MAP, PLAN, AND REPORT

FOR

THE TOWN OF JOHNSBURG

Warren County
New York

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1 EXECUTIVE SUMMARY

The Town of Johnsburg, located in northern Warren County is seeking to form a new sewer district to serve the Hamlet of North Creek, and surrounding area. The study area is a mix of densely developed residential/commercial areas, lower density residential areas, satellite commercial areas, and planned residential developments. Most of the proposed study area is served by the existing municipal water system. Wastewater in the study area is currently treated by individual septic systems of various treatment type, construction, age, and performance. Due to small lot sizes and other constraints, new replacement septic systems would not meet current design standards. Since the age and treatment ability of the individual systems are unknown, there is also the potential for environmental impact from the existing systems. North Creek was designated as a hamlet and it was intended to accommodate denser development with minimal impact to the natural resources. In order to appropriately accommodate dense development, the Town should have a wastewater treatment facility adequate to protect water quality.

Based upon an analysis of the existing conditions, response from Town Officials, and discussions with the Town of Johnsburg Sewer Committee, a single-phase plan with two locations is presented for the implementation of a comprehensive sewer district. This option was selected based on monetary and non-monetary factors and the potential for grant/loan opportunities and anticipated sewer fees.

Several alternatives were evaluated for the implementation of the collection and treatment system. Treatment options included a community subsurface disposal system, advanced fixed-film treatment units, a Sequencing Batch Reactor (SBR) system, and a force main connection to Gore Mountain. The advanced fixed-film process has been selected as the recommended alternative. The treatment system would be fed by a sanitary collection system with gravity collection and pump stations with force mains.

The proposed collection system would consist of 8" sewer mains, and residential connections. The gravity collection system would consist of approximately 7,000 linear feet of sewer main located along Main Street, Bridget Street, and Circle Ave. In addition to this gravity sewer main, there would be approximately eighty-three (83) lateral connections. Portions of the gravity collection system would discharge to three pump stations, located at the topographical low points of the system, which would pump through approximately 5,400 linear feet of force main.

As of writing of this report, the estimated construction cost for collection, treatment, and discharge is $7,902,598. The estimated O&M costs total $57,500 per year. This is likely a conservative estimate if two separate treatment systems are required; one behind the Town Hall and another unit on the south side of North Creek to serve the school and adjacent properties. If during technical design, it is determined to be feasible to convey all flow to a primary treatment system near the Town Hall, savings will be realized for both capital and O&M costs. For this report, the most conservative approach was used to ensure adequate funding can be secured.

2 PROJECT PLANNING

2.1 Purpose and Scope

In 2014, a grant was awarded by the New York Department of State to Warren County to investigate the potential for a centralized wastewater collection and treatment system for the Hamlet of North Creek. The existing Hamlet and surrounding area do not contain a centralized wastewater system; this lack of infrastructure has been noted as a potential source of pollution and a limitation for economic growth in the area. The following document outlines the initial planning, alternative screening, cost-estimation, and description, or selection of a centralized wastewater treatment system for the Hamlet of North Creek. Specific objectives of the following Engineering Report are: (1) determine the hydraulic and organic loading of the proposed sewer district, (2) screen potential locations for a centralized wastewater system, (3) select a treatment system for the sewer district, and (4) provide cost estimations for the collection system and treatment system based upon a preliminary design.

2.2 Location

The Hamlet of North Creek is in the northeastern portion of the Town of Johnsburg, Warren County, New York. The Hamlet is located between the Hudson River to the east and NY Route 28 to the west. (See Appendix A, Figure A-1). The Hamlet is in the southern Adirondack Park, northwest of the Lake George area. The Hamlet supports tourism, with winter activities centered around neighboring Gore Mountain Ski area. In addition, the Saratoga and North Creek Railroad (a heritage railway operating between North Creek and Saratoga Springs) brings visitors to the Hamlet year-round.

2.3 Environmental Resources Present

2.3.1 Topography

The Hamlet area contains mixed topography, with a general slope from west to east from NYS Route 28 to the Hudson River. Along the river there is a rapid grade transition to meet the water surface. The Hamlet contains some minor grade changes due to historic development and local topography. The most significant grade change is around the North Creek, which splits the Hamlet area. The topography of the site will require segmentation of the collection system and in-depth analysis to maximize the use of a gravity collection systems. It is likely that pumping of wastewater will be required as topography will not allow for draining to one area. The area topography is presented in Appendix A, Figure A-2. A proper topographical survey with one (1) foot contours is needed for the project area to ensure proper design of the collection system and treatment facility.

2.3.2 Geology

The area is in the Adirondack Park where bedrock and sand/gravel deposits dominate the local geology. In general, mountainous areas and areas with steeper slopes have shallow depths to bedrock. Alternatively, flatter areas and areas adjacent to existing rivers have sand or gravel deposits overlaying the bedrock formations. These sands and gravels are highly permeable and can have a significant depth to bedrock. Most of the Hamlet is located over sand and gravel deposits; however, there are isolated areas of exposed bedrock or large subsurface boulders.

Based upon observed geology, the wastewater system design will not be significantly impacted by the subsurface geology. However, borings along the proposed paths of the sanitary collection system and the proposed location of the wastewater treatment plant are needed to ensure depth to bedrock will not be an issue.

2.3.3 *Hydrology*

The area has significant underground water resources. Groundwater generally flows from surrounding mountain areas to the Hudson River through extensive sand and gravel deposits. Drinking water for the Hamlet and residences outside of the Hamlet is provided by wells located in these deposits. The local hydrology is critically important for water supply and should not be impacted by the proposed wastewater treatment system. Of special note are the existing water supply wells for the North Creek Water District as indicated in Appendix A, Figure A-2.

2.3.4 *Wetlands*

Wetlands information was taken from the United States Fish and Wildlife Service, New York State Department of Environmental Conservation, and Adirondack Park Agency. Several dispersed wetlands are present in the Hamlet area, with most of the wetlands adjacent to the North Creek and/or the Hudson River. A majority of the wetlands are Freshwater Forested/Shrub wetlands. The location of the wetlands is not anticipated to have a major impact on the design of the wastewater district or wastewater treatment area as few wetlands are located within the Hamlet area. Wetland maps are presented in Appendix A in Figures A-3A thru A-3C.

2.3.5 *Floodplains*

The Federal Emergency Management Administration (FEMA), Flood Insurance Rate Maps for the Town of Johnsburg shows the extent of the Hudson River and North Creek 100-year floodplains. The mapping indicates the 100-year floodplains are generally located adjacent to the Hudson River and North Creek, with minimal intrusion into the Hamlet area. The floodplains do limit the location of a wastewater disposal system to areas elevated above the nearby waterbodies. A map of the 100-year floodplains in the Hamlet area is shown in Appendix A, Figure A-4.

2.3.6 *Soils*

Soils in the Hamlet area are varied; however, the area is primarily composed of sandy soils with occasional areas of exposed ledge. The Town of Johnsburg owns and operates a parcel of land used as a highway garage and sandpit for the Hamlet area. Based upon observations at this site, soil mapping, and general topography of the area it is likely that most of the area is comprised of highly permeable sands. These highly permeable soils serve as a water source for the municipal water system for the Hamlet as discussed in section 2.3.3. A soils map of the Hamlet area is shown in Appendix A, Figure A-5.

2.3.7 *DEC Water Quality Classification*

The DEC water quality classification is shown in Appendix A, Figure A-6. The Hamlet area is located adjacent to the intersection of the Hudson River and the North Creek. The Hudson River is classified as C(T) for the section adjacent to the Hamlet area, and the North Creek is classified as a C(T) stream. These classifications require specific limits on the quantity and quality of wastewater discharged to nearby waterbodies if surface discharge is required.

2.3.8 *Natural Communities*

A map showing the presence of natural communities is presented in Appendix A, Figure A-7. The project area does not have any areas of significant natural communities; however, a portion of the project area is located within the boundary areas surrounding significant natural communities. The existing natural communities located adjacent to the Hudson River and other environmental areas may limit the possible wastewater system locations.

2.3.9 *Historic Resources*

The Hamlet area has several historically significant buildings and locations. A map of the historically significant components is shown in Appendix A, Figure A-8. Historic resources will not impact the type of wastewater system selected; although they may limit the final location. Should locations be identified for the wastewater system, historical surveys should be performed during the environmental review to determine presence or absence of historic sites. A list of historic resources in the Hamlet area is summarized in Table 2-1. It is not anticipated that historic buildings will limit the location of wastewater treatment facilities or the type of treatment used.

Table 2-1 - List of Historic Resources in Hamlet Area

USN	Name	Status
11306.00001	North Creek Railroad Station Complex - Railroad Pl	Listed
11306.00005	Owens House Gallery & Museum Store - 313 Main Street at Railroad Place	Undetermined
11306.00009	Motel - 1-story/14 tourist units - 264 Main St	Not Eligible
11306.00009	2-story commercial building - 272 Main St	Not Eligible
11306.00009	3-story commercial building - 274 Main St	Not Eligible
11306.00009	1-story commercial building - 302 Main St	Not Eligible
11306.0001	2-story/side-gabled residence - 41 NY 28 N	Not Eligible
11306.0001	Town of Johnsburg Library - 219 Main St	Not Eligible
11306.0001	Waddell house, frame residence - 52 NY 28N	Eligible
11306.0001	house - 1 Circle Ave	Eligible
11306.0001	house - 2 Circle Ave	Eligible
11306.0001	Owens House Gallery & Museum Shop - 312 Main St	Undetermined
11306.00011	St James Catholic Church - 239 Main Street	Undetermined
11306.00011	United Methodist Church - Main Street	Undetermined

2.3.10 *Tax Maps*

A map of the property parcels in the Hamlet area is shown in Appendix A, Figure A-9. The Hamlet area is primarily composed of small lots for single-family residences. Several of the existing parcels do not meet the separation distance requirements for new wastewater disposal systems. The small lot sizes would make the use of several decentralized wastewater treatment systems to serve the Hamlet area difficult. A centralized wastewater system would be best suited for treatment of the Hamlet area.

2.3.11 *Existing Zoning*

A map of the existing zoning is presented in Appendix A, Figure A-10. The Hamlet area is primarily zoned for business uses, residential uses, and public facilities. The project area spans several zoning districts in the Hamlet area. No zoning regulations were found to impact the location or treatment system type of a wastewater treatment system for the hamlet area.

2.3.12 Proposed Zoning

No proposed modifications to the existing zoning maps are known at the time of this report.

2.3.13 APA Land Use Classification

The Adirondack Park Agency designates a majority of the project area as Hamlet. Adjacent to the project area is a portion of Low-Intensity use areas. To simplify permitting requirements, the proposed wastewater treatment system should be located in an area zoned as Hamlet or in other zoning areas with less stringent controls. A map of the APA designated lands uses is presented in Appendix A, Figure A-11.

2.3.14 Regional Plans

The regional plans prepared by Warren County identify the Hamlet as an area of concentrated growth for the region. The Town of Johnsburg is part of the First Wilderness Heritage Corridor, a scenic corridor based around the Saratoga to North Creek Railway. The plans for the corridor call for the development of North Creek into a centralized tourism area as it is the end of the rail line. Regional plans indicate that the development of a centralized wastewater system will help facilitate growth in the area. North Creek was designated as a hamlet and it was intended to accommodate denser development with minimal impact to the natural resources. In order to appropriately accommodate dense development, the Town should have a wastewater treatment facility adequate to protect water quality. The centralized wastewater treatment system should not be sited in a tourism sensitive area, or create conditions (odors, increased traffic, visual impacts, etc.) that will impact tourism.

2.4 Population Trends

2.4.1 Population Data

North Creek is defined as an un-incorporated Hamlet within the Town of Johnsburg. The Hamlet is primarily residential and has several small to moderately sized businesses and restaurants but does not have any major industrial centers. The Hamlet area is currently served by a municipal water system.

As of the 2010 Census, there are 616 permanent residents living in the Hamlet. The permanent population is supplemented by seasonal visitors, who participate in both winter and summer recreation.

Based upon trends, the permanent population is relatively stable; however, the population is supplemented by seasonal visitors. Investment by the Town, private individuals and the State of New York has increased tourism in the area over the past ten years. Additional investment is anticipated in the future, and the development of a centralized wastewater system is likely to increase investment in the area by removing barriers to development. The growth to seasonal tourism is difficult to document and predict; however, it is reasonable to assume that population will increase in the area over time.

2.4.2 Concentrated Growth Areas

Redevelopment in the Hamlet area has increased with several new businesses supplementing the existing local businesses. Major institutions in the Hamlet area include the Johnsburg School, Town Hall, a supermarket, hotels, shopping areas, a laundry, and restaurants. It is anticipated that this growth will continue within the Hamlet area.

In addition to the Hamlet area there are two other areas of anticipated growth: Gore Mountain Ski Resort and the existing Front Street Development. Gore Mountain Ski Resort, owned and operated by the Olympic Regional Development Authority (ORDA), is primarily a day-use ski center during its six-month snow ski season. During that season, the mountain experiences its highest wastewater flows. ORDA is actively promoting increased off-season events at Gore Mountain. The Front Street Development provides slope-side residential facilities and anticipates a full-service complex in the future.

2.5 Community Engagement

This proposed wastewater system report was developed with a grant from the NYS Department of State through the First Wilderness Heritage Corridor. As part of the grant funding public meetings were held to discuss the planned area. Prior to the public meetings a Wastewater Advisory committee was developed. The committee was selected by the Town of Johnsburg and includes members of the business and residential communities. The committee has given guidance on the sewer district boundaries, siting of the treatment facilities, and potential areas of interest from the community.

3 EXISTING FACILITIES

3.1 Existing Facilities

The existing area is served by individual on-site wastewater treatment and disposal system. Most systems are simple septic tanks connected to an absorption bed or seepage pit. In addition to these individual systems there are two main treatment facilities in the area. One serves the Gore Mountain Ski Resort and the second serves a portion of the existing Front Street Development.

3.2 History

To date no major wastewater systems have been proposed or constructed to serve the Hamlet area. A history of the existing wastewater systems serving the concentrated growth areas adjacent to the Hamlet area are included in the following section.

3.3 Condition of the Existing Facilities

Gore Mountain

The wastewater treatment systems for Gore Mountain Ski Facility was most recently updated in 1991. The existing plant consists of two treatment processes, a Sequencing Batch Reactor (SBR) system for the summer months, and an Orbital Treatment System for the winter months when flows are higher. In addition to the two biological processes the plant has an effluent polishing filter and a sludge holding and digestion tank. The facility discharges under SPDES Permit No. 0034339. The plant has a maximum permit flow of 65,000 GPD. At the time of this report there were no major known violations and the plant is reported to be performing well.

Front Street Development

The wastewater treatment system for Front Street Development was commissioned in 2011. The site is planned to be developed into a mixed residential and recreational area adjacent to the North Creek Ski Bowl. Wastewater treatment is provided by a fixed-film Orenco treatment system. facility has permitted capacity of 12,000 GPD and operates under the SPDES permit No. NY0265870.

Individual Wastewater Systems

Several of the existing residences and businesses located in the Hamlet area are served by individual wastewater systems that consists of septic tanks and leach fields. These systems are assumed to be in varying levels of compliance. Several systems are located on lots where required separation distances are not possible and the physical and operational integrity is unknown. The main concern with these existing systems is the potential impact on water quality in the area.

3.4 Financial Status of the Existing Facilities

The existing wastewater system at Gore is financed by ORDA. The Front Street Development wastewater treatment facilities are owned by Mountain Sewer Company. Individual wastewater systems are owned and operated by residential users. Financial data for the two centralized systems is not available.

4 NEED FOR PROJECT

Although the Hamlet area and other locations have been developed without a centralized system, current standards for wastewater design have limited further development in the Hamlet. Small lot sizes and limited soil permeability have precluded several lots from changing or expanding due to limited wastewater treatment capacity. The development of a centralized wastewater system will help facilitate growth in the area. North Creek was designated as a hamlet and it was intended to accommodate denser development with minimal impact to the natural resources. In order to appropriately accommodate dense development, the Town should have a wastewater treatment facility adequate to protect water quality. Investment into the community has been limited due to the inability to handle increased wastewater flows.

It is anticipated that a centralized wastewater system will reduce the barriers to development in the community. In addition to reducing barriers for future investment in the community, the establishment of a centralized wastewater system would help residents with sub-standard wastewater systems and reduce the potential for an impact to the water quality in the area.

4.1 Health, Sanitation, and Security

At the time of this report there are no documented health issues related to existing wastewater systems. However, several facilities discharge wastewater to septic tanks and disposal fields that were designed under previous design standards. Several of these systems do not meet the existing requirements for setback distances, septic tank sizing, and/or application rates. These systems have the potential to discharge untreated wastewater to the environment where health related issues may occur. There have also been circumstances where existing businesses have been denied expansion of the number of seats because there isn't enough land to install a new wastewater system.

4.2 Aging Infrastructure

The individual wastewater systems serving the Hamlet area are of various ages and conditions. As stated previously, the existing parcels do not have sufficient space for conventional wastewater treatment and disposal systems. It is likely that several of the wastewater system will require replacement within the next five to ten years. Replacement costs for these systems are anticipated to be significant and limit further development in the Hamlet due to small parcel size. In addition, the effluent from these systems can enter the groundwater and ultimately negatively impact the local water supply or the Hudson River.

4.3 Reasonable Growth

The limitations on new wastewater systems have been noted as a limiting factor to new development in the Hamlet. The development of a centralized wastewater system will help facilitate growth in the area. North Creek was designated as a hamlet and it was intended to accommodate denser development with minimal impact to the natural resources. In order to appropriately accommodate dense development, the Town should have a wastewater treatment facility adequate to protect water quality.

5 SEWER DISTRICT DELINEATION

The proposed sewer district in the Town of Johnsburg for the Hamlet of North Creek is shown in the map included as Figure A-12 in Appendix A. No sewer district had been established for the area previously. The proposed sewer district was delineated based upon guidance from the Sewer Committee, local topography, and potential need for wastewater service. The sewer district includes the Hamlet area, the Ski Bowl, the Town of Johnsburg School, Front Street Development, and commercial/residential areas along Route 28.

6 DESIGN CRITERIA

6.1 Flow Data and Wastewater Characteristics

Based upon the size of the proposed sewer district flows can be determined for the design of a wastewater treatment system. The proposed district includes 48 residential properties and all the commercial district. This information is shown on the Warren County GIS Map of the proposed district included as Appendix A – Figure A-12. For the following section the design flows shall be considered Permit Flows (Maximum flow averaged over a 30-day period).

A previously completed feasibility study had determined that the design flow for the proposed sewer district would be approximately 72,000 gallons per day (GPD). This includes a mix of residential, commercial properties and the flow contribution from the school.

Table 6-1 - Proposed Flows (Contributions North of North Creek, Main Commercial Area)

Flow Condition	Estimated Flow (GPD)
Average Day (ADF)	40,000
Permit Flow, Max Monthly (MMF)	**60,000**
Peak Daily Flow (PDF)	80,000
Peak Hourly Flow (PHF)	160,000

Table 6-2 - Proposed Flows (Contributions South of North Creek, Johnsburg School Area)

Flow Condition	Estimated Flow (GPD)
Average Day (ADF)	8,000
Permit Flow, Max Monthly (MMF)	**12,000**
Peak Daily Flow (PDF)	16,000
Peak Hourly Flow (PHF)	36,000

For the design of a wastewater treatment system typical contaminant characteristics are required. Values for BOD, TSS, Ammonia and Phosphorus loading are included in **Error! Reference source not found.**3 below.

Table 6-3 - Typical Wastewater Characteristics

Parameter	Typical Value
Five-Day Biochemical Oxygen Demand (BOD_5)	250 mg/L
Total Suspended Solids (TSS)	250 mg/L
Ammonia (NH_3)	35 mg/L
Total Phosphorus (TP)	8 mg/L

6.2 Location Selection Criteria

No centralized wastewater system serves the Hamlet area; therefore, an appropriate location must be selected. The following selection criteria were reviewed by the Sewer Committee and used to determine the potential location for a wastewater treatment facility. Please note that the locations of the existing wastewater treatment facilities for Gore Mountain Ski Facility and Front Street Development were also evaluated.

6.2.1 Proximity to Sewer District

The primary selection criteria were the proximity of the location to the proposed sewer district and areas of concentrated growth. Priority was given to parcels located within or adjacent to the proposed sewer district. Secondary priority was given to locating the wastewater system in relation to the areas of concentrated development. Locating a wastewater treatment system close to these areas will reduce the cost of a wastewater collection system.

6.2.2 Topography

Location selection was also based upon local topography. To reduce the costs of a collection system, the proposed wastewater system should be in an area where wastewater generated from the proposed sewer district will drain by gravity. In lieu of draining by gravity, the sewer district should be served by a minimal number of pumping stations to convey wastewater to a treatment area. Lower topography areas generally located near the North Creek and Hudson Rivers were given priority as they would be better suited to gravity drainage.

6.2.3 Property Ownership

Parcels currently owned by the Town of Johnsburg or Warren County were given a higher ranking as no land purchase would be required. If a location was found to be suitable, the ability to purchase the land was considered.

6.2.4 Adequate Space

Locations were evaluated to determine if the selected site contained sufficient space for the wastewater systems considered. For planning purposes, a size of two acres was used to evaluate if a location had sufficient space for a full buildout of a conventional wastewater system along with all associated equipment. Space was evaluated based upon the presence of flat areas and lack of limits to construction.

6.2.5 Access for Construction and Maintenance

Parcels with easy access to a major roadway were given priority. Any proposed wastewater treatment system will require significant construction and road access will reduce land development costs. For the location evaluation priority was given to major State and County Routes that can handle large construction vehicles. Locations adjacent to residential developments were discouraged as the construction would negatively impact residents.

6.2.6 Construction Issues

Locations were evaluated to determine if there would be any major barriers to construction. Constructability evaluations were based upon desktop analysis of existing conditions and limited site inspections. Barriers to construction included the presence of shallow bedrock, wetlands, significant natural communities, historic resources, and location relative to floodplains. Priority was given to areas without major construction issues.

6.2.7 Regulatory Issues

Parcels with limited barriers to development due to regulatory controls should be given priority. Regulatory barriers can include permitting required to modify zoning requirements, obtaining approval from State of New York regulatory agencies, and approval of the Adirondack Park Agency.

6.2.8 Scenic and Tourism Impacts

The selected location should not have an impact to the scenic resources of the area or negatively impact the seasonal tourism. Locations with barriers to visibility or impact on both scenic and tourism resources were preferred over other locations.

6.3 Location Options

Based upon these criteria five locations were identified in a preliminary analysis. A summary of the locations evaluated is included below.

Town Hall Parcel (Tax Map 66.-10-2-41) – This is the parcel owned by the Town of Johnsburg and is currently utilized for the Town Hall and parking area. This location is in the main sewer district and centrally located between the two areas of concentrated development. This area is located down gradient of most of the sub-areas. Enough access to the site is provided from Route 28. The site is currently disturbed and is not anticipated to have major construction issues. The site is currently is a Town-designated park area and would require additional actions to be used as something other than a park.

Parcel Adjacent to Train Station (Tax Map 66.5-1-1) – This parcel is located at the northern end of the proposed sewer district and is adjacent to the Front Street Development concentrated growth area. Based upon local topography it is likely that Sub-Area 2 can drain to the area by gravity; however, some pumping may be required to bring the hydraulic profile to grade. The property is not owned by the Town of Johnsburg; therefore, the location would have to be purchased from the current owner. Preliminary evaluations indicate the site has enough space for a wastewater treatment facility and there appear to be no major barriers to construction. Vehicle access to the site can be provided from Main Street and Ski Bowl Road. The site is located within the APA designated Hamlet area and is listed as commercially zoned, indicating there may be some minor permitting issues with the site. The Hudson River and a small tributary stream border the property, although, no impacts to the environment are anticipated for this location. The Saratoga and North Creek Railway's northern station and the Copperfield Inn neighbor the property; visual barriers will be required to mitigate potential visual impacts to nearby properties.

Location along Peaceful Valley Road (Various Parcel Locations) – Several areas adjacent to Peaceful Valley Road were also evaluated. The sites evaluated were located distant from the sewer district; however, the location is centrally located between the Gore Mountain concentrated growth area and sewer district. This placement may reduce barriers to creating a centralized wastewater system serving both Gore Mountain and the sewer district. This location is at an elevation higher than most of the sewer district, requiring pump stations and force mains. Several suitable locations are available, and ownership ranges from private, to properties owned by the State of New York through ORDA and the Gore Mountain Ski Facility. An agreement between the Town and ORDA would be required to utilize this location. The site has enough space for the alternatives considered and construction access from Peaceful Valley Road. Existing forested areas and little flat areas will require site development including clearing of trees and grading for construction. The site is in the Gore Mountain Ski Facility lands and is designated for intensive use by the APA; therefore, the construction of a wastewater treatment system should be permissible. Adequate space is present to construct a new facility and provide screening from the road to limit visual impact.

Location near Landfill (Tax Map 66.-1-14) – The Town currently owns a large parcel (currently used as a transfer station and recreational paths) adjacent to the existing Ski Bowl. The location is southwest and upslope of the Town Highway Parcel previously presented and is slightly more distant from the proposed sewer district. Due to the relatively high elevation of this location, pumping will be required to convey wastewater to the treatment location. The site has limited space, and there are indications of exposed ledge at the site. A preliminary analysis should be conducted to determine sub-surface conditions at the site and potential for major barriers to construction. The land is currently used for municipal work and should not require major permitting changes to allow for the construction of a wastewater system. The site is located adjacent to the Ski Bowl recreational paths, the ski trails, and upslope of the Grunblatt Memorial Beach; therefore, additional analysis will be required to evaluate the impacts to scenic and recreational resources. The site is also a Town-designated park.

Based upon the observed locations the ***Town Hall Parcel*** was selected as the recommended location for the new wastewater treatment facilities. This location was preferred as the site is located downslope from most areas of the district and has adequate space and there are limited barriers to development at the site and the site is owned by the Town.

7 ALTERNATIVES ANALYSIS

The following section outlines the options evaluated for the wastewater design. Four treatment options were selected for evaluation and are listed below. Due to the various options available, only treatment options are considered in this section with collection systems discussed in Section 8. **Costs associated with collection and pump stations will be determined in the final design cost estimation.**

7.1 No-Action Alternative

The no-action alternative was initially reviewed but ruled out since it doesn't address any of the issues described in Section 4 which outlines the need for the project. Doing nothing will allow all issues that limit investment in the community to continue and may cause future health related issues due to future septic system failures and small lot sizes.

7.2 Option 1 – Conventional Sub-surface treatment and Disposal System

Option 1 would involve the construction of a traditional sub-surface treatment and disposal system. Wastewater would be collected and pumped to one central location where treatment would be provided by a single large septic tank and several absorption beds. Treated wastewater would be discharged to the soil. The following sections outline an analysis of this option.

7.2.1 Process Sizing

Three items would require sizing for this option; the septic tank, pumping station, and absorption area. Sizing for these systems is performed in accordance with the guidance from the New York State Design Standards for Intermediate Sized Wastewater Treatment Systems.

Septic tank size was determined based upon DEC design guidance for the requirement of holding tank volume equal to the daily average flow rate. For Phase I design the septic tank was sized to have a capacity of 80,000 gallons. A wastewater pumping station located adjacent to the septic tank would be sized to hold one-third of the daily flow, or approximately 27,000 gallons. For a pump station of this size, two pumps need to be present for redundancy.

The absorption field for this option would be sized based on soil conditions and applicable loading rates as stated in the design guidance. The soil conditions at the selected location (and most other alternative locations) are listed as very permeable. Due to the size of the system and the need for treatment of additional parameters in the wastewater (nitrogen compounds and phosphorus) a lower percolation rate is desired. Assuming soil amendments to achieve a percolation rate of 6-7 minutes per inch the soil can treat 1.0 gallons per square foot per day. For absorption beds the application rate is reduced by 75 percent to accommodate the limited reaeration capacity, resulting in an application rate of 0.75 gallons per square foot per day. With a wastewater loading of 80,000 gallons per day the required disposal area is 106,000 square feet. This total disposal area would be served by absorption beds 15 feet in width and 200 feet in length. Each absorption bed would provide 3,000 square feet of treatment area; with a total of 36 absorption beds required to treat the design flow. A 100 percent reserve area would also be required pursuant to regulatory mandates.

7.2.2 *Environmental Impacts*

The proposed treatment system for option 1 is anticipated to have minimal impact to the environment. The centralized treatment system with a lower application rate will provide enhanced treatment compared to the several existing sub-surface treatment systems. In addition to the enhanced treatment, the proposed system will have more stringent monitoring and maintenance requirements compared to the existing systems. This enhanced monitoring will result in detection of potential contamination issues, whereas the current systems lack monitoring requirements. Due to the size of the proposed system, groundwater monitoring will be required.

This treatment option will also have a minimal increase to impervious area, resulting in negligible stormwater runoff. Electrical demand for this option would be the lowest of all proposed alternatives as pumping from the septic tank would be the only source of demand.

7.2.3 *Land Requirements*

This option would require the most area of any option evaluated, mostly for the absorption beds. Based upon preliminary sizing using 15 feet x 200 feet absorption beds with a 5-foot spacing between beds the overall area for this option would require approximately 4.8 acres. This area would require regular mowing to prevent trees from setting roots into the absorption beds; the area could be used as a recreation field or open space. As stated previously, a 100 percent reserve area would also be required.

7.2.4 *Construction Problems*

This option would require construction activities typical of a conventional sub-surface wastewater disposal system; however, the scope of construction would be much larger than a conventional wastewater system. A cast-in-place concrete tank would likely be most economical for the required size; consequently, the proposed septic tank would require excavation and significant concrete work. The construction of the absorption beds would be relatively simple and could be accomplished with construction equipment typically owned by municipalities. The large amount of materials required for construction would require substantial material stockpiling and transportation as part of the construction process.

7.2.5 *Sustainability Concerns*

The modification to the site with this option would be minimal. The use of the existing site would be minimally impacted and allow for continued use of the area. This option would have the lowest electrical demand of any phase I option.

7.2.6 *Cost Estimates*

A cost estimation for the proposed project is presented in Table 7-1 below. This preliminary cost estimation breaks down the various cost categories by general work. Due to the large areas of absorption beds required, a significant portion of the cost for this option would come from the construction of absorption beds. This cost could be reduced with in-kind town construction and materials provided or procured by the Town of Johnsburg. A 25 percent contingency has been added for preliminary cost estimations.

The concrete construction would be the most significant cost for the septic tank and pump station component. This estimated amount is based upon cast-in-place construction as precast construction is typically higher for the sizes involved. Additional components for the septic tank and pump station (pumps, controls, and electrical work) would be relatively minor. A 25 percent contingency is added for preliminary design.

In addition to the septic tank and pump station, additional site work would be required. Yard piping connecting all the components, soil restoration, plantings, and an access road to allow for periodic pumping out the septic tank would be required.

Professional services anticipated for this project would involve advanced permitting, a hydrogeological study to ensure no contamination of nearby river, typical engineering design, bond counsel, various legal expenses, grant procurement and administration, and construction inspection/documentation. The total anticipated capital cost for this option is $1,916,246 and is shown in Table 7-1 below.

Operational and maintenance costs for this option were also evaluated to determine the ongoing costs. Operations costs are shown in Table 7-2 below and broken down by general category. Costs were estimated based on operational experience with similar sized municipal projects. Total annual O&M costs are estimated at $44,000.

The cost of the collection system construction **is not included in this cost estimate.** Costs assume funding and loan requirements including (but not limited to) State Prevailing Wage, Buy American Requirements, and Davis Bacon Requirements. Other conditions may apply from funding/grant/loan agencies increasing construction cost.

Table 7-1— Option 1 Capital Cost Estimation

Project:	**North Creek Map Plan and Report**	
Description:	**Option 1 - In-ground System**	
Date:	**2/8/2020**	
A	**Absorption Beds**	
1	Excavation and Storage	$50,400
2	Soil Amendments	$67,200
3	Crushed Stone	$144,300
4	Piping	$81,150
5	Filter Fabric	$49,000
6	Soil Restoration	$74,400

6a	Groundwater Monitoring Wells	$65,000
7	**Subtotal**	**$531,650**
8	Contingency (25 percent)	$132,912
9	**Absorption Beds Total**	**$664,562**
B	**Septic Tank / Pump Station**	
10	Concrete and Excavation	$252,000
11	Pumps	$24,000
12	Controls	$18,000
13	Electrical	$12,000
14	Misc. Components	$12,000
15	**Subtotal**	**$318,000**
16	Contingency (25 percent)	$79,500
17	**Septic Tank / Pump Station Total**	**$397,500**
C	**Misc. Field Work**	
18	Yard Piping	$90,000
19	Plantings	$60,000
20	Access Road	$12,000
21	**Subtotal**	**$162,000**
22	Contingency (25 percent)	$40,500
23	**Misc. Field Work Total**	**$202,500**
24	***Construction Grand Total***	***$1,264,562***
D	**Professional Services**	
25	Permitting	$38,400
26	Hydrogeological Study	$38,400
27	Engineering	$180,000
28	Legal	$76,000
29	Bond Counsel	$56,400
30	Construction Inspection	$72,000
31	**Professional Services Total**	**$462,000**
32	**Project Contingency (15 percent)**	**$189,684**
33	***Total Project Cost***	***$1,916,246***

Table 7-2–- Option 1 O&M Cost Estimation

Project:	**North Creek Map Plan and Report**	
Description:	**Option 1 - In-ground System**	
Date:	**8/8/2019**	
A		
1	Site Upkeep (Mowing, snow removal, etc.)	$3,000
2	Solids Hauling	$15,600
3	Staffing	$12,000
4	Electric	$3,000
5	Pump Maintenance and Replacement	$3,000
6	Contractual Services	$5,400
7	Water Quality Testing	$2,400
8	**Total**	**$44,400**

7.2.7 *Advantages/Disadvantages*

This option would likely have the lowest construction costs, most simplified construction, and lowest operational costs of any options listed. In addition, the construction would have minimal impacts on the site and allow for additional uses of the location. This option would also not require a certified operator, reducing operation costs.

Disadvantages include that this option would be a centralized septic system that would have little flexibility to handle industrial flows or significant changes to flow characteristics. In addition, the wastewater flow is the maximum recommended flow for an underground wastewater disposal system. Based upon the proposed flow, treatment for compliance with groundwater standards would likely be required. Compliance with nitrogen groundwater standards would likely be difficult with a traditional subsoil disposal system. The Town currently does not own property to locate a traditional subsoil disposal system. The combination of these factors is ultimately why Option 1 was not considered feasible.

7.3 Option 2 – In-Ground Advanced System

This option would involve the construction of a new wastewater treatment and disposal system that would include an advanced treatment system. This option would be like Option 1; however, the system would have a smaller size and would be able to provide some treatment flexibility. For the Map, Plan, and Report ORENCO treatment systems were evaluated and used for process sizing and cost estimations.

7.3.1 *Process Sizing*

Advanced Treatment Systems typically require vendor basis of design to provide a product warranty. This basis of design can be estimated from design documents, with final process sizing provided by the vendor.

Process sizing is like a conventional wastewater septic tank and absorption bed. The overall process consists of a primary settling tank, anoxic mixing basin, fabric media treatment units, recirculation pumping chamber and discharge pumping chamber.

Preliminary design information available from ORENCO provides typical loading rates to the fabric media treatment units in terms of pounds of BOD per day or gallons per day. Based upon Preliminary sizing information is presented by ORENCO in Appendix B. In addition to the treatment area requirements, a septic tank would be required. This septic tank would be sized as in the Option 1 design. For this design a surface discharge is assumed, and no disposal field is required.

7.3.2 *Environmental Impacts*

The proposed treatment system for Option 2 is anticipated to have minimal impact to the environment. The treatment system proposed will increase wastewater treatment and discharge treated effluent to surface waters. The system would be able to provide enhanced treatment compared to the several existing sub-surface treatment systems. In addition to the enhanced treatment, the proposed system will have more stringent monitoring and maintenance requirements compared to the existing systems. This enhanced monitoring will result in detection of potential contamination issues, whereas the current systems lack monitoring requirements. The proposed system can be modified to include treatment of additional parameters including nitrogen and phosphorus.

This treatment option will have a moderate increase to impervious area, resulting in stormwater runoff that can be treated by surface stormwater features. Electrical demand for this option would be moderate when compared to other options due to recirculation of the wastewater and pumping from the tanks to the location of discharge.

7.3.3 Land Requirements

This option would require significantly less area than option 1. Based upon preliminary sizing provided by ORENCO with typical surface features the overall area required for this option would be approximately 1.6 acres. This area would require fencing and screening to prevent trespassing on site.

7.3.4 Construction Problems

This option would require site construction typical of an advanced sub-surface wastewater disposal system, although the scope of construction would be much larger. Prefabricated treatment system components could be delivered and installed on-site. The installation of the process tanks would require the use of heavy equipment to lift and place components. Following placement of the process components, construction would be relatively simple and could be accomplished with typical construction equipment.

7.3.5 Sustainability Concerns

The modification to the site with this option would be moderate. Additional proprietary treatment units would be added to the proposed site. These units require additional recirculation to meet treatment goals, therefore additional electrical use would be required. As a result of construction, stormwater control features would be required. Although this option would use more electricity and generate more stormwater runoff than Option 1, the treatment flexibility with this setup is anticipated to result in better treatment of effluent.

7.3.6 Cost Estimates

A cost estimation for the proposed project is presented in Table 7-3 below. This preliminary cost estimation breaks down the various cost categories by general work. The advanced treatment units provided by ORENCO would be the largest cost item for the project; however, this item is comparable to the absorption fields presented in Option 1.

The concrete construction would be the most significant cost for the septic tank and pump station component. This estimated amount is based upon cast-in-place construction, as precast construction is typically higher for the sizes involved. Additional components for the septic tank and pump station (Pumps, Controls, and electrical work) would be relatively minor. A 15-percent contingency is added for preliminary design.

In addition to the septic tank and pump station, additional site work would be required. Yard piping connecting all the components, soil restoration, plantings, and an access road for pumping out the septic tank would be required. In addition to these items a new control building would be required to house controls, aeration equipment and other components.

Professional services anticipated for this project would involve advanced permitting, typical engineering design, ORENCO Engineering costs, bond counsel, various legal expenses, grant procurement and administration, and construction inspection/documentation. The total anticipated cost for this option is $3,797,840. This is likely a conservative estimate if two separate treatment systems are required; one behind the Town Hall and another unit on the south side of North Creek to serve the school and adjacent properties. If during technical design, it is determined to be feasible to convey all flow to a primary treatment system near the Town Hall, savings will be realized for both capital and O&M costs. For this report, the most conservative approach was used to ensure adequate funding can be secured.

Operational and maintenance costs for this option were also evaluated to determine the ongoing costs. Operations costs are shown in

Table 7-4 below and broken down by general category. Costs were estimated based on operational experience with similar sized municipal projects. Total annual O&M costs are estimated at $57,500 for both treatment systems.

The cost of the collection system construction **is not included in this cost estimate.** Costs assume funding and loan requirements including (but not limited to) State Prevailing Wage, Buy American Requirements, and Davis Bacon Requirements. Other conditions may apply from funding/grant/loan agencies increasing construction cost.

Table 7-3— Option 2 Capital Cost Estimation

Project:	**North Creek Map Plan and Report**	
Description:	**Option 2 - Advanced Fixed Film System**	
Date:	**2/8/2020**	
A	**Treatment System Components**	
1	ORENCO Treatment Units	$1,340,000
5	Septic Tanks	$190,000
6	Pumping Systems	$100,000

7	Controls/Electrical	$210,000
9	Backup Power Generation	$140,000
10	Closed Vessel UV System	$150,000
11	Dispersion/Outfall	$127,000
12	Control Building	$370,000
13	Yard Piping	$130,000
14	Miscellaneous	$265,000
15	**Subtotal**	**$2,892,000**
19	**Contingency (15 Percent)**	**$433,800**
20	***Construction Grand Total***	***$3,325,800***
F	**Professional Services**	
21	Engineering/Construction Inspection	$347,040
22	Legal/Permitting/Bonding/Grant Admin	$125,000
23	**Professional Services Total**	**$472,040**
24	***Total Project Cost***	***$3,797,840***

Table 7-4–- Option 2 O&M Cost Estimation

Project:	**North Creek Map Plan and Report**	
Description:	**Option 2 - Advanced System**	
Date:	**2/8/2020**	
A		
1	Site Upkeep (Mowing, snow removal, etc.)	$5,000
2	Solids Hauling	$15,000
3	Staffing	$10,000
4	Electric	$7,500
5	Equip Maintenance and Replacement	$4,000
6	Contractual Services	$11,500
7	Water Quality Testing	$5,000
8	**Total**	**$57,500**

7.3.7 Advantages/Disadvantages

This option would likely have construction costs that are higher yet comparable to Option 1. Due to additional site features and the proposed treatment system, the visual impact from this option would be increased compared to Option 1. The resulting construction would require the area dedicated for treatment to be isolated from the remainder of the Scenic Byway, likely by vegetated features. This option would also require a certified operator, increasing operational costs.

Advantages of this system include a more robust centralized treatment system that would have the flexibility to handle changes in wastewater flow concentration without the need for a traditional wastewater system.

7.4 Option 3 – Conventional SBR System

This option would involve the construction of a traditional sequencing batch reactor (SBR) system. The SBR is a modified activated sludge process for wastewater treatment. In this system, wastewater is added to a tank, mixed with bacteria by aeration, allowed to settle by gravity, and decanted to final disinfection and discharge. The advantage of an SBR process is that equalization, aeration, and clarification can all be achieved in a single tank. Although a single tank is required for treatment, at least two SBR units are required. SBR system are well suited to low flow conditions and can provide nutrient removal (phosphorus and nitrogen) in addition to BOD treatment.

7.4.1 Process Sizing

The SBR process requires sizing of the headworks screening and grit removal equipment along with determining the required SBR tank volume based upon hydraulic loading and organic loading.

Screening should be sized to treat the peak hourly flow. Based on the permit flow of 80,000 gallons per day a peaking factor of 4.0 would be used. The resulting peak hourly flow would be 240,000 gallons per day. Screening equipment does not take up a large area, therefore the flow to be treated will not have a major impact on the building size but will impact the proposed cost.

The Biological SBR system would not have flow equalization; therefore, it should be sized to treat the peak daily flow. The peak daily factor is 2.0, therefore the peak daily flow would be 120,000 gallons per day. The incoming wastewater characteristics used for system design are outlined in **Error! Reference source not found.**. Preliminary sizing calculations were used to determine that two tanks with a size of 30’ by 30’ and a depth of 12’ would be required. The tanks would be served by an aeration system providing approximately 60 cubic feet per minute of aeration to meet biological oxygen requirements.

7.4.2 Environmental Impacts

The SBR system is a standard method for treating wastewater, and the operational parameters are well understood. This option would allow for a large degree of flexibility in wastewater treatment and allow for treatment of additional components such as nitrogen and phosphorus compounds with modifications to the aeration and non-aerated mixing cycles. Discharge would likely be to a surface water, therefore a review of the discharge location and the impact to the receiving stream would be required.

The SBR process would require containment over the tank to prevent the spread of odors, provide visual screening, and minimize noise from operations. A simple building could be constructed over the SBR tank. This building would also provide an insulated area protected from the elements during winter operations.

7.4.3 Land Requirements

This option would require buildings for the screening, SBR treatment process and any sludge holding or treatment. This would also require some site modifications to allow for access by trucks and maintenance equipment. A total site area of approximately 1.3 acres is anticipated for this option.

7.4.4 Construction Problems

This option would involve traditional building and concrete construction. Although the tanks would be a large construction item, it is not likely that there would be major construction issues using contractors in the area. The proposed site would likely have a high groundwater table resulting in significant sheeting and dewatering during construction. The construction activities may require an extensive period to complete; depending upon the seasonal tourism activities, the construction may be visible from the roadway.

7.4.5 Sustainability Concerns

SBR treatment would require the construction of new impervious surfaces that would require the construction of stormwater treatment measures. SBR treatment would require the use of aeration blowers to provide oxygen to the process. These aeration blowers would require some electrical usage. The system would provide high quality effluent that could be discharged to surface waters including North Creek or the Hudson River.

7.4.6 Cost Estimates

A cost estimation for the proposed project is presented in Table 7-5 below. This preliminary cost estimation breaks down the various cost categories by general work. General categories for work include the headworks, SBR system, site work, and additional typical construction components (Sludge Handling, Electrical, SCADA, and HVAC).

The proposed headworks building would require components to provide preliminary treatment of wastewater to prevent clogging of downstream components. Costs for the headworks building would be primarily equipment for screening, new concrete work and the construction of a building to house the equipment. Some of these costs could be covered with in-kind services or materials to reduce costs.

Costs associated with the SBR process would be greater than 50percent of the proposed construction costs. Costs associated with the SBR process would include the construction of new concrete foundation and tanks, building construction, process equipment, pumps, blowers and other miscellaneous components. These costs would likely require contracting out construction activities.

Additional site construction would be required for construction access and maintenance, provide screening from adjacent properties, addition of stormwater control, and additional site improvements.

Professional services anticipated for this project would involve typical permitting, advanced engineering design, bond counsel, various legal expenses, grant procurement and administration, and construction inspection/documentation. The total anticipated cost for this option is $3,667,500.

Operation and maintenance costs for this option were also evaluated to determine the ongoing costs. Operations costs are shown in Table 7-6 below and broken down by general category. Costs were estimated based on operational experience with similar sized municipal projects, and other similar sized municipal systems in the region. Total annual O&M costs are estimated at $116,500.

The cost of the collection system construction **is not included in this cost estimate.**

Table 7-5– Option 3 Cost Estimation

Project:	**North Creek Map Plan and Report**	
Description:	**Option 3 - Conventional SBR**	
Date:	**2/8/2020**	
A	**Headworks**	
1	Equipment	$150,000
2	Concrete	$75,000
3	Building	$120,000
4	**Subtotal**	**$345,000**
5	Contingency (25 percent)	$69,000
6	**Headworks Total**	**$414,000**
B	**SBR Treatment System**	
7	Concrete and Excavation	$650,000
8	Piping/Diffusers/valves	$175,000
9	Equipment (including UV)	$400,000
10	Building	$360,000
11	Blowers	$70,000
12	**Subtotal**	**$1,655,000**
13	Contingency (25 percent)	$331,000
14	**SBR Treatment System Total**	**$1,986,000**
C	**Misc. Field Work**	
15	Yard Piping (including Outfall)	$105,000
16	Plantings	$40,000
17	Access Roads and Paving	$45,000
18	**Subtotal**	**$190,000**
19	Contingency (25 percent)	$42,500
20	**Misc Field Work Total**	**$232,500**
21	**Sludge Storage and Equip. Total**	**$125,000**
22	**Electrical Total**	**$150,000**
23	**SCADA Controls Total**	**$125,000**
24	**HVAC Total**	**$80,000**
25	***Construction Grand Total***	***$3,112,500***
D	**Professional Services**	
26	Permitting	$50,000
27	Engineering	$255,000
28	Legal	$90,000
29	Bond Counsel	$40,000
30	Construction Inspection	$120,000
31	**Professional Services Total**	**$555,000**
33	***Total Project Cost***	***$3,667,500***

Table 7-6-– Option 3 O&M Cost Estimation

Project:	**North Creek Map Plan and Report**	
Description:	**Option 3 - Conventional SBR**	
Date:	**3/8/2017**	
A		
1	Site Upkeep (Mowing, snow removal, etc.)	$5,000
2	Headworks Electric	$3,000
3	Headworks Maintenance	$1,500
4	SBR Electric	$10,000
5	SBR Maintenance	$3,500
6	SBR Chemicals	$5,000
7	Laboratory Electric	$250
8	Laboratory Heat	$1,250
9	Laboratory Equipment	$1,500
10	Telecom	$1,000
11	Sludge Hauling	$12,000
12	Sludge Electric	$1,500
13	Contractual Services	$6,000
14	Water Quality Testing	$5,000
15	Staff	$60,000
16	**Total**	**$116,500**

7.4.7 Advantages/Disadvantages

The advantages of this option would include the use of a conventional wastewater treatment process to handle the flow from the proposed sewer district. The SBR process would also be better able to deal with the variable flow rates and wastewater concentrations that would be generated by the sewer district than Option #1 or #2.

This option would require a significant investment in infrastructure, with new screening and grinding facilities, concrete tanks, building for treatment area, laboratory, sludge holding and disposal facilities, and a full-time certified operator to maintain the facility. These investments would require additional maintenance over the long-term to ensure compliance with wastewater regulations.

7.5 Option 4 – Force Main to Gore Mountain

This option would involve the agreement of Gore Mountain Ski Facility to convey wastewater from the proposed sewer district to the Gore Mountain Wastewater Treatment Facility (GMWWTF). This option would involve the construction of a series of pump stations to convey wastewater along the existing access road to the facility and upgrading the facility at Gore to treat the increased wastewater flow.

7.5.1 Process Sizing

The process sizing for this option would be relatively minor, with sizing of pump stations and force main lines required. Based upon preliminary evaluations three pump stations would be required to meet the pressure and flow requirements.

In addition to the sizing of the force main, additional improvements to the Gore Mountain Wastewater Treatment Facility would be required. Due to the many upgrade options to meet treatment requirements with increased flow, a specific treatment process cannot be identified at this time; however, based upon organic and hydraulic loading cost estimations can be made to estimate flow.

7.5.2 Environmental Impacts

This option would likely involve construction of a force main along an existing disturbed area or roadway to minimize construction impacts. Due to the construction issues caused by shallow depth to bedrock in the area, appropriate access to the construction site would be required. Construction along the Gore access road would be the most suitable location as the access road provides easy access for construction vehicles. If construction occurs along the existing access road the disturbances caused by construction would be minor. Required blasting would occur within the existing right-of-way for the (ROW) road, minimizing impacts to environmentally sensitive areas.

Should construction be located outside of the existing access road, significant disturbances to the existing natural areas would be required to provide access for construction vehicles. Blasting through bedrock would be required in areas along the existing ski trails and in forested areas. These activities would significantly impact the surrounding environmental areas.

In addition to the environmental impacts caused by the force main construction, the existing wastewater facility would likely be expanded to discharge increased amounts of treated wastewater. The existing plant discharges wastewater to an adjacent intermittent stream with strict effluent limitations. Increased flow of wastewater to the intermittent stream may result in impacts to the stream. Additional treatment may be required to meet new effluent discharge requirements.

7.5.3 Land Requirements

This option would have the lowest land requirements of any of the options listed. The new force main would be located within an existing ROW. to allow for long-term maintenance. New pumps stations would be required with this option; however, they could be located to minimize land investments.

7.5.4 Construction Problems

This option would involve the construction a new force main along an access road that would require significant construction. Potential construction issues include excavation located in bedrock/ledge and locating the proposed trench to minimize impacts to environmentally sensitive areas. The force main would have to be protected from freezing and require deep burial of any pipe. In addition to the methods of construction, the construction phasing should be planned in a way to prevent impacts to the seasonal tourism.

7.5.5 Sustainability Concerns

This option would require significant energy consumption due to pumping the wastewater to an elevated location. Additionally, the construction of a pressurized force main would result in a high-pressure line that has potential for breakage from shock loadings. Although this option would have the smallest land use of any option, the maintenance and energy requirements would be the greatest from any option.

7.5.6 Cost Estimates

A cost estimation for the proposed option is presented in Table 7-7 below. This preliminary cost estimation breaks down the various costs by general categories including the booster stations, force mains, and upgrades to the Gore Mountain Wastewater Treatment Facility.

Three booster stations would be required to convey wastewater from the selected location for treatment to the Gore Mountain Facility. These booster stations would require buildings to house and protect the required pumps, piping and additional force main components. Due to the need for continuous pumping each booster station would have a backup generation for emergency operations.

Most of the construction costs associated with this option would come from the installation of new pipeline along the existing access road. Due to the variable conditions and advanced construction techniques required, the installation costs for new ledge and non-ledge force main will higher than typical construction.

In addition to the proposed booster stations and force main, upgrades to the Gore Mountain Wastewater Treatment Facility will be required with this option. The existing facility had a maximum permitted flow of 65,000 GPD. Assuming additional flow of 80,000 GPD, the wastewater facility will require upgrades to the existing process components. A preliminary evaluation of the existing facility indicates that upgrades to the headworks facility, the biological system, and the tertiary filtration would be required per DEC requirements.

Professional services anticipated for this project would involve advanced permitting, advanced engineering design, bond counsel, various legal expenses, grant procurement and administration, and construction inspection/documentation. The total anticipated capital cost for this option is $5,193,750. Please note this treatment option would include treatment of flows and the existing permitted flow at Gore Mountain.

Operational and maintenance costs for this option were also evaluated to determine the ongoing costs. Operations costs are shown in Table 7-8 below and broken down by general category. Costs were estimated based on operational experience with similar sized municipal projects, and other similar sized municipal systems in the region. Total annual O&M costs are estimated at

$167,500. Please note this O&M cost would include treatment of flows and the existing permitted flow at Gore Mountain.

Estimated costs assume funding and loan requirements including (but not limited to) State Prevailing Wage, Buy American Requirements, and Davis Bacon Requirements. Other conditions may apply from funding/grant/loan agencies increasing construction cost.

Table 7-7— Option 4 Capital Cost Estimation

Project:	**North Creek Map Plan and Report**	
Description:	**Option 4 - Force Main to Gore**	
Date:	**2/8/2020**	
A	**Booster Stations**	
1	Pumps and Installation	$375,000
2	Electric Work	$120,000
3	Piping and Valves	$40,000
4	Site Work	$90,000
6	**Subtotal**	**$625,000**
7	Contingency (25 percent)	$156,250
8	**Booster Stations Total**	**$781,250**
B	**Force Main**	
9	Non-Ledge Force Main	$300,000
10	Ledge Force Main	$600,000
11	Directional Boring	$250,000
12	**Subtotal**	**$1,150,000**
13	Contingency (25 percent)	$287,500
14	**Force Main Total**	**$1,437,500**
C	**Gore WWTP Upgrade**	
16	Upgrade to Headworks	$375,000
17	Upgrade to Biological Treatment	$1,020,000
18	Upgrade to Tertiary Treatment	$385,000
19	**Subtotal**	**$1,780,000**
20	Contingency (25 percent)	$445,000
21	**Gore WWTP Upgrade Total**	**$2,225,000**
22	**Controls**	**$125,000**
323	***Construction Grand Total***	***$4,568,750***
D	**Professional Services**	
24	Permitting	$75,000
25	Engineering	$250,000
26	Legal	$50,000
27	Bond Counsel	$50,000
28	Construction Inspection	$200,000
29	**Professional Services Total**	**$625,000**
31	***Total Project Cost***	***$5,193,750***

Table 7-8-– Option 4 O&M Cost Estimation

Project:	**North Creek Map Plan and Report**	
Description:	**Option 4 – Force Main to Gore**	
Date:	**2/8/2020**	
A		
1	Headworks / Pump Station Electric	$8,000
2	Headworks Maintenance	$1,000
3	Biological Treatment Electric	$15,000
4	Biological Treatment Maintenance	$5,000
5	Biological Treatment Chemicals	$7,000
6	Laboratory Electric	$500
7	Laboratory Heat	$2,500
8	Laboratory Equipment	$2,000
9	Telecom	$1,000
10	Sludge Hauling	$12,000
11	Sludge Electric	$2,500
12	Tertiary Filters	$3,000
13	Reaeration System	$5,000
14	Contractual Services	$8,000
15	Water Quality Testing	$5,000
16	Staff	$90,000
17	**Total**	**$167,500**

7.5.7 Advantages/Disadvantages

This option would have the advantage of utilizing an existing wastewater treatment system, which may increase the potential for obtaining grant funding. In addition, the existing facility has operational staff with a history of successful wastewater plant operations.

Disadvantages for this option include the extensive construction requirements, construction costs, extensive permitting requirements, and placing more wastewater processing in an environmentally sensitive area adjacent to a major tourism center.

8 SELECTION OF AN ALTERNATIVE

8.1 Non-Monetary Considerations

Significant differences exist between the options listed and cannot be quantified in monetary terms. The primary differences between the options presented are the methods of meeting permit limits and type of additional equipment. Non-monetary components considered important when evaluating the alternatives are:

- Impact to Tourism/Environment
- Ease of Operation/Operator Training
- Treatment Performance

- Mechanical Reliability
- Ease of Construction
- Ease of Expansion (With Phase II)
- Future Treatment Standards
- Permitting Process

8.1.1 Impact to Tourism/Environment

Under Option 1 the site will not be significantly changed as most equipment will be located below ground, reducing visual impact. In addition to visual impact, operational traffic, and discharge of odors are anticipated to be minimal. Treated wastewater will be discharged to groundwater adjacent to the North Creek and may require further analysis to ensure no impact to downstream locations.

Option 2 would have minimal visual impacts and could be screened by vegetation. A security fence would likely be required to protect treatment equipment. Odors and operational traffic would be minimal, like Option 1. Treated wastewater would be discharged to the adjacent surface water. Due to treatment performance provided by the system and the large distance between the treatment system and downstream uses no impacts to recreational resources are anticipated.

Option 3 would have significant visual impacts and would require screening by vegetation. Due to the size of the building, additional architectural features may be required to meet permitting requirements. A security fence would likely be required to protect treatment equipment. Odors would be minimized by on-site treatment systems; however, operational traffic may be increased compared to Options 1 and 2. Wastewater would be treated to a higher standard than other treatment options and discharged to the adjacent surface water. Due to the level treatment provided by the system no impacts to recreational resources are anticipated.

Option 4 would require modifications at an existing wastewater facility. Typically, this is the least disruptive scenario; however, the location is near the Gore Mountain lodges and would require significant effort to minimize visual impacts. Odors would be contained by proposed equipment. Operational traffic may be problematic, and the wastewater facility is located past the base lodge, disrupting normal operations of the ski center.

8.1.2 Ease of Operation/Operator Training

Option 1 – The below ground system would have the lowest operational requirements and would not require significant training. If the system receives an unusual wastewater loading, it may cause operational issues that would be difficult to rectify.

Option 2 – The advanced treatment system would require additional operations oversight and training compared to Option 1. It is anticipated that a Town staff member would be required to perform operational duties daily, and a certified wastewater operator would be required for SPDES reporting.

Option 3 – The size and complexity of this treatment option would require one full time certified operator hired by the Town. The system would require a high amount of initial training; however, long term operation is anticipated to be minimal. Several communities in the region utilize similar treatment systems and report simplified operation compared to other treatment technologies.

Option 4 – Operations and maintenance would be similar to Option 3, with an increase in staffing due to the increased flow. This option would not require significant operator training as the facility has been in operation for over a decade and the existing operators are familiar with the facility.

8.1.3 Treatment Performance

Option 1 - Would meet the technical requirements for system performance; however, the limited control and reliance on sub-surface treatment would significantly limit the performance of the system. Since flow would be higher than 30,000 gallons per day to groundwater discharge, monitoring wells would be required to ensure compliance with groundwater standards. In other locations, compliance with groundwater Nitrogen standards has been variable with sub-surface systems.

Option 2 - The advanced treatment system would provide more operational control of wastewater treatment and would likely have increased treatment performance. Treatment performance may be impacted by variable flow loadings (summer vs. winter), temperature, and other conditions. It is anticipated that this option would be suitable for meeting stream discharge requirements.

Option 3 - The treatment system of this option would have the greatest flexibility and would be suitable for variable treatment requirements. Impacts due to seasonal loading, toxic shock, and temperature variations are anticipated to be minimal. It is anticipated that this option would be suitable for meeting stream discharge requirements.

Option 4 - The treatment system of this option would be similar to option 3. The existing facility discharges to an intermittent stream with significant discharge restrictions; therefore, more restrictive discharge limits may apply unless an alternative discharge can be identified.

8.1.4 Mechanical Reliability

Option 1 – This option is the simplest in terms of mechanical components. Pumps and distribution piping are anticipated to be reliable as pumping would offer redundancy. In the event of a major incident at the site, repairs could be completed by existing Town staff.

Option 2 – The proposed advanced treatment system would have more components and pumping equipment compared to option 1; however, the system is anticipated to have minimal issues. Repairs to the system would likely be performed by staff approved by the advanced treatment unit provider to ensure warranty.

Option 3 – There are significantly more system components and pumping requirements associated with Option 3. This naturally increases the potential for mechanical problems: however; the treatment system and components would be reliable, and with proper routine maintenance should have minimal issues. Most maintenance can be performed by the operational staff.

Option 4 – This option would be like Option 3.

8.1.5 Ease of Construction

Option 1 – This option would be relatively simple to construct and would have minimal issues at the site.

Option 2 – Construction of the septic tank and pumping station would be similar to Option 1, and the installation of Orenco systems would be simplified compared to Option 3 and 4. Heavy equipment would likely be required to place prefabricated units.

Option 3 – This option would have moderate construction issues. The site would be accessible for construction equipment, it would be anticipated to have minimal impacts to the surrounding properties. Due to the prevalence of sands in the construction area and assumed high groundwater table, sheeting may be required for concrete work.

Option 4 – Construction for this option would be difficult as the site is located at the Gore Mountain Ski facility. This would limit construction duration, and require work be performed to standards as to not impact the existing facility.

8.2 Selected Alternative

Based upon monetary factors and non-monetary factors **Option 2 – Advanced In-Ground Treatment** is recommended.

9 RECOMMENDED TREATMENT SYSTEM

9.1 System Overview

The proposed wastewater treatment system would utilize the Advanced In-Ground Treatment system discussed in Section 8 and include a new collection system and connections to residential units. In addition to the gravity system the proposed collection system would contain pump stations to connect hydraulically disconnected areas and a main pump station to transport wastewater to the selected treatment location.

9.2 Collection System

9.2.1 <u>Collection System Type</u>

For the establishment of a new sewer district there are two primary types of collection systems possible, gravity collection and pressure sewer system. Both types provide advantages and disadvantages when implemented.

A gravity collection system would involve the installation of new gravity sewer mains and service laterals. For each building in the sewer district a new gravity service line would connect between the existing building and new sewer mains. Wastewater would flow by gravity from homes, through the new service laterals to sewer mains located adjacent to, or underneath the existing roadway. The sewer mains would be located to take advantage of the existing topography to optimize gravity collection. The sewer mains would ultimately discharge to a pump station, located in the low point of each zone. The pump stations would utilize pumps sized to handle the zone flow and transfer wastewater from their sub-area to another sub-area, or to the central wastewater treatment area. Advantages of gravity collection include simpler operation, minimal mechanical components to maintain, reduced energy use with gravity flow, and a low instance of blockage or failure. Disadvantages of gravity collection include reliance on existing topography for proper operation, and larger line size compared to pressure systems.

In a pressure system setup new individual pump stations, pressure service laterals, and new pressure force main would be constructed. For a building in the sewer district, wastewater would flow by gravity to a septic tank/ pump station or pump station only. Due to site restrictions within the Hamlet area, septic tanks and pump stations would be located on the building owner's property. From the pump station, the water would be sent to a common force main and ultimately discharged to a common pump station and sent to the central wastewater treatment area. Advantages of pressure systems include the ability to transfer wastewater regardless of topography, more control over wastewater flow, and potential for simpler construction. Disadvantages include high energy use, increased chance of pump/mechanical failure, and the need for agreements on ownership, maintenance, and easements for the operation of the septic tank/pump stations.

Based upon a preliminary evaluation of the existing conditions, and experience of neighboring communities, a combination of gravity and pressure collection system was selected for design and estimation of the costs associated with implementing the recommended alternative. Actual conditions encountered during further, site evaluations, design phases, or construction may change conditions and/costs. Should changes be encountered, reevaluation of the collection system may be required.

9.2.2 <u>Collection System Layout</u>

The proposed collection system would consist of 8" sewer mains, and residential connections. The gravity collection system would consist of approximately 7,000 linear feet of sewer main located along Main Street, Bridget Street, and Circle Ave. In addition to this gravity sewer main, there would be approximately eighty-three (83) lateral connections. Portions of the gravity collection system would discharge to three pump stations, located at the topographical low points of the system, which would pump through approximately 5,400 linear feet of force main. Figure A-13 illustrates the layout of the system including gravity mains, force mains and pump stations.

9.2.3 Collection System Cost Estimate

No centralized wastewater system serves the Hamlet area; therefore, an entire sanitary collection and conveyance system is required. The cost for collection that will include the proposed sewer district are shown below in Table 9-2:

Table 9-1 – Collection System Costs

Project:	**North Creek Map Plan and Report**	
Description:	**Collection System Cost Estimate**	
Date:	**2/8/2020**	
A	**Collection System Construction**	
1	Gravity Sewer Line	$1,050,750
2	Manhole Structures	$480,000
3	Sewer Laterals	$456,500
4	Pumping Stations w/ Generators	$375,000
5	Force Mains	$567,200
6	Mobilization/Demobilization	$146,472.50
7	Traffic Control	$87,883.50
8	**Subtotal**	**$3,163,805.50**
9	Contingency (15 percent)	$439,417.50
10	**Collection System Total**	**$3,603,223**
B	**Professional Services**	
11	Permitting	$50,000
12	Engineering	$180,000
13	Legal	$50,000
14	Bond Counsel	$50,000
15	Construction Inspection	$171,534
16	**Professional Services Total**	**$501,534**
17	***Total Estimated Collection Cost***	***$4,104,757.50***

9.3 Total Project Cost Estimate

Collection System Total Estimated Project Cost:	$4,104,757.50
In-Ground Advanced Fixed-Film Treatment Cost:	$3,797,840.00
Total Estimated Project Capital Cost:	**$7,902,597.50**

9.4 Estimated Annual Operations Budget

Estimated Annual Operation and Maintenance Cost: **$57,500**

9.5 Calculated User Fees

Based upon the proposed selected alternative the following table, Table 9-1 shows potential user fees based on different levels of grant and loan funding. User fees would be based on Equivalent Dwelling Units or EDUs.

Table 9-1 Estimated User Fees

Design Permit Flow	72,000	GPD
Flow per Equivalent Dwelling Unit	330	GPD/EDU
Estimated Number of EDUs	218.2	
Annual O&M Cost per EDU	$ 263.54	
Estimated Annual O&M Cost	$ 57,500.00	
	Debt Load	Total w/ O&M
Amount to Finance	$ 7,902,597.50	
Cost per EDU-3 Percent Loan-No Grant	$ 1,832.34	$ 2,050.52
Cost per EDU - 3 Percent Loan w/ 25 percent Grant	$ 1,374.23	$ 1,592.41
Cost per EDU - 3 Percent Loan w/ 50 percent Grant	$ 916.17	$ 1,134.35
Cost per EDU - 3 Percent Loan w/ 75 percent Grant	$ 458.06	$ 676.24
Cost per EDU-0 Percent Loan-No Grant	$ 1,207.25	$ 1,425.43
Cost per EDU - 0 Percent Loan w/ 25 percent Grant	$ 905.44	$ 1,123.62
Cost per EDU - 0 Percent Loan w/ 50 percent Grant	$ 603.63	$ 821.81
Cost per EDU - 0 Percent Loan w/ 75 percent Grant	$ 301.81	$ 519.99

10 CONCLUSIONS AND RECOMMENDATIONS

The following section outlines possible implementation of the recommended alternative, including identification of lead agency, project partners, potential funding sources, permitting requirements, and a recommended project timeline.

10.1 Lead Agency / Project Partners

For the implementation of the recommended alternative the following parties have been identified as having a potential role in implementation.

Table 10-1 – Project Team / Stakeholders

Organization	Role
Town of Johnsburg Town Board	Lead Agency, Approve Resolutions,
Town of Johnsburg Sewer Committee	Advisory Committee
North Creek Business Alliance	Public Outreach
Warren County Planning	Grant/Loan Assistance
Project Attorney	Legal Assistance, Bond Counsel
Project Engineer	Engineering Plans, Construction Documents

10.2 Potential Funding Sources

The following section details potential grant and loan sources for the implementation of the recommended alternative.

10.2.1 Grant Funding

- Empire State Development Grant Funds – This program funds regional programs related to retaining or creating jobs. Specialty infrastructure projects can be funded through this program. This program can provide funds up to 20% of the total project cost.

- Community Development Block Grants – This program seeks to fund community development projects. This program is focused on infrastructure development. This program could be used to fund the project with funds up to $1,000,000. Two main considerations for this funding source are: (1) determining if the Hamlet will meet the economic requirements, and (2) determining if the pre-application and timeframe requirements can be met.

- New York Main Streets Program – This program seeks to fund projects enhancing the main street areas in the state. This program has three components, and funding would most likely fall under the NYMS Downtown Stabilization Program. This program offers up to $500,000 for programs that help stabilize downtown areas.

- Department of State – Local Waterfront Revitalization Program – This program seeks to fund projects along coasts or existing waterways that have an existing Local Waterfront Revitalization Plan (LWRP). The Town of Johnsburg has received funding under the Local Waterfront Revitalization Program, therefore the program may fund costs. This program is a 50% match grant, no limit on the funding amount is known.

- New York State DEC – Water Quality Improvement Project Program – This funding is aimed at funding projects that will improve the water quality. Funds for this program can be used for construction of new/improved infrastructure. The project would likely be considered "General Wastewater Improvement" and would be applicable for 40% of project costs.

- New York WIIA: – Clean Water Grant – This funding is aimed at funding projects that will improve wastewater infrastructure in the State of New York. Funds for this program can be used for construction of new/improved infrastructure. The program can fund up to 25%of eligible costs.

10.2.2 Low Cost Loans

- USDA Rural Development – This program provides funding for clean and reliable drinking water systems, sanitary sewage disposal, sanitary solid waste disposal, and storm water drainage to households and businesses in eligible rural areas. Financing typically consists of long-term, low-interest loans. If funds are available, a grant may be combined with a loan if necessary, to keep user costs reasonable.

- Clean Water State Revolving Fund – This program is administered by the Environmental Facilities Corporation and New York State Department of Environmental Conservation, to provide long-term, low interest or zero interest loans.

10.3 Permit Requirements

The following section outlines the minimum permits required for the project. Additional permits and/or permit approvals may be required.

- NYS DEC – State Pollution Discharge Elimination System (SPDES) Permit
- NYS DEC – Stormwater Construction Permit
- NYS DOT – Utility Work Permit
- Adirondack Park Agency – Major Project
- Warren County Public Works
- Town of Johnsburg – Building Permit
- Town of Johnsburg – Site Plan Approval

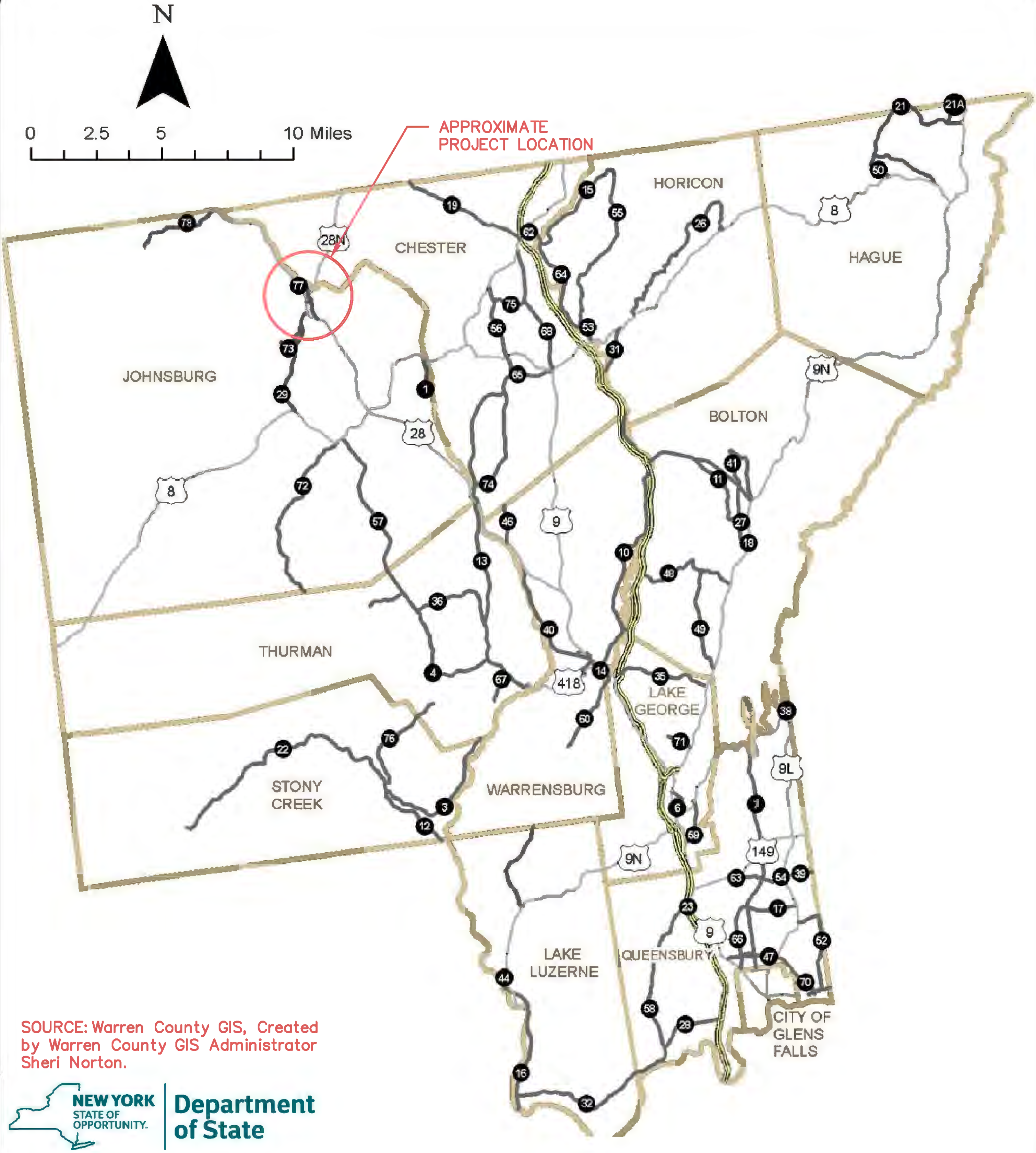
10.4 Project Timeline

The following section outlines a potential timeline for implementation of the Recommended Alternative.

Table 10-2 – Project Schedule

Task	Month - Year
Present Engineering Report	March 2020
Vote of Sewer District	June 2020
Secure Grants / Loans	June 2020 to December 2020
Prepare Engineer Plans	January 2021 – September 2021
Permit Approval	September 2021 – January 2022
Town Board Approval	January 2022
Bid Phase	February 2022 – March 2022
Contract Award	April - 2022
Construction	May 2022 – May 2023

APPENDIX A



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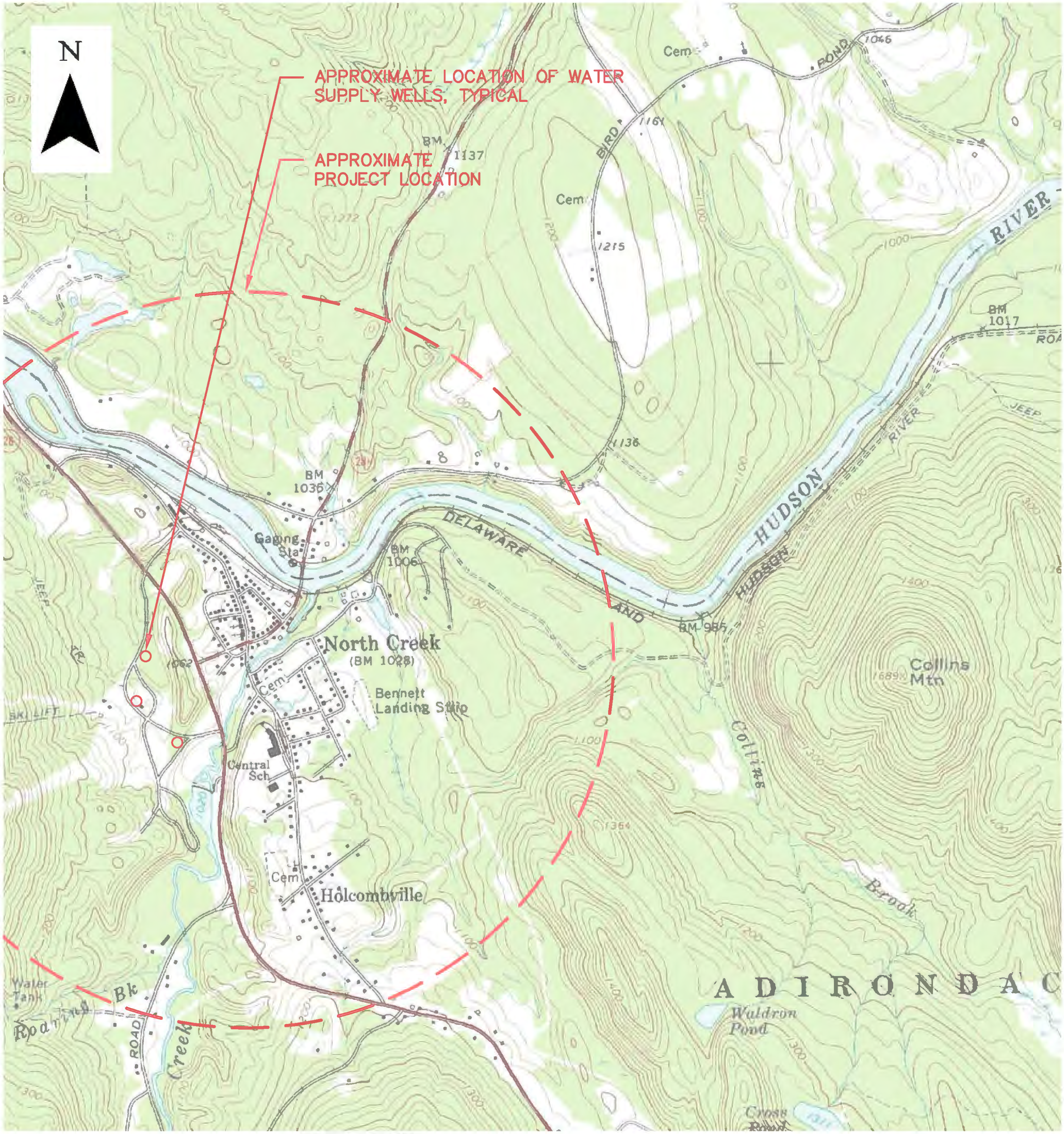
SOURCE: USGS NORTH CREEK QUADRANGLE – 1968



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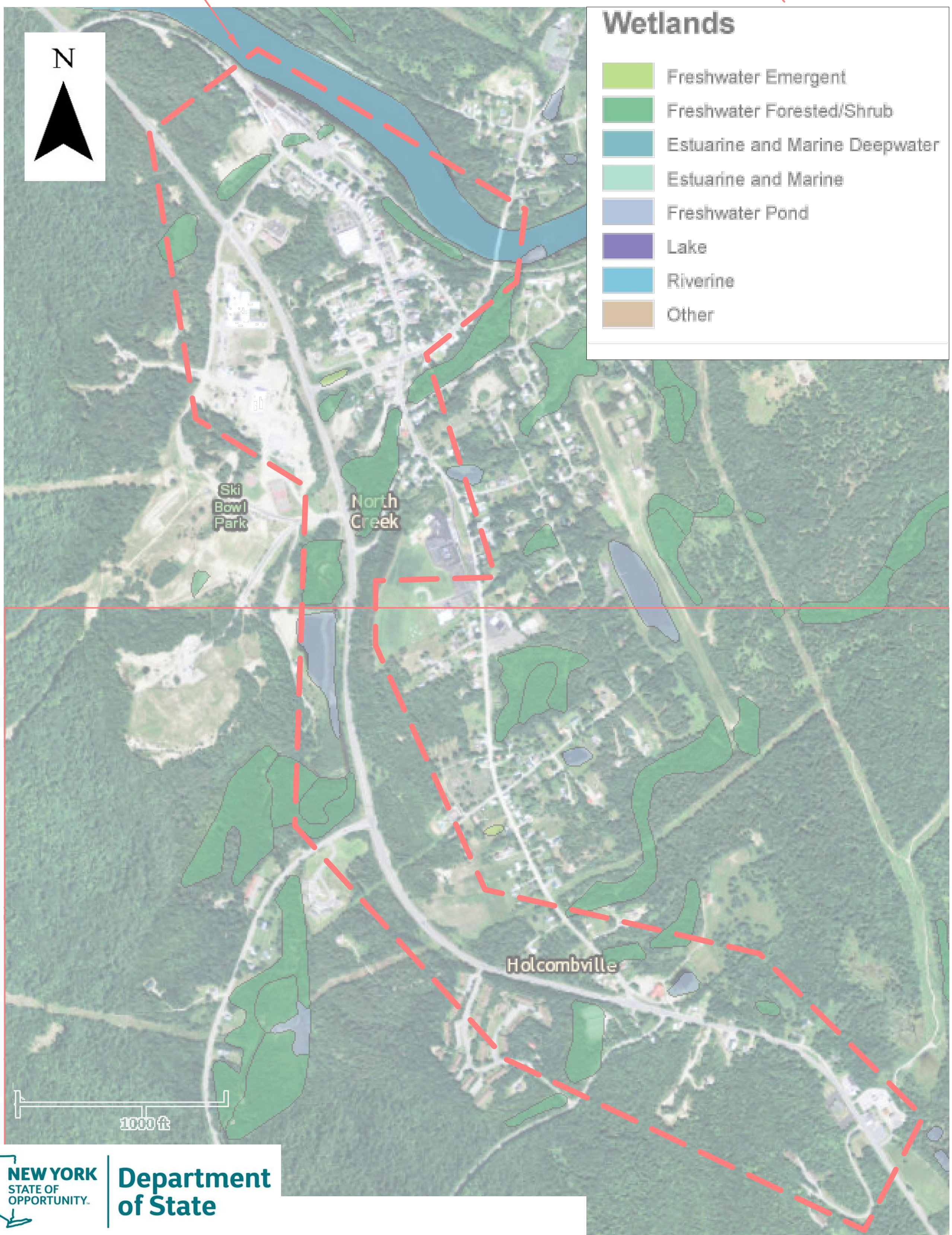
APPROXIMATE PROJECT LOCATION

SOURCE: U.S. FISH AND WILDLIFE SERVICE, NATIONAL WETLANDS INVENTORY (ACCESSED MARCH 14, 2016)



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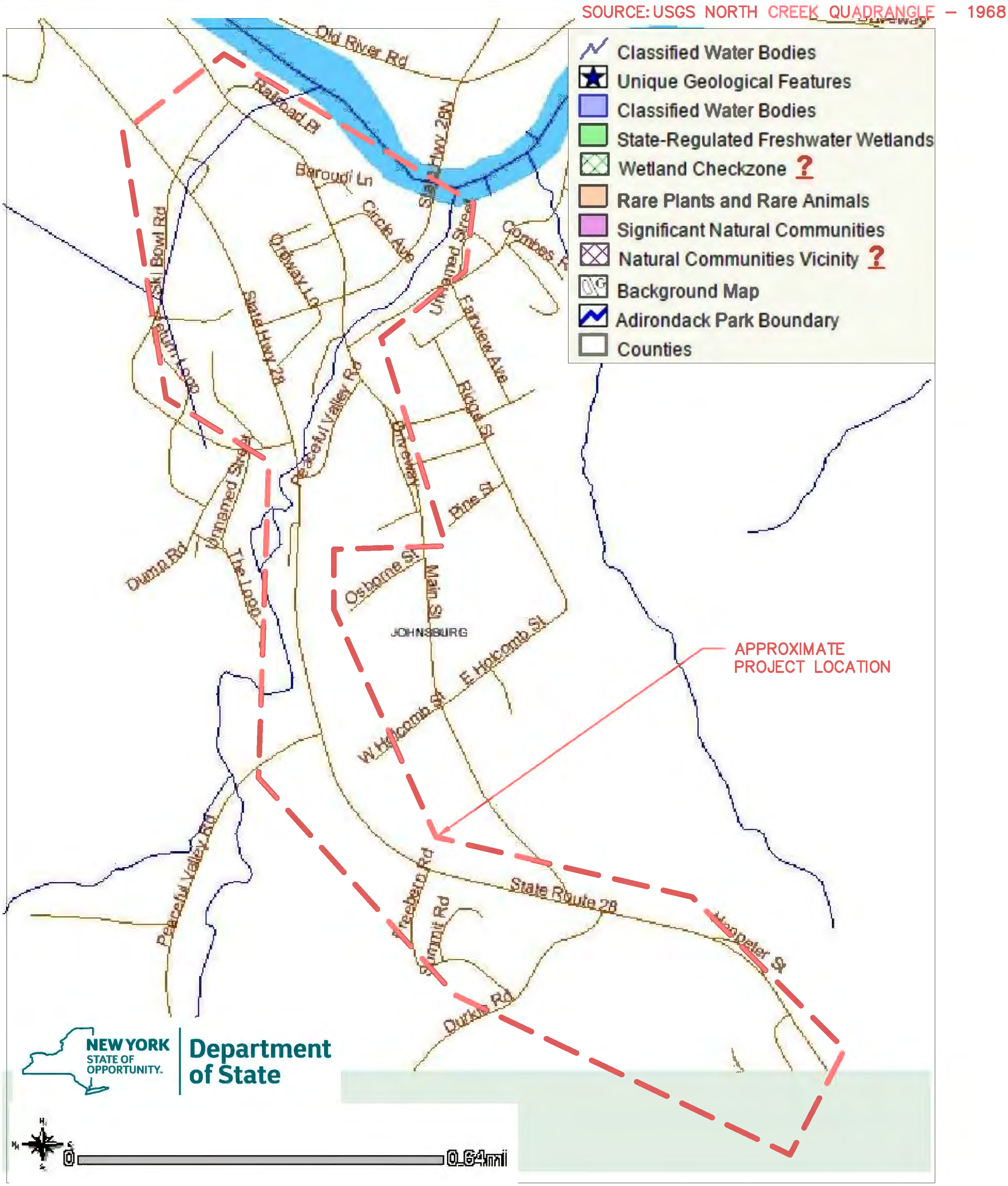

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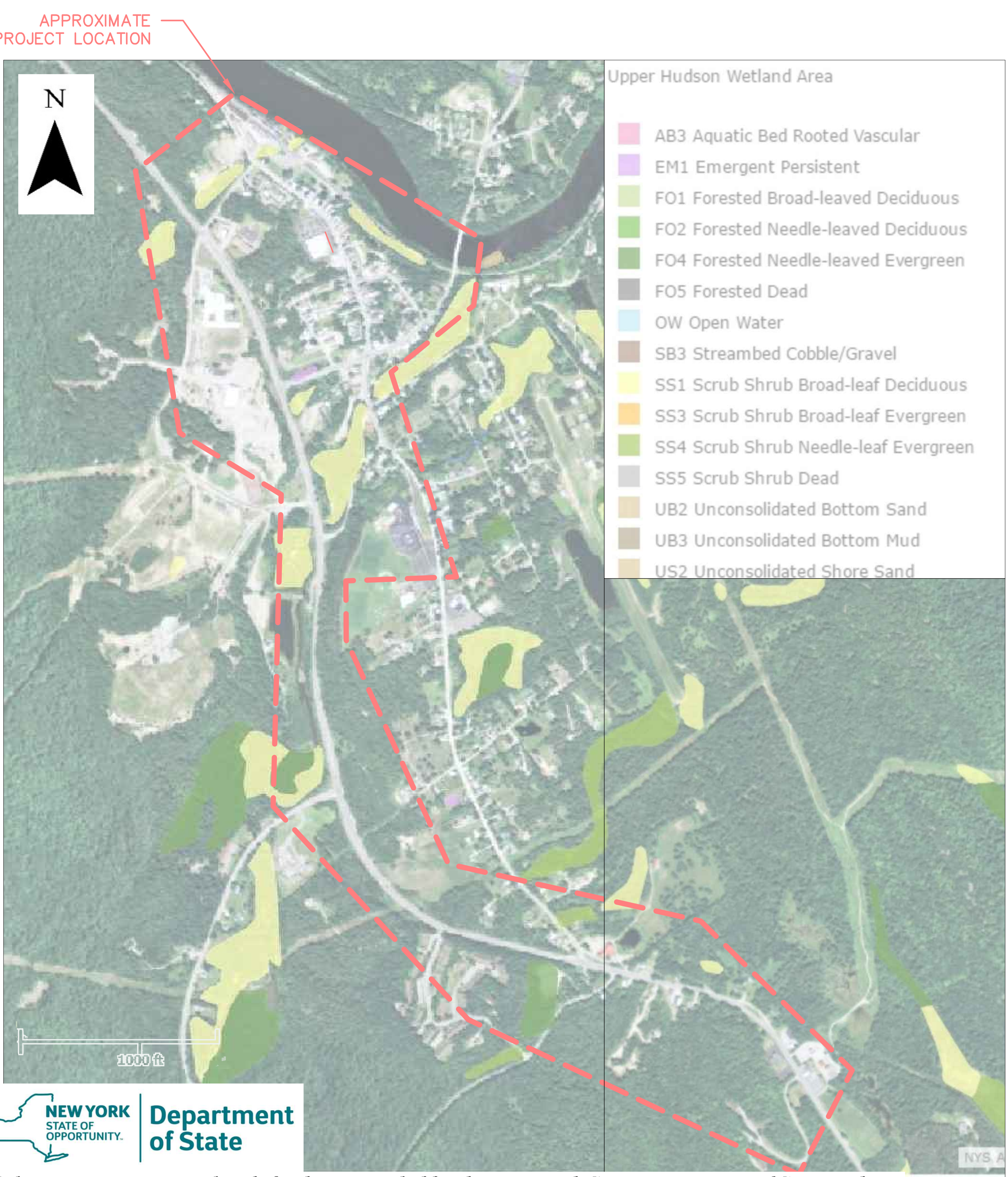

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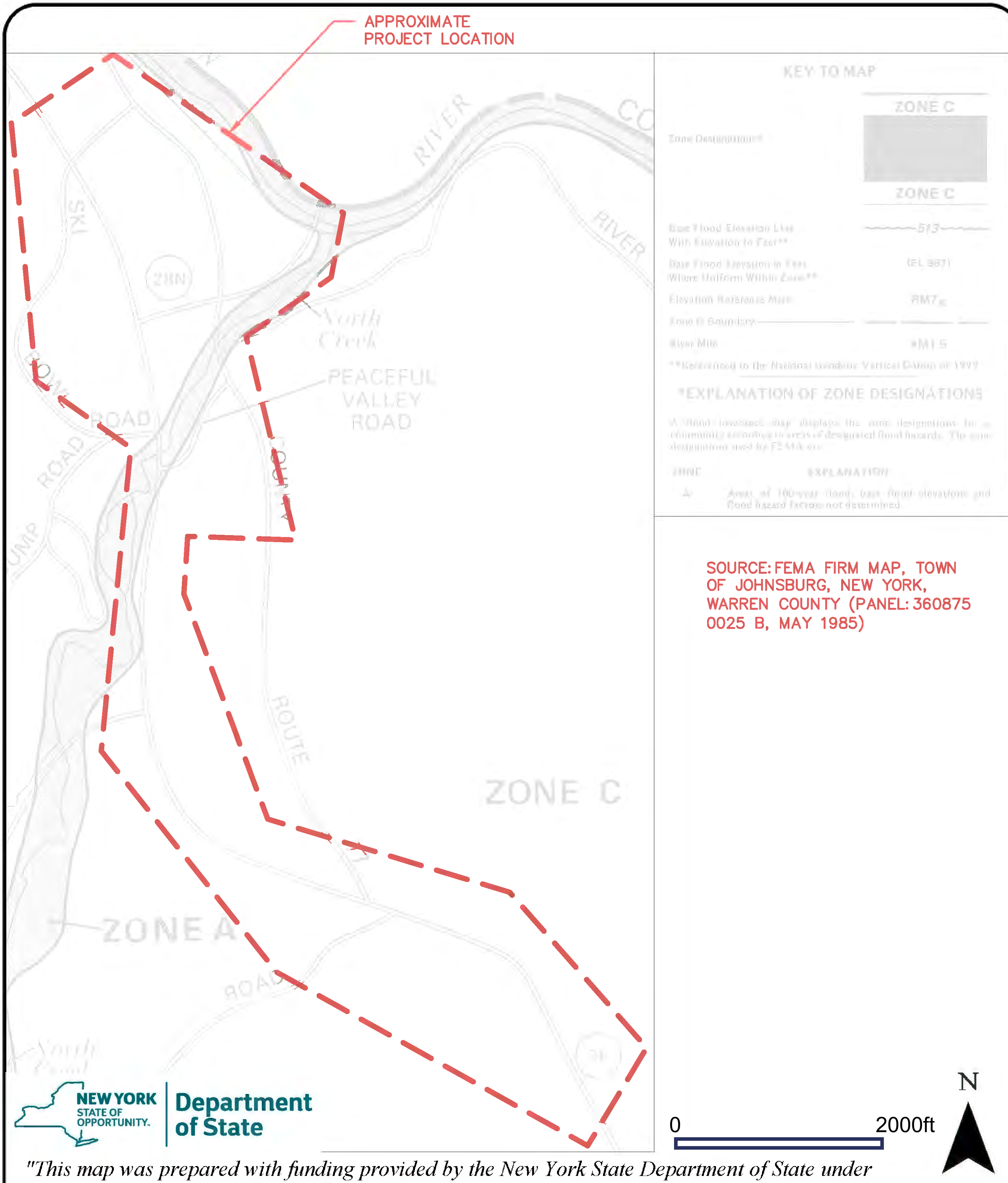

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SOURCE: NRCS SOIL SURVEY (ACCESSED 3/15/2016)

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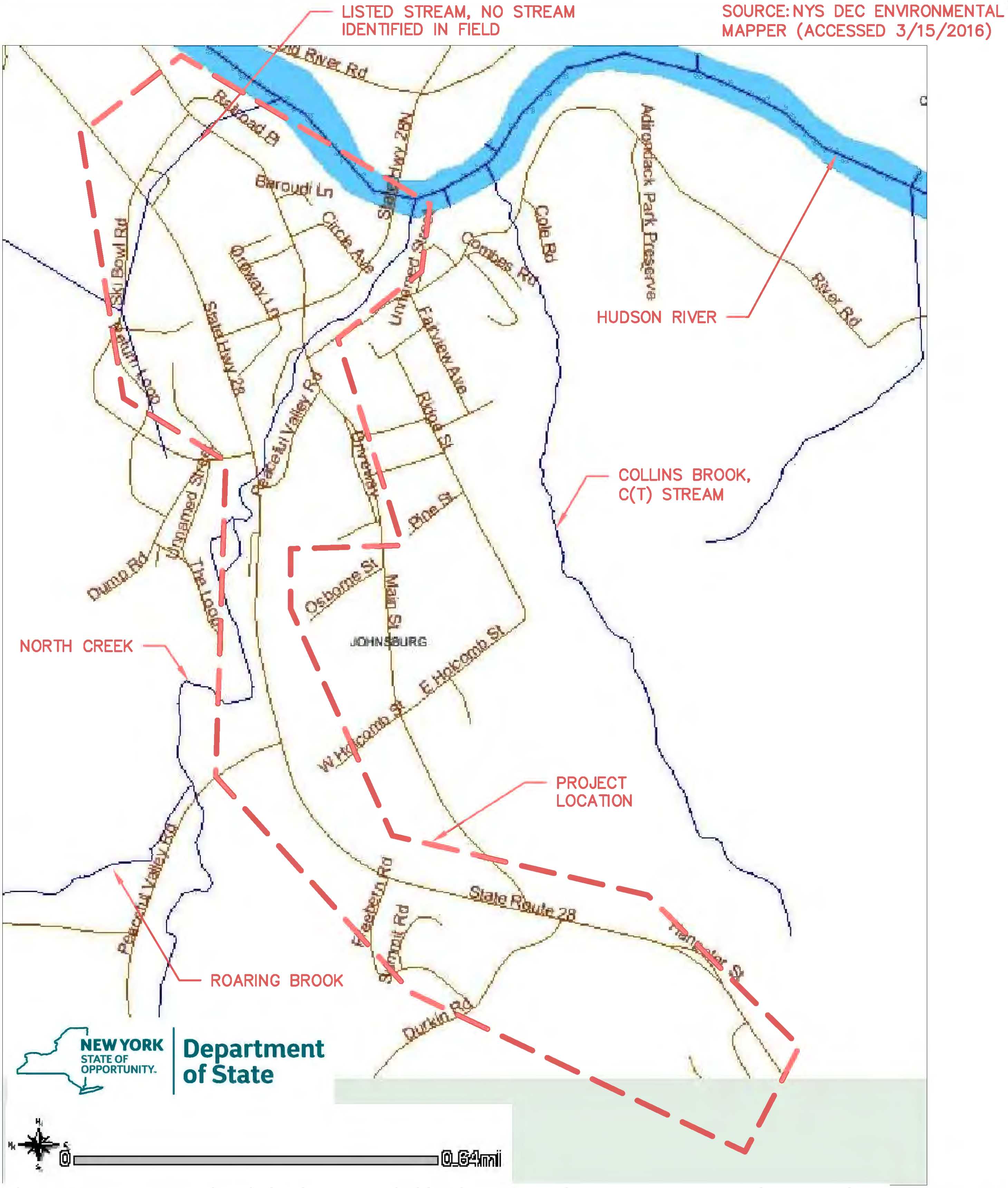

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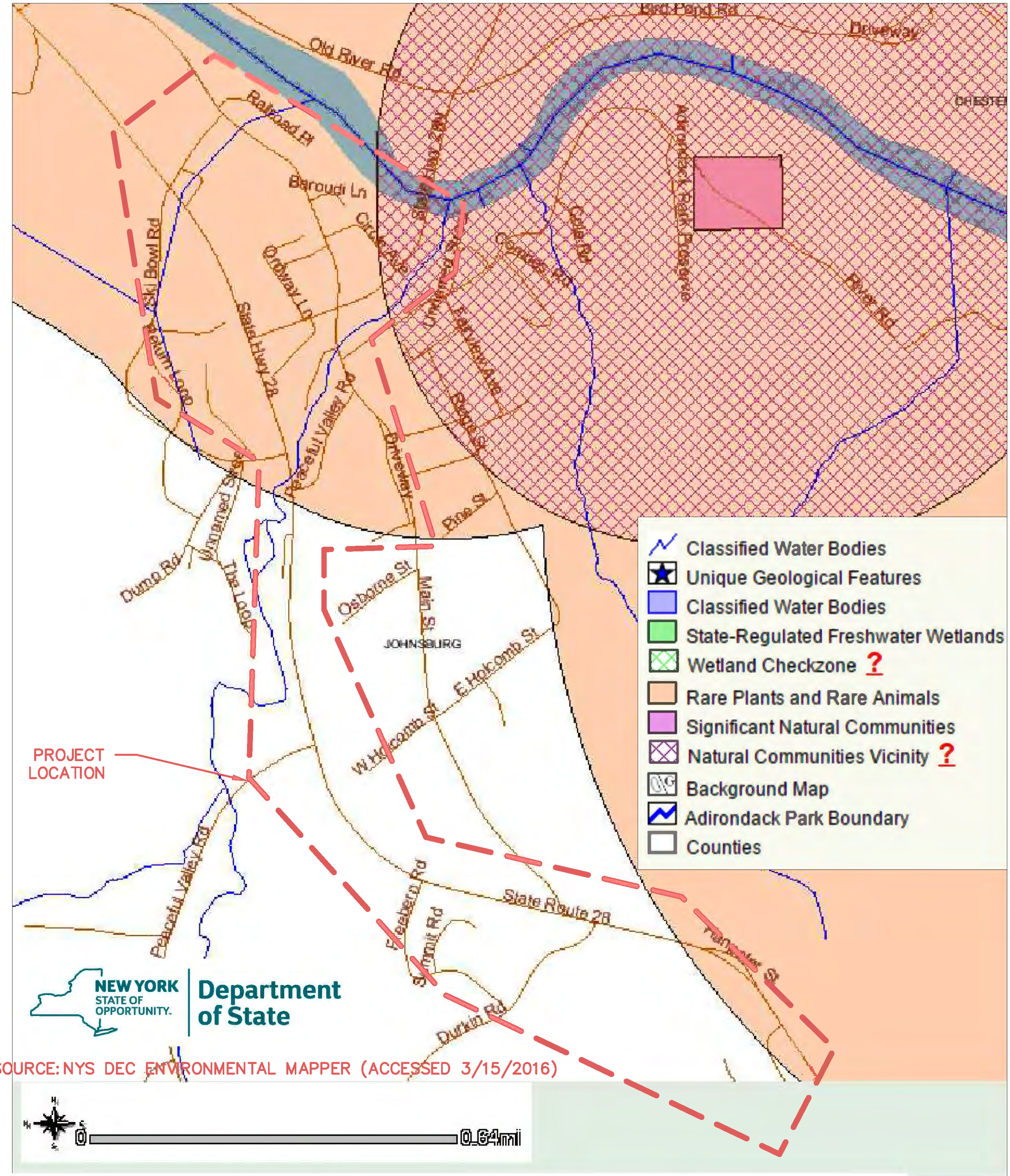

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MAP, PLAN & REPORT

NATURAL COMMUNITIES

TOWN OF JOHNSBURG

219 MAIN STREET

TOWN OF JOHNSBURG NEW YORK

WARREN COUNTY

A–7

CEDARWOOD ENGINEERING SERVICES PLLC

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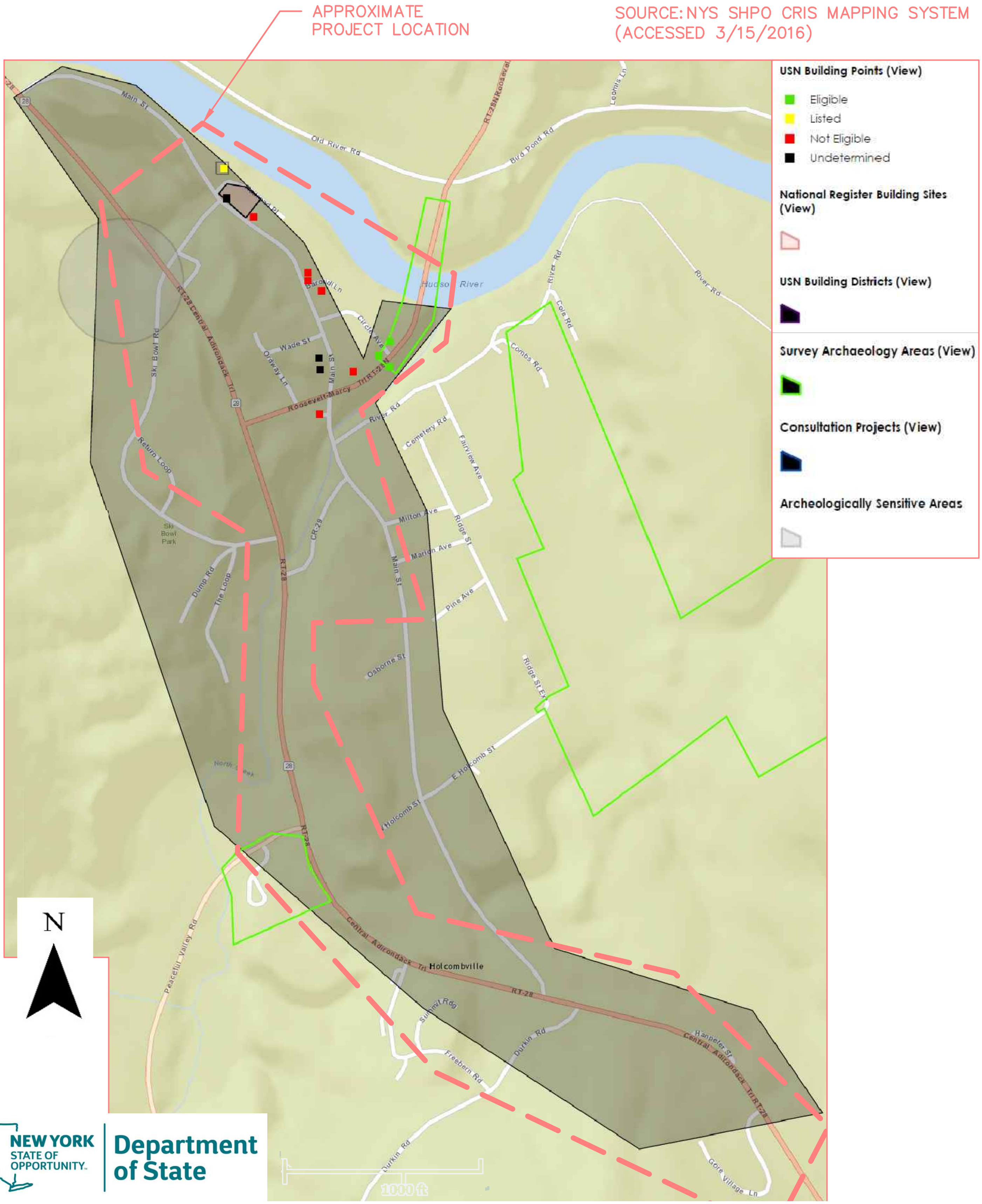

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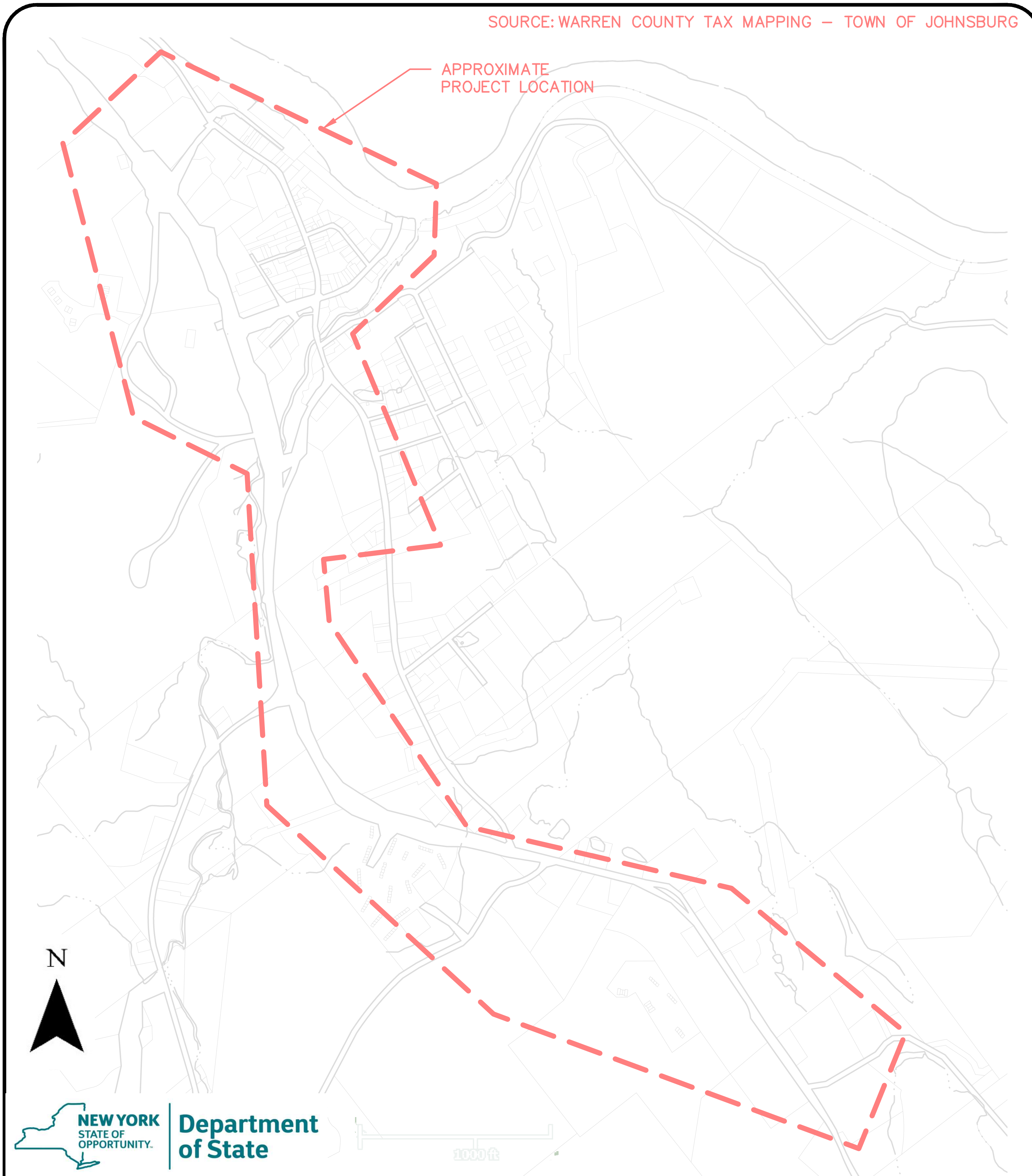

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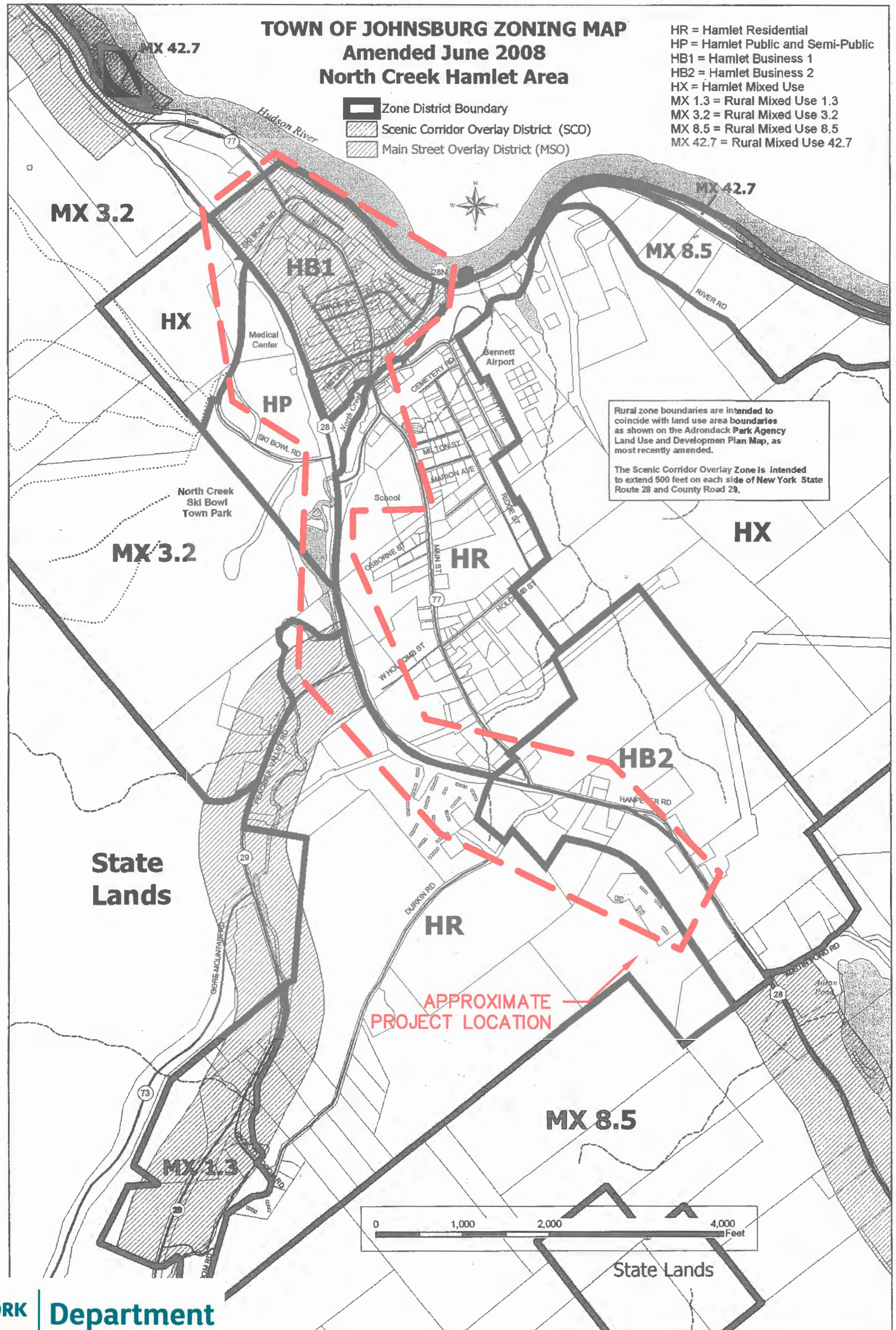

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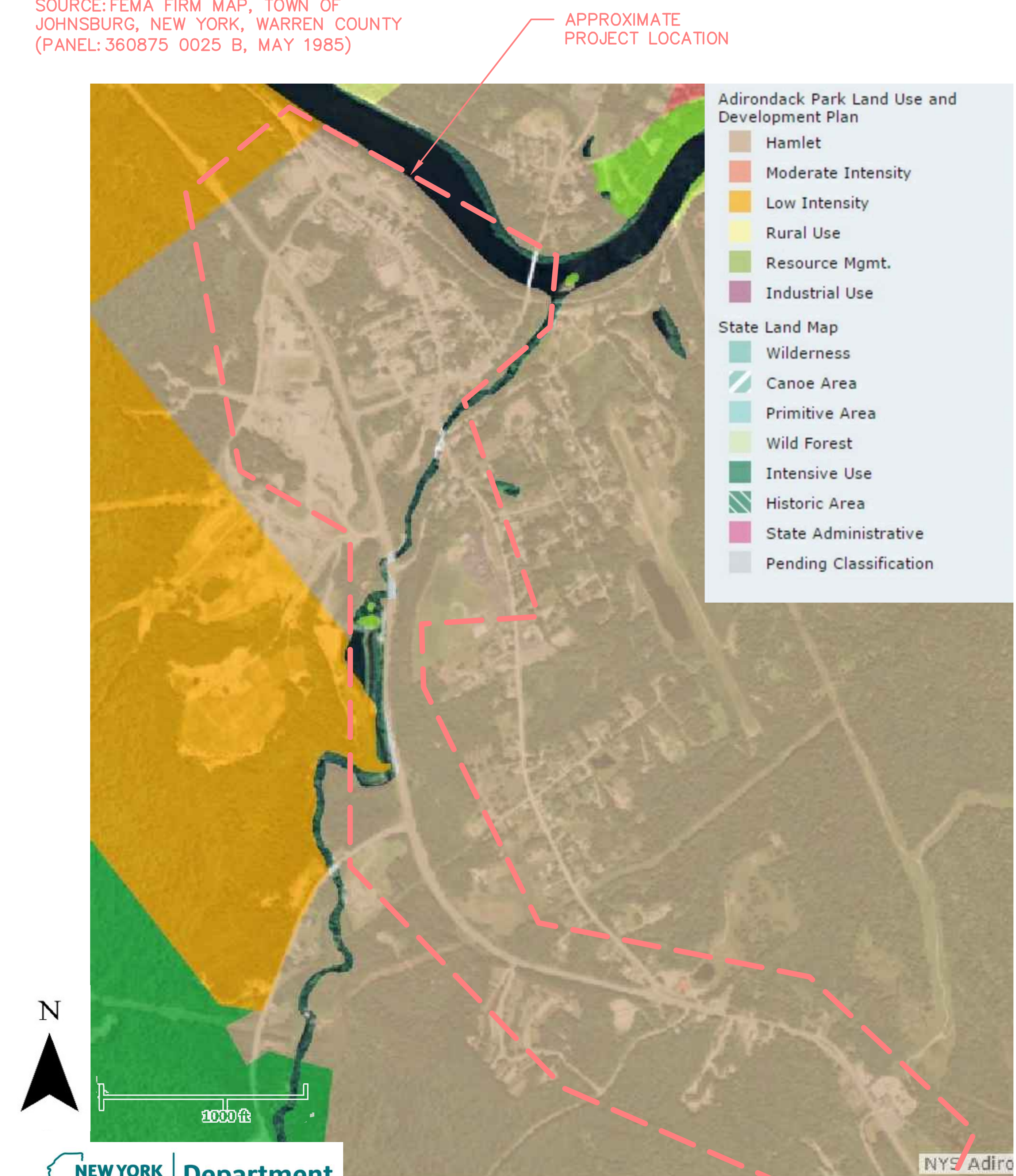

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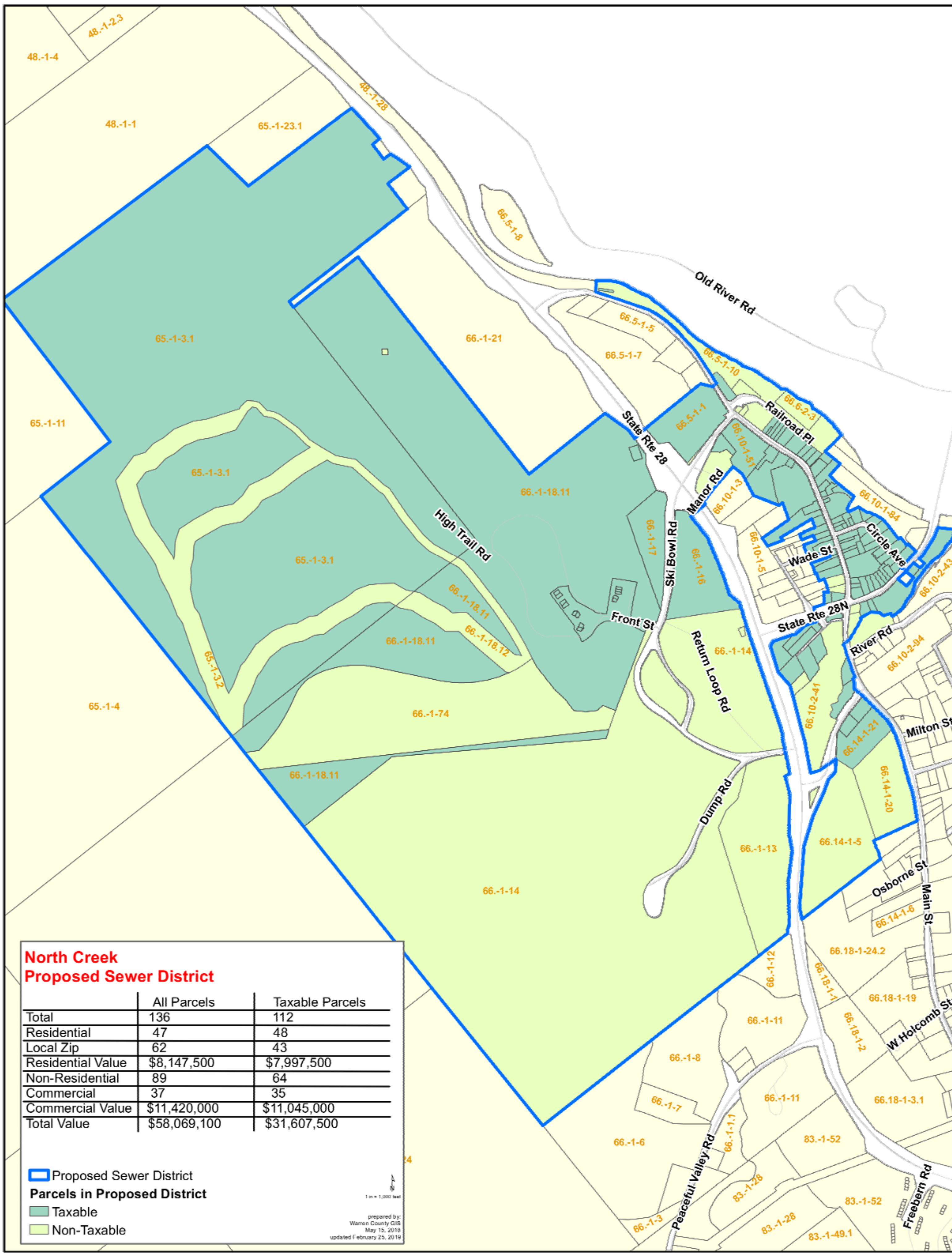

North Creek Proposed Sewer District

	All Parcels	Taxable Parcels
Total	136	112
Residential	47	48
Local Zip	62	43
Residential Value	$8,147,500	$7,997,500
Non-Residential	89	64
Commercial	37	35
Commercial Value	$11,420,000	$11,045,000
Total Value	$58,069,100	$31,607,500

prepared by:
Warren County GIS
May 15, 2018
updated February 25, 2019

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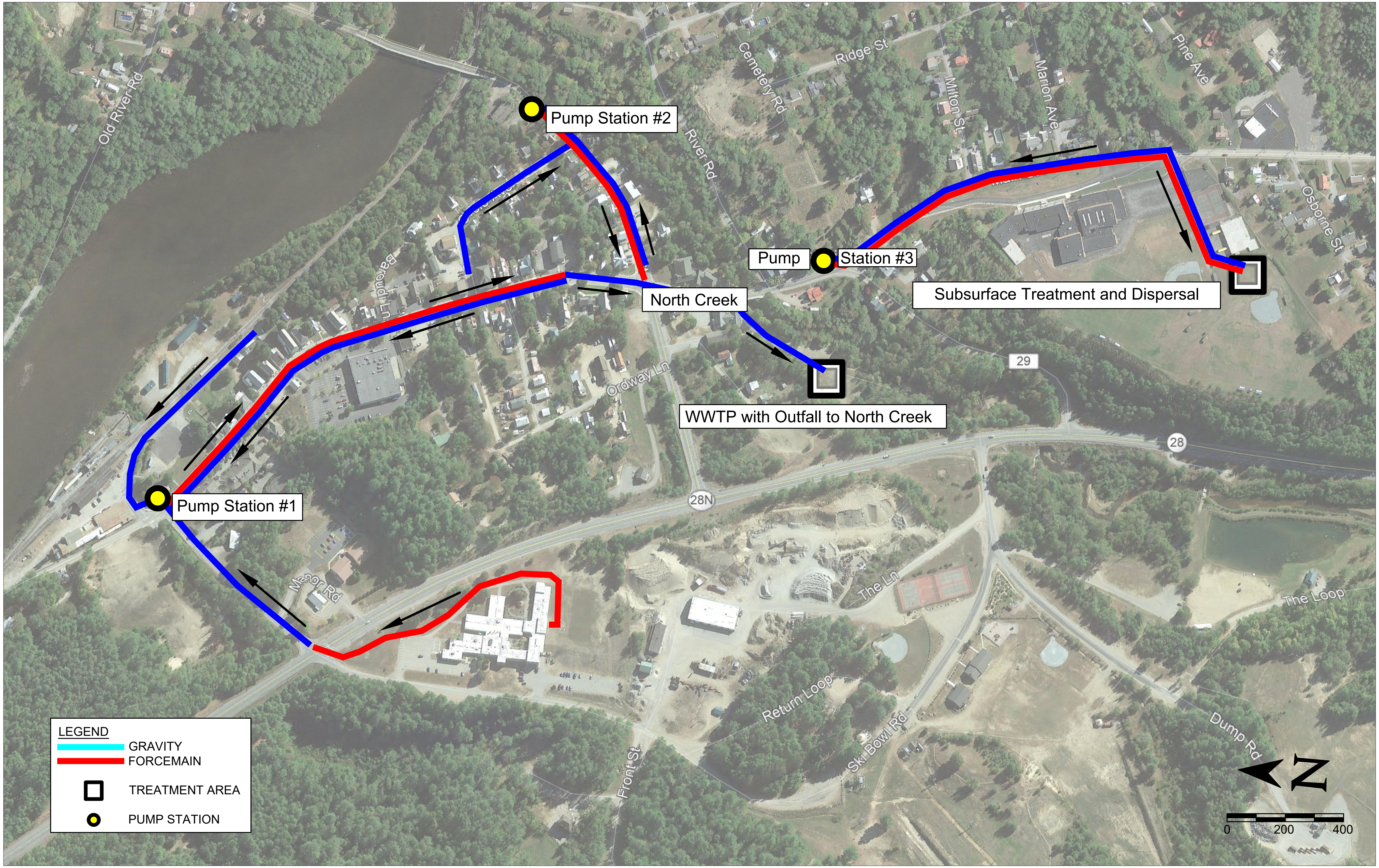
PROPOSED SEWER DISTRICT MAP	TOWN OF JOHNSBURG MAP, PLAN AND REPORT NORTH CREEK, NEW YORK WARREN COUNTY	A-12	CEDARWOOD ENGINEERING SERVICES PLLC 8-12 Dietz Street, Suite 302, Oneonta, NY 13820 3903 Main Street, Warrensburg, NY 12885



CEDARWOOD ENGINEERING SERVICES PLLC
3903 Main St., Warrensburg, NY 12885 (P) 518.623.5500
8-12 Dietz St., Oneonta, NY 13820. (P) 607.441.3246

A-13

TOWN OF JOHNSBURG
219 MAIN STREET
TOWN OF JOHNSBURG
WARREN COUNTY
NEW YORK

MAP, PLAN & REPORT
PROJECT SITE MAP

DATE: 3-3-2020

A-14

North Creek Sewer District Construction Items Estimate for Collection and Treatment
Estimate Prepared 01/2020

Pipe Lengths	Length (ft)	# MHs
Gravity Pipes		
8-inch gravity to PS #1	1715	10
8-inch gravity to WWTP	985	10
8-inch gravity to PS #2	730	8
8-inch gravity to PS #2	690	6
8-inch gravity to PS #1	720	5
8" gravity to PS #1	885	8
8-inch gravity to PS #3	1280	10
Total Length	**7005**	**57**

Force Mains	Length (ft)
Nursing Home FM to Gravity Line	1120
FM from PS #2 to Gravity Line	765
FM from PS #3 to Subsurface Treatment	1780
FM from PS #1 to Gravity Line	1715
Total Length	**5380**

Collection System Costs				
Item	**Unit Cost**	**Units**	**Qty**	**Total Estimated Cost**
Gravity Sewer Pipe (8-inch)	$ 150.00	LF	7005	$ 1,050,750.00
Sewer Manholes including Air Release	$ 8,000.00	EA	60	$ 480,000.00
Sewer Laterals	$ 5,500.00	EA	83	$ 456,500.00
Pumping Stations/w Backup Power	$ 125,000.00	EA	3	$ 375,000.00
2" HDPE Force Main from Nursing Home	$ 50.00	LF	1120	$ 56,000.00
3" HDPE Force Main from PS #1 to Gravity	$ 120.00	LF	1715	$ 205,800.00
3" HDPE Force Main from PS #2 to Gravity	$ 120.00	LF	765	$ 91,800.00
2" HDPE Force Main to Subsurface Treatment	$ 120.00	LF	1780	$ 213,600.00
Collection System Estimated Total				**$ 2,929,450.00**
Mobilization/Demobilization				$ 146,472.50
Maintenance and Protection of Traffic				$ 87,883.50
Contingencies				$ 439,417.50
Engineering and Construction Oversight				$ 351,534.00
Bonding, Permitting, and Grant Administration				$150,000
Total Estimated Cost				**$ 4,104,757.50**

***Need survey and borings to determine accurate topography and subsurface conditions.**

Treatment System - Main System behind Town Hall				
Item	**Unit Cost**	**Units**	**Qty**	**Total Estimated Cost**
Septic Tanks	$ 80,000.00	EA	2	$ 160,000.00
AX Max Units	$ 140,000.00	EA	8	$ 1,120,000.00
Recirculation and Pumping Systems	$ 80,000.00	EA	1	$ 80,000.00
Alkalinity Feed System	$ 40,000.00	EA	1	$ 40,000.00
Yard Piping	$ 80,000.00	LS	1	$ 80,000.00
Control Building	$ 320,000.00	LS	1	$ 320,000.00
Ventilation and Heating System for AX Units	$ 40,000.00	LS	1	$ 40,000.00
UV Disinfection System (Closed Vessel)	$ 150,000.00	LS	1	$ 150,000.00
Post Aeration Tank/Blowers	$ 50,000.00	LS	1	$ 50,000.00
8" Outfall Pipe	$ 120.00	LF	100	$ 12,000.00
Allowance for Outfall Structure	$ 15,000.00	LS	1	$ 15,000.00
Electrical/Controls	$ 150,000.00	LS	1	$ 150,000.00
Backup 75 KW Generator w/ ATS	$ 100,000.00	LS	1	$ 100,000.00
Treatment Estimated Total				**$ 2,317,000.00**
Contingency				$ 347,550.00
Engineering and Construction Oversight				$ 278,040.00
Bonding, Permitting, and Grant Administration				$ 100,000.00
Total Estimated Cost				**$ 3,042,590.00**
Estimated Annual O&M Cost				$ 45,000.00

Treatment System - Smaller System Behind School				
Item	**Unit Cost**	**Units**	**Qty**	**Total Estimated Cost**
Septic Tanks	$ 15,000.00	EA	2	$ 30,000.00
AX Max Units	$ 110,000.00	EA	2	$ 220,000.00
Recirculation and Pumping Systems	$ 20,000.00	EA	1	$ 20,000.00
Alkalinity Feed System	$ 15,000.00	EA	1	$ 15,000.00
Yard Piping	$ 25,000.00	LS	1	$ 25,000.00
Control Building	$ 50,000.00	LS	1	$ 50,000.00
Ventilation and Heating System for AX Units	$ 15,000.00	LS	1	$ 15,000.00
Dispersion Pits	$ 50,000.00	EA	2	$ 100,000.00
Electrical/Controls	$ 60,000.00	LS	1	$ 60,000.00
Backup 25 KW Generator w/ ATS	$ 40,000.00	LS	1	$ 40,000.00
Treatment Estimated Total				**$ 575,000.00**
Contingency				$ 86,250.00
Engineering and Construction Oversight				$ 69,000.00
Bonding, Permitting, and Grant Administration				$ 25,000.00
Total Estimated Cost				**$ 755,250.00**
Estimated Annual O&M Cost				$ 12,500.00

***Borings required to accurately determine subsurface conditions for subsurface release of water**

Collection System Total	**$ 4,104,757.50**
Main WWTP Total	**$ 3,042,590.00**
Secondary WWTP Total	**$ 755,250.00**
Total Estimated Project Cost	**$ 7,902,597.50**

Design Permit Flow	**72,000**	**GPD**
Flow per Equivalent Dwelling Unit	**330**	**GPD/EDU**
Estimated Number of EDUs	**218.2**	
Annual O&M Cost per EDU	**$ 263.54**	
Estimated Annual O&M Cost	**$ 57,500.00**	

	Debt Load	Total w/ O&M
Amount to Finance	**$ 7,902,597.50**	
Cost per EDU-3 Percent Loan-No Grant	**$ 1,832.34**	**$ 2,050.52**
Cost per EDU - 3 Percent Loan w/ 25 percent Grant	**$ 1,374.23**	**$ 1,592.41**
Cost per EDU - 3 Percent Loan w/ 50 percent Grant	**$ 916.17**	**$ 1,134.35**
Cost per EDU - 3 Percent Loan w/ 75 percent Grant	**$ 458.06**	**$ 676.24**
Cost per EDU-0 Percent Loan-No Grant	**$ 1,207.25**	**$ 1,425.43**
Cost per EDU - 0 Percent Loan w/ 25 percent Grant	**$ 905.44**	**$ 1,123.62**
Cost per EDU - 0 Percent Loan w/ 50 percent Grant	**$ 603.63**	**$ 821.81**
Cost per EDU - 0 Percent Loan w/ 75 percent Grant	**$ 301.81**	**$ 519.99**

APPENDIX B

Preliminary Evaluation of an Orenco® AdvanTex® Treatment Facility

Project Name
Hamlet of North Creek
Warren County, NY

Prepared for
Brian Suozzo, P.E.
Cedarwood Engineering Services, PLLC

Prepared by
Garry-Lee Espinosa
Orenco Systems, Inc.

Date
December 3, 2019

TABLE OF CONTENTS

SECTION 1: COST SUMMARY

This report presents the results of a feasibility study for the construction and long-term operation of a wastewater treatment system improvements for the Hamelt of North Creek, NY. All parcels in the study area are served by individual septic systems (with some advanced treatment systems) for treatment and disposal of wastewater. The on-site systems are obsolete and non-compliant with current regulatory standards.

Approximate construction costs, operation and maintenance costs, and life-cycle cost for an AdvanTex recirculating packed bed treatment system are included in this report.

Capital Costs

	Option 1		**Option 2**
	60,000gpd	**15,000gpd**	**75,000gpd**
STEP System	-	-	$54,879
Primary Treatment Tanks	$598,075	$239,251	$980,243
AdvanTex Treatment	$1,701,474	$513,444	$1,886,476
Total	$2,299,550	$752,695	$2,921,599

Operation & Maintenance Costs

Annual O&M Cost	$21,612	$5,839	$10,606

<u>Options 1: 60,000gpd System Includes the following components:</u>

- Two (2) 40,000gl Fiberglass Primary Tanks with access risers and lids
- One (1) 40,000gl Fiberglass Flow EQ/Pre-Anoxic Tank with:
  - Two (2) duplex pumping systems and equipment
  - Access risers and lids
  - Pumping system controlled by WWTP control panel
- Stage One AX-Max Treatment System (2,300sqft of textile) with:
  - Six (6) AX-Max300-42, each 300sqft
  - Two (2) AX-Max250, each 250sqft, (houses recirculation pumps, discharge pumps and fan assemblies)
- Stage Two AX-Max Treatment System (900sqft of textile) with:
  - Two (2) AX-Max250-35, each 250sqft

  - Two (2) AX-Max200, each 200sqft, (houses recirculation pumps, discharge pumps and fan assemblies)
- Alkalinity Feed System
- Flow Meter
- Telemetry control panel
- O&M Manual, start up, shipping costs, and installation costs

<u>Options 1: 15,000gpd System Includes the following components:</u>

- Two (2) 15,000gl Fiberglass Primary Tanks with access risers and lids
- One (1) 15,000gl Fiberglass Flow EQ/Pre-Anoxic Tank with:
  - One (1) duplex pumping systems and equipment
  - Access risers and lids
  - Pumping system controlled by WWTP control panel
- Stage One AX-Max Treatment System (575sqft of textile) with:
  - One (1) AX-Max300-42, 300sqft
  - One (1) AX-Max275, 275sqft, (houses recirculation pumps, discharge pumps and fan assemblies)
- Stage Two AX-Max Treatment System (275sqft of textile) with:
  - One (1) AX-Max275-35 (houses recirculation pumps, discharge pumps and fan assemblies)
- Alkalinity Feed System
- Flow Meter
- Telemetry control panel
- O&M Manual, start up, shipping costs, and installation costs

<u>Options 2: 75,000gpd System Includes the following components:</u>

- Seven (7) 1,000gl Concrete STEP tanks each with pump and controls (on-lot)
- Three (3) 50,000gl Fiberglass Primary Tanks with access risers and lids
- One (1) 50,000gl Fiberglass Flow EQ/Pre-Anoxic Tank with:
  - Two (2) duplex pumping systems and equipment
  - Access risers and lids
  - Pumping system controlled by WWTP control panel

- Stage One AX-Max Treatment System (2,950sqft of textile) with:
  - Nine (9) AX-Max300-42, each 300sqft
  - One (1) AX-Max200, 200sqft, (houses recirculation pumps, discharge pumps and fan assemblies)
- Stage Two AX-Max Treatment System (1,150sqft of textile) with:
  - Three (3) AX-Max300-42, each 300sqft
  - One (1) AX-Max250, 250sqft, (houses recirculation pumps, discharge pumps and fan assemblies)
- Alkalinity Feed System
- Flow Meter
- Telemetry control panel
- O&M Manual, start up, shipping costs, and installation costs

<u>Does Not Include:</u>

- Gravity collection or forcemain costs
- Anti-buoyancy flanges - add $36,000 per unit
- Control building to house controls and chemical feed
- UV disinfection treatment

SECTION 2: DESIGN SUMMARY

The facility addressed in this proposal includes a primary treatment (STEP), effluent sewer, and advanced secondary treatment for a new residential subdivision. Projected wastewater flow rates and organic loading were provided and based upon projected usage for the existing facility.

Wastewater Flow Rates

Hydraulic Design Parameters

	Option 1		Option 2
Design Average Day Flow	60,000 gal/day	15,000 gal/day	75,000 gal/day

Wastewater Strengths

Predicted wastewater strengths for the service area are outlined in the tables below. For TKN, TN, and NH_3-N restrictive permit limits, the primary treated effluent should have a minimum temperature of 15ºC, with pH ranging from 7.2 to 8, and a residual alkalinity of greater than 100 mg/L maintained throughout the process. This will typically require an alkalinity feed system.

Constituent Loading Assumptions - Option 1, 60,000gpd	DADF, gpd	Concentration (mg/L)	Primary Treated Load (lbs/day)
Biochemical Oxygen Demand (BOD5), mg/L:	60,000	150	75.0
Total Suspended Solids (TSS), mg/L:	60,000	40	20.0
Ammonia (NH_3-N), mg/L:	60,000	40	20.0

Constituent Loading Assumptions - Option 1, 15,000gpd	DADF, gpd	Concentration (mg/L)	Primary Treated Load (lbs/day)
Biochemical Oxygen Demand (BOD5), mg/L:	15,000	150	18.7
Total Suspended Solids (TSS), mg/L:	15,000	40	5.0
Ammonia (NH_3-N), mg/L:	15,000	40	5.0

Constituent Loading Assumptions - Option 2, 75,000gpd	DADF, gpd	Concentration (mg/L)	Primary Treated Load (lbs/day)
Biochemical Oxygen Demand (BOD5), mg/L:	75,000	150	93.8
Total Suspended Solids (TSS), mg/L:	75,000	40	25.0
Ammonia (NH_3-N), mg/L:	75,000	40	25.0

Permit Limitations

The following table provides the discharge limitations as provided by Cedarwood Engineering Services, PLLC.

Limitations	Concentration mg/L
Biochemical Oxygen Demand (BOD_5)	10
Total Suspended Solids (TSS)	5

Ammonia (NH_3-N), mg/L: (Summer)	1.2
Ammonia (NH_3-N), mg/L: (Winter)	2.2
Settable Solids (SS), mg/L:	0.1

Septic Tank Effluent Pumping (STEP)

STEP Interceptor Tanks are designed to collect wastewater; segregate settleable and floatable solids (sludge and scum); accumulate, consolidate and store solids; digest organic matter; and discharge primary-treated effluent. Passive, energy-free primary tank- age provides the most cost-efficient method of primary treatment available for nonindustrial sewage; BOD removal of >50% and TSS removal of > 90% (when using an effluent filter) are typically accomplished with passive primary treatment.

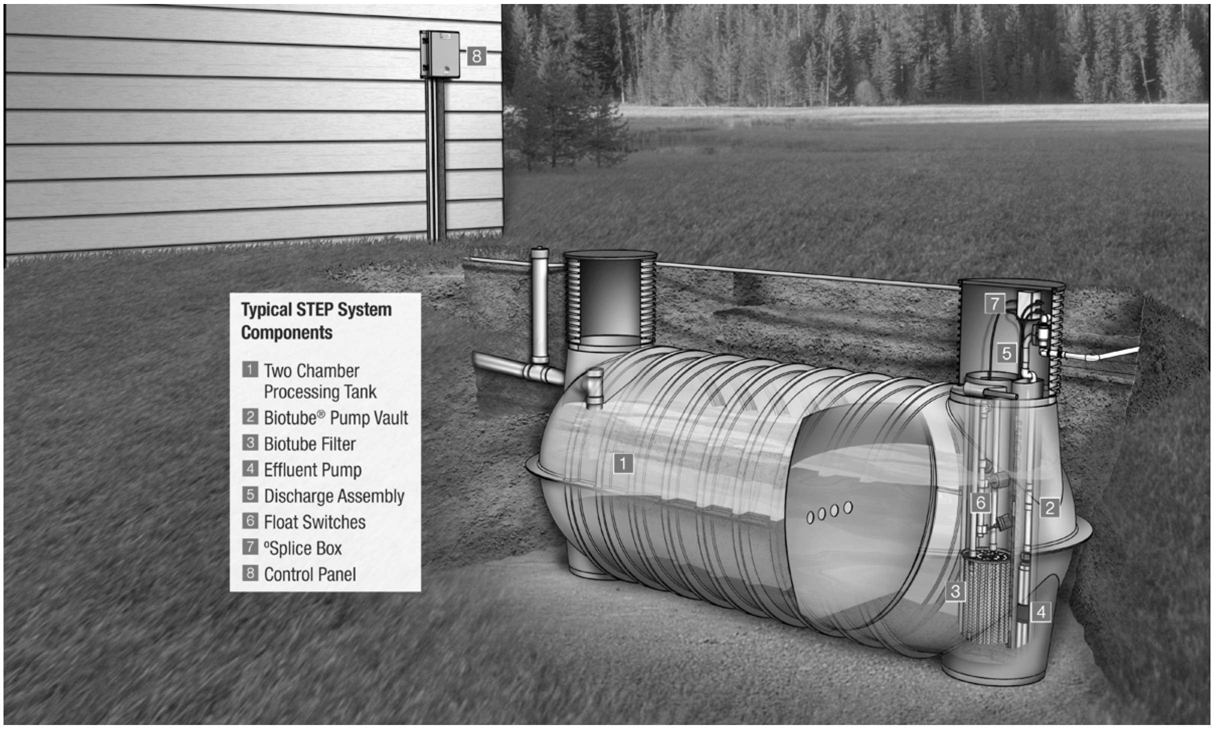


Figure 1. Typical STEP system components.

Forcemain (Effluent Sewer)

Effluent leaving the STEP tank is conveyed to the treatment plant using small diameter (typically 2 – 4" PVC or HDPE) forcemains. Only the filtered liquid is discharged by pump to shallow, small-diameter collection lines that follow the contour of the land. Solids remain in the underground tank, for passive, natural treatment.

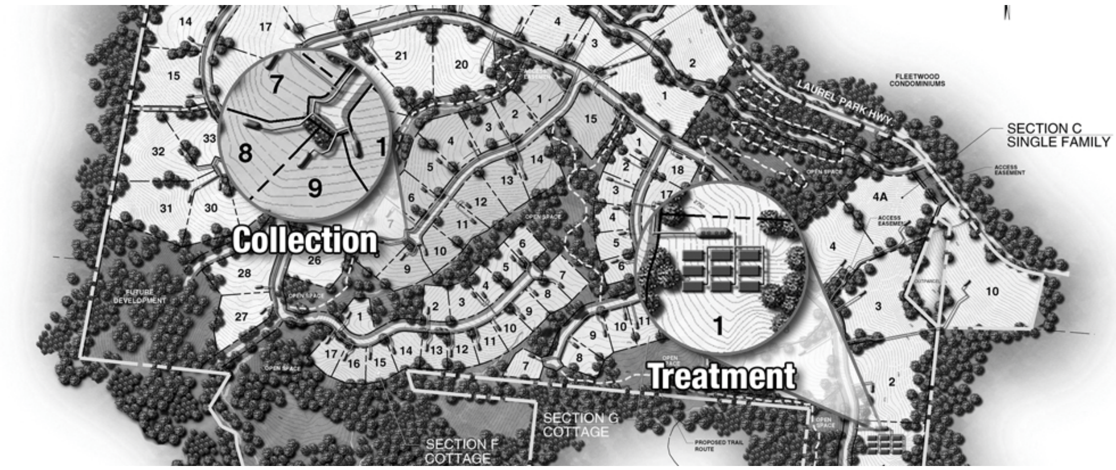


Figure 2. Orenco STEP System and AdvanTex Treatment Facility

Primary Treatment Stage

The primary treatment stage is designed to collect wastewater; segregate settleable and floatable solids (sludge and scum); accumulate, consolidate and store solids; digest organic matter; and discharge primary-treated effluent. Passive, energy-free primary tankage provides the most cost-efficient method of primary treatment available for nonindustrial sewage; BOD removal of >50% and TSS removal of > 90% (when using an effluent filter) are typically accomplished with passive primary treatment.

The primary treatment stage can be configured in several ways, including single- or multiple-compartment tanks, single tanks with meandering baffles (partitions), or multiple tanks in series. Some systems may utilize solids separation devices. Primary treatment includes effluent screening, and effluent may be discharged to the secondary treatment stage via gravity or pump.

Flow Equalization/Pre-Anoxic Tank

This process consists of recirculating a portion of the recirc-blend (or filtrate) from the AdvanTex secondary treatment system to an anoxic zone within the initial primary solids settling/collection chamber or, preferably, in a separate pre-anoxic tank. A pre-anoxic treatment stage tends to balance and lower concentrations by blending primary treated effluent with AX filtrate. It also provides an environment for denitrifying a portion of the nitrified filtrate.

The use of a pre-anoxic stage benefits all applications and is essential for those applications with high-strength waste (organic or nitrogen concentrations) and restrictive permit limits, as well as applications in which higher-quality effluent and enhanced overall removal performance are desired.

Flow equalization (**EQ**) provides stability by leveling out peaks in flow and allowing consistent loading of the treatment system. EQ is strongly recommended for systems with variable flow patterns and restrictive discharge limits. EQ is especially important for systems that have highly variable flow patterns due to usage (e.g., resorts and churches) or collection method (e.g., conventional gravity collection).

The EQ stage consists of a tank or tanks fitted with a timed-dose-controlled pumping system. It follows the primary tank and pre-anoxic tank (if used) and is typically located before pre-aeration/clarification tankage (if used) or a recirculation-blend chamber.

AdvanTex Treatment – Stage One

After pre-anoxic treatment, effluent is transported to the recirculation-blend tank or chamber, where it is blended with AdvanTex filtrate. The blended wastewater is distributed over the AdvanTex textile media and percolates down through the media, where it is filtered, cleaned, and nitrified by the naturally occurring microorganisms populating the media. After treatment, a portion of the filtrate is returned to the recirculation-blend chamber while a portion is transported to the next treatment stage or to dispersal. Note that a portion of the recirc-blend (or filtrate) is often returned directly to the pre-anoxic treatment stage.

Figure 3. Typical AX-Max Treatment Facility (Christiansburg, OH)

AdvanTex Treatment – Stage Two

After stage one treatment, effluent is transported to the stage two of an AdvanTex treatment system, which operates like stage one, except smaller. Because the BOD levels are low exiting stage one, nitrifiers populating stage two thrive in the low carbon environment providing additional reduction in ammonia.

STEP System (On-Lot) and Forcemain Components (Option 2 Only)

1,000 gal STEP System Estimate (Per Unit)

Interceptor Tank, 1,000 gal	$1,750
Access Equipment (2 ft & 4ft Burial Depth)	$473
STEP Pumping Equipment	$1,703
Control Panel (Telemetry & Non-Telemetry)	$617
Installation Estimate (% of Materials)	$2,726
Shipping Estimate (10% of materials)	$545
Total (Per Unit)	$7,840
Subtotal (7 total)	$54,879

Primary Treatment Tanks (Option 1)

Primary Treatment (WWTP)	**60,000gpd**	**15,000gpd**	**75,000gpd**
(2) 40,000gl / (2) 15,000gl / (3) 50,000gl Fiberglass	$220,000	$82,500	$412,500
Access Equipment	$8,109	$8,109	$12,163
Biotube Effluent Filter	$1,500	$750	$2,251
Subtotal	$229,609	$91,359	$426,914

Flow EQ/Pre-Anoxic Tank (WWTP)			
40,000gl / 15,000gl / 50,000gl Fiberglass	$110,000	$41,250	$137,500
Access Equipment	$4,054	$4,054	$4,054
Biotube Effluent Filter	$8,146	$4,073	$8,146
Subtotal	$122,200	$49,377	$149,700

Primary & Flow EQ/Pre-Anoxic Tank Shipping			
10% of material	$35,181	$14,074	$57,661

Construction Estimate			
Labor and Misc. Equipment (60% of Materials)	$211,085	$84,442	$345,968

Materials Total	$351,809	$140,736	$576,614
Construction Total	$211,085	$84,442	$345,968
Shipping	$35,181	$14,074	$57,661
Total	$598,075	$239,251	$980,243

AdvanTex® Treatment

Stage One AdvanTex Equipment	60,000gpd	15,000gpd	75,000gpd
AX-Max Treatment (2,300sqft / 575sqft / 2,950sqft)	$719,191	$181,814	$803,595
AX-MAX Pumping Equipment	$40,040	$20,020	$45,500
RNE Pump	$2,536	$2,536	$6,915
Discharge Pumping Equipment	$12,430	$5,269	$11,300
Ventilation Assemblies	$10,868	$2,717	$14,820
Float Assembly(s)	$622	$622	$565
Piping, fittings, glue	$2,400	$900	$3,000
Subtotal	$788,086	$213,877	$885,695

Stage Two AdvanTex Equipment			
AX-Max Treatment (900sqft / 275sqft / 1,150sqft)	$307,835	$92,169	$326,905
AX-MAX Pumping Equipment	$20,020	$6,215	$18,200
Discharge Pumping Equipment	$12,430	$5,269	$11,300
Ventilation Assemblies	$5,434	$2,717	$7,410
Float Assembly(s)	$677	$677	$615
Piping, fittings, glue	$300	$150	$450
Subtotal	$346,696	$107,197	$364,880

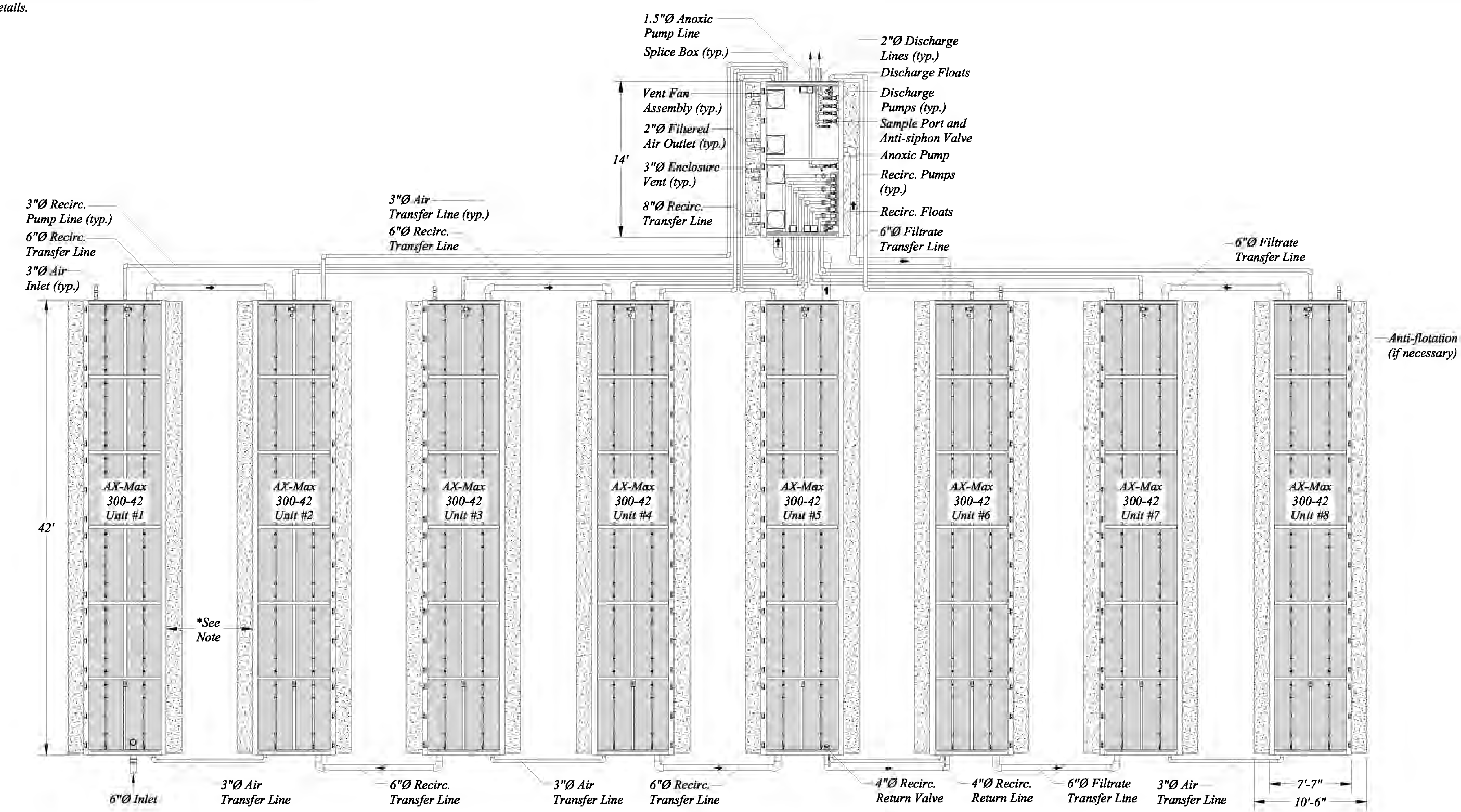
Ancillary Equipment			
Telemetry Control Panel w/ cell modem	$23,350	$14,250	$28,200
Alkalinity Equipment	$27,537	$13,705	$37,902
Instrumentation / Flow Meter	$7,975	$7,975	$7,250
Subtotal	$58,862	$35,930	$73,352

Shipping, Commissioning, and Operator Training			
Commissioning & Operator Training	$5,000	$5,000	$5,000
O&M Manual	$1,500	$1,500	$1,500
Shipping	$143,237	$42,840	$158,871
Subtotal	$149,737	$49,340	$165,371

Construction Estimate			
Labor and Misc. Equipment (% of Materials)	$358,093	$107,101	$397,178
Subtotal	$358,093	$107,101	$397,178

	60,000gpd	15,000gpd	75,000gpd
Materials Total	$1,193,644	$357,003	$1,323,927
Construction Total	$358,093	$107,101	$397,178
Shipping, Commissioning, and Operator Training	$149,737	$49,340	$165,371
Total	$1,701,474	$513,444	$1,886,476

Note: Spacing between AX-Max units is dependent on desired bury depth. Consult Orenco Engineering for details.



Customer Approval

Signature: ______________________ Date: __________

Customer Name: ______________________

By this signature, Customer indicates that they have reviewed this Proposed System Configuration Drawing and found that it meets all of the designer's functional requirements and/or specifications.

Orenco SYSTEMS

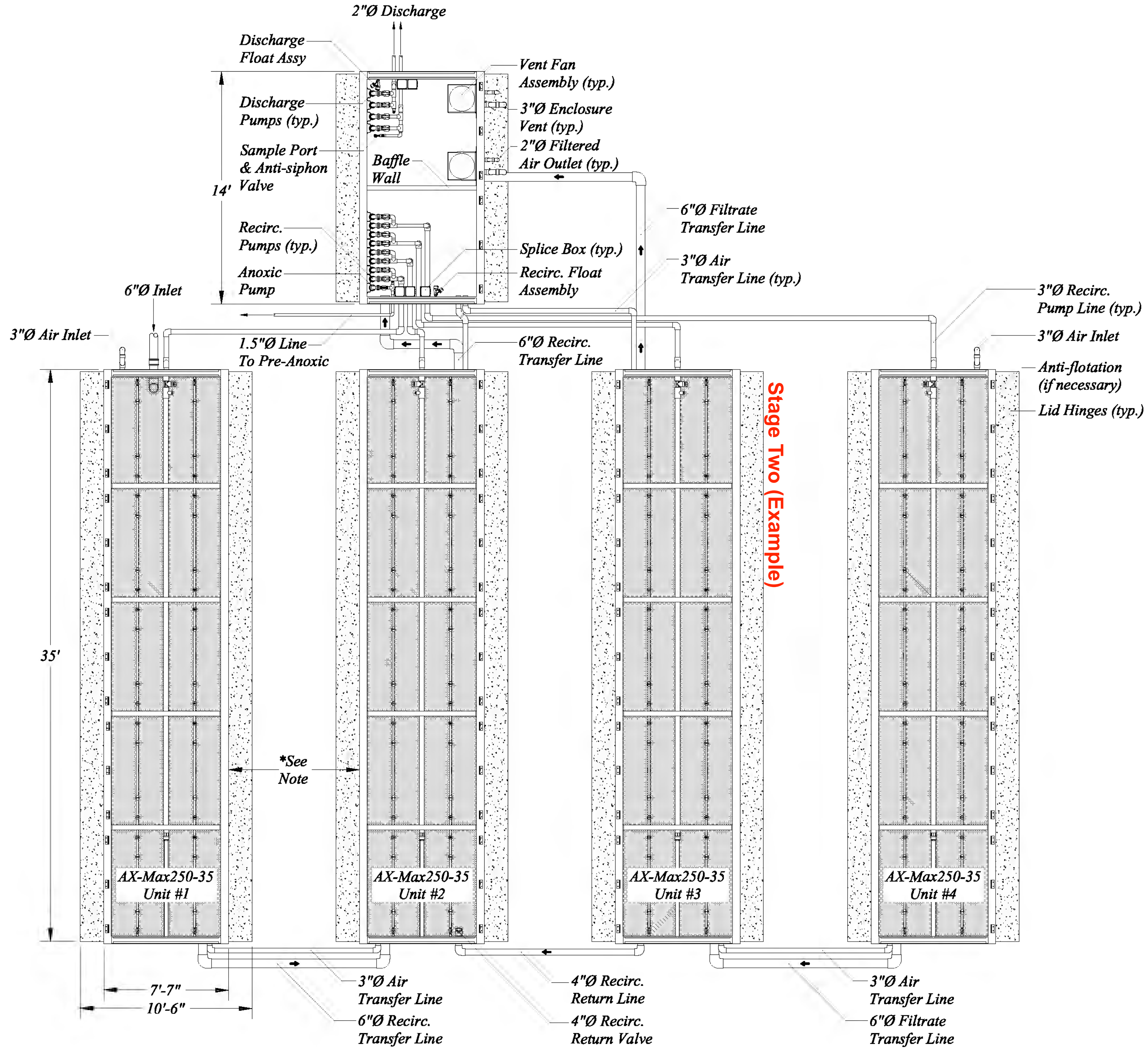
Disclaimer: This Proposed System Configuration Drawing is provided solely as a design aid and illustrates one possible configuration of a system that would comply with Orenco's design criteria for the requirements and/or specifications that have been communicated to Orenco (based on third-party standards, testing protocols and performance reports, as applicable). Design decisions, including the actual layout and configuration of the system and its viability for the project, are at the sole discretion of the system's designer.

AdvanTex AX-Max2400
Pump Discharge

Plan View

Drawn By:	BAS	Scale:	1" = 10'-0"
Reviewed By:	SH	Sheet:	1 OF 10
File Name:	AX-MAX2400-1.DWG	Rev: 2.0	Date: 11/02/2017

Note: Spacing between AX-Max units is dependent on desired bury depth. Consult Orenco Engineering for details.



Customer Approval

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Customer Name: ______________________

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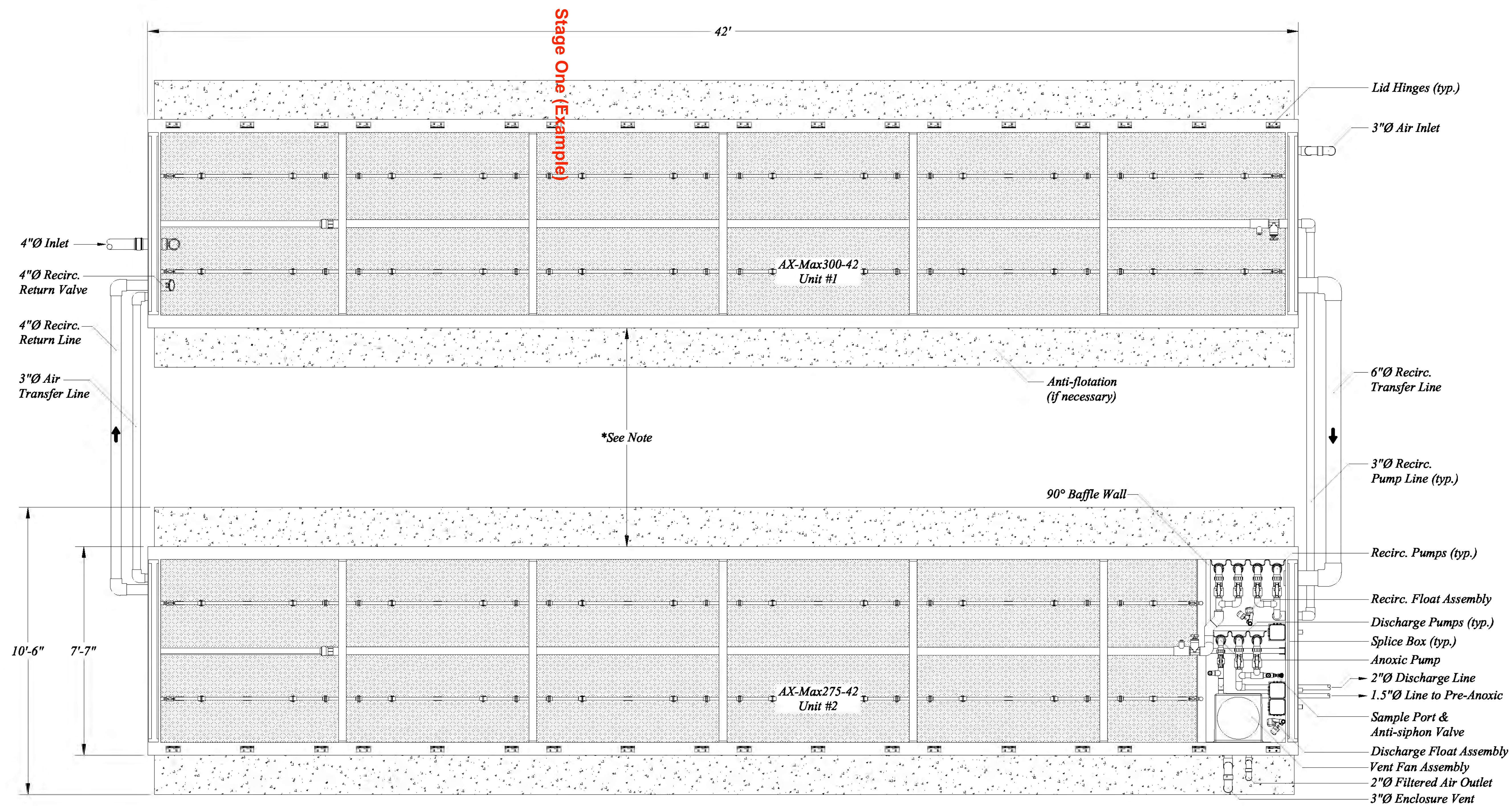
AdvanTex AX-Max1000 Pump Discharge	Drawn By: BAS	Scale: 1" = 8'-0"
	Reviewed By: SH	Sheet: 1 OF 6
Plan View	File Name: AX-MAX1000-1.DWG	Rev: 2.0 — Date: 12/20/2017

Note: Spacing between AX-Max units is dependent on desired bury depth. Consult Orenco Engineering for details.



Customer Approval

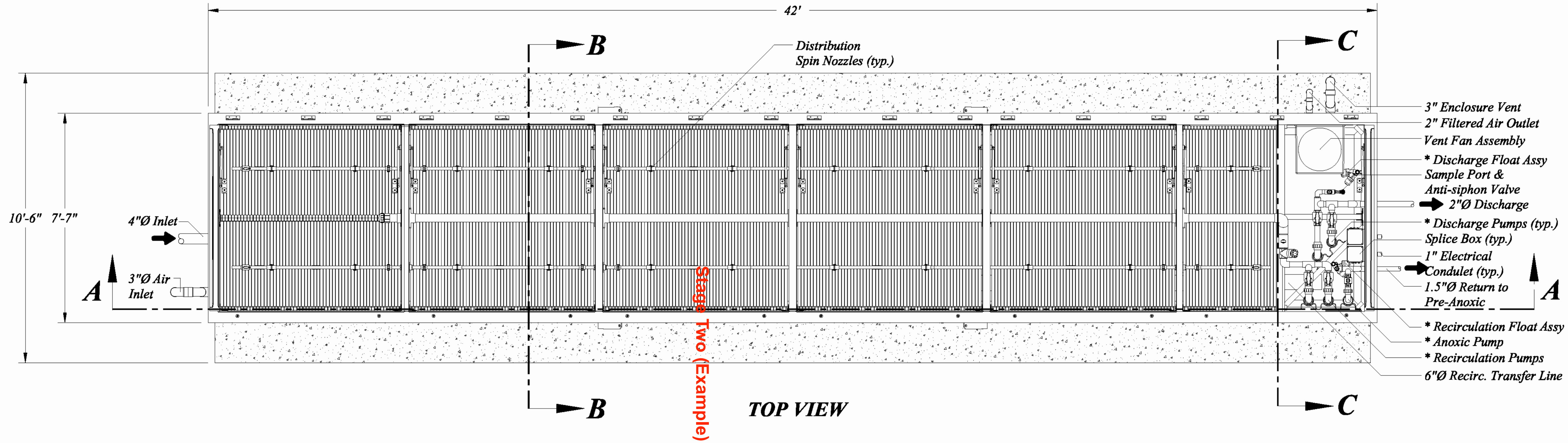
Signature: ______________________ Date: __________

Customer Name: ______________________

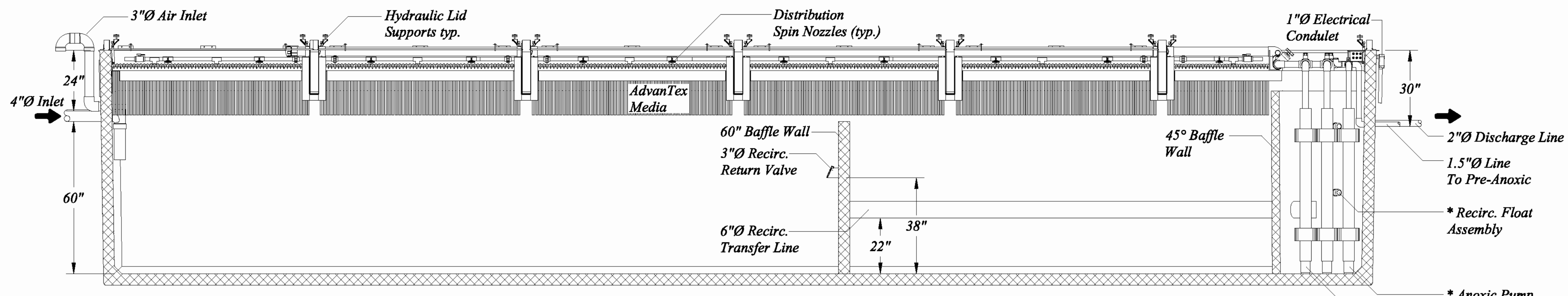
By this signature, Customer indicates that they have reviewed this Proposed System Configuration Drawing and found that it meets all of the designer's functional requirements and/or specifications.

Orenco® Orenco Systems®, Incorporated

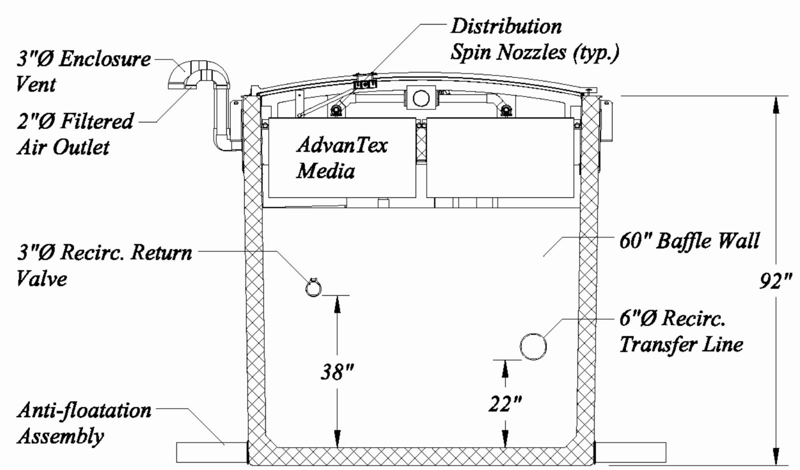
AdvanTex AX-Max575 Pump Discharge	Drawn By: BEN SMITH	Scale: 1" = 4'-0"
	Reviewed By: CSJ / NTB	Sheet: 1 OF 3
Plan View	File Name: AX-MAX575-1.DWG	Rev: 1.1 Date: 1/09/2017



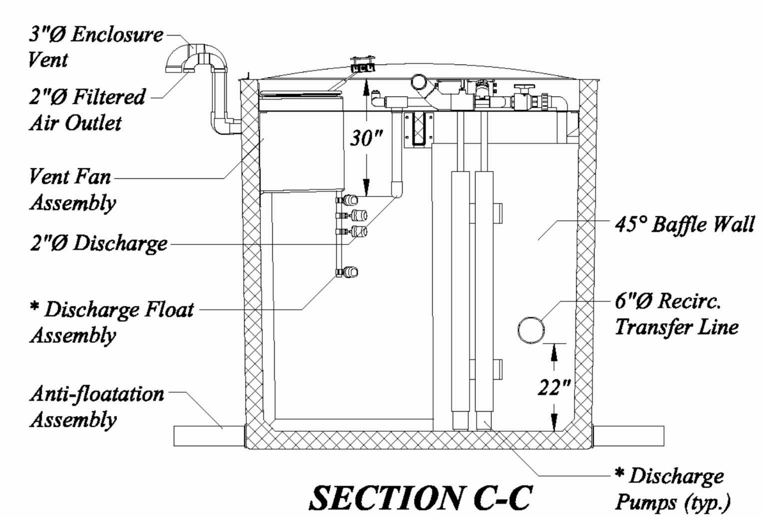
TOP VIEW



SECTION A-A



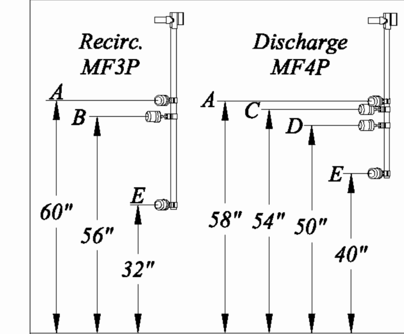
SECTION B-B



SECTION C-C

*** Float Functions & Pump Index**

A	High Level Alarm / Lag Enable
B	Override Timer
C	Pump ON
D	Pump OFF
E	Redundant Off / Low Level Alarm



Recirculation Pumps: PF7510	
Discharge Pumps: PF______	
Anoxic Return Pump: PF2005	

Customer Approval

_________________________ Date: __________

Customer Name: ____________________________

By this signature, Customer indicates that they have reviewed this Proposed System Configuration Drawing and found that it meets all of the designer's functional requirements and/or specifications.

Orenco®
Orenco Systems®, Incorporated

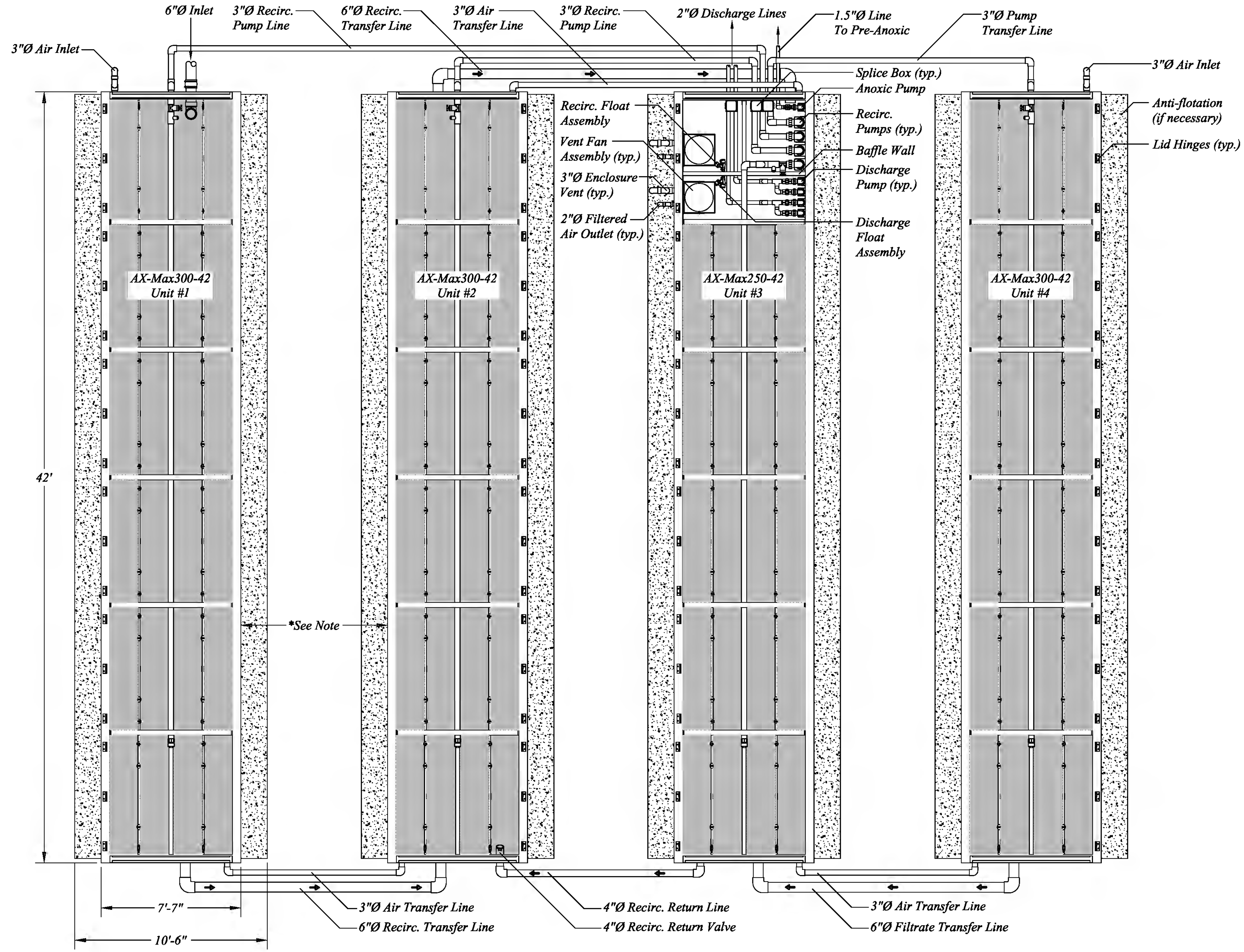
Disclaimer: This Proposed System Configuration Drawing is provided solely as a design aid and illustrates one possible configuration of a system that would comply with Orenco's design criteria for the requirements and/or specifications that have been communicated to Orenco (based on third-party standards testing protocols and performance reports, as applicable). Design decisions, including the actual layout and configuration of the system and its viability for the project, are at the sole discretion of the systems's designer.

AdvanTex AX-Max275-42

System Details

Drawn By: BEN SMITH		Scale: 1" = 4'-0"	
Reviewed By: CSJ / NTB		Sheet: 1 OF 1	
File Name: MAX275-42.DWG		Rev: 1.2	Date: 12/29/2016

Note: Spacing between AX-Max units is dependent on desired bury depth. Consult Orenco Engineering for details.



APPROVED:	
DATE APPROVED:	

UNAUTHORIZED CHANGES & USES

Orenco has prepared these drawings for use by the design engineer. Orenco will not be responsible or liable for unauthorized changes to or uses of these drawings. All changes to these drawings must be made in writing and must be approved by the design engineer.

PRODUCT CONFIGURATION DRAWINGS

Orenco Systems® Incorporated
Changing the Way the World Does Wastewater®

Drawn By: DSM	Project: AdvanTex AX-MAX 1150 Pump Discharge	Scale: 1" = 6'-0"	
Drawn For:		Sheet: 1 OF 5	
	Title: Plan View	Rev: 1.0	Date: 10/13/14