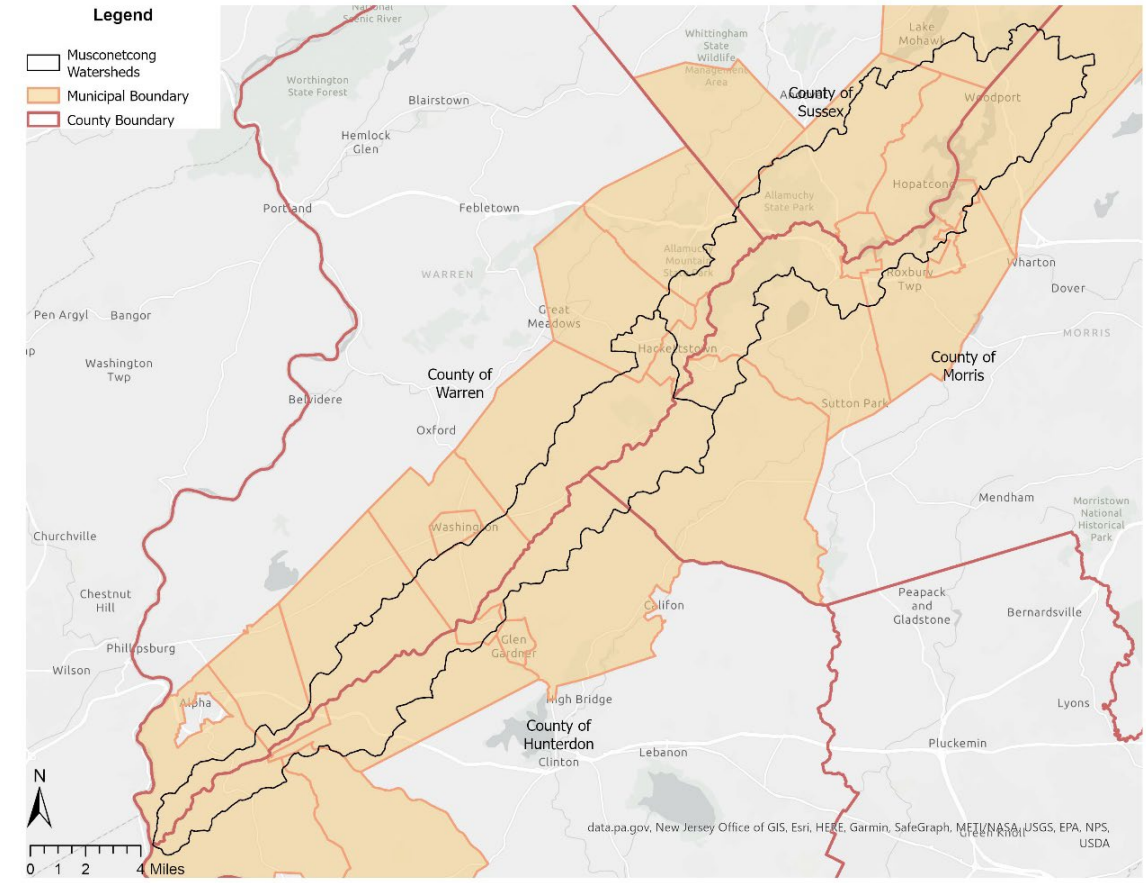

Figure 3. Municipal and County Map

Parameters Analysis

The analysis will review various existing parameters within the Musconetcong Watershed to determine septic system and other wastewater design feasibility and risk. The analysis is broken into two categories; natural or man-made features. Natural features include soil characteristics, groundwater recharge areas, geology, as well as stream location and classification. Manmade features include well head protection areas, existing sewer service areas, and State regulated facilities. Through this analysis, a more informed recommendation can be provided on septic system design and alternatives based on site conditions.

Natural Features

Natural earth features are important to consider when designing a septic or other wastewater system because the soil within and beneath the disposal field will be providing the final treatment of the effluent before it seeps into the groundwater. A profile of a typical septic disposal field is shown in Figure 4. Once the water flows out of the laterals and through the surrounding gravel, the effluent reaches the zone of treatment. The zone of treatment is always unsaturated soil that treats the wastewater through physical, chemical, and

biological processes. The zone of treatment cannot be within the groundwater table as it requires adequate oxygen to effectively convert ammonia nitrogen to nitrate nitrogen and reduce harmful bacteria and viruses. The water then flows into the zone of disposal which is permeable soil or rock material that is typically above the water table, if site conditions allow (NJDEP, 2023).

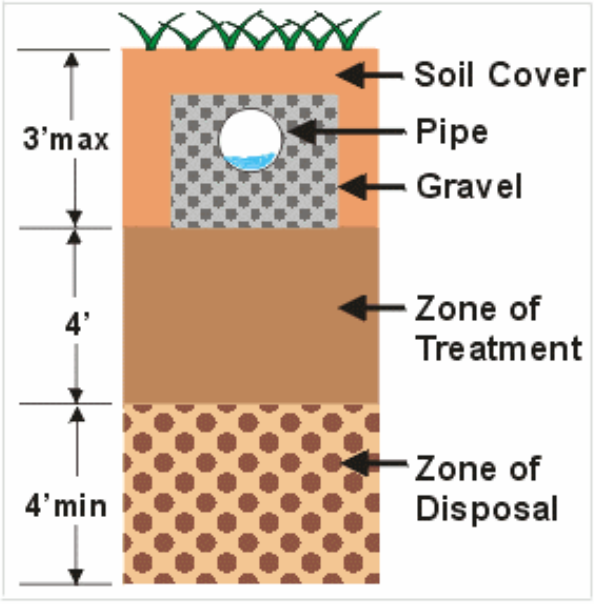

Figure 4. Septic System Profile (Source: NJDEP)

According to NRCS Web Soil Survey, the Musconetcong Watershed has 142 different soil groups with unique features and restrictions. Web Soil Survey data provides approximate depth to groundwater for each soil group. To be conservative, the most restrictive depth found within that soil group was assigned to the entire soil group boundary. As predicted, the analysis showed that shallow groundwater is mostly found along the streams throughout the watershed and particularly in the north surrounding Lake Hopatcong and Lake Musconetcong.

In areas of shallow groundwater, advanced treatment systems are recommended because there are only a few feet of fill material that is treating the effluent within the zone of treatment before it reaches the groundwater. Without pre-treatment, there is a higher risk of contamination. If groundwater is observed less than 24 inches (approx. 61 cm) below grade during initial site investigation, the septic system design requires a Treatment Works Approval (TWA) permit. A TWA permit will require a groundwater mounding analysis and installation of advanced treatment systems. Advanced treatment systems, as described later in this report, would allow the zone of treatment depth to be reduced by 2.5 feet for a final depth of 1.5 feet instead of 4.0 feet. Figure 5 below shows the approximate depth to groundwater, associated with individual soil groups, delineated as areas that would likely trigger TWA permitting as groundwater is expected to be less than 24 inches within the red zones.

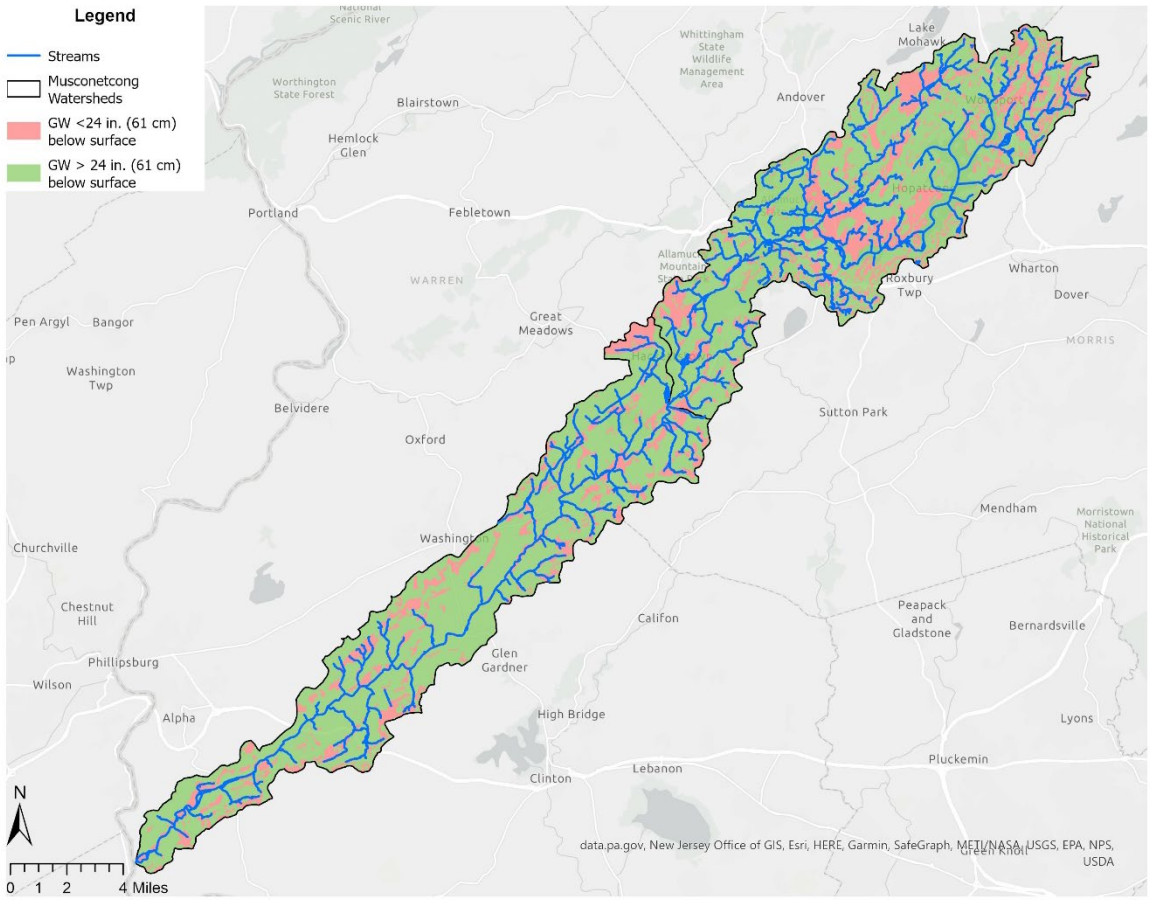

Figure 5. Depth to Groundwater Map

To ensure a septic system can function properly, the effluent needs to be able to infiltrate through the zone of treatment and zone of disposal at State required permeability rates. Select fill within the septic system profile is required to be classified as soil permeability class K4 and have a permeability rate between six and twenty (20) inches per hour. Substratum soil is required to have a permeability rate greater than 0.2 inches per hour for final effluent dispersal (N.J.A.C. 7:9A, 2021).

NJDEP Geoweb provides data for an estimation of groundwater recharge by analyzing land cover, soil, and municipality-based climate data as seen in Figure 6 below. The upper watershed area shows the greatest variety of groundwater recharge rates ranging from wetlands and open water to the highest rates of 16-23 inches per year. The middle of the watershed is mostly delineated as high recharge rates and the lower portion of the watershed is mostly mid-range recharge rates.

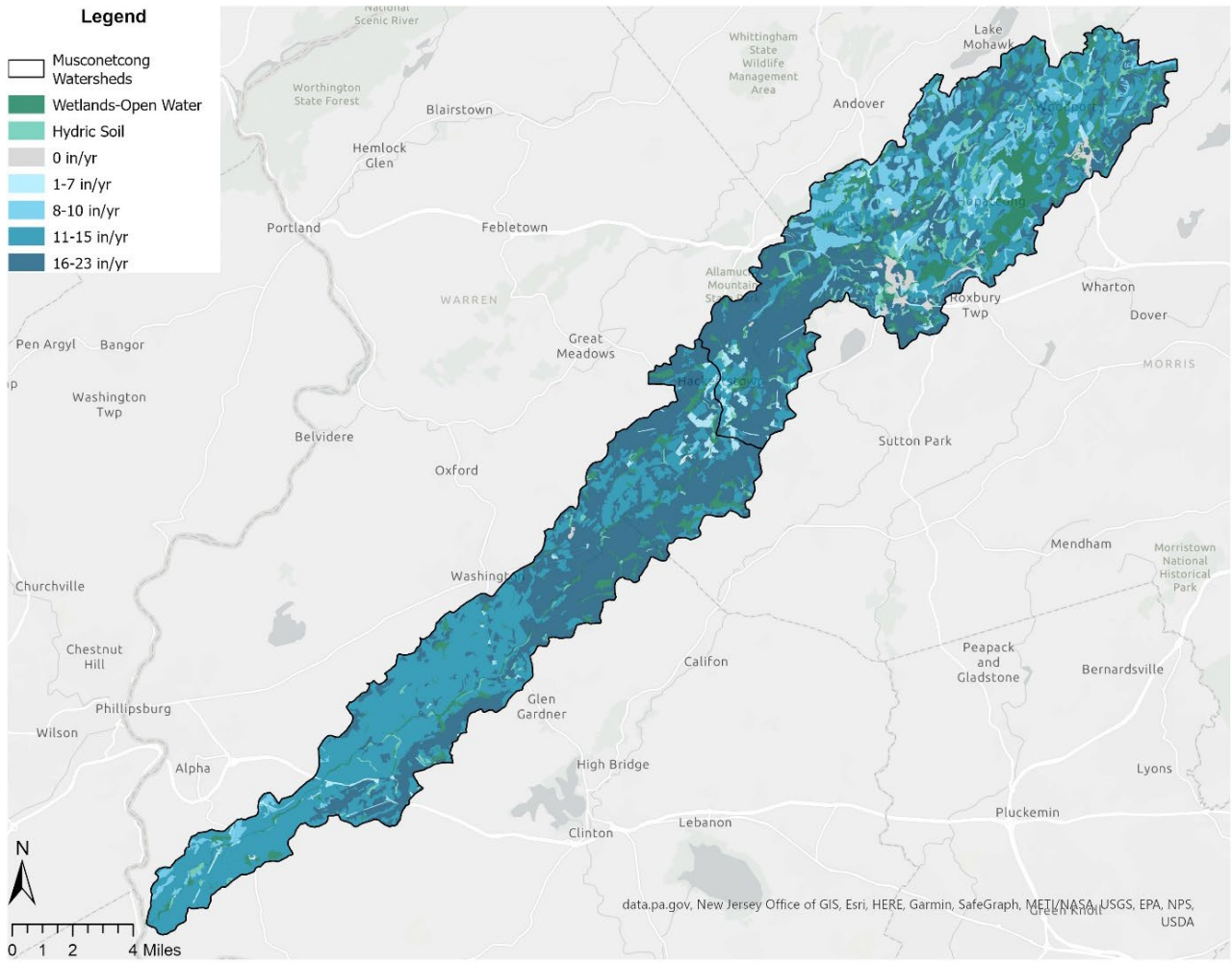

Figure 6. Groundwater Recharge Area Map

Groundwater infiltration and recharge are important for the proper function of a septic system. However, areas with high permeability rates could allow effluent wastewater to percolate faster through the subsurface soil. This limits the residence time of additional treatment. Therefore, groundwater recharge rates that are too high may pass the water faster which presents a greater risk of harmful bacteria and nutrients seeping into the water table.

An additional factor to consider when determining site suitability and groundwater infiltration is subsurface geology as rock can slow recharge rates. Many soil series within the northern portion of the state are described as having bedrock substrata at shallow depths below existing grade. In most cases, septic systems can be installed by excavating through the rock for the zone of disposal if its surficial or fractured rock. Fracture spacing within the rock would affect permeability and recharge rates of the disposed effluent. Septic systems can be designed in fractured rock or soil, as long as it has a minimum permeability of 0.2 inches per hour. However, if the subsurface geology presents a massive rock

substratum, it would be considered a design constraint. A massive rock substratum does not contain an adequate number of open fractures to allow for the absorption of wastewater and disposal (N.J.A.C. 7:9A, 2021).

As previously mentioned, even after proper treatment, wastewater effluent can still contain nutrients such as nitrogen and phosphorus. When these nutrients infiltrate into groundwater, they can be carried through subsurface groundwater flow into surface water. Deeper surface waters, such as lakes or major rivers, capture more groundwater flow due to the larger wetted perimeter. Figure 7 depicts how effluent wastewater can eventually flow into surface water bodies via groundwater.

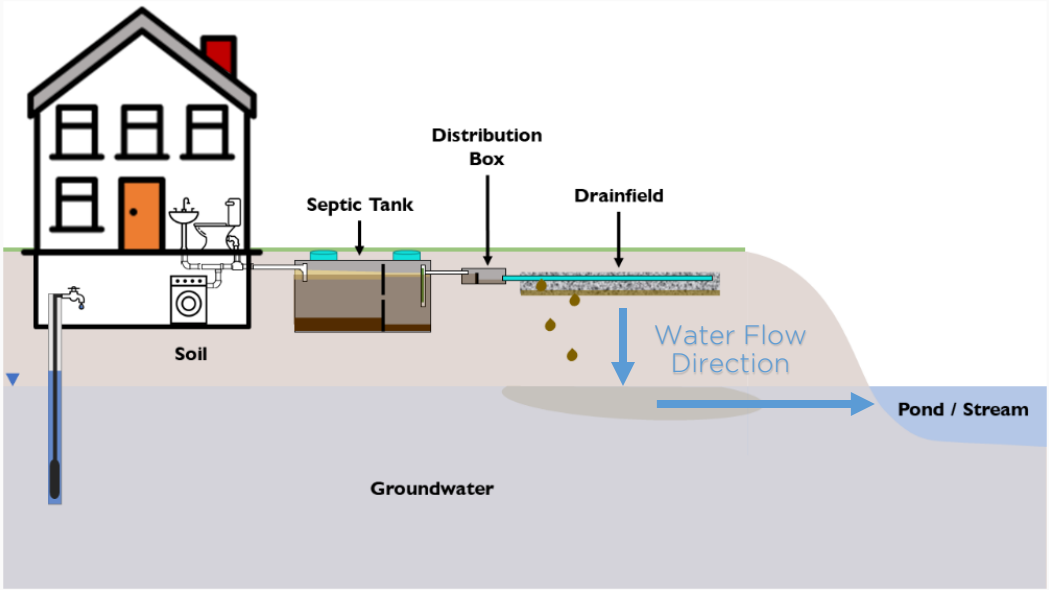

Figure 7. Septic System & Groundwater Flow (Source: University of Rhode Island Onsite Wastewater Resource Center, 2023.)

Excess nutrients or harmful bacteria carried within the effluent into surface waters can cause human health and ecological risks. The main concern with excess nutrients in surface water is the potential for harmful algal bloom (HABs). HABs are triggered by increased nutrient concentrations, warmer temperatures, and stagnant waters. HABs alter the ecological equilibrium of waterbodies which can result in anoxic (low oxygen) conditions which kill fish and subsurface vegetation (EPA, 2022). For this reason, septic systems are prohibited in areas of ecological sensitivity or exceptional resource value, such as wetlands. Therefore, as seen in later sections, the existing sewer service area surrounds much of the upper area of the watershed where there are wetlands and open waterbodies.

According to the Musconetcong River Management Plan, the waterway is widely considered to be a high-quality stream in comparison to most others in the state. However, due to urbanization within the watershed, there are indications that the water quality may be declining. The Management Plan states that some of the watershed's surface waters are in violation of NJDEP

permits due to nonpoint source pollution which includes runoff from farms, urban areas, and malfunctioning septic systems (Musconetcong Advisory Committee, 2003).

NJDEP breaks the Musconetcong Watershed into two sections; area above Trout Brook and below/including Trout Brook. Per NJDEP Geoweb, the waterways throughout the Musconetcong Watershed vary in stream classification. Generally, freshwaters are classified as FW1 waters, which are not subject to any manmade wastewater discharges unless it ameliorates an existing issue, or FW2 waters, which are all other freshwaters except for within the Pinelands. FW1 waters are nondegradation waters with ecological significance and FW2 waters are classified based on their ability to support trout. Trout classifications include trout production (TP), trout maintenance (TM), and nontrout (NT). Additionally, surface waters can be designated as Category 1 (C1) which are protected from any measurable change to existing water quality due to their exceptional ecological, recreational, and water supply significance, as well as fishery resources. The C1 designation does allow for some measurable change to existing water quality for important economic or social concerns. Stream classifications for the Musconetcong Watershed can be seen in Figure 8 below.

The majority of the streams within the watershed above Trout Brook are delineated as FW2-TM, with a few FW2-NTC1 and FW2-NT waters. However, below the Trout Brook, the streams are mostly classified as either FW2-TPC1 or FW2-TMC1 (NJDEP, 2023). Even if the northern subwatershed (with less C1 streams) is not held to the same strict regulations as the southern subwatershed (with all C1 streams), it is still important to regulate and maintain the water quality to protect the exceptional resource value waterways downstream in the Musconetcong Watershed.

The US EPA recognizes nutrients as one of the leading causes of water quality impairment in the country's waterbodies. Nutrients, specifically phosphorus, have been identified as the primary cause of over-enrichment in freshwater. NJDEP found that 31% of all freshwaters in the State were not supporting aquatic life uses due to the exceedances of phosphorus concentrations (NJDEP, 2022). As previously mentioned, septic systems that do not treat effluent properly or systems at high density can increase nutrient concentrations in groundwater which can flow into surface water. To avoid further surface water pollution from septic systems, advance wastewater treatments are recommended in areas that are in close proximity to waterways with exceptional resource value. Advanced treatment systems can remove greater nutrient loads than conventional systems, which reduces the risk of potential contamination of nearby ecological features.

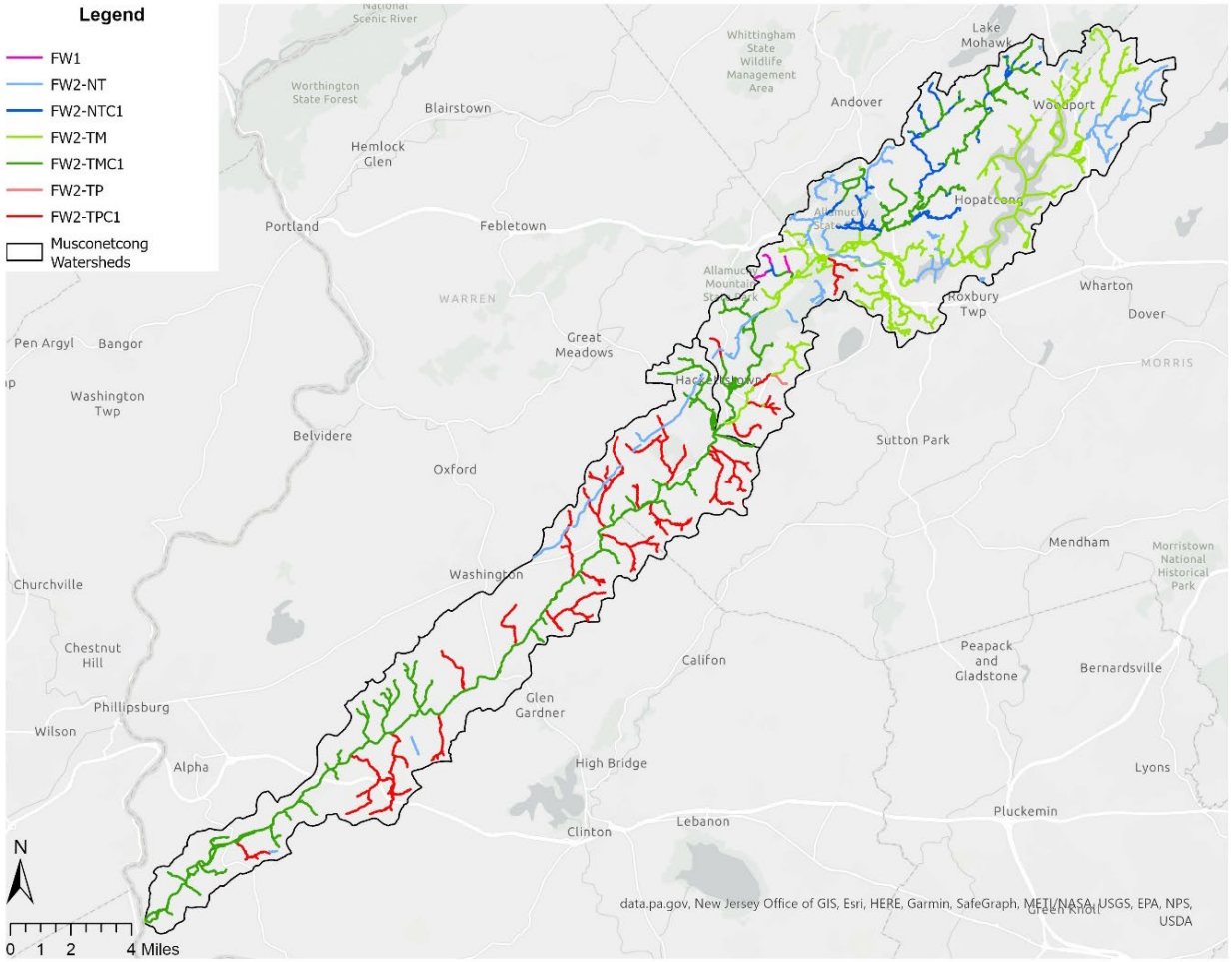

Figure 8. Stream Classification Map

Manmade Features

As previously mentioned, outdated septic system designs can impact surrounding drinking water due to leaching contaminants, which pollute groundwater. Well Head Protection Areas (WHPA) were implemented to safeguard public drinking water wells. WPHA are modeled around an unconfined public community water supply well that delineates the horizontal extent of groundwater captured by a well pumping at a specific rate over 2- (Tier 1), 5- (Tier 2), and 12-year (Tier 3) period of time for unconfined wells. The WPHA also represents a fifty (50) foot radius delineated around confined public water supply wells. Figure 9, below, shows the WHPA boundaries that prevent septic systems from being proposed in those areas.

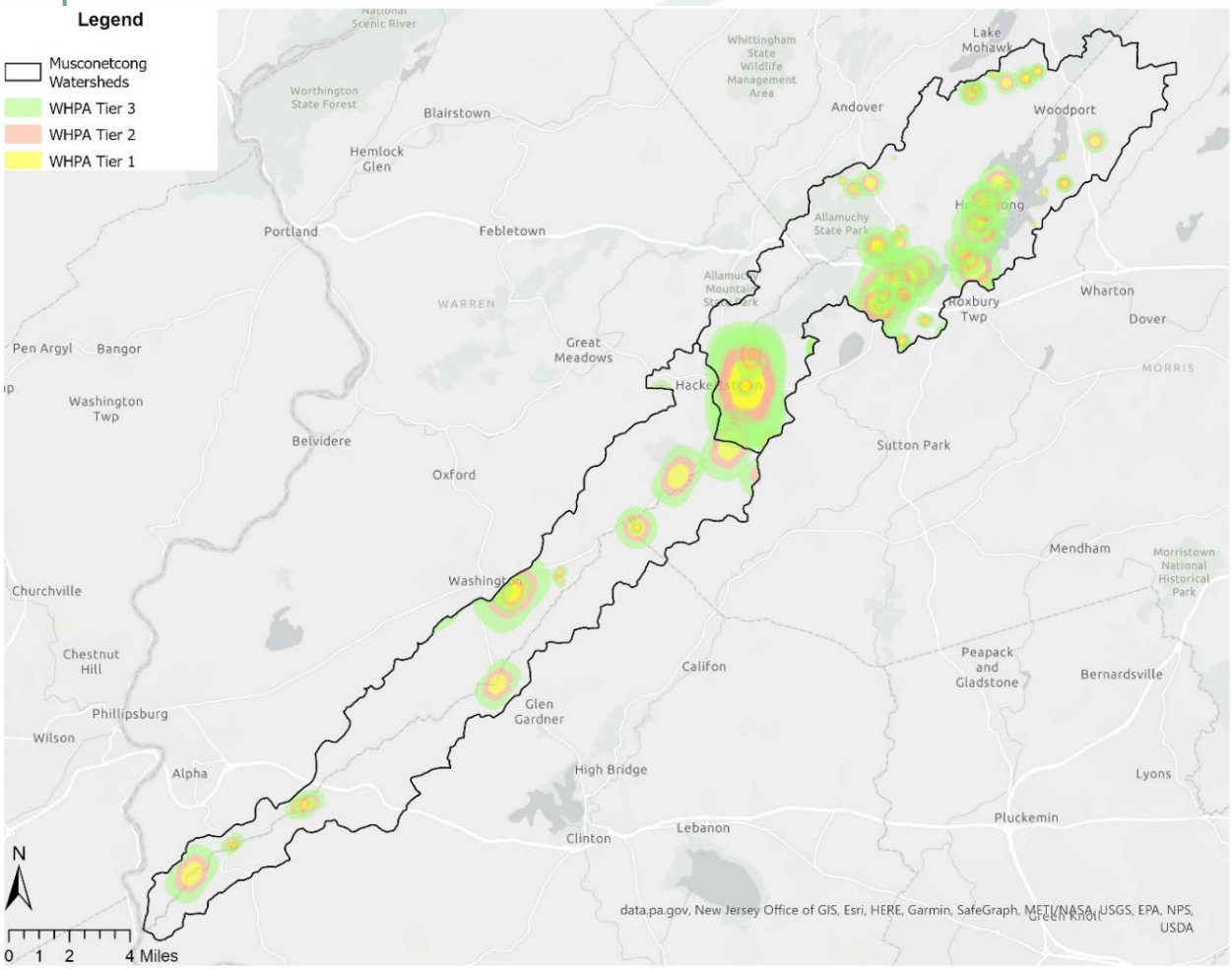

Figure 9. Well Head Protection Area (WHPA) Map

The majority of Musconetcong Watershed properties are outside of the existing sewer service areas which means most property owners utilize individual septic systems on their lots in lieu of wastewater being treated by a facility. Water quality for ground or surface waters is not as much of a concern in sewer serviced areas because their effluent is being routed to a wastewater treatment plant rather than percolation into the ground. Figure 10 delineates the extent of the existing sewer service area, which directly correlates to the WPHA boundaries in Figure 9. This relationship reinforces the restriction on septic systems being within close proximity of public water wells to avoid contamination. Figure 10 also shows a one-mile buffer from existing sewer service areas to show the potential for additional properties to tie into the wastewater treatment plant. It would be considered a best practice to expand the sewer service area in locations of the watershed where groundwater is most susceptible to pollution. However, due to the costs of installing a new wastewater treatment plant or expansion sewer infrastructure, a more practical solution would be to convert conventional septic systems to advanced

treatment systems to allow for additional contaminant removal and reduced risk of pollution. This option would also provide opportunities for limited growth to address current and future housing and economic development needs.

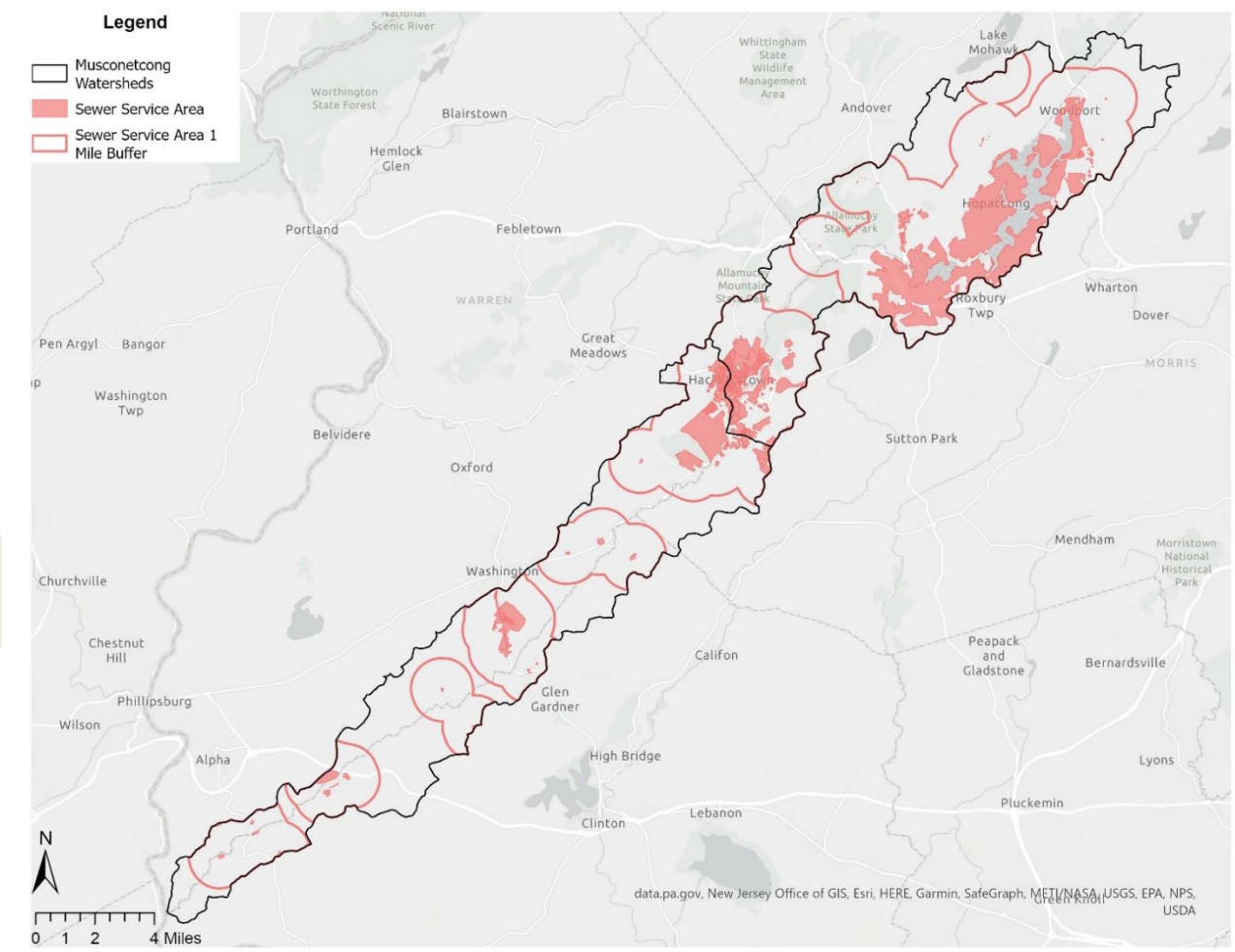

Figure 10. Sewer Service Area Map

NJDEP has a program to protect the state's ground and surface water quality by assuring the proper treatment and discharge of wastewater and stormwater. The NJ Pollutant Discharge Elimination System (NJPDES) program limits the mass or concentration of pollutants which may be discharged into groundwater, streams, rivers, and the ocean. NJPDES Wastewater Permits are classified by the type of system or type of activity that is producing the effluent. Figure 11 below depicts properties that have active sanitary wastewater, industrial wastewater, sanitary subsurface disposal, discharge to groundwater, and lined surface impoundment NJPDES permits. Sanitary Wastewater Individual Permits regulate discharges of sanitary wastewater over 2,000 gallons per day from various disposal methods to provide necessary management practices and monitoring requirements to ensure conformance with state regulations. An Industrial Wastewater Permit authorizes discharges

of industrial wastewater, such as cooling water, process wastewater, and boiler blowdown which require a permit for the particular disposal method employed by the facility. Sanitary Subsurface Disposal (T1) Permits authorize the discharge of sanitary sewage from facilities to a septic system with a design volume in excess of 2,000 gallons per day. Discharge to Groundwater (DGW) Permits regulates activities or pollution sources such as surface impoundments, overland flow, infiltration lagoons, injection wells, or land disposal of dredge spoils that could release contaminants into the groundwater. Lined Surface Impoundment (LSI) Permits authorizes the discharge of wastewater to lined surface impoundments and encourages the elimination of discharging to unlined systems (NJDEP, 2023). Although these activities are regulated by the State, they do provide a higher risk of groundwater contamination due to the excess volume or pollutants of the effluent.

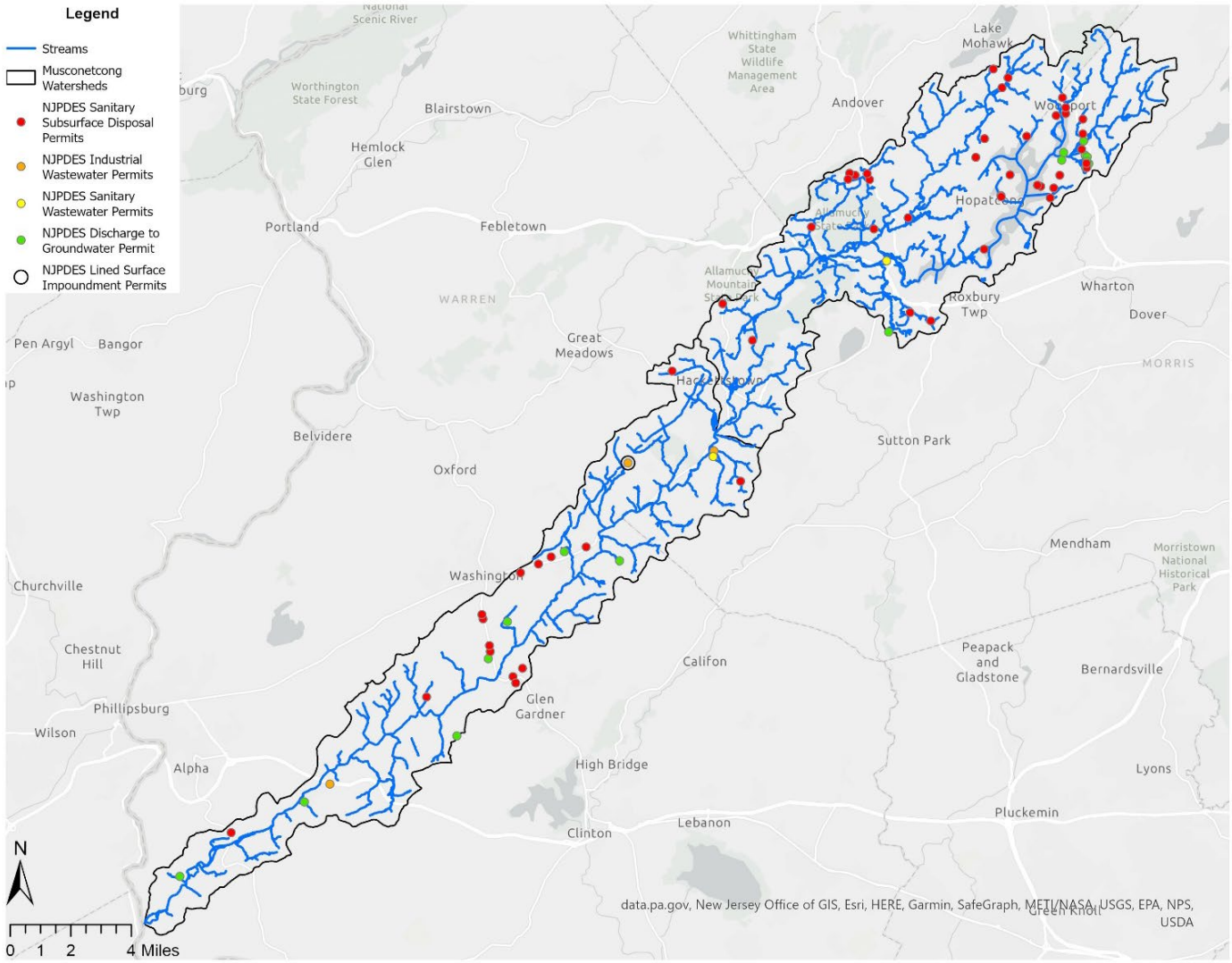

Figure 11. NJPDES Wastewater Permit Locations

NJPDES Surface Water Permits are categorized by their outfall or activity and further delineated by the type of facility. For example, Figure 12 shows surface water discharge locations within the watershed but they are split into two categories; pipe discharge or individual facility discharge. From the two categories, the locations can be broken down even further to determine if they are Category A (domestic) or Category B (industrial). Category A discharge to surface water permits are issued to facilities that discharge primarily domestic sewage from residential and commercial properties. Category B discharge to surface water permits are issued to facilities that discharge treated and non-treated wastewater derived from process/non-process wastewater, contact/non-contact cooling water, or stormwater runoff (NJDEP, 2023). All individual facility discharge locations shown on Figure 12 are considered to be Category A, as they are either a municipal utility authority or sewerage authority.

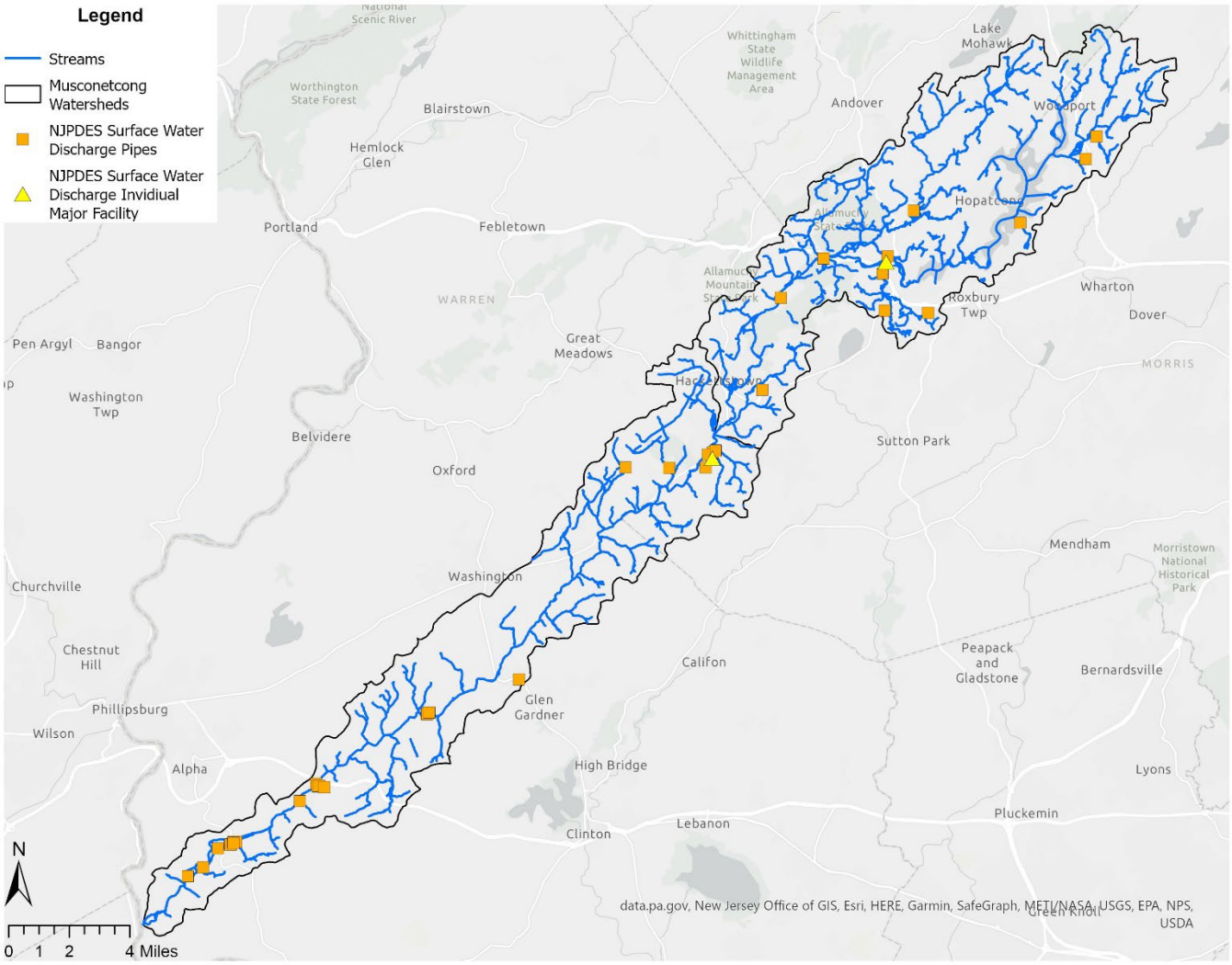

Figure 12. NJPDES Surface Water Permit Locations

SEPTIC SYSTEM REGULATIONS

Federal Regulations

The EPA first issued detailed guidance on the design, construction, and operation of onsite wastewater treatment systems in 1980 via their Design Manual: Onsite Wastewater Treatment and Disposal Systems. This manual provides a comprehensive summary of both treatment and disposal of wastewater while stressing the importance of site-specific soil, landscape, ground water, and effluent characterization. The 1980 Design Manual explored technologies such as the conventional system, alternating leach fields, uniform distribution systems, intermittent sand filters, aerobic units, disinfection technologies, and evapotranspiration systems (USEPA, 1980).

Much of the information provided in the original manual is still useful, however, advances in regional planning, improvement in water protection, and new technologies and management concepts necessitate an updated guidance. Therefore, a revised manual was created in 2002 to provide more comprehensive information on management approaches, updated information on treatment technologies, and describe the benefits of performance-based approaches to system design. The management approaches in the 2002 Onsite Wastewater Treatment Systems Manual suggest coordinating onsite system planning and management activities with land use planning and watershed protection efforts to ensure that the impacts of onsite wastewater systems are controlled at the appropriate scale. As explained in the manual, the incorporation of performance standards for management programs, system designs, and operations can help ensure that no onsite system alternative presents an unacceptable risk to the public health or water resources (USEPA, 2002)

The EPA design manuals, described above, are intended to serve as a technical guidance for designing, constructing, and maintaining onsite systems, however, they are not intended to be a substitute for region- and site-specific program criteria and standards (USEPA, 2022). Furthermore, the EPA can provide care and design guidance for wastewater management and septic systems; however, the EPA does not regulate single family home septic systems. The Agency defers to local health departments to issue construction and operating permits to install septic systems under state laws that govern public health protection and abatement of public nuisances (USEPA, 2023).

State Regulations

The New Jersey Department of Environmental Protection Agency Bureau of Ground Water, Residuals, and Permit Administration (BGRPA) section has two programs specific to monitoring wastewater treatment; the Onsite Wastewater Management Program and the Residual Management Program. The Onsite Wastewater Management Program is responsible for regulating and governing low volume residential and commercial septic systems. The Residuals Management Program regulates residuals that are generated by both domestic treatment plants and industrial treatment plants.

NJDEP refers to N.J.A.C. 7:9A Standards for Individual Subsurface Sewage Disposal Systems guidance which contains requirements for the proper design, construction, alteration, repair, and operation of systems in order to protect public health and the environment. N.J.A.C. 7:9A constitutes the rules for;

> "...all individual subsurface sewage disposal systems with an expected volume of sanitary sewage less than or equal to 2,000 gpd and shall be regarded as the minimum uniform standards, in force throughout the State, governing individual subsurface sewage disposal systems. Different requirements or specifications for individual subsurface sewage disposal systems may be set forth in a treatment works approval, general NJPDES permit or individual NJPDES permit as provided at N.J.A.C. 7:14A." (NJDEP, 2021)

When designing for an alteration or new septic system, N.J.A.C 7:9A provides important general design prohibitions that;

> "The construction, installation or operation of a subsurface sewage disposal system to serve more than one property is prohibited unless a treatment works approval and/or a NJPDES permit has been issued by the Department... The administrative authority shall not approve the construction or alteration of individual subsurface sewage disposal systems or other means of private sewage disposal where a sanitary sewer line is available within 100 feet of the property to be served." (NJDEP, 2021)

Additionally, N.J.A.C. 7:9A sets limitations for the installation, construction, or alteration of onsite septic systems such as;

> "The administrative authority shall not approve the installation, construction or alteration of an individual subsurface sewage disposal system unless the proposed system falls within the limits defined as follows:
>
> 1. A system serving one or more dwelling unit on one individual property where the total daily volume of sewage generated, calculated as prescribed in N.J.A.C. 7:9A-7.4, is no greater than 2,000 gallons per day and the type of waste discharged consists of sanitary sewage only; or
> 2. A system serving facilities other than one or more dwelling unit where the total daily volume of sewage generated, calculated as prescribed in N.J.A.C. 7:9A-7.4, is no greater than 2,000 gallons per day, the type of waste discharged consists of sanitary sewage only, and the system is connected to buildings, commercial units or other realty improvements on the same individual properties.
>
> When an individual subsurface sewage disposal system exceeds the limitations in above, a treatment works approval and a NJPDES permit issued by the Department will be required." (NJDEP, 2021)

When installing a new septic system onsite, N.J.A.C. 7:9A requires minimum separation distance between various components of the system and adjacent site features, as seen in Table 2 below.

Table 2. Minimum Required Separation Distances (feet)

Component	Reservoir, Well or Suction Line	Water Service Line, Pressure	Water Course	Occupied Building	Property Line	Disposal Field	Existing Seepage Pit or Cesspool	In-ground Swimming pool
Building Sewer	25	1	-	-	-	-	-	-
Septic Tank	50	10	25	10	5	-	-	10
D-Box	50	10	25	10	5	-	-	10
Disposal Field	100	10	50	25	10	50	50	20
Seepage Pit	150/100	25	100	50	20	50	50	30
Dry Well	50	-	-	-	-	50	50	-

Each component of an onsite septic disposal system is required to be designed and constructed to adequately treat and dispose of the expected volume of sanitary sewage to be discharged from the building. The expected volume of sanitary sewage from single residential occupancy activities is set by N.J.A.C. 7:9A below;

> "The criteria for estimating the volume of sanitary sewage from single residential occupancy activities shall be as follows:
>
> The daily volume for each bedroom or dwelling unit shall be:
>
> - Volume, first bedroom: 200 gallons per day ("gal/day")
> - Volume, each additional bedroom: 150 gal/day
> - Minimum volume per dwelling unit: 350 gal/day
> - Minimum volume per apartment: 350 gal/day
>
> The administrative authority may approve the reduction of the daily design volume for a one-bedroom age-restricted unit or one-bedroom mobile home dwelling units less than 500 square feet in size to 200 gallons per day." (NJDEP, 2021)

According to N.J.A.C. 7-9A-8.2, when serving single family dwelling units, septic tanks are required to have a minimum capacity of 350 gallons per bedroom. When serving buildings other than single family dwelling units, the minimum capacity is required to be 1.5 times the volume of sanitary sewage, when the volume is less than 1,500 gallons per day. When the volume is greater than 1,500 gallons per day, the minimum capacity in gallons is required to be 1,125 plus 0.75 times the volume. (NJDEP, 2021)

Additionally, N.J.A.C. 7-9A states that the use of advanced wastewater pretreatment devices in addition to a septic tank, or in lieu of a septic tank provided a primary settling component is incorporated into the design, may be allowed or required for new construction, projects where there is an increase in expected volume of sanitary sewage, or to an existing, malfunctioning system. Furthermore, the regulation states;

> "For individual systems with expected volumes of sanitary sewage less than or equal to 1,500 gallons per day, advanced wastewater pretreatment devices shall have obtained an NSF Standard 40 and/or Standard 245 certification, bear the mark of NSF and must be used in accordance with all conditions of that certification in addition to the requirements in this chapter. For systems with expected volumes of sanitary sewage greater than 1,500 gpd or systems that receive waste

flows that are not residential in nature, advanced wastewater pretreatment devices shall be from a manufacturer that has obtained an NSF Standard 40 and/or Standard 245 certification for the treatment technology, be certified by the manufacturer that the technology is designed to achieve secondary effluent standards for the actual or proposed waste strength that will be generated at the site and must be used in accordance with all requirements in this chapter." (NJDEP, 2021)

To ensure proper function of an onsite septic system, operation and maintenance is imperative. N.J.A.C 7:9A outlines maintenance requirements in Subchapter 12 of the guidance and states that all system is required to follow all applicable mandatory maintenance programs.

Local Ordinances

When expected volume of sanitary sewage is less than 2,000 gallons per day, the property owner should submit an application to the County Health Department. Four (4) counties span the Musconetcong Watershed; Warren, Sussex, Morris, and Hunterdon. The Warren County Health Department (WCHD) reviews plans for proposed installation of septic systems, physically inspects their installations, and responds to complaints concerning malfunctioning septic systems. The WCHD defers to the New Jersey Septic System Code for design requirements. Sussex County Health Department (SCHD) provides a comprehensive County Wastewater Management Plan (December, 2017) on their website for review. For design regulations, the SCHD defers to NJDEP and EPA guidances. Morris County Health Department (MCHD) follows NJDEP rules and guidances regarding septic design, however, they also offer additional resources via the Morris County Health Officers Model Septic Management Ordinance on the County website. The Hunterdon County Health Department (HCHD) Office of Environmental Health performs site inspections, review of septic designs, installation inspections, repair guidance, certification of completed systems, and compliant investigations. The HCHD defers the NJDEP's guidance for water quality requirements and septic system design.

In addition to the County Health Department requirements, property owners should also review the municipal ordinance for the site-specific Township, as they may differ from state or county requirements. For example, Washington Township has adopted additional standards and made amendments to the NJDEP guidance. Washington Township has adopted the Realty Improvement Sewerage and Facilities Act (1954) and its subsequent amendments known as Standards for Individual Subsurface Sewage Disposal Systems (2012) which provide standards for the proper location, design, construction, installation, alteration, operation, and maintenance of individual subsurface sewage disposal systems. Additionally, Washington Township's §247 Sewage Disposal Ordinance Subchapter 6 Amendments, outlines regulation deviation from the N.J.A.C. 7:9A guidance specific to their Township in regard to septic system design and installation.

SEPTIC SYSTEM DESIGN

Design Alternatives

Design and size of a property's septic system can vary based on household size, soil type, site slope, lot size, proximity to sensitive water bodies, weather conditions, and local regulations. The USEPA and NJDEP highlight several typical septic system alternative options in their guidances which are explored below. Guidances for NJDEP design alternatives can be found in Appendix B. As previously mentioned, the EPA provides information regarding septic systems, however, they refer to local and state regulations for design approvals.

Aerobic Treatment Systems

Aerobic Treatment Systems are an NJDEP approved septic system design alternate. This type of treatment system uses similar processes as a municipal sewage plant. An aerobic system injects oxygen into the treatment tank which increases natural bacterial activity that provides additional treatment for nutrients in the effluent flow (USEPA, 2022). Different types of treatment systems and processes that are used as Aerobic Treatment Systems include fixed activated sludge treatment, fixed film trickling filter, packed bed filters, sequencing batch reactors (SBR), and submerged attached growth bioreactors (NJDEP Division of Water Quality, 2022).

These types of systems significantly reduce biological oxygen demand and total suspended solids; therefore, the surrounding soil is used more for dispersal capabilities rather than effluent treatment. The reduced organic concentration in the treated effluent allows for a smaller dispersal system than a conventional septic design (NJDEP Division of Water Quality, 2022). Furthermore, aerobic treatment systems can be used on smaller lots, lots with inadequate soil conditions and/or high groundwater table, and for lots in close proximity to a sensitive surface water body (USEPA, 2022). Once treated, the effluent from an Aerobic Treatment System can be dispersed by a disposal field, seepage pit, or drip dispersal system (NJDEP Division of Water Quality, 2022). Regular lifetime maintenance is required for these types of systems.

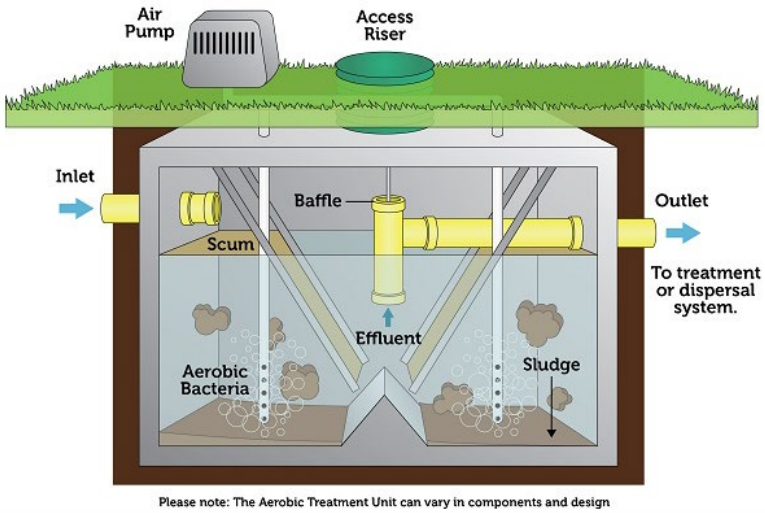

Figure 13. Aerobic Treatment System (Source: USEPA, 2022)

Peat Biofilters Treatment Units

Peat Biofilter Treatment Units are an NJDEP approved septic system design alternate. The system uses sphagnum peat moss or peat fiber for removing and retaining contaminants (NJDEP Division of Water Quality, 2022). Wastewater effluent undergoes primary treatment in a septic tank which settles out solid materials. The liquid effluent is then pumped by time dosing, and at even distribution, into the peat biofilter units. Biological, chemical, and physical processes within the biofilter units treat the wastewater as it percolates through, which can take around 36-48 hours before dispersal (Flemington Precast & Supply LLC, 2019).

This additional treatment reduces the organic nutrient concentration in the effluent which allows for a smaller dispersal system than a conventional septic design. Peat biofilter units reduce biological oxygen demand and total suspended solids, therefore, similar to the aerobic treatment, the surrounding soil is utilized for dispersal capabilities rather than treatment. Therefore, the effluent can be dispersed by disposal field, seepage pit, drip dispersal system, or an open or closed bottom design. An open-bottom design can be installed over a gravel bed but the subsurface soil is required to have a permeability rate less than two inches per hour (NJDEP Division of Water Quality, 2022).

Peat biofilter units can have a life expectancy of up to 15 to 20 years. It is recommended that the septic tank, effluent filter, pump, and control panel be maintained regularly, however, the peat filter units require minimal maintenance themselves and should be continually monitored per the manufacturer's specifications (Flemington Precast & Supply LLC, 2019).

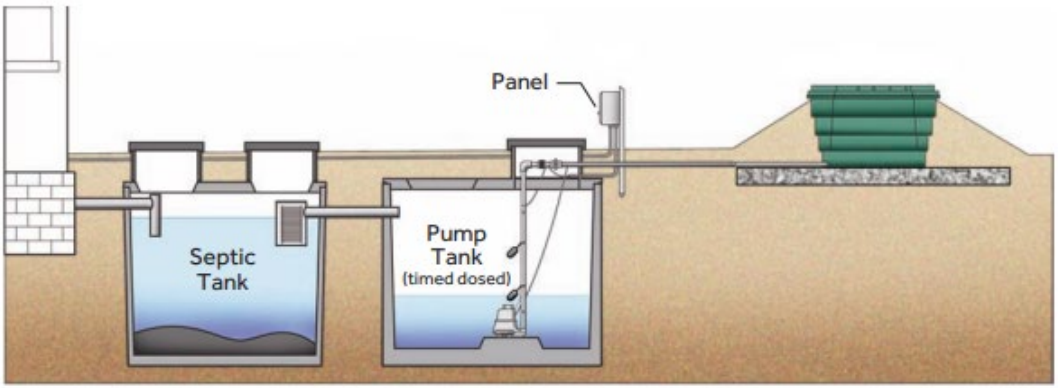

Figure 14. Peat Biofilter Treatment Systems (Source: Flemington Precast & Supply LLC*, 2019)*

Drip Dispersal/Distribution

Drip Dispersal Systems are an NJDEP approved septic system design alternate. Drip Dispersal Systems uniformly dose effluent wastewater and equally distribute it over an infiltration surface in small doses throughout the day via pumps. The system utilizes uniformly spaced drip emitters that are within flexible tubing to control the rate of wastewater discharges through the tube's small orifices. The dripperline can be installed directly into the soil without aggregate or media surrounding it. The intermittent dosing allows time for the

surrounding soil to reaerate and perform biochemical treatments within an aerobic environment (NJDEP Division of Water Quality, 2022).

The main advantage of a drip dispersal system is that the drip laterals are installed within the top 6-12 inches of soil, therefore, the system can be proposed for sites with high groundwater or bedrock. Alternatively, a disadvantage to the system is that it requires a large dose tank after the septic tank to accommodate timed doses of effluent to the drip absorption. This type of system requires frequent monitoring to ensure proper operation, particularly metering the dispersed volume which can affect the system's performance. Additional components are required for this system, such as electrical power, which is an added expense and increased maintenance (USEPA, 2022).

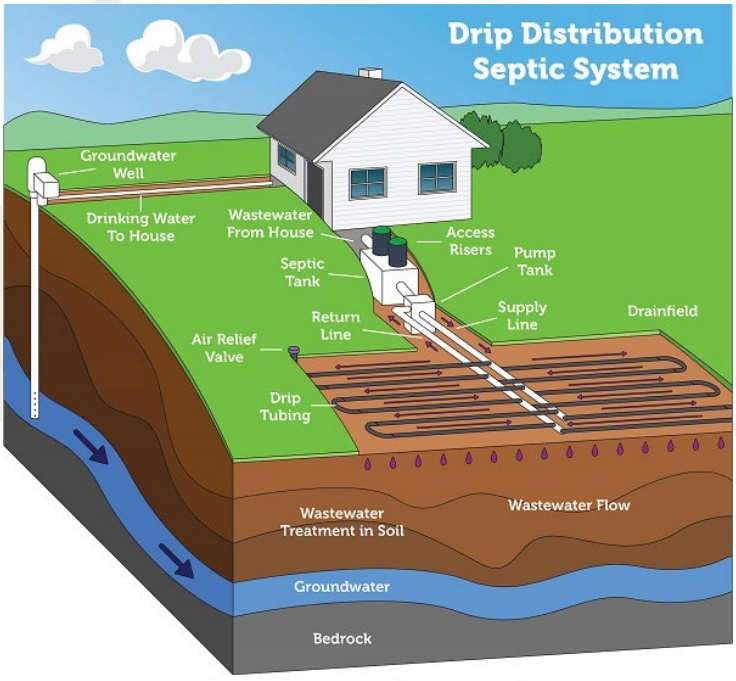

Figure 15. Drip Dispersal/Distribution System (Source: USEPA, 2022)

Mound Systems

Mound Systems are listed as an EPA Septic System Design Alternative, however, NJDEP does not have a specific guidance on these types of systems. The mound septic system alternative design works by pumping effluent from the site's septic tank to the constructed sand mound in prescribed doses. The sand mound contains an elevated drainfield trench. The effluent is treated as it discharges to the trench, filters through the sand, and disperses into native subsurface soil. The mound septic system is an option in areas of reduced soil depth, high groundwater, or shallow bedrock. It is a suitable alternative for certain soil conditions; however, mound systems require a substantial amount of space and periodic maintenance (USEPA, 2022).

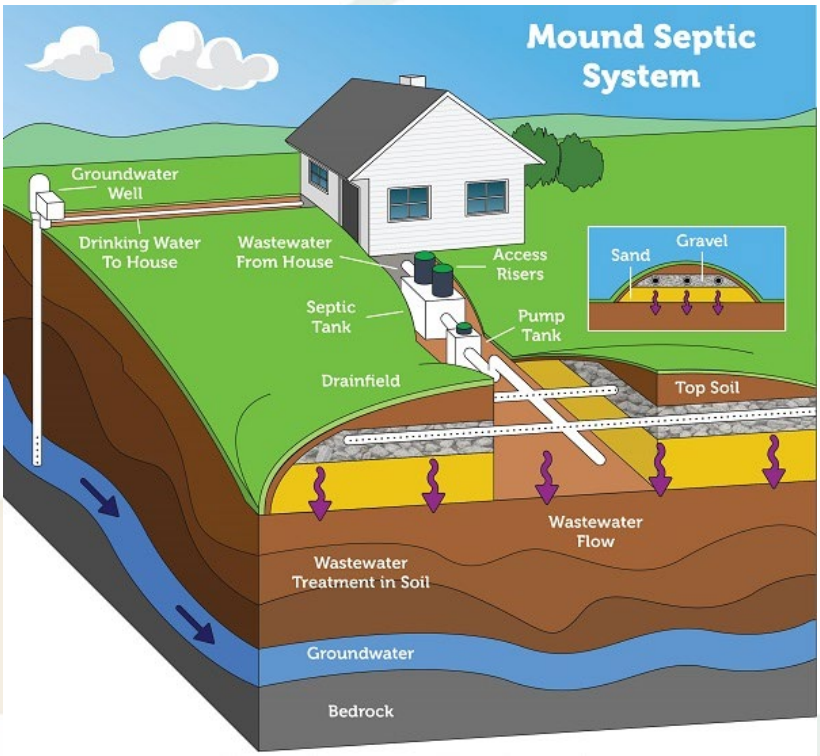

Figure 16. Mound Systems (Source: USEPA, 2022)

Recirculating Sand Filter Systems

Recirculating Sand Filter Systems are listed as an EPA Septic System Design Alternative, however, NJDEP does not have a specific guidance on these types of systems. The sand filter system works by pumping effluent at low pressure from the septic tank into the sand filter, which can be constructed above or below ground. The effluent is released into the sand filter along the top through perforated pipes and is treated as it trickles through the sand layer. Once the wastewater is treated, it is discharged to a drainfield (USEPA, 2022).

Sand filters are more expensive than a conventional septic system but they provide a higher level of treatment for nutrients which can be beneficial for sites in close proximity to sensitive waterbodies. Additionally, since sand filters can be constructed above ground in a concrete box, they can be proposed on sites that have a high groundwater table (USEPA, 2022).

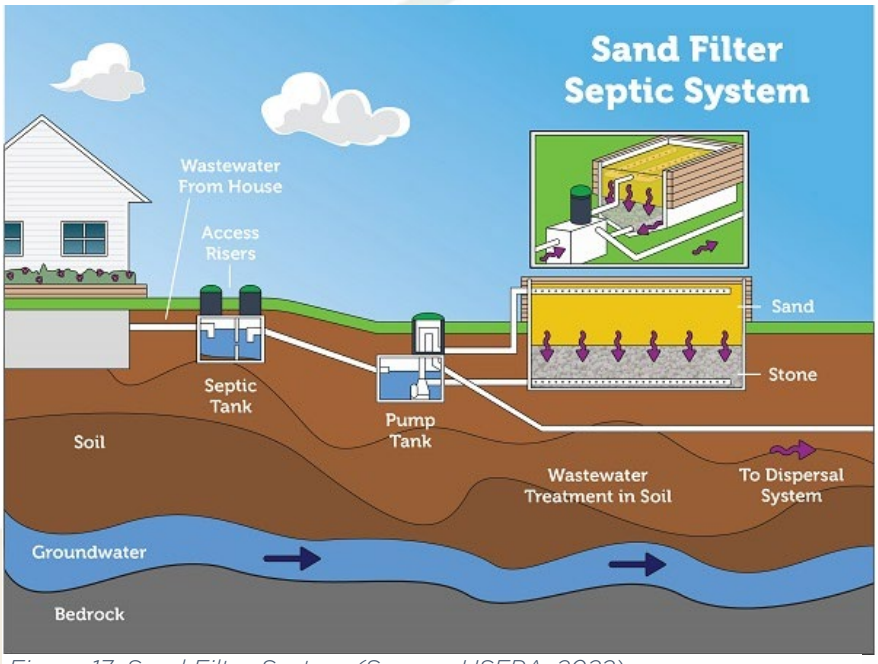

Figure 17. Sand Filter System (Source: USEPA, 2022)

Evapotranspiration System

Evapotranspiration Systems are listed as an EPA Septic System Design Alternative, however, NJDEP does not have a specific guidance on these types of systems.

Evapotranspiration systems are a specific design for a septic drainfield. After the effluent flows into the evapotranspiration system from the septic tank, it evaporates into the air. The base of the system is lined with a watertight material; therefore, the effluent cannot filter into the soil and reach groundwater. Due to their unique design, evapotranspiration systems are only useful in specific environmental conditions. The systems work well in shallow soil where the climate is arid with adequate heat and sunlight. Evapotranspiration systems have a high risk of failure if they take on too much rain or snow (USEPA, 2022). Therefore, while an interesting design alternative, evapotranspiration systems would be inefficient in the New Jersey area.

Constructed Wetland Systems

Constructed Wetland Systems are listed as an EPA Septic System Design Alternative, however, NJDEP does not have a specific guidance on these types of systems. The general purpose of a constructed wetland is to mimic the treatment processes that occur naturally in a wetland. The constructed wetland system collects wastewater from the septic tank and passes it through the media which contains microbes and plants that remove pathogens and nutrients from the effluent discharge. Typically, the wetland system will have an impermeable liner, gravel and sand fill, and appropriate wetland plantings that can withstand perpetual saturation. The treated effluent can then flow into a drainfield for additional wastewater treatment into the soil (USEPA, 2022).

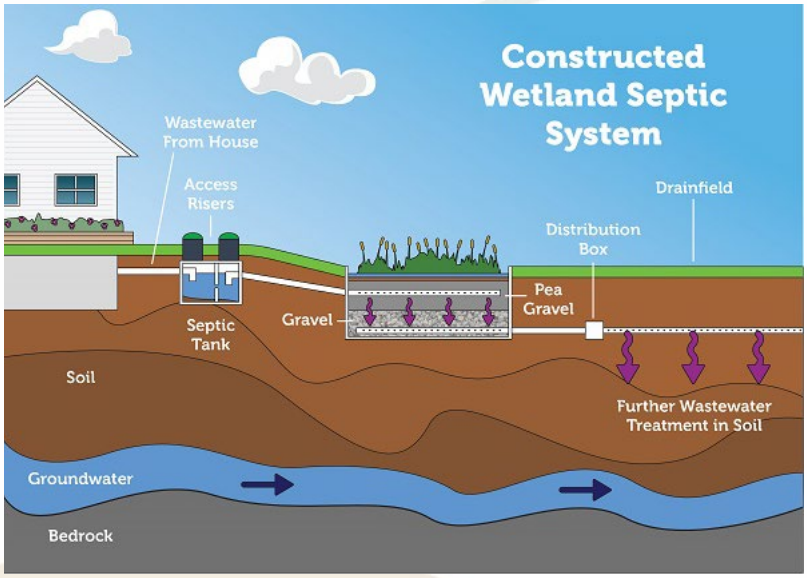

Figure 18. Constructed Wetland System (Source: USEPA, 2022)

Cluster/Community System

The EPA describes cluster decentralized wastewater treatment as a system that is under a form of common ownership and collects wastewater from two or more dwellings or buildings. The system conveys wastewater effluent to a treatment and dispersal system located at a common location near the dwellings or buildings. Cluster systems are typically found in rural subdivisions (USEPA, 2022). These cluster systems can be coupled with advanced pre-treatment technologies for even greater water quality benefits.

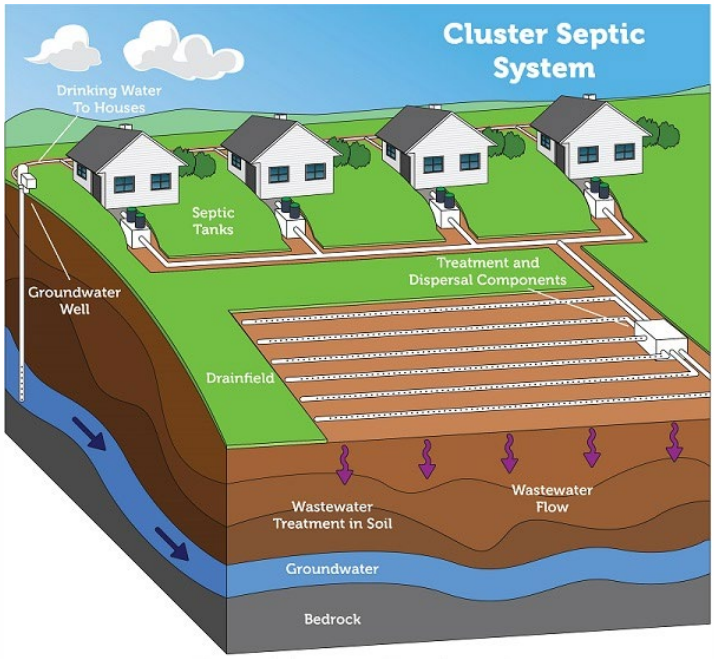

Figure 19. Cluster/Community Systems (Source: USEPA, 2022)

Pretreatment Product Alternatives

Per N.J.A.C. 7:9A, the use of an advanced wastewater pretreatment in addition to a septic tank may be allowed or required for new construction, projects with an increase in expected volume of sanitary sewage, or an alteration to an existing, malfunctioning system (NJDEP, 2021). Pretreatment systems are also applicable for use in areas adjacent to sensitive ecosystems of exceptional resource value to reduce the potential impact of contamination.

NJDEP maintains a list of advanced wastewater pretreatment products that are approved for use within septic system design. The list outlines pretreatment products and their manufacturers but each product would fall within one of the general system design alternative options as described in the previous section. The advanced wastewater treatment and disposal options are property- and case-specific, therefore property owners are encouraged to research vendors and manufacturers to determine which is best suited for their needs. The list of NJDEP-approved products is provided in Appendix C.

This report can aid in the decision-making process as it outlines a list of specific advanced wastewater treatment technologies that have been previously vetted to determine nutrient removal efficiencies, specifically for nitrogen. Controlling effluent wastewater nitrogen levels is crucial for reducing significant point and nonpoint source pollutants due to its role in eutrophication of surface waters (Pinelands Commission, 2015). NJDEP studies have utilized nitrate as a surrogate for assessing the impact of all parameters in septic system effluent, as it has been proven to provide the most protective approach with respect to groundwater. Processes within the soil readily convert other forms of nitrogen to nitrate which is stable and soluble in groundwater, therefore it is easily traceable (NJDEP Division of Watershed Management, 2007).

The advanced wastewater treatment technologies described below were a part of a New Jersey Pinelands Commission pilot program which installed and monitored hundreds of advanced systems throughout the Pinelands Region of the state. The New Jersey Pinelands is the country's first National Reserve which includes portions of seven (7) southern counties and encompasses over one-million acres. The exceptional quality of the Pinelands water resources is protected and maintained through the control of development through local, state, and federal agencies. The governing body that oversees the reserve is the NJ Pinelands Commission. Due to the areas sensitive ecological resources, the Commission conducted a thorough review of alternate septic system treatment technologies and conducted a pilot program that would test specific onsite wastewater treatment products to determine their nutrient removal efficiency and cost effectiveness (Pinelands Commission, 2015).

Due to the exceptional water quality of the Pinelands, the Pinelands Comprehensive Management Plan (CMP) focuses on controlling the total amount of nitrogen that enters the environment, instead of nitrate only. The CMP's water quality standards allow the use of onsite septic systems if the design of the system and size of the parcel will ensure the concentration of nitrogen in the ground water exiting the parcel or entering a surface water body will meet the Commission's water quality standard of 2 ppm. The CMP utilizes the Pinelands Septic Dilution Model to calculate nitrogen loading to groundwater from septic systems, as well as confirming the proposed loading

does not exceed the assimilative capacity of the environment. For example, the model calculates that a minimum of 3.2-acre parcel is required to dilute nitrogen to the required 2 ppm concentration when a conventional septic system technology is used. Therefore, in order to comply with the CMP water quality standards, unsewered residential development on parcels smaller than 3.2 acres requires the use of an advanced pretreatment system. If the nitrogen concentration in the wastewater discharged from an onsite septic system is sufficiently reduced through the use of an advanced pretreatment system, the Pinelands CMP allows the minimum lot size required to meet 2 ppm concentration to be reduced to 1.0-acre. In this scenario, it is assumed that the maximum effluent concentration from the septic system would be 14 mg/L to ensure that the effluent is diluted to 2 ppm by the time it reaches the property line or water body (Pinelands Commission, 2015). Therefore, the advanced pretreatment systems analyzed below are held to the 14 mg/L maximum nitrogen concentration. The alternative pretreatment technology products are reviewed in order of maximum to minimum nitrogen removal. All alternative pretreatment technology products discussed in this report are listed on the NJDEP-approved list of applicable advanced wastewater pretreatment devices, with the exception of the Cromaglass system. A similar analysis was conducted for the Highlands Region where a nitrate dilution model was used to calculate acceptable septic system densities; in the Highlands Preservation Area densities are 1 unit per 25 acres and 1 unit per 88 acres for non-forested and forested areas respectively when modeling target concentrations of 0.76 mg/L (non-forested) and 0.21mg/L (forested; New Jersey Highlands Water Protection and Planning Council 2008). These parcel sizes are significantly larger than those calculated for the Pinelands, indicating the need for lower septic density and greater adoption of advanced technologies in the Highlands Region.

Bioclere Technology

The Bioclere system uses an attached growth trickling filter concept for residential and commercial wastewater treatment. The trickling filter technology utilizes highly permeable media to which microorganisms attach as wastewater percolates through. The pilot program's results showed the effluent from the Bioclere technology contained approximately 11.2 mg/L of total nitrogen. The Commission's pilot program established a cost summary which includes the treatment unit and its 5-year maintenance service package, the soil absorption system, and the engineering, surveying, and other installation services. The average reported total cost of the Bioclere onsite treatment system, taking into account the product, 5-year maintenance, design, and construction, is approximately $27,802 (Pinelands Commission, 2015).

Amphidrome Technology

The Amphidrome technology supports an advanced biological treatment process which uses an attached growth treatment concept. Attached growth treatment systems cycle between aerobic and anoxic environments as wastewater passes from the tank through granular biological filters. Attached growth units rely on oxygen-dependent bacteria to break down wastewater and solids. The system is designed to remove soluble organic nitrogen, as well as facilitate nitrification and denitrification process within a single reactor. The pilot program's results showed the effluent from the Amphidrome technology contained approximately 11.9 mg/L of total nitrogen. The average reported total cost of the Amphidrome onsite treatment system, taking into account the product, 5-year maintenance, design, and construction, is approximately $31,502 (Pinelands Commission, 2015).

SeptiTech Technology

The SeptiTech system is a two-stage treatment technology that is based on a fixed film trickling filter which utilizes a patented highly permeable hydrophobic media. The technology is designed to remove total nitrogen from wastewater by nitrification and denitrification. The pilot program's results showed the effluent from the SeptiTech technology contained approximately 18.5 mg/L of total nitrogen. The average reported total cost of the SeptiTech onsite treatment system, taking into account the product, 5-year maintenance, design, and construction, is approximately $28,819 (Pinelands Commission, 2015).

FAST Technology

The Fixed Activated Sludge Treatment (FAST) technology is a modular system that is designed to treat wastewater from single homes, multiple homes, or commercial facilities. The system is a fixed film, aerated system which utilizes a combination of attached and suspended growth treatments working to achieve nitrification and denitrification in a single tank. The pilot program's results showed the effluent from the FAST technology contained approximately 19.0 mg/L of total nitrogen. The average reported total cost of the FAST onsite treatment system, taking into account the product, 5-year maintenance, design, and construction, is approximately $29,508 (Pinelands Commission, 2015).

BioBarrier Technology

The BioBarrier technology utilizes membrane filter technology to combine activated sludge treatment processes with solids separation. The pilot program's results showed the effluent from the BioBarrier technology contained approximately 19.7 mg/L of total nitrogen. The average reported total cost of the BioBarrier onsite treatment system, taking into account the product, 5-year maintenance, design, and construction, is approximately $28,783 (Pinelands Commission, 2015).

Cromaglass Technology

The Cromaglass technology is a sequencing batch reactor (SBR) that is designed as a continuously fed activated sludge process. Treatment is achieved by adding wastewater into a single reactor with both an aeration and settling chamber which removes undesirable components. However, the Commission removed this system from the pilot program after the effluent total nitrogen concentration was recorded at 31.5 mg/L. The average reported total cost of the Cromaglass onsite treatment system, taking into account the product, 5-year maintenance, design, and construction, is approximately $35,265 (Pinelands Commission, 2015).

HOOT ANR Technology

The HOOT ANR technology is an extended aeration and activated sludge treatment process coupled with anaerobic denitrification. The system includes five components; a pretreatment tank, aeration chamber, clarifier, media tank, and final clarifier/pump tank. The pilot program does not have nitrogen concentrations recorded for this system, as its still new to the study The Commission's pilot program did not install any HOOT ANR systems during the reporting period; therefore, a comprehensive price cost could not be calculated for the advanced onsite treatment system. However, the program estimates that the average cost per treatment unit and its 5-year maintenance service package would be $14,500 (Pinelands Commission, 2015).

Busse Green MBR Technology

The Busse system is a small-scale membrane bioreactor that provides treatment in a 3-stage, 4 tank process. Similar to the HOOT ANR system, the pilot program does not have nitrogen concentrations associated with the Busse system because its new to the study. The Commission's pilot program did not install any Busse Green systems during the reporting period; therefore, a comprehensive price cost could not be calculated for the advanced onsite treatment system. However, the program estimates that the average cost per treatment unit and its 5-year maintenance service package would be $24,000 (Pinelands Commission, 2015).

Septic System Risk Analysis

Conventional septic systems discharge various constituents including nutrients, bacteria, dissolved solids and organic compounds. Onsite septic systems can fail to meet public health and water quality requirements when the transport of these pollutants are not properly addressed. System failure can be due to improper siting of existing conditions, inappropriate choice of technology, faulty design, poor installation practices, poor operation, or inadequate maintenance. An example of inappropriate choice of technology would be installing conventional septic systems in a high-density subdivision as leaching nutrients could result in nitrate concentrations in local aquifers that exceed drinking water standards. An example of improper siting would be installing a conventional septic system in soil with excessive permeability or a shallow water table. This would lead to inadequate treatment in the unsaturated soil zone which presents the risk of pathogenic bacteria and viruses entering the ground water if no mitigation measures are taken. Alternatively, if a conventional septic system is constructed in poorly drained soil, the soil can restrict re-oxygenation of the subsoil and result in clogging the infiltration surface (USEPA, 2002).

Nutrient Treatment Analysis

A conventional septic system uses the septic tank for primary treatment of the wastewater by removing most of the settleable solids, greases, oils, and other floatable matter. However, the disposal field, and discharge into the surrounding soil profile, performs most of the treatment before the effluent reaches the saturated zone or groundwater (USEPA, 2002). Within the subsurface profile of the disposal field, most of the constituents within effluent wastewater are attenuated by the physical, chemical, and biological reactions that occur within the soil and are diluted with the groundwater over time. However, nitrate and dissolved solids are attenuated almost exclusively by dilution. Therefore, nitrate is typically monitored to determine the efficiency of a septic system. NJDEP maintains a maximum statewide ambient nitrate concentration standard for groundwater of 2 mg/L and USEPA maintains a maximum drinking water concentration of 10 mg/L (NJDEP Division of Watershed Management, 2007). Table 3, below, summarizes a case study that characterized the septic tank effluent and soil water quality in the first four feet of a disposal treatment system consisting of fine sand. As seen in the table, even after percolating through four feet of a treatment zone, the nitrate concentrations are still above drinking water standards (USEPA, 2002). The insufficient treatment may be attributed to the sandy soil which has a higher infiltration rate and lower retention time in the treatment zone. This could provide an opportunity to use an advanced pretreatment product to reduce nitrogen concentrations to meet state requirements.

Table 3. Water Quality of Septic System Effluent (Source: USEPA, 2002)

Parameter	Septic Tank Quality @ Effluent [mg/L]	Soil Quality @ 0.6 m [mg/L]	Soil Quality @ 1.2 [mg/L]
TKN	44.2	0.77	0.77
Nitrate	0.04	21.6	13.0
Phosphorus	8.6	0.40	0.18
Total Dissolved Solids	497	448	355

The relationship between total Kjeldahl nitrogen (TKN) and nitrate concentrations is exhibited in Table 3. TKN is a measurement of organic nitrogen and ammonia which represents the predominant forms of wastewater nitrogen. However, as the effluent moves through the soil profile, it converts to nitrate which is the inorganic form of nitrogen. (NJDEP Division of Watershed Management, 2007). Nitrogen in its nitrate form is a significant ground water pollutant which has been detected in urban and rural ground water nationwide. Conventional septic systems can remove some nitrogen from septic tank effluent, however, high-density system installations can cause contamination. Reduction of nitrate concentrations in ground water occurs primarily through dispersion or recharge of ground water supplies by precipitation. Due to the limited ability of conventional septic systems being able to achieve enhanced nitrate reductions and difficulty in predicting soil nitrogen removal rates, the EPA recommends that systems sited in drinking water aquifers or near sensitive aquatic areas should incorporate additional nitrogen removal technologies prior to final soil discharge (USEPA, 2002).

Phosphorus is a key plant nutrient and can contribute to eutrophication and depleted dissolved oxygen in surface waters. Transport of phosphorus in soils are controlled by sorption and precipitation reactions (USEPA, 2002). Phosphorus can adsorb to soil particles quickly which is reflected in the sharp concentration decline in the first 0.6 meters of soil profile shown in Table 3 (NJDEP Division of Watershed Management, 2007). However, the capacity of the soil to retain phosphorus is finite and with continued loading, phosphorus can move deeper into the soil profile until it reaches ground water (USEPA, 2002).

Total suspended solids (TSS), or particulate solids, in wastewater effluent can clog infiltrative surfaces. TSS in direct surface waters can result in sludge layers which are harmful to aquatic organisms. Biodegradable organic material creates biochemical oxygen demand (BOD) which result in low dissolved oxygen concentrations in surface water, taste and odor problems in well water, and causes metals to leach from soil and rock into the ground water. Septic systems that fail to remove BOD or TSS and are located near surface water or drinking water wells can result in pathogen or toxic pollutant contamination. However, under appropriate site and operating conditions, conventional septic systems can achieve significant removal rates for biodegradable organic compounds and suspended solids (USEPA, 2002).

Table 4, below, provides a comparison of multiple units' effluent treatment efficiencies. Domestic Septic Tank represents the primary treatment unit in a conventional septic system. As explained above, septic tanks are used to

remove settleable solids which is consistent with the analysis that the Domestic Septic Tank has the greatest capability of particulate solid treatment.

Aerobic Units are in reference to the Aerobic Treatment Systems in the Design Alternatives section of this report, as well as systems that utilize fixed activated sludge treatment, fixed film trickling filter, packed bed filters, sequencing batch reactors, and submerged attached growth bioreactors as described in the Pretreatment Product Alternatives section of this report. Aerobic Units are recommended to be incorporated in areas of high density or ecological sensitivity due to their nitrogen removal efficiency as seen in Table 4.

Sand Filters are classified as Recirculating Sand Filter System in the Design Alternatives section of this report. As seen in Table 4, Sand Filters show lower constituent removal efficiencies when compared to the other units. However, there is still measurement treatment and the units can be constructed above or below ground in areas of constraint.

Subsurface Infiltration System represents a disposal field and soil profile within a conventional septic system. This system has high removal rates for all constituents with the exception of Nitrogen, as nitrate does not adsorb to soil and is attenuated almost exclusively by dilution. Therefore, it is recommended that Aerobic Units are incorporated into conventional septic system designs to achieve maximum nitrogen removal and avoid ground and surface water contamination.

Table 4. Treatment Efficiencies of Wastewater Constituent (Source: USEPA, 2002)

Treatment Units	Nitrogen [mg/L]	Phosphorus [mg/L]	Particulate Solids [mg/L]	Oxygen Demand [mg/L]
Domestic Septic Tank	40-100	5-15	50-100	140-200
Aerobic Unit Effluent	25-60	4-10	5-100	5-50
Sand Filter Effluent	10-50	<1-10	5-20	2-15
Subsurface Infiltration System Percolates into GW @ 3-5 ft depth	10-20% Removal	1-100% Removal	> 90% Removal	> 90% Removal

Site Conditions Analysis

As explained previously, septic system failure can be due to improper siting of existing conditions such as hydrologic features, soil, proximity to waterways, distance from existing infrastructure such as wells and sewer service areas, as well as magnitude of surrounding discharges. The Parameters Analysis section of this report depicts the existing conditions of the Musconetcong Watershed, highlights their importance in regard to septic system design, and explains the potential site constraints associated with them.

Septic risk assessment due to natural features focuses on groundwater depth, groundwater recharge rate, and proximity to high quality streams. Shallow groundwater, for this report, is considered to be less than 24 inches below ground surface as this is the depth that would trigger a TWA permit. Unsuitable groundwater recharge rates would be areas classified as wetlands or hydric soil, areas classified as 0 in/hr as this would not allow septic effluent to infiltrate into the zone of treatment, and areas classified as 16-23 in/hr as this would not allow enough residence time in septic system profile for proper effluent treatment. As seen in Figure 20, areas where shallow groundwater (in blue) overlaps with unsuitable groundwater recharge rates (in grey) would be areas at moderate risk for conventional septic systems. If those areas are in close proximity to the Category 1 streams, as shown in Figure 20, these would be classified as high-

risk septic areas that have potential for contaminating nearby waterways. Figure 20 in full scale can also be found in Appendix A.

Septic risk assessment due to manmade features focuses on well head protection areas, sewer service areas, NJPDES permit locations, and proximity

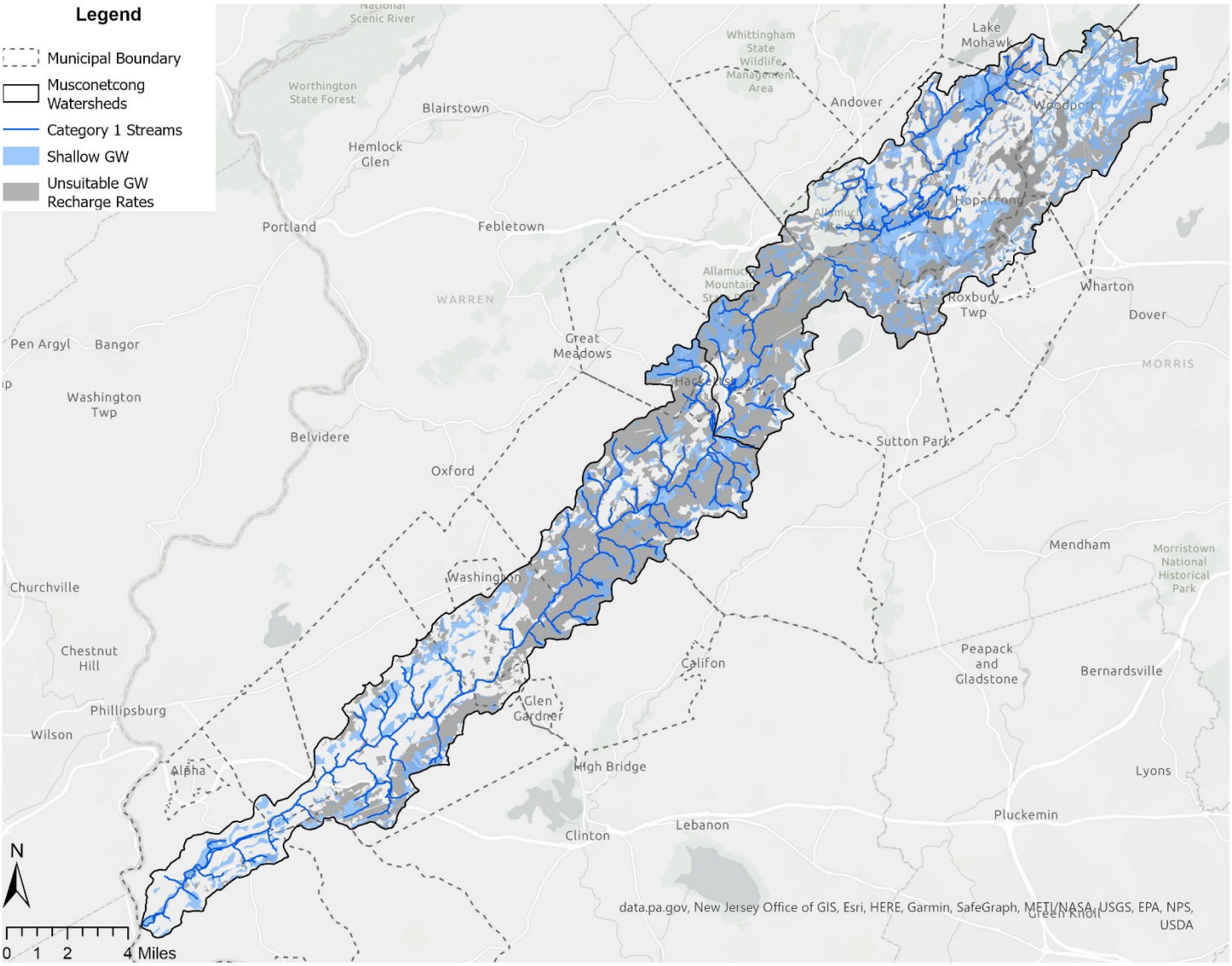

Figure 20. Natural Features Septic Risk Assessment Areas

to high quality streams. Well head protection areas delineate the horizontal extents that a public water drinking well is expected to extract groundwater. Sewer service areas show the boundary of properties that do not require conventional septic systems, as their effluent is routed to a wastewater treatment plant. Generally, NJPDES permits regulate properties that discharge over 2,000 gallons of sanitary wastewater per day. As seen in Figure 21, areas within the watershed boundaries that are outside of a sewer service area (in

red) but inside a well head protection area (in orange) are at moderate risk for conventional septic systems because drinking water wells are pulling from areas leaching treated effluent. If these areas overlap with NJPDES permit location, the area would be considered at high risk due to the excess effluent being treated by the subsurface soils. These high-risk areas are concerning when they are in close proximity to Category 1 waters or lakes, as there is a greater chance for ground and surface water contamination. Figure 21 in full scale can also be found in Appendix A.

After further detailed analysis of the existing site conditions of the watershed, five areas of concern have been delineated as high-risk and two areas have been

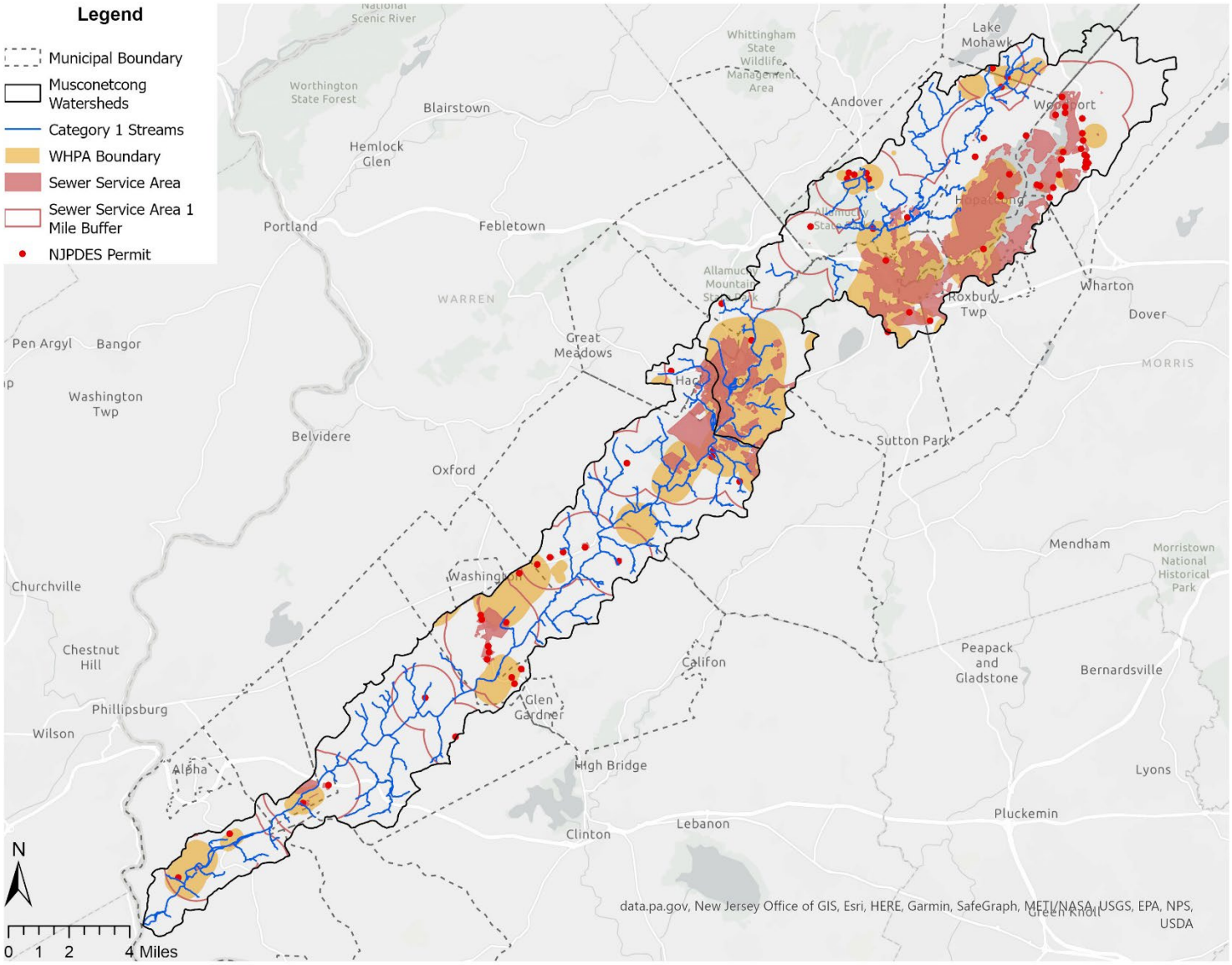

Figure 21. Manmade Features Septic Risk Assessment

delineated as moderate risk due to the surrounding natural and manmade features. Areas 1, 2, 3, 4, and 5, shown in Figure 22 through Figure 25 below, have been classified as high-risk areas because they are within a well head protection area, outside of a sewer service area, contains NJPDES permit properties along Category 1 waters, and overlaps with shallow groundwater and unsuitable recharge rates. Areas 6 and 7, shown in Figure 24 and Figure 25 below, are classified as moderate risk areas because they are within a well head protection area, outside of a sewer service area, contain NJPDES permit properties, however, the subsurface conditions are more conducive to treating effluent from conventional septic systems such deeper groundwater and better recharge rates.

It is recommended that alternative septic designs or wastewater systems and advanced pretreatment technologies are implemented in Areas 1-5 as the conventional septic systems have a higher risk of ground and surface water contamination that can drinking and recreational water toxicity. These areas include parts of Sparta Township, Byram Township, Stanhope Borough, and Mansfield Township (See Geodatabase).

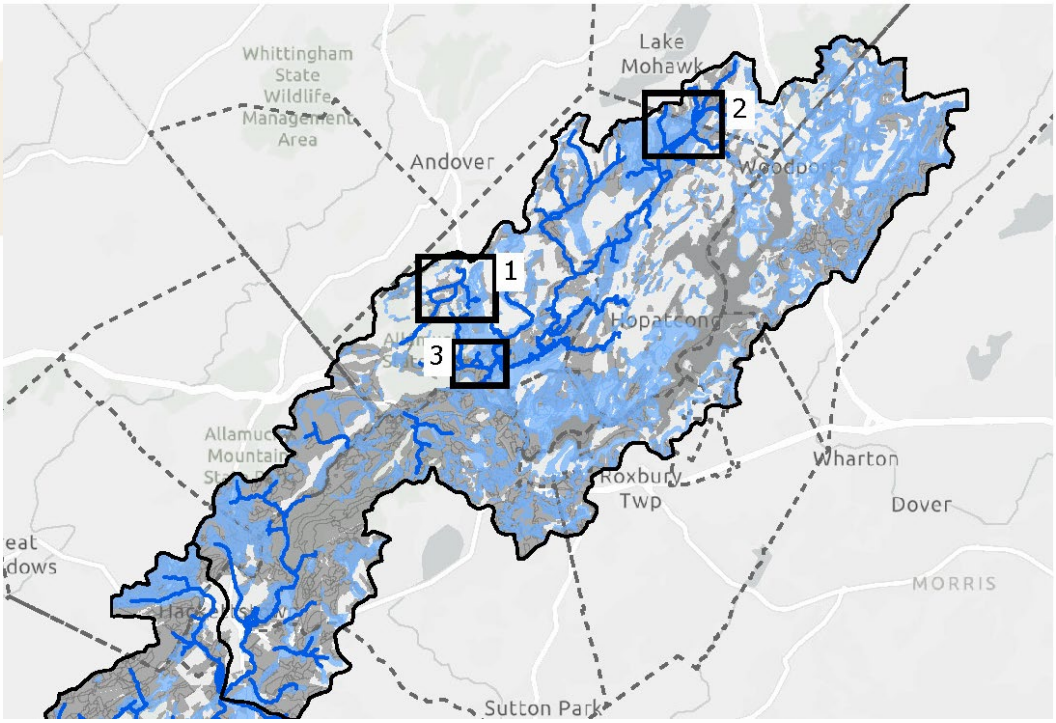

Figure 22. Natural Features Septic Risk Assessment (#1-3)

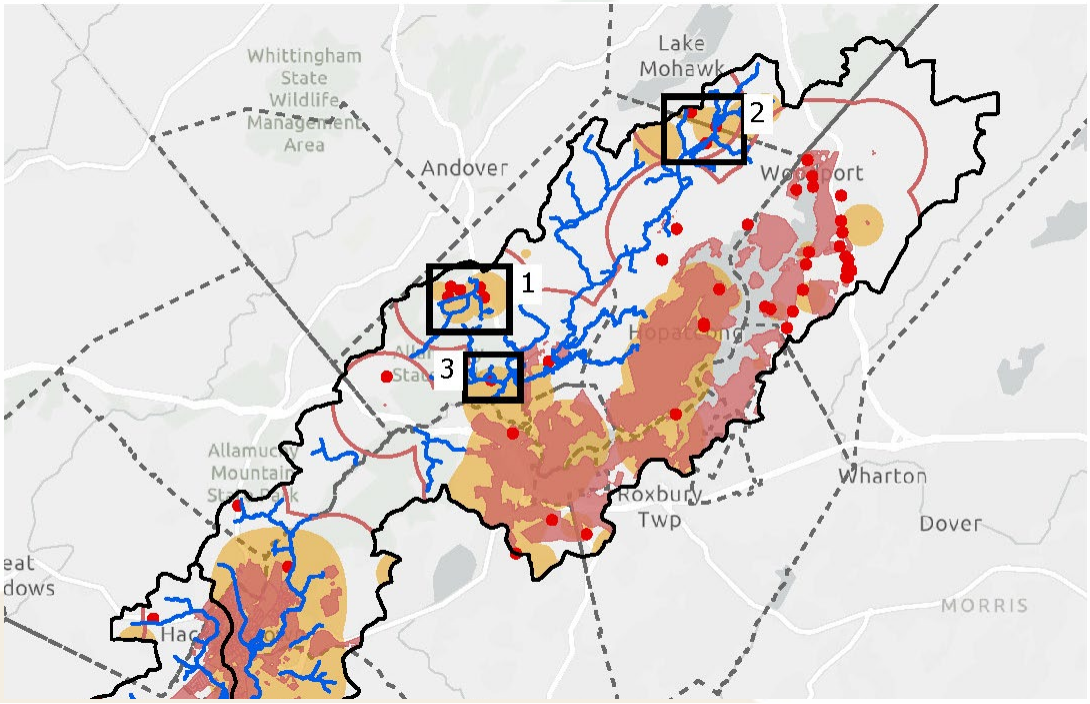

Figure 23. Manmade Features Septic Risk Assessment (#1-3)

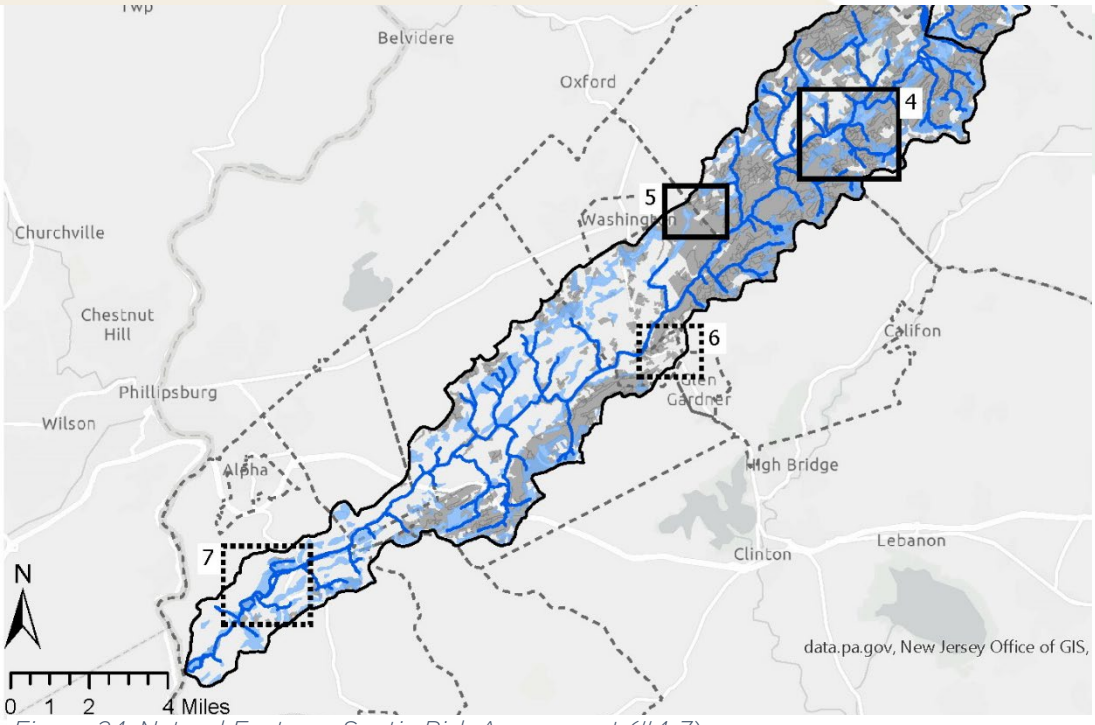

Figure 24. Natural Features Septic Risk Assessment (#4-7)

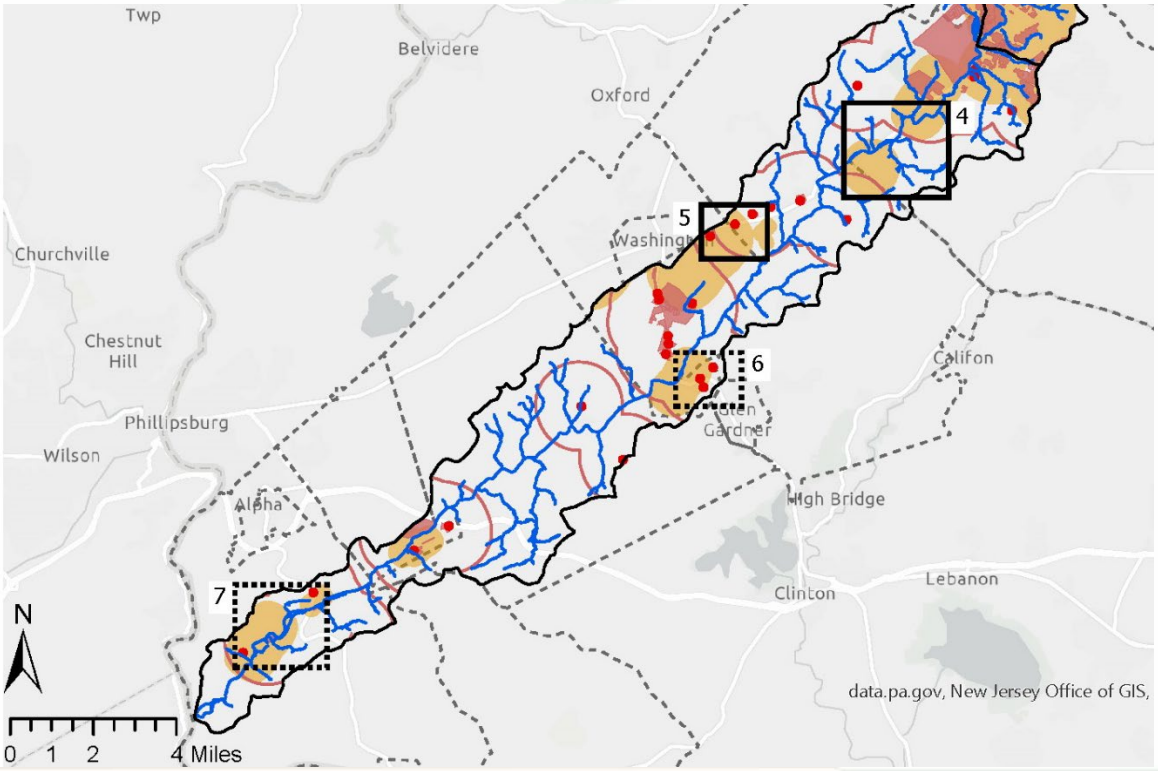

Figure 25. Manmade Features Septic Risk Assessment (#4-7)

FUNDING OPPORTUNITIES

To incorporate any of the design or product alternatives discussed in the previous section, the Musconetcong Watershed Association could recommend that municipalities or counties pursue additional funding opportunities at the Federal or State level as described below. This section also includes additional funding opportunities that may not be directly applicable to the Musconetcong Watershed, but are used as example programs for further consideration. See Appendix D for more information and funding guidance.

Federal Funding

Federal funding for wastewater treatment design and installation projects can be pursued through grant opportunities, loan programs, or finance centers. Opportunities from the US EPA and United States Department of Agriculture (USDA) are outlined below.

USEPA Programs

The EPA's Clean Water State Revolving Fund (CWSRF) program functions like an environmental infrastructure bank by providing low interest loans to eligible applicants for water-focused infrastructure projects. There are three types of decentralized wastewater treatment projects that are typically eligible for the CWSRF program. Upgrade, repair, or replacement of existing systems are eligible, which includes upgrades to enhance nutrient removal as discussed under Product Alternatives section. Projects focused on construction and

installation of new systems, as well as costs associated with establishing a responsible management entity, are eligible. Additionally, septage treatment works and pumper trucks to support proper maintenance of decentralized systems are CWSRF-eligible projects. More information can be found at the CWSRF website provided: https://www.epa.gov/cwsrf

The 1987 amendments to the Clean Water Act established the Section 319 Nonpoint Source Management Program which allows the EPA to provide grants to control nonpoint sources of pollution from a variety of sources, including malfunctioning onsite septic systems. Septic systems are defined as malfunctioning if they release high levels of bacteria, viruses, and chemicals which are toxic to local waterways. Depending on the state's nonpoint source management program, grants may be available to construct, upgrade, or repair individual septic systems. It should be noted that homeowners are not eligible to directly receive grant funding, as grants are typically awarded to watershed organizations that are actively implementing watershed-based plans to restore impaired waterbodies such as the Musconetcong Watershed Association (USEPA, 2023). More information can be found at 319 Grant Program website provided: https://www.epa.gov/nps/319-grant-program-states-and-territories

The EPA Environmental Finance Center Network is a group of 10 university-based environmental finance centers that are funded by the EPA. They work with the public and private sectors to fund environmental projects. Through this program, technical assistance providers will help communities develop and submit project proposals for funding opportunities. The technical assistance providers can identify sustainable infrastructure solutions and equitable health and environmental protections for the community (USEPA, 2023). More information can be found at the Environmental Finance Centers website provided: https://www.epa.gov/waterfinancecenter/efcn

USDA Programs

The USDA Single Family Housing Direct Home Loans assists low and very low-income applicants obtain safe and sanitary housing in eligible rural areas. Based on the USDA Property Eligibility Map, almost the entire Musconetcong Watershed would be eligible for this loan assistance, with the exception of Philipsburg, NJ. The program provides payment assistance to increase an applicant's repayment ability, however, the amount of assistance is determined by the adjusted family income. The loan funding can be used to build, repair, renovate, or relocate a home, as well as purchase and prepare sites including providing water and sewage facilities (USEPA, 2023). More information can be found at the Single Family Housing Direct Home Loan website provided: https://www.rd.usda.gov/programs-services/single-family-housing-programs/single-family-housing-direct-home-loans

The USDA Single Family Housing Repair Loans and Grants program provides loans to very low-income homeowners to repair, improve or modernize their homes, as well as grants to elderly very low-income homeowners to remove health and safety hazards. In the context of this program, health and safety hazards includes septic systems. Loans can be used on repairs and improvements, however, grants much be used to remove health and safety hazards. The maximum loan amount is $20,000 and the maximum grant award is $7,500 (USEPA, 2023). More information can be found at the Single-Family Housing Repair Loans and Grants website provided:

https://www.rd.usda.gov/programs-services/single-family-housing-programs/single-family-housing-repair-loans-grants

The USDA Rural Decentralized Water Systems Grant Program helps qualified nonprofits create a revolving loan fund to increase access to clean and reliable water and septic systems for households in eligible rural areas. Most of the Musconetcong Watershed is eligible for this grant program; the eligibility of specific properties can be determined from the USDA Property Eligibility Map.. The grant funding may be used to construct, refurbish, or service individually-owned household water well or septic systems (USEPA, 2023). More information can be found at the Rural Decentralized Water Systems Grant Program website provided:
https://www.rd.usda.gov/programs-services/water-environmental-programs/rural-decentralized-water-systems-grant-program

State Funding

The EPA's Clean Water State Revolving Fund program is described in the previous section. Although this is a federally funded EPA program, individual states are responsible for the operation of their CWSRF program and project selection. New Jersey's branch of the CWSRF is called the New Jersey Water Bank (NJWB) Program and is run through the NJDEP (USEPA, 2023). The program provides low interest loans for the construction of a variety of water quality protection measures such as wastewater treatment facilities and stormwater/nonpoint source management facilities (Grant and Loan Programs, 2023). The program can also fund improvements to septic systems. While most individual septic systems are privately owned, situations involving numerous system failures may be eligible for funding when a governing body or utilities authority establishes a Septic Management District to apply for financing for planning and corrective measure costs. Eligible projects include the purchase and installation of traditional or alternative septic systems (to replace failing systems), rehabilitation of an existing system or construction of community system. The current New Jersey application contact for the New Jersey Water Bank Program is charles.jenkins@dep.nj.gov and more information can be found at the NJWB website provided:
https://dep.nj.gov/grantandloanprograms/new-jersey-water-bank-njwb-program/

NJDEP's Drinking Water State Revolving Fund works to meet compliance requirements of the Safe Water Drinking Act (SWDA) by financing infrastructure costs to protect the public health. Financing is available for a variety of construction projects including new and rehabilitation of existing water treatment facilities, to address maximum contaminant levels exceedances, and to improve systems to meet surface water treatment requirements. Eligible applicants include publicly or privately owned community water systems and nonprofit non-community water systems. (NJDEP, 2023). Therefore, Musconetcong Watershed Association would not be eligible to directly apply for this grant but could work with a community partner to improve watershed infrastructure. More information can be found at the Drinking Water State Revolving Fund website provided: https://dep.nj.gov/grantandloanprograms/drinking-water-state-revolving-fund/

NJDEP's Water Quality Restoration Grants for Nonpoint Source Pollution are awarded to fund watershed restoration activities, specifically initiatives that

address nonpoint source pollution. Grants are focused on watershed restoration located in a priority waterbody area or region where the grant funding will help implement an approved TMDL or Watershed Based Plan. (NJDEP, 2023). As discussed in the Existing Conditions Section, around half of the Musconetcong Watershed's waterways are delineated as Category 1 which would be considered a priority waterway due to its exception resource value. More information can be found at the Water Quality Restoration Grants for Nonpoint Source Pollution website provided:
https://dep.nj.gov/grantandloanprograms/water-quality-restoration-grants-for-nonpoint-source-pollution/

Grant Opportunities

The Delaware River Watershed Protection Fund seeks to ensure abundant, clean water through support of the broader Delaware River Watershed Initiative, which is a coordinated effort involving 65 organizations working together to protect and restore the Delaware River watershed. The Initiative supports land protection, restoration, and water quality monitoring in eight regions of the watershed. Through the Delaware River Watershed Protection Fund, three types of grants are available; Capital Grants, Transaction Grants, and Catalyst Grants. More information can be found the Open Space Institute website provided: https://www.openspaceinstitute.org/funds/delaware-river-watershed-fund

Example Grant Programs from Neighboring States

Pennsylvania Department of Environmental Protection offers their Growing Greener Plus Program. Growing Greener Plus refers to three grant programs; Growing Greener (Watershed Restoration and Protection), Act 167 Stormwater Management Plans and Surface Mining Conservation and Reclamation Act (SMCRA) Bond Forfeiture. The Program notes that 97.1% of the state's water quality impaired waterways are polluted from nonpoint source pollution which could encompass abandoned mine drainage, urban and agricultural runoff, atmospheric deposition, on-lot sewage systems, earthmoving and time harvesting. The purpose of Growing Greener, SMCRA, and AMD remediation grants is to address nonpoint source pollution through local, watershed-based planning, restoration, and protection efforts. More information can be found at the PA DEP website provided:
https://www.dep.pa.gov/Citizens/GrantsLoansRebates/Growing-Greener/Pages/What-is-Growing-Greener.aspx

Delaware's Department of Natural Resources and Environmental Control (DNREC) Nonpoint Source (NPS) Pollution Program's Community Water Quality Improvement Grant is designed to help non-profit organizations, local conservation districts, community organizations, or homeowner's associations implement projects or programs within Delaware's developed landscape to improve water quality. It is meant for programs and projects that demonstrate innovative and sustainable methods, techniques, and/or practices for water quality improvements with cost effective and measurable results. More information can be found on the DNREC website provided: https://dnrec.alpha.delaware.gov/environmental-finance/community-water-quality-improvement/

The Chesapeake Small Watershed Grant Program supports efforts to achieve water quality improvement, restoration, and protection of key Chesapeake Bay

species and their habitats, as well as foster community and stakeholder engagement that will build upon and sustain measurable natural resource improvements. The Program's priorities include managing agricultural and urban runoff, improving water quality and stream health through riparian restoration, enhancing and protecting freshwater and tidal habitats, enhancing nature-based resilience for human communities, and building capacity for watershed-scale design and implementation. More information can be found on the NFWF website provided: https://www.nfwf.org/programs/chesapeake-bay-stewardship-fund/chesapeake-small-watershed-grants

New York's Septic System Replacement Fund Program provides funding to counties to help homeowners replace cesspools and septic systems. Participating counties, including the entirety of Nassau and Suffolk Counties on Long Island and portions of more than 35 other counties, provide grants to reimburse property owners for up to 50% of the costs (up to a maximum of $10,000) of their eligible septic system projects. Eligible costs include both design and installation costs for replacement of a cesspool with a septic system; Installation, replacement or upgrade of a septic system or septic system components; and installation of enhanced treatment technologies, including advanced nitrogen removal systems. https://efc.ny.gov/septic-replacement

FUTURE CONSIDERATIONS

This report provides a preliminary septic risk assessment for the Musconetcong Watershed. There are still several questions that, if asked, could further inform efforts to plan for future improvements. A few of these questions are presented below.

- Sewer system extensions:
  - Are the areas delineated as high risk for septic systems within the one-mile radius of existing sewer service areas?
  - How much additional infrastructure would be required to capture the high-risk properties and include them in the sewer service area?
  - Are the existing wastewater treatment plants at treatment capacity? If not, how many additional properties could route effluent flow for treatment?
  - Are there environmental constraints that would prevent a sewer extension in high-risk areas?

- Guidance and regulations:
  - Are there opportunities to influence state regulations or municipal codes?
  - Are there upcoming planning efforts that present an opportunity for sharing updated guidance for residential septic systems (e.g., river management plans)?

- Pilot programs:
  - Can MWA seek funding to pilot pretreatment system installations and monitor their efficiency?

CONCLUSION

Conventional septic systems have proven to become environmental hazards if not designed, installed, or maintained properly. If malfunctioning, the systems will leach contaminants into the ground and surface waters which can cause human and aquatic health concerns. Analyzing natural and manmade features within the Musconetcong Watershed highlighted areas of concern where septic systems are within areas of high groundwater recharge rates, well head protection areas, and in close proximity to waterways with extreme ecological value. In these cases, alternative designs or advanced pretreatment systems would be applicable to reduce potential contamination into the environment. There are extensive Federal, State, and local funding opportunities to aid in the design improvements in regards to water quality protection. This report investigates existing conditions and provides design options, however, the Musconetcong Watershed Association can further explore future infrastructure or regulatory improvements to safe guard the watershed's natural resources.

REFERENCES

Resources identified with an asterisk (*) are annotated below.

Flemington Precast & Supply LLC. *Anua International Puraflo Peat Biofilters*. 2019.

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*United States Environmental Protection Agency. *Septic System Impacts on Water Sources*. August, 2022.

United States Environmental Protection Agency. *Septic Systems Reports, Regulations, Guidance, and Manuals*. May, 2023.

*United States Environmental Protection Agency. *Types of Septic Systems*. August, 2022.

University of Rhode Island Onsite Wastewater Resource Center. *Understanding Septic Systems.* 2023.

Annotated Resources

New Jersey Department of Environmental Protection. *Grant and Loan Programs*. May, 2023.

The NJDEP Grant and Loan Program provides a full list of state funded grant and loans available, along with their applications and deadlines. Applicable NJDEP grants or loans would the Drinking Water State Revolving Fund or the Water Quality Restoration Grants for Nonpoint Source Pollution. The Drinking Water State Revolving fund provides low-interest loans to finance the costs of infrastructure needed to achieve or maintain compliance with Safe Drinking Water Act (SDWA) requirements. The Water Quality Restoration Grant funds watershed restoration activities and initiatives around New Jersey that address nonpoint source pollution (NPS). Generally, grants are focused on restoration of water quality impaired predominantly by NPS pollution for waters located in a priority waterbody or region.

United States Environmental Protection Agency. *Funding for Septic Systems*. May, 2023.

The US EPA Funding for Septic System resource highlights Federal, State, Tribal, and Local funding opportunities for septic system related improvements. The list includes both US EPA and US Department of Agricultural Programs for funding which are detailed in the Federal Funding section of this report.

United States Environmental Protection Agency. *Septic System Impacts on Water Sources*. August, 2022.

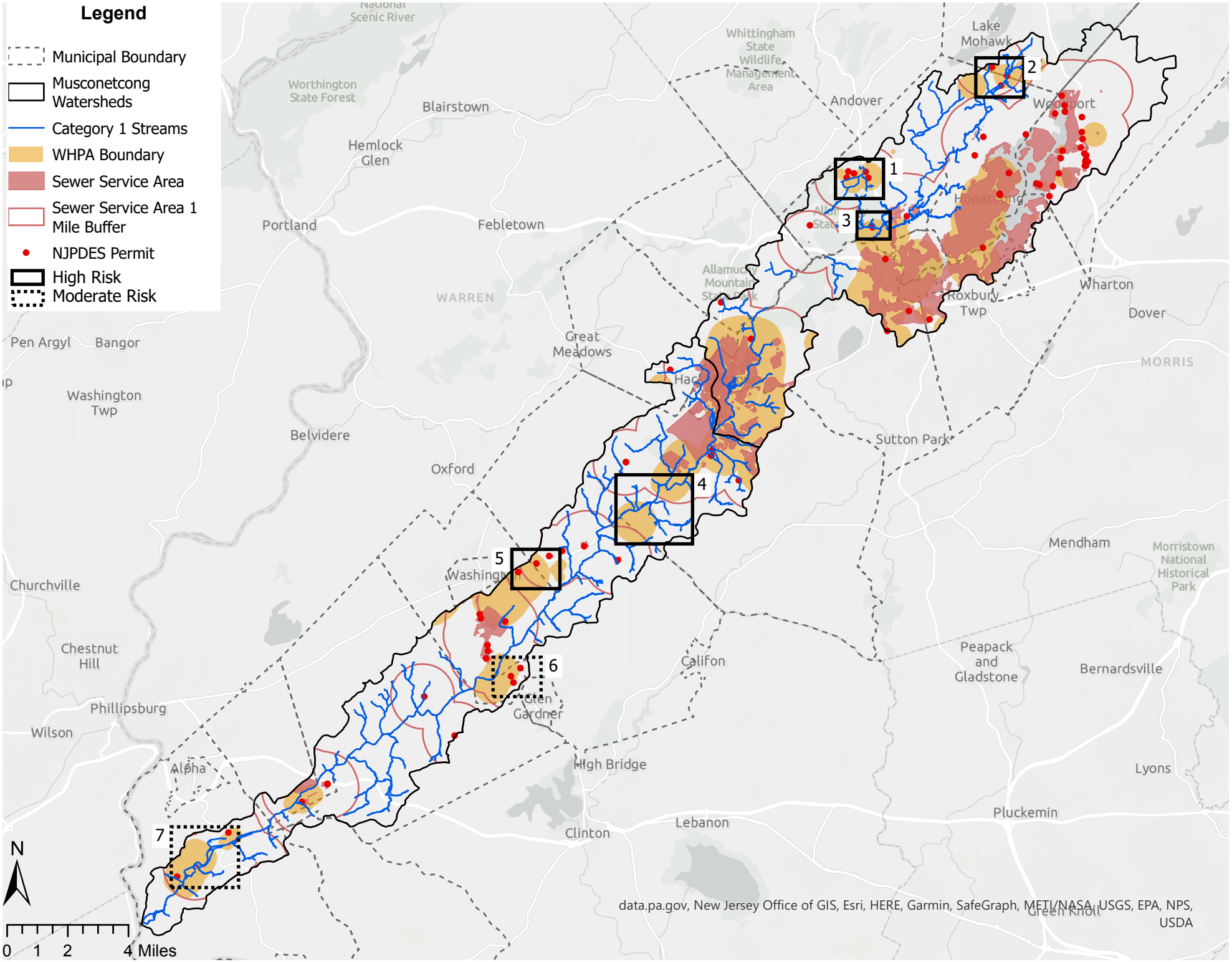
The US EPA Septic System Impacts on Water Sources page is an informative resource to understand the importance of a properly designed, installed, and maintained septic system. The resource highlights the potential risks to drinking water wells and local surface waters if a septic system leaches excess contaminants.

United States Environmental Protection Agency. *Types of Septic Systems*. August, 2022.

The US EPA Types of Septic System page provides a comprehensive summary of the ten most common types of conventional and alternative

septic system designs. The design and size of a septic system can vary depending on household size, soil type, site slope, lot size, proximity to waterbodies, and local regulations. The ten systems are detailed in the Design Alternatives section of this report.

APPENDIX A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Municipal Boundary
Musconetcong Watersheds
Category 1 Streams
WHPA Boundary
Sewer Service Area
Sewer Service Area 1 Mile Buffer
NJPDES Permit
High Risk
Moderate Risk
1
2
3
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6
7
Lake Mohawk
Andover
Hopatcong
Roxbury Twp
Wharton
Dover
Mendham
Morristown National Historical Park
Sutton Park
Peapack and Gladstone
Bernardsville
Lyons
Pluckemin
Califon
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High Bridge
Lebanon
Clinton
Oxford
Belvidere
Washington Twp
Great Meadows
Hackettstown
Portland
Febletown
Blairstown
Hemlock Glen
Worthington State Forest
Whittingham State Wildlife Management Area
Allamuchy Mountain State Park
WARREN
MORRIS
Pen Argyl
Bangor
Churchville
Chestnut Hill
Phillipsburg
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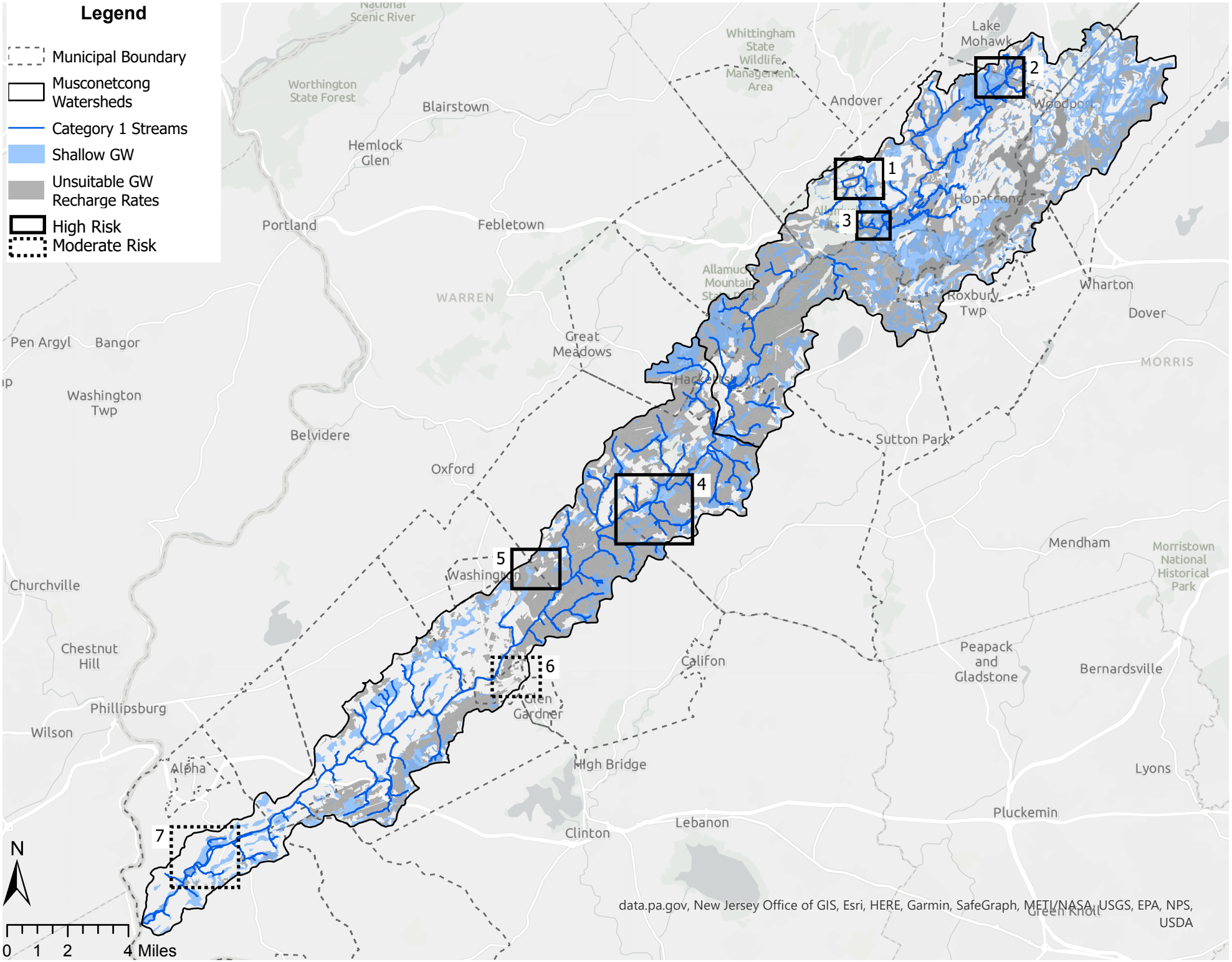
Legend
Municipal Boundary
Musconetcong Watersheds
Category 1 Streams
Shallow GW
Unsuitable GW Recharge Rates
High Risk
Moderate Risk
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2
3
4
5
6
7
Lake Mohawk
Andover
Woodport
Hopatcong
Portland
Blairstown
Hemlock Glen
Worthington State Forest
Whittingham State Wildlife Management Area
Febletown
WARREN
Great Meadows
Roxbury Twp
Wharton
Dover
MORRIS
Sutton Park
Pen Argyl
Bangor
Washington Twp
Belvidere
Oxford
Washington
Churchville
Chestnut Hill
Phillipsburg
Wilson
Alpha
Califon
Gardner
High Bridge
Clinton
Lebanon
Mendham
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Peapack and Gladstone
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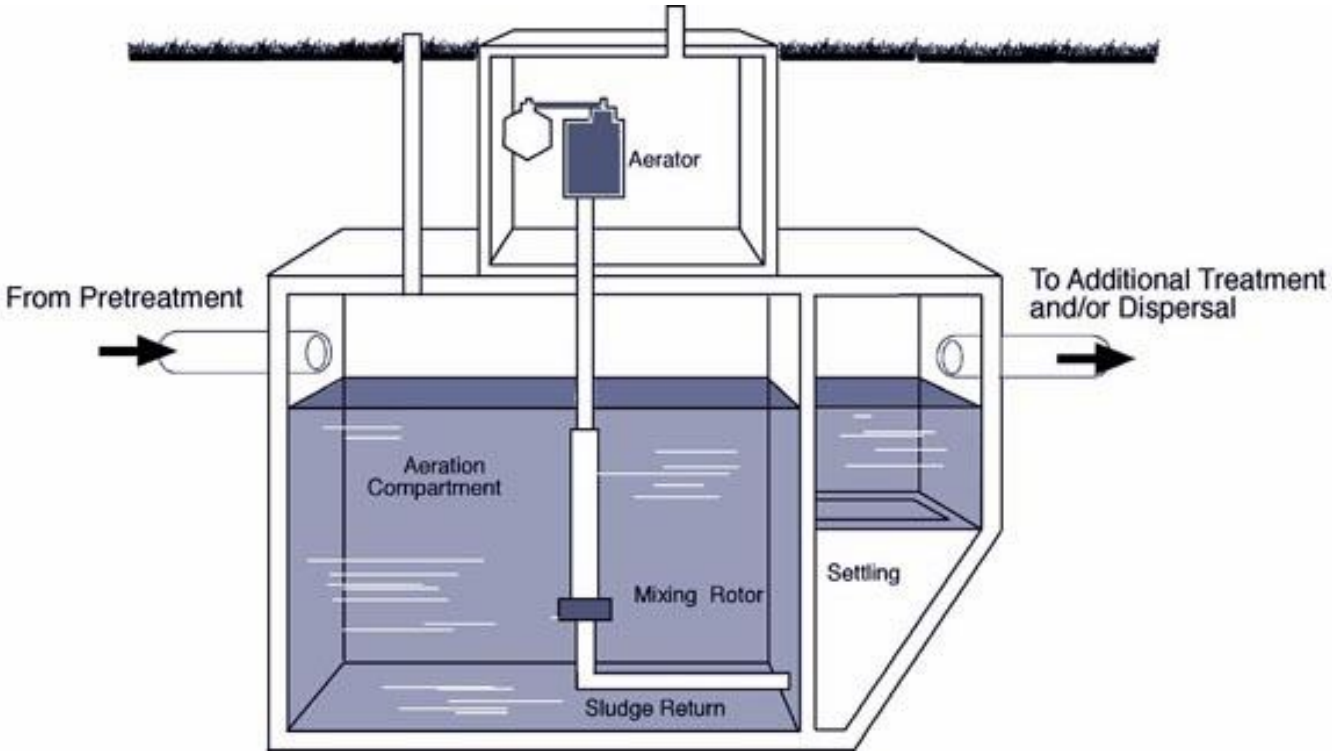
APPENDIX B

Aerobic Treatment Systems Guidance Document



NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION

DIVISION OF WATER QUALITY

BUREAU OF GROUND WATER, RESIDUALS, AND PERMIT ADMINISTRATION

JANUARY 2022

TABLE OF CONTENTS

Cover graphics were provided by the National Environmental Services Center located at West Virginia University.

A. Purpose

This guidance document is limited in applicability to onsite wastewater treatment systems subject to regulation under N.J.A.C. 7:9A.

The use of an aerobic treatment system may be allowed, as described below, for new construction, expanded project or to alter an existing, malfunctioning system. Under these circumstances, aerobic treatment systems may be considered by the local administrative authority, at their discretion. The issuance of this guidance does not exempt the applicant or his agents from the responsibility to comply with all applicable Federal, State, County and Municipal rules and regulations.

Proposals for use of an aerobic treatment system for a new or expanded project are allowed provided the treatment system is in addition to and not in lieu of any part of a system that meets all of the requirements of N.J.A.C. 7:9A. All other proposals for use of this technology for a new or expanded project that differ from the requirements of N.J.A.C. 7:9A must be directed to the Department for an individual Treatment Works Approval (TWA). The application must demonstrate that the site can support an individual subsurface sewage disposal system, which meets strict conformance with the requirements of N.J.A.C. 7:9A, on the property. TWA's will contain requirements for the proper maintenance and management of these systems that must be performed by the system owner and enforced by the administrative authority.

In accordance with N.J.A.C. 7:9A-3.3, alterations to repair existing, malfunctioning systems may be made in a manner that is in more compliance with current standards than the malfunctioning system. The Department interprets that regulation to provide the local administrative authority with the ability to approve of alterations using advanced treatment technologies, including an aerobic treatment system, described herein. These guidelines may not be construed as a device to require the use of a technology in any jurisdiction, does not limit the local administrative authority's ability to have additional requirements in their approval, and does not limit the local administrative authority's ability to apply the technology in applications that do not strictly meet these guidelines. As stated in the guidelines for administrative authorities, below, any questions regarding variances from these guidelines should be conveyed by the affected local administrative authority directly to the Department.

B. General Conditions

1. The Department may revise these guidelines or discontinue the use of any aerobic treatment systems at any time.

2. The Department will maintain a list of applicable manufacturers that have agreed to the provisions of this guidance and have demonstrated the ability to comply with the conditions of the guidance.

3. Any aerobic treatment system manufacturer that wishes to be listed as applicable under this guidance document shall submit a written request, a copy of their NSF Standard 40, ETV or other verification report and a report to the Department that details how the manufacturer will achieve compliance with the appropriate portions of this guidance document.

4. Any aerobic treatment system manufacturer that fails to comply with the provisions of this or any applicable document will be removed from the applicability list subject to this guidance. The Department will advise any affected manufacturer prior to taking this action.

5. For the life of the system, the owner of the system must have in place a preventative maintenance and monitoring contract with an Authorized Service Provider to ensure it is functioning properly and to optimize treatment performance. As part of this contract, the Authorized Service Provider must conduct a visual inspection of the internal components, including any treatment media, and maintain the complete treatment system. Upon expiration of a maintenance and monitoring contract, a new contract, which shall be at least one year in duration, shall be entered into by the property owner with an Authorized Service Provider. If the property owner fails to renew the maintenance and monitoring contract, written notification of such must be directed, by the Authorized Service Provider, to the local administrative authority.

C. Aerobic Treatment System Description

1. An aerobic wastewater treatment system is specifically designed and engineered for the treatment of wastewater. The treatment is achieved by microbes which oxidize and decompose the organic compounds in the presence of oxygen. There are different types of treatment systems and processes that are used to accomplish this treatment which include, but may not be limited to:

   a. **Fixed Activated Sludge Treatment:** This system is an aerobic wastewater treatment system that utilizes an aerobic fixed film process that is a combination of the conventional trickling filter and activated sludge processes. The system is designed to be installed within a two-compartment tank or into a two tank system, where the first compartment or tank provides a primary settling zone for incoming sewage and the second houses the actual treatment units. The technology contains submerged media specific to the application, which provides surface area for microbial growth. Aeration and circulation are provided by a blower that pumps air into a draft tube that extends down the center of the tank.

   b. **Fixed Film Trickling Filter:** is a treatment system which follows a primary septic tank in which the solids are settled and partially digested. The septic tank effluent flows to the trickling filter unit where microorganisms present in the wastewater attach to filter media and use the nutrients and organic materials provided by the constant supply of fresh wastewater to form new cell mass. The open spaces within the media allow air to freely pass through, providing oxygen to support the microorganisms. The system may be equipped with a recycle line for pumping of recycled solids from trickling filter, below the media, back to the primary tank. Final effluent may be recycled back to the head of the treatment to provided additional treatment (denitrification) or out to final discharge.

   c. **Packed Bed Filters:** Raw sewage enters a septic tank or multi-compartment tank through an inlet tee. In the septic tank or first compartment of a multi-compartment tank, the raw sewage separates into three distinct zones: a scum layer, a sludge layer, and a clear layer. Wastewater from the clear layer flows into the second compartment of the tank or a separate treatment tank. In this second compartment or tank, pumps convey filtered effluent to a distribution system in the treatment device. Effluent is treated by the device which contains a media of some type (textile, sand, foam, etc.) and is collected. In a single pass treatment system the effluent is directed to the final discharge. In a multi-pass or recirculating treatment system the effluent is diverted either back to the tank to be recirculated or out to final discharge.

   d. **Sequencing Batch Reactors (SBR):** This is a sequential process in which all major process steps occur in the same tank, in sequential order. Wastewater flows to a single reactor, is treated and then discharged. In this process aeration and clarification can all be achieved in a single reactor. All discharge from the system is by pumps activated by programmed controls. The treatment process uses activated sludge for treating raw wastewater by providing oxygen to reduce contaminants. Wastewater flow is accepted by the system as it occurs and is treated and a predetermined volume is discharged in batches. Excess flow is stored and

discharged as programmed. System design provides surge capacity to provide storage at times of high flows.

e. **Submerged Attached Growth Bioreactors (SAGB):** is a biological reactor in which the media is submerged in the process flow. Many SAGB configurations have been conceived and utilized for the oxidation of soluble organic matter and for biological nitrogen removal. The main components of a SAGB are the media for biofilm growth and the underdrain system for even distribution of air and water. The media in a SAGB has a high specific surface area which allows for a high biomass concentration leading to a short hydraulic retention time and, thus, a significantly reduced reactor volume. Some SAGBs are operated without downstream clarification. The media in such reactors is fine enough to provide physical filtration for solids separation and therefore, has high specific surface area. In such reactors the hydraulic retention is less than the minimum solids retention time required for microbial growth. Therefore, the growth of suspended microorganisms is minimized and the growth of attached microorganisms is maximized (Grady, C. P. L. Jr., Daigger, G. T. and Lim, H. C., 1999. Biological Wastewater Treatment, Second Edition, Marcel Dekker, Inc., New York.)

D. Effluent Quality

1. Because of the significant reduction in biological oxygen demand and total suspended solids that occurs in the aerobic treatment system, the soil is relied upon more for dispersal capabilities rather than treatment of effluent. The reduced organic concentration in the treated effluent allows for a smaller sized dispersal system to be relied upon to accomplish hydraulic dispersal of the treated effluent.

2. Many of the treatment systems listed in this document can be modified to provide denitrification of the wastewater to significantly reduce nitrogen species concentrations. If there is a desire to denitrify the wastewater, which is agreed to by the administrative authority, the Department can provide additional assistance in ensuring proper design of those systems.

E. Aerobic Treatment System Design

1. All system designs must be signed and sealed by a New Jersey licensed professional engineer (N.J.P.E.). The N.J.P.E. must be trained and authorized by the manufacturer as an Authorized Designer to design their aerobic treatment systems.

2. No aerobic treatment system shall be designed in a manner which does not meet the manufacturer's minimum recommendations.

3. All aerobic treatment systems shall be designed so that the raw wastewater cannot be discharged without first being properly treated by the treatment unit as it was designed. The liquid levels in the tanks or other treatment vessels shall be monitored by a properly functioning high level alarm and any other alarm as recommended by the manufacturer.

4. Any Authorized Designer that submits an aerobic treatment system design to any local administrative authority must notify the Department in writing or by email at CH199@dep.nj.gov within 24 hours of the submittal to the local administrative authority.

5. Treatment System Design Review

a. Residential Systems: Prior to issuing a construction approval, the local administrative authority may require plans to be reviewed by the technology manufacturer or the manufacturer's authorized representative to determine consistency with manufacturer's minimum specifications and recommendations for achieving treatment.

b. Commercial Systems: Prior to submitting the treatment system design for construction approval, the aerobic treatment system design shall be reviewed by the manufacturer. The manufacturer shall issue a letter to the designer indicating the design is consistent with manufacturer's minimum specifications and recommendations for achieving treatment.

6. All aerobic treatment systems may be equipped with a telemetry control panel which is attached to an internet based interface that provides continuous remote monitoring, information management and control of each individual aerobic treatment system. Sites that do not have a telemetry control panel must use an active phone line equipped with an auto dialer to notify the authorized service provider of alarm conditions, including if power to any of the system equipment is disconnected. The system should also include a control panel that tracks, at minimum, pump elapsed time, cycle counts and high level alarm counts or other means to determine flow through the system and other system information for troubleshooting purposes, as recommended by the manufacturer.

7. All processing tanks, discharge tanks and related treatment unit(s) must maintain the same setbacks as required for septic tanks at N.J.A.C. 7:9A-4.3.

8. All aerobic treatment units are required to be water tight. Those aerobic treatment units that will be located within a saturated soil condition must be designed in a manner that considers all other structural issues including, but not limited to, buoyancy and structural effects on the treatment unit.

9. In cases where setbacks to wells can not be increased to meet current requirements, the local administrative authority should consider ultraviolet disinfection on the well in addition to, or instead of, disinfection of the wastewater in accordance with G.4., below.

F. Dispersal Methods

Treated effluent from the aerobic treatment system shall be dispersed into the ground by any of the following methods:

1. Any New Jersey disposal field as allowed in N.J.A.C. 7:9A and sized according to those Standards or this guidance document.

2. Seepage pits as allowed by N.J.A.C. 7:9A.

3. Drip dispersal systems as outlined in the Department's Drip Dispersal Wastewater Disposal Systems Guidance.

G. Dispersal System Siting & Sizing Criteria

1. Permeability testing to determine the size of a dispersal area should be completed in native soils. For soil replacement systems, design permeability shall be determined after delineating an adequate zone of disposal as required in N.J.A.C. 7:9A-10.1(e). When the permeability in the zone of disposal has been determined to be greater than 0.2 inches per hour using test options 1, 5 or 6 (Table 6.1, below) or test option 4 where the basin drains in three hours or less, the permeability of the fill material shall be used. When other tests are used and are

not verified by test options 1, 5 or 6, the soil horizon of slowest permeability within the proposed adequate zone of disposal shall be used. If a passing basin flooding test takes three or more hours to drain after any filling, the design permeability range of 0.2-0.6 inches per hour shall be used.

2. The thickness of the zone of treatment may be reduced to a minimum of 18 inches for designing conventional disposal areas in accordance with N.J.A.C. 7:9A. This condition does not apply when designing drip dispersal systems.

3. If a drip dispersal system is used, it shall be sized according to the appropriate guidance document.

4. For systems located in areas where the depth to seasonal high water tables will be present at depths shallower than 24 inches to the infiltrative surface or where the existing, malfunctioning system infringes upon a setback to a well and the new system will not fully meet current setback requirements, ultraviolet (UV) disinfection of the wastewater may be required immediately prior to dispersal into the dispersal field. It is the responsibility of the system designer to design and ensure the installation a UV disinfection system that is designed to achieve fecal coliform levels of 200 colonies per 100 ml or less, based upon anticipated effluent quality at the point of disinfection. Any disinfection equipment shall be covered by the same warranty, maintenance and inspection conditions specified in this document.

5. Conventional disposal fields may be sized according to the following chart:

					Minimum Bed Size (sq.ft.)			
Soil Class	**Permeability (in/hr)**	**Percolation Rate (min/in)**	**Standard A/Q (sqft/gpd)**	**Adjusted A/Q (sqft/gpd)**	**350gpd / 2BDRM**	**500gpd / 3BDRM**	**650gpd / 4BDRM**	**800gpd / 5BDRM**
K4	6-20	3-15	1.61	1.233	432	617	802	987
K3	2-6	16-30	2.08	1.704	597	853	1,108	1,364
K2	0.6-2	31-45	2.56	2.190	767	1,095	1,424	1,752
K1	0.2-0.6	46-60	2.96	2.596	909	1,298	1,688	2,077
Pressure Dosing Design			1.33	0.956	400*	479	622	765

* The Department does not recommend sizing disposal beds at less than 400 sq.ft.

6. For the alteration of a malfunctioning system where native soil percolation rates are between 60 and 120 minutes per inch, an aerobic treatment system may be used in conjunction with a conventional disposal field if drip dispersal is not feasible, however the design engineer must provide a detailed analysis of the proposed disposal field to identify that the sizing criteria chosen is appropriate and adequate for the alteration.

H. Aerobic Treatment System Installation

1. A preconstruction conference is highly recommended prior to beginning construction of the system and should be attended by the Authorized Designer of the system, the Authorized Installer, and the local administrative authority.

2. All aerobic treatment systems shall be installed according to directions provided in the aerobic treatment system manufacturer's installation manual and approved manufacturer's treatment system design.

3. All companies/personnel installing the aerobic treatment system shall be in possession of all necessary permits and licenses before attempting any portion of an installation.

4. Only an Authorized Installer shall install the aerobic treatment system.

5. The Authorized Installer must notify the Department at least one week prior to the installation of the aerobic treatment units at CH199@dep.nj.gov and coordinate inspections with the Department in addition to any inspections required by the local administrative authority.

6. An Authorized Installer must be present at all times during an aerobic treatment system installation. No work on an aerobic treatment system may be conducted unless under the direct supervision of an Authorized Installer.

7. Watertightness of any septic, processing and dispersal system dosing tanks specified in the design must be watertight tested at the installation site after being installed using hydrostatic or vacuum tests. Testing of the tanks shall include all upper portions of the tank, including riser joints. Testing must be done in accordance with the following:

   a. Water tightness testing procedures and criteria for concrete tanks shall follow the methods described in ASTM C-1227 standards or National Precast Concrete Association appropriate testing criteria and procedures

   b. Tanks made of materials other then concrete shall be tested, after installation, in accordance with the methods described in ASTM C-1227 standards, if applicable, or other hydrostatic or vacuum testing methods approved by the tank manufacturer.

   c. Water used for this testing shall be either from a potable water source or Reclaimed Water for Beneficial Reuse authorized by a NJPDES permit.

   d. The use of an onsite potable well for purposes of supplying water for this testing is not recommended. If an onsite potable well is to be used, pumping of the well must be done in a manner which will withdraw water at a rate less than 50% of the safe yield of that well and will not damage the pump or any other component of the well.

I. Aerobic System Start-up

1. The Authorized Service Provider shall inspect the system following each installation. The Authorized Service Provider shall complete the System Start-up Checklist - contact the manufacturer for a copy of the most recent edition of this checklist. The service provider shall provide the completed start-up checklist to the local administrative authority.

2. The Authorized Installer shall be present at the time of start-up.

J. Aerobic System Operation, Maintenance & Monitoring

1. All aerobic treatment systems shall be maintained according to the manufacturer's Operation and Maintenance Manual by an Authorized Service Provider. An up to date copy of the manual must be made available upon request or on the manufacturer's website.

2. Aerobic treatment systems shall be inspected by an Authorized Service Provider on the following schedule, at a minimum:
   a. Once within 30 days following system startup.
   b. Twice per year for the first year of system operation (excluding a., above); twice per year thereafter.
   c. For all systems, a meeting with a new operator of the system is recommended at the time of transfer of the property. The local administrative authority should be notified of this meeting and invited to participate.
   d. Additionally, as required by the manufacturer.

3. At each regularly scheduled maintenance visit, as outlined in the Operation and Maintenance Manual, the Authorized Service Provider shall, at minimum, observe, monitor and record:
   a. Wastewater level in the tanks,
   b. Any effluent/pump filter for clogging,
   c. Clarity in NTU's
   d. Final effluent for odor
   e. All tanks for oily film
   f. All tanks for foam
   g. pH of final effluent
   h. Ponding of effluent around the aerobic treatment system and dispersal area
   i. Pump cycle and run time meters

4. At least once per year the Authorized Service Provider shall, at minimum:
   a. Measure sludge and scum levels in the septic tank and notify the homeowner if the tank is in need of pumping
   b. Check effluent filter for clogging and clean, as needed.

5. All aerobic treatment systems require an operation and maintenance contract to be in place with an Authorized Service Provider for the life of the system.

6. Authorized Service Providers shall be trained and authorized by the manufacturer or the manufacturer's Authorized Dealer. An up to date list of Authorized Service Providers shall be made available upon request. This list may also be made available on the manufacturer's website.

7. The operation and maintenance contract must be signed by the property owner and an Authorized Service Provider prior to issuance of the occupancy permit.

8. The Authorized Service Provider must have proper equipment and training to access and program any system control panel on site.

K. Training & Education

1. The manufacturer or authorized representative shall hold, at minimum, one training event annually for Designers, Service Providers, and Installers.

2. The manufacturer or authorized representative shall provide a written and dated authorization for Designers, Service Providers and Installers. This authorization shall be valid for one year for those who have completed the appropriate requirements.

3. A list of these authorized Designers, Service Providers, and Installers shall be kept up-to-date by the manufacturer and made available upon request. This list may also be made available on the manufacturer's website.

4. The manufacturer shall hold free training, when necessary, for New Jersey regulators that covers the design, installation and service of their aerobic treatment system.

5. All Authorized Designers, Service Providers and Installers shall be required to receive annual, or more frequently as needed, refresher training as a requirement to continue to be authorized by the manufacturer. An updated system integrator authorization shall be provided after refresher training has been successfully attended.

L. Reporting

1. The manufacturer shall submit an annual report to NJ DEP by March 1st of each year containing the following information for the previous 12 months:
   a. Number of aerobic treatment systems installed
   b. The address of each installed aerobic treatment system, the owners name and address, the type of use (e.g. residential, commercial)
   c. Date when the aerobic treatment system was installed and started up
   d. Administrative authority and permit number
   e. Status of the maintenance and monitoring contract
   f. Number of inspection/maintenance calls conducted
   g. The inspection results recorded on a Department approved inspection form and/or checklist, copies of which shall be made available by the aerobic treatment system manufacturer. The forms must be completed by the aerobic treatment system Authorized Service Provider and submitted to the Department upon written request.
   h. General summary of the results for the year, all known problems or failures with a brief summary of the cause and remedial measures taken.
   i. Any recommended changes to the design, installation and/or operation and maintenance procedures and a schedule for implementing those changes.

2. Web access to online information regarding the systems may be considered by the local administrative authority as an alternative or in addition to paper reporting.

3. Failure of a client to renew a service agreement shall be reported to the Department and local administrative authority within 30 days by the Authorized Service Provider.

4. The manufacturer or authorized representative shall submit to the Department a summary of any changes made to their design, installation or service documents within 7 business days of those changes. Design, installation or service documents shall be submitted to the Department upon request.

M. Manufacturer Responsibilities

1. All sites shall be tracked by the manufacturer or their designated authorized representatives to update site and system information, manage contact information, manage maintenance activities, and generate reports.

2. All components of the aerobic treatment system supplied by the aerobic treatment system manufacturer shall be covered under a minimum five-year warranty. This warranty shall be fully transferable to assure the current homeowner that any equipment failure will be covered as stipulated in that warranty during the warranty period. This is provided that operation and maintenance of the treatment system is done in conformance with manufacturer's requirements as stipulated in that warranty. Additionally, any component of the system which is specifically identified by the aerobic treatment unit manufacturer, by manufacturer and model, shall be reviewed by the aerobic treatment system manufacturer to ensure that the required component is covered by a minimum five year warranty from the applicable manufacturer. This warranty provision should not be applied to components that are reviewed for acceptability for use in the manufacturer's systems, but are not specifically required (e.g., a list of tank manufacturer's and their tanks sizes which are acceptable for use with a particular aerobic treatment system).

3. Provide the property owner with a copy of this guidance document, the operation, maintenance and monitoring agreement and obtain their written acknowledgement of the need to comply with the provisions of this document via signature prior to the sale of any an aerobic treatment system.

4. Institute and maintain a training program for prospective designers, installers, and service providers in the proper design, installation, and servicing of their system.

5. Maintain up to date lists of manufacturer Authorized Designers, Authorized Installers and Authorized Service Providers that have passed the training program and make these lists available upon request or on the manufacturer's website.

6. Maintain an up-to-date website that contains the information necessary to obtain all applicable Design, Installation, Start-up, Operation and Maintenance or other required documentation.

7. Establish a process for investigating complaints and removing authorized personnel from authorized lists as appropriate.

8. Provide the Department or any local administrative authority with all training materials and the expected qualifications for the installer and service providers upon request. The Department should be notified of any training event at least two weeks prior to the event. No administrative authority shall approve an aerobic treatment system without receiving all training and materials that are requested from the manufacturer.

N. Property Owner Responsibilities

1. The local administrative authority may require the property owner to record with the deed to the property a notice that identifies the technology, acknowledges the owner's responsibility to have in place at all times a maintenance and monitoring contract, and grants access to the property for the purpose of system monitoring, inspection and maintenance.

2. Have in place, at all times, an operation, maintenance and monitoring agreement with an Authorized Service Provider. Failure to maintain this agreement threatens and endangers human health and the environment by not providing an adequately operated and maintained system and shall constitute a public health nuisance violation and a violation of N.J.A.C. 7:9A-3.2 and/or 3.3(e), as applicable.

3. In accordance with applicable law, the Department and the local administrative authority may require the owner of the system to cease use of the system and/or to take any other actions as it deems necessary to protect public health, safety, welfare or the environment.

4. The aerobic treatment system may be approved for use in conjunction with the treatment and dispersal of sanitary sewage only. Non-sanitary sewage generated or used at the facility shall not be introduced into the system and shall be lawfully disposed of.

5. Provide any future purchaser of the property with a copy of this guidance, the operation, maintenance and monitoring agreement, any deed notices required by the local administrative authority for the property and obtain their approval via signature prior to entering into a contract of sale for the subject property.

O. Administrative Authority Responsibilities

1. The Department recommends that the local municipality in which an aerobic treatment system is proposed adopt a local ordinance authorizing the use of this technology. At a minimum, this ordinance should include monitoring and enforcement provisions to ensure that annual service agreements are maintained for the life of the system and appropriate fees to allow the local administrative authority to implement a tracking program. Establishment of a septic management program will be required for Treatment Works Approvals authorizing new construction or expansion applications using an aerobic treatment system.

2. Track, in database format, all approvals issued under this guidance. The information recorded shall include, at a minimum:

    a. municipal block and lot information,
    b. street address,
    c. date of installation,
    d. date of system start-up,
    e. type of dispersal area,
    f. the number of bedrooms at the facility, and
    g. the type of dispersal area and size in square feet and the reduction allowed for the dispersal system,
    h. the type of aerobic treatment systems used, and
    i. identification of a aerobic treatment system designer and installer.

3. Contact the Department directly with any questions regarding the application of aerobic treatment system applications which include variances from this guidance or to discuss issues not addressed by this guidance. In

no instance should any other party seek alternative guidance for a site specific system from the Department until the local administrative authority has expressed its position directly to the Department.

4. Identify in the construction approval for this system that the New Jersey Department of Environmental Protection must be notified at least one week prior to the installation of any component of the proposed system and the anticipated date of installing the aerobic treatment unit(s).

5. Identify in the construction approval for this system that failure to operate and maintain the system in accordance with the requirements outlined in this document and failure to maintain an agreement with an authorized service provider threatens and endangers human health and the environment by not providing an adequately operated and maintained system and shall constitute a public health nuisance violation and a violation of N.J.A.C. 7:9A-3.2 and/or 3.3(e).

Appendix A: Definitions

Aerobic treatment system: means an aerobic treatment unit and associated pumps, piping and control panels which are part of an onsite wastewater treatment system.

Authorized Designer: A licensed New Jersey Professional Engineer who has completed all Manufacturer training requirements, including annual refresher training, and has been identified as "authorized" by the Manufacturer to design aerobic treatment systems.

Authorized Installer: An individual person who has completed all Manufacturer training requirements, including annual refresher training, and has been identified as "authorized" by the Manufacturer to install aerobic treatment systems.

Authorized Service Provider: An individual person who has completed all Manufacturer training requirements, including annual refresher training, and has been identified as "authorized" by the Manufacturer to service aerobic treatment systems.

Authorized Dealer: Company(s) who has been "authorized" by the Manufacturer to distribute aerobic treatment system components. Contact the manufacturer to obtain information on their authorized dealers.

Department: New Jersey Department of Environmental Protection

Disposal Field: defined by N.J.A.C. 7:9A-2.1

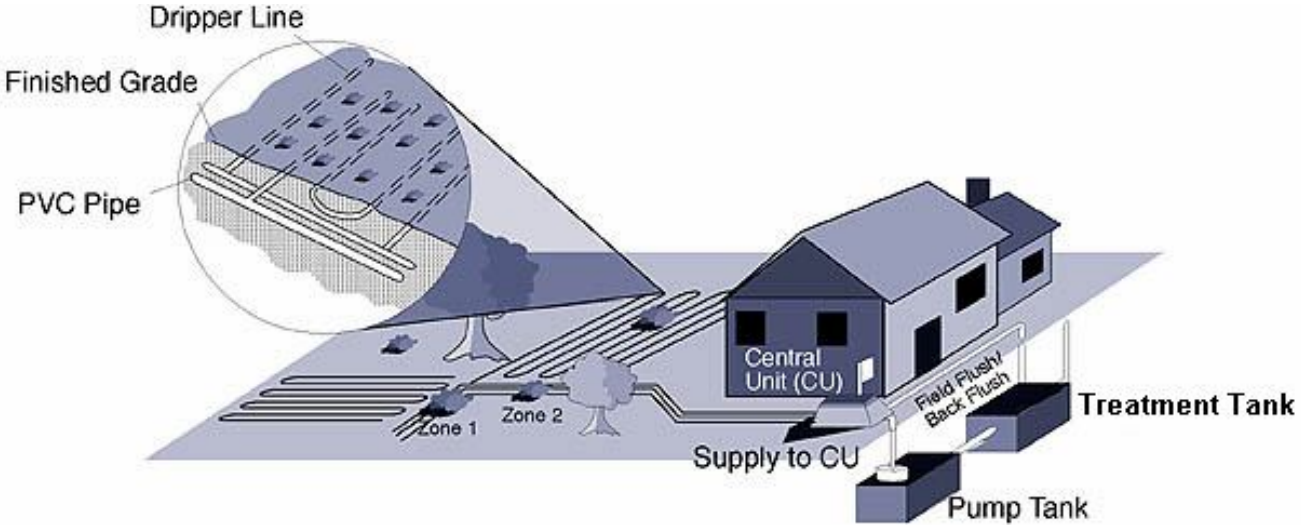
Drip Dispersal System: A drip dispersal wastewater disposal system with associated tanks, pumps, control panels, and piping that is designed, installed, operated and maintained in accordance with the Department's Drip Dispersal Wastewater Disposal System Guidance.

Manufacturer: Company who directly manufactures components of the aerobic treatment system and holds proprietary rights to that system. For the purposes of this document the applicable Manufacturer's are listed by the Department in a separate document available on the Department's website or by request at CH199@dep.nj.gov.

NTU: Nepholometric Turbidity Units. Measure of clarity

System: An onsite wastewater treatment system subject to regulation under N.J.A.C. 7:9A-1 et seq. For the purpose of this document the "System" is an aerobic wastewater treatment system with associated tanks, effluent distribution network, control panels and a disposal field or drip dispersal system and all other associated components.

Drip Dispersal
Wastewater Disposal System
Guidance Document



NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION

DIVISION OF WATER QUALITY

BUREAU OF GROUND WATER, RESIDUALS, AND PERMIT ADMINISTRATION

JANUARY 2022

Table of Contents

Cover graphics were provided by the National Environmental Services Center located at West Virginia University.

A. Purpose

This guidance document is limited in applicability to onsite wastewater treatment systems subject to regulation under N.J.A.C. 7:9A.

The use of a drip dispersal system may be allowed, as described below, for new construction, expanded project or to alter an existing, malfunctioning system. Under these circumstances, these drip dispersal systems may be considered by the local administrative authority, at their discretion. The issuance of this guidance does not exempt the applicant or his agents from the responsibility to comply with all applicable Federal, State, County and Municipal rules and regulations.

Proposals for use of a drip dispersal system for a new or expanded project must be directed to the Department for an individual treatment works approval (TWA). The location of the onsite wastewater treatment system must conform to all provisions of N.J.A.C. 7:9A for new or expanded systems. The application must demonstrate that the site can support an individual subsurface sewage disposal system, which meets strict conformance with the requirements of N.J.A.C. 7:9A, on the property. TWA's will contain requirements for the proper maintenance and management of these systems that must be performed by the system owner and enforced by the administrative authority.

In accordance with N.J.A.C. 7:9A-3.3, alterations to repair existing, malfunctioning systems may be made in a manner that is in more compliance with current standards than the malfunctioning system. The Department interprets that regulation to provide the local administrative authority with the ability to approve of alterations using advanced treatment technologies, coupled in application with a drip dispersal system, described herein. These guidelines may not be construed as a device to require the use of a technology in any jurisdiction, does not limit the local administrative authority's ability to have additional requirements in their permit or other approval, and does not limit the local administrative authority's ability to apply the technology in applications that do not strictly meet these guidelines. As stated in the guidelines for administrative authorities, below, any questions regarding variances from these guidelines should be conveyed by the affected local administrative authority directly to the Department.

B. General Conditions

1. The Department may revise these guidelines or discontinue the use of any drip dispersal systems at any time.

2. The Department will maintain a list of applicable manufacturers and system integrators that have agreed to the provisions of this guidance and have demonstrated the ability to comply with the conditions of the guidance.

3. Any dripperline manufacturer or system integrator that wishes to be listed as applicable under this guidance document shall submit a written request and a report to the Department that details how the manufacturer will achieve compliance with the appropriate portions of this guidance document.

4. Any dripperline manufacturer or system integrator that fails to comply with the provisions of this document will be removed from the applicability list subject to this guidance. The Department will advise any affected party in writing prior to taking this action.

5. The dripperline shall be color coded by the drip tube manufacturer to be easily recognized as suitable for wastewater dispersal. The dripperline shall be warranted fully by the dripperline manufacturer for protection against root intrusion for a minimum period of ten (10) years.

6. For the life of the system, the owner of the system must have in place a preventative maintenance and monitoring contract with an Authorized Service Provider to ensure it is functioning properly and to optimize treatment performance. As part of this contract, the Authorized Service Provider must conduct a visual inspection of the internal components, including any treatment media, and maintain the complete treatment system. Upon expiration of a maintenance and monitoring contract, a new contract, which shall be at least one year in duration, shall be entered into by the property owner with an Authorized Service Provider. If the property owner fails to renew the maintenance and monitoring contract, written notification of such must be directed, by the Authorized Service Provider, to the local administrative authority.

C. Drip Dispersal Technology Description

Subsurface drip dispersal is an efficient method for dispersal of wastewater into the soil. It is a precise method for applying wastewater effluent over an infiltration surface in small volume doses throughout the day. The uniformity of the dosing and equal distribution can be designed and operated to provide for unsaturated flow over the entire infiltration area.

The unique feature of drip dispersal networks is the use of uniformly spaced drip emitters that are inserted within flexible tubing to control the rate of wastewater discharges out the tubing through small orifices. Typically, the dripperline is installed directly into the soil without aggregate or other media. Pumps are used to fill and pressurize the dripperline sufficiently to achieve uniformity of distribution.

The drip emitter is designed to create a high headloss between the in-line pressure of the dripperline and the outlet orifice in dripperline wall. The pressure loss that is created controls the pressure at the outlet orifice so that the discharge is maintained within a desired range. Each emitter acts as a point discharge, which releases water at a rate nearly equal to the discharge rate from other emitters in the same dripperline.

The pressure compensating emitter discharges water at a nearly constant rate over a wide range of pressures above a minimum pressure. Below the minimum pressure the pressure compensating emitter operates similarly to a turbulent flow emitter.

The treated wastewater is dosed to each drip dispersal zone intermittently. Intermittent dosing provides several significant benefits. It allows time for the soil at the infiltrative surface to reaerate so the soil can maintain an aerobic environment for biochemical treatment of the wastewater to occur. It makes better use of the hydraulic capacity of the system to accept the wastewater by avoiding few, large doses. Timed dosing protects the infiltration system from receiving wastewater in excess of the daily design flow storing excessive flows in the dose tank for later dispersal.

Monitoring system function and performance is essential to proper operation. In addition, metering the volume of water dispersed is a critical monitoring item for evaluating performance.

The dispersal system is to be operated by an integrated controller, which is programmed to activate the pumps to dose the dripperline at appropriate intervals and duration. The controller can also be programmed to flush the dripperline and backflush/flush the liquid/solid separator device. It also may be used to store operating data for later use in documenting system performance and diagnosing system malfunctions.

D. Effluent Quality

1. Sewage from the realty improvement(s) must be treated to at least secondary treatment levels prior to entering a drip dispersal system. Secondary effluent quality must be provided by a technology which is indicated as appropriate for use with drip dispersal systems in a Department issued document. Final determinations regarding the acceptability of any treatment technology used with a drip dispersal system is at the discretion of the local administrative authority.

2. Due to the relatively low concentrations of $CBOD_5$ and TSS that result from secondary wastewater treatment, the soil is relied upon more for dispersal capabilities rather than treatment of effluent.

E. Drip Dispersal System Design

1. All pre-engineered drip dispersal system designs from a system integrator must be signed and sealed by a New Jersey licensed professional engineer (N.J.P.E.). The N.J.P.E. must be trained and authorized by a system integrator as an Authorized Designer to design that system integrator's drip dispersal system.

2. All drip dispersal systems and components shall be designed according to the most recent dripperline manufacturer and/or system integrator design criteria.

3. Any Authorized Designer that submits a drip dispersal system design to any local administrative authority must notify the Department, within 24 hours of the submittal to the local administrative authority, in writing or by email at CH199@dep.nj.gov.

4. Drip Dispersal System Design Review:

    a. Residential Drip Dispersal Systems: Prior to issuing a construction approval, the local administrative authority may require the design to be reviewed by a system integrator or their authorized representative as being consistent with minimum specifications and recommendations.

    b. Commercial Drip Dispersal Systems: Prior to submitting the drip dispersal system design for construction approval, the drip dispersal system design shall be reviewed by a system integrator representative. The system integrator or their authorized representative shall issue a letter to the designer indicating the design is consistent with manufacturer's minimum specifications and recommendations.

5. Both the Authorized Designer and/or a system integrator's representative may be required by the local administrative authority to conduct a final construction inspection and/or certify that as-built conditions are in conformance with the approved system design and/or submit "as-built" plans.

6. All drip dispersal systems shall be equipped with devices or methods to prevent the redistribution of effluent by gravity in the dispersal area and which will minimize the effluent remaining in the lines after the end of a dose cycle from redistribution to lower portions of the drip zone (Variable distribution due to drain down shall be 10% or less).

7. All drip dispersal systems shall be equipped with self cleaning, pressure compensating or turbulent flow emitters. The discharge rate of any two emitters shall not vary by more than 10% in order to ensure that the

effluent is uniformly distributed over the entire drip field or zone. Pressure gauge access points (Schrader valves) are required at appropriate locations on system networks utilizing turbulent flow emitters to verify design and operational performance. Pressure gauge access points are recommended to be installed on all systems.

8. All drip dispersal systems shall incorporate a method of filtration sufficient to remove suspended solids and prevent clogging of the emitters as specified by the drip tubing manufacturer. The filter shall achieve the drip tubing manufacturer's minimum specified filtration at a rate equal to or greater than the peak discharge rate, typically during network forward flushing. The filter(s) are to be washed automatically on a routine basis. Any filter backwash is to return to the head of the pretreatment train or a settling tank to allow for primary settling prior to a dosing station.

9. The system shall be capable of forward flushing each drip field or zone at a minimum fluid velocity as required by the dripperline manufacturer back to the head of the pre-treatment train or a settling tank to allow for primary settling prior to a dosing station. Field flushing velocity shall be designed at the distal end of each lateral connection. Field flushing shall be accomplished automatically according to manufacturer's recommendations to prevent damage to the drip tubing and maintain product warranty.

10. The flush return volume is not to exceed the hydraulic capacity of the pretreatment unit.

11. The approved system shall provide the means, at minimum, to accurately calculate flows, pump cycle counter, pump elapsed time, counts of automated flushing events and alarm events. This may be accomplished by having a flow meter and a control unit that counts pump cycles, pump run time and counts flushing and alarm events. These functions are necessary to provide proper operation and maintenance and to verify and monitor emitter performance, scouring or flushing performance, and water use.

12. Pump selection shall take account of the operating volume and pressure for the drip dispersal field when calculating the total dynamic head required for filter flushing and/or back flushing, field dosing, and dripperline flushing. All disposal and flushing parameters must fall within the operational range of the pump selected.

13. The Dripperline Manufacturer and/or system integrator shall make available head loss charts, tables and/or formulas for various drip tubing lateral lengths during the disposal cycle. The Dripperline Manufacturer and/or system integrator shall also identify a minimum scouring/flushing velocity for the distal end of the drip tubing lateral and minimum and maximum operating pressures.

14. All piping, valves, fittings, level control switches, and all other components shall be designed and manufactured to resist the corrosive effects of wastewater and common household chemicals.

15. A dosing chamber shall be employed after the treatment device and before the drip dispersal system, and shall be sized and equipped so as to permit timed dosing of the daily sewage flow with adequate reserve storage capacity for those times when the system is inoperable. The system design shall comply with the following:

    (a) The dosing chamber working volume (surge storage) shall be at a minimum 75% of the peak design flow volume. This volume may be calculated from the timer enable to the high water alarm floats. The Authorized Designer and the system integrator shall calculate and verify the flows appropriate for systems using Program Logic Controls (PLC) or other methods alternative to timers. In no case shall a pump tank volume be less than what is typically required for a standard septic tank for the system.

(b) The dosing chamber shall be equipped with an audible and visual high-water alarm set to provide reserve capacity to allow for the prompt repair of the system. The minimum amount of reserve volume above the high water alarm is 25% of the peak daily flow. A low-water cutoff device shall be provided to prevent damage to the pump during low-water conditions and shall be separate from the timer enable device. The Authorized Designer and the system integrator shall calculate and verify the flows appropriate for systems using Program Logic Controls (PLC) or other methods alternative to timers.

(c) The dosing chamber shall be fitted with watertight access risers to grade that are secured against unauthorized entry.

(d) Each drip dispersal field or zone shall be time-dosed at regular intervals, throughout the day, based on the peak design flow, as specified by the manufacturer, system integrator and Authorized Designer. To maintain uniform distribution, the minimum dose volume in a drip dispersal network is calculated using 80% of the dose being dispersed during times of equal distribution, accounting for pressurization time and redistribution at pump shut off and no less than three times the volume of the pipe (plus the volume of supply /return lines and field manifolds where applicable). Requests for alternative minimum dose volumes shall be accompanied by a detailed justification by the Authorized Designer and verified as acceptable by the system integrator.

(e) A programmable timer and control panel shall be employed to regulate dosing frequency / volume, record the number doses, field flushing events and other pertinent information.

F. Drip Dispersal System Siting & Sizing Criteria

1. Permeability testing to determine the size of a dispersal area must be completed in native soils. Testing conducted on fill material should not be used. Permeability testing should be conducted in the most hydraulically restrictive zone within the 24 inches of soil material below the proposed bottom of the installed dripperline. If the permeability of the zone of dispersal for a soil replacement system is greater than 20 inches per hour, the Authorized Designer may use a design value of 6 inches per hour for the purposes of designing the drip dispersal field.

2. The Department recommends using percolation tests to measure native soil permeability for designing drip dispersal systems. When soil permeability class rating tests are used, the lowest permeability for that range of K-class shall be used.

3. When a basin flood test is the only permeability test possible, a permeability of 0.2 inches per hour may be used for areas that pass the test. However, if the basin flooding test drains in less than three hours on each and every filling, the permeability of the select fill may be used, provided percolation testing or tube permeameter testing is completed in the fill material after emplacement and compaction of the material.

4. The bottom of the dripperline shall be at least 24 inches above any limiting zone.

5. Dispersal areas are sized in accordance with the following. The minimum area of a drip dispersal system should be determined using the permeability of the most restrictive native soils, above the limiting zone, in the proposed dispersal area and from the following table:

Table 1

Percolation Rate	Area Loading	Percolation Rate	Area Loading
Mpi	gal/ft^2/day	Mpi	gal/ft^2/day
5	0.303	*65	0.146
10	0.278	*70	0.139
15	0.253	*75	0.133
20	0.228	*80	0.127
25	0.211	*85	0.122
30	0.203	*90	0.117
35	0.196	*95	0.116
40	0.189	*100	0.105
45	0.180	*105	0.096
50	0.173	*110	0.088
55	0.162	*115	0.080
60	0.154	*120	0.073

(*Rates above 60 Mpi are provided only for alterations to correct malfunctioning systems.)

The minimum amount of tubing required is the area divided by 2 (two foot center).

> For example, based on 60 mpi, 500 gpd / 0.154 gal/ft^2/day = 3247 ft^2 of area, 3247 ft^2 of area / 2' center = 1624' of tubing, an area approximately 101' x 30'.

Authorized Designers may specify lesser or greater tubing separation depending on the specific site conditions. However, the minimum tubing length must be provided. A minimum of two zones is recommended. In the case of smaller dispersal areas, and in consideration of a system provider's minimum zone size, single zone systems, and/or closer tubing spacings may be permissible.

6. Mounded soil replacement drip dispersal designs.

   a. Mounded soil replacement drip dispersal systems require a minimum soil depth of 18" from the pre-existing natural ground surface to any limiting condition and should not be used at sites where there is a 30" depth or more to a limiting zone where a traditional drip dispersal system can be designed as described above.

   b. Undisturbed soil and the depth of dispersal, is to be maximized below the bed bottom but in no case is to be less than 12" in thickness. The minimum depth of soil excavation for select fill depth is to be 4". In all cases the select fill is to be mounded, extending a minimum of 6" above grade to provide a minimum of 24" of separation, select fill and soil, to limitation. For the purposes of this section, the term "select fill" means material which meets the requirements of N.J.A.C. 7:9A-10.1(f)4 or Treatment Works Approval 03-3487-4SG.

   c. The bed bottom is to be installed level. The length to width ratio of the bed(s) is to be maximized as the site allows and to be no less than 3:1. The use of two or more narrow beds to maintain the required minimum depth to a limiting condition and geometry may be necessary. One bed may be possible on sites where the pre-existing natural ground surface is flat across the entire area required for the bed, however re-grading

shall not be allowed in any case. The minimum separation between beds (sidewall to sidewall) is to be 6' of native soil material.

d. Permeability testing should be conducted in the most hydraulically restrictive zone within the 24 inches of soil / fill material (see below) below the proposed bottom of the installed dripperline.

e. The beds will be sized in accordance with Table 1 except the bed bottom loading rate is to be the "Area Loading" multiplied by three.

For example, based on 60 mpi, 0.154 gal/ft^2/day area loading rate x 3 = 0.462 gal/ft^2/day bed loading rate. 500 GPD / 0.462 = 1083 ft^2 of bed bottom. If there was 45' of available length (contour) the bed would be 45' x 23' (1083 ft^2 of bed bottom / 45') representing a ratio of approximately 2:1. Two beds, each 45' x 12', and separated by a minimum of 6', would be required, representing a ratio of 3.75:1 per bed. In the case of these smaller dispersal areas, and in consideration of a system provider's minimum zone size, single zone systems, and/or closer tubing spacing (typically 12" or less) may be indicated.

f. An additional lateral fill extension is not required. The minimum distance from the edge of the fill bed to any drip line is to be one (1) foot. Tubing separation over the soil replacement bed may be less (minimum of 0.5 feet) to accommodate minimum zone sizes in accordance with manufacturer's recommendations. The drip tubing is to be covered with a minimum 2" of additional select fill. Drainage fabric, which meets the requirements of N.J.A.C. 7:9A-10.3(e)3ii., shall then be placed over the additional select fill covering the drip tubing. Salt-hay or straw shall not be used in these installations.

g. If the permeability of the zone of dispersal for a soil replacement system is greater than 20 inches per hour, the Authorized Designer shall use a design value of 6 inches per hour for the purposes of designing the drip dispersal field. For areas where only a basin flood test is possible, a permeability of 0.2 inches per hour may be used for a passing basin flood test. However, if the basin flooding test drains in less than three hours on each and every filling, the permeability of the select fill may be used, provided percolation testing or tube permeameter testing is completed in the fill material after emplacement and compaction of the material.

h. All other considerations regarding the design of a mounded soil replacement drip dispersal system shall be in conformance with N.J.A.C. 7:9A-10.6.

7. An additional zone of disposal is not required for drip dispersal systems. Typical subsurface installation depths are 6-12" below the ground surface.

8. For drip dispersal systems located in areas where the existing, malfunctioning system infringes upon a setback to a well and the new system will not fully meet current setback requirements, ultraviolet (UV) disinfection of the wastewater may be required on the well and/or prior to discharge into the dispersal field.

9. The dripperlines shall be laid level as possible and shall run with the contour. The maximum lateral length of a dripperline, measured from supply to return manifolds, shall be specified by the Authorized Designer in accordance with dripperline manufacturer and/or system integrator recommendations. The Authorized Designer, in accordance with manufacturer and/or system integrator recommendations, shall also specify the maximum linear feet of dripperline that may be placed in a zone.

10. Minimum horizontal separation distances are stipulated in Table 2 for new construction or expansion projects. For alterations to correct a malfunctioning condition, the setbacks should be brought into closer conformance with these requirements than what previously existed with the malfunctioning system.

11. In cases where setbacks to wells can not be increased to meet current requirements, the local administrative authority should consider ultraviolet disinfection on the well in addition to, or instead of, disinfection of the wastewater.

Table 2. Minimum Required Horizontal Separation Distances (in feet)

Land Feature or Component	Drip Dispersal Area	Septic Tank, Processing Tank, Secondary Treatment Units
Water Course	50	25
Well or suction line	100	50
Water Service Line	10	10
Occupied Building	25	10
Property Line	10	5
Disposal Field	50	0
Existing Seepage Pit or Cesspool	50	0
In-ground Swimming Pool	20	10

G. Drip Dispersal System Installation

1. A preconstruction conference is highly recommended prior to beginning construction of the system and should be attended by the Authorized Designer of the system, the Authorized Installer, and the local administrative authority.

2. All drip dispersal systems shall be installed according to directions provided in the drip dispersal system manufacturer's installation manual, installation requirements specified by the system integrator (if applicable) and approved drip dispersal system design.

3. All companies/personnel installing the drip dispersal system shall be in possession of all necessary permits and licenses before attempting any portion of an installation.

4. Only an Authorized Installer shall install the drip dispersal system.

5. The Authorized Installer must notify the Department at least one week prior to the installation of the drip dispersal system at CH199@dep.nj.gov and coordinate inspections with the Department in addition to any inspections required by the local administrative authority.

6. An Authorized Installer must be present at all times during drip dispersal system installation. No work on the drip dispersal system may be conducted unless under the direct supervision of an Authorized Installer.

7. Watertightness of any septic, processing and dispersal system dosing tanks specified in the design must be watertight tested at the installation site after being installed using hydrostatic or vacuum tests. Testing of the

tanks shall include all upper portions of the tank, including riser joints. Testing must be done in accordance with the following:

a. Water tightness testing procedures and criteria for concrete tanks shall follow the methods described in ASTM C-1227 standards or National Precast Concrete Association appropriate testing criteria and procedures

b. Tanks made of materials other then concrete shall be tested, after installation, in accordance with the methods described in ASTM C-1227 standards, if applicable, or other hydrostatic or vacuum testing methods approved by the tank manufacturer.

c. Water used for this testing shall be either from a potable water source or Reclaimed Water for Beneficial Reuse authorized by a NJPDES permit.

d. The use of an onsite potable well for purposes of supplying water for this testing is not recommended. If an onsite potable well is to be used, pumping of the well must be done in a manner which will withdraw water at a rate less than 50% of the safe yield of that well and will not damage the pump or any other component of the well.

8. The dripperline shall be installed by a method that will prevent pulling, stretching, or crimping of the dripperline, and smearing, compaction, or altering of the soil texture. The method shall be acceptable to the dripperline manufacturer, system integrator and the Authorized Designer.

9. Drip tubing shall not be installed when soils are saturated. In soil textures other than sands or loamy sands, drip tubing installation shall not be carried out when the soil moisture content is above the lower plastic limit from the surface of the ground to 12” below the proposed tubing installation depth. This means that when a small lump of soil, taken within the above depth, can be rolled out with the fingers to form a wire or rod, one-eighth of an inch in thickness, and does not crumble when handled, the soil is too wet to proceed with the installation.

10. On sites where vegetation will be removed, methods to minimize soil disturbance must be used. Any soil disturbance below four (4) inches shall be backfilled with material meeting the specifications of N.J.A.C. 7:9A-10.1(f)4. Additional fill material and/or topsoil may be used above this level, provided the drip tubing will be installed within at least two (2) inches of specified fill above the top of the drip tubing.

11. All system control units, valve boxes, drip dispersal lines, conveyance lines and other system appurtenances shall be designed and installed to prevent freezing per the system integrator and dripperline manufacturer recommendations.

12. Both the Authorized Designer and/or a system integrator’s representative may be required by the local administrative authority to conduct a final construction inspection and/or certify that as-built conditions are in conformance with the approved system design and/or submit “as-built” plans.

H. Drip Dispersal System Start-up

1. The Authorized Service Provider shall inspect the drip dispersal system following each installation. The Authorized Service Provider shall complete the drip dispersal system start-up checklist. The Authorized Service Provider shall provide the completed start-up checklist to the local administrative authority.

2. The Authorized Installer shall be present at the time of start-up.

I. Drip Dispersal System Operation, Maintenance & Monitoring

1. All drip dispersal systems shall be maintained according to the system integrator's current Operation and Maintenance Manual by an Authorized Service Provider.

2. Drip dispersal systems shall be inspected by an Authorized Service Provider on the following schedule, at a minimum:
    a. Once within 30 days of system start up.
    b. Once per year for systems equipped with Telemetry control panels.
    c. Twice per year for the first two years of system operation for systems equipped with auto dialers and control panels; once per year thereafter.
    d. Three times per year for the first two years for all other systems; twice per year thereafter.
    e. For all systems, a meeting with a new operator of the system is recommended at the time of transfer of the property. The local administrative authority should be notified of this meeting and invited to participate.
    f. Additionally, as required by the dripperline manufacturer and/or system integrator.

3. At each regularly scheduled maintenance visit the Authorized Service Provider shall, at minimum, observe, monitor and record:
    a. General condition of the drip dispersal system;
    b. Wastewater level in the tanks,
    c. Any effluent/pump filter for clogging,
    d. Ponding of sewage or effluent around the drip dispersal system;
    e. Pump cycle, run time and all other meters
    f. All other parameters recommended by the drip tubing manufacturer and/or system integrator.

4. All drip dispersal systems require an operation and maintenance contract to be in place with an Authorized Service Provider for the life of the system.

5. Authorized Service Providers shall be trained and authorized by the system integrator. An up to date list of Authorized Service Providers shall be maintained by the system integrator and be made available upon request.

6. The operation and maintenance contract must be signed by the property owner and an Authorized Service Provider prior to issuance of the occupancy permit.

7. The Authorized Service Provider must have proper equipment and training to access and program any system control panel on site.

J. Training & Education

1. The system integrator or authorized representative shall hold, at minimum, one training event annually for Designers, Service Providers, and Installers.

2. The system integrator or authorized representative shall provide a written and dated authorization for Designers, Service Providers and Installers. This authorization shall be valid for one year for those who have completed the appropriate requirements.

3. A list of these authorized Designers, Service Providers, and installers shall be kept up-to-date by the system integrator and made available upon request or on its website.

4. The system integrator shall hold free training for New Jersey regulators, when necessary, that covers the design, installation and service of the drip dispersal system.

5. All Authorized Designers, Service Providers and Installers shall be required to receive annual, or more frequently as needed, refresher training as a requirement to continue to be authorized by the system integrator. An updated system integrator authorization shall be provided after refresher training has been successfully attended.

K. Reporting

1. The system integrator or their authorized representative shall submit an annual report to the Department by March 1st of each year containing the following information for the previous 12 months:
    a. Number of drip dispersal systems installed;
    b. The address of each installed drip dispersal system, the owners name and address, municipal tax block and lot, and the type of use (e.g. residential, commercial);
    c. Date when the drip dispersal system was installed and started up;
    d. Administrative authority and permit number;
    e. Status of the maintenance and monitoring contract;
    f. Number of inspection/maintenance calls conducted;
    g. The inspection results recorded on a manufacturer or system integrator approved inspection form and/or checklist, copies of which are available from the manufacturer or system integrator (as applicable). The forms must be completed by the drip dispersal system Authorized Service Provider and submitted to the Department upon written request;
    h. General summary of the results for the year, all known problems or failures with a brief summary of the cause and remedial measures taken;
    i. Any recommended changes to the design, installation and/or operation and maintenance procedures and a schedule for implementing those changes; and
    j. Original equipment manufacturer name and model of the wastewater treatment system(s) providing secondary treated effluent to the drip dispersal system.

2. Web access to online information and reports regarding the systems may be considered by the local administrative authority as an alternative or in addition to paper reporting.

3. Failure of a client to renew a service agreement shall be reported to the Department and local administrative authority by the Authorized Service Provider within 30 days.

4. Each drip tubing manufacturer and system integrator shall submit a summary of any changes made to that manufacturer's design, installation or service documents to the Department within seven (7) days of those changes. Design, installation or service documents shall be submitted to the Department upon request.

L. Manufacturer/System Integrator Responsibilities

1. All sites shall be tracked by the system integrator or an authorized representative to update site and system information, manage contact information, manage maintenance activities, and generate reports.

2. The drip tubing shall be warranted fully by the Dripperline Manufacturer for protection against root intrusion for a minimum period of ten (10) years. This warranty shall be fully transferable to assure the current homeowner that any equipment failure will be covered as stipulated in that warranty during the warranty period. This is provided that operation and maintenance of the treatment system is done in conformance with manufacturer's requirements as stipulated in that warranty.

3. The system integrator or their authorized representative shall provide the property owner with a copy of all warranty information for each component of the system provided.

4. The system integrator or their authorized representative shall provide the property owner with a copy of this guidance document, the operation, maintenance and monitoring agreement and obtain their written acknowledgement of the need to comply with the provisions of this document via signature prior to the sale of any a drip dispersal system.

5. The system integrator or their authorized representative shall institute and maintain a training program for prospective designers, installers, and service providers in the proper design, installation, and servicing of their system.

6. The system integrator or their authorized representative shall maintain up to date lists of Authorized Designers, Installers and Service Providers that have passed the training program and make these lists available to the Department upon request or made available on its website.

7. The system integrator or their authorized representative shall establish a process for investigating complaints and removing authorized personnel from authorized lists as appropriate.

8. The system integrator or their authorized representative shall provide the Department or any local administrative authority with all training materials and the expected qualifications for the installer and service providers upon request. The Department should be notified of any training event at least two weeks prior to the event. No administrative authority shall approve a drip dispersal system without receiving all training and materials that are requested from the manufacturer or system integrator.

M. Property Owner Responsibilities

1. The local administrative authority may require the property owner to record with the deed to the property a notice that identifies the technology, acknowledges the owner's responsibility to have in place at all times a maintenance and monitoring contract, and grants access to the property for the purpose of system monitoring, inspection and maintenance.

2. Have in place, at all times, an operation, maintenance and monitoring agreement with an Authorized Service Provider. Failure to maintain this agreement threatens and endangers human health and the environment by not providing an adequately operated and maintained system and shall constitute a public health nuisance violation and a violation of N.J.A.C. 7:9A-3.2 and/or 3.3(e), as applicable.

3. In accordance with applicable law, the Department and the local administrative authority may require the owner of the drip dispersal system to cease use of the drip dispersal system and/or to take any other actions as it deems necessary to protect public health, safety, welfare or the environment.

4. The drip dispersal system may be approved for use in conjunction with the treatment and dispersal of sanitary sewage only. Non-sanitary sewage generated or used at the facility shall not be introduced into the drip dispersal system and shall be lawfully disposed of.

5. Provide any future purchaser of the property with a copy of this guidance, the operation, maintenance and monitoring agreement, any deed notices required by the local administrative authority for the property and obtain their approval via signature prior to entering into a contract of sale for the subject property.

N. Administrative Authority Responsibilities

1. The Department recommends that the local municipality in which the drip dispersal system is proposed adopt a local ordinance authorizing the use of this technology for alterations to malfunctioning systems. At a minimum, this ordinance should include monitoring and enforcement provisions to ensure that annual service agreements are maintained for the life of the drip dispersal system and appropriate fees to allow the local administrative authority to implement a tracking program. Establishment of a septic management program will be required for Treatment Works Approvals for new construction or expansion applications using a drip dispersal system.

2. Track all approvals issued under this guidance in a database format. The information recorded shall include, at a minimum:

    a. municipal block and lot information,
    b. street address, date of installation,
    c. date of system start-up, type of dispersal area,
    d. the number of bedrooms at the facility and
    e. the type of dispersal area and size in square feet,
    f. the type of drip dispersal system used and
    g. identification of the drip dispersal system designer and installer.

3. Contact the Department directly with any questions regarding the application of drip dispersal system applications which include variances from this guidance document or to discuss issues not addressed by this guidance. In no instance should any other party seek alternative guidance for a site specific drip dispersal

system from the Department until the local administrative authority has expressed its position directly to the Department.

4. Identify in the construction approval for this system that the New Jersey Department of Environmental Protection must be notified at least one week prior to the installation of any component of the proposed system and the anticipated date of installing the dripperlines.

5. Identify in the construction approval for this system that failure to operate and maintain the system in accordance with the requirements outlined in this document and failure to maintain an agreement with an authorized service provider threatens and endangers human health and the environment by not providing an adequately operated and maintained system and shall constitute a public health nuisance violation and a violation of N.J.A.C. 7:9A-3.2 and/or 3.3(e).

Appendix A: Definitions

Authorized Dealer (or authorized representative): Company(s) who has been "authorized" by the system integrator to distribute drip dispersal systems.

Authorized Designer: A licensed New Jersey Professional Engineer who has completed all Manufacturer training requirements, including annual refresher training, and has been identified as "authorized" by the Manufacturer to design drip dispersal systems.

Authorized Installer: An individual person who has completed all Manufacturer training requirements, including annual refresher training, and has been identified as "authorized" by the Manufacturer to install drip dispersal systems.

Authorized Service Provider: An individual person who has completed all Manufacturer training requirements, including annual refresher training, and has been identified as "authorized" by the Manufacturer to service drip dispersal systems.

$CBOD_5$: Carbonaceous Biochemical Oxygen Demand (5 day, uninhibited)

Department: New Jersey Department of Environmental Protection

Disposal Field: defined by N.J.A.C. 7:9A-2.1

Drip Dispersal System: A pre-engineered wastewater treatment and disposal system that incorporates a high pressure, low flow disposal mechanisms in a manner that does not create saturated flow conditions with associated treatment units, tanks, filters, pumps, control panels, piping and all other equipment that is designed, installed, operated and maintained in accordance with this document by a drip dispersal system manufacturer.

Drip Emitter: The engineered flow control device that is typically attached to the inside wall of the dripperline over each orifice. The emitter discharges water at a predictable rate under a given pressure, typically stated in gallons per hour.

Dripperline (or drip tubing): The wastewater rated polyethylene tubing that has uniformly spaced drip emitters along its length, which are attached to the inside wall of the tubing.

Dripperline (or drip tubing) Manufacturer: Company who directly produces the original dripperline/drip tubing component of a drip dispersal system consisting of the dripperline and pressure compensating or turbulent flow emitters and holds proprietary rights to that component of a drip dispersal system. For the purposes of this document the applicable Manufacturer's are listed by the Department in a separate document available on the Department's website or by request at CH199@dep.nj.gov.

Emitter, pressure compensating (PC): A drip emitter that discharges water out an orifice of the dripperline at a constant rate over a range of operating pressures.

Emitter, turbulent flow: a non-pressure compensating (non-PC) emitter that discharges water out an orifice of the dripperline at a rate that varies directly with the operating pressure.

Flow, pressurizing: The portion of a dosing event during which the dispersal system is being filled to its operating pressure.

Flow equalization: The process of reducing the variability of the influent flow to a system component by storing peak flows and metering their release at a predetermined rate close to the average daily flow.

Flushing: The process by which dripperlines are hydraulically cleansed to prevent emitter clogging by increasing the velocity of water flow through the dripperlines to scour and transport solid materials that may have accumulated in or on the interior surfaces of the dripperlines.

Minimum dose volume: The is volume of water discharged during a dosing event that is necessary to pressurize the entire drip dispersal system and sustain that pressure over a sufficient period to achieve the desired uniformity of discharges between all orifices. It is commonly specified as a multiple of the total volume of the laterals in the drip dispersal system (*e.g.*, four times the volume of the piping network).

NTU: Nepholometric Turbidity Units. Measure of clarity

Return manifold: The pipe to which the distal ends of each lateral in a dispersal zone are connected. Its purposes are to help equalize the pressure between laterals of a zone, provide an alternative pathway to a lateral that may be obstructed, and collects the wastewater from the laterals during field flushing for discharge to the return flush main.

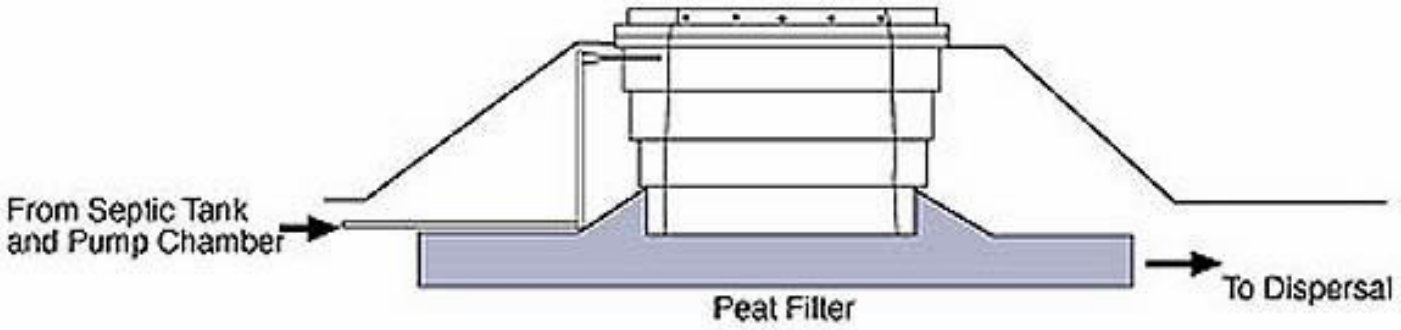
Supply manifold: The pipe to which the proximal ends of the laterals of a dispersal zone are connected to supply water to the dripperline during dosing events.

System: An onsite wastewater treatment system which is subject to regulation under N.J.A.C. 7:9A-1 et seq. For the purpose of this document the "System" is a pre-engineered drip dispersal system with associated treatment units, tanks, pumps, effluent distribution network, control panels and all other associated components.

System Integrator: A company that is responsible for the pre-engineering of drip dispersal systems, authorizing designers, installers and service providers, and maintains the overall responsibility of the system management. For the purposes of this document the applicable system integrators are listed by the Department in a separate document available on the Department's website or by request at CH199@dep.nj.gov.

TSS: Total Suspended Solids

Peat Biofilter
Wastewater Treatment Systems
Guidance Document



NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION

DIVISION OF WATER QUALITY

BUREAU OF GROUND WATER, RESIDUALS, AND PERMIT ADMINISTRATION

JANUARY 2022

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Cover graphics were provided by the National Environmental Services Center located at West Virginia University.

A. Purpose

This guidance document is limited in applicability to onsite wastewater treatment systems subject to regulation under N.J.A.C. 7:9A.

The use of a peat biofilter treatment system may be allowed, as described below, for new construction, expanded project or to alter an existing, malfunctioning system. Under these circumstances, a peat biofilter treatment system may be considered by the local administrative authority, at their discretion. The issuance of this guidance does not exempt the applicant or his agents from the responsibility to comply with all applicable Federal, State, County and Municipal rules and regulations.

Proposals for use of a peat biofilter treatment unit for a new or expanded project are allowed, provided the peat biofilter treatment system is in addition to and not in lieu of any part of a system that meets all of the requirements of N.J.A.C. 7:9A. All other proposals for use of this technology for a new or expanded system that differ from the requirements of N.J.A.C. 7:9A, including variations from the regulatory requirements discussed in this guidance, must be directed to the Department for an individual Treatment Works Approval (TWA). The application must demonstrate that the site can support an individual subsurface sewage disposal system, which meets strict conformance with the requirements of N.J.A.C. 7:9A, on the property. TWA's will contain requirements for the proper maintenance and management of these systems that must be performed by the system owner and enforced by the administrative authority.

In accordance with N.J.A.C. 7:9A-3.3, alterations to repair existing, malfunctioning systems may be made in a manner that is in more compliance with current standards than the malfunctioning system. The Department interprets that regulation to provide the local administrative authority with the ability to approve of alterations using advanced treatment technologies, including a peat biofilter treatment system, described herein. These guidelines may not be construed as a device to require the use of a technology in any jurisdiction, does not limit the local administrative authority's ability to have additional requirements in their approval, and does not limit the local administrative authority's ability to apply the technology in applications that do not strictly meet these guidelines. As stated in the guidelines for administrative authorities, below, any questions regarding variances from these guidelines should be conveyed by the affected local administrative authority directly to the Department.

B. General Conditions

1. The Department may revise these guidelines or discontinue the use of any peat biofilter treatment systems at any time.

2. The Department will maintain a list of applicable manufacturers that have agreed to the provisions of this guidance and have demonstrated the ability to comply with the conditions of the guidance.

3. Any peat biofilter treatment system manufacturer that wishes to be listed as applicable under this guidance document shall submit a written request, a copy of their NSF Standard 40, ETV or other verification report and a report to the Department that details how the manufacturer will achieve compliance with the appropriate portions of this guidance document.

4. Any peat biofilter treatment system manufacturer that fails to comply with the provisions of this or any applicable document will be removed from the applicability list subject to this guidance. The Department will advise any affected manufacturer prior to taking this action.

5. For the life of the system, the owner of the system must have in place a preventative maintenance and monitoring contract with an Authorized Service Provider to ensure it is functioning properly and to optimize treatment performance. As part of this contract, the Authorized Service Provider must conduct a visual inspection of the internal components, including any treatment media, and maintain the complete treatment system. Upon expiration of a maintenance and monitoring contract, a new contract, which shall be at least one year in duration, shall be entered into by the property owner with an Authorized Service Provider. If the property owner fails to renew the maintenance and monitoring contract, written notification of such must be directed, by the Authorized Service Provider, to the local administrative authority.

C. Peat Biofilter Treatment System Description

Peat biofilter treatment units use sphagnum peat moss or peat fiber for removing and retaining contaminants until they are broken down. The partially treated septic tank effluent is dosed several times a day or conveyed by gravity to the peat module units. As the wastewater percolates through the peat medium, it is absorbed briefly where beneficial aerobic microorganisms degrade the waste constituents. Peat provides a large surface area as well as void space for air movement to put oxygen in contact with the thin films of wastewater moving over the peat medium. For final effluent disposal, the peat biofilter treatment system can employ an open-bottom design that is installed over a gravel bed, or a closed-bottom design that discharges to a conventional disposal area or drip dispersal.

D. Effluent Quality

Because of the significant reduction in biological oxygen demand and total suspended solids that occurs in a peat biofilter treatment system, the soil is relied upon more for dispersal capabilities rather than treatment of effluent. The reduced organic concentration in the treated effluent allows for a smaller sized dispersal system to be relied upon to accomplish hydraulic dispersal of the treated effluent.

E. Peat Biofilter Treatment System Design

1. All system designs must be signed and sealed by a New Jersey licensed professional engineer (N.J.P.E.). The N.J.P.E. must be trained and authorized by the manufacturer as an Authorized Designer to design peat biofilter treatment systems.

2. No peat biofilter treatment system shall be designed in a manner which does not meet the manufacturer's minimum recommendations.

3. If the estimated volume of sanitary sewage for the structure(s) served, as calculated using N.J.A.C. 7:9A-7.4, is greater than the manufacturer's specifications for maximum flow to the proposed peat biofilter treatment unit, the manufacturer's sizing criteria may be used for sizing the treatment unit only.

4. Peat biofilter treatment units may only be installed within saturated, subsurface conditions (including, but not limited to seasonal high water tables) if the treatment unit enclosure is a single piece unit and can be demonstrated to be water tight. All peat biofilter treatment units that will be located within a saturated soil condition must be designed in a manner that considers all structural issues including, but not limited to, buoyancy and structural effects on the treatment unit.

5. Any Authorized Designer that submits a peat biofilter treatment system design to any local administrative authority must notify the Department in writing or by email at CH199@dep.nj.gov within 24 hours of the submittal to the local administrative authority.

6. Treatment System Design Review

   a. Residential Systems: Prior to issuing a construction approval, the local administrative authority may require plans to be reviewed by the technology manufacturer or the manufacturer's authorized representative to determine consistency with manufacturer's minimum specifications and recommendations for achieving treatment.

   b. Commercial Systems: Prior to submitting the treatment system design for construction approval, the peat biofilter treatment system design shall be reviewed by the manufacturer. The manufacturer shall issue a letter to the designer indicating the design is consistent with manufacturer's minimum specifications and recommendations for achieving treatment.

7. All peat biofilter treatment systems may be equipped with a telemetry control panel which is attached to an internet based interface that provides continuous remote monitoring, information management and control of each individual aerobic treatment system. Sites that do not have a telemetry control panel must use an active phone line equipped with an auto dialer to notify the authorized service provider of alarm conditions, including if power to any of the system equipment is disconnected. The system should also include a control panel that tracks, at minimum, pump elapsed time, cycle counts and high level alarm counts or other means to determine flow through the system and other system information for troubleshooting purposes, as recommended by the manufacturer. This condition is not required for any system that contains no electrical components, such as a pump or a blower.

8. The peat biofilter treatment unit(s) must maintain the same setbacks as required for septic tanks at N.J.A.C. 7:9A-4.3.

9. In cases where setbacks to wells can not be increased to meet current requirements, the local administrative authority should consider ultraviolet disinfection on the well in addition to, or instead of, disinfection of the wastewater in accordance with G.8., below.

10. Alterations to systems which serve a structure containing a garbage grinder unit should require full compliance with N.J.A.C. 7:9A-1 et seq. When the use of a garbage grinder or grinding sewage ejector pump is required, the minimum liquid capacity of the septic tank should be at least 1500 gallons or meet the requirements of N.J.A.C. 7:9A-8.2(c), whichever is greater. The area required for disposal area sizing shall be increased by 50% prior to the application of any allowable reduction in disposal area.

11. Systems incorporating peat biofilters shall include an effluent filter in the design.

12. Open bottom dispersal designs shall incorporate inspection ports in each corner of the dispersal area to the level of infiltration. A deep inspection port to the depth of the full excavation may be incorporated into the design or required by the local administrative authority.

F. Dispersal Methods

Treated effluent from the peat biofilter treatment system shall be dispersed into the ground by any of the following methods:

1. Any New Jersey disposal field as allowed in N.J.A.C. 7:9A and sized according to those Standards or this guidance document.

2. Seepage pits as allowed by N.J.A.C. 7:9A.

3. Drip dispersal systems as outlined in the Department's Drip Dispersal Wastewater Disposal Systems Guidance Document.

4. Open bottom peat biofilter designs if allowed by the manufacturer. Open bottom disposal mechanisms may be allowed by a local administrative authority, at their discretion, without the use of a conventional disposal field. Sizing for these designs are provided in these guidelines. Care should be taken using open bottom disposal designs in native soils with permeability less than 2 inches per hour. When other limiting zones are present in these soils, the potential for breakout must be considered and evaluated in the design.

G. Dispersal System Siting & Sizing Criteria

1. Permeability testing to determine the size of a dispersal area should be completed in native soils. For soil replacement systems, design permeability shall be determined after delineating an adequate zone of disposal as required in N.J.A.C. 7:9A-10.1(e). When the permeability in the zone of disposal has been determined to be greater than 0.2 inches per hour using test options 1, 5 or 6 (Table 6.1, below) or test option 4 where the basin drains in three hours or less, the permeability of the fill material shall be used. When other tests are used and are not verified by test options 1, 5 or 6, the soil horizon of slowest permeability within the proposed adequate zone of disposal shall be used. If a passing basin flooding test takes three or more hours to drain after any filling, the design permeability range of 0.2-0.6 inches per hour shall be used.

2. The peat biofilter unit is an extension of the zone of treatment. An adequate zone of treatment must be accounted for in the design of all peat biofilter systems. In addition to the peat biofilter, an additional 18 inches, minimum, of suitable soil or select fill material, if necessary, shall be located beneath an open bottom or N.J.A.C. 7:9A disposal area design. This additional zone of treatment does not have to be continuous, but must be entirely above the seasonal high water table. Gravel material shall not be included in the zone of treatment.

3. A peat biofilter unit that is enclosed in a water tight vessel may be located within a seasonal high water table or other saturated soil condition if that unit is installed in accordance with the manufacturer's specifications for installation under those conditions. If the vessel is installed within a saturated soil condition, the vessel shall be tested for water tightness following the installation of that vessel. Water tightness testing shall be conducted in a manner that includes all risers and joints (i.e., top of the tank or highest seam in the riser), and shall be certified by a New Jersey Licensed Professional Engineer.

4. An acceptable zone of disposal, not including the gravel zone, should be demonstrated to be present in compliance with N.J.A.C. 7:9A-10. Gravel may not be used in lieu of select fill beneath the bottom of the zone of treatment. This condition shall not be applied to drip dispersal designs.

5. If a drip dispersal system is used, it shall be sized according to the appropriate guidance document.

6. For systems located in areas where the depth to the seasonal high water table will be present at a depth more shallow than 24 inches of the bottom of a dispersal system or where the existing, malfunctioning system infringes upon a horizontal setback to a well and the new system will not fully meet current setback requirements, ultraviolet (UV) disinfection of the wastewater may be required immediately prior to dispersal in the design of the system. However, additional filtration to reduce turbidity may also be required to allow for UV disinfection to work properly. It is the responsibility of the system designer to design and ensure the installation a UV disinfection system that is designed to achieve fecal coliform levels of 200 colonies per 100 ml or less, based upon anticipated effluent quality at the point of disinfection. Any disinfection equipment shall be covered by the same warranty, maintenance and inspection conditions specified in this document.

7. Conventional disposal beds and open bottom designs may be sized according to the following chart:

					Minimum Bed Size (sq.ft.)			
Soil Class	**Permeability (in/hr)**	**Percolation Rate (min/in)**	**Standard A/Q (sqft/gpd)**	**Adjusted A/Q (sqft/gpd)**	**350gpd/ 2BDRM**	**500gpd/ 3BDRM**	**650gpd/ 4BDRM**	**800gpd/ 5BDRM**
K4	6-20	3-15	1.61	1.233	432	617	802	987
K3	2-6	16-30	2.08	1.704	597	853	1,108	1,364
K2	0.6-2	31-45	2.56	2.190	767	1,095	1,424	1,752
K1	0.2-0.6	46-60	2.96	2.596	909	1,298	1,688	2,077
Pressure Dosing Design			1.33	0.956	400*	479	622	765

* The Department does not recommend sizing disposal beds at less than 400 sq.ft.

8. For the alteration of a malfunctioning system where native soil percolation rates are between 60 and 120 minutes per inch, a peat biofilter treatment system may be used in conjunction with a conventional disposal field if drip dispersal is not feasible, however the design engineer must provide a detailed analysis of the proposed disposal field to identify that the sizing criteria chosen is appropriate and adequate for the alteration.

H. Peat Biofilter Treatment System Installation

1. A preconstruction conference is highly recommended prior to beginning construction of the system and should be attended by the Authorized Designer of the system, the Authorized Installer, and the local administrative authority.

2. All peat biofilter treatment systems shall be installed according to directions provided in each peat biofilter manufacturer's installation manual and approved peat biofilter treatment system design.

3. All companies/personnel installing a peat biofilter treatment system shall be in possession of all necessary permits and licenses before attempting any portion of an installation.

4. Only an Authorized Installer shall install a peat biofilter treatment system.

5. The Authorized Installer must notify the Department at least one week prior to the installation of the peat biofilter units at CH199@dep.nj.gov and coordinate inspections with the Department in addition to any inspections required by the local administrative authority.

6. An Authorized Installer must be present at all times during peat biofilter treatment system installation. No work on a peat biofilter treatment system may be conducted unless under the direct supervision of an Authorized Installer.

7. Watertightness of any septic, processing and dispersal system dosing tanks specified in the design must be watertight tested at the installation site after being installed using hydrostatic or vacuum tests. Testing of the tanks shall include all upper portions of the tank, including riser joints. Testing must be done in accordance with the following:

   a. Water tightness testing procedures and criteria for concrete tanks shall follow the methods described in ASTM C-1227 standards or National Precast Concrete Association appropriate testing criteria and procedures

   b. Tanks made of materials other then concrete shall be tested, after installation, in accordance with the methods described in ASTM C-1227 standards, if applicable, or other hydrostatic or vacuum testing methods approved by the tank manufacturer.

   c. Water used for this testing shall be either from a potable water source or Reclaimed Water for Beneficial Reuse authorized by a NJPDES permit.

   d. The use of an onsite potable well for purposes of supplying water for this testing is not recommended. If an onsite potable well is to be used, pumping of the well must be done in a manner which will withdraw water at a rate less than 50% of the safe yield of that well and will not damage the pump or any other component of the well.

I. Peat Biofilter Treatment System Start-up

1. The Authorized Service Provider shall inspect the system following each installation. The Authorized Service Provider shall complete the System Start-up Checklist - contact the Manufacturer for a copy of the most recent edition of this checklist. The service provider shall provide the completed start-up checklist to the local administrative authority.

2. The Authorized Installer shall be present at the time of start-up.

J. Peat Biofilter Treatment System Operation, Maintenance & Monitoring

1. All peat biofilter treatment systems shall be maintained according to the peat biofilter manufacturer's Operation and Maintenance Manual by an Authorized Service Provider. An up to date copy of the manual must be made available upon request or on the manufacturer's website.

2. Peat biofilter treatment systems shall be inspected by an Authorized Service Provider on the following schedule, at a minimum:

a. Once within 30 days following system startup.
b. Twice per year for the first year of system operation (excluding a., above); twice per year thereafter.
c. For all systems, a meeting with a new operator of the system is recommended at the time of transfer of the property. The local administrative authority should be notified of this meeting and invited to participate.
d. Additionally, as required by the manufacturer.

3. At each regularly scheduled maintenance visit, as outlined in the Operation and Maintenance Manual, the Authorized Service Provider shall, at minimum, observe, monitor and record:
   a. Wastewater level in the tanks,
   b. Any effluent/pump filter for clogging,
   c. Clarity in NTU's
   d. Final effluent for odor
   e. All tanks for oily film
   f. All tanks for foam
   g. pH of final effluent
   h. Ponding of effluent around a peat biofilter treatment system or dispersal area
   i. For pump systems, all meter readings from the control panel.

4. At least once per year the Authorized Service Provider shall, at minimum:
   a. Measure sludge and scum levels in the septic tank and notify the homeowner if the tank is in need of pumping
   b. Check effluent filter for clogging and clean, as needed.

5. All peat biofilter treatment systems require an operation and maintenance contract to be in place with an Authorized Service Provider for the life of the system.

6. All sites shall be tracked using, a web based program used to track and update site and system information, manage contact information, manage maintenance activities, and generate reports.

7. Authorized Service Providers shall be trained and authorized by the manufacturer or the manufacturer's Authorized Dealer. An up to date list of Authorized Service Providers shall be made available upon request or on the manufacturer's website.

8. The operation and maintenance contract must be signed by the property owner and an Authorized Service Provider prior to issuance of the occupancy permit.

9. The Authorized Service Provider must have proper equipment and training to access and program any system control panel on site.

K. Training & Education

1. The manufacturer or authorized representative shall hold, at minimum, one training event annually for Designers, Service Providers, and Installers.

2. The manufacturer or authorized representative shall provide a written and dated authorization for Designers, Service Providers and Installers. This authorization shall be valid for one year for those who have completed the appropriate requirements.

3. A list of these authorized Designers, Service Providers, and Installers shall be kept up-to-date by the manufacturer and made available upon request or on the manufacturer's website.

4. The manufacturer shall hold free training when necessary for New Jersey regulators that covers the design, installation and service of a peat biofilter treatment system.

5. All Authorized Designers, Service Providers and Installers shall be required to receive annual, or more frequently as needed, refresher training as a requirement to continue to be authorized by the manufacturer. An updated system integrator authorization shall be provided after refresher training has been successfully attended.

L. Reporting

1. The manufacturer or authorized representative shall submit an annual report to NJ DEP by March 1st of each year containing the following information for the previous 12 months:
   a. Number of peat biofilter treatment systems installed
   b. The address of each installed peat biofilter treatment system, the owners name and address, the type of use (e.g. residential, commercial)
   c. Date when a peat biofilter treatment system was installed and started up
   d. Administrative authority and permit number
   e. Status of the maintenance and monitoring contract
   f. Number of inspection/maintenance calls conducted
   g. The inspection results recorded on a Department approved inspection form and/or checklist, copies of which shall be made available by the peat biofilter manufacturer. The forms must be completed by a peat biofilter treatment system service provider and submitted to the Department upon written request.
   h. General summary of the results for the year, all known problems or failures with a brief summary of the cause and remedial measures taken.
   i. Any recommended changes to the design, installation and/or operation and maintenance procedures and a schedule for implementing those changes.

2. Web access to online information regarding the systems may be considered by the local administrative authority as an alternative or in addition to paper reporting.

3. Failure of a client to renew a service agreement shall be reported to the Department and local administrative authority within 30 days by the Authorized Service Provider.

4. The manufacturer or authorized representative shall submit to the Department a summary of any changes made to their design, installation or service documents within seven (7) business days of those changes. Design, installation or service documents shall be submitted to the Department upon request.

M. Manufacturer Responsibilities

1. All sites shall be tracked by the manufacturer or their designated authorized representatives to update site and system information, manage contact information, manage maintenance activities, and generate reports.

2. All components of the peat biofilter treatment system supplied by the peat biofilter manufacturer shall be covered under a minimum five-year warranty. This warranty shall be fully transferable to assure the current

homeowner that any equipment failure will be covered as stipulated in that warranty during the warranty period. This is provided that operation and maintenance of the treatment system is done in conformance with manufacturer's requirements as stipulated in that warranty. Additionally, any component of the system which is specifically identified by the peat biofilter treatment unit manufacturer, by manufacturer and model, shall be reviewed by the peat biofilter treatment system manufacturer to ensure that the required component is covered by a minimum five year warranty from the applicable manufacturer. This warranty provision should not be applied to components that are reviewed for acceptability for use in the manufacturer's systems, but are not specifically required (e.g., a list of tank manufacturer's and their tanks sizes which are acceptable for use with a particular peat biofilter treatment system).

3. Provide the property owner with a copy of this guidance document, the operation, maintenance and monitoring agreement and obtain their written acknowledgement of the need to comply with the provisions of this document via signature prior to the sale of any peat biofilter treatment system.

4. Institute and maintain a training program for prospective designers, installers, and service providers in the proper design, installation, and servicing of their system.

5. Maintain up to date lists of manufacturer Authorized Designers, Authorized Installers and Authorized Service Providers that have passed the training program and make these lists available upon request or on the manufacturer's website.

6. Maintain an up-to-date website that contains the information necessary to obtain all applicable Design, Installation, Start-up, Operation and Maintenance or other required documentation.

7. Establish a process for investigating complaints and removing authorized personnel from authorized lists as appropriate.

8. Provide the Department or any local administrative authority with all training materials and the expected qualifications for the installer and service providers upon request. The Department should be notified of any training event at least two weeks prior to the event. No administrative authority shall approve a peat biofilter treatment system without receiving all training and materials that are requested from the manufacturer.

N. Property Owner Responsibilities

1. The local administrative authority may require the property owner to record with the deed to the property a notice that identifies the technology, acknowledges the owner’s responsibility to have in place at all times a maintenance and monitoring contract, and grants access to the property for the purpose of system monitoring, inspection and maintenance.

2. Have in place, at all times, an operation, maintenance and monitoring agreement with an Authorized Service Provider. Failure to maintain this agreement threatens and endangers human health and the environment by not providing an adequately operated and maintained system and shall constitute a public health nuisance violation and a violation of N.J.A.C. 7:9A-3.2 and/or 3.3(e), as applicable.

3. In accordance with applicable law, the Department and the local administrative authority may require the owner of the system to cease use of the system and/or to take any other actions as it deems necessary to protect public health, safety, welfare or the environment.

4. The peat biofilter treatment system may be approved for use in conjunction with the treatment and dispersal of sanitary sewage only. Non-sanitary sewage generated or used at the facility shall not be introduced into the system and shall be lawfully disposed of.

5. Provide any future purchaser of the property with a copy of this guidance, the operation, maintenance and monitoring agreement, any deed notices required by the local administrative authority for the property and obtain their approval via signature prior to entering into a contract of sale for the subject property.

O. Administrative Authority Responsibilities

1. The Department recommends that the local municipality in which the peat biofilter treatment system is proposed adopt a local ordinance authorizing the use of this technology. At a minimum, this ordinance should include monitoring and enforcement provisions to ensure that annual service agreements are maintained for the life of the system and appropriate fees to allow the local administrative authority to implement a tracking program. Establishment of a septic management program will be required for Treatment Works Approvals authorizing new construction or expansion applications using a peat biofilter treatment system.

2. Track, in database format, all approvals issued under this guidance. The information recorded shall include, at a minimum:

    a. municipal block and lot information,
    b. street address,
    c. date of installation,
    d. date of system start-up,
    e. type of dispersal area,
    f. the number of bedrooms at the facility, and
    g. the type of dispersal area and size in square feet and the reduction allowed for the dispersal system,
    h. the type of peat biofilter treatment systems used, and
    i. identification of a peat biofilter treatment system designer and installer.

3. Contact the Department directly with any questions regarding the application of a peat biofilter treatment system application which include variances from this guidance or to discuss issues not addressed by this guidance. In no instance should any other party seek alternative guidance for a site specific system from the Department until the local administrative authority has expressed its position directly to the Department.

4. Identify in the construction approval for this system that the New Jersey Department of Environmental Protection must be notified at least one week prior to the installation of any component of the proposed system and the anticipated date of installing the peat biofilter treatment unit(s).

5. Identify in the construction approval for this system that failure to operate and maintain the system in accordance with the requirements outlined in this document and failure to maintain an agreement with an authorized service provider threatens and endangers human health and the environment by not providing an adequately operated and maintained system and shall constitute a public health nuisance violation and a violation of N.J.A.C. 7:9A-3.2 and/or 3.3(e).

Appendix A: Definitions

Authorized Designer: A licensed New Jersey Professional Engineer who has completed all manufacturer training requirements, including annual refresher training, and has been identified as "authorized" by the Manufacturer to design peat biofilter treatment systems.

Authorized Installer: An individual person who has completed all manufacturer training requirements, including annual refresher training, and has been identified as "authorized" by the manufacturer to install peat biofilter treatment systems.

Authorized Service Provider: An individual person who has completed all manufacturer training requirements, including annual refresher training, and has been identified as "authorized" by the manufacturer to service peat biofilter treatment systems.

Authorized Dealer: Company(s) who has been "authorized" by the manufacturer to distribute peat biofilter treatment system components. Contact the manufacturer to obtain information on their authorized dealers.

Department: New Jersey Department of Environmental Protection

Disposal Field: defined by N.J.A.C. 7:9A-2.1

Drip Dispersal System: A drip dispersal wastewater disposal system with associated tanks, pumps, control panels, and piping that is designed, installed, operated and maintained in accordance with the Department's Drip Dispersal Wastewater Disposal System Guidance.

Manufacturer: Company who directly manufactures components of a peat biofilter treatment system and holds proprietary rights to a peat biofilter treatment unit. For the purposes of this document the applicable Manufacturer's are listed by the Department in a separate document available on the Department's website or by request at CH199@dep.nj.gov.

NTU: Nepholometric Turbidity Units. Measure of clarity

Peat biofilter treatment system: means a wastewater treatment device consisting of a peat biofilter treatment unit and associated pumps, piping and control panels which are part of an onsite wastewater treatment system.

System: An onsite wastewater treatment system regulated pursuant to N.J.A.C. 7:9A-1 et seq. For the purpose of this document the "System" is a peat biofilter treatment system with associated tanks, effluent distribution network, control panels and a disposal field or drip dispersal system.

APPENDIX C

List of Applicable Advanced Wastewater Pretreatment Device Manufacturers pursuant to N.J.A.C. 7:9A-8.3

Updated 11/02/2022

Applicable Manufacturers – Aerobic Treatment Unit (ATU)	Applicable System(s):
Aero-Stream, LLC W300 N7706 Christine Lane Hartland, WI 53029 Contact: Karl Holt, President Ph: 262-538-4000 Fx: 262-538-4093 www.aero-stream.com Email: kholt@aero-stream.com info@aero-stream.com	AS450-2, AS450-3 AS500-2, AS500-3 AS600-2, AS600-3 AS750-2. AS750-3 AS1000-2, AS1000-3 AS1500-2, AS1500-3
Aero-Tech 2900 Gary Drive Plymouth Indiana 46563 http://www.aerotech-atu.com Contact: Dan Papczynski Phone 574-935-0908 Email: dan_pap@embarqmail.com	AT500 AT600 AT750 AT1000 AT1500
Anua P.O. Box 77457 Greensboro, North Carolina 27417 https://www.anuainternational.com/ Contact: Colin Bishop, REHS, RS Director of Sales and Government Relations Phone: 800-787-2356 Fax: 336-547-8559 Email: info@anua-us.com	Puraflo® Peat Fiber Biofilter units PuraSys SBR

AquaKlear, Inc. 876 North Bierdeman Road Pearl, Mississippi 39208 http://www.aquaklear.net Contact: Grady Tucker, President/CEO Phone: 601-936-7711 Fax: 601-936-7723	AK6PT AK500 AK750 AK800 AK1000 AK1500
Aquapoint, An OBEH Company 39 Tarkiln Place P.O. Box 50549 New Bedford, Massachusetts 02745 http://www.aquapoint.com Contact: Mark Lubbers, Vice President of Sales Phone: 508-985-9050 x105 Email: sales@aquapoint.com	Bioclere Modified Trickling Filter
Bio-Microbics, Inc. 8450 Cole Parkway Shawnee, Kansas 66227 http://www.biomicrobics.com Phone: 800-753-FAST Email: sales@biomicrobics.com	MicroFast® & BioBarrier® systems
Busse Green Technologies, Inc. P.O. Box 1123 Oak Park, Illinois 60304 http://www.busse-gt.com Phone: 708-204-3504 info@busse-gt.com	BUSSE MF Type systems
Clarus Environmental 3649 Cane Run Road Louisville, Kentucky 40211 www.clarusenvironmental.com Phone: 877-244-9340 Fax: 877-414-4316	Fusion Series Wastewater Treatment System models: ZF-450, ZF-600, and ZF-800

Delta Environmental™ Pentair Water 8263 Florida Blvd. Denham Springs, Louisiana 70726 http://www.pentair.com Contact: Mike Catanzaro Telephone: 800-219-9183 Email: Mike.Catanzaro@pentair.com	Whitewater DF and Ecopod Series
Ecological Tanks, Inc. 2247 Highway 151 North Downsville, Louisiana 71234 Phone: 318-644-0397 http://www.etiaquasafe.com Contact: Calvin Locker, R.S., National Sales Director Telephone: 618-659-1367 Email: calvinlocker@sbcglobal.net	Aqua Safe aerobic treatment systems: AS500 series, AS 500L series and AS 600+4NR series Aqua Aire aerobic treatment systems: AA500 through AA1500 series, including AA500—35NR
Fluegeln, LLC/PekaSys, Inc. P.O. Box 3230 Philadelphia, Pennsylvania 19130 877-735-2797 Joshua N. Meyer josh@pekasys.com http://www.pekasys.com	Clear Rex Bubbler is now authorized by Anua as PuraSys SBR due to the partnership between the two companies.
F.R. Mahony & Associates, Inc. 273 Weymouth Street Rockland Massachusetts 02370 http://www.frmahony.com Contact: W. Keith Dobie, Sr., President Telephone: 781-982-9300 Email: info@frmahony.com	Amphidrome Fixed Film, Sequencing Batch Bio Filter
Fuji Clean USA, LLC 41-2 Greenwood Road Brunswick, Maine 04011 207-406-2927 Scott Samuelson scott@fujicleanusa.com http://www.fujicleanusa.com/	CE 5, 7 and 10 models and CEN 5, 7 and 10 models

Hoot Aerobic Systems, Inc. 2885 Highway 14 East Lake Charles, Louisiana 70607 http://www.hootsystems.com Contact: Mike Dunn, Mid Atlantic Regional Manager, Chalfont, Pennsylvania Phone: 267-221-9378 Mike@hootsystems.com	H-Series Aerobic Treatment Systems & ANR Series Denitrification Systems
Hydro Action Industries P.O. Box 640 Plymouth, Indiana 46563 http://www.hydro-action.com/ Contact: Steve Davis, Approvals Manager Phone: 800-370-3749 574-936-2542	AN-400, AN-500, AN-600, AN-800, AN-1100 AP-500, AP-600, AP-750, AP1000, AP-1500
Jet Incorporated 750 Alpha Drive Cleveland, Ohio 44143 http://www.jetincorp.com Contact: Trent Lydic Technical Manager Phone: 800-321-6960 Email: tlydic@jetincorp.com	Jet BAT® Media Treatment Systems
Norweco, Inc. 220 Republic Street Norwalk, Ohio http://www.norweco.com Phone: 419-668-4471 Email: email@norweco.com	Singulair® Systems Hydro-Kinetic model 600 FEU
Orenco Systems, Inc. 814 Airway Avenue Sutherlin, Oregon http://www.orenco.com Contact: Nick Noble, Government Relations Manager Phone: 877-371-3172 Email: nnoble@orenco.com	AdvanTex AX20N, AX20RTN and AX25RTN Treatment Systems

Premier Tech Aqua 1, avenue Premier Rivière-du-Loup (Québec) G5R 6C1 CANADA Phone: 418 867-8883 Fax: 418 862-6642 http://www.premiertechaqua.com Contact: Mike Kaub, Regional Supervisor Phone: 570-369-0583 kaum@premiertech.com	EcoFlo® Peat Filter models: ST-500; STB-500; STB-500B/BR ST-570P; STB-570P/PR ST-650; STB-650; STB-650B/BR; ST-650P; STB-650P/PR ST-730P; STB-730P/PR EcoFlo® Coco Filter Series Concrete, Fibreglass and Polyethylene models using a Gravity (G) or Pumped (P) Disposal mode. (No open bottom)
Quanics 6244 Old LaGrange Road P.O. Box 1520 Crestwood, Kentucky 40014 http://www.quanics.net Contact: Kevin Sherman, P.E., Ph.D. Phone: 1-877-782-6427 Email: Ksherman@quanics.net	AeroCell® and BioCOIR® Treatment Units
SeptiTech, LLC 69 Holland Street Lewiston, Maine 04240 http://www.septitech.com Contact: Scott Samuelson Phone: 207-333-6940 Email: info@septitech.com	SeptiTech advanced treatment systems

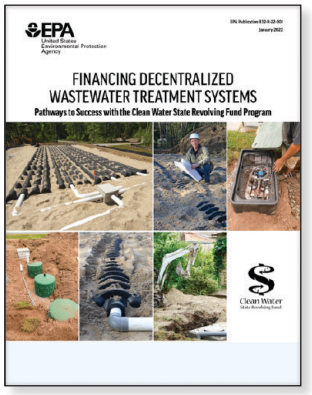
APPENDIX D

United States Environmental Protection Agency

Financing Decentralized Wastewater Treatment Systems

INTRODUCTION

Approximately one in five households in the United States rely on decentralized wastewater systems, such as single-family home septic systems or community cluster systems, for wastewater treatment and disposal. For communities relying on decentralized systems, costs to repair, replace, or install systems can be expensive, and these costs are often the homeowner's responsibility. EPA's *Financing Decentralized Wastewater Treatment Systems: Pathways to Success with the Clean Water State Revolving Fund Program* Guide helps community leaders, local and state decentralized wastewater treatment programs and state Clean Water State Revolving Fund (CWSRF) administrators understand how the CWSRF can be a viable source of financing for decentralized systems.



The Guide details (1) the CWSRF Program; (2) How to Use the CWSRF to Finance Decentralized System Projects; (3) Options for CWSRF Loan Repayment; and (4) Initiating a Financing Program for Decentralized Wastewater Systems with the CWSRF. This summary sheet highlights key content from these sections.

1 The CWSRF Program

EPA's CWSRF Program, administered individually by each state and Puerto Rico, provides low-cost financing for wastewater infrastructure and water quality projects, including decentralized wastewater system projects. The CWSRF functions like an environmental infrastructure bank, providing funding, primarily in the form of below-market interest rate loans to eligible borrowers. However, it is important to note that States are afforded extensive flexibility in administering their program, including defining project and applicant eligibilities, financing terms, and loan forgiveness options for qualified borrowers. Contact your state for details.

CWSRF Financing Fundamentals

Is my project eligible for CWSRF funding?

- Planning and design
- Construction
- CWSRF CANNOT pay for *operations and maintenance* (O&M)

Your state's CWSRF staff can help you understand what costs may/may not be included in a CWSRF loan.

What kinds of projects are eligible?

- New septic system installation
- Repair/replacement projects
- Converting cesspools to septics
- Cluster systems or community package plants
- Certain fees associated with setting up a special district or a Responsible Management Entity

Am I eligible to apply?

The CWSRF may lend to:

- Communities, municipalities, townships, counties, political subdivisions
- Individual homeowners
- Citizen groups
- Non-profit organizations
- Public utility computers

What terms are available?

Within statutory limits, state CWSRF programs have a great deal of flexibility to offer borrowers, including leeway with:

- Interest rate and repayment loans
- Limited amounts of loan forgiveness
- Sculpted repayment structures to accommodate borrower cash flows

Check with staff in your state about how a CWSRF loan can be customized to fit your needs.

2 How Can I Use the CWSRF to Finance My Decentralized System Project?

Federal statutes give states the ability to finance decentralized systems, but states determine whether and how to provide the financing. If a CWSRF program determines there is a need and demand for decentralized system financing, it will assess the best way(s) to offer financing. The table below highlights the most common mechanisms used by states for financing decentralized systems. As of 2020, only 11 states regularly use the CWSRF to finance decentralized wastewater projects. The Guide provides detailed information on each of these mechanisms, including case studies.

How Do CWSRF Decentralized System Financing Programs Work?

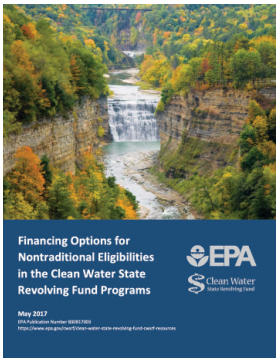
Lending Structure	How does it work?	Who is doing it?
Direct homeowner loan	The state CWSRF signs a loan directly with the property owner.	DE
Linked deposit loan	The borrower applies for funding at a participating bank. The CWSRF buys down the interest rate that the bank charges the borrower.	IA, MD, OH
Pass-through loan	The CWSRF makes a loan to a state or local government unit (agency, county, or special district), which uses the funds to make loans for decentralized projects. The government unit ensures repayment of the CWSRF loan.	CT, MA, MN, NJ, OH, PA, WV
CDFI pass-through	Same as above, but through a CDFI or other financial institution.	ID, OR, WA, WV
Sub-state revolving fund	The CWSRF makes a loan to the partner to capitalize another revolving fund. Returns on the sub-state revolving fund are used to repay the CWSRF and to make new loans.	MO, OH, RI, VA, WA
Sponsorship	A utility increases the size of its loan to sponsor a NPS project. In exchange, the CWSRF reduces the interest rate on the loan to cancel out the cost of the NPS project.	DE, IA, OH, OR all have sponsorship programs but they have not been used for decentralized projects
Co-funding	The CWSRF co-finances projects with another funding entity.	Every state does this, but may not have used this approach for financing decentralized projects.

3 Options for Loan Repayment

Federal statutes require that borrowers have a viable source of loan repayment. The three most common forms of repayment for decentralized system projects include:

- **Property Tax Assessment Financing (PTAF):** A commonly used tool to help avoid high upfront costs with decentralized system projects. This approach allows the homeowner to pay for the project through a long-term, fixed-cost financing option underwritten by the value of the property.
- **Septic Utility Fees:** A cluster system or group of households may collect fees to pay for O&M. This fee can be used as a potential repayment source for the installation, repair, or replacement costs of decentralized systems.

• **Homeowners Association Dues:** The CWSRF can make loans directly to homeowner's associations (HOAs), which are then repaid with revenues from HOA dues. Maryland has used this approach for several types of nonpoint source projects and could also include decentralized system projects.



In addition to these options, the *Financing Options for Non-Traditional Eligibilities in the CWSRF* report features a variety of additional potential repayment sources.

4 Initiating a Financing Program for Decentralized Wastewater Systems with the CWSRF

Stakeholders may approach a CWSRF with a decentralized system financing proposal if the CWSRF does not already offer decentralized financing or if a different mechanism than what is offered would be a better fit. The Guide provides a roadmap for how a decentralized system program can be successfully financed by the CWSRF.

1. **Identify the Problem and Technical Solution.** Issues are determined by public health, environmental, and economic impacts. Technical solutions include community engagement as well as consulting engineers/designers early in the process.
2. **Review CWSRF Financing Options.** These include eligibility, repayment, and types of financing mechanisms.
3. **Identify Potential Partners.** Partnering organizations must be eligible CWSRF participants.
4. **Meet with CWSRF Staff.** CWSRF program staff can discuss proposed projects and identify the best financing mechanism.
5. **Develop an O&M Plan.** These activities are not eligible expenses for CWSRF financing, yet property owners should be equipped with appropriate education and training tools.
6. **Communicate Potential Costs and Benefits.** Meet with community members to discuss the potential costs, benefits, timelines, and plans.
7. **Put Together a CWSRF Financing Proposal.** Identify the financing mechanism and tailor the CWSRF application to suit it.
8. **Sign Financing Agreements.** This arrangement is dependent on the type of financing mechanism selected.
9. **Implement Decentralized System Projects.** These can include construction, repair, and replacement of a septic system.

Finally, for a decentralized system financing program to thrive, communication to stakeholders about financing options available is critical. The Guide provides several outreach examples for reaching potential borrowers.

MORE INFORMATION

CWSRF State Program Contacts: www.epa.gov/cwsrf/state-cwsrf-program-contacts

Financing Decentralized Wastewater Treatment Systems: Pathways to Success with the Clean Water State Revolving Fund Program: www.epa.gov/system/files/documents/2022-02/financing-dwts.pdf

Financing Options for Nontraditional Eligibilities in the Clean Water State Revolving Fund Programs: epa.gov/cwsrf/financing-options-nontraditional-eligibilities-cwsrf

Document Number: EPA-832-F-22-013 | August 2022

Funding Decentralized Wastewater Treatment Systems with the Clean Water State Revolving Fund

The U.S. Environmental Protection Agency's (EPA) Clean Water State Revolving Fund (CWSRF) is a low interest source of funding for the installation, repair, and upgrading of decentralized wastewater treatment systems. Projects that may be eligible for CWSRF funding include:

- New system installation (single and cluster systems).
- Replacement, upgrade, or modification of inadequate or failing systems.
- Costs associated with the establishment of a centralized management entity (e.g., permitting and legal fees).
- Capital associated with management programs (e.g., trucks, storage buildings, spare parts)

HOW THE CWSRF WORKS

CWSRF programs in each state and Puerto Rico operate like banks. Federal and state contributions are used to capitalize the programs. These assets are used to make low- or no-interest loans for important water quality projects. Funds are then repaid to the CWSRFs over terms as long as 30 years and are recycled to fund other water quality and public health projects.

WHO MAY QUALIFY

The CWSRF may provide assistance to any public, private or non-profit entity for decentralized projects. Eligible loan recipients include community groups, farmers, homeowners, small businesses, conservation districts, and nonprofit organizations. Since the program is managed by the states, project funding and eligibility requirements vary according to the priorities, policies, and laws within each state.

GETTING A PROJECT FUNDED

The EPA encourages states to open their CWSRFs to the widest variety of eligible water quality and public health projects. Those interested in implementing or upgrading a decentralized treatment system should seek out their CWSRF program to determine whether their state CWSRF has the legal authority to make loans for decentralized projects, and participate in the annual process that determines which projects are funded. The list of CWSRF state programs can be found on our website at:

www.epa.gov/cwsrf

Here are some questions to ask the CWSRF in your state:

- Does the state have the legal authority to use its CWSRF for decentralized systems?
- Does the state CWSRF enabling legislation provide the legal authority to provide loans to an individual or private entity?
- Has the state committed to funding decentralized systems in its CWSRF Intended Use Plan (IUP)?
- If not, what can I do to help get these systems listed on the IUP?
- Can an individual or private entity receive a CWSRF loan for a decentralized system?
- If not, can I receive a CWSRF loan through a pass-through entity?

The CWSRF in your state will be able to guide you through the application process.

SOURCES OF LOAN REPAYMENT

Potential borrowers must identify a repayment source before a loan is approved. Though finding a source of repayment may prove challenging, it does not have to be burdensome. Many recipients demonstrate a high level of creativity in developing sources of repayment. The source of repayment need not come from the project itself.

Some potential repayment sources include:

- Property owner's ability to pay (determined during loan application)
- Fees paid by developers
- Recreational fees (fishing licenses, entrance fees)
- Dedicated portions of local, county, or state taxes or fees
- Donations or dues made to nonprofit groups
- Stormwater management fees
- Wastewater user charges

A CWSRF-funded decentralized wastewater treatment system in Lincoln County, West Virginia.

CLEAN WATER SUCCESS STORIES

Rhode Island

The Rhode Island Clean Water Finance Agency (CWFA) successfully developed innovative partnership programs and lending practices such as the Community Septic System Loan Program (CSSLP). To expand its borrower base, the Rhode Island CWFA crafted CSSLP in cooperation with the Rhode Island Department of Environmental Management and Rhode Island Housing. The CSSLP puts low interest SRF funds within reach of all communities and allows them to access the SRF to repair or replace septic systems when necessary. Thus far, the Rhode Island CWFA has made CSSLP loans totaling $2.95 million. Approximately 400 septic systems have been repaired or replaced to date, improving water quality in communities across the state.

Alabama

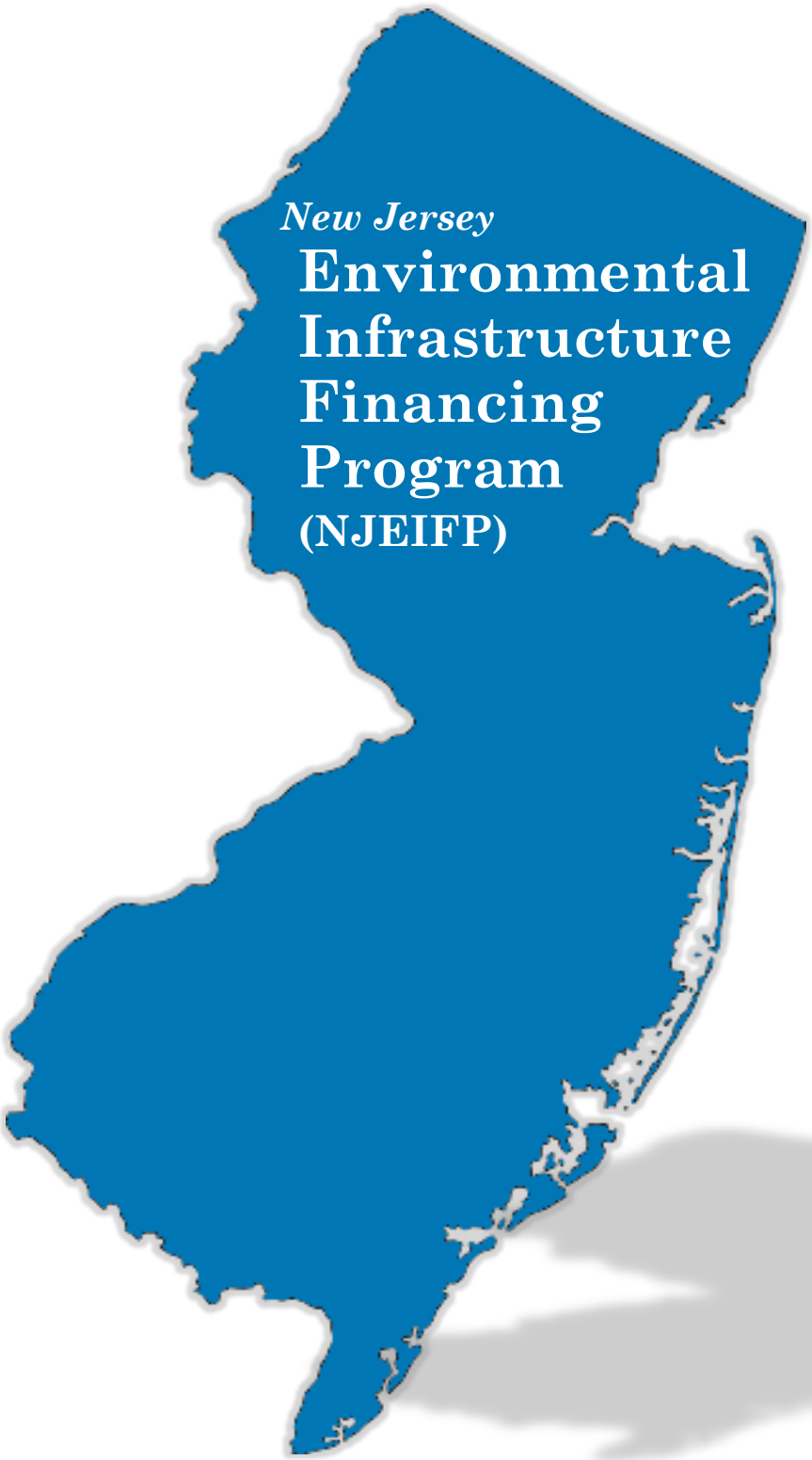
The Alabama Department of Environmental Management made $15 million in financial assistance available to the South Alabama Utilities using funds from the Clean Water State Revolving Fund (CWSRF) loan program. The proposed work is expected to cost about $1.25 million and will consist of the construction of decentralized wastewater treatment systems in three subdivisions: Colleton, Labrador Run, and Johnson Road. Proper use of decentralized treatment and disposal is a cost-effective, environmentally sound option for meeting public demand for sewer service and avoiding potential health concerns related to the use of septic tanks.

For more information about the CWSRF please contact us at:

United States Environmental Protection Agency
Clean Water State Revolving Fund Branch
Office of Water, Office of Wastewater Management
1200 Pennsylvania Avenue , NW (mail code 4204M)
Washington, DC 20460

EPA 832F16006
JUNE 2016
www.epa.gov/cwsrf

Funding Water Infrastructure for New Jersey



The Partnership:

New Jersey Department of Environmental Protection

New Jersey Environmental Infrastructure Trust

May 2017

About Us

The New Jersey Environmental Infrastructure Financing Program (NJEIFP) is a partnership between the New Jersey Department of Environmental Protection (NJDEP) and the New Jersey Environmental Infrastructure Trust (Trust) to provide low cost financing for the design, construction, and implementation of projects that help protect and improve water quality and help ensure safe and adequate drinking water.

The NJEIFP finances projects by utilizing two funding sources. The Trust borrows funds through the issuance of revenue bonds. The NJDEP administers a combination of Federal State Revolving Fund (SRF) capitalization grants, as well as the State's matching funds, loan repayments, State appropriations and interest earned on such funds.

Since its inception in 1988, the NJEIFP has funded 1,350 projects totaling $6.3 billion, provided an estimated $2.3 billion in interest cost savings to the State's taxpayers and ratepayers, and provided over 130,000 direct construction jobs.

Our Financial Assistance Programs

Small System Asset Management

The Small System Asset Management funding package is designed for small water and wastewater systems to affordably finance and develop asset management programs. Asset management is the categorization of system assets along with a financial plan that lays out the methods, scheduling and financing of the strategic upkeep and replacement of such assets.

Larger systems are eligible for the interest-free planning and design loans (see page 15).

Benefits and Terms

- Projects can receive:
  - 100% principal forgiveness

Applicants are limited to $100,000 per year.

Eligible Applicants

- Small drinking or clean water systems
- Municipalities or municipal utility authorities
- Regional water authorities or joint partnerships
- Qualifying local government units
- Public and privately-owned water systems
- Nonprofit non-community water systems
- Public community water systems owned by water commissions, water supply authorities, or water districts

Applicants must serve 10,000 or fewer people.

Eligible Projects

- Asset management program development

Estimated Project Savings: 100%

Asset management helps achieve needed repairs, replacements, maintenance and upgrades.

Additional information:

- NJDEP Asset Management Program (www.nj.gov/dep/assetmanagement/)
- NJDEP Asset Management Guidance and Best Practices (www.nj.gov/dep/assetmanagement/pdf/asset-management-plan-guidance.pdf)

Coastal Community Water Quality Restoration

The Coastal Community Water Quality Restoration funding package provides funding for projects that eliminate, prevent or reduce shellfish bed or beach closings due to the presence of pathogens. The package prioritizes projects that fix failing onsite wastewater systems and cross connections between sanitary sewer and storm sewers.

Benefits and Terms

- Projects can receive:
  - 50% principal forgiveness
  - 25% DEP interest-free loans
  - 25% NJEIT market rate financing

Applicants are limited to $5,000,000 per year. Allowable costs that exceed $5,000,000 can receive the Base Clean Water Funding Package (see page 12).

Financing is dependent on the availability of funds.

Eligible Applicants

- Municipalities or municipal utility authorities
- Counties or county utility authorities
- Regional water authorities or joint partnerships
- Qualifying local government units
- Private entities through public conduits

Eligible Projects

- Capital improvement projects
- Septic system rehabilitation
- Elimination of cross connections
- Projects that reduce shellfish bed or beach closings due to pathogens

Estimated Project Savings: 57%

Old Bridge Municipal Utilities Authority Laurence Harbor bulkhead and walkway funded through the NJEIFP

Additional information:

- Coastal Nonpoint Pollution Control Program (www.nj.gov/dep/cmp/czm_cnpp.html)
- Onsite Wastewater Management Program (www.nj.gov/dep/dwq/owmp_main.htm)

Green Infrastructure in Combined Sewer Overflow (CSO) Sewersheds

The Green Infrastructure in Combined Sewer Overflow (CSO) Sewershed funding package supports the utilization of green infrastructure practices to manage stormwater in CSO areas. Green infrastructure practices restore natural hydrology by infiltrating, evapotranspiring, harvesting, or otherwise managing stormwater. Effective use of green infrastructure is an important tool in a comprehensive approach to reducing the overflow of untreated wastewater from CSO outfalls.

Benefits and Terms

- Projects can receive:
  - 50% principal forgiveness
  - 25% DEP interest-free loans
  - 25% NJEIT market rate financing

The amount of applicants' allowable project cost per year is not limited.

Financing is dependent on the availability of funds.

Eligible Applicants

- Municipalities or municipal utility authorities
- Counties or county utility authorities
- Regional water authorities or joint partnerships
- Qualifying local government units
- Private entities through public conduits

All applicants must be in a CSO sewershed.

Additional information:

- Green Infrastructure in New Jersey (www.nj.gov/dep/gi/index.html)
- NJDEP CSO Basics (www.nj.gov/dep/dwq/cso-basics.htm)

Estimated Project Savings: 57%

Hoboken City green infrastructure funded through the NJEIFP

Eligible Projects

- Bioswales, rain gardens and green roofs
- Porous pavement, permeable pavers and porous concrete
- Urban parks incorporating green infrastructure practices
- Green streets and street tree pits
- Other green infrastructure practices

Flow Abatement in Combined Sewer Overflow (CSO) Sewersheds

The Flow Abatement in Combined Sewer Overflow (CSO) Sewersheds funding package confirms New Jersey's commitment to supporting communities affected by CSOs. Waste water constructions projects in CSO sewersheds that reduce or eliminate excessive infiltration/inflow or extraneous flows can receive principal forgiveness and interest-free financing.

Benefits and Terms

- Projects can receive:
  - 50% principal forgiveness
  - 25% DEP interest-free loans
  - 25% NJEIT market rate financing

Applicants are limited to $10,000,000 per year. Allowable costs exceeding $10,000,000 can receive the Base Clean Water Funding Package (see page 12).

Financing is dependent on the availability of funds.

Eligible Applicants

- Municipalities or municipal utility authorities
- Counties or county utility authorities
- Regional water authorities or joint partnerships
- Qualifying local government units
- Private entities through public conduits

All applicants must be in a CSO sewershed.

Additional information:

- NJDEP CSO Basics (www.nj.gov/dep/dwq/cso-basics.htm)

Estimated Project Savings: 57%

City of Paterson sewer system upgrade project

Eligible Projects

- Infiltration and inflow correction
- Sewer system rehabilitation
- Interceptors, pumping stations and force mains
- Treatment plant expansions
- Sewer separation
- Flood resiliency
- Wastewater reuse and conservation
- Other flow abatement projects

Barnegat Bay Loans

The Barnegat Bay funding package prioritizes and funds stormwater and non-point source pollution management projects in the Barnegat Bay Watershed. Stormwater runoff is the most common way that nonpoint source pollution reaches local rivers, creeks, and other waterways, including the Barnegat Bay. In Federal Fiscal Year 2017, a total of $6 million in principal forgiveness is committed for the Barnegat Bay Watershed.

Benefits and Terms

- Projects can receive:
  - 50% principal forgiveness
  - 25% DEP interest-free loans
  - 25% NJEIT market rate financing

Applicants are limited to $4,000,000 per year.

Eligible Applicants

- Municipalities or municipal utility authorities
- Counties or county utility authorities
- Regional water authorities or joint partnerships
- Qualifying local government units
- Private entities through public conduits

Eligible Projects

- Stormwater basin retrofits and retrofits to subsurface gravel wetlands
- Replacement of stormwater drainage collection systems and outfall reconstruction
- Underground stormwater detention and ground water recharge systems

Additional information:

- NJDEP Barnegat Bay – Stormwater Runoff (www.nj.gov/dep/barnegatbay/plan-stomrwaterrunoff.htm)

Estimated Project Savings: 57%

Eligible Projects (cont'd)

- Porous pavement, permeable pavers and porous concrete
- Extension of sanitary sewer service in communities with failing septic systems
- Street sweepers, vacuum trucks and vehicle wash facilities
- Other non-point source pollution management projects

Lead Service Line Replacement Loans

The Lead Service Line Replacement funding package significantly reduces public health risks by identifying and replacing lead service lines in the state's drinking water infrastructure. Cost effective principal forgiveness funds are available to replace lead pipes and lead components, including mains and service lines. In Federal Fiscal Year 2017, a total of $30 million in principal forgiveness is committed for lead service line replacement.

Benefits and Terms

- Projects can receive:
  - 90% principal forgiveness
  - 10% DEP interest-free loans

Applicants are limited to $1,000,000 per year.

Eligible Applicants

- Publicly owned and nonprofit non-community water systems
- Public community water systems owned by water commissions, water supply authorities, or water districts

Applicants must serve communities with a median household income (MHI) less than the MHI for the county in which they are located

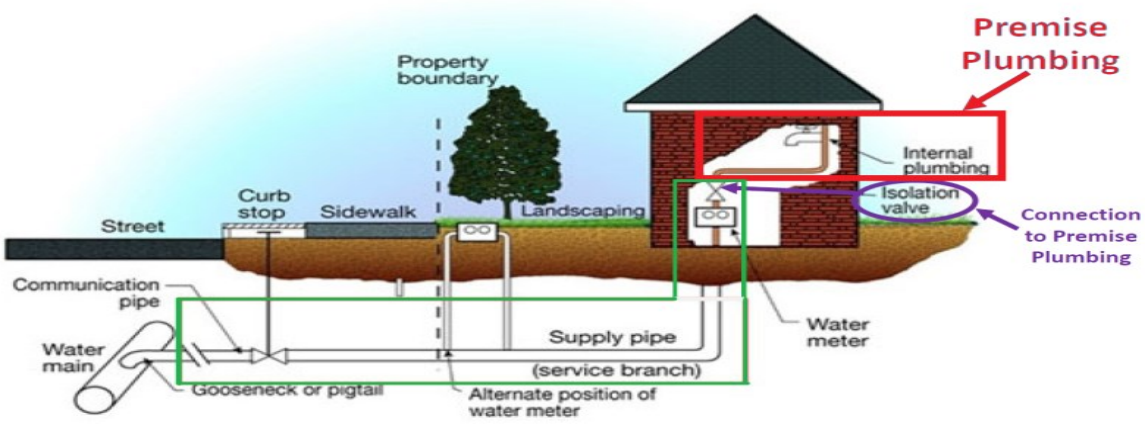
Estimated Project Savings: 93%

Eligible Projects

- Replacement of lead pipes and lead components, including mains and service lines
- Partial lead line replacements are not eligible

Additional information:

- NJDEP Lead in Drinking Water (www.nj.gov/dep/watersupply/dwc-lead.html)



Drinking water service line replacement up to the isolation valve is eligible

Nano Loans Program

The Nano Loans Program provides funding for small communities that prevent drinking water pollution. These projects are typically sponsored by smaller water companies that have limited financial and professional resources. In Federal Fiscal Year 2017, a total of $4 million in principal forgiveness is committed for this funding package.

Benefits and Terms

- Projects can receive:
  - 50% principal forgiveness
  - 25% DEP interest-free loans
  - 25% NJEIT market rate financing

Applicants are limited to $1,000,000 per year. Allowable costs exceeding $1,000,000 can receive the Base Drinking Water Funding Package (see page 13).

Eligible Applicants

- Small public and privately-owned water systems
- Small nonprofit non-community water systems
- Small public community water systems owned by water commissions, water supply authorities or water districts
- Larger water systems acquiring small water systems in the calendar year 2016 or later, and that make the associated capital improvements

Applicants must serve 10,000 persons or fewer.

Eligible Projects

- Drinking water projects that protect public health
- Transmission and distribution systems
- Treatment systems

Estimated Project Savings: 57%

Clayton Borough 750,000 gallon water tower funded through the NJEIFP

Eligible Projects (cont'd)

- Water tower construction and painting
- Test and production wells
- Maintaining compliance with existing regulations

Additional information:

- NJDEP Drinking Water Loan Program (http://www.nj.gov/dep/watersupply/dws_loans.html)

Small Water System Engineering Loans

NJDEP is partnering with the Community Engineering Corps to identify water systems that serve fewer than 500 persons and need assistance meeting compliance. In Federal Fiscal Year 2017, a total of $2.8 million in principal forgiveness is committed for improving treatment and distribution systems of small drinking water systems.

Benefits and Terms

- Projects can receive:
    - 100% principal forgiveness

Applicants are limited to $500,000 per year.

Eligible Applicants

- Small public and privately-owned water systems
- Small nonprofit non-community water systems
- Small public community water systems owned by water commissions, water supply authorities or water districts

Applicants must serve 500 persons or fewer.

Eligible Projects

- Drinking water projects that protect the public health
- Upgrades in order to comply with existing regulations
- Transmission and distribution systems
- Treatment systems
- Water tower construction and painting
- Test and production wells

Estimated Project Savings: 100%

Borough of Beach Haven pump station funded through the NJEIFP

Additional information:

- NJDEP Drinking Water Loan Program (www.nj.gov/dep/watersupply/dws_loans.html)

Base Clean Water Funding Package

The Base Clean Water Funding Package provides low-cost financing to New Jersey communities for a wide range of water quality infrastructure projects that include wastewater, stormwater and other pollution control projects. The package prioritizes projects that repair wastewater problems such as leaking pipes, inadequate capacity, deficient treatment, combined sewer overflows, failing septic systems, or sludge disposal problems.

Benefits and Terms

- Projects can receive:
  - 75% DEP interest-free loans
  - 25% NJEIT market rate financing

The amount of the applicant's allowable project cost per year is not limited.

Eligible Applicants

- Municipalities or municipal utility authorities
- Counties or county utility authorities
- Regional water authorities or joint partnerships
- Qualifying local government units
- Private entities through public conduits

Eligible Projects

- Wastewater treatment facilities
- Flood resiliency
- Infiltration and inflow correction
- Sewer system rehabilitation

Additional information:

- NJEIT Clean Water State Revolving Fund (www.njeit.org/clean-water/)
- NJDEP Clean Water State Revolving Fund (www.nj.gov/dep/grantandloanprograms/

Estimated Project Savings: 20%

Township of Middletown Sewerage Authority aeration basin funded through the NJEIFP

Eligible Projects (cont'd)

- Interceptors, pumping stations and force mains
- New collection systems
- Correction of combined sewer overflows
- Malfunctioning septic systems solutions
- Wastewater reuse and conservation
- Other clean water projects

Base Drinking Water Funding Package

The Base Drinking Water Funding Package assists publicly owned and privately owned community water systems and nonprofit, non-community water systems to finance the cost of the wastewater infrastructure.

Benefits and Terms

- Projects can receive:
  - 75% DEP interest-free loans
  - 25% NJEIT market rate financing

The amount of the applicant's allowable project cost per year is not limited.

Eligible Applicants

- Public and privately owned water systems
- Nonprofit non-community water systems
- Public community water systems owned by water commissions, water supply authorities or water districts

Eligible Projects

- Drinking water treatment facilities
- Conveyance lines
- Water tower construction and rehabilitation
- Drinking water well drilling
- Projects to maintain compliance with existing regulations
- Other drinking water projects

Estimated Project Savings: 20%

Berkeley Township Municipal Utilities Authority drilling of a drinking water well funded through the NJEIFP

Additional information:

- NJEIT Drinking Water State Revolving Fund (www.njeit.org/drinking-water/)
- NJDEP Drinking Water State Revolving Fund (www.nj.gov/dep/grantandloanprograms/lu_dwsrf.htm)

Brownfield Redevelopment Funding Package

The Brownfield Redevelopment Funding Package provides funding to support a wide range of cleanup and remediation activities necessary to restore brownfield sites for re-use. Returning brownfield sites to productive use protects and improves water quality and preserves open space. It also boosts local tax revenue, creates jobs, revitalizes New Jersey's cities and towns, and improves the quality of life for area residents. In Federal Fiscal Year 2017, a total of $60 million is committed for this funding package.

Benefits and Terms

- Projects can receive:
  - 50% DEP interest-free loans
  - 50% NJEIT market rate financing

Interest-free loans are limited, while NJEIT market rate financing is not.

Additional funding may be available through the Hazardous Discharge Site Remediation Fund (http://www.nj.gov/dep/srp/finance/hdsrf/).

Eligible Applicants

- Private entities through public conduits. Public conduit partners include:
  - Municipalities or municipal utility authorities
  - Counties or county utility authorities
  - Regional water authorities or joint partnerships
  - Qualifying local government units

Public entities can access additional savings for similar eligible projects via the Base Clean Water Funding Package (see page 12).

Estimated Project Savings: 13%

Eligible Projects

- Land acquisition and conservation
- Site remediation and contaminated site cleanups
- New Landfills (water quality/protection aspects)
- Well sealing activities
- Capping systems and liners
- Stormwater runoff controls
- Sewer connections
- Treatment systems
- Leachate collection systems
- Barge shelters and containment booms
- Other remediation activities

Additional information:

- Brownfield Development Area Initiative (www.nj.gov/dep/srp/brownfields/bda)
- NJDEP Site Remediation (www.nj.gov/dep/srp/)

Planning and Design Loans

Planning and Design Loans are interest-free loans provided for engineering and environmental planning costs incurred during the planning and design phase of a water infrastructure project. Projects to develop and implement asset management plans, CSO long-term control plans and water loss prevention plans are eligible for financing and may be eligible for principal forgiveness.

Benefits and Terms

- Projects can receive:
    - 100% DEP interest-free loans

Loans must roll into an NJEIFP capital improvement project or be repaid in 3 years.

CSO long term control plans can receive loans for up to 10 years.

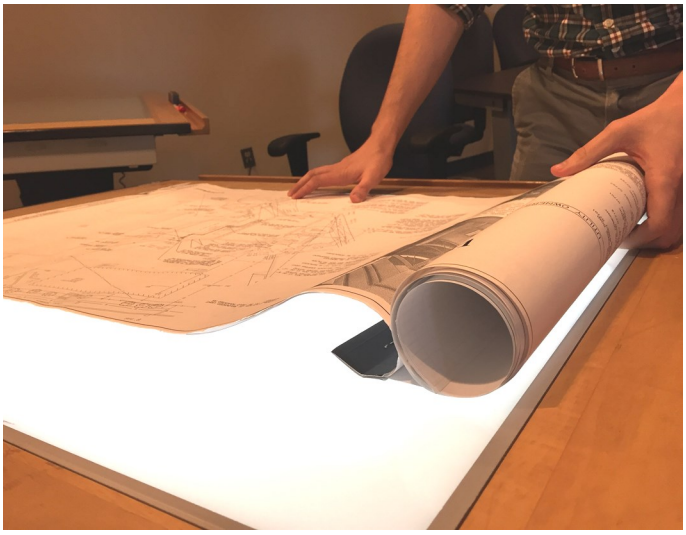
Eligible Applicants

- Municipalities or municipal utility authorities
- Counties or county utility authorities
- Regional water authorities or joint partnerships
- Qualifying local government units
- Private entities through public conduits

Eligible Projects

- Project plan preparation costs
- Engineering fees or surveys
- Environmental or geological studies
- Development of asset management plans
- CSO long-term control plans

Estimated Project Savings: 27%



New Jersey Department of Environmental Protection engineer reviews plans for well improvements

Additional information:

- NJDEP Asset Management Program (www.nj.gov/dep/assetmanagement/)
- NJDEP Asset Management Guidance and Best Practices (www.nj.gov/dep/assetmanagement/pdf/asset-management-plan-guidance.pdf)

Statewide Assistance Infrastructure Loan Program (SAIL)

The Statewide Assistance Infrastructure Loan (SAIL) program is a disaster relief loan program designed for project sponsors that anticipate receiving FEMA or other federal disaster relief grants. SAIL finances projects within a declared disaster area to rebuild water systems directly impacted by a declared disaster or improve resiliency of Clean Water and Drinking Water systems, without direct disaster impact. The program provides timely and cost effective funds in order to expedite support for impacted communities before they receive federal reimbursements.

Benefits and Terms

- Projects can receive:
  - 0-25% DEP interest-free loans
  - 75-100% NJEIT market rate financing

Loans must be repaid in 3 years.

Eligible Applicants

- Municipalities or municipal utility authorities
- Counties or county utility authorities
- Regional water authorities or joint partnerships
- Qualifying local government units
- Public and privately-owned water systems
- Nonprofit, non-community water systems
- Public community water systems owned by water commissions, water supply authorities and water districts

Applicants must be anticipating federal relief grant reimbursements (e.g. FEMA or HUD).

Eligible Projects

- Secondary and advanced wastewater treatment
- Well sealing
- Flood resiliency
- Treatment and storage facilities
- Interceptors, pumping stations and force mains
- Sewer system rehabilitation
- Transmission and distribution pipes
- Rehabilitated or developed sources that replace contaminated sources
- Projects to maintain compliance with existing regulations for contaminants with acute health effects and existing regulations for contaminants with chronic health effects
- Projects that address the exceedance of a recommended upper limit for secondary contaminants

Additional information:

- NJEIT State Wide Assistance Infrastructure Loan (SAIL) Program (www.njeit.org/disaster-relief)

How to Apply

Under the NJEIFP rolling application process, applications can be submitted year-round via the H20 loans portal.

To set up an H2LOans account, the project sponsor's Authorized Official should contact the NJEIT at 609-219-8601.

Once an account login and password have been created, the Authorized Official can access the Sponsor's H2LOans account using the login box at www.njeit.org or www.h2loans.com.

Upon login, the Authorized Official will be provided with additional information as to the designation of an Authorized Representative (who can create and submit applications) and Collaborators (who can contribute to document content).

Steps to Financing

Via H2LOans

1. Submit a Letter of Intent/Project Environmental Planning Document.
2. Submit a Project Loan Application, along with hardcopies of plans and specifications.
3. Upon approval from MFCE's Construction Section, the Project Sponsor will receive an Authorization to Award.
4. After a pre-construction conference and the issuance of a Notice to Proceed, construction will commence and the project will enter short-term financing.
5. Upon substantial completion of construction, the project will enter long-term financing.

Short-Term Loan Program

Short-term loans are available to fund construction of eligible infrastructure projects, provided that the projects have satisfied all NJEIFP requirements.

For State fiscal year 2017, all short-term construction loans are issued at a 0% interest rate for the duration of the construction period, not to exceed three fiscal years. Upon project completion, loans are rolled into NJEIFP long-term loans.

Additional short-term financing for engineering design and planning costs is available through the Planning and Design Loans (see page 15).

Disaster-impacted communities can apply for bridge loan financing projects to repair infrastructure and improve resiliency through the SAIL program (see page 16).

Program Requirements

All applicants must satisfy NJEIT, State of New Jersey and federal technical, administrative and environmental provisions as well as creditworthiness standards.

Unless otherwise noted, NJEIFP maximum loan terms are generally 30 years but cannot exceed the useful life of the facility.

Authorization to advertise and authorization to award will be provided to the project sponsor, upon approval from the NJDEP Municipal Finance and Construction Element (MFCE) and the Office of Equal Opportunity.

For further information regarding the regulations and policies of the NJEIFP go to: www.nj.gov/dep/dwq/722.htm.

Long Term Loan Program Overview

Loan Type	Max Term	Available Funds	Long Term at AAA Market Rate	Interest Free Loans	Principal Forgiveness (PFL)	Fees/Notes
Base Drinking and Clean Water	30 Years		25%	75%	0%	Fees: Standard DEP Fee[1]; Standard Trust Fee[2]; Standard COI Fee[3]
Barnegat Bay	30 Years		25%	25%	50%	Fees: Standard DEP and Trust Fee Notes: $2M PFL cap per applicant
Coastal Community Water Quality Restoration	30 Years	First $5M of Project Cost Above $5M of Project Cost	25% 25%	25% 75%	50% 0%	Fees: Standard DEP and Trust Fee Notes: $2.5M PFL cap per applicant
Brownfield Redevelopment	30 Years	First $50M of Project Cost Above $50M of Project Cost	50% 100%	50% up to $25M of Project Costs	0% 0%	Fees: Either Standard DEP fee or Borrowers responsible for payment of third party engineering costs; Standard Trust Fee Notes: $30M is reserved
Green Infrastructure in CSO Sewersheds	30 Years		25%	25%	50%	Fees: Standard DEP and Trust Fee Notes: No cap on PFL per applicant
Flow Abatement in CSO Sewersheds	30 Years	First $10M Above $10M	25% 0%	25% 100%	50% 0%	Fees: Standard DEP and Trust Fee Notes: $5M PFL per applicant
NANO (0-10,000 residents)	30 Years		25%	25%	50%	Fees: No DEP Fee; Standard Trust Fee; No COI Fee Notes: $500K PFL per applicant
Lead Service Line Replacment	30 Years		0%	10%	90%	Fees: Standard DEP and Trust Fee Notes: Available to communities with MHI less than county MHI; $1M total cap per applicant
Small System Asset Management	30 Years		0%	0%	100%	Notes: $100K PFL per applicant
Small Water System Engineering	30 Years		0%	0%	100%	Notes: $500K PFL per applicant
Supplemental (additional loans for projects already funded)	See Notes					Notes: Term equal to original loan; No PFL Fees: Standard DEP and Trust Fee

[1]Standard DEP Fee = 2% loan origination fee on total project costs.
[2]Standard Trust Fee = 0.30% annual fee on original Trust loan amount.
[3]Standard COI Fee = 0.10% on the Trust loan amount payable at time of long-term loan issuance.
50% of the standard DEP fee will be incurred and financed through the Trust at the short-term loan closing. This amount will be refinanced at long-term loan closing. The remaining balance shall be billable in the long-term loan repayment schedule.

Project Index

New Jersey

Environmental Infrastructure Financing Program (NJEIFP)

New Jersey Department of Environmental Protection

609-633-1170

www.nj.gov/dep/dwq/cwpl.htm

New Jersey Environmental Infrastructure Trust

609-633-1170

www.njeit.org

Rural Decentralized Water Systems Grant Program

What does this program do?

This program helps qualified nonprofits and tribes create a revolving loan fund to increase access to clean, reliable water and septic systems for households in eligible rural areas.

Who may apply for these grants?

Nonprofits that have:

- **Expertise and experience promoting the safe, productive use of individually-owned household water wells systems**
- **Legal authority to act as a lender**
- **Sufficient expertise and experience in lending activities**
- **Financial, technical, and managerial capacity to comply with relevant federal and state laws and regulations**

How may grant funds be used?

Grant funds may be used to help a nonprofit create a revolving loan fund for eligible individuals who own and occupy a home in an eligible rural area. The fund may be used to construct, refurbish, or service individually-owned household water well and septic systems. Terms for the loans include one percent fixed interest rate, 20-year maximum term, and an $15,000 maximum loan per household.

What is an eligible area?

- Rural areas and towns with populations of 50,000 or less – check eligible addresses
- Tribal lands in rural areas
- Colonias

Are matching funds required for the grant?

Yes. The nonprofit must contribute at least 10 percent. Matching funds may be from the nonprofit applicant or a third party and matching funds may not be in-kind.

How do we get started?

- Electronic applications are accepted through Grants.gov.
- Paper applications may be sent to Water Programs Division, Rural Utilities Service, Stop: 1570, Room 2234-S, 1400 Independence Avenue SW., Washington, DC 20250-1570.

Who can answer questions?

Contact your local RD office.

What governs this program?

- Code of Federal Regulations 7 CFR 1776
- Section 306E of the Consolidated Farm and Rural Development Act

Why does USDA Rural Development do this?

This program helps communities improve access to safe, reliable drinking water for households in rural areas. It also helps improve the sanitary conditions caused by inadequate septic systems.

NOTE: Because citations and other information may be subject to change, please always consult the program instructions listed in the section above titled "*What Governs This Program?*" You may also contact your local office for assistance. You will find additional forms, resources, and program information at www.rd.usda.gov. *USDA is an equal opportunity provider, employer, and lender.*

Last Updated September 2020

Rural Home Loans (Direct Program)

What does this program do?

Also known as the Section 502 Direct Loan Program, this program helps low- and very-low-income applicants buy decent, safe, and sanitary housing in eligible rural areas by providing payment assistance to increase their applicant's repayment ability. Payment assistance is a type of subsidy that reduces the mortgage payment for a short time. The amount of assistance is determined by the adjusted family income.

Who can apply for this program?

A number of factors are considered when determining eligibility for Single Family Direct Home Loans. At a minimum, applicants must have an adjusted income that is at or below the applicable low-income limit for the area in which they wish to buy a house (an income limit map is available at this link: https://go.usa.gov/xzcfb). They must also demonstrate a willingness and ability to repay debt.

Applicants must:

- Be without decent, safe, and sanitary housing
- Be unable to obtain a loan from other resources on terms and conditions that can reasonably be expected to be met
- Agree to occupy the property as their principal residence
- Have the legal capacity to incur a loan obligation
- Meet citizenship or eligible noncitizen requirements
- Not be suspended or debarred from participation in federal programs

Properties financed with direct loan funds must:

- Be modest in size for the area
- Not have market value in excess of the applicable area loan limit
- Not be designed for income-producing activities

Borrowers are required to repay all or a portion of the payment subsidy received over the life of the loan when the title to the property transfers, or the borrower is no longer living in the dwelling.

Applicants must meet income eligibility for a direct loan. You can visit the USDA Income and Property Eligibility website (available at this link: https://go.usa.gov/xzcdM) for complete details. Or, contact your local Rural Development office (a map is available at this link: https://www.rd.usda.gov/browse-state) to learn more.

What is an eligible area?

Properties must be located in an eligible rural area. Visit the USDA Income and Property Eligibility website (available at this link: https://go.usa.gov/xzcdM) for details.

How can funds be used?

Loan funds can be used to help low-income people or households buy homes in rural areas. Funds can be used to build, repair, renovate, or relocate a home, or to purchase and prepare sites, including providing water and waste treatment equipment.

How much can I borrow?

The maximum loan amount an applicant qualifies for depends on their ability to repay a loan. Rural Development considers various factors, such as income, debts, assets, and the amount of payment assistance the applicant is eligible to receive. Regardless of repayment ability, applicants can never borrow more than the area loan limit (plus certain other costs eligible to be financed) in the county in which the property is located (information is available at this link: https://go.usa.gov/xzcGB - PDF)

Rural Home Loans (Direct Program)

What is the interest rate and payback period?

- The interest rate is fixed, and based on current market rates at loan approval or closing, whichever is lower.
- When modified by payment assistance, the monthly mortgage payment can be reduced to a low as an effective 1 percent interest rate.
- The payback period is 33 years (38 years for very-low-income applicants who can't afford a 33-year loan term).

How much down payment is required?

Down payments are not typically required, but applicants with assets higher than the asset limit can be required to use a portion of those assets.

Is there a deadline to apply?

Applications are accepted year-round through your local Rural Development office. A map is available at this link: https://www.rd.usda.gov/browse-state.

How long does an application take?

Processing times vary depending on funding availability and program demand in the area in which the applicant is interested in buying. Processing times also are dependent upon the completeness of the applicant's package.

What governs this program?

- The Housing Act of 1949 as amended; 7 CFR, Part 3550 (available at this link: https://go.usa.gov/xzcvG)
- HB-1-3550 - Direct Single Family Housing Program Field Office Handbook (available at this link: https://go.usa.gov/xzcvM - PDF)

NOTE: Because citations and other information are subject to change, always consult the program instructions listed in the section above titled "*What Governs This Program?*" You can also contact your local office for assistance (a list is available at this link: https://go.usa.gov/xzjP7). You will find additional forms, resources, and program information at rd.usda.gov. *USDA is an equal opportunity provider, employer, and lender.*

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