WWIDA CANALSIDE ENERGY PARK REPORT

AN OPPORTUNITY ANALYSIS STUDY

WESTON & SAMPSON, PE, LS, LA, PC

FINAL REPORT SEPTEMBER 2021

EXECUTIVE SUMMARY

This report was prepared on behalf of the Warren and Washington Industrial Development Agency (WWIDA), a public benefit corporation organized under the laws of the State of New York. The WWIDA sought to understand the existing conditions of the Canalside Energy Park, located within the Town and Village of Fort Edward. An 80-acre portion of the approximately 110-acre park was leased to and developed by General Electric to process contaminated sediment from the Hudson River. The site was fully remediated and is ready for active use, but its onsite infrastructure required a thorough assessment to determine if it could support new users. Additionally, the WWIDA needed to identify industries that are appropriate for the site's location and local workforce and to understand the regional marketplace for industrial use spaces and how this site can compete and contribute to the Town of Fort Edward, and the Villages of Fort Edward and Hudson Falls, the Town of Kingsbury, Queensbury, and City of Glens Falls.

Weston & Sampson reviewed historical documents, reports, and studies conducted for the site. A feasibility analysis was conducted to estimate the market potential of the site both locally and regionally, evaluate the feasibility of a regional composting facility, and provide conceptual site plans to support a larger vision. A public outreach session was also held to get feedback from local residents that would potentially be impacted or benefit from development of this site. The intent of this analysis is to provide the WWIDA a full understanding of the economic context for site development, a vision and implementation plan that outlines the steps required for build-out, and the needed resources and funding to achieve this vision.

This report includes the following components:

- Project background and site overview
- Analysis of existing infrastructure
- Demographics and Economic Considerations
- Site Opportunity analysis
- Recommended future actions to support development of the site

Project Background and Site Overview

In response to the 2002 Record of Decision with respect to General Electric and PCB contamination in the Hudson River, the US EPA selected the then named "Energy Park" in 2004 as the site designated to develop a facility to dewater the solids dredged from the Hudson River. The "Energy Park," located on the eastern side of the Village of Fort Edward along the Champlain Canal, originally consisted of approximately 110 undeveloped acres within a larger 410-acre industrial park owned by WCC, Inc. Approximately 80 acres (two parcels) of the "Energy Park" were leased to GE for dredging operations, and this area became commonly referred to as the "Dewatering Facility." The facility was completed, and dredging operations commenced in 2009 and continued through 2015. Demobilization of the facility began in 2016 and was completed with EPA approval in 2019. Subsequent to demobilization, a total of 80 partially developed acres in both public and private ownership remains. Additionally, approximately 330 acres in adjoining parcels in private ownership offer the potential to be incorporated into the park creating a regionally significant industrial park. There are also adjoining parcels owned by the NYS Canal Corp that may be integrated into this project.

Site and Infrastructure

The scope of this report includes the 80-acre former dewatering site owned by the Fort Edward Local Property Development Corp. as well as the adjacent 330+/- acres to the north owned by WCC LLC which taken together forms the 410-acre Canalside Energy Park. The 80-acre piece had been fully developed for the dewatering project and is largely paved with three remaining buildings, stormwater basins, canal access, and a rail spur. The 330-acre piece is largely undeveloped consisting of woods, brush and grass, filled areas, and wetlands. To the east and west of the site are existing industrial businesses and a golf course on the other side of the canal. Residential neighborhoods flank the southwestern edge of the site, and much of the remainder is vacant or agricultural land. Corn is grown on much of the acreage of the agricultural land. To the west of the site beyond the rail lines is the Feeder Canal Trail, a scenic recreational path along Towpath Lane.

As part of this feasibility study, the existing infrastructure within the vicinity of the site was evaluated to determine the potential for industrial development on the site. In general, the existing site infrastructure was developed to serve the specific needs of the dewatering site. The water supply was constructed to meet the needs of a private industrial site, the sanitary system utilized a series of holding tanks, and the electrical service was constructed with its own substation to serve a single metered user, and cannot easily be sub-metered to accommodate other users. Natural gas was not brought in to the site, and primary transportation access is via a single point of access from the north via Lock 8 Way, with a second gated emergency access point on East Street. There is potential for the East Street gate to be opened for car traffic. Our investigation revealed that all the necessary utilities and infrastructure to bring the site up to the standards of a fully functioning and robust municipal industrial park are available nearby and can readily be extended to serve the site in whatever configuration the future ownership dictates. This includes water, sewer, gas, electrical and transportation systems.

Environmental and archaeological resources were noted at the site, and outreach to permitting entities is recommended. An assessment-level field study of the adjoining 330 acre parcel revealed that approximately 75% of that parcel should be considered to be federal wetlands, subject to regulation under Section 404 of the Clean Water Act, and another small fraction of that parcel has been filled by a neighboring industry which may further limit the placement of roads and foundations. Furthermore, the site forms part of the habitat for migratory birds and at least one species of bat. Legislation that protects migratory birds is currently in flux; nonetheless, design considerations that support habitat can and should be integrated within Industrial Park design. Sites with cultural, historical, and archaeological significance are also present on the site, and additional conversations with relevant authorities will illuminate any requirements for documentation and/or further investigation that may be warranted.

Demographics and Economic Considerations

The consulting team examined the historic and current trends for population, incomes, education, commuting, and other data points. This research establishes that the population of Warren and Washington Counties is decreasing, with older residents remaining in the area while younger workers appear to be leaving. This trend presents challenges in building a workforce for the future, and businesses that are currently established in the area may find difficulty replacing retiring workers. Many factors may contribute to this trend, but it appears that wages in the Capital Region are higher for young workers, and career opportunities are more diverse and plentiful. Furthermore, workers in Warren and Washington County are also becoming more college-educated, but higher-level wages are still earned by mostly White and Asian workers. Because the area is becoming more diverse (the non-White population grew by 23% in the last decade), special attention should be given to cultivating job training, re-skilling, and ensuring that educational and apprenticeship opportunities extend to all residents.

Currently, the Warren-Washington Region employs approximately 56,000 workers, with Government, Health Care, Retail Trade, Manufacturing, and Accommodation/Food Service representing the largest source of employment (approximately 30,000 people or 54 percent of all employment in the two counties). The consulting team assessed hard skills in the region (i.e. what workers know), and found that while the top hard skills align more closely with prevailing industry sectors like Healthcare and Social Assistance and Food Services and Accommodations, it is the skills for jobs in manufacturing, production, transportation and logistics, green energy production, and professional and technical services that will more closely align with the future of the local region and the larger Capital Region. With a shrinking population and an aging workforce, the strategy for the region should include employee attraction, but another critical component is boosting the skills of those coming through the educational pipeline within the region and showing them potential pathways for immediate employment. Partnerships with schools, universities, and non-profits will be critical to developing clear pathways from school to work, and sites such as the Industrial Park could incubate young workers as well as businesses.

Based on the demographic, economic, and locational analyses, four broad industry types offer the best strategic direction for the Site: renewable energy and waste processing, food production/processing (including cannabis), manufacturing of organic material, renewable energy components, and medical waste devices, and transfer/storage. Each of these industry types offers the possibility for co-location of several complementary businesses and can include both small start-ups as well as more established companies. To assist the WWIDA in comparing industry opportunities with one another based on their time horizon, utilization of existing transport networks, infrastructure upgrade needs, revenue, and community benefits, the consulting team created an Opportunity Matrix, a tool to support decision-making. Furthermore, the consulting team provided a conceptual scheme that illustrates possible buildable areas on the site, as well as possible configurations for individual building sites. The Implementation Strategy at the conclusion of this report offers recommended actions to upgrade or add infrastructure, as well as measures to build the scaffolding for a much-needed collaborative workforce development effort. Also recommended is the creation of a strategic marketing plan directed towards the industries described in this report that can foster conversation and connections with business representatives. Furthermore, because the Site spans multiple jurisdictions, it is recommended the communities work together to create a unified plan and regulatory scheme for the site and consider a collaborative approach to economic development.

Site Opportunities

It is definitely seen as a positive that this site has multi-modal transportation options available to it – truck, railroad, and canal (seasonally). Rail is already successfully utilized in the transportation of bulk agricultural products; this model needs to be leveraged into other opportunities. The canal can be utilized as a green alternative to other forms of transportation, drawing upon the available storage space on the site to allow for off-season manufacturing and storage, followed by on-season shipment.

Recommended Future Actions

The implementation strategy that follows in Section 4.8 of this report is a matrix of items that are recommended to be undertaken to further the development of the WWIDA Canalside Energy Park. We have chosen to highlight some of the important items below.

General: The process of interacting with potential developers need to be streamlined and concentrated into a single entity or point of contact. This includes creation of a single jurisdiction zoning district that can supersede individual village/town(s) jurisdictions.

Infrastructure:

- Water: improve the existing water system to bring into compliance at an estimated cost range of $2,700,000 - $3,150,000. The Village may have plans for water line improvements on East Street and there could be an opportunity for the Village and site owner to jointly work together to reduce costs.
- Sanitary Sewer: Construct a compliant sanitary sewage system which connects into the existing system at an estimated cost range of $900,000 – $1,870,000, or for smaller scale needs construct on-site sanitary sewer disposal systems at an estimated cost of $385,000. The Washington County Sewer District may also have plans for sanitary sewer line improvements on East Street. It may be beneficial for the Washington County Sewer District and site owner to partner on this work to reduce costs.
- Transportation: Remove and reconstruct a new bridge on the access road at an estimated cost of $2.2 million.
- Transportation: If warranted, construct a new second access to the site on the East Street side connection to Baldwin Avenue at an estimated cost of $2.15 million.

Land Use:

Undertake a full wetland delineation and obtain a jurisdictional determination from the Corps of Engineers to pin down developable acreage. Part of this effort will need to include mapping of the wetlands.

The Warren-Washington Industrial Development Agency would like to thank the USDA and National Grid for the funding that made this feasibility study possible.

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1.0 PROJECT BACKGROUND

1.1 Introduction & Site Overview

Weston & Sampson PE, LS, LA, PC (Weston & Sampson), on behalf of the Warren and Washington Industrial Development Agency (WWIDA), has prepared this summary report for an 80-acre vacant industrial property located on Lock 8 Way, in Fort Edward, New York. Adjacent properties included in this report are the 330-acre WCC, LLC property and the access road (16 +/- acres) owned by the WWIDA. The Site Location map can be found in Appendix A of this report.

Site Ownership and Location

<u>Lock 8 Way—Fort Edward, New York</u>

Latitude (North): 43.276871 - 43˚ 16' 36.73''
Longitude (West): 73.569322 - 73˚ 34' 9.56''
Universal Transverse Mercator: Zone 18
UTM X (Meters): 383912 mE
UTM Y (Meters): 4792555 mN
Elevation: ±130 ft. above sea level
Site Owner: Fort Edward Local Property Development Corp.
Site Occupants: None
County: Washington
Parcel ID: 163.15-1-4, 163.-2-20.1
Size: 80 acres

Purpose

The intent of this report is to outline the current status of the Site regarding utility, infrastructure, environmental, and zoning. This information will help to guide options for future use.

Current Use of Property

The Site is currently owned by the Fort Edward Local Property Development Corp., which acquired the property after the Site was used as the Sediment Processing Facility. The Site is an 80-acre vacant industrial property with three (3) remaining buildings, paved areas, stormwater basins, and a rail spur. Groundcover for a portion of the Site consists of grass and overgrown wooded areas. The Site is serviced by public utilities consisting of water and electricity. The Existing Conditions map can be found in Appendix A of this report.

Current Use of Adjacent Properties

The Site is bordered by the Champlain Canal to the southeast and railroad to the northwest. Areas surrounding the Site are industrial except for a residential area to the south. The Land Use map can be found in Appendix A of this report.

Site History

Before use as the Sediment Processing Facility, portions of the Site were forested or used as a feed lot for livestock. The southern end of the Site was historically used as a topsoil mine. In recent years fill has been brought in from Clean Earth (formerly ESMI) to fill in the area within the 330-acre WCC portion of the site. During use as the Sediment Processing Facility, the Site was developed with water, and electricity utilities, a rail spur, a wharf along the Canal, several buildings to support processes at the Facility, and approximately 34 acres of impervious surface.

Previous Investigations

Numerous investigations have previously been performed on the Site. The following list is comprehensive of the past investigations and reports:

- Regional Biosolids Management Evaluation
- Creighton Manning Lock 8 Way Bridge Replacement Preliminary Engineering Report
- Industrial Park Overlay Analysis
- Dewatering Site Adaptive Reuse
- Northeast Industrial Development and Reuse Strategy
- Greenman-Pedersen Industrial Access Road Traffic Assessment
- Sewer Infrastructure Assessment
- Geotechnical Report
- SUNY Adirondack Center for Agriculture and Food Education
- Marine Terminal Study
- BridgeNY Funding Application

Included in the environmental-related investigations are Phase I Environmental Site Assessments, a Phase 2 Restoration Plan, and at least three (3) rounds of sampling. These investigations outline the pre-development use of the Site, the Dewatering Facility, and post-use closure activities performed at the Site.

2.0 EXISTING INFRASTRUCTURE

Weston & Sampson (W&S) was retained by WWIDA to assess the existing conditions of the former dewatering site, estimate the market potential of the site both locally and regionally, evaluate the feasibility of a regional composting facility, and provide conceptual site plans to support a larger vision. As part of this feasibility study, the existing infrastructure within the vicinity of the site was evaluated to determine the potential for industrial development on the site. Infrastructure, including water, sewer, stormwater, transportation, and culverts, was analyzed to determine the current capacity that the existing site can provide for a new industrial user. This analysis will provide a baseline for what the current site infrastructure can support and what an industrial user can expect to upgrade to meet their demands. Appendix B of this report includes an existing utilities map of the project site.

The result of our study of the infrastructure revealed one constant theme: that the infrastructure that was developed to serve this site was designed to serve ONLY the needs of the dewatering operation, and not the needs of a future industrial park. This site was not engineered to any pertinent municipal development standards, nor was it engineered to be readily adapted to a future, more public usage like an industrial park.

2.1 Ingress/Egress from the Site

The site currently has two points of ingress and egress for vehicular access. The main point of ingress and egress is located northeast of the site, before the bridge, from Lock 8 Way. Lock 8 Way transitions from NY-196 traversing parallel to the Champlain Canal. This road is currently owned by the WWIDA and is currently utilized by grain operators who use the rail yard at the site. The entrance to the site is gated and locked, restricting public access when there is no activity at the canal or at the site itself for public safety. Public access is maintained for those visiting the public areas at Lock 8. This is currently the only point of ingress and egress that is utilized at the site. The second point of ingress and egress is located to the southeast of the site which transitions from East Street. This point is currently owned by the Canal Corp and is not intended for permanent use, however, there is potential utilize this entrance to allow car traffic through this gate[1]. Currently, access through this point must be granted by the Canal Corp. The Village does not want truck traffic along East Street since it's not built for heavy traffic and concern for effects on buried utility lines. It is also located within a residential neighborhood which is another reason why this entrance is not used. A second two lane access road can be constructed at this entrance to the site to allow commercial traffic. This road would extend from the emergency access entrance to Baldwin Road, following the Champlain Canal through lands owned by the Canal Corp and NYSDOT. The estimated cost for the installation of this road is $2.15 million which includes, land acquisition, engineering, and other soft costs, along with construction costs, and an escalation factor.

[1] While WL Plastics was looking to redevelop an area within the park, Canal Corp was approached about allowing car traffic to use the gate near East Street. Canal Corp required greater discussion and evaluation. However, discussion was terminated when WL Plastics withdrew from the site.

Access Road Construction Cost Estimate				
Item	Unit	Quantity	Unit Price	Cost
Land Acquisition	LS	1	$ 25,000.00	$ 25,000.00
Clearing & Grubbing	LS	1	$ 100,000.00	$ 100,000.00
Grading & Box Out	CY	9600	$ 15.00	$ 144,000.00
Fabric	SF	130000	$ 0.25	$ 32,500.00
Subbase	CY	4800	$ 45.00	$ 216,000.00
Drainage	LS	1	$ 100,000.00	$ 100,000.00
Asphalt Pavement	TON	5800	$ 120.00	$ 696,000.00
			Construction Contingency (20%)	$ 270,000.00
			Construction Cost	**$ 1,590,000.00**
			Permitting (10%)	$ 160,000.00
			Engineering (15%)	$ 240,000.00
			Escalation (10%)	$ 160,000.00
			Total Project Cost	**$ 2,150,000.00**

The site also has access via rail and the Champlain Canal. The Champlain Canal is a 60-mile canal system that connects the southern end of Lake Champlain and the Hudson River. The project site is located adjacent to the Champlain Canal as the canal was used to transport sediment and transfer sediment to the site. The site has a bulkhead located on the east side of the site that was used to dock barges during transport and transfer. The Champlain Canal is currently used for more recreational activities such as leisure boating. The canal is only operational during part of the season as it is drained during the winter months and can handle limited commercial traffic. To accommodate industrial traffic along the canal, the canal would need to be widened and dredged in order to create more space for barge traffic, and some of these improvements may be in the planning stages at the Canal Corp.

The rail system is located to the west side of the site which consists of six separate tracks. The rail system at the site is currently being utilized for a grain operation. There is a current agreement in place with the SMS Rail Lines of New York which was established in 2017 within the Fort Edward area. The rail infrastructure is classified as Class 1 Rail which 3.5 miles of rail spurs and in-motion rail scale has been installed and belongs to the owner of the lot and is leased to SMS Rail Lines. This rail infrastructure is directly adjacent to Canadian Pacific Railway's Fort Edward hub. The SMS serves the industry in the region and provides on-demand rail car switching with an array of logistical loading and unloading services as well as rail car storage. The SMS interchanges with the local Canadian Pacific Railway.

The area's unique access to NY-196, an active rail line, and the Champlain Canal can provide multi-modal transportation access which can serve both commercial and industrial businesses.

2.2 Bridges and Culverts

An existing bridge lies along Lock 8 Way, which is the main entrance to the site and crosses one of the old Champlain feeder canals. The existing structure is a Mabey Truss bridge located at the north end of Lock 8 Way in Kingsbury, NY. The existing bridge has one 95.55 ft. span, with two 12 ft. travel lanes, each with a 3 ft. shoulder for total roadway width of 30 ft. Concrete barriers bound each shoulder with galvanized steel trusses outside for a total out-to-out width of approximately 43'-7". The bridge bears on concrete abutments supported by driven steel H-piles. The bridge was designed for two lanes of traffic and HS25-44 loading per AASHTO Standard Specifications for Highway Bridges, 17th Ed. The bridge is classified as "temporary" and has not been properly rated for permanent use.

A study was conducted by Creighton Manning Engineering, LLP in March of 2021, and it was concluded that there weren't any immediate concerns about the bridge at the time of the inspection. A few minor deficiencies were reported including minor leaking, observed corrosion, surface cracking of the concrete foundation and small deflection of the superstructure. It was recommended to replace the existing Mabey truss superstructure with a new steel multi-girder superstructure to safely accommodate the long-term traffic for the newly developed Energy Park. It is quoted that the total cost for this alternative, including material, construction, architectural and engineering design, and inspection is approximately $1,132,000. This report can be found in Appendix B of this Report.

McFarland Johnson prepared an updated cost estimate for the WWIDA for preparation of their 2021 BridgeNY application. The WWIDA submitted the application asking New York State for $2.2 million to support funding for this bridge construction project. This is well above the estimated cost provided by Creighton Manning.

Lock 8 Way is a two-mile-long access road connecting the former GE dewatering site to NY Route 196. The road consists of one 12-foot lane in both the northbound and southbound directions, except for a "neck-down" located at an existing culvert. The existing 48" cast iron concrete-encased culvert was installed before the installation of the road. This location constricts to just a single lane to avoid conflict with the culvert as it has historical significance. This narrowing to a single lane requires vehicles to travel 210 feet within a conflict zone before clearing back to two-lane operations. Based on a traffic analysis conducted by GPI in 2016, the following findings of this critical section of the road were reported:

1. The estimated peak-hour design capacity of this road segment ranges from 250 to 465 vehicles per hour.
2. The estimated daily design capacity of the road segment is 8,600 vehicles per day.
3. This road segment could support approximately 250,000 square feet of industrial space without exceeding the calculated functional capacity of the critical road segment of the Lock 8 Way.

If more than 250,000 square feet of industrial space is anticipated for a new industrial user, the roadway and culvert would need to be extended to support the functional capacity of the road. This would require the construction of a twelve-foot lane and the culvert to be extended past the limits of the second lane. The anticipated cost for this is approximately $284,000, the breakdown of this cost estimate can be found below.

Culvert Extension Construction Cost Estimate				
Item	Unit	Quantity	Unit Price	Cost
Land Acquisition	LS	1	$ 25,000.00	$ 25,000.00
Clearing & Grubbing	LS	1	$ 10,000.00	$ 10,000.00
Grading, Box Out & Fill	CY	500	$ 45.00	$ 22,500.00
Fabric	SF	2600	$ 0.25	$ 650.00
Subbase	CY	100	$ 45.00	$ 4,500.00
Culvert Extension	LF	20	$ 500.00	$ 10,000.00
Headwall (Wingwall)	LS	1	$ 25,000.00	$ 25,000.00
Drainage/Restoration	LS	1	$ 25,000.00	$ 25,000.00
Asphalt Pavement	TON	350	$ 140.00	$ 49,000.00
			Construction Contingency (20%)	$ 35,000.00
			Construction Cost	**$ 210,000.00**
			Permitting (10%)	$ 21,000.00
			Engineering (15%)	$ 32,000.00
			Escalation (10%)	$ 21,000.00
			Total Project Cost	**$ 284,000.00**

2.3 Electric

The existing site currently has a substation which was built about 10 years ago by General Electric and is owned by the current property owner, the WWIDA. The substation is well oversized, by a factor of 4 or 5, and was built for General Electric's use. The substation cannot be further sub-metered down the line as it was originally constructed for an individual user. The substation was built to commercial standards, and not utility-grade standards. A commercial substation can only be utilized by a single large user without the user forming a public utility. If the site is serviced by a public utility, such as National Grid, multiple users can use the utility. Alternatively, a substation of this size can be sold for about $500,000 as confirmed by National Grid. National Grid is the local power distributor for the area and has the capabilities of bringing distribution-voltage services to serve any future users at the site. National Grid has power on both sides of the site and could easily add these services to serve multiple users at the site.

2.4 Natural Gas

National Grid confirmed that there is an existing 2" gas main located along Towpath Lane, located to west of the railroad. The 2" gas main is able to provide 35 PSI of pressure, which is capable of serving most warehouse and manufacturing operations. Other operations such as glass making, metals, chemicals, pulp & paper can be gas intensive, so an evaluation would be required to be conducted by National Grid to determine if adequate capacity can be provided. If connecting to this gas main, this will require a service connection underneath the railroad. It is our opinion that there isn't an adequate supply of gas to support numerous buildings or heavy development at the site.

2.5 Water

The existing site contains a system of 4" and 6" diameter water mains and a series of fire hydrants (some inoperable) that traverse the site in a dead-end fashion. Some fire hydrants were found to be shut off and water lines were previously drained to prevent building damage or freezing of the system. While the water system was suitable for a temporary industrial use as a dewatering facility, it does not meet the Great Lakes Upper Mississippi River Board Standards for drinking water systems (10 States Standards), and therefore it would need to be upgraded to be in compliance with municipal design standards. This includes a minimum of 8" diameter water mains, hydrant spacings suitable for firefighting, and a looped redundant source of supply or on-site storage to accommodate outages and firefighting. In spite of the obvious flaws in the existing system, we can report that the water supply is connected to the Village of Fort Edward's water supply system.

On April 9th, 2021, W&S had conducted flow testing along East Street to determine the maximum capacity of water which can reach the site. Based on our findings it was determined that the maximum flow rate along East Street was 800 GPM (1.15 MGD) based on NFPA standards for fire flow. The treatment plant on average distributes 400,000-440,000 gallons per day with a maximum of 565,000 gallons per day. The Village's water treatment plant has a current capacity of approximately 1.3 MGD which includes water storage within the system. The water treatment plant has a water withdrawal limit of 1.2 MGD.

Between the water main connection at East Street and the site, there is a backflow preventer that reduces the working pressure at the site by approximately 13 PSI, therefore reducing the amount of water reaching the site to 650 GPM. Based on the type of industrial user anticipated to move to the site, we recommend that the backflow preventer be removed to increase the capacity reaching the site. Based on our analysis of the Village's existing water system, 635,000 GPD (440 GPM) can be used for the site. The current infrastructure connecting to the site is adequate to get this supply of water to the site. A developer who needs to add between 0 MGD and 0.5 MGD above the current capacity to the site will be required to implement on-site storage. Water storage tanks range from $1-$5 per gallon based on the amount of storage needed, for example, a 40,000-gallon water storage tank will cost around $200,000 while a 500,000-gallon tank will cost $500,000. This is due to the economies of scale as you pay less per gallon of storage for a larger tank. This analysis does not account for future growth within the Village which could influence the available capacity of the system. The Village is currently looking to pursue replacement of both the water and sewer mains along East Street. This project can be grouped with a series of infrastructure improvements along East Street which can provide cost savings to both the Village and the owner of the site.

The cost for replacing the existing distribution system and providing on-site storage ranges from $2,700,000-$3,150,000. The variability in this cost is based on the amount of on-site storage needed. The breakdown of the cost estimate included below assumes full replacement of the distribution system and a 500,000-gallon tank. This cost is only applicable to the 80-acre area of the previous dewatering facility, this cost estimate did not account for expansion into other areas of the site. This cost estimate includes materials, installation, permitting, engineering design fees and an escalation factor. A breakdown of this estimate can be found below.

Water Distribution System Replacement Cost Estimate				
Item	Unit	Quantity	Unit Price	Cost
8" PVC Water Main	LF	6500	$ 200.00	$ 1,300,000.00
On-Site Water Storage	LS	1	$ 500,000.00	$ 500,000.00
Fire Hydrant	EA	15	$ 5,000.00	$ 75,000.00
8" Gate Valve	EA	10	$ 5,000.00	$ 50,000.00
			Construction Contingency (20%)	$ 390,000.00
			Construction Cost	**$ 2,320,000.00**
			Permitting (10%)	$ 240,000.00
			Engineering (15%)	$ 350,000.00
			Escalation (10%)	$ 240,000.00
			Total Project Cost	**$ 3,150,000.00**

2.6 Stormwater

The existing site currently manages stormwater runoff through a series of sediment ponds and detention ponds located on-site. There are a series of catch basins throughout the site that collects and conveys stormwater to the different ponds on site. There are a total of three detention ponds that previously treated contaminated surfaces in direct contact with dewatering operations. These concrete ponds were designed for the treatment of hot spot areas on site due to the level of potential contamination of their combined tributary areas. They can be utilized by an industrial user who anticipates contaminated runoff from their operation. These ponds were connected to an existing onsite water treatment facility before releasing discharge into the Champlain Canal. The onsite water treatment facility has since been decommissioned and would likely need to be replaced if “hot spot” stormwater treatment is determined to be necessary as part of future development. For future development, these ponds could be utilized for stormwater management depending on the type of industrial activity proposed. The type of industrial activity will determine the amount of treatment required before releasing into the Canal. These ponds are tributary to approximately 37 acres of the existing site. The other four sediment ponds located around the site are tributary to overland runoff generated from previously non-contaminated surfaces. This consists of approximately 24 acres of the site. The sediment basins discharge directly into Bond Creek, the Lock Diversion Canal, or the

Champlain Canal. The current stormwater system provides adequate capacity for the existing hardscape on-site per current DEC design standards; therefore, the site has adequate stormwater infrastructure to support a new industrial user.

2.7 Wastewater

There is presently no operating sanitary system on the site, the developer elected to install a system of temporary holding tanks which were pumped and hauled at regular intervals to a treatment facility. To function as a municipal industrial park, a sanitary sewer system will need to be engineered and constructed in accordance with Great Lakes Upper Mississippi River Board Standards (10 States Standards) for wastewater facilities. We have evaluated two alternatives to accomplish a sanitary sewer connection between this site and the Washington County Sewer District No. 2.

Approximately half of the existing site is currently located within the Washington County Sewer District No. 2 boundary but is not officially part of the sewer district. The other half of the site is currently not located within an existing sewer district. For the site to become amended within the Sewer District, a map, plan, and report must be submitted for an extension of the existing Sewer District.

The WWTP has the current capacity to add an additional 0.1 MGD demand to their system. The WWTP design capacity is 2.0 which 90% of this total capacity can be used (1.8 MGD). The WWTP currently sees an average daily flow of 1.7 MGD. As required by the NYSDEC, a sanitary sewer connection will also likely require a 4:1 offset to relieve the system of stormwater runoff since this is a combined sewer system, meaning for every 1 gallon of wastewater estimated to be produced by the site, 4 gallons of stormwater will need to be removed elsewhere within the sewer collection system. A separate analysis would need to be done to identify areas within the collection system where stormwater separation can be done to meet this offset. Sanitary sewer connection would only be feasible for an industrial developer who would require a maximum of 0.1 MGD wastewater demand at the site. Anything above this threshold would require capacity upgrades at the WWTP including the installation of a secondary clarifier, among other upgrades. For the purpose of this analysis, it was assumed that the daily demand would be equal to a typical warehouse complex or office building with only one building service connecting to the pump station. If more than 0.1 MGD is required for the user, major upgrades at the WWTP would be required which will come with significant costs.

There are a series of alternatives that the developer can choose to construct to meet their required sanitary sewer capacity on-site, both of which include connecting into the Washington County Sewer District No.2 existing sanitary sewer system as there is available capacity at the WWTP. A map depicting these alternatives is included in Appendix B of this report. A description of these alternatives is outlined below:

Alternative 1 – Forcemain Connection to Existing WWTP

This alternative includes the construction of a pre-engineered duplex grinder pump station and forcemain which would directly connect from the on-site pump station to the existing system located at Argyle Street. The sewer main located along Argyle Street has a higher capacity compared to East Street, making this alternative most feasible if a relatively high sewer demand is needed at the site. From the on-site pump station, the forcemain would follow an alignment parallel to the Champlain Canal prior to connecting at Argyle Street.

This alternative does not account for future growth within the Village which could influence the available capacity of the system. The estimated cost for this alternative is $1,870,000 which includes cost of material, labor, permitting, engineering fees and an escalation factor. A breakdown of the cost estimate can be found below.

Sewer Alternative #1 Cost Estimate				
Item	Unit	Quantity	Unit Price	Cost
6" HDPE Directional Drill Forcemain	LF	5000	$ 200.00	$ 1,000,000.00
6" PVC Lateral	LF	500	$ 150.00	$ 75,000.00
Duplex Grinder Pumping Station	LS	1	$ 75,000.00	$ 75,000.00
			Construction Contingency (20%)	$ 230,000.00
			Construction Cost	**$ 1,380,000.00**
			Permitting (10%)	$ 140,000.00
			Engineering (15%)	$ 210,000.00
			Escalation (10%)	$ 140,000.00
			Total Project Cost	**$ 1,870,000.00**

Alternative 2 – East Street Sewer Connection

This alternative includes connecting a new sewer forcemain at the main located along East Street via the existing utility easement between the site and East Street. East Street is located directly southwest of the existing site and is in very close proximity. The sewer system located along East Street is currently a combined system that receives both residential wastewater and stormwater runoff during rainfall events. An analysis of the available capacity within the East Street sewer would need to be conducted to determine if it is adequate to support the proposed connection. Therefore, this alternative would be viable if a relatively low wastewater demand is needed on site. This alternative would be cheaper than the previously outlined alternative as the connection point is closer, and the required pumping demand would be much less. If a higher demand is needed, the developer would likely be required to replace the existing sewer main with new and provide a new stormwater collection system along East Street. This alternative does not account for future growth within the Village which could influence the available capacity of the system. The Village is currently looking to pursue replacement of both the water and sewer mains along East Street. This project can be grouped with a series of infrastructure improvements along East Street which can provide cost savings to both the Village and the owner of the site. The estimated cost for this alternative is $900,000 which includes cost of material, labor, permitting, engineering fees and an escalation factor for a pre-engineered pump station, forcemain installation, sewer connection, and sewer service laterals from the new buildings to the pump station. A breakdown of the cost estimate can be found below.

Sewer Alternative #2 Cost Estimate				
Item	Unit	Quantity	Unit Price	Cost
6" HDPE Directional Drill Forcemain	LF	2000	$ 200.00	$ 400,000.00
6" PVC Lateral	LF	500	$ 150.00	$ 75,000.00
Duplex Grinder Pumping Station	LS	1	$ 75,000.00	$ 75,000.00
			Construction Contingency (20%)	$ 110,000.00
			Construction Cost	**$ 660,000.00**
			Permitting (10%)	$ 70,000.00
			Engineering (15%)	$ 100,000.00
			Escalation (10%)	$ 70,000.00
			Total Project Cost	**$ 900,000.00**

Alternative 3 – On-Site Septic Systems

This alternative includes the use of on-site septic systems for disposal of sanitary waste. A typical septic system utilizes a septic tank, distribution box and distribution lines which discharges into a soil-based treatment system. The NYSDEC only permits between 1,000 to 10,000 gallons per day (gpd) per system which discharges treated sanitary wastewater into groundwater. As stated within the

SPDES General Permit GP-0-15-001, all facilities are limited to less than 30,000 gpd of total combined discharge. Each septic system would be sized based on estimated loading rates and soil percolation test results. A SPDES permit application would need to be filed with the NYSDEC for each proposed system on site. The existing septic tanks on-site could be reused in the design of the proposed septic system, which can provide additional savings to this alternative. This will be the cheapest of the three alternatives outlined within this report but would only be feasible if less than 30,000 gpd of sanitary wastewater production is expected at the site. This cost estimate assumes three (3) separate 10,000-gallon systems which includes material, installation, permitting, engineering design and an escalation factor. It is also assumed that none of the existing septic tanks would be incorporated within the design of these septic systems. A breakdown of the cost estimate can be found below:

Sewer Alternative #3 Cost Estimate				
Item	Unit	Quantity	Unit Price	Cost
15,000-Gallon Septic Tank	EA	3	$ 50,000.00	$ 150,000.00
Drainage Fields	EA	3	$ 25,000.00	$ 75,000.00
			Construction Contingency (20%)	$ 50,000.00
			Construction Cost	$ 275,000.00
			Permitting (10%)	$ 30,000.00
			Engineering (15%)	$ 50,000.00
			Escalation (10%)	$ 30,000.00
			Total Project Cost	$ 385,000.00

2.8 Broadband

Broadband internet is available within the Fort Edward area through a series of providers such as Spectrum, Hudson Valley Wireless, and Verizon. Fixed wireless internet will most likely be the most feasible internet connection to the site as it is relatively secluded from residential housing. As long as the site is located within the range of a wireless tower, then fixed wireless internet would be the most feasible option. Based on Phase 3 broadband mapping for the Village, fixed wireless internet service is provided by Hudson Valley Wireless to the northwest of the site.

2.9 Environmental

To determine possible future uses of the Site, an environmental review was conducted to assess the current status of the Site. This review included environmental resource mapping for natural resources, wetlands, and protected species; cultural resource mapping; desktop review of prior environmental reports provided by the WWIDA; and a windshield survey of the Site. The following paragraphs provide an overview of water, soils, and wildlife and potential permitting implications.

Waterbodies

The Champlain Canal is located along the eastern site boundary and runs from north to south. Bond Creek runs parallel near State Route 196 and intersects with the Canal. Here these waterbodies contain Flood Zone A with floodway elevations ranging between 130 and 142. The FEMA map can be found in Appendix B of this report. The Flood Zone continues south to about 500-feet north of the Town of Kingsbury municipal boundary. As such, the project area is located outside of this Flood Zone and is not located within a mapped floodway nor floodplain.

In addition to Bond Creek and Champlain Canal, there are a few unnamed streams within and surrounding the project area classified by the New York State Department of Conservation (NYSDEC) as class C streams. There are also some NYSDEC unclassified streams or ditches in the area. The Natural Resources Map can be found in Appendix B of this report.

U.S. Fish and Wildlife Service (USFWS) National Wetlands Inventory identified the following federal wetlands within and around the project site:

Freshwater Emergent Wetland habitat

- PEM1B
- PEM1C
- PEM1Cd
- PEM1E
- PEM1Ed
- PEM1F
- PEM1/SS1Cd
- PEM1/UBF
- PEM5E

Freshwater Forested Shrub Wetland habitat

- PFO1C
- PFO1Cd
- PFO1E
- PFO1Ed
- PFO1/SS1Cd
- PFO1/SS1Ed
- PSS1Ed
- PSS1/EM1E
- PSS1/FO1Ed

Freshwater Pond habitat

- PABFh

Lake habitat[2]

- L1UBHh

Riverine habitat

- R3UBH
- R4SBC

Freshwater Emergent and Forested Shrub Wetlands can be found along the southeastern portion of the project area and to the north. The Champlain Canal is classified as a Lake habitat and the various streams within and around the project area are considered Riverine habitat. Before developing any of these areas, wetland delineations are necessary to determine whether the wetlands are considered Waters of the U.S. and regulated under the Clean Water Act 404. An initial jurisdictional delineation is sent to the U.S. Army Corps of Engineers (USACOE) as part of a permit application. This is then verified by the USACOE, and the applicant can decide if they want a final approved delineation or if they want to proceed with an application with a verified preliminary delineation. The latter option is a

[2] Champlain Canal

shorter process. There are currently no NYSDEC wetlands indicated within the project area. The NWI map can be found in Appendix B of this report.

In addition to the information above, the NYSDEC Environmental Assessment Form (EAF) Mapper found that the site is located over a Principal Aquifer. Within the mapper, no threatened or endangered species or their critical habitat were found to be located within the project site. See section below for more wildlife information.

Wetlands & Filling Operations

A wetland assessment of the 330-acre parcel was performed by Quenzer Environmental LLC for the purposes of providing an estimate of the possible extent of wetlands. The assessment process is less detailed than a full delineation and does not include the process of obtaining a Jurisdictional Determination (JD) from the Army Corps of Engineers (ACOE) but is considered dependable for planning purposes such as this report. This assessment concluded that approximately 75% +/- of the 330 acres is federal wetlands, subject to regulation under Section 404 of the Clean Water Act. This designation severely limits the availability of development on this area, and any disturbance above one-tenth of an acre typically requires the issuance of a ACOE permit. It is possible that some level of solar development utilizing a small-disturbance foundation style could be considered after consultation with the ACOE. Additionally, a small zone of the parcel has been filled with reclaimed and treated soils from a neighboring industry and this area would require special consideration before development as fill soils can be unpredictable when supporting loads.

Soils

According to the USDA Natural Resources Conservation Service Web Soil Survey, soils primarily found within the project area include:

Table 2-1 - Canalside Energy Park Site Soils

Soil Type (%)	Setting Description	Depth to Restrictive Feature	Drainage Class	Depth to Water Table	Hydrologic Soil Group | Hydric Soil Rating
ClA - Claverack loamy fine sand, 0 to 2 percent slopes (28%)	Lake plain	20 to 40 inches	Moderately well-drained	18 to 24 inches	C/D | No
KbA - Kingsbury silty clay, 0 to 2 percent slopes (15%)	Lake plain	> 80 inches	Somewhat poorly drained	6 to 18 inches	D | No[3]
OP - Orthents and Psamments (15%)	Dredge spoils	> 80 inches	Well-drained	36 to 72 inches[4], > 80 inches[5]	A | No[6]
Wa - Wallington	Lake plain	15 to 24	Somewhat	6 to 18	D | No[7]

[3] Contains minor soil component Covington, which has a hydric rating.
[4] Orthants
[5] Psamments
[6] Contains minor soil components Covington and Fredon, which have a hydric rating.
[7] Contains minor soil component Madalin, which has a hydric rating.

silt loam, sandy substratum (15%)		inches	poorly drained	inches	
Ca - Catden muck, 0 to 2 percent slopes (11%)	Depressions, fens, bogs, swamps, and marshes in semi-rich organic wetlands	< 80 inches	Very poorly drained	0 to 6 inches	B/D | Yes

Most of the other soil groups have greater than 80-inch depth to a restrictive feature and an 8 to 24-inch depth to the water table. The soil report can be found in Appendix B of this report. The soil groups are mostly characterized as very poorly drained to moderately poorly drained with a few that are well-drained. However, the frequency of flooding and ponding is rare. Some of the soils are hydric while many are not. Soil hydrological group varies from A to D, with a few dual combinations with group D. The first letter relates to the soil type in a drained condition, and the second letter refers to an undrained situation.

Depth to restrictive features and depth to bedrock may indicate potential constraints to constructing structures with basements. According to The Northeast Industrial Development and Reuse Strategy[8], the former GE dewatering site was in an area with a shallow water table depth. Four to five feet of fill material and a clay liner were placed to ameliorate issues related to the high-water table.

Wildlife

USFWS Information for Planning and Consultation (IPaC) database identified the Indiana Bat (Myotis sodalis), an endangered species, as potentially being affected by activities within the project area. However, no critical habitats, National Wildlife Refuge Lands, and Fish Hatcheries were found to be located within the project area in this database. Information on migratory birds was not available.

In addition, NYSDEC Environmental Assessment Form (EAF) Mapper, an Internet-based application that assists the NYS Environmental Quality Review (SEQR) process by providing general information found on the forms, identified a couple of migratory birds that were listed as endangered, threatened, or having critical habitat that could be impacted by construction within the project area.

Species identified as potential concerns include:

- Northern Harrier (Circus cyaneus) is a state-protected threatened bird. It is protected by the Migratory Bird Treaty Act as a species not currently endangered but may become so.
- Short-Eared Owl (Asio flammeus) is listed as endangered in New York State. The Short-Eared Owl is also protected under the Migratory Bird Treaty Act.

State and federal permits may be required, as well as compliance with State and Federal Endangered Species Acts. As a result of these findings, time restrictions for clearing potential habitats may also be required, which is contingent upon permitting approvals.

Conclusions

A multitude of natural resources can be found around and within the project area. Before any additional planning occurs, it is recommended to contact the NYSDEC and USACOE to determine if any proposed improvements would require State or Federal Permits resulting from the identified

[8] (ELAN, The Williams Group and CT Male Associates, July 2014)

resources. Consultation with the agencies will determine the next steps necessary to proceed with potential improvements. In addition, a wetland delineation will likely be needed to verify boundaries and jurisdiction.

Cultural Resources

Several spatial features were found during an initial review on the NYS Cultural Resources Information System (CRIS) website around the project area. Nearby properties or features listed on the National or State Register of Historic Places or State Sites include:

Listed
- Lock C8 Lockhouse
- Lock C8 Storehouse
- Lock C8

Eligible
- Lock 8 Feeder Canal with Dam/Spillway Structure
- New York State Barge Canal Historic District
- Champlain Canal
- Fort Edward Delaware and Hudson Railroad Station

Before further development, a State Historic Preservation Office (SHPO) Consultation should be submitted to ensure no historic properties or archeological sites are impacted. The Cultural Resources map can be found in Appendix B of this report.

Historical Environmental Document Review Summary

At the request of the Warren and Washington Industrial Development Agency (WWIDA), Weston & Sampson (W&S) reviewed numerous environmental reports and documents regarding the Canalside Energy Park (the Site), including the former Sediment Processing Facility, in Fort Edward, New York. The following records were reviewed:

Table 2-2 – Environmental Historical Documents for Canalside Energy Park

Title	Subject Property	Prepared By	Prepared For	Date
Consent Decree	Extend of PCB contamination in the Hudson	United States	US District Court for the Northern District of New York	September 3, 2005
Phase 2 Sediment Processing Facility Demobilization and Restoration Plan	Sediment Processing Facility	Arcadis	GE	September 2015
Sediment Processing Facility Decontamination Report	Sediment Processing Facility	Parsons	General Electric	December 2016
Sediment Processing Facility Environmental Sampling Data Summary Report	Sediment Processing Facility	Arcadis	General Electric	December 2016
ASTM Phase I	Property on Lock	Civil &	WL Plastics Corp	October 2019

Environmental Site Assessment Report & Limited Subsurface Investigation	8 Way	Environmental Consultants of New York		
Sketch Subdivision Plan, S-1	Sediment Processing Facility	Van Dusen & Steves Land Surveyors	Fort Edward Local Development corporation	November 12, 2019
Contract Agreement		CT Male Associates	WWIDA	December 4, 2019
Phase I Environmental Site Assessment Former Sediment Processing Facility Site	1400 Towpath Lane	CT Male Associates	WWIDA	February 28, 2020
ASTM Phase I Environmental Site Assessment Report & Limited Subsurface Investigation	1400 Towpath Road	Civil & Environmental Consultants of New York	WL Plastics Corp	July 2020
User Questionnaire	Sediment Processing Facility	Unknown	Unknown	Unknown

2.9.1.1 Site Location and History

As previously mentioned, the Site was agricultural until construction began for the Sediment Processing Facility (the Facility) in 2007. The Facility was in use from 2009 through 2015 and decommissioned beginning in 2016. Within the WCC 330-acre property, over two million tons of thermally treated material have been brought in from Clean Earth (formerly ESMI) to fill in the area. This was completed under a Beneficial Use Determination (BUD) agreement between Clean Earth and the New York State Department of Environmental Conservation.

Before development as the Facility, soil samples were collected to gain an understanding of background levels of compounds and create a baseline against which future samples could be compared. Baseline samples from on- and off-site sources were collected. Some SVOCs and metals were detected above background levels during the pre-development sampling.

2.9.1.2 Use as the Sediment Processing Facility

The 80-acre Dewatering Facility was constructed with two zones - an exclusion zone where any PCB containing materials would be located, and the outer areas which would not be in contact with PCBs.

All 34 acres of impermeable surfaces within the exclusion zone were constructed with an underlayment of geosynthetic flexible membrane liner (FML). During use, the Facility processed 2.75 million cubic yards of material and removed 310,000 pounds (lbs) of PCBs. The canal was widened by 65 feet to streamline the removal of sediment from barges transporting to the Site. Seven (7) miles of railroad tracks were installed to transport treated sediment off the site. To protect the soil beneath the tracks, concrete panels were placed between and around the rails in the rail car loading area.

When the sediment handling facility was no longer needed, the site was decommissioned and decontaminated. Solid surfaces were pressure washed and flushed with water and confirmatory wipe tests were conducted to confirm decontamination was successful. Soils, stone, and railroad ties found to be contaminated were removed and disposed of offsite. Samples were collected before disposal of materials to confirm that decontamination was successful, and that waste was handled appropriately.

2.9.1.3 Post-Decommission Sampling

After decommissioning the Site, multiple rounds of testing were conducted to gain insight into the current conditions of the soils.

Post decommissioning samples were collected in 2015 and 2016 for soil, surface water, and groundwater at and adjacent to the Site. The following describes the samples collected:

- Surficial soil samples were collected at 31 locations across the Site. Three (3) samples contained PCBs in concentrations exceeding 1 part per million (ppm). Soil from these three (3) areas was removed until confirmatory samples were below the 1ppm guidance value.
- Subsurface samples were collected from 21 locations by Arcadis using soil boring technology. Parsons advanced an additional 31 bores across the Site. Coring and air knife methods were used to expose the FML in paved areas. Borings were advanced to 4' bgs or below the liner. 0-2' sample submitted, 2-4' sample archived. No analytes were detected above guidance values listed in New York State's (NYS) DER-10 Technical Guidance for Site Investigations and Remediation.
- Surface water samples were collected in five (5) locations adjacent to the Facility, three (3) from Bond Creek and two (2) from the Lock Diversion Channel. No PCBs were detected.
- Sediment samples were collected from 14 locations, with no PCBs detected above 1ppm. Total Organic Compounds (TOC) concentrations ranged from 8,100 to 83,000 ppm, comparable with pre-development samples.
- Groundwater samples were collected from 11 monitoring wells. All parameters were in line with pre-construction samples, with all detected analytes below guidance values listed in NYS Department of Environmental Conservation's (DEC) *Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations* (TOGS 1.1.1), except for four (4) metals. Oil and grease were detected in more samples post-construction, but in lower concentrations than pre-construction values.

Three separate sampling events took place between 2019 and 2020, collecting 7, 11, and 13 samples. These samples were also compared to baseline sampling taken before the construction of the facility. All samples had values lower than Restricted Use SCOs, except arsenic. However, arsenic was found in the pre-construction samples as well. Samples of impervious surfaces were also collected and analyzed. Any samples that did not meet the criteria for unrestricted use according to Appendix A of the Sediment Processing Facility Demobilization Plan were either removed and disposed of off-site or re-cleaned and re-sampled until the criteria were met[9].

A search of the NYSDEC spills database shows many spills associated with the Site. However, all spills were relatively minor and have since been closed out. Weston & Sampson does not consider this to be a source of contamination.

[9] See report reference in Table 2-2

No institutional or engineering controls have been reported for the Site. Recent Phase I Environmental Assessments completed for the Site indicate that no additional action or further investigation was required.

2.10 Discussion and Conclusions

As part of this feasibility study, the existing infrastructure within the vicinity of the site was evaluated to determine the potential for industrial development on the site. In general, the existing site infrastructure was developed to serve the specific needs of the dewatering site. The water supply was constructed to meet the needs of a private industrial site, the sanitary system utilized a series of holding tanks, and the electrical service was constructed with its own substation to serve a single metered user, and cannot easily be sub-metered to accommodate other users. Natural gas was not brought in to the site, and primary transportation access is via a single point of access from the north via Lock 8 Way, with a second gated emergency access point on East Street. There is potential for the East Street gate to be opened to car traffic. Our investigation revealed that all the necessary utilities and infrastructure to bring the site up to the standards of a fully functioning and robust municipal industrial park are available nearby and can readily be extended to serve the site in whatever configuration the future ownership dictates. This includes water, sewer, gas, electrical and transportation systems.

Environmental aspects for the project site were also reviewed to determine future uses. A review of the environmental resource mapper had shown that there are multiple natural resources within the area of the project site including Freshwater Emergent Wetland habitat, Freshwater Forested Shrub Wetland habitat, Freshwater Pond habitat, Lake habitat, and Riverine habitat. A review of the USDA Natural Resources Conservation Service Web Soil Survey had shown that the majority of the natural soils within the area had a relatively shallow water table and are typically poorly drained. Fill was placed overtop these natural soils to resolve issues related to the high-water table when General Electric was on site. Wildlife was reviewed utilizing the IPaC and NYSDEC environmental resource mappers to identify local wildlife species within the area. Species identified within the area included the Indiana Bat, Northern Harrier, and Short-eared Owl which are all considered endangered species in New York State. State and federal permits may be required, as well as compliance with State and Federal Endangered Species Acts for development within the project area. Cultural resources were reviewed using the Cultural Resources Information System mapping to identify spatial features within the area. Many of the resources identified as Listed were identified at Lock 8. A handful of eligible resources were also identified within the area. Before further development, it is recommended that a State Historic Preservation Office (SHPO) Consultation should be submitted to ensure no historic properties or archeological sites are impacted.

A desktop review of previous environmental reports reproduced for the dewatering site was done to determine the potential level of contamination of the site. Based on this review, it was determined that the site was decontaminated satisfactorily as indicated by the sample results provided in these reports. It is Weston & Sampson's opinion that no further actions are required to address contamination concerns at the Site.

3.0 SOCIO-ECONOMICS & MARKET

RKG Associates evaluated the demographic and economic base of the region across three geographies: 1) Warren and Washington Counties (together and separate), 2) The Lake Champlain-Lake George Region (LCLG)[10], and 3) The Capital Region[11]. By evaluating three regions, RKG Associates was able to better understands trends in the local area and how they align or deviate from trends in the broader regions. Each section of the analysis will detail the regions analyzed.

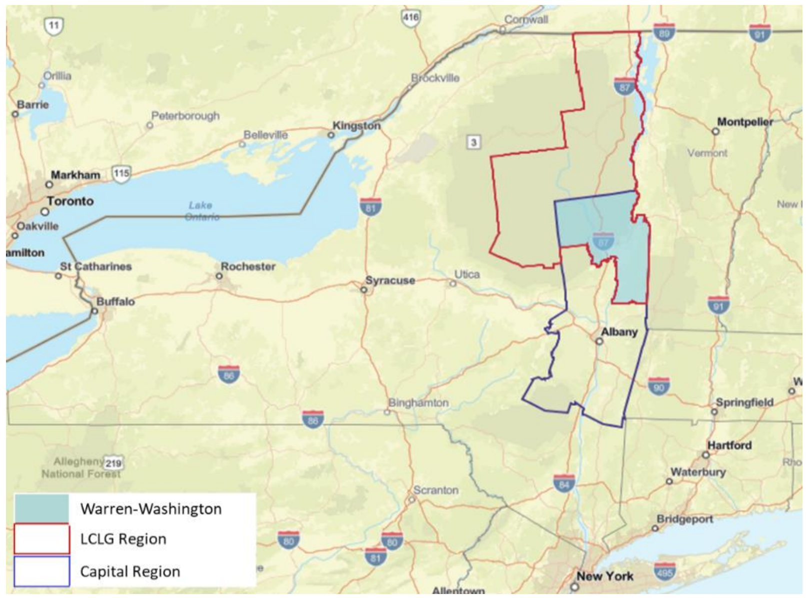


Figure 3-1 - Map of Study Areas 2021

Primary data sources used for this analysis include demographic information from the U.S. Census Bureau and current estimates and projections from Esri and EMSI, both are nationally recognized third-party data providers that use U.S. Census data to generate estimates and projections of a variety of socioeconomic variables for a range of geographic areas. Any additional data sources not outlined here are noted within that respective section or appropriate table or figure.

3.1 Population Trends

Currently, the Warren-Washington region is home to approximately 126,000 residents, with the population nearly evenly split between Warren and Washington Counties. Together, these two counties account for approximately half of the population of the LCLG Region and approximately 12 percent of the population of the Capital Region. Since 2010, the population in the Warren-Washington region has contracted, with the region losing a net 3,000 residents, equating to a 2.25 percent decline. However, the Warren-Washington region contracted at a slower rate than the LCLG Region, which contracted by 2.76 percent over the same period. This indicates that while neither region is a major population growth center, Warren-Washington Counties may represent a slightly more preferable

Table 3-1 - Population by Region 2010-2019

Population	2010	2019	Growth (%)
Washington	63,088	61,616	-2.33%
Warren	65,707	64,276	-2.18%
Warren-Washington	128,795	125,892	-2.25%
LCLG Region	255,499	248,449	-2.76%
Capital Region	1,074,639	1,083,201	0.8%

Source: American Community Survey

[10] Region included Warren, Washington, Clinton, Essex, and Hamilton Counties
[11] Region included Warren, Washington, Albany, Columbia, Greene, Rensselaer, Saratoga, and Schenectady Counties

residential location. However, the Capital Region experienced positive, yet modest, population growth over the same period indicating that the population trends in the broader region and those in Warren and Washington Counties were moving in opposite directions. Total population counts from the 2020 Decennial Census were released at the end of this study and indicate Washington County continues to lose population while Warren County actually gained population from the 2019 ACS estimates. Warren County's total population now stands at 65,737 while Washington County has declined to 61,302. As more data is released by the Census from the 2020 counts, regional partners should continue to evaluate the results and potential impacts on the workforce and ability to attract and fill jobs in the region.

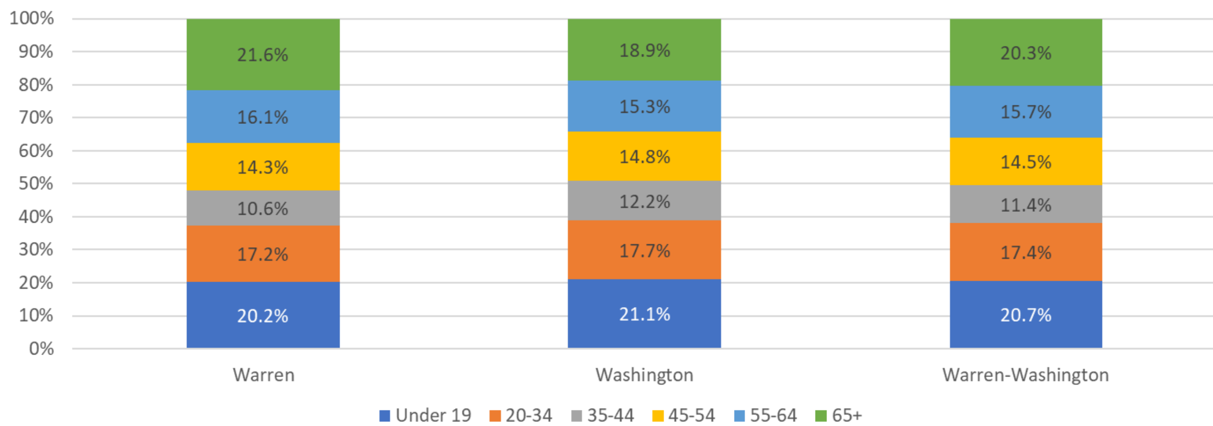


Figure 3-2 - Population by Region 2010-2019
Source: American Community Survey

Population by Age

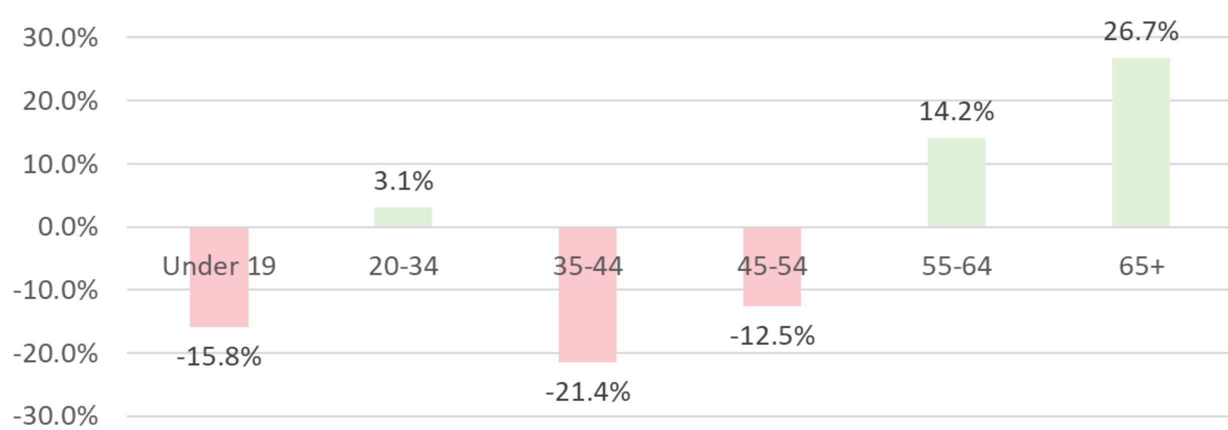


Figure 3-3 - Population Change by Age, Warren-Washington County 2010-2019
Source: American Community Survey

Partially fueled by this growth, the population in the Warren-Washington region skews older, with 36 percent of the total population aged 55 or older. Comparatively, the population aged 20-54 that typically comprises the vast majority of a region's workforce, comprised 43 percent of the population. This is not significantly higher than the oldest cohorts.

From 2010 to 2019, the number of residents aged 65 years or older grew approximately 27 percent and the population aged 55-64 grew 14 percent. These were the only cohorts with significant population growth over the past ten years. Additionally, the 35-44 and 45-54 age cohorts experienced significant contraction over the past ten years, declining approximately 21 percent and 13 percent, respectively. These two trends taken together could have significant, negative impacts on the workforce as workers retire and their jobs are not as easily backfilled by younger workers.

Race and Ethnicity

The population in the Warren-Washington Region is not particularly diverse, with White, non-Hispanic residents accounting for over 90 percent of the total population. Comparatively, the Capital Region is more diverse with residents identifying as a race other than White accounting for approximately 19 percent of the total population.

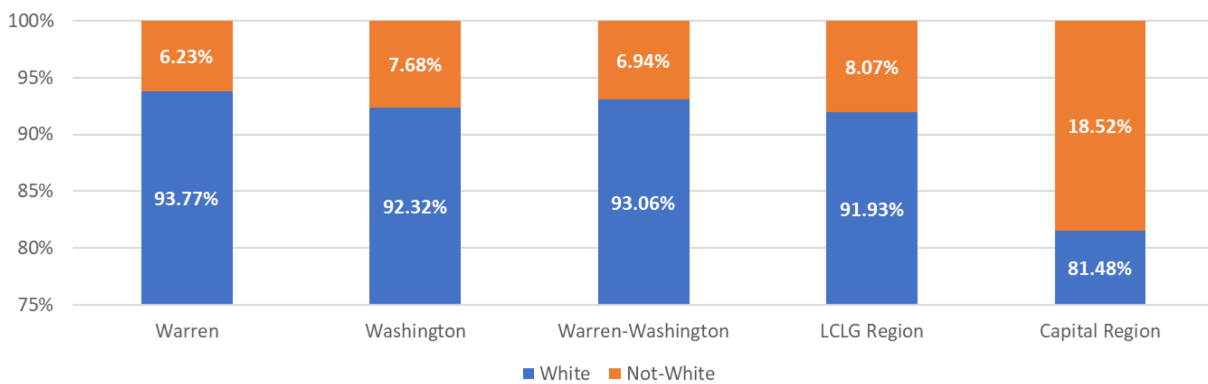


Figure 3-4 - Population by Race/Ethnicity 2010-2019
Source: American Community Survey

While Warren-Washington Counties have a high percentage of residents identifying as White the percentage declined 3.7 percent since 2010. Moving forward, it is possible that the region may attract a greater diversity of residents.

Table 3-2 - Population Change by Race/Ethnicity, Warren-Washington County 2010-2019

	2010	2019	Growth (%)
White	121,670	117,152	-3.71%
Not-White	7,125	8,740	22.67%

Source: American Community Survey

Household Income

In 2019, the median household income in the Warren-Washington Region was $59,000, slightly more than the $57,970 median income in the LCLG Region, indicating that higher-income households in the LCLG Region tend to be concentrated in Warren and Washington Counties. However, both regions significantly lag the median income of the Capital Region at $69,200, indicating that within the Capital Region, higher income households tend to reside outside of Warren and Washington Counties. The differences in median incomes between the three geographies are primarily driven by differences in the share of households earning over $150,000 annually.

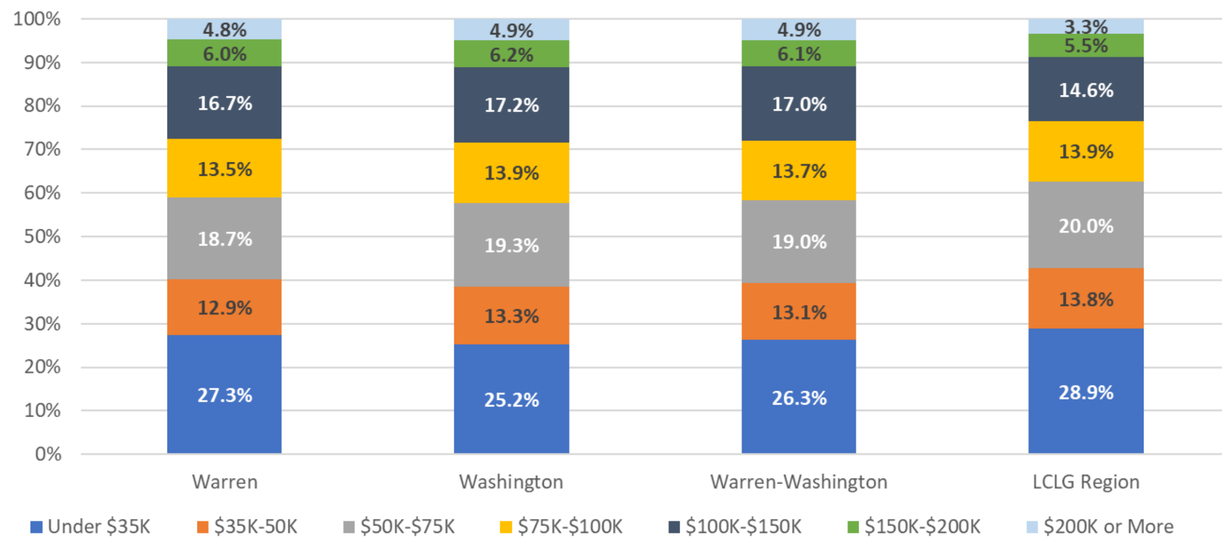


Figure 3-5 - 2019 Income Distribution

Sources: American Community Survey

Table 3-3 - 2019 Income Distribution

	Median Income (2019)	Growth (2010-2019)
Warren	$61,024	10.2%
Washington	$57,258	18.5%
Warren-Washington	$59,286	18.3%
LCLG Region	$57,970	19.5%
Capital Region	$69,187	22.9%

Sources: American Community Survey

In addition to having a lower median household income compared to the Capital Region, the Warren-Washington Region experienced a lower rate of income growth compared to the Capital Region. From 2010-2019, median income in the Warren-Washington Region grew 18.3 percent while median incomes in the Capital Region grew 23 percent. Additionally, income growth in the Warren-Washington Region also lagged the LCLG Region, where median incomes grew 19.5 percent. The differences in median incomes between regions is likely attributable to the differences in industry sectors and occupations. For example, there are higher percentages of professional and technical service jobs, institutes of higher education, and larger healthcare facilities across the broader Capital Region than what may be found in the smaller Warren-Washington Region. While this is not inherently a negative, it may be more difficult to attract employees to the Warren-Washington Region if salaries are not commensurate with the Capital Region and tangential elements such as housing, downtown activation, and transportation options are not addressed.

Educational Attainment

The Warren-Washington Region and the LCLG Region display similar levels of educational attainment, with approximately 25 percent of the population in each region holding a bachelor's degree or higher degree. Other educational attainment metrics are also similar between these two regions. However, both regions have lower levels of educational attainment compared to the Capital Region, where approximately 35 percent of the population holds a bachelor's degree or higher.

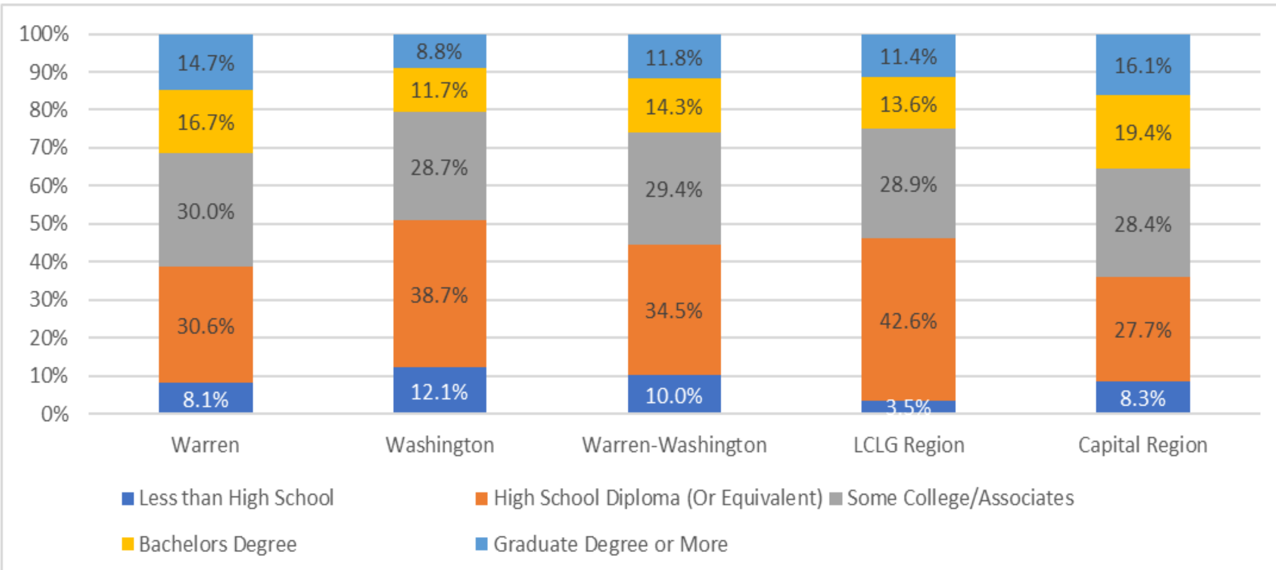


Figure 3-6 - Educational Attainment 2010-2019

Source: American Community Survey

Since 2010, all three regions saw levels of educational attainment grow – those with a graduate degree or higher growing 25 percent in Washington-Warren, 18 percent in the LCLG Region, and 21 percent in the Capital Region. On the other end of the education spectrum, the number of people attaining less than a high school education contracted 5 percent in the Warren-Washington Region, 18 percent in the LCLG Region, and 15 percent in the Capital Region. In general, these trends are supportive of a workforce with a diversity of skill sets to support a variety of industries.

Table 3-4 - Change in Educational Attainment 2010-2019

	Warren	Washington	Warren-Washington	LCLG Region	Capital Region
Less than High School	-1.9%	-5.5%	-4.2%	-18.3%	-15.2%
High School Diploma (Or Equivalent)	-9.1%	-7.0%	-7.9%	-5.3%	-6.6%
Some College/Associates	4.4%	8.5%	6.3%	6.5%	5.1%
Bachelors Degree	11.0%	26.8%	16.8%	7.2%	19.7%
Graduate Degree or More	26.3%	23.6%	25.3%	18.2%	20.8%

Source: American Community Survey

Employment by Age

As previously mentioned, the population in Warren and Washington Counties has been rapidly aging. This dynamic is having a measurable effect on the workforce. Since 2001, the number and share of workers aged 55 and older have increased from 6,800 workers in 2001 to over 13,000 workers in 2020. Additionally, this age cohort increased its share of the workforce from 14 percent in 2001 to 28 percent in 2020. Over the same period, the number and share of workers aged 35-44 decreased, as these workers aged into the 55 and older age cohort. From an economic perspective, this dynamic could jeopardize the ability of current employers in the region to backfill positions vacated by retiring workers.

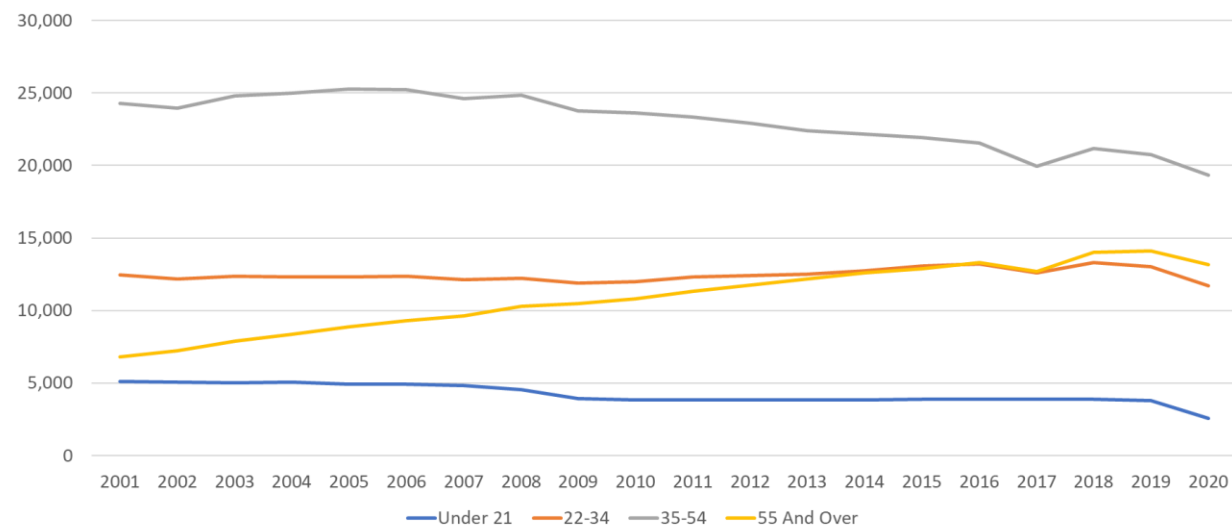


Figure 3-7 - Workers by Age, Warren-Washington Counties 2001-2020
Source: Census QWI Survey

Commuting

The Warren-Washington Region contains communities with a stronger residential focus than commercial focus as they are a net exporter of workers – meaning more residents live in the Region and commute elsewhere than workers commuting into the Region. However, it is worth noting that the employment base in the Warren-Washington Region is predominately local, with 58 percent of all workers in the Region also living in the Region.

Saratoga County is a large importer and exporter of workers to/from Warren-Washington Counties. This is not surprising given the proximity of Saratoga to the Warren-Washington Region's employment and population centers. However, it is important to note that after Saratoga, relatively fewer workers are traveling to the Warren-Washington Region to work. This would seem to indicate that while there is inter-county travel for work in the Region, relatively few people are traveling farther distances into the Warren-Washington Region for work. This may also reflect the number of employment opportunities in the more populated cities and counties in the Capital Region compared to Warren-Washington Counties.

Table 3-5 - Where People Employed in Warren-Washington Live 2018

	Count	Share
Warren-Washington Counties	22,525	57.6%
Saratoga County, NY	7,090	18.1%
Albany County, NY	830	2.1%
Essex County, NY	769	2.0%
Rensselaer County, NY	737	1.9%
All Other Locations	7,144	18.3%

Source: Census OnTheMap

Table 3-6 - Where People Residing in Warren-Washington Work 2018

	Count	Share
Warren-Washington Counties	22,525	50.1%
Saratoga County, NY	7,444	17.1%
Albany County, NY	2,919	6.7%
Rutland County, VT	1,039	2.4%
Schenectady County, NY	978	2.2%
All Other Locations	9,388	21.5%

Source: Census OnTheMap

3.2 Economic Base and Historical Trends

Currently, the Warren-Washington Region employs approximately 56,000 workers. The five biggest industries in terms of employment are Government, Health Care, Retail Trade, Manufacturing, and

Table 3-7 - Employment and Gross Regional Product by Industry Sector, Warren-Washington Counties 2020

		Employment		Gross Regional Product	
NAICS	Description	#	%	$	%
11	Agriculture, Forestry, Etc.	811	1.5%	$48,779,547	0.9%
21	Mining, Quarrying, etc.	245	0.4%	$55,616,792	1.0%
22	Utilities	203	0.4%	$157,374,975	2.7%
23	Construction	2,818	5.1%	$284,303,708	5.0%
31	**Manufacturing**	**5,864**	**10.5%**	**$1,062,339,473**	**18.5%**
42	Wholesale Trade	1,170	2.1%	$264,401,479	4.6%
44	**Retail Trade**	**7,169**	**12.9%**	**$559,892,366**	**9.8%**
48	Transportation and Warehousing	747	1.3%	$72,162,784	1.3%
51	Information	883	1.6%	$199,602,318	3.5%
52	Finance and Insurance	1,591	2.9%	$406,961,341	7.1%
53	Real Estate and Rental and Leasing	531	1.0%	$143,048,705	2.5%
54	Professional, Scientific, and Technical	1,806	3.2%	$220,205,299	3.8%
55	Management of Companies	601	1.1%	$50,173,653	0.9%
56	Administrative and Support Services	3,193	5.7%	$190,552,736	3.3%
61	Educational Services	455	0.8%	$17,344,953	0.3%
62	**Health Care and Social Assistance**	**7,935**	**14.2%**	**$575,420,317**	**10.0%**
71	Arts, Entertainment, and Recreation	1,496	2.7%	$78,801,398	1.4%
72	**Accommodation and Food Services**	**5,570**	**10.0%**	**$339,853,591**	**5.9%**
81	Other Services (except Public Admin.)	2,716	4.9%	$130,540,620	2.3%
90	**Government**	**9,831**	**17.7%**	**$878,901,877**	**15.3%**
	Total	**55,698**	**100.0%**	**$5,736,277,930**	**100.0%**

Source: EMSI

Accommodation/Food Service. Together, these five industries employ approximately 30,000 people, accounting for 54 percent of all employment in the two counties. From a Gross Regional Product (GRP), a measure of industry output, these five industry sectors account for approximately 59 percent of all GRP, underscoring the importance of these industries to the Warren-Washington Region.

For this analysis, RKG evaluated the economic base for the Warren-Washington Region, however, it is important to understand the differences in the economies between the two counties. In both counties,

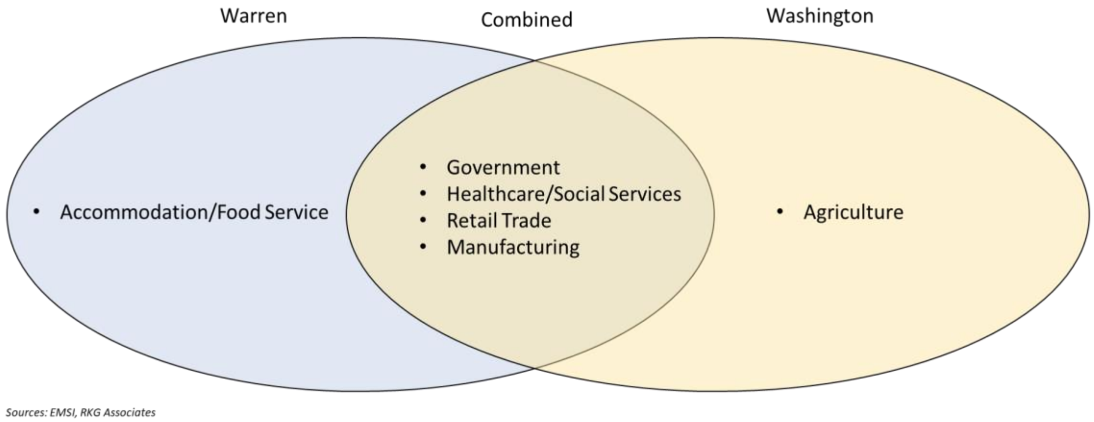


Figure 3-8 - Top Industry Sectors 2020

Government, Health Care, Retail Trade, and Manufacturing comprise four of the top five industry sectors. However, Accommodation/Food Service is one of the largest sectors in Warren County, given the county's large tourism focus, and Agriculture is one of the top industry sectors in Washington County.

Since 2010, the Warren-Washington Region employment base has contracted five percent. By comparison, the employment base in the LCLG Region contracted three percent and the employment

Table 3-8 – Historical Employment Growth by Region 2010-2020

NAICS	Description	Warren-Washington	LCLG Region	Capital Region
11	Agriculture, Forestry, Etc.	(2%)	15%	1%
21	Mining, Quarrying, Etc.	2%	(6%)	67%
22	Utilities	(16%)	(8%)	16%
23	Construction	(14%)	(11%)	5%
31	***Manufacturing***	***(9%)***	***(10%)***	***17%***
42	Wholesale Trade	7%	(0%)	5%
44	Retail Trade	*(5%)*	(5%)	(6%)
48	Transportation and Warehousing	(4%)	5%	16%
51	Information	(15%)	(17%)	(12%)
52	Finance and Insurance	(6%)	(3%)	4%
53	Real Estate and Rental and Leasing	(1%)	4%	19%
54	Professional, Scientific, Etc.	3%	4%	4%
55	Management of Companies	2%	(12%)	2%
56	Administrative/Support Services	(0%)	3%	12%
61	Educational Services	17%	22%	(5%)
62	Health Care and Social Assistance	*(2%)*	1%	7%
71	Arts, Entertainment, and Recreation	(16%)	(10%)	(10%)
72	Accommodation and Food Services	*5%*	3%	6%
81	Other Services	(5%)	2%	(2%)
90	Government	*(8%)*	(6%)	(5%)
99	Unclassified Industry	(12%)	17%	31%
	Total	**(5%)**	**(3%)**	**2%**

Source: EMSI

base in the Capital Region expanded two percent. This indicates that the Warren-Washington Region has not been able to capture as much employment growth during the economic expansion of the 2010s. It is also worth noting that Manufacturing, one of the largest and most important industry sectors to the region, experienced marked employment decline, contracting nine percent in the Warren-Washington Region and ten percent in the LCLG Region. This is in sharp contrast to the Capital Region, which experienced 17 percent growth over the same period. The Capital Region's manufacturing base overall has been stronger and growing in the counties outside of Warren and Washington.

Unemployment

The average unemployment rate in 2020 for the Warren-Washington Region was 7.8 percent, slightly higher than the 7.2 percent unemployment rate in the Capital Region. Historically, unemployment has been higher in the Warren-Washington Region than in the Capital Region, indicating that the Warren-Washington Region labor market is slightly weaker than that of locales elsewhere in the Capital Region. However, the gap between the Warren-Washington Region and the Capital Region had started to shrink with Covid-19 related unemployment surges nationally and in the Capital Region bringing the gap to 60 basis points.

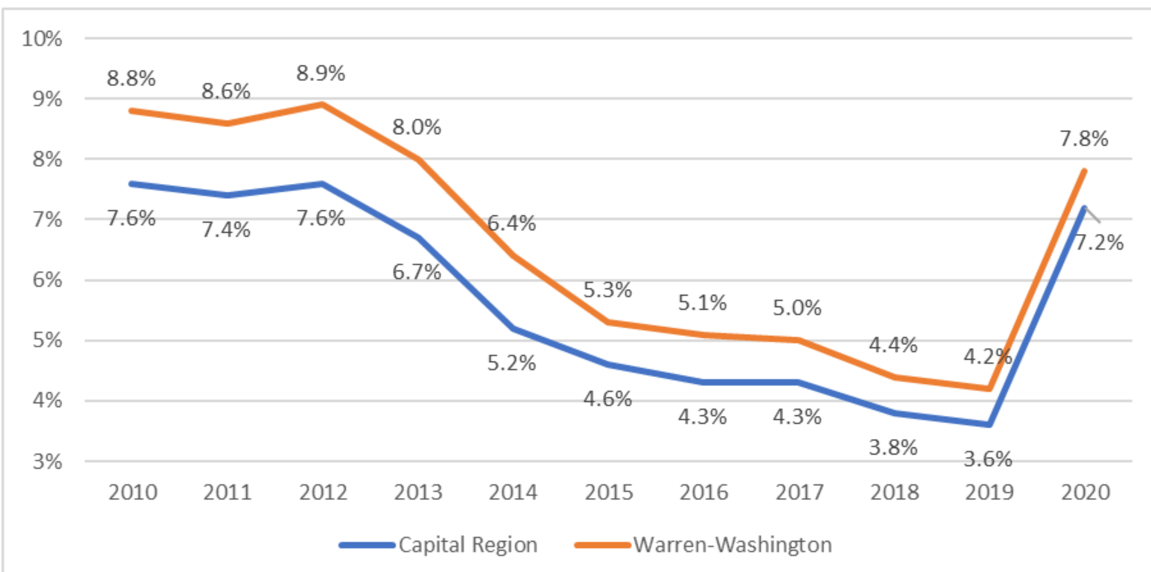


Figure 3-9 - Employment and Gross Regional Product by Industry Sector, Warren-Washington Counties 2020
Source: NY Department of Labor

Industry Sector Wages

The average wage for all jobs in the Warren-Washington Region was $59,754 in 2020, which is 19 percent lower than the average wage of $74,027 in the Capital Region. While some of this difference is likely driven by differences in the industry composition of the economies of both places, across nearly every industry sector, wages in the Warren-Washington Region were below those in the Capital Region. Of note, average wages in Manufacturing were 27 percent lower in the Warren-Washington Region compared to the Capital Region. From an employees' perspective, jobs located elsewhere in the larger Capital Region which pay higher wages are creating competition for the already limited and shrinking employment base. This may be contributing to the shortage of skilled workers described to RKG during stakeholder interviews early on in the process.

Table 3-9 - Average Wage by Industry Sector by Region 2020

NAICS	Description	Capital Region	Warren-Washington	Wage Gap
11	Agriculture, Etc.	$46,723	$46,246	(1%)
21	Mining, Etc.	$88,970	$67,988	(24%)
22	Utilities	$183,708	$153,103	(17%)
23	Construction	$76,986	$63,098	(18%)
31	Manufacturing	$111,708	$81,366	(27%)
42	Wholesale Trade	$89,615	$97,411	9%
44	Retail Trade	$41,315	$40,810	(1%)
48	Transportation and Warehousing	$60,156	$56,579	(6%)
51	Information	$94,627	$74,520	(21%)
52	Finance and Insurance	$108,475	$81,872	(25%)
53	Real Estate and Rental and Leasing	$63,754	$50,729	(20%)
54	Professional, Scientific, and Technical	$101,467	$74,007	(27%)
55	Management of Companies	$102,480	$71,268	(30%)
56	Administrative/Support Services	$47,625	$41,452	(13%)
61	Educational Services	$62,722	$29,931	(52%)
62	Health Care and Social Assistance	$61,906	$61,249	(1%)
71	Arts, Entertainment, and Recreation	$35,128	$33,834	(4%)
72	Accommodation and Food Services	$27,414	$28,649	5%
81	Other Services (except Public Admin)	$39,560	$32,220	(19%)
90	Government	$97,522	$79,685	(18%)
99	Unclassified Industry	$55,641	$32,170	(42%)
	Total	**$74,027**	**$59,754**	**(19%)**

Source: EMSI

3.1.1 Location Quotient

One useful measure of the comparative performance of an economy is through a location quotient (or LQ) whereby the employment in any one sector of the economy relative to its total employment is benchmarked against that of a larger economy – such as the United States. An LQ in the range of 0.80 to 1.20 generally indicates that the local (smaller) economy is performing on par with the larger economy. An LQ of less than 0.80 suggests under-performance while an LQ greater than 1.20 suggests over-performance.

Arts, Entertainment, and Recreation, Manufacturing, Retail Trade, and Accommodation and Food Service have particularly strong Location Quotients within the Warren-Washington Region, indicating the economy has a high degree of specialization and concentration within these industry sectors. This is unsurprising given the regional economy's focus on tourism, supporting local retail and food and beverage services, and manufacturing.

In looking at specific industries with high LQs; Pulp, Paper, and Paperboard Mills have the highest LQ of any industry by a significant margin. This is not surprising given the presence of Finch Paper, Essity, and Irving Tissue in the region. Of the fifteen industries with the highest location quotients in the

Warren-Washington Region, eight are in the manufacturing sector, again underscoring the importance of this sector to the regional economy.

Table 3-10 - Industries with the 15 Largest Location Quotients, Warren-Washington Counties 2020

NAICS	Description	2020 Location Quotient
3221	Pulp, Paper, and Paperboard Mills	38.08
3271	Clay Product and Refractory Manufacturing	17.67
7212	RV (Recreational Vehicle) Parks and Recreational Camps	16.06
3391	Medical Equipment and Supplies Manufacturing	13.78
3161	Leather and Hide Tanning and Finishing	10.21
2123	Nonmetallic Mineral Mining and Quarrying	6.89
3279	Other Nonmetallic Mineral Product Manufacturing	5.96
3212	Veneer, Plywood, and Engineered Wood Product Manufacturing	4.68
7131	Amusement Parks and Arcades	4.58
1133	Logging	4.38
5191	Other Information Services	3.87
3314	Nonferrous Metal (except Aluminum) Production and Processing	3.75
4442	Lawn and Garden Equipment and Supplies Stores	3.44
1152	Support Activities for Animal Production	3.36
3399	Other Miscellaneous Manufacturing	3.26

Source: EMSI

3.1.2 Employment Projections

According to EMSI, the overall employment decline that occurred from 2010-2020 in the Warren-Washington Region is forecasted to very slowly reverse. From 2020 to 2030, EMSI forecasts that the region will add approximately 1,200 jobs, expanding the employment base by two percent. Health Care is forecasted to add the most jobs (412), driven by the increased need for health care and assistance services related to the increasing aging of the regional population, as well as reflecting growth across this industry sector in general. After Health Care, Wholesale Trade and Manufacturing are forecasted to add the most jobs, with 300 over the next ten years. For the Canalside Energy Park, these would be positive developments as these two industries are among the most likely to seek industrial and warehouse-type space and be the best fit for the site from a physical development perspective.

Only Accommodation and Food Services is forecasted to lose a significant number of jobs. However, strong marketing and promotion of the tourism sector in the region may help to support this industry and otherwise lessen the forecasted job loss.

RKG considered the projected demand for additional development, or more appropriately, square footage (SF) needs across the Capital Region, which is inclusive of Warren and Washington Counties. Over the ten-year period between 2020 to 2030, total employment in the Capital Region (for selected industry sectors) is projected to decline by nearly 28,865, with a notable exception of an approximate growth of 7,760 positions concentrated in the Health Care, Wholesale Trade and Manufacturing sectors.

The projected employment change by selected industry sectors in 2030 helps describe which sectors have the highest chance of driving future demand for additional space as represented by employment growth. This projected change in employment from 2020 to 2030 was then converted into estimates of

SF needs utilizing industry standards for the average square feet per employee by specific industry sector.

For the three sectors with projected employment growth, total ten-year demand equates to nearly 3.4 million SF. RKG cautions that this represents demand across the entire Capital Region and is not specific to Warren and Washington Counties. Further, that the projected demand for additional SF does not necessarily equate to a demand for newly built SF, as it could reflect better utilization of existing space or a reduction in existing vacancies. Nonetheless, some of the regional demand from employment increases could permeate the Warren-Washington Region market and translate to demand at the Canalside Energy Park.

Table 3-11 - Forecasted Employment Growth by Industry Sector, Warren-Washington Counties 2020-2030

NAICS	Description	2020 Jobs	2030 Jobs	Growth (#)	Growth (%)
11	Agriculture, Etc.	819	808	(11)	(1%)
21	Mining, Etc.	238	236	(2)	(1%)
22	Utilities	199	197	(2)	(1%)
23	Construction	2,811	2,826	15	1%
31	Manufacturing	5,800	6,094	294	5%
42	Wholesale Trade	1,155	1,459	304	26%
44	Retail Trade	7,059	6,979	(80)	(1%)
48	Transportation and Warehousing	736	797	61	8%
51	Information	866	866	0	0%
52	Finance and Insurance	1,590	1,624	34	2%
53	Real Estate and Rental and Leasing	529	543	15	3%
54	Professional, Scientific, and Technical	1,782	1,811	29	2%
55	Management of Companies	575	644	69	12%
56	Administrative/Support Services	3,095	3,242	147	5%
61	Educational Services	436	514	78	18%
62	Health Care and Social Assistance	7,832	8,244	412	5%
71	Arts, Entertainment, and Recreation	1,234	1,194	(40)	(3%)
72	Accommodation and Food Services	5,053	4,743	(309)	(6%)
81	Other Services (except Public Admin)	2,577	2,587	10	0%
90	Government	9,680	9,890	210	2%
99	Unclassified Industry	64	65	2	3%
	Total	**54,126**	**55,361**	**1,235**	**2%**

Source: EMSI

Despite a projected loss of employment across all other industry sectors, some opportunity for additional SF may emerge from existing entities desiring to expand or otherwise relocate their operations. In the broader region, announcements like that of GlobalFoundries to expand by nearly 1,000 employees in the coming years will help to boost regional employment and possibly attract more companies to the area. This may also have an effect of drawing more workers in the Warren-Washington Region to jobs outside the two counties. Considering these employment projections and resulting estimates of SF demand expanded opportunities for the Canalside Energy Park may require a capture of non-Capital Region businesses and employment growth – possibly with the competitive advantages of rail and canal access offered by Canalside Energy Park.

Table 3-12 - Space Demand Projections 2020-2030

Projected Employment and SF Needs by Selected Industry Sector	Capital Region			
	Avg/SF per	2030 Emp	Δ from 2020	Est. Gross Demand - SF
OFFICE/FLEX				
Information	175	8,846	(328)	na
Finance/Insurance	200	22,734	(1,261)	na
Real Estate	200	6,509	(1,063)	na
Management of Companies	200	7,153	(52)	na
Professional/Technical	175	34,346	(1,546)	na
Administration/Waste Services	200	20,675	(1,695)	na
Subtotal		**100,263**	**(5,945)**	***na***
INSTITUTIONAL				
Health Care/Social Assistance	150	84,559	4,033	605,007
Educational Services	150	20,191	(375)	na
Subtotal		**104,751**	**3,658**	**605,007**
COMMERCIAL				
Arts and Entertainment	150	4,386	(4,361)	na
Retail Trade	175	51,850	(4,763)	na
Accommodations/Food Services	175	30,560	(8,554)	na
Other exc. Public Administration	150	16,592	(7,557)	na
Subtotal		**103,388**	**(25,235)**	***na***
INDUSTRIAL				
Construction	150	22,463	(3,473)	na
Wholesale Trade	500	15,421	181	90,506
Transportation/Warehousing	500	13,761	(1,595)	na
Manufacturing	750	37,833	3,544	2,657,934
Subtotal		**89,478**	**(1,343)**	**2,748,440**
TOTAL (these sectors)		**397,879**	**(28,864)**	**3,353,446**

Source: EMSI, Urban Land Institute (ULI) and RKG (2021)

3.3 Real Estate Analysis and Market Trends

Industrial Market - Current Market Metrics

According to data compiled by CBRE, as of H2 2020, there were approximately 66 million square feet (SF) of industrial space in the Capital Region[12]. Albany County contained the most space at approximately 25 million SF, followed by Saratoga, with approximately 11 million SF. The Non-Core Areas, which are comprised of Greene, Columbia, Montgomery, Fulton, and Warren Counties, contained 16 million SF, approximately 24 percent of the region's total inventory.

Nationally, industrial markets posted their strongest quarter on record in Q4 2020, due to increased demand for warehousing and logistics space due, in part, to the continued increase in e-commerce consumer spending, which was further heightened by the impacts of the COVID-19 pandemic. These trends impact market performance in the Capital Region with many companies, such as Amazon, expanding their presence in the Capital Region.

In H2 2020, total vacancy in the Capital Region was 2.7 percent, indicating there is little available space for users wanting to move or expand, a finding that was confirmed by local sources during interviews. Vacancy is low across all subregions within the Capital Region – with Albany County having the highest vacancy rate at 3.1 percent and Rensselaer having the lowest at 1.7 percent. The Non-Core Areas, which include Warren County, had a vacancy rate of 2.3 percent, indicating that there is still demand for space in the outlying areas of the Capital Region.

The average asking rent in the Capital Region was $5.38 per SF in H2 2020, but asking rents varied significantly from county to county. Saratoga had the highest average asking rents at $6.73 per SF, followed by Albany at $6.10 per SF. Saratoga's higher asking rents, when contrasted to the larger and more central Albany County is likely due, in part, to slightly lower vacancy and space that is newer on average. The Non-Core Areas had some of the lowest rents, averaging $3.93 per SF. While this is the average value for several counties, according to local interviews, leases for industrial space in Warren County are more likely in the $3.00 per SF range.

Table 3-13 - Current Industrial Market Statistics H2 2020

Market	Total Inventory (Square Feet)	Vacant (Square Feet)	Vacancy Rate %	Asking Lease Rates (Per Square Feet)
Albany	25,390,442	794,450	3.1%	$6.10
Rensselaer	3,919,254	65,631	1.7%	$3.00
Saratoga	10,690,770	303,612	2.8%	$6.73
Schenectady	9,940,750	239,082	2.4%	$4.63
Non-core Areas	16,174,074	366,323	2.3%	$3.93
Total	**66,115,290**	**1,769,098**	**2.7%**	**$5.38**

Source: CBRE-Albany Research, H2 2020

In general, the industrial market in the Capital Region appears healthy and supportive of new development, particularly if companies continue to invest in logistics and warehousing space in the region. However, demand for space is likely not evenly distributed among the counties, and while

[12] CBRE's Capital Region includes Albany, Greene, Columbia, Rensselaer, Montgomery, Fulton, Schenectady, Saratoga, and Warren Counties *(note that Washington County is not tracked by CBRE)*

there may be regional demand, more outlying counties such as Warren may likely be at a disadvantage compared to more central counties in the Capital Region.

Historical Industrial Market Performance

Since H1 2015, the inventory of industrial space expanded from approximately 63 million square feet to 66 million square feet, a 4.5 percent growth. Much of this development has occurred since 2018. According to interviews, nearly all of the new development has been concentrated in more central counties in the Capital Region, and not in the further out counties such as Warren. As such, this may indicate a location preference for new industrial users for space in the more central counties.

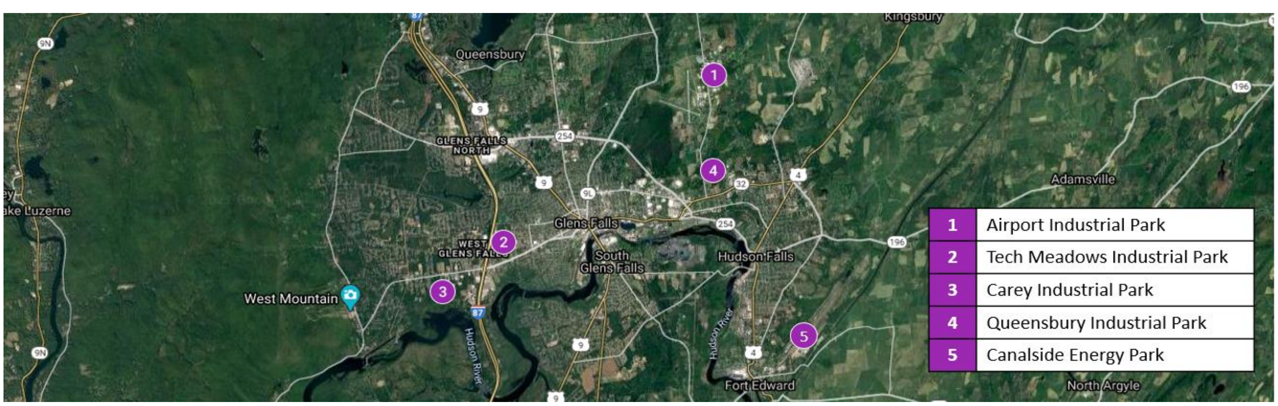
Since 2015, the vacancy has dropped significantly in the Capital Region. In H1 2015, the market-wide vacancy rate was 7.4 percent and may not be suggestive that the market is supply constrained. Vacancies fell to approximately 3.8 percent in H2 2017 which coincided with a contraction of inventory from 63 million SF to approximately 62.6 million SF. However, vacancies continued to decline despite more industrial space coming online likely indicating that demand for industrial space in the Capital Region has increased sharply since 2017. These more recent market dynamics and historically low vacancy rates may be a better indicator that industrial space in today's market is supply constrained. This could offer an opportunity to provide additional space in the region. However, as previously mentioned, demand in the region is likely not evenly distributed among the counties.

Table 3-14 - Current Industrial Market Statistics Trends

Time Period	Inventory	Vacancy	Lease Rates
H1 2015	63.1 Million SF	7.4%	-
H2 2015	63.6 Million SF	6.2%	-
H1 2016	63.3 Million SF	5.4%	-
H2 2016	62.4 Million SF	4.8%	-
H1 2017	62.5 Million SF	4.0%	-
H2 2017	62.6 Million SF	3.8%	-
H1 2018	62.8 Million SF	4.8%	-
H2 2018	63.1 Million SF	4.4%	$4.25
H1 2019	63.9 Million SF	4.2%	$4.42
H2 2019	65 Million SF	3.6%	$5.14
H1 2020	66 Million SF	3.6%	$5.31
H2 2020	65 Million SF	2.7%	$5.38
Change	***+ 2.9 Million SF***	***-470 bps (4.7%)***	***26.6%***

Source: CBRE-Albany Research, H2 2018, H2 2020

Since H2 2018, asking rents increased in the Capital Region from $4.25 to $5.38, equating to rent growth of 26.5 percent. While rent growth year to year is expected, a 26.5 percent growth in two years is significant, there may have been new space or specialized industrial space that entered the market in addition to regular intervals of rent increases. In general, the industrial market in the Capital Region continues to grow and could likely support additional development over time.



Competitive Industrial Parks

Understanding current and historical industrial market performance only gives partial insight into the potential market opportunity at the Canalside Energy Park. To better understand the local industrial market and how the Canalside Energy Park could be positioned, RKG identified and evaluated four industrial parks located proximate to Canalside Energy Park as shown in the figure before and described in the proceeding paragraphs.

3.3.1.1 Airport Industrial Park

The Airport Industrial Park is located adjacent to Floyd Bennet Memorial Airport, approximately five miles from the center of Glens Falls, NY. The Park has approximately 61 acres available across 23 different parcels ranging in size from 1.75 acres to 5 acres. A sampling of current tenants includes Praxis Technology, Adirondack Precision Cut Stone, Ergo Robotic Solutions, W F Lake Corporation, and other small-to-medium-sized industrial users. The site is certified "shovel ready" by New York State, indicating that the site has proper zoning and infrastructure, has completed the appropriate surveys and studies, and has received the necessary permits and approvals. The only major weakness of the site is that it is located approximately 15 minutes away from I-87 when most users have a strong location preference to be close to the highway according to local sources.

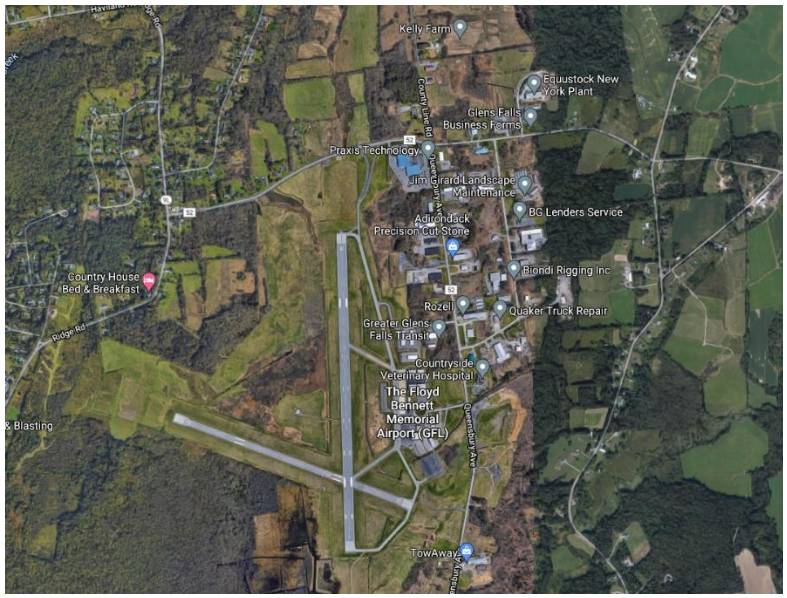


Figure 3-11 - Aerial View of Airport Industrial Park

Source: RKG Associates, Google Maps

3.3.1.2 Tech Meadows Industrial Park

The Tech Meadows Industrial Park is a 46-acre industrial park located along Luzerne Road, just to the northeast of the Main Street and I-87 interchange. The site currently has 35 acres available, with the ability to subdivide lots into varying sizes. The site is currently home to the Local 773 Plumbers and Steamfitters headquarters. The site is a New York State certified "shovel ready" site. The site's major attributes include land availability and location just off of I-87. However, the site is located adjacent to residential developments to the south and east which may not be the most compatible with all industrial space users.

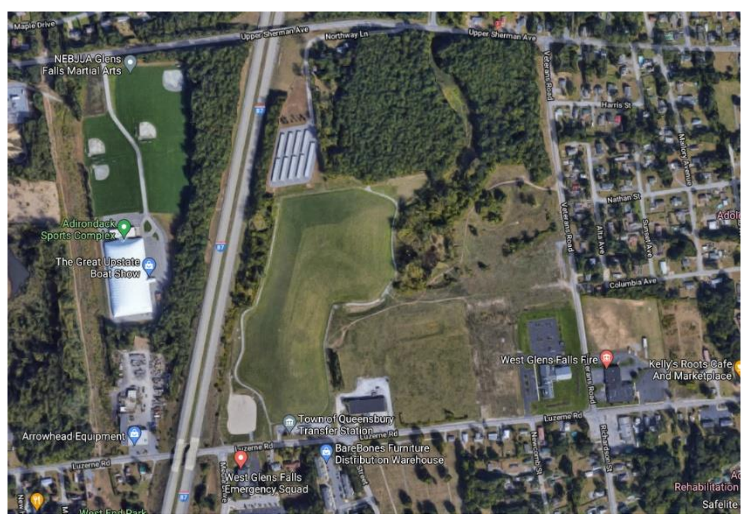


Figure 3-12 - Aerial View of Tech Meadows Industrial Park 2021

Source: RKG Associates, Google Maps

3.3.1.3 Carey Industrial Park

The Carey Industrial Park is located just on the other side of the Main Street and I-87 interchange from Tech Meadows Industrial Park. Currently, 50 acres are available in the park, with available parcels ranging from 2 to 26 acres. The Park has significant development already, including Sheet Labels and an indoor climbing gym. Adirondack Radiology also recently announced they purchased 2.8 acres in the park and plan to build a $1.4 million medical office property in the park. The sites' main attributes are its close proximity to I-87, in addition to having full utilities available.

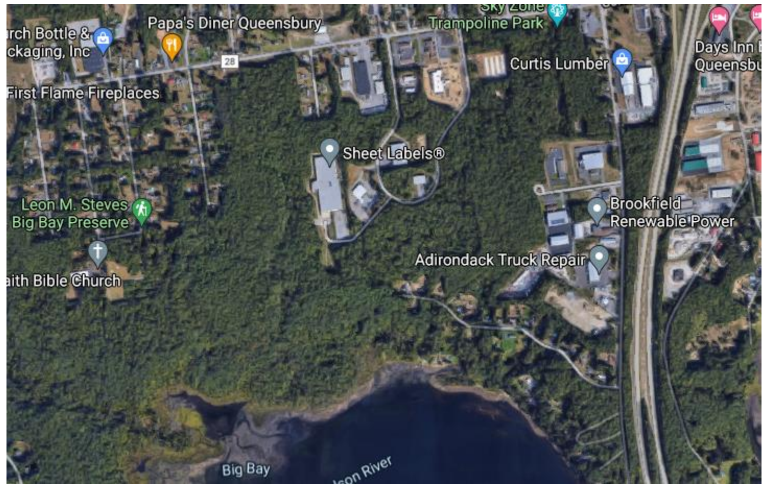


Figure 3-13 - Aerial View of Carey Industrial Park 2021

Source: RKG Associates, Google Maps

3.3.1.4 Queensbury Business Park

The Queensbury Industrial Park is a 56-acre industrial park located just south of Floyd Bennet Memorial Airport of Queensbury Avenue. The Park currently has 41 acres available with parcels from 2 to 9 acres available. The site is a certified "shovel-ready" site, including all utilities. Currently, the Queensbury Army National Guard is the only tenant in the park. However, the park is not without challenges, according to local interviewers, the soils on the site are soggy, which can lead to challenges supporting certain development types. Previously, a large user decided to locate elsewhere after previously committing to a site in the industrial park due to design challenges with the building.

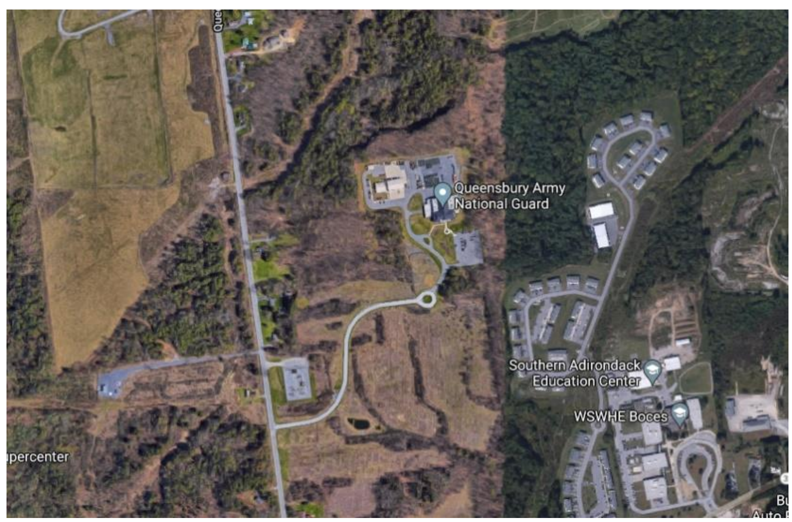


Figure 3-14 - Aerial View of Queensbury Business Park 2021

Source: RKG Associates, Google Maps

3.3.1.5 Canalside Energy Park Advantages/Disadvantages

Compared to the other competitive industrial parks, the Canalside Energy Park's main competitive advantages are its access to dedicated rail facilities, the canal, the size of the site, and the relative remoteness of the site compared to other industrial parks in the area. None of the other parks are near rail access, let alone have rail access directly on site. Additionally, the canal on site is a feature unique to Canalside Energy Park. The canal has seasonal capabilities to connect south to the Port of Albany and serves as yet another transportation option for shipping goods to and from market. However, the site does have some challenges. Nearly all interviewees mentioned that the difficulty of accessing the site via road could put the site at a disadvantage in trying to find a suitable user. The site is limited from a development perspective due to its lack of sewer capacity. Lastly, the $1M+ tax encumbrance may create a financial challenge for any purchaser of the site.

Figure 3-15 - Aerial View of Canalside Energy Park 2021

Source: RKG Associates, Google Maps

While the site's remote access may be a challenge for some users, it is also an opportunity. Many industrial users, particularly heavy industry, may not want to co-locate near other land use types such as residential. Given the site's more removed location, it may be more attractive to users that desire distance from other potential conflicts.

3.4 Target Industry Analysis

The target industry analysis for this study "cast a wide net" regarding the potential for different industry sectors to identify those that could be a good fit for Canalside Energy Park. In analyzing possible target industries beyond the region's historical economy or previous development efforts, this screening process ensured that any potentially viable target industries could be tested and analyzed before being eliminated in favor of more promising options. This analysis also acknowledges that not every industry sector may be a perfect fit for the site and regional economy.

Table 3-15 - Strengths and Weaknesses of Industrial Parks 2021

	Airport Industrial Park	Tech Meadows Industrial Park	Carey Industrial Park	Queensbury Industrial Park	Canalside Energy Park
Strengths	• All utilities available • Proximate to airport • Located on major local road • Variety of available site	• All utilities available • Located on major local road • 35 available acres that can be subdivided	• All utilities available • Located at intersection of Main and I-87 • Variety of available sites (2–26-acre parcels are available)	• All utilities available • 9 available sites from 2 to 9 acres • Located on major local road	• Large site, flat, ready for development • Isolated from conflicting uses • Rail and canal access located directly on site • On-site power substation
Weaknesses	• No rail or water access • Further away from I-87 than other competitive parks	• No rail or water access • Adjacent to residential development to the south and east	• No rail or water access	• No rail or water access • Located further from I-87 than other competitive parks • Potential design challenges with site	• No water or sewer on site • Site has road accessibility challenges • Located further from I-87 than other competitive parks • Tax encumbrance

Source: RKG Associates

The target industry analysis as presented in this report identified two groupings of industry clusters. The first are those industries that are established and present in the regional economy today and could be marketed to new companies or allow the expansion of companies already operating in the space. These industry clusters, referred to as Established Target Industries Clusters, include:

- Organic Material Processing and Manufacturing
- Non-Metallic Processing and Manufacturing
- Metallic Processing and Manufacturing
- Medical Device Supplies Manufacturing

The second grouping of industry clusters referred to as Growth Opportunity Target Industries Clusters, are those that do not currently have a strong presence in the Warren-Washington Region but could be a good fit based on the criteria described below. These industry clusters include:

- Green Energy Production
- Warehousing, Transportation, and Wholesaling

Lastly, some industry sectors do not have a strong presence in the region and were not part of the target industry cluster scores but have shown interest in locating in the region or were noted during interviews with regional experts. These clusters are ones the IDA and regional partners should be aware of as the site is being marketed and tenanted and include:

- AgTech
- Food Processing and Manufacturing
- Cannabis Processing
- Hospitality Training
- Freight Rail Transportation and Storage

Cluster Scoring and Identification

To identify the Established Target Industries, all three-digit industry sectors were evaluated and scored on a 1-5 scale for each of the following quantitative and qualitative metrics:

- Current employment base (Number of employees)
- Historical employment growth 2010-2020 (Number of employees)
- Historical growth rate 2010-2020 (% growth)
- Forecasted employment growth (Number of employees)
- Forecasted employment growth rate (% growth)
- Regional Specialization (location quotient)
- Regional Fit (Assessment of how well the industry fits in the regional market)
- Local Fit (Qualitative assessment of how well the industry fits in the local market)

For each of these metrics, industries were scored based on how they compared to other industries in the Warren-Washington Region, with one (1) being a low score and five (5) being a high score. For this analysis, Regional Fit was calculated based on the size of the industry in the LCLG Region, so industries containing many employees compared to the total employment base in the LCLG Region received higher scores, and those with smaller employment compared to the overall employment base received lower scores. Local fit scores were assigned based on a qualitative analysis of how well the industry would fit in the Warren-Washington Region market. This assessment was based on our understanding of the skill sets and availability of the workforce, availability of appropriate land/facilities for the industry, and local preferences based on information gathered from interviews in the local market.

Each industry was then scored based on a set of weighted metrics to create a composite score helping us to understand the relative success an industry could have in the region compared to its peers. Weighting was applied to each metric to calculate a total score for each industry to help evaluate possibilities for the Canalside Energy Park site. The table below shows the weights for each of the different metrics.

Table 3-16 - Metrics and Weighing for Target Industry Analysis

Metric	Weight
Size of Industry (# Of Employees in 2020)	30%
Historical Employment Growth 2010-2020 (# of Employees)	10%
Historical Employment Growth Rate 2010-2020 (% Growth)	5%
Forecasted Employment Growth 2020-2030 (# of Employees)	10%
Forecasted Employment Growth Rate 2020-2030 (% Growth)	5%
Local Specialization (Location Quotient)	10%
Regional Fit (Size of Industry Sector in LCLG Region)	15%
Local Fit (Qualitative Assessment)	15%
Total	**100%**

Source: RKG Associates

After each industry was scored, the top-scoring industries were evaluated for how well each may fit at the Canalside Energy Park. Below is a table detailing the fifteen highest scoring industry sectors. Unsurprisingly, many industries with high total scores were related to health care and tourism – two of the strongest industries in the region. However, these industries are not strong fits for the Canalside Energy Park site and therefore were excluded from consideration. While the table below details the highest-scoring industries, they were not necessarily the industries selected to be in Target Industry Clusters.

Table 3-17 - Highest Scoring Industries, Cluster Fit Scoring, Warren-Washington Counties

		Weighted Scores								
NAICS	Description	Size	Hist. Growth	% His Growth	Fore. Growth	% Fore. Growth	Location Quotient	Regional Fit	Local Fit	TOTAL
902	State Government	1.5	0.5	0.25	0.5	0.2	0.3	0.75	0.6	**4.6**
624	Social Assistance	1.2	0.5	0.2	0.5	0.25	0.3	0.75	0.75	**4.45**
722	Food Services and Drinking Places	1.5	0.4	0.1	0.5	0.1	0.3	0.75	0.75	**4.4**
721	Accommodation	1.5	0.5	0.15	0.1	0.05	0.5	0.75	0.75	**4.3**
332	Fabricated Metal Product Manufacturing	1.2	0.5	0.25	0.5	0.2	0.3	0.45	0.75	**4.15**
621	Ambulatory Health Care Services	1.5	0.1	0.05	0.5	0.15	0.3	0.75	0.75	**4.1**
623	Nursing and Residential Care Facilities	1.5	0.4	0.15	0.1	0.05	0.4	0.75	0.75	**4.1**
561	Administrative and Support Services	1.5	0.2	0.1	0.5	0.15	0.3	0.75	0.45	**3.95**
423	Merchant Wholesalers, Durable Goods	1.2	0.5	0.2	0.5	0.2	0.2	0.6	0.45	**3.85**
441	Motor Vehicle and Parts Dealers	1.2	0.4	0.15	0.5	0.15	0.4	0.6	0.45	**3.85**
238	Specialty Trade Contractors	1.5	0.4	0.1	0.5	0.1	0.3	0.75	0.15	**3.8**
541	Professional, Scientific, and Technical Services	1.5	0.4	0.1	0.3	0.1	0.1	0.75	0.45	**3.7**
339	Miscellaneous Manufacturing	1.5	0.1	0.05	0.1	0.05	0.5	0.6	0.75	**3.65**
611	Educational Services	0.9	0.4	0.2	0.5	0.2	0.1	0.6	0.75	**3.65**
312	Beverage and Tobacco Product Manufacturing	0.9	0.4	0.25	0.5	0.25	0.3	0.3	0.75	**3.65**

Source: RKG Associates

Once the industries with high location scores and strong fits for the Canalside Energy Park were identified, they were categorized into the three Established Target Industry Clusters detailed below:

- Organic Material Processing and Manufacturing
    - Wood-related manufacturing industries
    - Paper manufacturing industry

- Metallic Processing and Manufacturing
    - Powder Metallurgy
    - Machine Shops

- Medical Device Supplies Manufacturing
    - Surgical and Medical Instrument Manufacturing

In addition to the Established Industry Clusters listed above, RKG identified two Growth Target Industry Clusters. These industry clusters were not identified solely using the methodology outlined above but instead were identified through local interviews. People in the region familiar with business activity felt these might be a good fit based on the locational attributes and amenities at the site, prior inquiries for tenanting, and the local and regional economies. These include:

- Green Energy Production
    - Support of Offshore Wind
    - Solar Component Manufacturing
    - Biomass Power Generation

- Transportation and Storage
    - Wholesaling
    - Rail transportation
    - Warehousing

Established Target Industry Clusters

3.4.1.1 Organic Material Processing and Manufacturing

The Warren-Washington Region is an established hub for manufacturing involving wood and paper products. Combined these two industries employ approximately 1,700 people in the region and comprise one of the largest manufacturing sectors with 29 percent of total manufacturing employment. However, over the past ten years, this industry's growth has stagnated as automation and corporate downsizing impacted the industry, particularly the large paper manufacturers.

These trends are forecast to accelerate into the future as increased automation and foreign competition cause existing producers to continue to streamline their operations. However, wood product manufacturing, including companies like Commonwealth Plywood, has seen growth over the past ten years. While this industry sector is smaller than the larger paper product manufacturers in the region, it is forecast to have job growth over the next ten years. Both sectors are vital to the economy of the region – as illustrated by the high location quotients (LQ) of both industries.[13]

Table 3-18 - Organic Materials Processing and Manufacturing Sub-Industry Metrics 2010-2030

NAICS	Description	2020 Jobs	Historical Job Growth Rate (2010-2020)	Forecasted Job Growth Rate (2020-2030)	2020 LQ
321	Wood Product Manufacturing	394	11%	2%	2.7
322	Paper Manufacturing	1,338	(2%)	(6%)	10.8

Source: EMSI

[13] Typically, an LQ exceeding 1.20 suggests that a local economy is outperforming the larger, broader economy for that specific sector.

Given these industries have a strong presence in the region, industries that are adjacent and/or support this Target Industry Cluster would be a great fit for the local and regional economy. The site is well-positioned to support these industries as its on-site railyard and canal access could provide the site with opportunities to handle raw materials or finished products before they go to either the manufacturing process or final buyers. Additionally, much of the lumber in the US is imported from Canada, according to local sources, and the site's proximity to the Canadian border makes it an attractive option for those looking to process or store imported Canadian lumber.

According to IBISWorld, the industry outlook of this Target Industry Cluster is uncertain, as there are numerous supply-side and demand-side issues that could hurt the industry's outlook in the future. On the supply side, the costs of inputs such as lumber are very high because of shortages during the pandemic, and fluctuations in the market are expected to continue for some time[14] with demand from final producers likely increasing, including paper/wood products manufacturing and construction increases. This could make it more expensive for producers located in the Warren-Washington Region to purchase raw materials and could result in additional employment loss or industry contraction if higher prices for raw materials cannot be accounted for elsewhere in the upstream or downstream supply chain. The demand side of the equation also includes some uncertainty, with the rise of e-commerce and online advertising affecting demand for paper. While these trends may challenge the overall industry, the fact that much of the region's paper production is focused on personal hygiene may help insulate it from some of these demand issues.

Additionally, foreign competition could be a factor in the demand for final products. However, in the wake of the pandemic, some manufacturers have noted they believe there will be an increased appetite for products made in the United States as they want to be better prepared for future global supply chain interruptions. As such, the increasing trend towards global competition in these sectors could reverse in the future. This may help bolster demand and support these industries over time.

3.4.1.2 Metallic Processing and Manufacturing

Metallic Processing and Manufacturing encompasses both the manufacturing of raw metal ore into metal products for use elsewhere in industrial processes as well and the processing of metal into final products. The main industries that comprise this target industry cluster in the Warren-Washington Region employ approximately 540 people or about ten percent of all manufacturing-related employment in the region.

Table 3-19 - Metallic Processing and Manufacturing Sub-Industry Metrics 2010-2030

NAICS	Description	2020 Jobs	Historical Job Growth Rate (2010-2020)	Forecasted Job Growth Rate (2020-2030)	2020 LQ
3314	Nonferrous Metal Rolling, Drawing, and Extruding	78	(12%)	(3%)	15.07
3315	Aluminum Foundries (except Die-Casting)	49	~400%	68.7%	8.55
3321	Powder Metallurgy Part Manufacturing	76	New to Region	84.6%	25.28
3327	Machine Shops	251	5.4%	11.4%	2.59
3329	Industrial Valve Manufacturing	90	169.7%	7.2%	9.71

Source: EMSI

While this is significantly smaller than many of the other manufacturing and industrial sectors in the region, this Target Industry Cluster has experienced growth over the past ten years making it a cluster

[14] https://fortune.com/2021/04/27/lumber-prices-are-up-232-and-it-could-spiral-out-of-control-in-the-next-few-months/

that could continue to flourish in the region. Since 2010, four of the five industries have experienced employment growth and overall employment growth of 49 percent. This growth is forecast to continue, with these sectors growing from 540 jobs in 2020 to 714 jobs in 2030, a 31 percent increase. Additionally, all of these industries have high location quotients, with powder metallurgy part manufacturing having an LQ of over 25.

Canalside Energy Park appears to be a good fit for these industries for similar reasons described for Organic Material Processing and Manufacturing. The site has existing rail and canal access to allow for the shipping of raw materials or finished goods. Of note, a user in this industry would likely be of a smaller scale in nature, similar to those currently active in the region today, such as Doty Machine Works, Ames Goldsmith, and Miller Mechanical, and may not lease-up or purchase the entire Canalside Energy Park site. As such, attracting a user in this industry to the site would likely be part of a strategy to subdivide the site and sell or lease a portion over time.

According to research from IBISWorld, demand for outputs from this industry cluster tends to be localized in nature – with local producers selling to other local and regional businesses. As such, the industry outlook for this Target Industry Cluster is heavily tied to the regional and local manufacturing outlook and the effectiveness of the Capital and LCLG Regions' ability to attract and invest in manufacturing into the future. While there have been some recent manufacturers attracted to the Warren-Washington and LCLG Regions, manufacturing in the larger Capital Region has thrived. A potential strategy for attracting firms in this cluster to the region and supporting their longer-term is to help establish supplier relationships with other firms in the broader Capital Region.

Additionally, similar to Organic Material Processing and Manufacturing, foreign competition could be a threat to the sector. However, the severity of this threat will likely depend on how the national and global economy evolves as we exit the pandemic and if there is a shift back to favoring suppliers and manufacturers within the United States versus global entities.

3.4.1.3 Medical Device and Supplies Manufacturing

Medical Device and Supplies Manufacturing is the largest manufacturing sector in the Warren-Washington Region and has historically been one of the foundations of the local economy. This industry employs 1,500 people in the region, accounting for 26 percent of all manufacturing employment and has the highest location quotient of any industry in the Warren-Washington Region at 32.7, further underscoring its importance to the regional economy. However, this industry experienced

Table 3-20 - Medical Device and Supplies Manufacturing Sub-Industry Metrics 2010-2030

NAICS	Description	2020 Jobs	Historical Job Growth Rate (2010-2020)	Forecasted Job Growth Rate (2020-2030)	2020 LQ
339	Surgical and Medical Instrument Manufacturing	1,515	(31%)	(3%)	32.68

Source: EMSI

a significant decline since 2010, losing over 30 percent of its workforce. This decline in employment is projected to continue, albeit at a much slower rate than the previous ten years. This decline in regional employment is in sharp contrast to national trends where employment within the subcategory of Surgical and Medical Instrument Manufacturing, grew 17 percent nationally.

According to IBISWorld, demand for surgical and medical devices is anticipated to remain strong moving forward as the population in the United States continues to age and therefore requires more medical treatments and surgeries. Additionally, more people gaining access to health insurance they may otherwise not have had, (either via being eligible for Medicare or expansion of access due to governmental programs) is also anticipated to help increase demand for medical care and thus medical equipment moving forward.

Additionally, IBISWorld lists R&D expenditure as a key component affecting the Medical Device and Supplies manufacturing is spending on research & development. R&D expenditures are anticipated to increase markedly over the next few years in the wake of the pandemic as there is a renewed focus on finding more effective ways of treating medical illnesses.

Like the other manufacturing clusters, Canalside Energy Park would be a good fit for users looking to capitalize on direct rail and water access at the site. However, the limited access to the via roadways may make it more difficult to attract a medium to the large-sized user. As such, any users at the site would likely be smaller and provide support services to the larger companies located in the region, such as AngioDynamics and BD Becton Dickinson. During interviews with local stakeholders, there was also mention of attracting smaller more nimble companies who may be looking to work with larger more established companies to modernize manufacturing processes or design and manufacture new devices. Smaller buildings and sites at Canalside Energy Park offered at lower rents could help smaller start-up companies enter the region and build off the clusters' existing strengths.

Growth Target Industry Clusters

3.4.1.4 Green Energy Production

The Green Energy Production Target Industry Cluster refers to a broad range of industries that produce energy either from renewable resources or from waste products of other industries. In the context of the Warren-Washington Region and Canalside Energy Park, two main green energy industries would be good fits for Canalside Energy Park: Support for Offshore Wind and Biomass/Waste-to-Energy Production.

In early 2021, New York State awarded Equinor, a European energy company, a contract to build offshore wind power generation facilities in one of the largest renewable energy awards in United States History[15]. One of the sites is at the Port of Albany where Equinor will work with Marmen and Welcon to help the port become the first offshore wind tower and transition piece manufacturing facility, where it will produce components for Equinor’s projects located elsewhere in New York State. The site, located in the State’s Capital Region, will be a location for future projects to source offshore wind towers, transition pieces, and other manufacturing components for many years to come as offshore wind continues to grow along the East Coast.

While the main tower production facility will be located at the Port of Albany, there may be other ancillary support services for this industry that would be a good fit for Canalside Energy Park, particularly if they require rail or water transportation, or cannot be co-located with other uses. This could include small manufacturing facilities producing necessary parts or components to the offshore wind industry, or storage and shipping of parts and products to the Port of Albany site.

A second potential source of green energy production and/or manufacturing is through the utilization of solar panels and solar energy infrastructure on site. Given the size of the Park and that there are areas which may not be appropriate for buildings, solar panels could be constructed to produce energy for the park or sold back to the grid. In addition to generating solar power from the site itself, Canalside Energy Park could also serve as a location for the manufacturing of solar panels. This

[15] https://www.businesswire.com/news/home/20210113005811/en/Equinor-Selected-for-Largest-ever-U.S.-Offshore-Wind-Award

industry is projected to increase revenues by 6.8% annually through 2026 as demand for solar panels continues to increase both domestically and internationally.[16] The United States is projected to continue to be a net importer of solar cells and panels which could lead to opportunities to advance domestic production benefitted by the US government's renewed focus on increasing alternative energy production. The reliance on semiconductors for solar photovoltaic cells could provide an interplay between Canalside Energy Park and major semiconductor manufacturers nearby like Global Foundries.

The third potential source of green energy production is through Biomass Power, which is a process of taking biological material from living, or recently living organisms, such as plants or plant-derived materials, and converting to energy[17]. This type of energy production has expanded rapidly over the past ten years, due to government subsidies, investments, and regulatory standards designed to increased interest in renewable energy sources. While many types of biomass can be used in the production of power, one of the most relevant to the Warren-Washington Region is the use of animal manure and other farming byproducts. Given the agricultural base located in the region, there is already a local source of biomass inputs readily available. Other potential sources of local inputs for biomass energy production include waste from the brewing or fermentation processes of alcohol from local producers.

Demand for this industry is anticipated to continue to grow into the future as there is continued focus and investment in renewable energy sources. However, despite coming from renewable sources, biomass power produces significant emissions that may make it less favorable for future investment compared to other types of renewable energy such as wind or solar.

Waste-to-energy is similar in concept to biomass power production, in that solid waste, often from households or other industries is incinerated to reduce its physical footprint with the resulting energy used to generate electricity. The key difference in industry outlook compared to biomass power production is that the world price of steel is a major driver of the industry, as construction of these facilities is even more steel and capital intensive than biomass power facilities, and thus the price of construction inputs more heavily affects waste-to-energy industry outlook compared to biomass power. However, the future outlook from a demand perspective and environmental concerns impact both biomass power and waste-to-energy facilities.

The site's relatively remote location may be an advantage for biomass power and waste-to-energy production, as there are fewer conflicting uses in the immediate area compared to other industrial parks in the region.

3.4.1.5 Transportation, Wholesaling, and Storage

From the quantitative cluster scoring analysis, industries related to wholesaling, such as Medical Equipment Wholesalers, Industrial Machinery Wholesalers, Photography Equipment Wholesalers, and Electrical Equipment Wholesalers, experienced significant employment growth from 2010 to 2020, growing 124 percent (191 jobs). This growth is forecast to continue, with these industries expanding to 696 employees in 2030, a 33 percent increase.

Transportation and storage-related industries were mentioned during interviews for this study as possible fits for the Canalside Energy Park, given its rail and canal access. However, these industries, particularly warehousing, are not currently present in the local market in large numbers. Combined,

[16] IBISWorld, Solar Panel Manufacturing Industry Report
[17] IBISWorld, Biomass Power Industry Report

these industries employed approximately 100 people, with location quotients near or markedly below national averages.

While wholesaling and transportation/storage industries are different, they share common similarities around the space needs and access requirements and thus make sense to view them similarly. Both industries could be good fits at Canalside Energy Park if they desire rail and canal access as part of their transportation and logistics process. However, the distance from I-87 may make other industrial parks and sites in the region a better fit for logistics relying solely on truck transportation. One point worth noting is the potential value add of the large rail yard and the potential for bringing in raw materials, such as grain, by train and storing these materials on site. The synergy between the rail connections and the size of the potential storage facilities at Canalside EnergyPark could make that an attractive option as well. Materials could be transferred between rail, barge, and/or truck to be shipped elsewhere within the larger region or to other national or international locations.

According to IBISWorld, the long-term industry outlook for both wholesalers and transportation/storage is strong as consumer spending is forecasted to continue to grow, particularly in the wake of the covid-19 pandemic and the economy reopens. This could position Canalside Energy Park as there will be a need to transport goods produced in the Warren-Washington region downstream to other markets as well as a need to serve the household base and businesses that call the Warren-Washington region home.

3.5 Workforce Analysis

As previously mentioned, the population in Warren and Washington Counties is rapidly aging. This dynamic is having a measurable impact on the workforce. Since 2001, the number and share of workers aged 55 and older have increased from 6,800 workers to over 13,000 workers in 2020. Additionally, this age cohort increased in its share of the total workforce from 14 percent in 2001 to 28 percent in 2020. Over the same period, the number and share of workers aged 35-44 decreased, as these workers aged into the 55 and older age cohort. From an economic perspective, this dynamic could jeopardize the ability of current employers in the region to backfill positions vacated by retiring workers.

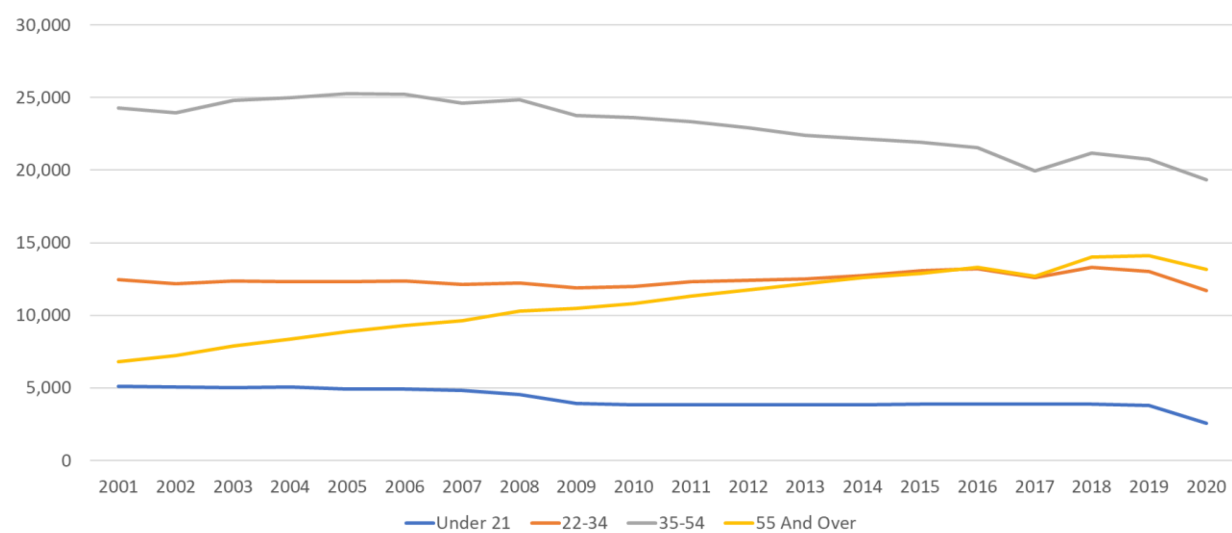


Figure 3-16 - Workers by Age, Warren-Washington Counties 2001-2020

Source: Census QWI Survey

As such, the biggest issue around workforce facing businesses in the region today is employee attraction. According to interviews, employers in the region, particularly on the manufacturing side, have had challenges finding enough skilled and unskilled workers to fill job openings. As such, a primary focus and effort for the Warren-Washington Region should be employee attraction and retention. Without efforts to reverse recent trends, the region will likely not be able to support its current economic base, let alone attract additional users to the site.

The impacts of the Covid-19 pandemic on the nation's workforce also cannot be ignored. According to the US Department of Labor, a total of 11.5 million workers quit their jobs during the months of April, May, and June 2021. Some workers are retiring early, some are changing jobs and fields altogether, and some are pursuing additional educational opportunities. There is also a segment of the workforce that during the pandemic could not remain in the workforce due to the lack of childcare options, limited availability of transportation, and/or the fear of contracting the Covid-19 virus. The impacts of this "Great Resignation" are further constricting the available workforce particularly for lower-paying jobs with higher risk of contracting the virus. As the labor shortage continues, companies will need to pay higher wages and offer increasingly competitive benefits to attract and retain workers over time. As we saw from the income data, Warren and Washington Counties already lag the larger Capital Region in wages and household income. The tightening of the labor market could exacerbate these already existing challenges.

Occupation and Wage Analysis

According to EMSI, Office and Administrative Support occupations were the largest occupational group in the Warren-Washington Region, with approximately 6,600 employees in 2020. This occupation classification, along with Sales, Food Preparation, Production, and Educational Instruction comprised the five largest occupation classifications, accounting for approximately 24,000 jobs, and equating to approximately 45 percent of all jobs in the Warren-Washington Region in 2020. However, it should be noted that all of these sectors accounted for a decline of more than 3,000 positions from their 2010 totals. In other words, the dominant sectors are shrinking.

As discussed in the previous section where employment growth by industry sector was reviewed, overall employment in the Warren-Washington Region declined from 2010-2020. As such, it is unsurprising that most occupation classifications lost jobs during this time. Office and Administrative Support lost the most employees (1,800) and contracted by approximately 22 percent. This is also indicative of an overall decline in the economy of the region, as these occupations support a wide variety of industry sectors. Additionally, the other four largest occupation classifications lost jobs from 2010 to 2020.

Of note, Production occupations lost 143 jobs, declining four percent. These occupations are likely to be the workers responsible for the actual production of goods and services in Manufacturing (versus back-office staff or maintenance, etc.). While these jobs declined four percent, the decline has been slower than in the overall manufacturing industry. This may indicate that some of the job losses may not have been directly linked to declines in production.

Table 3-21 - Historical Occupation Trends, Warren-Washington Counties 2010-2020

SOC	Description	2010 Jobs	2020 Jobs	2010 - 2020 Change	2010 - 2020 % Change
11	Management	2,630	2,682	52	2%
13	Business and Financial Operations	1,561	2,130	568	36%
15	Computer and Mathematical	489	775	286	58%
17	Architecture and Engineering	567	570	3	0%
19	Life, Physical, and Social Science	276	265	(10)	(4%)
21	Community and Social Service	1,253	1,066	(187)	(15%)
23	Legal	320	336	16	5%
25	***Educational Instruction and Library***	***4,315***	***3,794***	***(521)***	***(12%)***
27	Arts, Design, Entertainment, Sports, and Media	891	726	(165)	(19%)
29	Healthcare Practitioners and Technical	3,776	3,619	(157)	(4%)
31	Healthcare Support	3,379	3,220	(158)	(5%)
33	Protective Service	1,703	1,868	164	10%
35	***Food Preparation and Serving Related***	***4,618***	***4,335***	***(283)***	***(6%)***
37	Building and Grounds Cleaning and Maintenance	2,727	2,265	(462)	(17%)
39	Personal Care and Service	1,701	1,540	(161)	(9%)
41	***Sales and Related***	***5,898***	***5,299***	***(599)***	***(10%)***
43	***Office and Administrative Support***	***8,451***	***6,604***	***(1,847)***	***(22%)***
45	Farming, Fishing, and Forestry	422	429	7	2%
47	Construction and Extraction	3,247	2,768	(478)	(15%)
49	Installation, Maintenance, and Repair	2,820	2,729	(90)	(3%)
51	***Production***	***3,952***	***3,809***	***(143)***	***(4%)***
53	Transportation and Material Moving	3,360	3,199	(161)	(5%)
55	Military-only	110	99	(11)	(10%)
99	Unclassified Occupation	0	0	0	0%

Source: EMSI

In both the Capital Region and in the Warren-Washington Region, the highest annual earnings are for Management occupations, with median earnings of $102,852 and $92,043, respectively. Food Preparation workers had the lowest annual wages in the Capital Region, earning $28,475 annually while Personal Care Service Providers had the lowest annual earnings in the Warren-Washington Region at $28,537 per year. Across nearly all occupational categories, wages were higher in the Capital Region, with the largest gap in Computer and Mathematical occupations (21 percent) and Arts, Design, Entertainment, Sports, and Media (20 percent). Given that employers in the parts of the Capital Region farther south than the Warren-Washington counties pay higher wages, it is likely that employees have a location preference for jobs located in these regions with higher wages. As such, jobs in the Warren-Washington Region may need to offer higher wages to attract workers, particularly skilled workers to the region.

Table 3-22 - Median Earnings by Occupation 2020

SOC	Description	Capital Region Median Earnings	Warren-Washington Median Earnings	Gap (%)
11	Management	$102,853.60	$92,039.39	(11%)
13	Business and Financial Operations	$69,325.68	$60,753.64	(12%)
15	Computer and Mathematical	$78,374.89	$61,943.15	(21%)
17	Architecture and Engineering	$84,979.86	$74,131.04	(13%)
19	Life, Physical, and Social Science	$63,979.11	$66,451.08	4%)
21	Community and Social Service	$50,579.61	$47,094.83	(7%)
23	Legal	$90,254.36	$81,788.49	(9%)
25	Educational Instruction and Library	$57,584.67	$54,117.60	(6%)
27	Arts, Design, Entertainment, Sports, and Media	$51,407.87	$41,094.50	(20%)
29	Healthcare Practitioners and Technical	$67,459.05	$63,999.49	(5%)
31	Healthcare Support	$32,238.23	$33,429.84	4%)
33	Protective Service	$55,351.47	$55,789.28	1%)
35	Food Preparation and Serving Related	$28,474.83	$31,211.43	10%)
37	Building and Grounds Cleaning and Maintenance	$30,382.77	$30,192.25	(1%)
39	Personal Care and Service	$29,091.30	$28,537.38	(2%)
41	Sales and Related	$32,136.00	$30,111.35	(6%)
43	Office and Administrative Support	$41,439.72	$37,429.41	(10%)
45	Farming, Fishing, and Forestry	$32,846.83	$31,280.88	(5%)
47	Construction and Extraction	$50,965.21	$43,741.70	(14%)
49	Installation, Maintenance, and Repair	$49,494.80	$44,676.40	(10%)
51	Production	$41,949.22	$36,861.79	(12%)
53	Transportation and Material Moving	$36,876.08	$34,116.88	(7%)
55	Military-only	$42,838.12	$42,444.82	(1%)

Source: EMSI

In the Warren-Washington Region, Food Preparation and Serving occupations experienced the largest wage growth, with median annual wages growing from under $20,000 to $31,000, a growth of 60 percent. Legal occupations saw the smallest wage growth, with wages essentially staying flat from 2010 at approximately $81,000 annually. In general, occupations with lower median wages experienced higher rates of wage growth than higher-paying occupations. Differences in wage growth between the Capital Region and the Warren-Washington Region were occupation-specific with no overarching patterns.

Table 3-23 - Occupations and Earnings, Warren-Washington Counties 2010-2020

SOC	Description	2010 Median Annual Earnings	2020 Median Annual Earnings	Growth (%) 2010-2020
11	Management	$74,376.13	$92,039.39	23.7%
13	Business and Financial Operations	$51,816.11	$60,753.64	17.2%
15	Computer and Mathematical	$52,093.33	$61,943.15	18.9%
17	Architecture and Engineering	$64,376.05	$74,131.04	15.2%
19	Life, Physical, and Social Science	$53,786.71	$66,451.08	23.5%
21	Community and Social Service	$38,878.87	$47,094.83	21.1%
23	Legal	$81,851.74	$81,788.49	-0.1%
25	Educational Instruction and Library	$42,883.34	$54,117.60	26.2%
27	Arts, Design, Entertainment, Sports, and Media	$36,545.36	$41,094.50	12.4%
29	Healthcare Practitioners and Technical	$52,986.94	$63,999.49	20.8%
31	Healthcare Support	$27,583.96	$33,429.84	21.2%
33	Protective Service	$47,187.92	$55,789.28	18.2%
35	Food Preparation and Serving Related	$19,467.50	$31,211.43	60.3%
37	Building and Grounds Cleaning and Maintenance	$22,988.95	$30,192.25	31.3%
39	Personal Care and Service	$21,777.14	$28,537.38	31.0%
41	Sales and Related	$23,929.22	$30,111.35	25.8%
43	Office and Administrative Support	$29,319.17	$37,429.41	27.7%
45	Farming, Fishing, and Forestry	$24,105.94	$31,280.88	29.8%
47	Construction and Extraction	$36,586.33	$43,741.70	19.6%
49	Installation, Maintenance, and Repair	$38,557.25	$44,676.40	15.9%
51	Production	$32,231.08	$36,861.79	14.4%
53	Transportation and Material Moving	$27,655.29	$34,116.88	23.4%
55	Military-only	$32,454.83	$42,444.82	30.8%

Source: EMSI

Opportunity Analysis

While people of color make up a small share of the population of the Warren-Washington Region, ensuring equal opportunities across race and ethnicity is important. Opportunity gaps exist when certain populations, often workers of color, are underrepresented in certain industries and occupations due to systemic forces in the education system, hiring process, and the labor markets.

In the Warren-Washington Region, White workers and Asian workers have significantly higher per capita incomes compared to other workers identifying with other races and ethnicities, with per capita incomes of $33,007 and $35,930, respectively. These figures are nearly double the next highest-earning group, those identifying as Other (Native Americans, Pacific Islanders, Others), who earned $18,275 per year. African American and Black workers had the lowest per capita incomes in the region, earning under $10,000 annually. While there is undoubtedly some statistical error in these estimates due to the relatively small sample size associated with some of these populations in the region, there is a disparity in the per capita income of various racial/ethnic groups that must be recognized and addressed.

A major driver of the per capita income gap between White and Asian workers and other racial/ethnic groups is the gap in educational attainment. Currently, in the Warren-Washington Region, White residents account for 96 percent of all those in the region with a college degree. Asian residents account for 1.3 percent of all residents in the region with a college degree while comprising 0.8 percent of the total population.

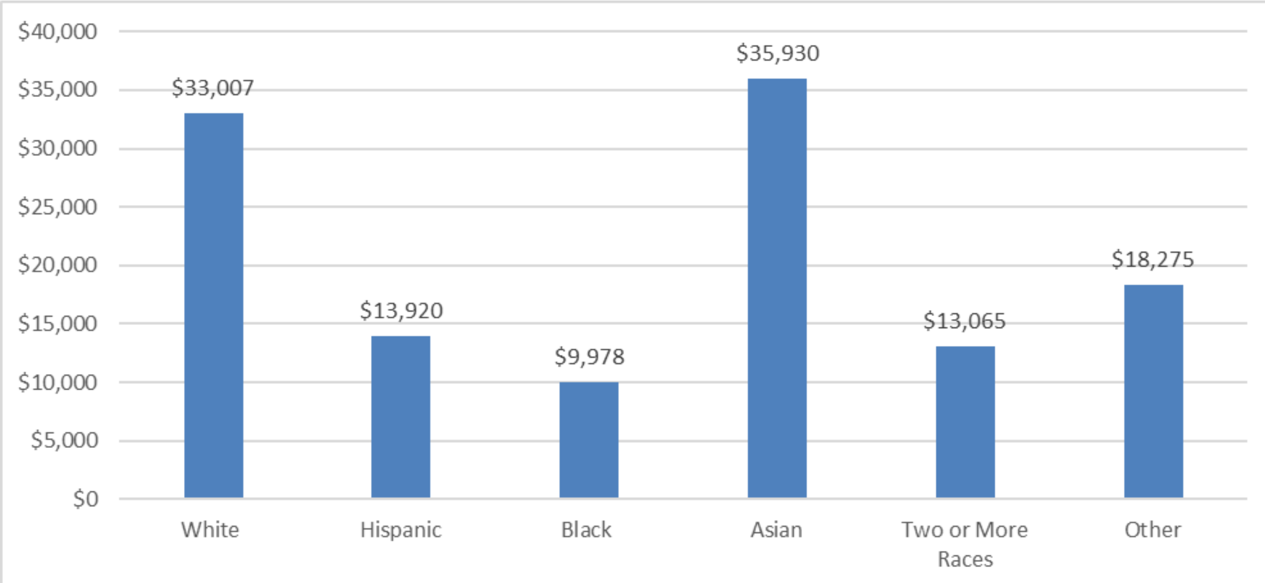


Figure 3-17 - Per Capita Income, Warren-Washington Counties 2019

Source: American Community Survey, 2015-2019 Estimates

Residents who do not identify as white alone comprise 19 percent of the population who have attained less than a high school diploma but make up approximately 7 percent of the total population of the Region. This difference is most heavily pronounced among African American and Black residents and Latino residents, who comprise approximately 5 percent of the total population in the region but account for over 12 percent of those with less than a high school diploma.

While there are many factors tied to educational discrepancies, from an economic development and workforce perspective, ensuring the entire working population has quality access to educational opportunities at an early age is important.

Table 3-24 - Educational Attainment by Race/Ethnicity, Warren-Washington Counties 2019

	Less Than HS		College Graduate		Population	
	#	%	#	%	#	%
White	8,254	81.3%	23,231	95.7%	117,152	93.1%
Hispanic	687	6.8%	256	1.1%	3,337	2.7%
Black	541	5.3%	176	0.7%	2,487	2.0%
Asian	275	2.7%	311	1.3%	1,004	0.8%
Two or More Races	139	1.4%	183	0.8%	1,427	1.1%
Other	256	2.5%	113	0.5%	485	0.4%

Source: American Community Survey, 2015-2019 Estimates

In looking at the share of each population with different levels of education by race or ethnicity, White residents have the lowest share of the population with less than a high school diploma at only 9

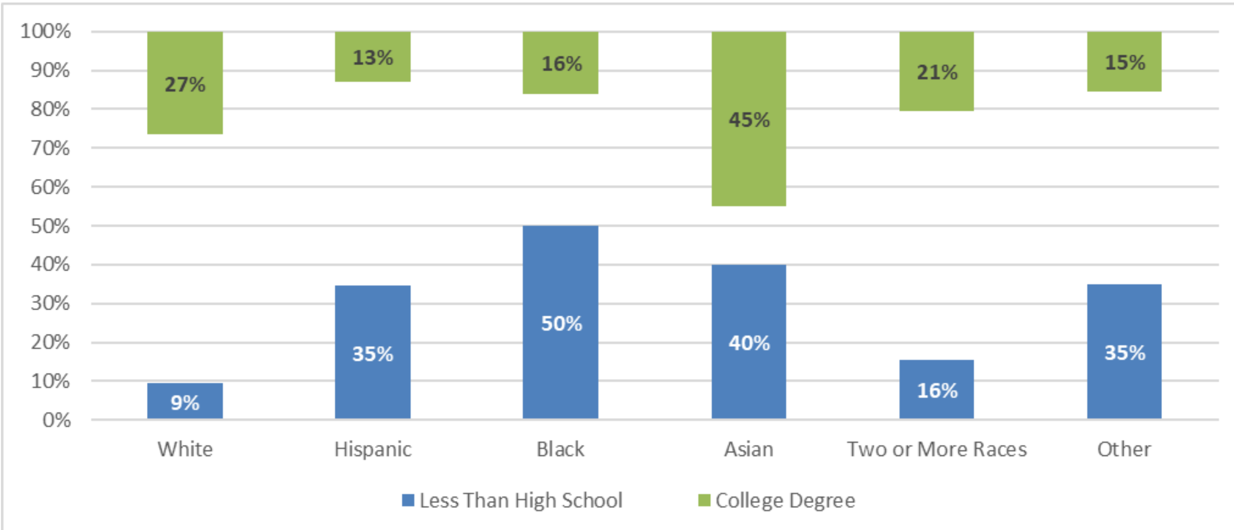


Figure 3-18 - Educational Attainment by Race/Ethnicity, Warren-Washington Counties 2019

Source: American Community Survey, 2015-2019 Estimates

percent. On the other end of the education spectrum, Asian residents have the highest share of the population with a college degree at 45 percent. Of note, residents identifying with two or more races have educational distributions most similar to White residents, but still, have a 7 percent higher share of those with less than a college degree and a 6 percent lower share of those with a college degree. However, the per capita income of those residents identifying with two or more races is $13,065 (60%) less than the per capita income of White residents at $33,065.

In addition to identifying differences in income and educational attainment by race and ethnicity, employment was also analyzed to help further identify opportunity gaps that exist across occupations. The current job base was analyzed and compared to the racial and ethnic distribution of high-wage

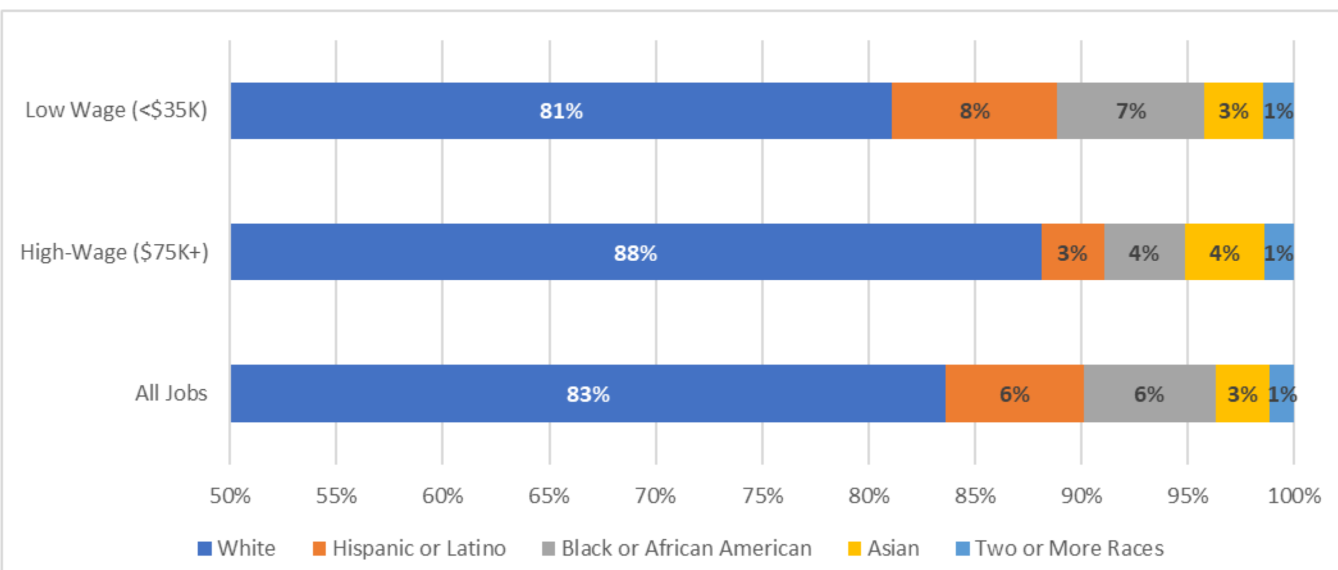


Figure 3-19 - Wages by Occupation and Race/Ethnicity, Warren-Washington Counties 2020

Source: EMSI, RKG Associates

jobs (those with median annual wages of $75,000 or more) and low-wage jobs (those with median annual wages of $35,000 or less). This helps identify instances where disparities may exist by race and ethnicity between high-wage and low-wage jobs within each industry.

In the Warren-Washington Region, approximately 83 percent of all jobs are held by White workers, but White workers hold over 88 percent of all high-wage jobs. Conversely, African American and Latino workers hold 12 percent of all jobs, yet only seven percent of all high-wage jobs. As a share of population, White workers in the region are overrepresented in high-wage jobs while African American and Latino workers are underrepresented. Asian workers have a higher share of high-wage jobs compared to their overall composition of the region's population, accounting for 4 percent of all high-wage jobs.

To best position the region to attract new businesses, both to Canalside Energy Park and elsewhere, efforts should be made to ensure access to education and job opportunities for those who are qualified across the whole population.

Workforce and Skills Assessment

The availability of a skilled labor force, or the ability to cultivate a skilled labor force, is a critical component to supporting future employment and economic growth. The regional Workforce and Skills Analysis aims to identify the skills currently possessed by the workforce in the Warren-Washington Region and understand what skills are needed to support the region's economy.

This analysis aims to understand the core competencies of the regional workforce today and for each target industry to identify the most critical occupations and corresponding skills needed for those occupations. This comparison of industries, occupations, and skills provides insight on the skills that may be missing and need to be cultivated to ensure existing industries can continue to thrive and the region has a workforce prepared to support future industry attraction and growth. When compared to the skills of the current workforce, the analysis identifies gaps in skills by target industry which will help guide strategies for upskilling, education pipelines, job training, and apprenticeships.

3.5.1.1 Top Hard Skills Within Warren-Washington Workforce

The Workforce and Skills Analysis first aims to identify the skills already most prevalent in the region's workforce to understand the core competencies that exist today. This analysis is completed using EMSI's Labor Market Analytics platform, which analyzes the prevalence of hard skills (those requiring specific technical knowledge) and soft skills (those based on personality traits) contained within historical job postings, online resumes, and LinkedIn profiles in the region.

The following table lists the most prevalent hard skills in the workforce today. While many of the top 40 skills, such as Auditing, Accounting, and Purchasing are applicable across a wide swath of industries and occupations, most of the skills are more specialized to the healthcare or food service industries, two of the largest industries in the Warren-Washington Region.

Table 3-26 - Top Hard Skills, Warren-Washington Counties 2020

Number	Skill	Number	Skill
1	Merchandising	21	Medication Administration
2	Nursing	22	Pediatric Advanced Life Support
3	Basic Life Support	23	Customer Relationship Management
4	Restaurant Operation	24	Rehabilitation
5	Flatbed Truck Operation	25	Caregiving
6	Cash Register	26	Dry Van Truck Operation
7	Advanced Cardiovascular Life Support (ACLS)	27	Billing
8	Food Services	28	Food Preparation
9	Auditing	29	Reefer Truck Operation
10	Cash Handling	30	Loss Prevention
11	Cardiopulmonary Resuscitation (CPR)	31	Packaging And Labeling
12	Warehousing	32	Safety Standards
13	Long-Term Care	33	Telemetry
14	Intensive Care Unit	34	Deposit Accounts
15	Accounting	35	Medical Records
16	Emergency Departments	36	Acute Care
17	Purchasing	37	Inventory Management
18	Psychiatry	38	Geriatrics
19	Visual Merchandising	39	Post-Anesthesia Care Unit
20	Food Safety	40	Loans

Source: EMSISource: Esri Business Analyst, RKG Associates

Normally, work force training and "re-skilling" programs tend to focus on hard skills. However, based on interviews completed during this project, there are gaps in soft skills for many industries – with potential employees having the hard skills needed to be successful but not the soft skills. Below is a table of the top soft skills desired by employers in the region.

Table 3-25 - Top Soft Skills, Warren-Washington Counties 2020

Number	Skill	Number	Skill
1	Customer Service	21	Professionalism
2	Communications	22	Cleanliness
3	Sales	23	Enthusiasm
4	Management	24	Written Communication
5	Valid Driver's License	25	Innovation
6	Operations	26	Accountability
7	Leadership	27	Microsoft Excel
8	Detail Oriented	28	Microsoft Office
9	Basic Math	29	Teaching
10	Teamwork	30	Time Management
11	Computer Literacy	31	Coordinating
12	Problem Solving	32	Compassion
13	Interpersonal Communications	33	Retail Sales
14	Planning	34	Research
15	Presentations	35	Prioritization
16	Verbal Communication Skills	36	Mentorship
17	Scheduling	37	Troubleshooting (Problem Solving)
18	Organizational Skills	38	Sanitation
19	Good Driving Record	39	Decision Making
20	Self-Motivation	40	Loading And Unloading

Source: EMSI

While the current list of Top 40 hard skills aligns more closely with prevailing industry sectors like Healthcare and Social Assistance and Food Services and Accommodations, it is the skills for jobs in manufacturing, production, transportation and logistics, green energy production, and professional and technical services that will more closely align with the future of the local region and the larger Capital Region. New York State is focused on advanced manufacturing, green energy production (offshore wind), and life sciences which all have applicability for target industries at the Canalside Energy Park. With a shrinking population and an aging workforce, the strategy for the region should include employee attraction, but another critical component is boosting the skills of those coming through the educational pipeline within the region and showing them potential pathways for immediate employment. This could be done through middle school and high school educational programs, learning skills during secondary education, and even reskilling younger workers in the region.

4.0 OPPORTUNITY ANALYSIS & CONCLUSION

4.1 Industry Opportunities

To date, it appears that the WWIDA receives consistent interest in the Site, but few opportunities have resulted in substantial investment and a reactive approach seems unlikely to result in development that provides a stable source of revenue, or to be met by a single industry or investor. In commissioning this study, the WWIDA seeks to understand where the Canalside Energy Park stands in terms of its current infrastructure capacity as well as its viability in the regional and local market. Additional, but significant, considerations include the need for tax liability relief and the desire to utilize the site for community co-benefits such as skills training and job creation.

To identify the industries most suited for the site and with the most potential for growth, RKG Associates and Weston & Sampson benchmarked other regional industrial parks, spoke with a wide range of government, utility, real estate and development, economic development, and university entities about emerging opportunities in the region, as well as potential development of the Canalside Energy Park in comparison to other industrial sites (see Section 3). This research enabled the team to home in on specific industries or industry groups and determine the feasibility of these industries at the Canalside Energy Park with and without additional infrastructure investment. Furthermore, it allowed the team to gauge the receptiveness of potential partners or champions for development at the site and to dismiss potential industries that were unlikely to locate at this site. As described in detail in Section 3, industries and opportunities that emerged from our analysis with the most promise for the Canalside Energy Park included:

Green Industries

- **Renewable energy** arose to the forefront as an attractive possibility for the site, particularly solar arrays which would provide an immediate source of revenue and occupy portions of the site that did not lend themselves to construction, such as those bound by wetlands, lacked access, or other constraints.
- **Biomass energy** was also assessed, although profitability from this source can fluctuate depending on supply. Sources assessed include spent grains (from regional breweries), and other sources.
- Other complementary green industries include **industrial waste processing, conversion, and disposal**, such as PFAS removal, which dovetail with the adjacent specialty waste company Green Earth. **Composting**, which includes processing organic waste from residential, commercial, private, and institutional sources (discussed further below), represents a potential source of short and long-term revenue, and the Canalside Energy Park is well-located as a receiver and is largely buffered by the canal, the rail, and agricultural lands.

Food Production and Processing

- **Processing and preparation of food products** fits well with the agricultural setting of the Canalside Energy Park and can include a wide range of potential manufacturing scales and types, such as farm to table, wine/beer making, canning/bottling, etc. Food processing presents opportunities to build training platforms for new workers (perhaps including local schools) and to involve universities. Food processing incubators often serve as a hub for multiple community interests, from local farmers and restaurants to non-profits dedicated to job creation or skill-building. Models can be found in Greenfield, Massachusetts and throughout New England and New York.

- Although not strictly a food product, the **cannabis industry** is currently experiencing a demand for space and could provide needed revenue to relieve the tax liability. Moreover, cannabis does not require skilled labor like other manufacturing industries, and workers. Aquaculture is also a potential industry which often works synergistically with livestock production.

Specialized Manufacturing.

- Although many manufacturing industries are seeing declines in employment, **organic material processing** (wood pulp, pellets, etc.) has performed well.
- Other manufacturing that may be suitable for the Canalside Energy Park include **manufacturing components for renewable energy**, such as wind turbines, or another existing regional sector, such as medical device manufacturing. These industries are actively seeking space and could provide revenue and job opportunities.

Innovation and Skills-Based Industries (particularly Agricultural).

- Although **technological/business incubators** can be found throughout the region, the Canalside Energy Park could tie into the regional strength of agriculture and draw from regional resources such as SUNY Adirondack. With a university partner, an agricultural technology hub could become a regional resource for training, research, and industry networks. Private partnerships could support activities at the hub.
- Agricultural Tech hubs can support other potential uses, such as hospitality training, as accessory or complementary programs in cooperation with a university or non-profit partner.

Transfer and Storage.

- With the prominence of online retailing, **warehousing, and storage** are in generally high demand, particularly if the site could be built out with temperature-controlled storage and supplemented with logistical services for shipping dairy products, groceries, meat, and produce. Pharmaceuticals and life science goods also require storage at specific temperatures, and demand has been rising for storage of vaccines or biologic drugs such as Humira and Neulasta. The “biopharma cold chain” has been fueled not only by the COVID 19 pandemic, but by new therapies for cancer and other diseases. In May of this year, UPS launched its own cold chain services to meet this demand, and emerging companies specialize in planning, designing, and building cold chain facilities.
- The railyard could also potentially serve as a **transfer and storage area**. These industries require a range of skilled labor and space, but the Site could be complicated by the distance from the highway.

4.2 Evaluation of Opportunities

The Site offers potential investors the opportunity to leverage existing rail, canal, and highway connections, and a few key advantages. The site is not in a flood zone, is relatively flat, and is fairly removed from adjacent land uses. Environmental contamination has been remediated from the site, and key infrastructure is in place (electric, stormwater) or can be added with minimal cost (broadband).

The site also includes several development constraints, which create uncertainty for developers and may steer them toward other industrial parks that are "shovel ready" or more proximate to workers and highway access. Much of the 330 acres parcel contains wetlands under federal jurisdiction, which would limit site buildability, and soils may not be sturdy enough to support structures with basements. Natural gas and wastewater are not present at the site and the water system needs to be upgraded. Other utilities, such as electricity, are available, but cannot be segmented for different users, so a management structure will have to be devised. Other potential constraints include environmental and cultural resources on the site, and further clarification is needed to understand their impacts. Finally, the Canalside Energy Park is proximate to the highway but not directly adjacent to it, so industries that rely on trucks may find access complicated, particularly with the poor visibility approaching Route 196 from Lock 8 way. Highway access becomes further problematic by the need for additional bridge support (see Table 29, below).

Based on the strengths and challenges of the site, it appears that those opportunities that can produce acceptable revenue while minimizing the need for water, wastewater, and truck travel are optimal; however, they may not realize substantial long-term revenue, alleviate tax liability, or provide other desirable benefits (job training, etc.) that Warren and Washington Counties need; however, these opportunities can serve to anchor the park while development challenges for larger and/or more complex opportunities can be sorted out.

Table 4-1 - Summary of Development Constraints based on Existing Infrastructure

Infrastructure	Limit, if known	Other Considerations
Traffic (Lock 8 Way)	250,000 square feet/ industrial	Bridge truss on Lock 8 Way needs to be replaced.
Electrical		Requires a single user or management of billing
Stormwater	NA	NA
Natural Gas	Not on site	Requires further study
Water	• 800 GPM (1.15 MGD) based on NFPA standards for fire flow	Water Treatment Plant: • avg. distribution of 400,000-440,000 gpd (max. 565,000 gallons per day). • capacity of approximately 1.3 MGD which includes water storage within the system • The water treatment plant has a water withdrawal limit of 1.2 MGD
Wastewater	• need to connect to sewer or on-site septic systems Washington County Sewer District No. 2 Wastewater Treatment Plant: • permitted discharge limit of 2.5 MGD • plant design capacity is 2.0 MGD (90% of design capacity is available = 1.8 MGD) • currently discharges avg. 1.7 MGD • capacity to handle an extra 0.1 MGD of sanitary sewer flow	

Opportunity Matrix

In order to understand how to weigh the relative costs and benefits of one opportunity over another, the Team needed to know the benefits that the WWIDA hopes to receive in the short and long term. Based on discussions and research, the consulting team and the WWIDA determined that the following values were key to the WWIDA and the community:

- Utilization of existing infrastructure onsite (particularly the rail lines and canal)
- Short term revenue
- Long term revenue
- Relief from tax liability
- Co-location of similar industries (creation of a hub)
- Regional partnerships
- Job creation
- Potential grant funding
- Community support
- Compatibility with adjacent land uses.

Once the core values for the site were established, the team developed a rubric to enable the WWIDA to compare one industry with another relative to these values in the form of an Opportunity Matrix (see Appendix C). The matrix is in an Excel spreadsheet with target industries along the y-axis and values along the x-axis. In addition to the values above, the matrix also factors in capital costs for infrastructure upgrades to serve the industry and the time horizon for total build-out (long, medium, short). These criteria are weighted based on discussions with the WWIDA and each industry receives a total score for how well it achieves each value and requires less infrastructure upgrades and time for build out (a higher score indicates more value, less cost, and less time). Although the matrix is certainly subjective, it is a conceptual tool intended to evaluate disparate industries according to shared values. In this way, community needs, and desires communicated through the visioning session are synthesized into the overall Opportunity Analysis.

Based on the Matrix, the selected industries were scored with the highest score reflecting lower capital costs, higher revenue, and greater community benefits:

1. Food Production and Processing (including cannabis): All aspects of food production and processing scored high, although it has been noted that cannabis is still considered against federal law, and therefore not eligible for federal funding.
2. Solar Energy Production: Unlike other renewables and green industries, solar energy production scored high because it does not require substantial infrastructure upgrades, capital investment, or skilled labor and can provide short term revenue. Other renewables scored somewhat lower because the do require infrastructure upgrades.
3. Warehouse and Storage. This sector builds off current demand for space and distribution, offers employment to both low and high skill workers, and utilizes all available transportation modes.
4. Agricultural Technology/Accelerator. Although this opportunity represents an exciting possibility that meshes well with the agricultural uses in the area, some challenges exist for coordination, and needs for infrastructure upgrades may not be immediately offset by revenues.

It should be noted that this ranking is based on a variety of assumptions about needed infrastructure, scale of production, estimates of revenue, etc. and should be regarded as a tool to support conversation and decision-making.

Community Visioning Session

To gauge community support for potential industries, the WWIDA hosted a virtual Community Visioning Workshop on June 29, 2021. The goal of the meeting was to present an overview of the project and to solicit feedback, ideas, and opinions about the site. The meeting was advertised in the newspaper, online, and through WWIDA email lists, and a local report attended.

At this meeting, Weston & Sampson and RKG Associates presented a history of the site, an assessment of its infrastructure strengths and weaknesses, and regional market opportunities.

The visioning session spurred a considerable amount of comment, and participants clearly felt strongly about the site's opportunities but also its potential to have negative impacts on adjacent neighborhoods and agricultural lands, and some questioned any approaches that re-introduce contaminated materials to a site that recently was remediated. A word cloud activity was conducted where the participants were asked to answer the question, what benefit would you MOST like to see for this site's development? A picture of the results can be seen in Figure 4-1 above. Overall, attendees were generally supportive of the target industries, and the consensus was that new industries at the site can be managed to reduce impacts to adjacent land uses.

Figure 4-1 - Slido Word Cloud from the Community Visioning session.

Public comment was incorporated into the actions of the Implementation Plan and the conceptual site plan. Most of the public feedback involved removing the tax liability from the site and creating jobs. All of the feedback was included in this report, and factors into the economic development analysis and the conceptual plan.

4.3 Buildable Area Analysis/Conceptual Site Plan

Because of the number of unknowns at the site (particularly wetlands), a detailed conceptual site plan is not possible at this point. Please see the conceptual site plan in Appendix C. For this conceptual plan, the intent is to estimate where buildings could generally go, and to show that the site can serve multiple small users and a wide variety of uses. In addition to business investment, this site has the potential to integrate with recreational uses that surround the site, including the bike trail and the canal. Site amenities in an industrial park may seem frivolous, but amenities are important to workers, particularly younger workers, and in turn may attract employers seeking to keep their workers happy. To that end, the site plan is based on the following concepts:

1. Use solar arrays or other renewables to create a stable revenue stream without substantial upfront infrastructure investment. These spaces can occupy stray patches of upland that are largely surrounded by wetland.
2. Create a "modular" approach to planning the site that includes different building sizes and configurations to accommodate multiple, small-medium scale users. This site plan includes a

larger building for anchor tenant(s), small studio/maker spaces, and a public-facing facility for job training and other educational purposes, rentable spaces, conference space.

3. Plan for additional investment to support rail line activities (such as storage and transfer).
4. Study the canal further and its potential for transport, but also accommodate its recreational potential.
5. Through strategic landscaping, blend the site with the adjacent neighborhoods, farms, and the bike path area.
6. Incorporate commercial and flexible space that supports healthy lifestyles for workers and residents, such as:
    a. Gyms, rock-climbing facilities, etc.
    b. Food truck areas with associated space for eating and relaxing (picnic tables, café space)
    c. Rentable bicycles, kayaks/canoes, scooters, etc. and connections to the bike path or the canal for recreational purposes

The Canalside Energy Park has the potential to support a number of possible businesses, but it is in competition with industrial parks that are shovel ready or already have rented space. The Canalside Energy Park can build off of existing recreational assets to create an industrial park that offers workers quality of life amenities.

4.4 Planning Context

Clarifying the planning and regulatory context can facilitate the location of new business investment. The Canalside Energy Park and neighboring WCC property spans the Village of Fort Edward, the Town of Fort Edward (and Kingsbury, although this area is minor and agricultural). Each entity has its own master plan, zoning codes, points of contact, and review boards. This situation, even when parties are responsive and cooperative, complicates discussions with potential investors. Furthermore, the Village and Town guidance documents (master plans) hardly address the Site at all. In its 2018 Master Plan, the Town of Fort Edward does not discuss the Canalside Energy Park other than to indicate that industrial uses should be steered toward the park. The Village of Fort Edward's Master Plan, completed in 2006, encourages a more balanced mix of residential, commercial, and industrial development in the future. The Plan states as an action that the Village should promote commercial and industrial development that is appropriate in size and scale and in keeping with the Village's historic features.

The Village and Town should update their plans and include the Canalside Energy Park as a potential hub for economic activity, addressing common issues of a decline in population, an atrophied workforce, challenges, and opportunities in a post-COVID economy, etc. This effort could be undertaken jointly. NY General Municipal Law (5g) allows cities, towns, and villages to enter into agreements to undertake comprehensive planning and land use regulation with each other or one for the other, and provides that any city, town, or village may contract with a county to carry out all or a portion of the ministerial functions related to the land use of such city, town or village as may be agreed upon. It is recommended that the Town of Fort Edward and the Village of Fort Edward collaborate on a single plan for the Canalside Energy Park that includes one zoning code (with a single review board), with defined uses that are allowable by-right or with site plan review.

While a single review board is recommended, during the Opportunity Analysis process, subdividing the property was considered to house multiple tenants. Due to the vast amount of land and multiple market opportunities, this option should be further explored if one suitor for the entire site is not identified.

4.5 Regional Composting Facility Feasibility Analysis

The Project Team analyzed the demographic and market data and conducted outreach to relevant officials in Warren and Washington Counties. Given the configuration of the site, composting can be a feasible option for use at this site.

Composted materials can consist of the following:

- Leaf/yard/organic waste
- Food, diary, and brewery waste
- Biosolids from wastewater facilities

Food, Dairy, and Brewery Waste

Food, dairy, and brewery waste can be anaerobically digested onsite and used for energy production onsite. Given the site's original purpose as a dewatering facility, this option becomes attractive.

Biosolids

Biosolids from wastewater treatment plant sludge can be anaerobically digested onsite and used for energy production onsite. Given the site's original purpose as a dewatering facility, this option becomes attractive. The location of this site is in close proximity of the Washington County Sewer District No. 2 wastewater facility, Glens Falls Wastewater Treatment Plant, and the Saratoga County Wastewater Treatment Plant. In addition, this location can be used as a septage receiving facility as the Washington County Sewer Distinct No. 2 facility does not have these capabilities at this time.

A draft Regional Biosolids Management Evaluation was conducted in August 2017 by Barton & Loguidice reviewing the feasibility of creating a regional facility. This evaluation can be found in Appendix C of this report. The report concludes that a public private partnership is the ideal agreement for this application. This arrangement would consist of a private entity that manages biosolids in the region, because it avoids large capital investment, decreases required operational maintenance, and mitigates risk for the municipality. The report recommends that a Request for Proposal (RFP) be issued to solicit proposals from perspective private partners. The proposals should be evaluated on a financial and logistical basis. Once the ideal private partner is determined, the municipalities will enter into a long-term contract for biosolids management, paying an established per-ton tipping fee. The key to making this a viable operation is to establish long term contracts that provide established loading rates so the developer can anticipate volumes of digested material to ensure consistent energy production.

Building on the biosolids report from Barton & Loguidice, we have assembled a tabulation of all of the permitted wastewater treatment plants and their permitted flows, if available. The Publicly Owned Treatment Works (POTWs) are highlighted in yellow in the tabulation below and we have converted the flow into a daily biosolids production using accepted rates of generation. This assumes each facility receiving its design flow with an average influent Total Suspended Solids (TSS) and Biological Oxygen Demand (BOD) concentration of 180 mg/L and a net facility yield of 1. This approach would result in a conservative (overestimate) sludge production from a solids handling standpoint. The result is a potential biosolids generation of up to 18,662 pounds per day or up to 11 tons per day at permitted flows. Knowing that this analysis likely overestimates the amount of biosolids, the number correlates nicely with the projected amount of biosolids from the B&L report which also includes septage sludge. The conclusion here is that there is a decent amount of biosolids available in the two-county region to support a biosolids composting or digestion facility.

COUNTY	MUNICIPALITY	NAME	Permitted Flow MGD	Sludge Production Projection lbs/d
WASHINGTON	FORT EDWARD	IRVING TISSUE FT EDWARD OPERATIONS		
WASHINGTON	GREENWICH	HOLLINGSWORTH & VOSE GREENWICH MILL		
WASHINGTON	EASTON	HOLLINGSWORTH & VOSE-EASTON MILL		
WASHINGTON	GREENWICH	PAPER MILL OF GREENWICH		
WASHINGTON	GREENWICH	PAPER MILL OF GREENWICH		
WASHINGTON	FORT EDWARD	GENERAL ELECTRIC COMPANY - TDIS		
WASHINGTON	GRANVILLE	VILLAGE OF GRANVILLE WWTP	none identified	
WASHINGTON	WHITEHALL	WHITEHALL STP	0.6	901
WASHINGTON	FORT ANN	FORT ANN STP	0.11	165
WASHINGTON	FORT ANN	NYS GREAT MEADOW CORRECTIONAL FACILITY		
WASHINGTON	KINGSBURY	WASHINGTON CO. S. D. NO. 1--INDUST. PARK	none listed	
WASHINGTON	ARGYLE	MALLINCKRODT ANESTHESIA PRODUCTS		
WASHINGTON	ARGYLE	The Noah Project LLC		
WASHINGTON	GREENWICH	GREENWICH STP	0.05	75
WASHINGTON	FORT EDWARD	WASHINGTON CO SEWER DIST #2	2.5	820*
WASHINGTON	FORT ANN	WASHINGTON CORRECTIONAL FACILITY		
WASHINGTON	FORT EDWARD	GEN. ELEC. CO. FT MILLER REMED. SITE		
WASHINGTON	KINGSBURY	WHEELABRATOR HUDSON FALLS		
WASHINGTON	KINGSBURY	BAKER PROPERTY REMEDEATION SITE		
WASHINGTON	SALEM	RACE OIL SERVICE STATION--SALEM		
WASHINGTON	SALEM	SALEM SERVICE STATION		
WASHINGTON	DRESDEN	HULETTS LANDING SEWER DISTRICT NO 1		
WASHINGTON	KINGSBURY	FORMER SUNOCO STA		
WASHINGTON	GREENWICH	GREENWICH BULK PLANT		
WASHINGTON	KINGSBURY	PECKHAM MATERIALS CORP PLANT 31		
WASHINGTON	DRESDEN	FREDERICK'S POINT SEWER DISTRICT NO 2	0.00956	GW
WASHINGTON	PUTNAM	ROYAL ANCHORAGE SEWER DISTRICT NO 1	0.00678	GW
WASHINGTON	KINGSBURY	EASTSIDE METALS AND RECYCLING CORP		
WASHINGTON	FORT ANN	HARRIS MINOR SUBDIVISION		
WASHINGTON	FORT ANN	HARRIS MINOR SUBDIVISION		
WASHINGTON	FORT ANN	HARRIS MINOR SUBDIVISION		
WARREN	QUEENSBURY	CIBA / HERCULES MAIN PLANT SITE		
WARREN	GLENS FALLS	FINCH PAPER LLC		
WARREN	GLENS FALLS	GLENS FALLS STP	9.5	14261
WARREN	JOHNSBURG	RUBY MOUNTAIN GARNET MINE		
WARREN	BOLTON	TOWN OF BOLTON WWTP	0.3	450
WARREN	LAKE GEORGE	LAKE GEORGE STP	1.75	1485*
WARREN	CHESTER	WORD OF LIFE CAMP		
WARREN	WARRENSBURG	Warrensburg Sewer District # 1	0.25	375
WARREN	CHESTER	MORATTA RESIDENCE		
WARREN	LAKE GEORGE	THOMSON'S GARAGE		
WARREN	QUEENSBURY	NORTHWAY PLAZA SHOPPING CENTER		
WARREN	LAKE GEORGE	SUNCASTLE DEVELOPMENT		
WARREN	HAGUE	TOWN OF HAGUE SEWER DISTRICT # 1	0.0865	130
WARREN	BOLTON	SHIRLEY JACKSON PROPERTY		
WARREN	LAKE GEORGE	LAKE GEORGE CORNER PROPERTIES SUBDIVISION		
WARREN	BOLTON	NEW VERMONT RD RESIDENTIAL SUBDIVISION		
WARREN	LAKE GEORGE	GROSS RESIDENCE		
WARREN	QUEENSBURY	Bardin Property		

**Composting data provided by the Washington County Sewer District #2*

Leaf/Yard/Organic Waste

Composting of leaf and yard waste is a popular way to divert a waste stream that in the past might have taken up valuable space in a landfill and process it into a beneficial product. Composting of leaf and yard waste is an aerobic process whereby naturally occurring bacteria, in the presence of oxygen, break down the waste into an organic product that can be used as a mulch or a soil amendment. The process is also highly exothermic (heat producing) which also tends to break down the mass as well as kill potential pathogens. Many times, the final compost product is returned to the public free of charge, thereby completing the cycle of recycling what was once a waste product back to the consumer for reuse.

Composting can be accomplished in a variety of ways, the most common being to pile the mixed leaf, brush, grass, and other organics into a linear pile, or windrow. The size and shape of the windrow is important to maximize the volume of material processed while also retaining the heat that is produced. There is a limit to the size of the windrow as too tall a pile will preclude oxygen transfer and can trap too much heat – in rare cases piles have caught fire. The windrow will need to be turned periodically to promote mixing and oxygen transfer using heavy equipment - ranging from a simple backhoe to a specialized windrow turner that can neatly turn long windrows without disturbing the overall shape of the pile. Like most equipment, these machines are costly and will need to be figured into the overall cost of the operation.

A composting operation may be considered a form of solid waste handling facility and therefore could require a permit the NYSDEC under Part 360 of their regulations. Under the regulations, the composting operation will be required to control runoff and manage odors among other operations. Leaf and yard waste composting typically works best in areas where the collection of leaf and yard waste materials is already established, resulting in a steady (if somewhat seasonal) supply of raw material, and requires a large area for processing and storage until it can be returned to the end user. Depending upon the market, screening of the final product may be desirable to produce a higher quality product that will meet the needs of homeowners and landscape companies and a high-quality product may even be sold to provide cash flow to offset the processing and equipment costs. Other organic items can also be introduced into the composting stream if there is sufficient raw material, and the process can be adjusted accordingly. Like any business, composting will require a reliable flow of source material, an investment in equipment, and possibly permitting and monitoring under NYS regulations. There are similar concerns for other forms of composting, including the presence of Polycyclic Aromatic Hydrocarbons (PAH) in composted leaf and yard waste, and the presence of microplastics in composted food wastes that derive from leftover packaging. These all are considered what we call "emerging contaminants" that are not yet well knows and the regulations are not yet mature – hence it is hard to recommend some of these processes as a potential market.

Discussion

Composting, according to the Request for Proposals that was issued by WWIDA, has always been of interest as a potential use on this site. Composting, like anerobic digestion, is seen as a green technology, and it reduces the volume of organic materials that would otherwise need to be handled as a waste material. The end result of composting is typically land applied as a soil amendment or used by individual consumers as a mulch. The actual end use of the compost is highly dependent on the blend of the feed materials and the processing that takes place at the end of the composting process – such as screening or grinding. We believe that some level of a composting operation would be beneficial to the Canalside Energy Park, although it is unlikely to generate enough revenue to be a major player in the cash flow and will need to be evaluated in light of recent and evolving changes in the environmental concerns over PFAS chemicals. PFAS is short for per – and polyfluoroalkyl substances, a group of man-made carcinogenic chemicals that are turning up in drinking water and other areas of the environment. A close relative of Teflon, these are often referred to as “forever chemicals” as they do not break down in nature and are both persistent and very difficult to treat.

In the last year, which includes the time since the Request for Proposals was issued by WWIDA, the emergence of PFAS chemicals in soil and water has been the source of a lot of regulation by the EPA and state agencies, with many states adopting very low allowable concentrations in drinking water for example. The persistence of these chemicals means that they are now present in treated wastewater and, by extension, in sewage sludges and biosolids. While the presence of PFAS is generally not yet regulated in sewage sludge, their mere presence has all but halted the composting and land application in neighboring states. Since the typical reuse of composting is to land apply, the notion that these forever chemicals would be reintroduced into the soil mass and also the groundwater is causing a pause in the attractiveness of composting of biosolids. It is therefore hard to recommend this as a business strategy for the Canalside Energy Park until the regulations are established and the rules are known.

4.6 Identify and Describe Strategies, Recommendations, and Actions

Based on the established values, discussions with the WWIDA, and community feedback through the visioning session, a draft vision for the Canalside Energy Park emerged and is articulated here:

Canalside Energy Park will be a hub for business and industry that draws on community assets and regional partnerships to attract, train, and retain workers and support the future economies of Warren and Washington Counties.

Strategies, recommendations, and actions made throughout this study are summarized in the Implementation Plan in section 4.8.

4.7 Conclusions

The implementation strategy that follows in section 4.8 of this report is a matrix of items that are recommended to be undertaken to further the development of the WWIDA Canalside Energy Park. We have chosen to highlight some of the important items below.

General: The process of interacting with potential developers need to be streamlined and concentrated into a single entity or point of contact. This includes creation of a single jurisdiction zoning district that can supersede individual village/town(s) jurisdictions.

Infrastructure:

- Water: improve the existing water system to bring into compliance at an estimated cost range of $2,700,000 - $3,150,000. The village may have plans for water line improvements on East Street and there could be an opportunity for the Village and site owner to jointly work together to reduce costs.
- Sanitary Sewer: Construct a compliant sanitary sewage system which connects into the existing system at an estimated cost range of $900,000 – $1,870,000, or for smaller scale needs construct on-site sanitary sewer disposal systems at an estimated cost of $385,000. The Washington County Sewer District may also have plans for sanitary sewer line improvements on East Street. It

may be beneficial for the Washington County Sewer District and site owner to partner on this work to reduce costs.

- Transportation: Remove and reconstruct a new bridge on the access road at an estimated cost of $2.2 million.
- Transportation: If warranted, construct a new second access to the site on the East Street side connection to Baldwin Avenue at an estimated cost of $2.15 million.

Land Use:

Undertake a full wetland delineation and obtain a jurisdictional determination from the Corps of Engineers to pin down developable acreage. Part of this effort will need to include mapping of the wetlands.

4.8 Implementation Strategy

Recommended Action	Timeframe	Cost	Potential Funding Sources
	• Short – within 1 year • Medium – within 3 years • Long – within 7 years		
SITE INFRASTRUCTURE			
1. Replace Lock 8 Bridge Truss to better support future capacity	Medium	$2,200,000	• Bridge NY • EDA ARPA (with partners) • Northern Border Regional Commission RFA
2. Work with National Grid to bring distributed voltage to site	Short	TBD Based on Site Usage	• NA
3. Work with National Grid to bring natural gas to site	Short	TBD Based on Site Usage	• NA
4. Commission a study to clarify water distribution system	Short	TBD Based on Site Usage	• Water and Waste Disposal Guaranteed Loan Program (water, sewer)
5. Submit a map plan report for an extension of the existing Sewer District to include the whole site	Short	$7,500	• Water and Waste Disposal Guaranteed Loan Program (water, sewer) • Northern Border Regional Commission RFA
6. Consider wastewater alternatives	Medium	TBD Based on Site Usage	• Water and Waste Disposal Guaranteed Loan Program (water, sewer) • Northern Border Regional Commission RFA

7. Broadband	Short	TBD Based on Site Usage	• Northern Border Regional Commission RFA
8. Create site amenities for workers, including outdoor eating space/food truck space, bike path/kayak connections	Long	TBD Based on Site Usage	• EDA Travel, Tourism and Outdoor Recreation (with partners)
PERMITTING			
9. Delineate wetland to determine whether the wetlands are considered Waters of the U.S. and regulated under the Clean Water Act 404, conduct a wildlife study, and review potential impacts to archeological/cultural sites with the State Historic Preservation Office (SHPO)	Short	$25,000	
PLANNING & ECONOMIC DEVELOPMENT			
10. Work with the Village and Town of Fort Edward to create one joint jurisdiction zoning district and work with staff to identify uses which can be approved by-right	Short	None	
11. Work with the Village and Town of Fort Edward to understand their future infrastructure capacity needs, and how that may affect the Canalside Energy Park	Ongoing	None	
12. Encourage the Village and Town of Fort Edward to update their Master Plans, accounting for demographic shifts in the area (age, race, etc.), the loss of population and workforce and participate in the process so that the Energy Park can work with local efforts	Medium	Varies	
13. Clarify the development process for potential investors i. Create a development package marketing the site ii. Document permitting requirements	Medium	$50-100,000	
14. Establish clear lines of communication with potential investors as defined by a written marketing plan.	Medium	None	
15. Solidify relationships with potential partners by holding onsite meetings, attending conferences, and setting up regular phone calls with key officials, potential institutional, and	Short	None	

private partners			
16. Initiate specific conversations with university representatives and local high schools to determine if is potential for onsite job and skills training	Short	None	

APPENDIX A

Project Background

A.1 SITE LOCATION MAP

1 SITE LOCATION MAP

SCALE: BAR SCALE

0 1000 2000

Weston & Sampson

Sheet Number:

SK-1

A.2 EXISTING CONDITIONS MAP

LEGEND

- PROJECT BOUNDARY
- MUNICIPAL BOUNDARY
- PROPERTY LINE
- EASEMENT / PRIVATE ROW
- RAILROAD
- STREET CENTERLINE
- CANAL
- STREAM / DITCH

MAJOR LAND OWNERS

- DELAWARE & HUDSON RAILWAY CORP
- NEW YORK STATE
- WCC, LCC

1 EXISTING CONDITIONS
SCALE: BAR SCALE

0 500 1000

Weston & Sampson

Sheet Number:

SK-2

A.3 LAND USE MAP

LEGEND

- PROJECT BOUNDARY
- MUNICIPAL BOUNDARY
- PROPERTY LINE
- EASEMENT / PRIVATE ROW
- RAILROAD
- STREET CENTERLINE
- CANAL
- STREAM / DITCH
- AGRICULTURAL DISTRICT
- AGRICULTURAL
- COMMERCIAL
- CONSERVATION
- INDUSTRIAL / MANUFACTURING
- RECREATION
- RESIDENTIAL
- TRANSPORTATION
- VACANT / ABANDONED - AGRICULTURAL
- VACANT - COMMERCIAL
- VACANT - INDUSTRIAL / MANUFACTURING
- VACANT - RESIDENTIAL

1 LAND USE MAP
SCALE: BAR SCALE

0 500 1000

Weston & Sampson

Sheet Number:

SK-3

Rev: 1.7 Date: 09/11/2019

APPENDIX B

Existing Infrastructure

B.1 EXISTING UTILITIES

LEGEND

- PROJECT BOUNDARY
- MUNICIPAL BOUNDARY
- PROPERTY LINE
- EASEMENT / PRIVATE ROW
- RAILROAD
- STREET CENTERLINE
- CANAL
- STREAM / DITCH

1 EXISTING UTILITIES

SCALE: BAR SCALE

0 200 400

Weston & Sampson

Sheet Number:

SK-1

Rev: 1.7 Date: 09/12/2019

B.2 WASTEWATER ALTERNATIVE ALIGNMENTS

1 CONCEPT SEWER LINE ALIGNMENTS

SCALE: BAR SCALE

0 200 400

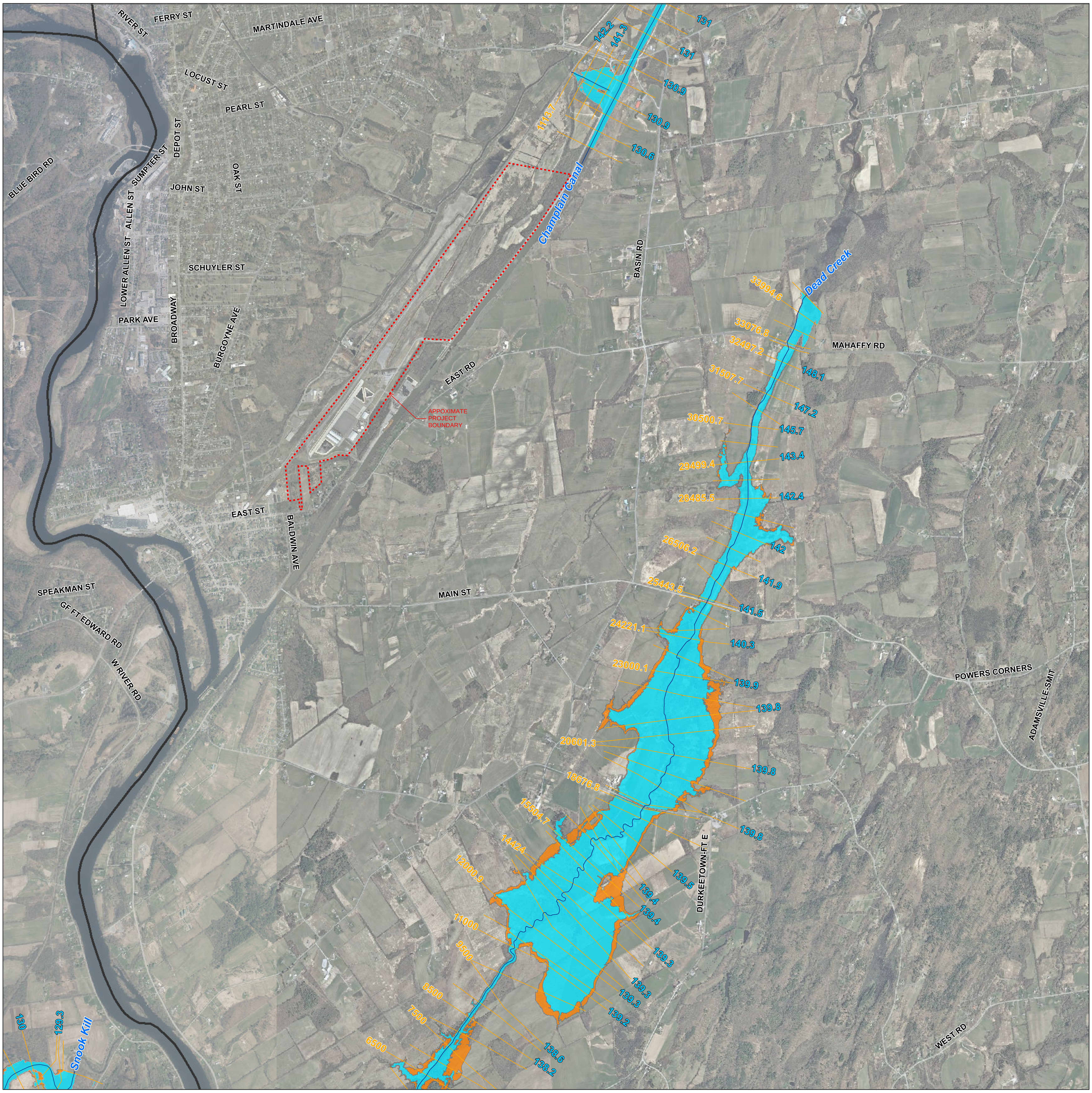
Weston & Sampson

Sheet Number:

SK-2

B.3 FEMA MAP

Hudson Hoosic Watershed Workmap



Draft Flood Hazard Information

- Index Grid
- County Boundary
- Floodway
- Zone A (1% - Annual Chance)
- Zone AE (1% - Annual Chance)
- Zone X (0.2% - Annual Chance)
- Modeled Cross Sections (XS)
- Streamline

* Water Surface Elevations (WSEL) correspondto the 1% - annual flood in U.S. Feet and are referenced in NAVD88.

XS Annotation
(WSEL)
(Stream Station)

1 inch = 1000 feet

0 1,375 2,750 5,500 Ft

N

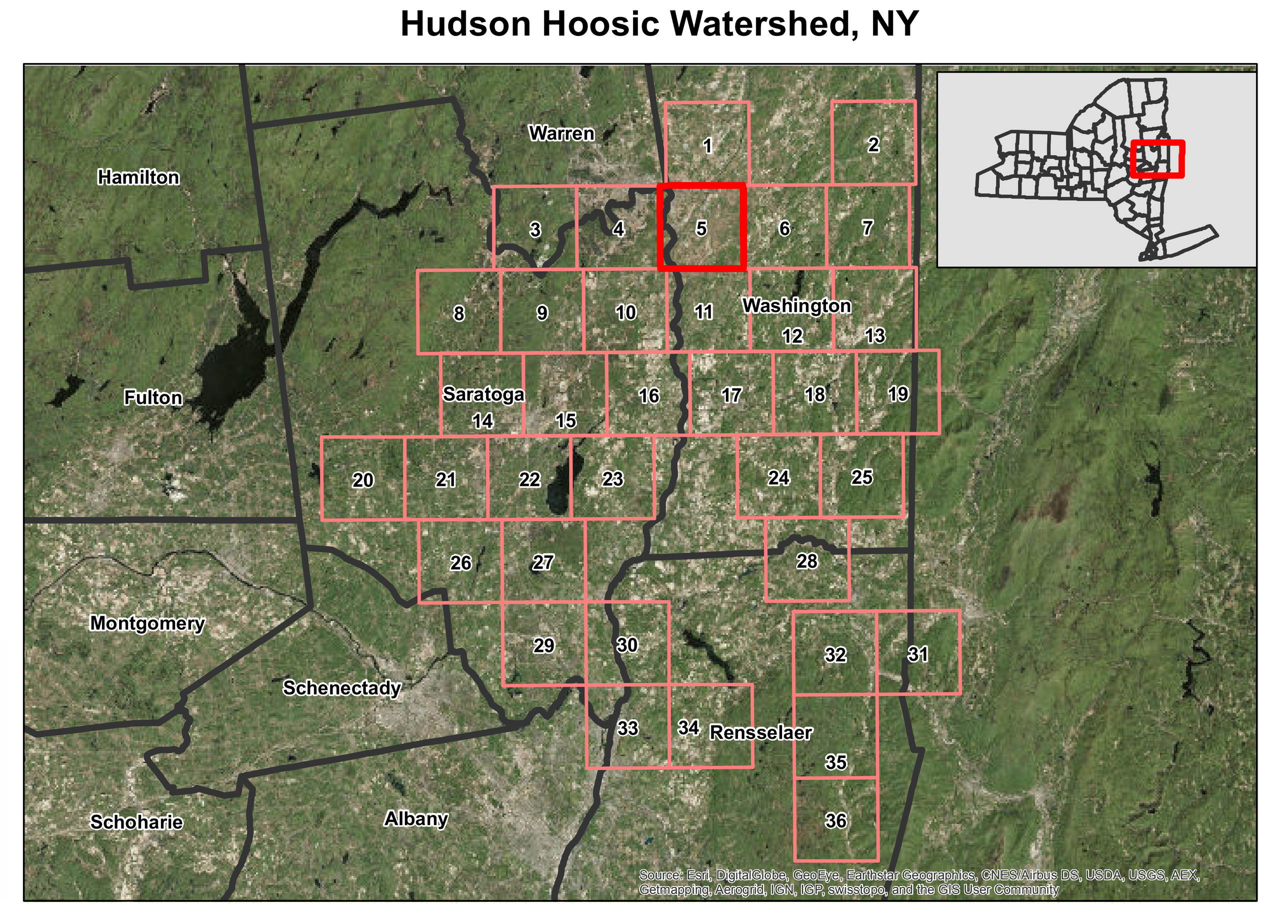
Map No.
5

NOTE: This work map contains draft flood hazard information for informational purposes, not intended for official use.

A JV of Dewberry, URS, and ESP
RAMPP
Risk Assessment, Mapping, and Planning Partners

U.S. DEPARTMENT OF HOMELAND SECURITY
FEMA

Hudson Hoosic Watershed, NY



B.4 NATURAL RESOURCES MAP

LEGEND

- PROJECT BOUNDARY
- MUNICIPAL BOUNDARY
- PROPERTY LINE
- EASEMENT / PRIVATE ROW
- RAILROAD
- STREET CENTERLINE
- CANAL WITH A NYSDEC CLASSIFICATION OF C
- STREAM WITH A NYSDEC CLASSIFICATION OF C
- STREAM / DITCH NOT CLASSIFIED BY NYSDEC
- STREAM / DITCH OUTSIDE OF PROJECT AREA (NYSDEC STATUS NOT INCLUDED)
- NEW YORK STATE REGULATED WETLAND AREA
- POTENTIAL NEW YORK STATE REGULATED WETLAND AREA
- FEDERAL WETLAND
- FEMA ZONE A - 1% ANNUAL CHANCE OF FLOODING
- GENERAL LOCATION OF RARE PLANTS AND RARE ANIMALS - INCLUDING BUT NOT LIMITED TO THOSE LISTED ON THE NYSDEC'S ENDANGERED AND THREATENED LIST (SOURCE: NY NATURAL HERITAGE PROGRAM'S BIODIVERSITY DATABASE)
- CONTOUR INTERVAL - 50's AND 100's
- CONTOUR INTERVAL - 10's

1 NATURAL RESOURCES MAP
SCALE: BAR SCALE

0 500 1000

Weston & Sampson

Sheet Number:

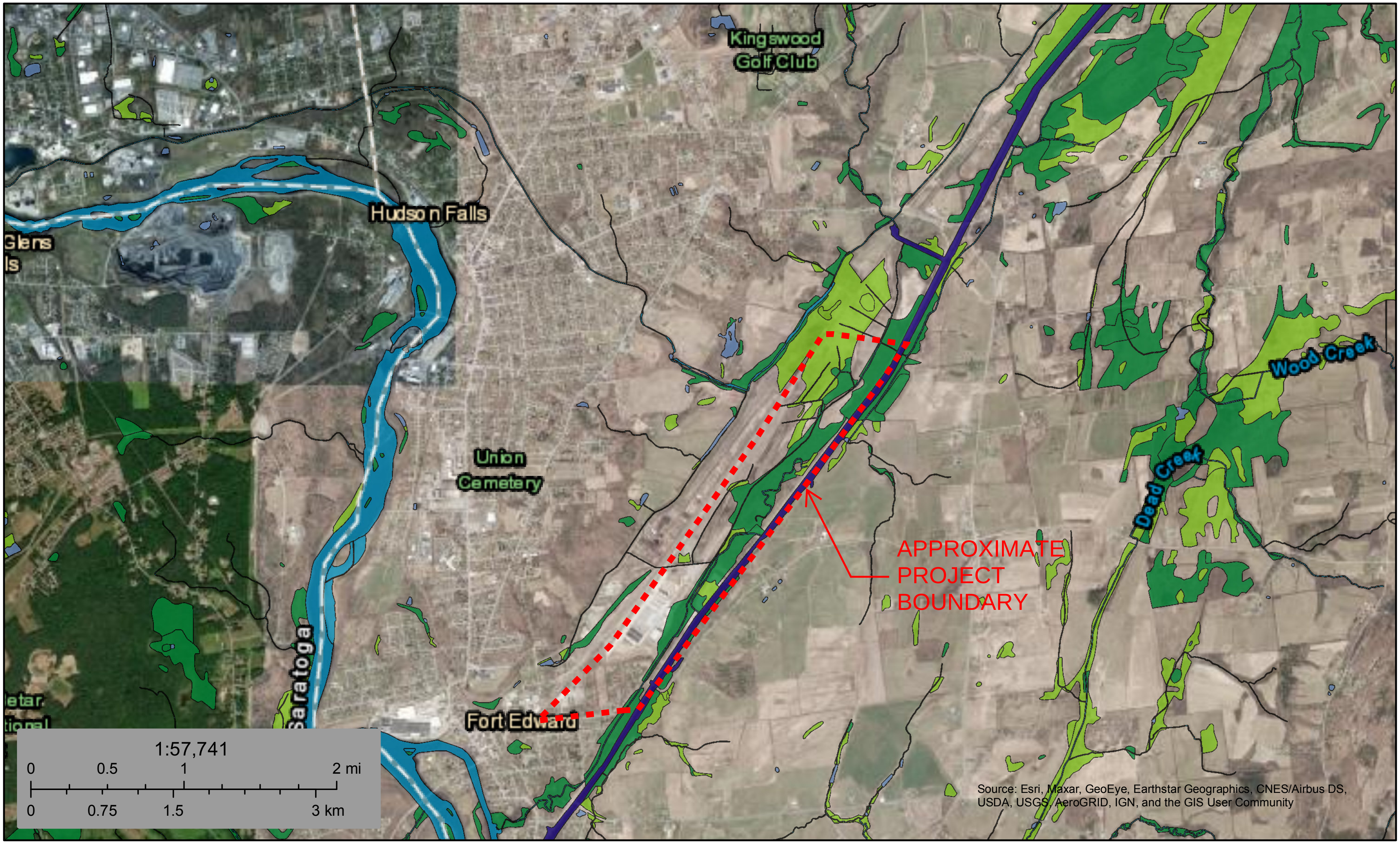
SK-3

B.5 NATIONAL WETLANDS INVENTORY MAP

U.S. Fish and Wildlife Service

National Wetlands Inventory

NWI



April 27, 2021

Wetlands

- Estuarine and Marine Deepwater
- Estuarine and Marine Wetland
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
- Other
- Riverine

This map is for general reference only. The US Fish and Wildlife Service is not responsible for the accuracy or currentness of the base data shown on this map. All wetlands related data should be used in accordance with the layer metadata found on the Wetlands Mapper web site.

B.6 SOIL REPORT

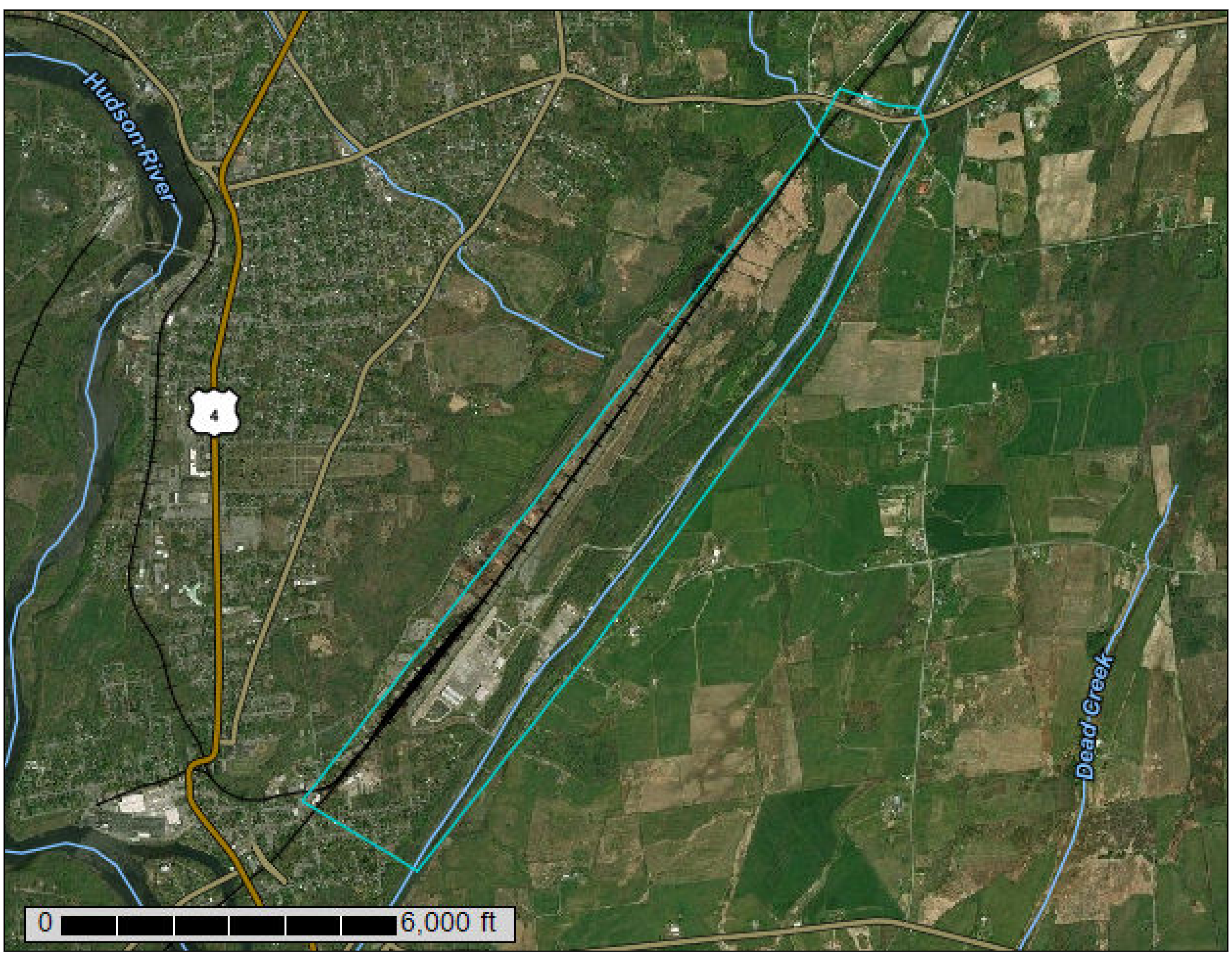
United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Washington County, New York



February 19, 2021

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

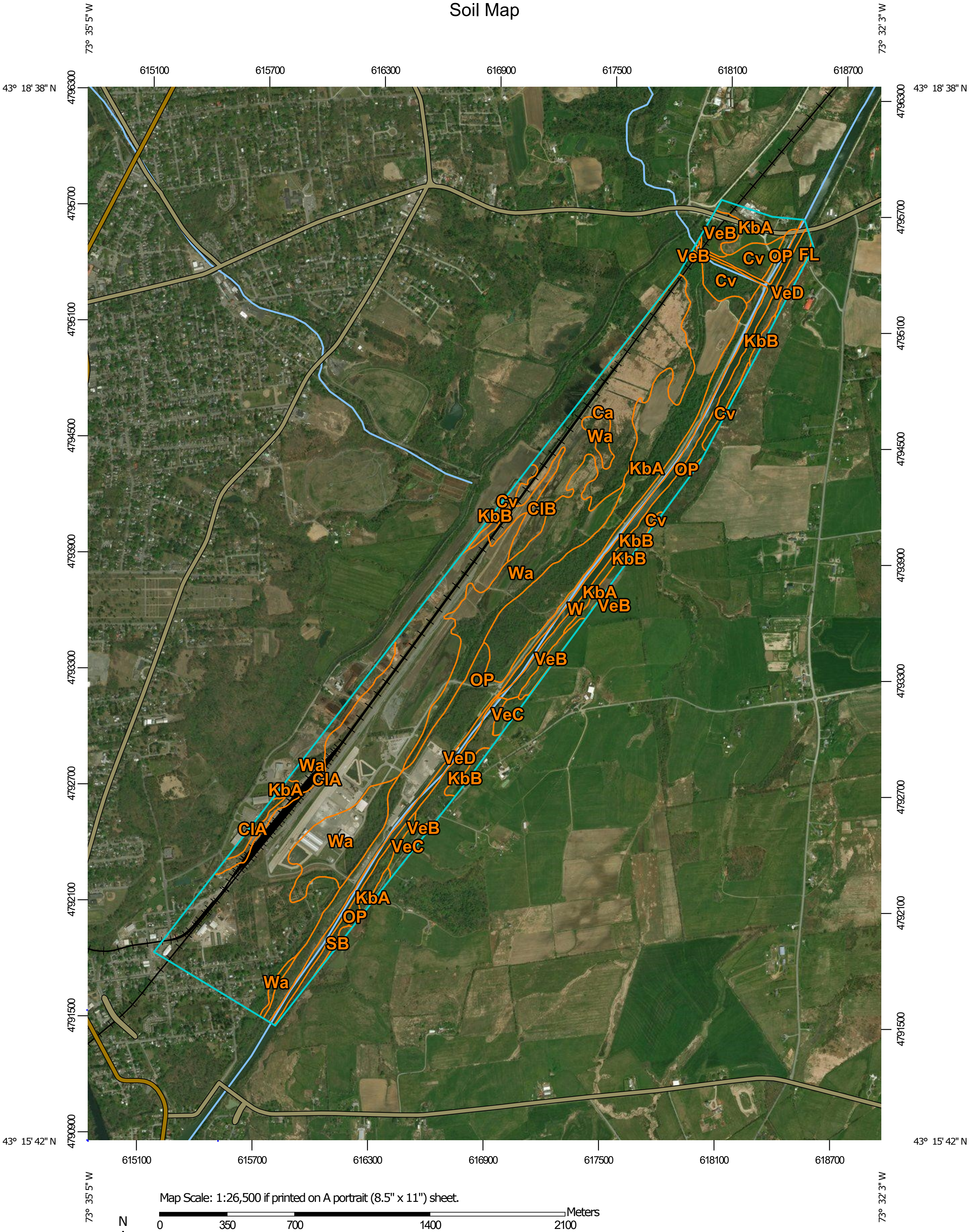
Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map



Map Scale: 1:26,500 if printed on A portrait (8.5" x 11") sheet.

Meters: 0, 350, 700, 1400, 2100

Feet: 0, 1000, 2000, 4000, 6000

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Map Unit Polygons

Soil Map Unit Lines

Soil Map Unit Points

Special Point Features

Blowout

Borrow Pit

Clay Spot

Closed Depression

Gravel Pit

Gravelly Spot

Landfill

Lava Flow

Marsh or swamp

Mine or Quarry

Miscellaneous Water

Perennial Water

Rock Outcrop

Saline Spot

Sandy Spot

Severely Eroded Spot

Sinkhole

Slide or Slip

Sodic Spot

Spoil Area

Stony Spot

Very Stony Spot

Wet Spot

Other

Special Line Features

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Washington County, New York
Survey Area Data: Version 20, Jun 11, 2020

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jun 10, 2015—Mar 29, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
Ca	Catden muck, 0 to 2 percent slopes	96.3	11.4%
ClA	Claverack loamy fine sand, 0 to 2 percent slopes	240.7	28.4%
ClB	Claverack loamy fine sand, 2 to 6 percent slopes	6.5	0.8%
Cv	Covington silty clay loam	27.3	3.2%
FL	Fluvaquents	0.3	0.0%
KbA	Kingsbury silty clay, 0 to 2 percent slopes	128.3	15.2%
KbB	Kingsbury silty clay, 2 to 6 percent slopes	7.2	0.8%
OP	Orthents and Psamments	127.2	15.0%
SB	Saprists, Aquepts, and Aquents	1.3	0.2%
VeB	Vergennes silty clay loam, 3 to 8 percent slopes	14.0	1.7%
VeC	Vergennes silty clay loam, 6 to 12 percent slopes	9.4	1.1%
VeD	Vergennes silty clay loam, 12 to 20 percent slopes	17.2	2.0%
W	Water	42.5	5.0%
Wa	Wallington silt loam, sandy substratum	128.1	15.1%
Totals for Area of Interest		**846.1**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Washington County, New York

Ca—Catden muck, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 2t2qk
Elevation: 0 to 1,430 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Catden and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Catden

Setting

Landform: Depressions, fens, depressions, depressions, swamps, bogs, marshes, kettles
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope, tread
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Highly decomposed herbaceous organic material and/or highly decomposed woody organic material

Typical profile

Oa1 - 0 to 2 inches: muck
Oa2 - 2 to 79 inches: muck

Properties and qualities

Slope: 0 to 1 percent
Surface area covered with cobbles, stones or boulders: 0.0 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Very poorly drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.14 to 14.17 in/hr)
Depth to water table: About 0 to 6 inches
Frequency of flooding: None
Frequency of ponding: Frequent
Available water capacity: Very high (about 26.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 5w
Hydrologic Soil Group: B/D
Ecological site: F144AY042NY - Semi-Rich Organic Wetlands
Hydric soil rating: Yes

Minor Components

Canandaigua

Percent of map unit: 5 percent
Landform: Depressions
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope, tread
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Natchaug

Percent of map unit: 5 percent
Landform: Depressions, depressions
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope, tread
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Timakwa

Percent of map unit: 5 percent
Landform: Swamps
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope, tread
Down-slope shape: Linear, concave
Across-slope shape: Linear, concave
Hydric soil rating: Yes

Alden

Percent of map unit: 5 percent
Landform: Depressions
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope, tread
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

ClA—Claverack loamy fine sand, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 9xyy
Elevation: 600 to 1,800 feet
Mean annual precipitation: 35 to 42 inches
Mean annual air temperature: 45 to 48 degrees F
Frost-free period: 110 to 175 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Claverack and similar soils: 80 percent

Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Claverack

Setting

Landform: Lake plains
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread
Down-slope shape: Concave
Across-slope shape: Convex
Parent material: Sandy glaciolacustrine deposits, derived primarily from non-calcareous sandstone or granite, that overlie clayey glaciolacustrine deposits

Typical profile

H1 - 0 to 8 inches: loamy fine sand
H2 - 8 to 33 inches: loamy fine sand
H3 - 33 to 80 inches: silty clay loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: 20 to 40 inches to strongly contrasting textural stratification
Drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 18 to 24 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Available water capacity: Very low (about 2.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: C/D
Ecological site: F101XY006NY - Moist Outwash
Hydric soil rating: No

Minor Components

Cosad

Percent of map unit: 8 percent
Hydric soil rating: No

Hudson

Percent of map unit: 4 percent
Hydric soil rating: No

Belgrade

Percent of map unit: 4 percent
Hydric soil rating: No

Oakville

Percent of map unit: 4 percent
Hydric soil rating: No

ClB—Claverack loamy fine sand, 2 to 6 percent slopes

Map Unit Setting

National map unit symbol: 9xyz
Elevation: 600 to 1,800 feet
Mean annual precipitation: 35 to 42 inches
Mean annual air temperature: 45 to 48 degrees F
Frost-free period: 110 to 175 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Claverack and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Claverack

Setting

Landform: Lake plains
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread
Down-slope shape: Concave
Across-slope shape: Convex
Parent material: Sandy glaciolacustrine deposits, derived primarily from non-calcareous sandstone or granite, that overlie clayey glaciolacustrine deposits

Typical profile

H1 - 0 to 8 inches: loamy fine sand
H2 - 8 to 33 inches: loamy fine sand
H3 - 33 to 80 inches: silty clay loam

Properties and qualities

Slope: 2 to 6 percent
Depth to restrictive feature: 20 to 40 inches to strongly contrasting textural stratification
Drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 18 to 24 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Available water capacity: Very low (about 2.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: C/D
Ecological site: F142XB018VT - Moist Lake Plain
Hydric soil rating: No

Minor Components

Cosad

Percent of map unit: 8 percent
Hydric soil rating: No

Oakville

Percent of map unit: 6 percent
Hydric soil rating: No

Hudson

Percent of map unit: 4 percent
Hydric soil rating: No

Unnamed soils

Percent of map unit: 2 percent

Cv—Covington silty clay loam

Map Unit Setting

National map unit symbol: 9xz1
Elevation: 50 to 1,000 feet
Mean annual precipitation: 35 to 42 inches
Mean annual air temperature: 45 to 48 degrees F
Frost-free period: 110 to 175 days
Farmland classification: Not prime farmland

Map Unit Composition

Covington and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Covington

Setting

Landform: Depressions
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Calcareous clayey glaciolacustrine deposits or glaciomarine deposits

Typical profile

H1 - 0 to 6 inches: silty clay loam
H2 - 6 to 13 inches: silty clay
H3 - 13 to 27 inches: clay
H4 - 27 to 80 inches: clay

Properties and qualities

Slope: 0 to 2 percent

Depth to restrictive feature: More than 80 inches
Drainage class: Poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: About 0 to 12 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Available water capacity: Moderate (about 6.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 5w
Hydrologic Soil Group: D
Ecological site: F142XB007VT - Wet Clayplain Depression
Hydric soil rating: Yes

Minor Components

Kingsbury

Percent of map unit: 8 percent
Hydric soil rating: No

Madalin

Percent of map unit: 5 percent
Landform: Depressions
Hydric soil rating: Yes

Rhinebeck

Percent of map unit: 4 percent
Hydric soil rating: No

Unnamed soils

Percent of map unit: 3 percent

FL—Fluvaquents

Map Unit Setting

National map unit symbol: 9xz4
Elevation: 300 to 1,800 feet
Mean annual precipitation: 35 to 42 inches
Mean annual air temperature: 45 to 48 degrees F
Frost-free period: 110 to 175 days
Farmland classification: Not prime farmland

Map Unit Composition

Fluvaquents and similar soils: 75 percent
Minor components: 25 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Fluvaquents

Setting

Landform: Flood plains
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Dip
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Alluvium with highly variable texture

Typical profile

H1 - 0 to 11 inches: mucky silt loam
H2 - 11 to 72 inches: gravelly sandy loam

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.06 to 5.95 in/hr)
Depth to water table: About 0 to 18 inches
Frequency of flooding: FrequentNone
Frequency of ponding: Frequent
Calcium carbonate, maximum content: 15 percent
Available water capacity: Moderate (about 7.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 5w
Hydrologic Soil Group: A/D
Hydric soil rating: Yes

Minor Components

Teel

Percent of map unit: 6 percent
Hydric soil rating: No

Limerick

Percent of map unit: 6 percent
Landform: Flood plains
Hydric soil rating: Yes

Hamlin

Percent of map unit: 5 percent
Hydric soil rating: No

Saco

Percent of map unit: 5 percent
Landform: Flood plains
Hydric soil rating: Yes

Palms

Percent of map unit: 3 percent
Landform: Marshes, swamps
Hydric soil rating: Yes

KbA—Kingsbury silty clay, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 9xzv
Elevation: 80 to 600 feet
Mean annual precipitation: 35 to 42 inches
Mean annual air temperature: 45 to 48 degrees F
Frost-free period: 110 to 175 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Kingsbury and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Kingsbury

Setting

Landform: Lake plains
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Calcareous, clayey glaciomarine deposits or glaciolacustrine deposits

Typical profile

H1 - 0 to 8 inches: silty clay
H2 - 8 to 28 inches: clay
H3 - 28 to 60 inches: clay

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: About 6 to 18 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Available water capacity: Moderate (about 8.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: D
Ecological site: F142XB006NY - Moist Clayplain
Hydric soil rating: No

Minor Components

Vergennes

Percent of map unit: 5 percent
Hydric soil rating: No

Covington

Percent of map unit: 5 percent
Landform: Depressions
Hydric soil rating: Yes

Farmington

Percent of map unit: 4 percent
Hydric soil rating: No

Hollis

Percent of map unit: 3 percent
Hydric soil rating: No

Charlton

Percent of map unit: 3 percent
Hydric soil rating: No

KbB—Kingsbury silty clay, 2 to 6 percent slopes

Map Unit Setting

National map unit symbol: 9xzw
Elevation: 80 to 600 feet
Mean annual precipitation: 35 to 42 inches
Mean annual air temperature: 45 to 48 degrees F
Frost-free period: 110 to 175 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Kingsbury and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Kingsbury

Setting

Landform: Lake plains
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Calcareous, clayey glaciomarine deposits or glaciolacustrine deposits

Typical profile

H1 - 0 to 8 inches: silty clay

H2 - 8 to 28 inches: clay
H3 - 28 to 60 inches: clay

Properties and qualities

Slope: 2 to 6 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: About 6 to 18 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Available water capacity: Moderate (about 8.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: D
Ecological site: F142XB006NY - Moist Clayplain
Hydric soil rating: No

Minor Components

Vergennes

Percent of map unit: 5 percent
Hydric soil rating: No

Covington

Percent of map unit: 5 percent
Landform: Depressions
Hydric soil rating: Yes

Farmington

Percent of map unit: 4 percent
Hydric soil rating: No

Hollis

Percent of map unit: 3 percent
Hydric soil rating: No

Charlton

Percent of map unit: 3 percent
Hydric soil rating: No

OP—Orthents and Psamments

Map Unit Setting

National map unit symbol: 9y03
Elevation: 80 to 330 feet
Mean annual precipitation: 35 to 42 inches
Mean annual air temperature: 45 to 48 degrees F

Frost-free period: 110 to 175 days
Farmland classification: Not prime farmland

Map Unit Composition

Orthents and similar soils: 50 percent
Psamments and similar soils: 40 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Orthents

Setting

Parent material: Dredge spoils

Typical profile

H1 - 0 to 10 inches: silt loam
H2 - 10 to 60 inches: channery loam

Properties and qualities

Slope: 0 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.06 to 5.95 in/hr)
Depth to water table: About 36 to 72 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Available water capacity: Low (about 5.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: A
Hydric soil rating: No

Description of Psamments

Setting

Parent material: Dredge spoils

Typical profile

H1 - 0 to 10 inches: fine sand
H2 - 10 to 60 inches: coarse sand

Properties and qualities

Slope: 0 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Low (about 3.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: A
Hydric soil rating: No

Minor Components

Herkimer

Percent of map unit: 2 percent
Hydric soil rating: No

Claverack

Percent of map unit: 2 percent
Hydric soil rating: No

Covington

Percent of map unit: 2 percent
Landform: Depressions
Hydric soil rating: Yes

Fredon

Percent of map unit: 2 percent
Landform: Depressions
Hydric soil rating: Yes

Hoosic

Percent of map unit: 1 percent
Hydric soil rating: No

Rhinebeck

Percent of map unit: 1 percent
Hydric soil rating: No

SB—Saprists, Aquepts, and Aquents

Map Unit Setting

National map unit symbol: 9y0n
Elevation: 10 to 2,400 feet
Mean annual precipitation: 35 to 42 inches
Mean annual air temperature: 45 to 48 degrees F
Frost-free period: 110 to 175 days
Farmland classification: Not prime farmland

Map Unit Composition

Saprists and similar soils: 30 percent
Aquepts and similar soils: 25 percent
Aquents and similar soils: 20 percent
Minor components: 25 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Saprists

Setting

Landform: Swamps, marshes
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Talf
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Organic material

Typical profile

H1 - 0 to 70 inches: muck

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Very poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (0.20 to 19.98 in/hr)
Depth to water table: About 0 inches
Frequency of flooding: None
Frequency of ponding: Frequent
Available water capacity: Very high (about 23.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8w
Hydrologic Soil Group: A/D
Hydric soil rating: Yes

Description of Aquepts

Setting

Landform: Depressions
Landform position (two-dimensional): Toeslope
Down-slope shape: Concave
Across-slope shape: Concave

Typical profile

H1 - 0 to 9 inches: mucky silty clay loam
H2 - 9 to 72 inches: silt loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Very poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.06 to 1.98 in/hr)
Depth to water table: About 0 inches
Frequency of flooding: None
Frequency of ponding: Frequent
Calcium carbonate, maximum content: 15 percent
Available water capacity: Moderate (about 7.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8w

Hydrologic Soil Group: B/D
Hydric soil rating: Yes

Description of Aquents

Setting

Landform: Depressions
Landform position (two-dimensional): Toeslope
Down-slope shape: Concave
Across-slope shape: Concave

Typical profile

H1 - 0 to 12 inches: gravelly fine sandy loam
H2 - 12 to 70 inches: gravelly loamy sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Very poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.06 to 1.98 in/hr)
Depth to water table: About 0 inches
Frequency of flooding: None
Frequency of ponding: Frequent
Calcium carbonate, maximum content: 15 percent
Available water capacity: Moderate (about 8.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8w
Hydrologic Soil Group: B/D
Hydric soil rating: Yes

Minor Components

Madalin

Percent of map unit: 5 percent
Landform: Depressions
Hydric soil rating: Yes

Sun

Percent of map unit: 5 percent
Landform: Depressions
Hydric soil rating: Yes

Fluvaquents

Percent of map unit: 5 percent
Landform: Flood plains
Hydric soil rating: Yes

Halsey

Percent of map unit: 5 percent
Landform: Depressions
Hydric soil rating: Yes

Carlisle

Percent of map unit: 5 percent
Landform: Swamps, marshes
Hydric soil rating: Yes

VeB—Vergennes silty clay loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 2rvsk
Elevation: 100 to 510 feet
Mean annual precipitation: 31 to 59 inches
Mean annual air temperature: 39 to 48 degrees F
Frost-free period: 120 to 175 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Vergennes and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Vergennes

Setting

Landform: Lake terraces
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Calcareous clayey estuarine deposits derived from limestone and/or calcareous clayey glaciolacustrine deposits derived from limestone

Typical profile

Ap - 0 to 8 inches: silty clay loam
B/E - 8 to 10 inches: clay
Bt - 10 to 22 inches: clay
BC - 22 to 29 inches: silty clay
C1 - 29 to 37 inches: silty clay
C2 - 37 to 45 inches: silty clay
C3 - 45 to 79 inches: silty clay

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: About 18 to 30 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 20 percent
Available water capacity: Moderate (about 8.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: D
Hydric soil rating: No

Minor Components

Cayuga

Percent of map unit: 5 percent
Landform: Drumlinoid ridges
Landform position (two-dimensional): Shoulder, summit
Landform position (three-dimensional): Crest, side slope
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Kingsbury

Percent of map unit: 5 percent
Landform: Lake terraces
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

Wilpoint

Percent of map unit: 3 percent
Landform: Lake terraces
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread
Down-slope shape: Concave
Across-slope shape: Convex
Hydric soil rating: No

Farmington

Percent of map unit: 2 percent
Landform: Hills
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Crest
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

VeC—Vergennes silty clay loam, 6 to 12 percent slopes

Map Unit Setting

National map unit symbol: 9y0y
Elevation: 50 to 1,000 feet
Mean annual precipitation: 35 to 42 inches

Mean annual air temperature: 45 to 48 degrees F
Frost-free period: 110 to 175 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Vergennes and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Vergennes

Setting

Landform: Lake plains
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread
Down-slope shape: Concave
Across-slope shape: Convex
Parent material: Clayey calcareous glaciolacustrine, glaciomarine, or estuarine deposits

Typical profile

H1 - 0 to 6 inches: silty clay loam
H2 - 6 to 13 inches: silty clay
H3 - 13 to 25 inches: clay
H4 - 25 to 60 inches: clay

Properties and qualities

Slope: 6 to 12 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: About 18 to 24 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Available water capacity: Moderate (about 6.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: D
Hydric soil rating: No

Minor Components

Kingsbury

Percent of map unit: 5 percent
Hydric soil rating: No

Hollis

Percent of map unit: 5 percent
Hydric soil rating: No

Farmington

Percent of map unit: 5 percent
Hydric soil rating: No

Hudson

Percent of map unit: 3 percent
Hydric soil rating: No

Eroded soils

Percent of map unit: 2 percent
Hydric soil rating: No

VeD—Vergennes silty clay loam, 12 to 20 percent slopes

Map Unit Setting

National map unit symbol: 9y0z
Elevation: 50 to 1,000 feet
Mean annual precipitation: 35 to 42 inches
Mean annual air temperature: 45 to 48 degrees F
Frost-free period: 110 to 175 days
Farmland classification: Not prime farmland

Map Unit Composition

Vergennes and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Vergennes

Setting

Landform: Lake plains
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Riser
Down-slope shape: Concave
Across-slope shape: Convex
Parent material: Clayey calcareous glaciolacustrine, glaciomarine, or estuarine deposits

Typical profile

H1 - 0 to 6 inches: silty clay loam
H2 - 6 to 13 inches: silty clay
H3 - 13 to 25 inches: clay
H4 - 25 to 60 inches: clay

Properties and qualities

Slope: 12 to 20 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: About 18 to 24 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent

Available water capacity: Moderate (about 6.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: D
Hydric soil rating: No

Minor Components

Farmington

Percent of map unit: 5 percent
Hydric soil rating: No

Unnamed soils

Percent of map unit: 5 percent

Kingsbury

Percent of map unit: 5 percent
Hydric soil rating: No

Eroded soils

Percent of map unit: 3 percent
Hydric soil rating: No

Hudson

Percent of map unit: 2 percent
Hydric soil rating: No

W—Water

Map Unit Setting

National map unit symbol: 1qdsb
Mean annual precipitation: 35 to 42 inches
Mean annual air temperature: 45 to 48 degrees F
Frost-free period: 110 to 175 days
Farmland classification: Not prime farmland

Map Unit Composition

Water: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Wa—Wallington silt loam, sandy substratum

Map Unit Setting

National map unit symbol: 9y10
Elevation: 80 to 850 feet
Mean annual precipitation: 35 to 42 inches
Mean annual air temperature: 45 to 48 degrees F

Frost-free period: 110 to 175 days
Farmland classification: Prime farmland if drained

Map Unit Composition

Wallington, sandy substratum, and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Wallington, Sandy Substratum

Setting

Landform: Lake plains
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Glaciolacustrine or eolian deposits high in silt and very fine sand

Typical profile

H1 - 0 to 9 inches: silt loam
H2 - 9 to 17 inches: silt loam
H3 - 17 to 48 inches: silt loam
H4 - 48 to 80 inches: stratified loamy fine sand to very gravelly coarse sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: 15 to 24 inches to fragipan
Drainage class: Somewhat poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 6 to 18 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Low (about 3.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: D
Ecological site: F144AY018NY - Moist Lake Plain
Hydric soil rating: No

Minor Components

Belgrade

Percent of map unit: 5 percent
Hydric soil rating: No

Hartland

Percent of map unit: 5 percent
Hydric soil rating: No

Rhinebeck

Percent of map unit: 5 percent
Hydric soil rating: No

Madalin

Percent of map unit: 5 percent

Landform: Depressions
Hydric soil rating: Yes

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B.7 NATIONAL FISH & WILDLIFE INFORMATION FOR PLANNING AND CONSULTING REPORT

IPaC resource list

This report is an automatically generated list of species and other resources such as critical habitat (collectively referred to as *trust resources*) under the U.S. Fish and Wildlife Service's (USFWS) jurisdiction that are known or expected to be on or near the project area referenced below. The list may also include trust resources that occur outside of the project area, but that could potentially be directly or indirectly affected by activities in the project area. However, determining the likelihood and extent of effects a project may have on trust resources typically requires gathering additional site-specific (e.g., vegetation/species surveys) and project-specific (e.g., magnitude and timing of proposed activities) information.

Below is a summary of the project information you provided and contact information for the USFWS office(s) with jurisdiction in the defined project area. Please read the introduction to each section that follows (Endangered Species, Migratory Birds, USFWS Facilities, and NWI Wetlands) for additional information applicable to the trust resources addressed in that section.

Location

Washington County, New York

Local office

New York Ecological Services Field Office

(607) 753-9334
(607) 753-9699

3817 Luker Road
Cortland, NY 13045-9385

http://www.fws.gov/northeast/nyfo/es/section7.htm

Endangered species

This resource list is for informational purposes only and does not constitute an analysis of project level impacts.

The primary information used to generate this list is the known or expected range of each species. Additional areas of influence (AOI) for species are also considered. An AOI includes areas outside of the species range if the species could be indirectly affected by activities in that area (e.g., placing a dam upstream of a fish population even if that fish does not occur at the dam site, may indirectly impact the species by reducing or eliminating water flow downstream). Because species can move, and site conditions can change, the species on this list are not guaranteed to be found on or near the project area. To fully determine any potential effects to species, additional site-specific and project-specific information is often required.

Section 7 of the Endangered Species Act **requires** Federal agencies to "request of the Secretary information whether any species which is listed or proposed to be listed may be present in the area of such proposed action" for any project that is conducted, permitted, funded, or licensed by any Federal agency. A letter from the local office and a species list which fulfills this requirement can **only** be obtained by requesting an official species list from either the Regulatory Review section in IPaC (see directions below) or from the local field office directly.

For project evaluations that require USFWS concurrence/review, please return to the IPaC website and request an official species list by doing the following:

1. Draw the project location and click CONTINUE.
2. Click DEFINE PROJECT.
3. Log in (if directed to do so).
4. Provide a name and description for your project.
5. Click REQUEST SPECIES LIST.

Listed species

[1] and their critical habitats are managed by the Ecological Services Program of the U.S. Fish and Wildlife Service (USFWS) and the fisheries division of the National Oceanic and Atmospheric Administration (NOAA Fisheries[2]).

Species and critical habitats under the sole responsibility of NOAA Fisheries are **not** shown on this list. Please contact NOAA Fisheries for species under their jurisdiction.

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1. Species listed under the Endangered Species Act are threatened or endangered; IPaC also shows species that are candidates, or proposed, for listing. See the listing status page for more information. IPaC only shows species that are regulated by USFWS (see FAQ).
2. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

The following species are potentially affected by activities in this location:

Mammals

NAME	STATUS
Indiana Bat Myotis sodalis Wherever found There is **final** critical habitat for this species. The location of the critical habitat is not available. https://ecos.fws.gov/ecp/species/5949	Endangered

Critical habitats

Potential effects to critical habitat(s) in this location must be analyzed along with the endangered species themselves.

THERE ARE NO CRITICAL HABITATS AT THIS LOCATION.

Migratory birds

Certain birds are protected under the Migratory Bird Treaty Act

[1] and the Bald and Golden Eagle Protection Act[2].

Any person or organization who plans or conducts activities that may result in impacts to migratory birds, eagles, and their habitats should follow appropriate regulations and consider implementing appropriate conservation measures, as described below.

1. The Migratory Birds Treaty Act of 1918.
2. The Bald and Golden Eagle Protection Act of 1940.

Additional information can be found using the following links:

- Birds of Conservation Concern http://www.fws.gov/birds/management/managed-species/birds-of-conservation-concern.php
- Measures for avoiding and minimizing impacts to birds http://www.fws.gov/birds/management/project-assessment-tools-and-guidance/conservation-measures.php
- Nationwide conservation measures for birds http://www.fws.gov/migratorybirds/pdf/management/nationwidestandardconservationmeasures.pdf

MIGRATORY BIRD INFORMATION IS NOT AVAILABLE AT THIS TIME

Tell me more about conservation measures I can implement to avoid or minimize impacts to migratory birds.

Nationwide Conservation Measures describes measures that can help avoid and minimize impacts to all birds at any location year round. Implementation of these measures is particularly important when birds are most likely to occur in the project area. When birds may be breeding in the area, identifying the locations of any active nests and avoiding their destruction is a very helpful impact minimization measure. To see when birds are most likely to occur and be breeding in your project area, view the Probability of Presence Summary. Additional measures or permits may be advisable depending on the type of activity you are conducting and the type of infrastructure or bird species present on your project site.

What does IPaC use to generate the migratory birds potentially occurring in my specified location?

The Migratory Bird Resource List is comprised of USFWS Birds of Conservation Concern (BCC) and other species that may warrant special attention in your project location.

The migratory bird list generated for your project is derived from data provided by the Avian Knowledge Network (AKN). The AKN data is based on a growing collection of survey, banding, and citizen science datasets and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle (Eagle Act requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the AKN Phenology Tool.

What does IPaC use to generate the probability of presence graphs for the migratory birds potentially occurring in my specified location?

The probability of presence graphs associated with your migratory bird list are based on data provided by the Avian Knowledge Network (AKN). This data is derived from a growing collection of survey, banding, and citizen science datasets .

Probability of presence data is continuously being updated as new and better information becomes available. To learn more about how the probability of presence graphs are produced and how to interpret them, go the Probability of Presence Summary and then click on the "Tell me about these graphs" link.

How do I know if a bird is breeding, wintering, migrating or present year-round in my project area?

To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating or year-round), you may refer to the following resources: The Cornell Lab of Ornithology All About Birds Bird Guide, or (if you are unsuccessful in locating the bird of interest there), the Cornell Lab of Ornithology Neotropical Birds guide. If a bird on your migratory bird species list has a breeding season associated with it, if that bird does occur in your project area, there may be nests present at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

What are the levels of concern for migratory birds?

Migratory birds delivered through IPaC fall into the following distinct categories of concern:

1. "BCC Rangewide" birds are Birds of Conservation Concern (BCC) that are of concern throughout their range anywhere within the USA (including Hawaii, the Pacific Islands, Puerto Rico, and the Virgin Islands);
2. "BCC - BCR" birds are BCCs that are of concern only in particular Bird Conservation Regions (BCRs) in the continental USA; and
3. "Non-BCC - Vulnerable" birds are not BCC species in your project area, but appear on your list either because of the Eagle Act requirements (for eagles) or (for non-eagles) potential susceptibilities in offshore areas from certain types of development or activities (e.g. offshore energy development or longline fishing).

Although it is important to try to avoid and minimize impacts to all birds, efforts should be made, in particular, to avoid and minimize impacts to the birds on this list, especially eagles and BCC species of rangewide concern. For more information on conservation measures you can implement to help avoid and minimize migratory bird impacts and requirements for eagles, please see the FAQs for these topics.

Details about birds that are potentially affected by offshore projects

For additional details about the relative occurrence and abundance of both individual bird species and groups of bird species within your project area off the Atlantic Coast, please visit the Northeast Ocean Data Portal. The Portal also offers data and information about other taxa besides birds that may be helpful to you in your project review. Alternately, you may download the bird model results files underlying the portal maps through the NOAA NCCOS Integrative Statistical Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic Outer Continental Shelf project webpage.

Bird tracking data can also provide additional details about occurrence and habitat use throughout the year, including migration. Models relying on survey data may not include this information. For additional information on marine bird tracking data, see the Diving Bird Study and the nanotag studies or contact Caleb Spiegel or Pam Loring.

What if I have eagles on my list?

If your project has the potential to disturb or kill eagles, you may need to obtain a permit to avoid violating the Eagle Act should such impacts occur.

Proper Interpretation and Use of Your Migratory Bird Report

The migratory bird list generated is not a list of all birds in your project area, only a subset of birds of priority concern. To learn more about how your list is generated, and see options for identifying what other birds may be in your project area, please see the FAQ "What does IPaC use to generate the migratory birds potentially occurring in my specified location". Please be aware this report provides the "probability of presence" of birds within the 10 km grid cell(s) that overlap your project; not your exact project footprint. On the graphs provided, please also look carefully at the survey effort (indicated by the black vertical bar) and for the existence of the "no data" indicator (a red horizontal bar). A high survey effort is the key component. If the survey effort is high, then the probability of presence score can be viewed as more dependable. In contrast, a low survey effort bar or no data bar means a lack of data and, therefore, a lack of certainty about presence of the species. This list is not perfect; it is simply a starting point for identifying what birds of concern have the potential to be in your project area, when they might be there, and if they might be breeding (which means nests might be present). The list helps you know what to look for to confirm presence, and helps guide you in knowing when to implement conservation measures to avoid or minimize potential impacts from your project activities, should presence be confirmed. To learn more about conservation measures, visit the FAQ "Tell me about conservation measures I can implement to avoid or minimize impacts to migratory birds" at the bottom of your migratory bird trust resources page.

Facilities

National Wildlife Refuge lands

Any activity proposed on lands managed by the National Wildlife Refuge system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

THERE ARE NO REFUGE LANDS AT THIS LOCATION.

Fish hatcheries

THERE ARE NO FISH HATCHERIES AT THIS LOCATION.

Wetlands in the National Wetlands Inventory

Impacts to NWI wetlands and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local U.S. Army Corps of Engineers District.

Please note that the NWI data being shown may be out of date. We are currently working to update our NWI data set. We recommend you verify these results with a site visit to determine the actual extent of wetlands on site.

This location overlaps the following wetlands:

FRESHWATER EMERGENT WETLAND

- PEM1Ed
- PEM1/UBF
- PEM1/SS1Cd
- PEM1Cd
- PEM5E
- PEM1F
- PEM1C
- PEM1E
- PEM1B

FRESHWATER FORESTED/SHRUB WETLAND

- PFO1Cd
- PFO1/SS1Cd
- PFO1Ed
- PSS1/FO1Ed
- PFO1E
- PSS1/EM1E
- PFO1/SS1Ed
- PSS1Ed
- PFO1C

FRESHWATER POND

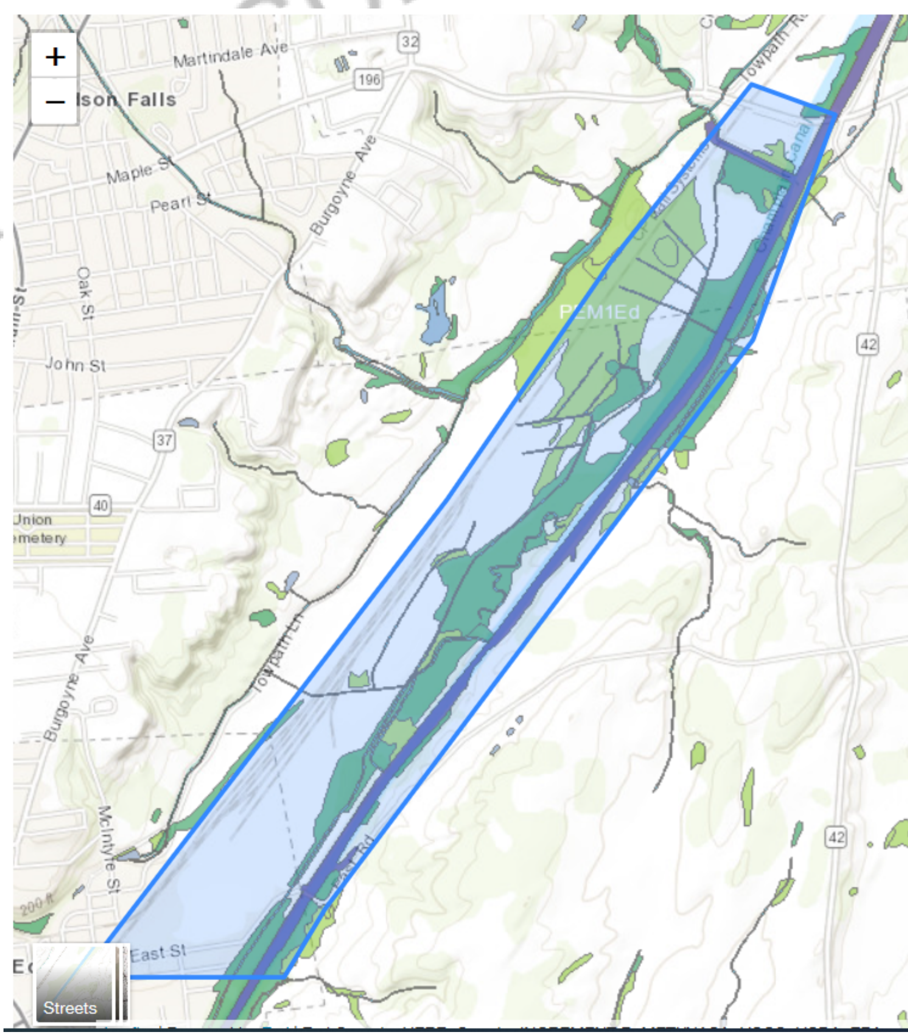
- PABFh

LAKE

- L1UBHh

RIVERINE

- R3UBH



R4SBC

A full description for each wetland code can be found at the National Wetlands Inventory website

Data limitations

The Service's objective of mapping wetlands and deepwater habitats is to produce reconnaissance level information on the location, type and size of these resources. The maps are prepared from the analysis of high altitude imagery. Wetlands are identified based on vegetation, visible hydrology and geography. A margin of error is inherent in the use of imagery; thus, detailed on-the-ground inspection of any particular site may result in revision of the wetland boundaries or classification established through image analysis.

The accuracy of image interpretation depends on the quality of the imagery, the experience of the image analysts, the amount and quality of the collateral data and the amount of ground truth verification work conducted. Metadata should be consulted to determine the date of the source imagery used and any mapping problems.

Wetlands or other mapped features may have changed since the date of the imagery or field work. There may be occasional differences in polygon boundaries or classifications between the information depicted on the map and the actual conditions on site.

Data exclusions

Certain wetland habitats are excluded from the National mapping program because of the limitations of aerial imagery as the primary data source used to detect wetlands. These habitats include seagrasses or submerged aquatic vegetation that are found in the intertidal and subtidal zones of estuaries and nearshore coastal waters. Some deepwater reef communities (coral or tuberficid worm reefs) have also been excluded from the inventory. These habitats, because of their depth, go undetected by aerial imagery.

Data precautions

Federal, state, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner than that used in this inventory. There is no attempt, in either the design or products of this inventory, to define the limits of proprietary jurisdiction of any Federal, state, or local government or to establish the geographical scope of the regulatory programs of government agencies. Persons intending to engage in activities involving modifications within or adjacent to wetland areas should seek the advice of appropriate federal, state, or local agencies concerning specified agency regulatory programs and proprietary jurisdictions that may affect such activities.

B.8 CULTURAL RESOURCES

LEGEND

PROJECT BOUNDARY	USN BUILDING
MUNICIPAL BOUNDARY	NATIONAL REGISTER BUILDING SITE
PROPERTY LINE	SURVEY BUILDING AREAS
EASEMENT / PRIVATE ROW	SURVEY ARCHEOLOGICAL AREAS
RAILROAD	CONSULTATION PROJECTS
STREET CENTERLINE	DOT BINS
CANAL	
STREAM / DITCH	

NOTE: ENTIRE PROJECT AREA IS LOCATED WITHIN AN ARCHEOLOGICAL SENSITIVE AREA AS SHOWN ON NEW YORK STATE CULTURAL RESOURCE SYSTEM (CRIS) MAPPING.

1 CULTURAL RESOURCES MAP
SCALE: BAR SCALE

0 500 1000

Weston & Sampson

Sheet Number:

SK-4

B.9 WINDSHIELD SURVEY

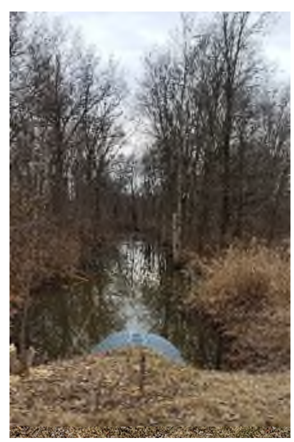
1.) Looking north- northeast, rail line and former dewatering areas

2.) Looking northeast, rail lines

3.) Looking north, remaining transformer station and warehouse

4.) Looking northeast, remaining warehouse

5.) Looking southwest, other remaining warehouse and former tank pads



6.) Looking northeast, wetland area between dewatering facility and canal

7.) Looking northeast, former dewatering areas and warehouses

10.) Looking east, fill material pile

8.) Looking northeast, grain processing equipment

11.) Looking northeast, Champlain Canal

9.) Looking northwest, former dewatering areas

12.) Looking south, wetland area

B.10 CREIGHTON MANNING LOCK 8 WAY BRIDGE RREPLACEMENT PRELIMINARY ENGINEERING REPORT

Preliminary Engineering Report

ENGINEERS
PLANNERS
SURVEYORS

Date: March 12, 2021

To: David O'Brien
Hampton Town Supervisor
Chair, Warren-Washington County IDA
Chair, Lake Champlain Lake George Regional Planning Board

From: Luke Thompson, PE
Creighton Manning Engineering, LLP

Project: **Lock 8 Way Bridge over Old Feeder Canal – Bridge Replacement; Town of Fort Edward; Washington County, NY; CM# 120-291**

Re: **Preliminary Engineering Report**

---

1. Introduction and Background

The purpose of this Preliminary Engineering Report is to document what, if any, components of the existing bridge can be maintained or reused, and if necessary, recommend new bridge components to allow for long-term operation of the bridge in accordance with current New York State Department of Transportation (NYSDOT) and American Association of State Highway and Transportation Officials (AASHTO) standards. Long-term operation of the bridge will allow vehicular access to the Canalside Energy Park industrial site located directly south of the bridge, which as described in the ED-900, is in a designated Opportunity Zone and provides a major opportunity for economic growth by creating manufacturing jobs in the region. The Energy Park had been abandoned by previous industrial employers, but is still fully equipped to operate, provided that access to the site via the bridge is maintained. This report will summarize the scope of work for the above referenced project, document the existing conditions and environmental concerns, estimate the cost and timeline for the anticipated work, and provide preliminary engineering analyses of alternatives for modifications needed to allow safe continued operation of the bridge. The project components described in this report are consistent with the EDA investment project description provided in Section B.2 of Form ED-900.

2. Existing Conditions

The existing structure is a Mabey Truss bridge located at the north end of Lock 8 Way in Kingsbury, NY. The Canalside Energy Park is located in the Town of Fort Edward south of the bridge. Previous investigation and records suggest that the bridge and surrounding roadway were constructed in 2007 to provide access to a dewatering facility located at the Canalside Energy Park during the General Electric Hudson River Dredging project. The facility has since been decommissioned, but the site is slated for future industrial redevelopment and the bridge crossing will be utilized to provide future access.

The existing bridge has one 95.55 ft. span, with two 12 ft. travel lanes, each with a 3 ft. shoulder for total roadway width of 30 ft. Concrete barriers bound each shoulder with galvanized steel trusses outside for a total out-to-out width of approximately 43'-7". The bridge bears on concrete abutments supported by driven steel H-piles. Record drawings of the bridge indicate that it was designed for two lanes of traffic and HS25-44 loading per AASHTO Standard Specifications for Highway Bridges, 17^{th} Ed. The bridge is classified as "temporary" and has not been properly rated for permanent use. The bridge manufacturer indicated that with proper maintenance and assuming the intended design load is followed, the bridge would have an expected minimum life span of 25 years from the date of construction. The bridge remains open and serving two-way traffic to present date.

3. Site Investigation

At the request of WWIDA, John Geisler, PE, and Timothy Cremins, IE, of Creighton Manning Engineering (CM) performed a site visit on March 3, 2021 to observe the existing bridge site. A visual inspection was performed to determine the existing conditions, and to determine if any issues were present that would impact the potential bridge modifications. Minor leaks were observed on the underside of the deck, as well as minor corrosion of the steel superstructure elements. The superstructure appeared to have a small deflection as observed by previous inspectors noted in the next section of this report, however no measurement was taken. Minor surface cracks were also observed on the abutments, primarily near the weep holes through the abutments. No immediate concerns with the bridge superstructure or substructure were noted at this time. For photos of the site visit, see Appendix D.

4. Previous Inspections

Greenman-Pedersen Inc. (GPI) performed the most recent known inspection of the bridge in January of 2020. The inspection was performed at the request of the New York State Canal Corporation (NYSCC), and models NYSDOT bridge inspection format in accordance with the NYS Bridge Inspection Manual. The inspection determined a general recommendation rating of 6 out of 7. This rating indicates that inspectors observed only minor deterioration of the bridge. This would include observations such as paint loss, minor damage to secondary members, and small cracks in substructures. Minor repairs to secondary elements and touch-ups of protective coatings are typical recommendations for this rating.

C.T. Male Associates performed a more detailed investigation of the site in 2019. In addition to an on-site inspection, C.T. Male Associates was provided with as-built drawings, design calculations, and correspondence from the bridge manufacturer. At the conclusion of their inspection, they determined the bridge to be in “good condition” except for a significant deflection observed in the trusses. They could not determine the bridge’s anticipated deflection from the design calculations, and recommended the designer comment on the observed deflection for a more accurate determination. The bridge designer also confirmed the expected design life of 25 years for the bridge, provided proper maintenance was performed throughout that period of time.

5. Design Criteria

The design criteria for this project are based on the 2020 Edition of the NYSDOT Highway Design Manual, Chapter 2 and the 2019 Edition of the NYSDOT Bridge Design Manual. The NYSDOT Functional Class Viewer indicates that Lock 8 way is within the Glens Falls urban area. However, the roadway primarily serves as an access road to the industrial site at its south end. Within this context, Lock 8 Way is best classified as an urban local road. An annual average daily traffic (AADT) has not been determined at this time; however, the ED-900 documentation suggests that 50 new full-time jobs will be created at the site. With an understanding that the employees and their suppliers will be the primary users of the bridge, a design volume of under 400 vehicles/day is anticipated for the bridge.

5.1 Critical Design Elements:

Exhibit 5.1a – Critical Design Elements					
Route No. & Name:		Lock 8 Way	**Project Type:**	Bridge Replacement	
Roadway Classification:		Urban Local	**ETC+30 AADT (2048):**	400 vpd	
Element		**Standard**		**Existing Condition**	**Proposed Condition**
1	**Design Speed**	20 mph Min, 30 mph Max, – HDM 2.7.4.3		35 mph *	30 mph *
2	**Lane Width**	10 ft - BM Table R and N, Appendix 2A 12 ft – HDM Sect 2.7.4.3, Exhibit 2-8		12 ft	12 ft
3	**Shoulder Width**	2 ft - BM Table R and N, Appendix 2A 2 ft – HDM Sect 2.7.4.3, Exhibit 2-8		3 ft	3 ft
4	**Maximum Grade**	8.0% Max - HDM Sect 2.7.4.3		0.50%	<8.0%
5	**Cross Slope**	-1.5% Max, -3.0% Max - HDM Sect 2.7.4.3		-2.0%	-2.0%
6	**Structural Capacity**	NYSDOT LRFD Specifications (BM Section 1.3)		AASHTO HS-25	HL-93
* Although the nature of the roadway suggests a maximum design speed of 30 mph, CM observed several existing 35 mph speed limit signs on Lock 8 Way near the bridge during the site visit. It is conservative to assume this speed will be maintained for the new bridge.					

5.2 Additional Design Considerations:

Due to the presence of the feeder canal below the existing and proposed bridge site, hydraulics is important to consider in the design of the bridge. Though no documentation of previous hydraulic analysis on the existing bridge was found, it is likely that some analysis was performed. Therefore, at a minimum, the new bridge low chord should be level with, or higher than, the existing bridge low chord. Ideally, it is recommended that a formal hydraulic analysis be performed to determine any impact the bridge may have on the water flowing through the feeder canal.

6. Alternatives Considered

When considering alternatives, cost was a driving factor. Any components of the existing bridge that could be reused would reduce the cost of the project significantly.

An initial evaluation of the existing truss superstructure indicates that with a design life of 25 years under proper maintenance, the existing superstructure is expected to remain adequate for use until 2032. This life span would not achieve the project's long-term use objectives. Retrofitting the existing superstructure could extend the life of the bridge, however, significant deflections have been observed during the bridge's 14 years of service. Additionally, retrofitting the existing truss superstructure would be comparable in cost to installing a new superstructure, so it is not a preferred alternative.

Each of the existing foundations are concrete abutments supported by 30 piles. The record plans suggest that the pile and abutment foundations have significant capacity to sustain long-term traffic over the bridge. Although the piles could not be observed during the previous site investigations, none of the inspectors noted any significant deficiencies in the concrete abutments. Considering the relatively young age of the piles, it is safe to assume that the existing substructures are in good condition. From a demolition perspective, a significant amount of money and time would be saved if the piles and abutments could remain and accept a new superstructure. Additionally, reusing the existing foundations would eliminate the need for excavation and disturbance of the surrounding soil. It is recommended to reuse the existing concrete foundations and modify as needed to accommodate a new superstructure above.

With the above considerations, two (2) alternatives are evaluated to achieve the project objectives.

Alternative 1 – Steel Multi-Girder Superstructure

This alternative consists of replacing the existing Mabey truss superstructure with a new steel multi-girder superstructure. The existing substructures will be reused, and the top of the abutment will be modified to accommodate the new superstructure.

The new superstructure will be a 95’-6”, single span bridge on existing reinforced concrete abutments. The deck will be a 9.5” reinforced concrete composite deck supported by steel girders spanning between the abutments. The steel should be given a protective coating, galvanized, or metallized to prevent long-term deterioration. The travel way will consist of two 12’-0” lanes (one in each direction) with 3’-0” shoulders for a total roadway width of 30’-0”, similar to the existing bridge. The outsides of the shoulders will be bounded by steel 4-rail bridge railing without curb for a total deck width of 33’-4”. The existing pedestals and top of the concrete abutments will be removed and reconstructed as needed to accommodate bearings for the girders. Additionally, if any utilities are required on the bridge, they can easily be mounted adjacent to the girders.

With this alternative, the bridge can safely accommodate the long-term traffic anticipated for the Energy Park and achieves the project objectives. This is the least costly alternative, estimated at approximately $600,000 for construction.

Alternative 2 – Steel Truss Superstructure

This alternative consists of replacing the existing Mabey truss superstructure with a new steel truss superstructure. The existing substructures will be reused, and the top of the abutment will modified to accommodate the new superstructure.

Similar to alternative 1, the new superstructure will be a 95’-6”, single span bridge on existing reinforced concrete abutments. The deck will be a 9.5” reinforced concrete composite deck supported by steel stringers and floorbeams. The floorbeams will frame into trusses on either side. The steel should be galvanized, coated, or painted to prevent long-term deterioration. Like alternative one, the travel way will consist of two 12’-0” lanes (one in each direction) with 3’-0” shoulders for a total roadway width of 30’-0”, similar to the existing bridge. The outsides of the shoulders will be bounded by steel 2-rail bridge railing on brush curb for a total deck width of 34’-2”. A small gap will be required between the deck and trusses, creating an approximate distance between centerline of trusses of 36’-2”. The existing pedestals and top of the concrete abutments will be removed and reconstructed as needed to accommodate bearings for the girders. Utilities can also be mounted to the side of the truss if required.

With this alternative, the bridge can safely accommodate the long-term traffic anticipated for the Energy Park and achieves the project objectives. This is the most costly alternative, estimated at approximately $776,000.

7. Constructability and Staging Considerations

All alternatives require replacement of the superstructure, meaning the bridge will need to be closed for the entirety of construction. Access to the south side of the bridge and industrial site is attainable via two entrances to the north and south. The north entrance connects to Lock 8 way via Route 196 but required crossing the bridge which will be closed. South of the Energy Park, there is an access road from East Street which is typically closed, but can be used for traffic to the site during bridge construction.

Proximity to Route 196 would suggest that construction access from the north end is the easiest option. A crane will likely be positioned behind the northern bridge abutment. Trucks could deliver structural members via the north end of Lock 8 way, behind the crane, and the crane could set them in their final position.

8. Recommended Alternative

CM recommends Alternative 1 – Steel Multi-Girder Superstructure. Both alternatives achieve the project objectives, but alternative 1 does so at the least cost. Since both alternatives provide the same roadway, require the same amount of disturbance to the surrounding area, and have similar construction durations, neither one offers any structural, environmental, or transportation advantages. Alternative 1 achieves the same goal at a lower price and is therefore preferable.

9. Utilities

There are no known utilities located on or adjacent to the existing bridge. The ED-900 documentation indicates that there is no municipal sewer located in the industrial park and that the construction and maintenance of a septic system will be necessary for a business to locate at the park. This report and corresponding cost estimate have been progressed assuming the bridge and septic system are independent and have not included the cost of any wastewater system construction. Given that there are no other utilities to coordinate with, however, the incorporation of wastewater lines onto the bridge should not significantly complicate the bridge design.

10. Right of Way

Extents of previous impacts due to construction of the existing bridge are shown in the plan view of Appendix A. All construction for the proposed bridge is anticipated to remain within the established right of way. Therefore, no additional easements or acquisitions should be necessary.

11. Environmental

11.1 **SHPO:** The New York State Historic Preservation Office (SHPO) was consulted regarding any potential impact to existing cultural or historic resources within the proposed project's area of effect. SHPO noted that that the proposed bridge crosses the National Register eligible Lock 8 Feeder Canal and that the project is adjacent to the New York State Barge Canal, which is listed in the National Registry. However, SHPO assessed that the proposed project would have "No Adverse Effect" to the existing historic and cultural resources in the area.

11.2 **Wetlands:** A wetland screening was performed on January 18, 2021 using the Information for Planning and Consultation (IPaC) web tool provided by the U.S. Fish & Wildlife Service (USFWS). The screening identified three types of wetlands within the project area: freshwater emergent wetland, freshwater forested/shrub wetland, and lake area. These areas extend throughout the entire site with the exception of the northern bridge approach. Extensive excavation and modifications to the ground in these areas would likely require U.S., Army Corps of Engineers permitting. However, a superstructure replacement as recommended previously would not disturb the ground significantly and would likely not impact the surrounding wetlands.

11.3 **<u>Surface Waterbodies and Watercourses:</u>** The existing bridge traverses the Bond Creek waterway which feeds into the Lake Champlain Canal directly adjacent and parallel to the bridge. The NYSDEC classifies both of these waterways as Class "C" streams. The best usage for Class "C" water is fishing. The water quality is suitable for fish propagation and survival. Water quality shall be suitable for primary and secondary contact recreation, although other factors may limit the use for these purposes. Since no work would be done in the water, there would be no impact on the surface water bodies and watercourses.

11.4 **<u>Endangered Species:</u>** The USFWS IPAC system, accessed January 18, 2021, was used to screen for any endangered or threatened species that could be found within the project area. The Indiana Bat was the only identified endangered species within the project area. Their roosting habitat is in trees greater than 4" in diameter. Though there are a large number of trees near the project site, most of the larger tress where the bats would roost are at least 20 ft away from the existing bridge. This would suggest that the bats are unlikely to be affected by the construction operations. Additionally, a superstructure replacement would require event less, if any, removal of surrounding trees, minimizing any potential effects to the Indian Bat.

12. Method of Construction and Related Contracts

The project can be progressed with a traditional design/bid/build process with sealed competitive bidding. Three main contracts will be necessary during this process: design, construction, and inspection. The first contract will be with a design engineer who will progress a set of construction drawings and a project manual that would be made available to perspective contractors. The advertisement period for construction is recommended to last a minimum of 3 weeks to allow an adequate number of contractors to view and bid the project. The construction contract will be awarded to the lowest responsible bidder. One primary contract will be executed between the owner and contractor. The prime contractor will subcontract out work, as needed, to subcontractors. The contract for the subcontractors will be between the prime contractor and the subcontractor. Construction is anticipated to last 4-5 months. A construction inspection contract will be arranged with a professional engineering firm prior to construction. Any additional contracts for construction support and material testing will be issued after design and prior to construction.

13. Required Permits

Anticipated Permits:

- Army Core of Engineers (USACE) - Nationwide Permit #3
- New York State Department of Environmental Conservation (NYSDEC) – Stream Disturbance

Although no work is anticipated to take place in water, it is recommended to obtain the above permits as work will take place above water. The Joint Application can be submitted simultaneously to both agencies (USACE and NYSDEC) to obtain the necessary permits. Primary construction plans should be available at the time of the application and the permitting process typically takes 2-3 months.

14. Project Schedule

Based on the ED-900, work is anticipated to begin in July 2021 after funding has been secured. It is estimated that the engineering and design of the bridge will be completed by April 2022, with construction occuring from August 2022 to August 2023. A detailed project schedule chart will be developed during the design phase to include the following estimated project durations.

Exhibit 14 – Project Schedule	
Milestone	**Duration**
Bridge Design	6 Months
Environmental Permitting	3 Months
Easement/ROW Acquisitions	None Anticipated
Project Advertisement	1 Month
Project Bidding and Awarding	1 Month
Bridge Construction	5 Months

15. Project Budget Breakdown

A summary of the project budget breakdown can be found in the SF-424C located in Appendix B. Descriptions of what each Cost Classification includes can be found below.

- 4. Architectural and engineering fees – Engineering fee related to the design process of the bridge
- 5. Other architectural and engineering fees – Costs of surveying and construction materials testing
- 6. Project inspection fees – Fee for construction inspection services
- 7. Site work – Cost for clearing and grubbing and site restoration services required for construction
- 8. Demolition and removal – Cost for removal of existing superstructure and top of existing abutments
- 9. Construction – Cost of bridge construction (See Alternative 1 & 2 Estimates in Appendix B)
- 10. Equipment – Cost of additional equipment associated with the bridge replacement
- 11. Miscellaneous – Cost to account for incidental or unpredicted costs and adjustments

The total estimated budget required for this project is $1,132,000.

APPROVAL: ____ DATE: ________________________

Dave O'Brien
Chair, Warren-Washington County IDA
Chair, Lake Champlain – Lake George Regional Planning Board

Appendix A – Plans

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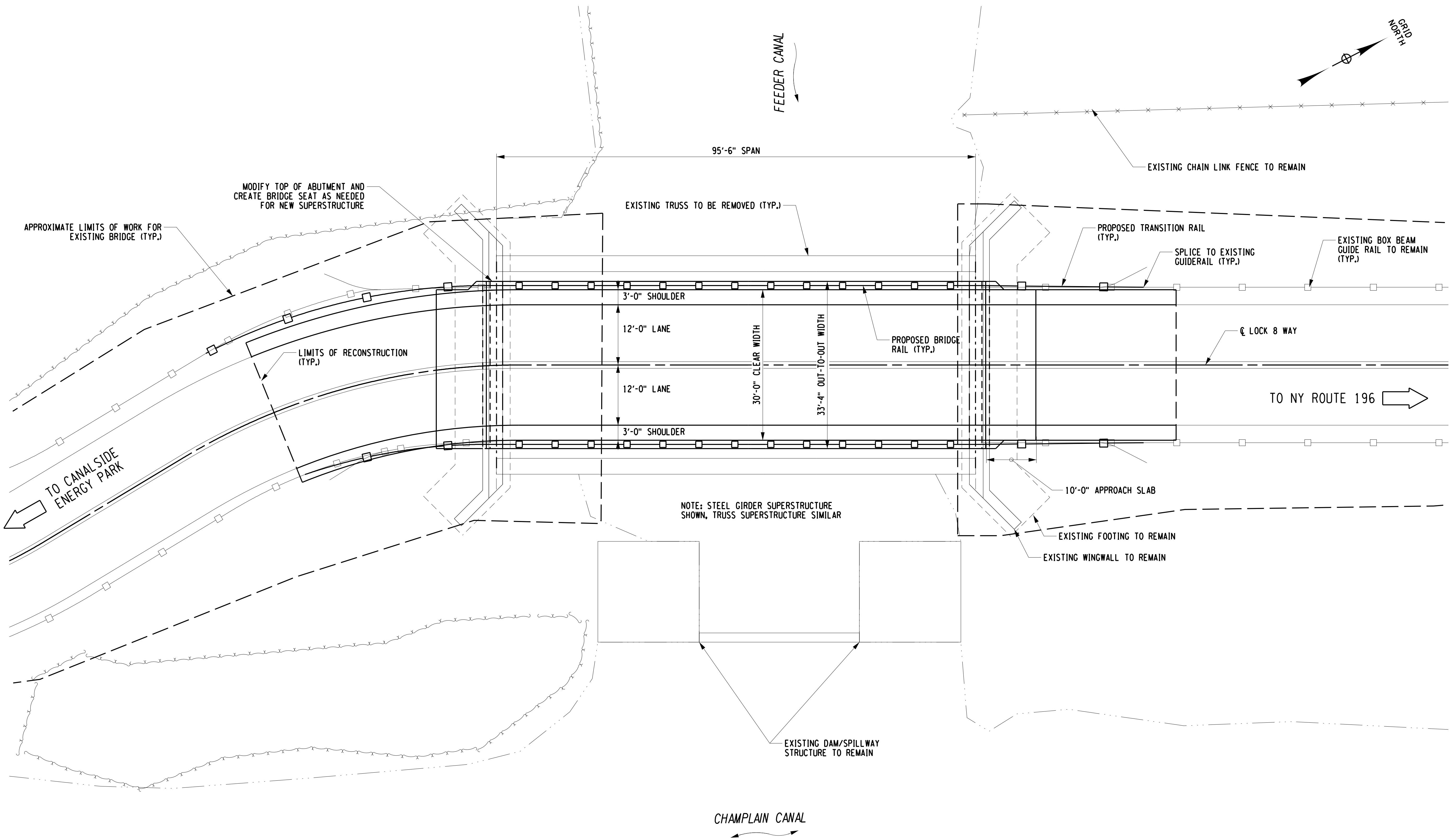

GENERAL PLAN

LEGEND:

APPROXIMATE EDGE OF WATER
APPROXIMATE EDGE OF FORESTED AREA

10 0 10 20 30 40'
1" = 20'

NO.	REVISION	DATE	BY

PPREPAIRED FOR:
Warren-Washington County IDA
5 Warren Street | Suite 210
Glens Falls, New York 12801

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P: (518) 446-0396 F: (518) 446-0397 WWW.CMELLP.COM

DESIGNED: TRC | DRAWN BY: K.H.D. | CHECKED: JCG

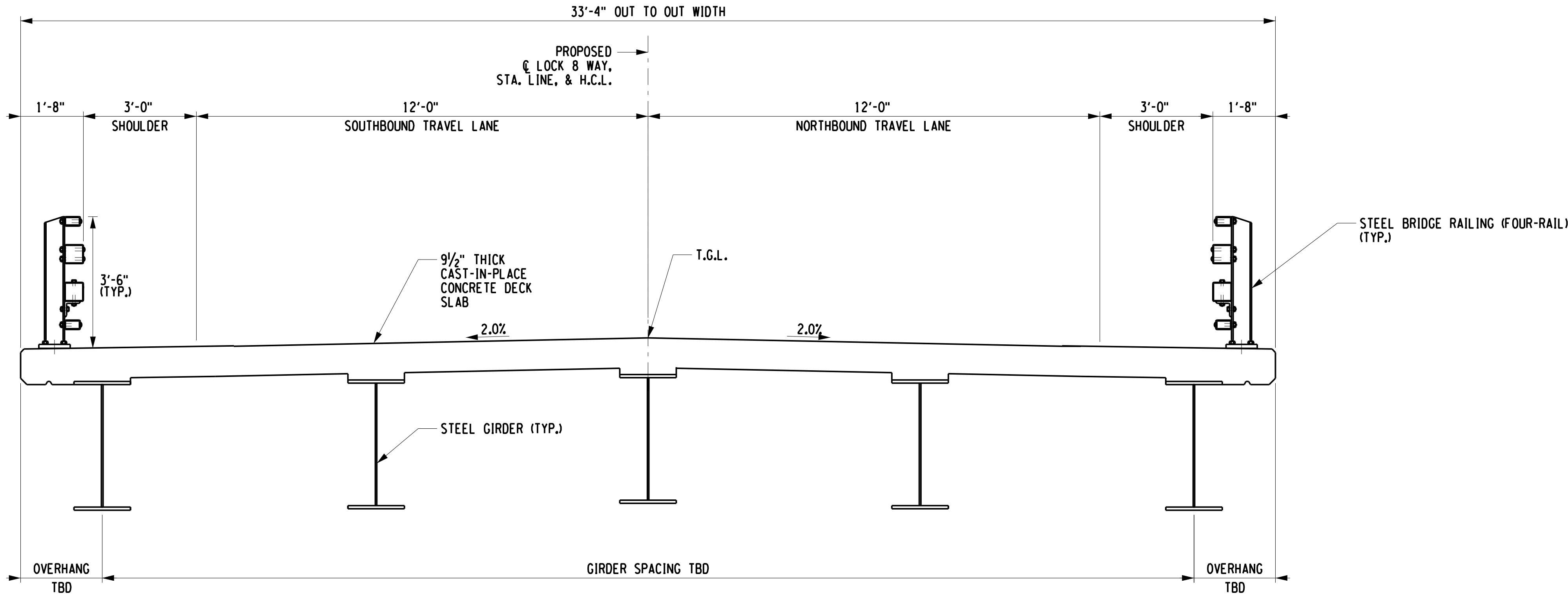
LOCK 8 WAY BRIDGE OVER OLD FEEDER CANAL BRIDGE REPLACEMENT
TOWN OF FORT EDWARD, WASHINGTON

GENERAL PLAN

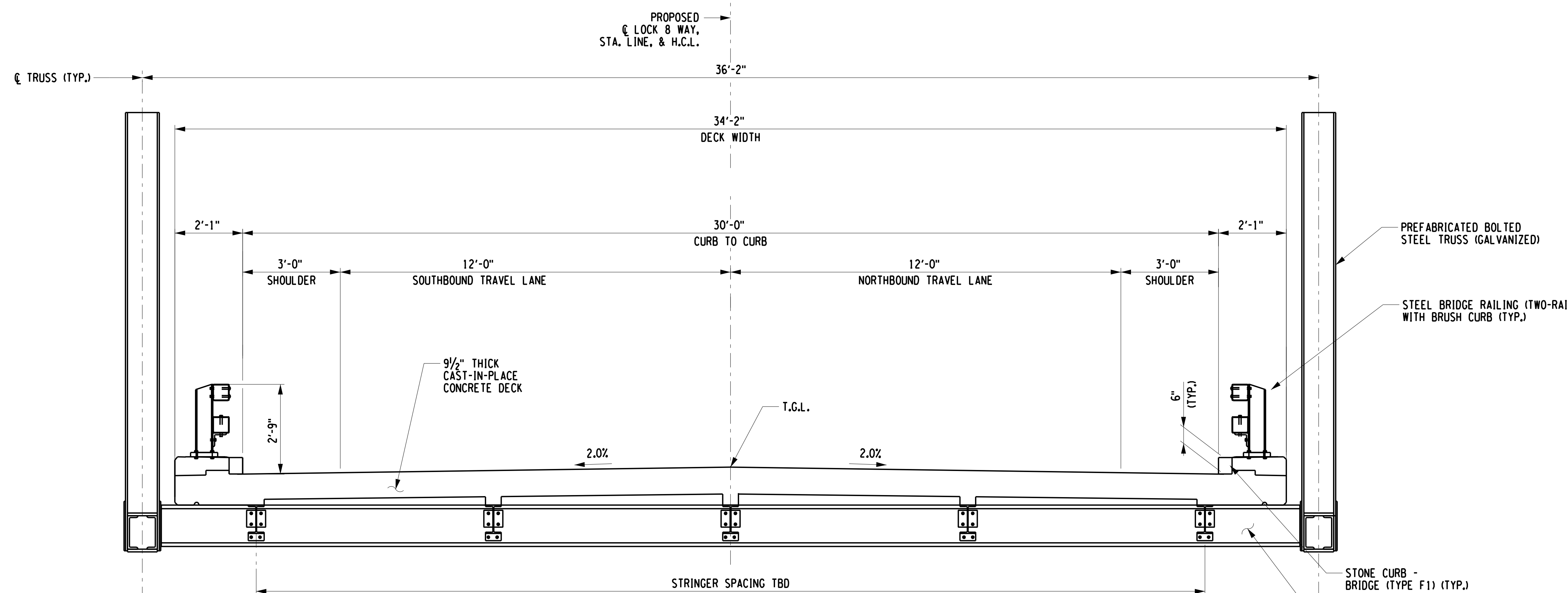
DATE: MARCH 2021 | CM No.: 120-291 | SCALE: AS NOTED

ST-1

SHEET NUMBER 1 of 2



ALTERNATIVE 1
MULTI-GIRDER BRIDGE SECTION
N.T.S.



ALTERNATIVE 2
TRUSS BRIDGE SECTION
N.T.S.

IT IS A VIOLATION OF LAW FOR ANY PERSON, UNLESS THEY ARE ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER, ARCHITECT, LANDSCAPE ARCHITECT, OR LAND SURVEYOR, TO ALTER AN ITEM IN ANY WAY. IF AN ITEM BEARING THE STAMP OF A LICENSED PROFESSIONAL IS ALTERED, THE ALTERING ENGINEER, ARCHITECT, LANDSCAPE ARCHITECT, OR LAND SURVEYOR SHALL STAMP THE DOCUMENT AND INCLUDE THE NOTATION "ALTERED BY" FOLLOWED BY THEIR SIGNATURE, THE DATE OF SUCH ALTERATION, AND A SPECIFIC DESCRIPTION OF THE ALTERATION.

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DESIGNED: TRC | DRAWN BY: K.H.D. | CHECKED: JCG

LOCK 8 WAY BRIDGE OVER OLD FEEDER CANAL BRIDGE REPLACEMENT
TOWN OF FORT EDWARD, WASHINGTON

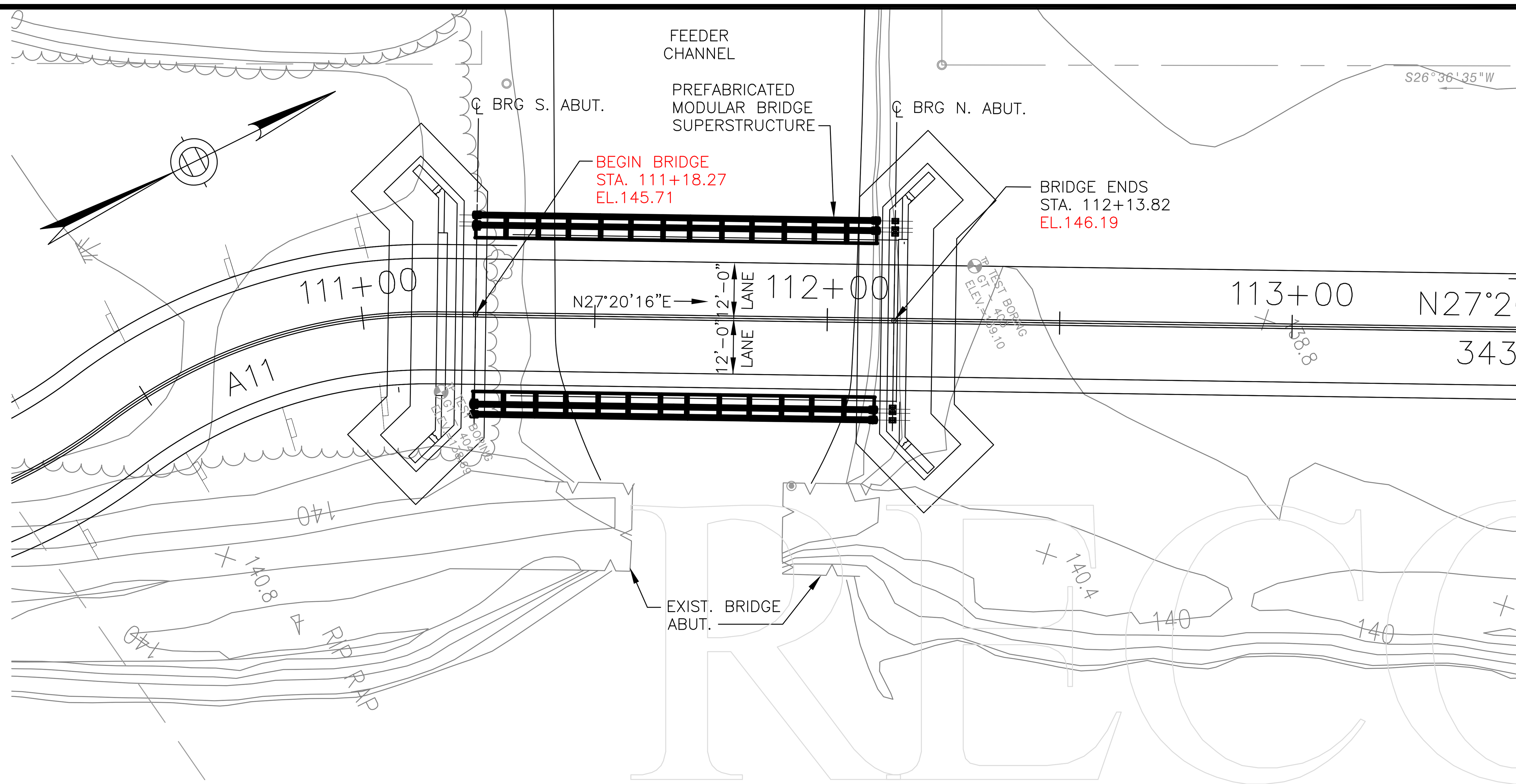
BRIDGE SECTIONS

DATE: MARCH 2021 | CM No.: 120-291 | SCALE: AS NOTED

ST-2

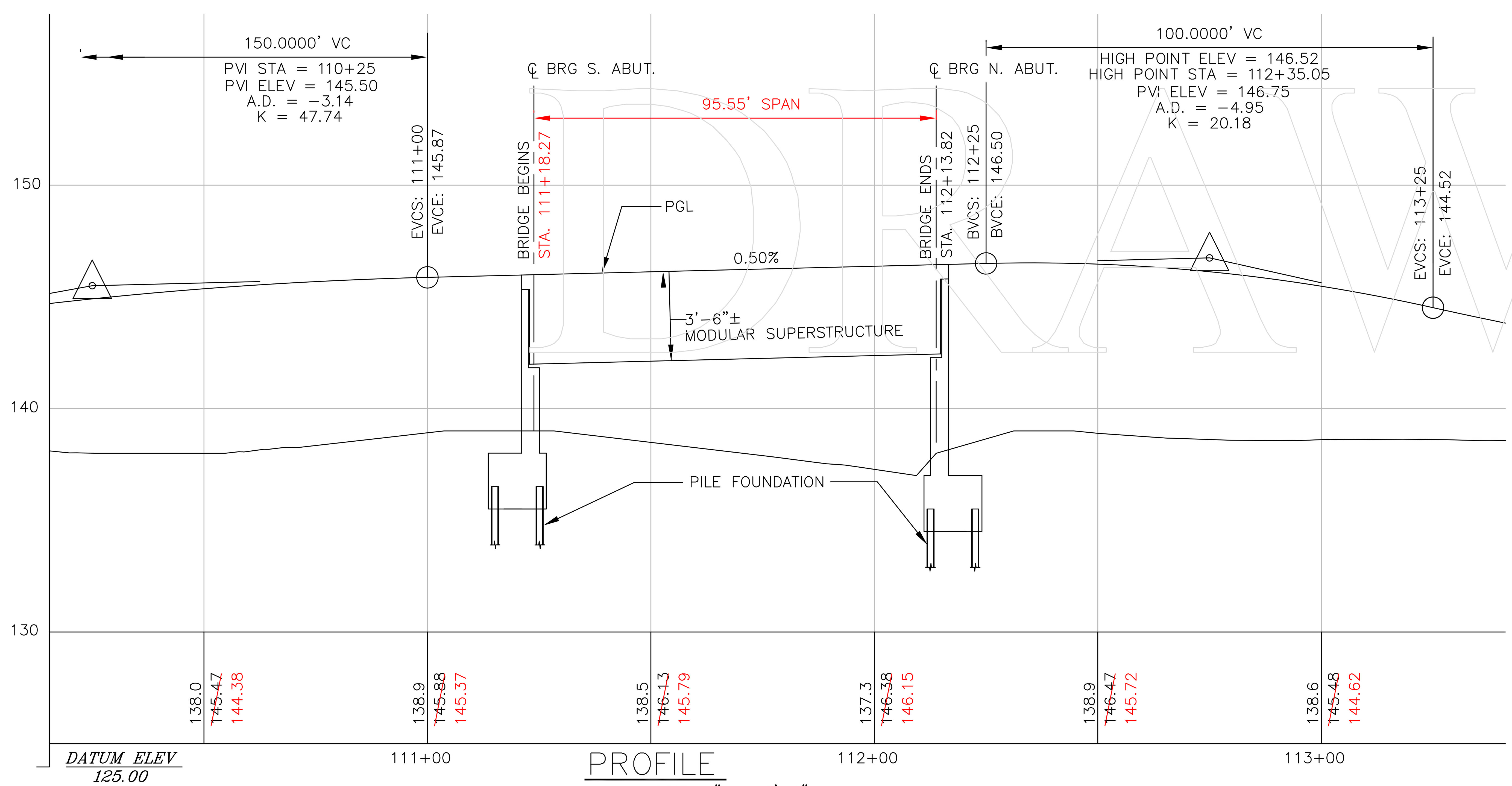
SHEET NUMBER 2 of 2

EXISTING BRIDGE PLAN



PLAN

SCALE: 1" = 40'-0"



PROFILE

HORIZ 1" = 40'-0"
VERT 1" = 8'-0"

D.A. COLLINS CONSTRUCTION COMPANY, INC.
OCTOBER 30, 2009

GENERAL NOTES:

DESIGN:

IN ACCORDANCE WITH THE 2002, 17th EDITION, STANDARD SPECIFICATIONS FOR HIGHWAY BRIDGES OF THE AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO) FOR HS25-44 LOADING AND SPECIALIZED CONSTRUCTION VEHICLE LOADS AS PROVIDED IN THE SPECIAL PROVISIONS.

ALSO IN ACCORDANCE WITH NYSDOT LRFD BRIDGE DESIGN SPECIFICATIONS WITH ALL PROVISIONS IN EFFECT AS OF 2005 FOR THE SUBSTRUCTURE DESIGN.

BENCH MARK:

SEE HIGHWAY PLANS.

DATUM:

ELEVATIONS ARE BASED ON VERTICAL DATUM NAVD88.

SURVEY NOTEBOOKS:

SEE HIGHWAY PLAN GENERAL NOTES.

SCALES:

SCALES ARE AS NOTED

FOUNDATIONS:

FOUNDATIONS MAY BE ALTERED, IF NECESSARY, TO SUIT CONDITIONS ENCOUNTERED DURING CONSTRUCTION, WITH THE APPROVAL OF THE ENGINEER.

UNSUITABLE MATERIAL:

ALL UNSUITABLE MATERIAL SHALL BE REMOVED WITHIN THE LIMITS OF THE FOUNDATIONS OF THE STRUCTURE, AS DIRECTED BY THE ENGINEER.

CONCRETE:

ABUTMENT CONCRETE SHALL BE HIGH EARLY STRENGTH CEMENT CONCRETE WITH A COMPRESSIVE STRENGTH OF 5000 P.S.I. AT 28 DAYS.

ANCHOR BOLTS:

UNLESS NOTED OTHERWISE, ALL ANCHOR BOLTS SHALL BE SET BY TEMPLATE BEFORE THE CONCRETE IS PLACED AND SHALL BE ASTM F1554.

REINFORCEMENT:

REINFORCING STEEL, INCLUDING DOWELS, SHALL CONFORM TO THE REQUIREMENTS OF ASTM DESIGNATION A615 GRADE 60. UNLESS OTHERWISE NOTED ON THE PLANS, ALL BARS SHALL BE NON EPOXY COATED AND SHALL BE LAPPED AS IN ACCORDANCE WITH AASHTO REQUIREMENTS.

STRUCTURAL STEEL:

ALL STRUCTURAL STEEL SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M183. ALL STRUCTURAL STEEL SHALL BE GALVANIZED IN ACCORDANCE WITH AASHTO M232 AND AASHTO M111 AS APPLICABLE. WELDED FABRICATION SHALL BE IN ACCORDANCE WITH THE BRIDGE WELDING CODE, ANSI/AASHTO/AWS D1.5 AND ALL INTERIM REVISIONS PUBLISHED BY AASHTO AS OF THE BID OPENING DATE.

MODULAR BRIDGE PLANS AND DETAILS:

INFORMATION ON THE MODULAR (PANEL) BRIDGE SHOWN ON THESE PLANS SHOWN ARE CONCEPTUAL AND ARE BASED ON ON A PRELIMINARY MODULAR BRIDGE DESIGN BY MABEY BRIDGE & SHORE, INC.

GEOMETRY, LOADS, BRIDGE CONFIGURATION, AND ALL DIMENSIONS SHOWN ARE THEREFORE APPROXIMATE AND ARE NOT GUARANTEED.

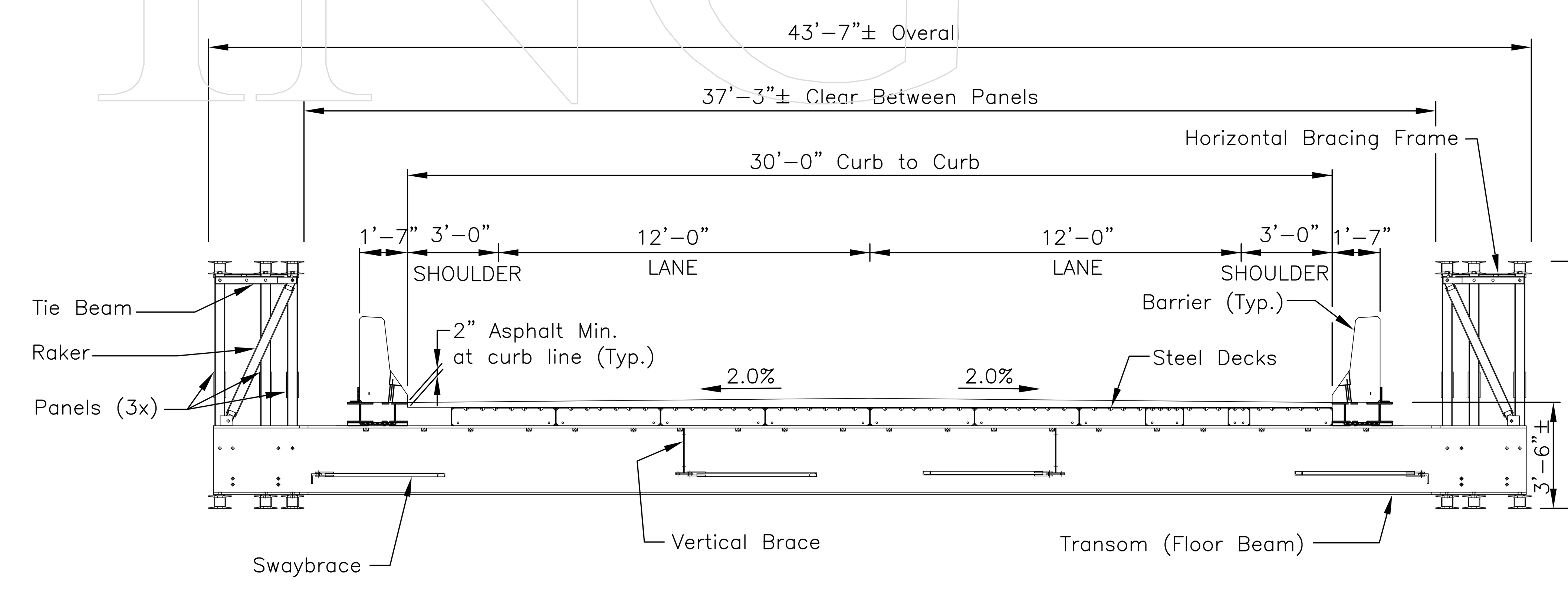
THE CONTRACTOR SHALL DETERMINE AND ESTABLISH ALL DIMENSIONS AND DETAILS NECESSARY FOR THE COMPLETION OF ALL WORK BY FIELD MEASUREMENTS AND SURVEY AND AS RECOMMENDED BY THE MODULAR BRIDGE MANUFACTURER.

THE CONTRACTOR SHALL BE RESPONSIBLE FOR ACCURACY THEREOF AND SHALL NOT ORDER ANY MATERIAL, OR COMMENCE ANY FABRICATION, UNTIL HE HAS MADE THE REQUIRED MEASUREMENTS ON THE MODULAR STRUCTURE, AND THE EXTENT OF PROPOSED WORK AS WELL AS ALL MODULAR BRIDGE PLANS AND DETAILS ARE APPROVED BY THE ENGINEER.

BARRIER AND GUARDRAIL:

FOR BARRIER MATERIAL SPECIFICATIONS, DIMENSIONS AND REINFORCEMENT DETAILS SEE NYSDOT STANDARD DETAIL SHEET BD-RC1. THE CONTRACTOR SHALL DESIGN THE BARRIER CONNECTION TO THE MODULAR BRIDGE SUPERSTRUCTURE.

FOR HIGHWAY BOX BEAM GUARDRAIL TRANSITION TO CONCRETE BRIDGE BARRIER SEE NYSDOT STANDARD DETAIL SHEETS BD-RC3 AND BD-RC4.



TRANSVERSE SECTION

RECORD DRAWING

ENGINEER OF RECORD
HENNINGSON, DURHAM, AND RICHARDSON ARCHITECTURE AND ENGINEERING, P.C.

ORIGINAL SCALE APPLIES TO 22"X34" DRAWING

THIS DRAWING WAS PREPARED AT THE SCALE(S) INDICATED. INACCURACIES IN THE STATED SCALE(S) MAY BE INTRODUCED WHEN DRAWINGS ARE REPRODUCED. USE THE GRAPHIC SCALE BAR(S) TO DETERMINE THE ACTUAL SCALE(S) OF THIS DRAWING.

No.	Date	Revisions	Init
	10/30/09	RECORD DRAWING	APL

NO ALTERATIONS PERMITTED HEREON EXCEPT AS PROVIDED UNDER SECTION 7209 SUBDIVISION 2 OF THE NEW YORK STATE EDUCATION LAW

Professional Engineer's Name: THOMAS C. MCLAUGHLIN
Professional Engineer's No.: 075823
State: NY
Date Signed:
Project Mgr.: KFB
Designed by:
Drawn by: JM

HDR Henningson, Durham and Richardson Architecture and Engineering, P.C.
711 WESTCHESTER AVE WHITE PLAINS, NY 10604-3504 (914) 993-2000

GENERAL ELECTRIC COMPANY • HUDSON RIVER PCBs SUPERFUND SITE
SEDIMENT REMEDIATION PHASE 1 PROJECT

BRIDGE PLAN, PROFILE AND TRANSVERSE SECTION

CONTRACT 1 – FACILITY SITE WORK CONSTRUCTION – ACCESS ROAD CONSTRUCTION

BBL Project No. 20435.700

Date DECEMBER 15, 2006

Blasland, Bouck & Lee, Inc.
Corporate Headquarters
6723 Towpath Road
Syracuse, NY 13214
315-446-9120

A-0025

Appendix B – Cost Estimates

Lock 8 Way Bridge Replacement

Hudson Falls, Washington County, NY
CME#: 119-054

Alternative 1 - Steel Multi-Girder Superstructure

Mar-21

Item No.	Description	Unit	Quantity	Unit Price	Total Cost
1	Excavation	CY	50	$100.00	$5,000.00
2	Bridge Rail (4-Rail)	LF	192	$235.00	$45,120.00
3	Guide Rail	LF	128	$160.00	$20,480.00
4	Superstructure Slab	SY	374	$375.00	$140,250.00
5	Approach Slab	SY	78	$325.00	$25,350.00
6	Concrete	CY	6	$2,000.00	$12,000.00
7	Rebar	LB	1925	$4.00	$7,700.00
8	Superstructure Steel	LS	1	$211,000.00	$211,000.00
9	Misc. Highway	LS	1	$50,000.00	$50,000.00
			Bridge Total		$466,900.00
			Highway Total		$50,000.00
			Field Change (5%)		$26,000.00
			Subtotal 1		**$543,000**
			Mobilization (4%)		**$22,000**
			Subtotal 2		**$565,000.00**
			Inflation (3.0%/yr)		**$35,000.00**
			TOTAL		**$600,000.00**

Lock 8 Way Bridge Replacement

Hudson Falls, Washington County, NY
CME#: 119-054

Alternative 2 - Steel Truss Superstructure

Mar-21

Item No.	Description	Unit	Quantity	Unit Price	Total Cost
1	Excavation	CY	51	$100.00	$5,100.00
2	Bridge Rail (2-Rail with Curb)	LF	192	$230.00	$44,160.00
3	Guide Rail	LF	128	$160.00	$20,480.00
4	Superstructure Slab	SY	383	$375.00	$143,625.00
5	Approach Slab	SY	80	$325.00	$26,000.00
6	Concrete	CY	6	$2,000.00	$12,000.00
7	Rebar	LB	1925	$4.00	$7,700.00
8	Truss Superstructure	LS	1	$358,000.00	$358,000.00
9	Misc. Highway	LS	1	$50,000.00	$50,000.00
			Bridge Total		$617,065.00
			Highway Total		$50,000.00
			Field Change (5%)		$34,000.00
			Subtotal 1		**$702,000**
			Mobilization (4%)		**$29,000**
			Subtotal 2		**$731,000.00**
			Inflation (3.0%/yr)		**$45,000.00**
			TOTAL		**$776,000.00**

OMB Approval No. 0348-0041

BUDGET INFORMATION - Construction Programs

NOTE: Certain Federal assistance programs require additional computations to arrive at the Federal share of project costs eligible for participation. If such is the case, you will be notified.

COST CLASSIFICATION	a. Total Cost	b. Costs Not Allowable for Participation	c. Total Allowable Costs (Columns a-b)
1. Administrative and legal expenses	$ 0 .00	$ .00	$ 0 .00
2. Land, structures, rights-of-way, appraisals, etc.	$ 0 .00	$ .00	$ 0 .00
3. Relocation expenses and payments	$ 0 .00	$ .00	$ 0 .00
4. Architectural and engineering fees	$ 130,000 .00	$ .00	$ 130,000 .00
5. Other architectural and engineering fees	$ 30,000 .00	$ .00	$ 30,000 .00
6. Project inspection fees	$ 132,000 .00	$ .00	$ 132,000 .00
7. Site work	$ 10,000 .00	$ .00	$ 10,000 .00
8. Demolition and removal	$ 50,000 .00	$ .00	$ 50,000 .00
9. Construction	$ 600,000 .00	$ .00	$ 600,000 .00
10. Equipment	$ 20,000 .00	$ .00	$ 20,000 .00
11. Miscellaneous	$ 60,000 .00	$ .00	$ 60,000 .00
12. SUBTOTAL *(sum of lines 1-11)*	$ 1,032,000 .00	$ 0 .00	$ 1,032,000 .00
13. Contingencies	$ 100000 .00	$ .00	$ 100,000 .00
14. SUBTOTAL	$ 1,132,000 .00	$ 0 .00	$ 1,132,000 .00
15. Project (program) income	$ 0 .00	$ .00	$ 0 .00
16. TOTAL PROJECT COSTS *(subtract #15 from #14)*	$ 1,132,000 .00	$ .00	$ 1,132,000 .00
FEDERAL FUNDING			
17. Federal assistance requested, calculate as follows: (Consult Federal agency for Federal percentage share.) Enter the resulting Federal share.	Enter eligible costs from line 16c Multiply X _______%		$ 0 .00

Previous Edition Usable **Authorized for Local Reproduction** **Standard Form 424C (Rev. 7-97)**
Prescribed by OMB Circular A-102

INSTRUCTIONS FOR THE SF-424C

This sheet is to be used for the following types of applications: (1) "New" (means a new [previously unfunded] assistance award); (2) "Continuation" (means funding in a succeeding budget period which stemmed from a prior agreement to fund); and (3) "Revised" (means any changes in the Federal Government's financial obligations or contingent liability from an existing obligation). If there is no change in the award amount, there is no need to complete this form. Certain Federal agencies may require only an explanatory letter to effect minor (no cost) changes. If you have questions, please contact the Federal agency.

Column a. - If this is an application for a "New" project, enter the total estimated cost of each of the items listed on lines 1 through 16 (as applicable) under "COST CLASSIFICATION."

If this application entails a change to an existing award, enter the eligible amounts *approved under the previous award* for the items under "COST CLASSIFICATION."

Column b. - If this is an application for a "New" project, enter that portion of the cost of each item in Column a. which is *not* allowable for Federal assistance. Contact the Federal agency for assistance in determining the allowability of specific costs.

If this application entails a change to an existing award, enter the adjustment [+ or (-)] to the previously approved costs (from column a.) reflected in this application.

Column. - This is the net of lines 1 through 16 in columns "a." and "b."

Line 1 - Enter estimated amounts needed to cover administrative expenses. Do not include costs which are related to the normal functions of government. Allowable legal costs are generally only those associated with the purchases of land which is allowable for Federal participation and certain services in support of construction of the project.

Line 2 - Enter estimated site and right(s)-of-way acquisition costs (this includes purchase, lease, and/or easements).

Line 3 - Enter estimated costs related to relocation advisory assistance, replacement housing, relocation payments to displaced persons and businesses, etc.

Line 4 - Enter estimated basic engineering fees related to construction (this includes start-up services and preparation of project performance work plan).

Line 5 - Enter estimated engineering costs, such as surveys, tests, soil borings, etc.

Line 6 - Enter estimated engineering inspection costs.

Line 7 - Enter estimated costs of site preparation and restoration which are not included in the basic construction contract.

Line 9 - Enter estimated cost of the construction contract.

Line 10 - Enter estimated cost of office, shop, laboratory, safety equipment, etc. to be used at the facility, if such costs are not included in the construction contract.

Line 11 - Enter estimated miscellaneous costs.

Line 12 - Total of items 1 through 11.

Line 13 - Enter estimated contingency costs. (Consult the Federal agency for the percentage of the estimated construction cost to use.)

Line 14 - Enter the total of lines 12 and 13.

Line 15 - Enter estimated program income to be earned during the grant period, e.g., salvaged materials, etc.

Line 16 - Subtract line 15 from line 14.

Line 17 - This block is for the computation of the Federal share. Multiply the total allowable project costs from line 16, column "c." by the Federal percentage share (this may be up to 100 percent; consult Federal agency for Federal percentage share) and enter the product on line 17.

Appendix C – Cultural and Environmental Info.

February 8, 2021

Timothy Cremins
Assistant Project Engineer
Creighton Manning Engineering
2 Winners Circle
Albany, NY 12205

Re: IDA
120-291 WWIDA - Lock 8 Bridge Replacement
Town of Kingsbury, Washington County, NY
21PR00452

Dear Timothy Cremins:

Thank you for requesting the comments of the New York State Historic Preservation Office (SHPO). We have reviewed the provided documentation in accordance with Section 106 of the National Historic Preservation Act of 1966. These comments are those of the SHPO and relate only to Historic/Cultural resources. They do not include other environmental impacts to New York State Parkland that may be involved in or near your project. Such impacts must be considered as part of the environmental review of the project pursuant to the National Environmental Policy Act and/or the State Environmental Quality Review Act (New York Environmental Conservation Law Article 8).

We note that the proposed project crosses the National Register eligible Lock 8 Feeder Canal. In addition, the project is adjacent to New York State Barge Canal, which is listed in the National Register. We understand that the proposed project will include replacement of the existing temporary bridge that was installed in 2007.

Based on this review, it is the opinion of the SHPO that the proposed project will have No Adverse Effect to historic and cultural resources.

If you have any questions, I can be reached at (518) 268-2164.

Sincerely,

Weston Davey
Historic Site Restoration Coordinator
Weston.davey@parks.ny.gov

HOME SUBMIT SEARCH COMMUNICATE

View and/or Address a Response

Project 21PR00452: 120-291 WWIDA - Lock 8 Bridge Replacement (3DERM2BDONDB)

Please accept the following information below as the consolidated response from NYS SHPO for the above referenced submission.

Review Responses

Reviewer	Review Type
Jessica Schreyer	Archaeology

Information Requests

Process	Status	Reviewer	Review Type	Request Type
No Request Records				

Attachments

Attachment	Reviewer	Review Type	Type
No Attachment Records			

IPaC **U.S. Fish & Wildlife Service**

IPaC resource list

This report is an automatically generated list of species and other resources such as critical habitat (collectively referred to as *trust resources*) under the U.S. Fish and Wildlife Service's (USFWS) jurisdiction that are known or expected to be on or near the project area referenced below. The list may also include trust resources that occur outside of the project area, but that could potentially be directly or indirectly affected by activities in the project area. However, determining the likelihood and extent of effects a project may have on trust resources typically requires gathering additional site-specific (e.g., vegetation/species surveys) and project-specific (e.g., magnitude and timing of proposed activities) information.

Below is a summary of the project information you provided and contact information for the USFWS office(s) with jurisdiction in the defined project area. Please read the introduction to each section that follows (Endangered Species, Migratory Birds, USFWS Facilities, and NWI Wetlands) for additional information applicable to the trust resources addressed in that section.

Project information

NAME

120-291 WWIDA - Lock 8 Bridge

LOCATION

Washington County, New York

DESCRIPTION

None

Local office

New York Ecological Services Field Office

(607) 753-9334
(607) 753-9699

3817 Luker Road
Cortland, NY 13045-9385

http://www.fws.gov/northeast/nyfo/es/section7.htm

Endangered species

This resource list is for informational purposes only and does not constitute an analysis of project level impacts.

The primary information used to generate this list is the known or expected range of each species. Additional areas of influence (AOI) for species are also considered. An AOI includes areas outside of the species range if the species could be indirectly affected by activities in that area (e.g., placing a dam upstream of a fish population even if that fish does not occur at the dam site, may indirectly impact the species by reducing or eliminating water flow downstream). Because species can move, and site conditions can change, the species on this list are not guaranteed to be found on or near the project area. To fully determine any potential effects to species, additional site-specific and project-specific information is often required.

Section 7 of the Endangered Species Act **requires** Federal agencies to "request of the Secretary information whether any species which is listed or proposed to be listed may be present in the area of such proposed action" for any project that is conducted, permitted, funded, or licensed by any Federal agency. A letter from the local office and a species list which fulfills this requirement can **only** be obtained by requesting an official species list from either the Regulatory Review section in IPaC (see directions below) or from the local field office directly.

For project evaluations that require USFWS concurrence/review, please return to the IPaC website and request an official species list by doing the following:

1. Log in to IPaC.
2. Go to your My Projects list.
3. Click PROJECT HOME for this project.
4. Click REQUEST SPECIES LIST.

Listed species[1] and their critical habitats are managed by the Ecological Services Program of the U.S. Fish and Wildlife Service (USFWS) and the fisheries division of the National Oceanic and Atmospheric Administration (NOAA Fisheries[2]).

Species and critical habitats under the sole responsibility of NOAA Fisheries are **not** shown on this list. Please contact NOAA Fisheries for species under their jurisdiction.

---

1. Species listed under the Endangered Species Act are threatened or endangered; IPaC also shows species that are candidates, or proposed, for listing. See the listing status page for more information. IPaC only shows species that are regulated by USFWS (see FAQ).
2. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

The following species are potentially affected by activities in this location:

Mammals

NAME	STATUS

Indiana Bat Myotis sodalis — Endangered

Wherever found

There is **final** critical habitat for this species. The location of the critical habitat is not available.
https://ecos.fws.gov/ecp/species/5949

Critical habitats

Potential effects to critical habitat(s) in this location must be analyzed along with the endangered species themselves.

THERE ARE NO CRITICAL HABITATS AT THIS LOCATION.

Migratory birds

Certain birds are protected under the Migratory Bird Treaty Act[1] and the Bald and Golden Eagle Protection Act[2].

Any person or organization who plans or conducts activities that may result in impacts to migratory birds, eagles, and their habitats should follow appropriate regulations and consider implementing appropriate conservation measures, as described below.

---

1. The Migratory Birds Treaty Act of 1918.
2. The Bald and Golden Eagle Protection Act of 1940.

Additional information can be found using the following links:

- Birds of Conservation Concern http://www.fws.gov/birds/management/managed-species/birds-of-conservation-concern.php
- Measures for avoiding and minimizing impacts to birds http://www.fws.gov/birds/management/project-assessment-tools-and-guidance/conservation-measures.php
- Nationwide conservation measures for birds http://www.fws.gov/migratorybirds/pdf/management/nationwidestandardconservationmeasures.pdf

The birds listed below are birds of particular concern either because they occur on the USFWS Birds of Conservation Concern (BCC) list or warrant special attention in your project location. To learn more about the levels of concern for birds on your list and how this list is generated, see the FAQ below. This is not a list of every bird you may find in this location, nor a guarantee that every bird on this list will be found in your project area. To see exact locations of where birders and the general public have sighted birds in and around your project area, visit the E-bird data mapping tool (Tip: enter your location, desired date range and a species on your list). For projects that occur off the Atlantic Coast, additional maps and models detailing the relative occurrence and abundance of bird species on your list are available. Links to additional information about Atlantic Coast birds, and other important information about your migratory bird list, including how to properly interpret and use your migratory bird report, can be found below.

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, click on the PROBABILITY OF PRESENCE SUMMARY at the top of your list to see when these birds are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON (IF A BREEDING SEASON IS INDICATED FOR A BIRD ON YOUR LIST, THE BIRD MAY BREED IN YOUR PROJECT AREA SOMETIME WITHIN THE TIMEFRAME SPECIFIED, WHICH IS A VERY LIBERAL ESTIMATE OF THE DATES INSIDE WHICH THE BIRD BREEDS ACROSS ITS ENTIRE RANGE. "BREEDS ELSEWHERE" INDICATES THAT THE BIRD DOES NOT LIKELY BREED IN YOUR PROJECT AREA.)
Bald Eagle Haliaeetus leucocephalus This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1626	Breeds Dec 1 to Aug 31
Black-billed Cuckoo Coccyzus erythropthalmus This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9399	Breeds May 15 to Oct 10
Bobolink Dolichonyx oryzivorus This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 20 to Jul 31
Canada Warbler Cardellina canadensis This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 20 to Aug 10
Prairie Warbler Dendroica discolor This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 1 to Jul 31

Snowy Owl *Bubo scandiacus* — Breeds elsewhere

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Wood Thrush *Hylocichla mustelina* — Breeds May 10 to Aug 31

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Probability of Presence Summary

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read and understand the FAQ "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

Probability of Presence (■)

Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. (A year is represented as 12 4-week months.) A taller bar indicates a higher probability of species presence. The survey effort (see below) can be used to establish a level of confidence in the presence score. One can have higher confidence in the presence score if the corresponding survey effort is also high.

How is the probability of presence score calculated? The calculation is done in three steps:

1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.
2. To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is 0.25/0.25 = 1; at week 20 it is 0.05/0.25 = 0.2.
3. The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

To see a bar's probability of presence score, simply hover your mouse cursor over the bar.

Breeding Season (■)

Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

Survey Effort (|)

Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps. The number of surveys is expressed as a range, for example, 33 to 64 surveys.

To see a bar's survey effort range, simply hover your mouse cursor over the bar.

No Data (–)
A week is marked as having no data if there were no survey events for that week.

Survey Timeframe
Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.

Tell me more about conservation measures I can implement to avoid or minimize impacts to migratory birds.

Nationwide Conservation Measures describes measures that can help avoid and minimize impacts to all birds at any location year round. Implementation of these measures is particularly important when birds are most likely to occur in the project area. When birds may be breeding in the area, identifying the locations of any active nests and avoiding their destruction is a very helpful impact minimization measure. To see when birds are most likely to occur and be breeding in your project area, view the Probability of Presence Summary. Additional measures or permits may be advisable depending on the type of activity you are conducting and the type of infrastructure or bird species present on your project site.

What does IPaC use to generate the migratory birds potentially occurring in my specified location?

The Migratory Bird Resource List is comprised of USFWS Birds of Conservation Concern (BCC) and other species that may warrant special attention in your project location.

The migratory bird list generated for your project is derived from data provided by the Avian Knowledge Network (AKN). The AKN data is based on a growing collection of survey, banding, and citizen science datasets and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle (Eagle Act requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the AKN Phenology Tool.

What does IPaC use to generate the probability of presence graphs for the migratory birds potentially occurring in my specified location?

The probability of presence graphs associated with your migratory bird list are based on data provided by the Avian Knowledge Network (AKN). This data is derived from a growing collection of survey, banding, and citizen science datasets .

Probability of presence data is continuously being updated as new and better information becomes available. To learn more about how the probability of presence graphs are produced and how to interpret them, go the Probability of Presence Summary and then click on the "Tell me about these graphs" link.

How do I know if a bird is breeding, wintering, migrating or present year-round in my project area?

To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating or year-round), you may refer to the following resources: The Cornell Lab of Ornithology All About Birds Bird Guide, or (if you are unsuccessful in locating the bird of interest there), the Cornell Lab of Ornithology Neotropical Birds guide. If a bird on your migratory bird species list has a breeding season associated with it, if that bird does occur in your project area, there may be nests present at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

What are the levels of concern for migratory birds?

Migratory birds delivered through IPaC fall into the following distinct categories of concern:

1. "BCC Rangewide" birds are Birds of Conservation Concern (BCC) that are of concern throughout their range anywhere within the USA (including Hawaii, the Pacific Islands, Puerto Rico, and the Virgin Islands);
2. "BCC - BCR" birds are BCCs that are of concern only in particular Bird Conservation Regions (BCRs) in the continental USA; and
3. "Non-BCC - Vulnerable" birds are not BCC species in your project area, but appear on your list either because of the Eagle Act requirements (for eagles) or (for non-eagles) potential susceptibilities in offshore areas from certain types of development or activities (e.g. offshore energy development or longline fishing).

Although it is important to try to avoid and minimize impacts to all birds, efforts should be made, in particular, to avoid and minimize impacts to the birds on this list, especially eagles and BCC species of rangewide concern. For more information on conservation measures you can implement to help avoid and minimize migratory bird impacts and requirements for eagles, please see the FAQs for these topics.

Details about birds that are potentially affected by offshore projects

For additional details about the relative occurrence and abundance of both individual bird species and groups of bird species within your project area off the Atlantic Coast, please visit the Northeast Ocean Data Portal. The Portal also offers data and information about other taxa besides birds that may be helpful to you in your project review. Alternately, you may download the bird model results files underlying the portal maps through the NOAA NCCOS Integrative Statistical Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic Outer Continental Shelf project webpage.

Bird tracking data can also provide additional details about occurrence and habitat use throughout the year, including migration. Models relying on survey data may not include this information. For additional information on marine bird tracking data, see the Diving Bird Study and the nanotag studies or contact Caleb Spiegel or Pam Loring.

What if I have eagles on my list?

If your project has the potential to disturb or kill eagles, you may need to obtain a permit to avoid violating the Eagle Act should such impacts occur.

Proper Interpretation and Use of Your Migratory Bird Report

The migratory bird list generated is not a list of all birds in your project area, only a subset of birds of priority concern. To learn more about how your list is generated, and see options for identifying what other birds may be in your project area, please see the FAQ "What does IPaC use to generate the migratory birds potentially occurring in my specified location". Please be aware this report provides the "probability of presence" of birds within the 10 km grid cell(s) that overlap your project; not your exact project footprint. On the graphs provided, please also look carefully at the survey effort (indicated by the black vertical bar) and for the existence of the "no data" indicator (a red horizontal bar). A high survey effort is the key component. If the survey effort is high, then the probability of presence score can be viewed as more dependable. In contrast, a low survey effort bar or no data bar means a lack of data and, therefore, a lack of certainty about presence of the species. This list is not perfect; it is simply a starting point for identifying what birds of concern have the potential to be in your project area, when they might be there, and if they might be breeding (which means nests might be present). The list helps you know what to look for to confirm presence, and helps guide you in knowing when to implement conservation measures to avoid or minimize potential impacts from your project activities, should presence be confirmed. To learn more about conservation measures, visit the FAQ "Tell me about conservation measures I can implement to avoid or minimize impacts to migratory birds" at the bottom of your migratory bird trust resources page.

Facilities

National Wildlife Refuge lands

Any activity proposed on lands managed by the National Wildlife Refuge system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

THERE ARE NO REFUGE LANDS AT THIS LOCATION.

Fish hatcheries

THERE ARE NO FISH HATCHERIES AT THIS LOCATION.

Wetlands in the National Wetlands Inventory

Impacts to NWI wetlands and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local U.S. Army Corps of Engineers District.

Please note that the NWI data being shown may be out of date. We are currently working to update our NWI data set. We recommend you verify these results with a site visit to determine the actual extent of wetlands on site.

This location overlaps the following wetlands:

FRESHWATER EMERGENT WETLAND
- PEM1Ed

FRESHWATER FORESTED/SHRUB WETLAND
- PFO1E

LAKE
- L1UBHh

A full description for each wetland code can be found at the National Wetlands Inventory website

Data limitations

The Service's objective of mapping wetlands and deepwater habitats is to produce reconnaissance level information on the location, type and size of these resources. The maps are prepared from the analysis of high altitude imagery. Wetlands are identified based on vegetation, visible hydrology and geography. A margin of error is inherent in the use of imagery; thus, detailed on-the-ground inspection of any particular site may result in revision of the wetland boundaries or classification established through image analysis.

The accuracy of image interpretation depends on the quality of the imagery, the experience of the image analysts, the amount and quality of the collateral data and the amount of ground truth verification work conducted. Metadata should be consulted to determine the date of the source imagery used and any mapping problems.

Wetlands or other mapped features may have changed since the date of the imagery or field work. There may be occasional differences in polygon boundaries or classifications between the information depicted on the map and the actual conditions on site.

Data exclusions

Certain wetland habitats are excluded from the National mapping program because of the limitations of aerial imagery as the primary data source used to detect wetlands. These habitats include seagrasses or submerged aquatic vegetation that are found in the intertidal and subtidal zones of estuaries and nearshore coastal waters. Some deepwater reef communities (coral or tuberficid worm reefs) have also been excluded from the inventory. These habitats, because of their depth, go undetected by aerial imagery.

Data precautions

Federal, state, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner than that used in this inventory. There is no attempt, in either the design or products of this inventory, to define the limits of proprietary jurisdiction of any Federal, state, or local government or to establish the geographical scope of the regulatory programs of government agencies. Persons intending to engage in activities involving modifications within or adjacent to wetland areas should seek the advice of appropriate federal, state, or local agencies concerning specified agency regulatory programs and proprietary jurisdictions that may affect such activities.

SPECIAL FLOOD HAZARD AREA

ZONE C

ZONE A

ZONE C

Base Flood Elevation Line With Elevation In Feet**	513
Base Flood Elevation in Feet Where Uniform Within Zone**	(EL 987)
Elevation Reference Mark	RM7 ×
River Mile	• M1.5

**Referenced to the National Geodetic Vertical Datum of 1929

*EXPLANATION OF ZONE DESIGNATIONS

ZONE	EXPLANATION
A	Areas of 100-year flood; base flood elevations and flood hazard factors not determined.
A0	Areas of 100-year shallow flooding where depths are between one (1) and three (3) feet; average depths of inundation are shown, but no flood hazard factors are determined.
AH	Areas of 100-year shallow flooding where depths are between one (1) and three (3) feet; base flood elevations are shown, but no flood hazard factors are determined.
A1-A30	Areas of 100-year flood; base flood elevations and flood hazard factors determined.
A99	Areas of 100-year flood to be protected by flood protection system under construction; base flood elevations and flood hazard factors not determined.
B	Areas between limits of the 100-year flood and 500-year flood; or certain areas subject to 100-year flooding with average depths less than one (1) foot or where the contributing drainage area is less than one square mile; or areas protected by levees from the base flood.
C	Areas of minimal flooding.
D	Areas of undetermined, but possible, flood hazards.
V	Areas of 100-year coastal flood with velocity (wave action); base flood elevations and flood hazard factors not determined.
V1-V30	Areas of 100-year coastal flood with velocity (wave action); base flood elevations and flood hazard factors determined.

NOTES TO USER

Certain areas not in the special flood hazard areas (zones A and V) may be protected by flood control structures.

This map is for flood insurance purposes only; it does not necessarily show all areas subject to flooding in the community or all planimetric features outside special flood hazard areas.

INITIAL IDENTIFICATION
NOVEMBER 1, 1974

FLOOD HAZARD BOUNDARY MAP REVISIONS:
5-28-76

FLOOD INSURANCE RATE MAP EFFECTIVE:
SEPTEMBER 7, 1979

FLOOD INSURANCE RATE MAP REVISIONS:

Refer to the FLOOD INSURANCE RATE MAP EFFECTIVE date shown on this map to determine when actual rates apply to structures in the zones where elevations or depths have been established.

To determine if flood insurance is available in this community, contact your insurance agent, or call the National Flood Insurance Program, at (800) 638-6620, or (800) 424-8872.

APPROXIMATE SCALE IN FEET
800 0 800

NATIONAL FLOOD INSURANCE PROGRAM

FIRM
FLOOD INSURANCE RATE MAP

TOWN OF
KINGSBURY, NEW YORK
WASHINGTON COUNTY

PANEL 4 OF 4
(SEE MAP INDEX FOR PANELS NOT PRINTED)

COMMUNITY-PANEL NUMBER:
361235 0004 B

EFFECTIVE DATE:
SEPTEMBER 7, 1979

Appendix D – Site Visit Photos

Photo 1 – South side Bridge Approach, looking north toward bridge

Photo 2 – North side Bridge Approach, looking south toward bridge

Photo 3 – East side Elevation of Bridge, looking west from southeast side

Photo 4 – North Abutment, looking north from south end underside of bridge

Photo 5 – South Abutment, looking south from underside of bridge

Photo 6 – Feeder Canal, looking west from bridge

Photo 7 – Feeder Canal downstream from bridge, looking east

Photo 8 – Canal Spillway/Dam structure downstream of bridge, looking north

B.11 GREENMAN-PEDERSEN INDUSTRIAL ACCESS ROAD TRAFFIC ASSESSMENT

GPI Greenman-Pedersen, Inc.
Engineering and Construction Services

Offices Throughout the United States

March 18, 2016

Mr. Robert Manz
C/O D.A. Collins
269 Ballard Road
Wilton, NY 12931

Re: Traffic Assessment; Industrial Access Road
Ft. Edward, Washington County, New York
GPI Project Number – ALB-2016041.00

Dear Mr. Manz:

As requested, Greenman-Pedersen, Inc. (GPI) has reviewed the traffic conditions at the location of the "neck-down" along the industrial site access road (also known as Lock 8 Way) leading to the former GE dewatering facility in Ft. Edward New York. The purpose of this review is to estimate the functional capacity of this critical roadway segment as it relates to future industrial development at the vacated site, and to quantify the level of development that could be accommodated on-site withhout exceeding the estimated traffic carrying capacity. Based on our analysis we offer the following findings:

1. The estimated peak hour design capacity of the critical road segment ranges from 250 to 465 vehicles per hour.
2. The estimated daily design capacity of the critical road segment is 8,600 vehicles per day.
3. The critical road segment could support approximately 250,000 square feet of industrial space without exceeing the calculated functional capacity of the critical road segment of the industrial site access road (Lock 8 Way).

The following is a summary of the analyses that support these findings.

Existing Conditions

Lock 8 Way is a two mile long access road connecting the former GE dewatering facility to NY Route 196 in Ft. Edward. The posted speed limit along the roadway is 25 mph. The road consists of one 12 foot lane in both the northbound and southbound directions, except for the "neck-down" location pictured above. This location constricts to just a single lane in this area to avoid conflicts with a large culvert that has historical significance. This narrowing to a single-lane requires vehicles to travel approximately 210 feet within a conflict zone before clearing back to two-lane operations. The northbound direction consists of free-flow traffic and is not delayed, but the southbound direction is controlled by a stop sign and vehicles on that approach must stop and ensure adequate clearance is available before entering the conflict zone.

Definition of Functional Capacity

When determining the capacity of the critical roadway segment, two different thresholds could be considered. The "Maximum Capacity", which is the maximum number of vehicles that could move through the conflict zone within an hour regardless of wait time per vehicle, and the "Functional Capacity", which is the number of vehicles that could move while still providing a reasonable level of service and delay. Level of service (LOS) is defined in the *Highway Capacity Manual* (HCM), 2010 published by the Transportation Research Board (TRB) as a way to quantify traffic operating conditions. In general, LOS A represents the best operating condition with unrestricted flow and little or no delay per vehicle, and LOS F represents the worst, with congested conditions, long delays and poor traffic operations. LOS C or better is generally desirable, but LOS D is commonly acceptable during peak periods. As such, the threshold between LOS D and LOS E provides the estimation of Functional Capacity as traffic flows over this threshold may cause drivers to become impatient and accept traffic gaps that are shorter than necessary to safely maneuver through the conflict zone.

Time Gap Required to Clear the Conflict Zone

Two methods were reviewed to determine the time gap necessary to clear the conflict zone, the first is based on Intersection Sight Distance (ISD) methodologies found in *A Policy on Geometric Design of Highways and Streets*, 2011, published by AASHTO (also known as the AASHTO Green Book). The second is based on the methodology presented in *NCHRP Report 505: Review of Truck Characteristics as Factors in Roadway Design*. In both cases, because of the high percentage of truck expected for the site, the time gap requirements were calculated for tractor trailer movements instead of just passenger cars. This provides the most conservative estimate for safety purposes.

Based on the AASHTO publication for a left turn movement from a side street, which is a similar situation operationally to the neck-down condition, the time gap necessary for a combination truck movement at an intersection is 11.7 seconds, with the caveat that for every additional lane a left turn vehicle must cross, an additional 0.7 seconds should be added. For the length necessary to traverse the conflict zone, it was determined that would be equivalent to an additional 17 lanes. Applying this modifier, the time gap required for this location is 23.4 seconds using this methodology.

Using the NCHRP Report 505 publication, which contains equations and table defining heavy truck acceleration characteristics. Equation 10 of that publication shows that the time required to clear a particular length zone is 0.682 x (the length of zone + length of vehicle) all divided by the maximum speed in the gear selected by the driver plus 3 seconds. Additionally Table 27 of that publication defines that speed as 8 mph for percent grades up to 2%. Applying equation 10 to the 210 foot conflict zone assuming a WB-67 tractor trailer, the resulting necessary time gap using this methodology is 27.2 seconds.

To be conservative, the longest calculated time gap, 27.2 seconds, will be used in the sight distance and capacity calculations for the remainder of the assessment.

Required Sight Distance

For vehicles on the southbound stop controlled approach to safety traverse the conflict zone there must be adequate sight distance to identify the appropriate gaps in traffic. As discussed above, the time gap necessary for a tractor trailer to make this movement is 27.2 seconds. Using the Intersection sight distance formula found in the AASHTO Green Book with that time gap and assuming a 25 mph operating speed, the necessary amount of sight distance required to identify an appropriate gap and move through the conflict zone is 1,000 feet. Based on a review of sight lines from Google Earth Pro, it is estimated that more than 1,100 feet of sight distance is available at the southbound stop bar location. This is more than sufficient for acceptable operations.

Roadway Capacity

The Roadway Capacity for the industrial site access road is limited by the Functional Capacity of the conflict zone area, which is the focus of this assessment. To determine capacity of this area, a modified HCM 2010 Stop Controlled Facility analysis was performed. For this analysis, all southbound vehicles were treated as westbound left turn vehicles, and the critical gap factor used in the analysis for determining traffic gaps of sufficient length to make a movement was changed to the 27.2 seconds discussed previously. As there is no published methodology to analyze the specific condition that exists on the critical roadway segment, we feel this methodology provides a reasonable approximation of traffic operations, especially considering the conservative approach taken in calculating the required time gap and because the analysis performed assumed 100% truck traffic, which is higher than what would normally be expected on the roadway, even for an industrial site.

For this analysis to appropriately model conditions for the new industrial site, the directional distribution (percentage inbound versus outbound) must first be estimated. As such, the *Trip Generation Manual*, 9th edition was reviewed for Land Use Code (LUC) 110 – General Light Industrial. The data in this publication revealed that an industrial site should expect a "90% entering/10% exiting" distribution in the AM peak hour for site traffic, and a "14% entering/86% exiting" in the PM peak hour. Splitting traffic volumes by those percentages and applying those volumes to the traffic model using an iterative method, the Functional Capacity of the roadway was determined for the AM and PM peak hours. The final capacity analysis worksheets for each of the peak hours is attached. Based on the analysis the Functional Capacity of the roadway is 465 vehicles in the AM peak hour and 250 vehicles in the PM peak hour. Using an average of these two analyzed hours (357.5) and applying that to a 24 hour period equates to an estimated daily capacity of this critical road segment of approximately 8,600 vehicles per day.

GPI

Site Development

Knowing the Functional Capacity of the roadway, trip generation data for LUC 110 – Light Industrial was reviewed to determine the estimated square footage hat could be supported by the roadway in its current configuration. For this determination, the more restrictive of the two peak hours (250 PM peak hour trips) was used as a base. At a trip generation rate of 0.97 trips per 1,000 square foot of light industrial space, it is calculated that the roadway has sufficient capacity to support 250,000 of light industrial space. A development of this size, in addition to generating 250 PM peak hour trips, would also generate, 230 AM peak hour trips and approximately 1,740 daily trips.

Conclusion

The analysis performed indicates that there is enough Functional Capacity to support approximately 250,000 square feet of industrial development on this site before exceeding the calculated functional capacity of the critical road segment of the industrial site access road (Lock 8 Way).

If you have any questions or require additional information, please let us know.

Sincerely,

GPI/Greenman-Pedersen, Inc.

Michael R. Wieszchowski, P.E., PTOE
Senior Traffic Engineer

Peter Faith, P.E.
Assistant Vice President

Enc.

```
                      HCS+: Unsignalized Intersections Release 5.6

_______________________TWO-WAY STOP CONTROL SUMMARY___________________________

Analyst:              GPI
Agency/Co.:
Date Performed:       3/16/2016
Analysis Time Period: PM Capacity Test 14%in/86%out
Intersection:         Industrial Access Neckdown
Jurisdiction:
Units: U. S. Customary
Analysis Year:        2016
Project ID:  Fort Edward Industrial Site
East/West Street:     Industrial Access Road
North/South Street:   Stop Control Approach
Intersection Orientation: NS                 Study period (hrs):  0.25

______________________Vehicle Volumes and Adjustments_________________________
Major Street:  Approach        Northbound              Southbound
               Movement     1      2      3      |  4      5      6
                            L      T      R      |  L      T      R
______________________________________________________________________________
Volume                             215
Peak-Hour Factor, PHF              1.00
Hourly Flow Rate, HFR              215
Percent Heavy Vehicles             --     --                 --     --
Median Type/Storage         Undivided            /
RT Channelized?
Lanes                              1
Configuration                      T
Upstream Signal?                   No                       No
______________________________________________________________________________
Minor Street:  Approach        Westbound               Eastbound
               Movement     7      8      9      |  10     11     12
                            L      T      R      |  L      T      R
______________________________________________________________________________
Volume                      35
Peak Hour Factor, PHF       1.00
Hourly Flow Rate, HFR       35
Percent Heavy Vehicles      100
Percent Grade (%)                  0                        0
Flared Approach:  Exists?/Storage               /                      /
Lanes                         1
Configuration                  L
______________________________________________________________________________

__________________Delay, Queue Length, and Level of Service___________________
Approach            NB     SB           Westbound             Eastbound
Movement            1      4    |  7      8      9     |  10     11     12
Lane Config                     |  L                   |
______________________________________________________________________________
v (vph)                            35
C(m) (vph)                         164
v/c                                0.21
95% queue length                   0.78
Control Delay                      32.8
LOS                                 D
Approach Delay                            32.8
Approach LOS                               D
______________________________________________________________________________
```

Critical Gap Calculation

Movement		1	4	7	8	9	10	11	12
		L	L	L	T	R	L	T	R
t(c,base)				9.0*					
t(c,hv)		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)				100					
t(c,g)				0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade				0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)				0.70					
t(c,T):	1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c)	1-stage			27.2*					
	2-stage								

Follow-Up Time Calculations

Movement	1	4	7	8	9	10	11	12
	L	L	L	T	R	L	T	R
t(f,base)			4.00*					
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)			100					
t(f)			5.0*					

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: GPI
Agency/Co.:
Date Performed: 3/16/2016
Analysis Time Period: AM Capacity Test 90%in/10%out
Intersection: Industrial Access Neckdown
Jurisdiction:
Units: U. S. Customary
Analysis Year: 2016
Project ID: Fort Edward Industrial Site
East/West Street: Industrial Access Road
North/South Street: Stop Control Approach
Intersection Orientation: NS Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1 L	2 T	3 R	4 L	5 T	6 R
Volume		47				
Peak-Hour Factor, PHF		1.00				
Hourly Flow Rate, HFR		47				
Percent Heavy Vehicles		--	--		--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes		1				
Configuration		T				
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume	418					
Peak Hour Factor, PHF	1.00					
Hourly Flow Rate, HFR	418					
Percent Heavy Vehicles	100					
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/			/
Lanes	1					
Configuration	L					

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config			L					
v (vph)			418					
C(m) (vph)			521					
v/c			0.80					
95% queue length			7.64					
Control Delay			34.3					
LOS			D					
Approach Delay				34.3				
Approach LOS				D				

Critical Gap Calculation

Movement		1	4	7	8	9	10	11	12
		L	L	L	T	R	L	T	R
t(c,base)				9.0*					
t(c,hv)		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)				100					
t(c,g)				0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade				0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)				0.70					
t(c,T):	1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c)	1-stage			27.2*					
	2-stage								

Follow-Up Time Calculations

Movement	1	4	7	8	9	10	11	12
	L	L	L	T	R	L	T	R
t(f,base)			4.00*					
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)			100					
t(f)			5.0*					

B.12 BRIDGENY GRANT APPLICATION

BridgeNY 2021 Program Application

Consult the BridgeNY Notice of Funding Availability to review the specific eligibility requirements prior to beginning the application.

Application Information

The application is to apply for one bridge project or one culvert project under the BridgeNY Program funding.

To use the Adobe Livecycle form, save a copy of the form to your computer. From your computer, open the saved form to start entering the requested information.

Web browsers such as Apple Safari, Google Chrome, and Mozilla may have their own non-Adobe PDF readers set as the default reader. If using one of these browsers, ensure that the default PDF viewer is changed to Adobe Reader. If Internet Explorer is used as the browser, typically no further action is needed. Applicants can use the latest version of the free Adobe Acrobat Reader to complete the form. The latest versions Adobe Acrobat Standard, Pro or DC can be used to maximize the functionality in the form.

Unless otherwise indicated, use the "Tab" function to navigate through the form to ensure questions are answered in the correct order. Applicants should complete all fields as they appear in the application.

Required fields are designated by a preceding asterisk (*).

General Instructions for Completing the Application

PART A: Project Sponsor Information

Enter the Project Sponsor Information in the designated boxes. If the project sponsor does not already have a NYS Grants Gateway ID, one can be obtained at https://grantsmanagement.ny.gov/register-your-organization

PART B: Application Type

Choose whether this application is going to be for a bridge project or a culvert project. The appropriate fields will remain visible in the application depending on the type chosen. Example: For a bridge project, the bridge only fields remain visible and the culvert only fields become invisible.

PART C: Project Estimate

Enter the estimated costs for each of the following project costs: construction, construction inspection, right of way acquisition, and design. Enter the amount of any other funds you have already secured for this project.

A table of suggested values based on a percentage of construction costs is shown for reference to the applicants. The Sponsor is responsible for all costs input into the application. There are situations where costs may be more or less than the ranges given in the table.

PART D: Existing Structure Information

For a bridge application, enter the fields that are visible under Existing Bridge Information. Download the Existing Bridge Information Worksheet (ExistingBridgeInfo2019Data.xlsx) from https://www.dot.ny.gov/bridgeny to obtain information on the bridge you are applying for. A copy of this information should be attached in PART G of the application. This information will be used by reviewers during the project evaluation process.

For a culvert application, enter the fields that are visible under Existing Culvert Information.

Save Form

PART E: Project Needs

Enter the appropriate information regarding the project needs, scope and special features. Note that the space is limited to the visible area for text fields.

PART F: Project Delivery

Enter the information pertaining to the delivery of the project, including design status and any right of way needs.

PART G: Project Attachments

Attach appropriate documents to the application. Listed attachments preceded by an asterisk are required (*). All other attachments listed allow the applicant to better describe the need for the project.

Project draft applications (bridge or culvert) that have had a coordinated pre-review with NYSDOT prior to final submission will receive additional weight during the scoring process. To show that the pre-review was completed, the pre-review comment form needs to be attached to the application for the final submission. This comment form will be provided to the applicant after the pre-review.

Applications for bridge projects that have had a NYS PE review along with a letter certifying the review of the application will receive additional weight during the scoring process. To show that the application has been reviewed by a NYS PE, a letter stating such needs to be attached to the application for the final submission. This letter needs to contain the signature of the NYS PE.

Project attachments are not limited to those listed in the application. The applicant may attach other files to the email being submitted with the application itself.

PART H: Application Submission

A digital signature or a wet signature is required to complete the application. If you do not have a digital ID already created, follow the directions that show up when you click on signature. If you cannot create a digital signature, include a scan of the final page of the application with a wet signature with your submission.

Once the form is signed the application may be submitted. Press the "Submit BridgeNY Application to NYSDOT" button to create a new email with BridgeNY@dot.ny.gov as the to address and the application already attached. The applicant can also create an email outside of the application and attach it to the email. Any additional attachments can be added at this point. To facilitate the application submission, zip any large files prior to attaching them, as the limit on overall file size is approximately 20MB. Completed applications and any required information described above, must be submitted no later the deadline posted to the BridgeNY website:

https://www.dot.ny.gov/bridgeny

Submit all applications to: BridgeNY@dot.ny.gov

Pre-Review Submission

A coordinated pre-review of each draft application by NYSDOT is recommended. The draft applications must be submitted no later than the deadline posted on the BridgeNY website: ***https://www.dot.ny.gov/bridgeny***

Pre-review submissions must be emailed to BridgeNY@dot.ny.gov. Parts A thru G should be completed and submitted for the pre-review. A signature is not required for the pre-review submission. At the end of the pre-review you will receive a filled-out comment form pertaining to the draft application. Addressing these comments in the final application will provide a better submission for reviewers.

If the Sponsor elects to have NYSDOT design and let a culvert project, then the sponsor is required to submit the draft application for pre-review. Questions regarding applications may be directed to: BridgeNY@dot.ny.gov

Save Form

NEW YORK STATE OF OPPORTUNITY. | Department of Transportation

BridgeNY 2021 Program Application

PART A: SPONSOR INFORMATION

Applicants must complete all required fields as they appear in the application. Required fields are designated by a preceding asterisk (*).

*Project Sponsor: Warren and Washington IDA

*NYS GRANTS GATEWAY ID: (click link on Page 1 for more info) GDV-DOT-14244

SPONSOR RESPONSIBLE POINT OF CONTACT INFORMATION:

Salutation: Mr. *First Name: David *Last Name: O'Brien

*Title:

*Address: 1 5 Warren Street

Address 2:

*City: Glens Falls *State: NY *Zip Code: 12801

*Phone #: 518-792-1312 *E-mail: dobrien@washingtoncountyny.gov

☒ Check here if Business address and Contact address are the same. If not, please provide the Business address below:

PART B: APPLICATION TYPE

*Application Type: Bridge *Region: 1

Choose bridge or culvert for application type. Select the NYSDOT Region the project is in.

A bridge application is required if the span length is greater than or equal to 20 ft. A culvert application is required if the span length is less than 20 ft. Use the span length of the existing structure, not the span length of the proposed structure.

Save Form

PART C: PROJECT ESTIMATE

Input values for the following project costs. A detailed project estimate should be attached in PART G of the application.

Description	Costs
Construction	$1,431,000
Field Change Payment, 5% and Mobilization, 4%	$128,790
Construction Inspection	$292,000
Right of Way *	$0
Design (Preliminary & Final) **	$350,000
Total Project Cost	$2,201,790

*Right of Way costs include the cost for hiring a firm to process the ROW and the cost of the acquisition itself. The cost of hiring a firm may be as much as $30,000.

**Design Costs shall include but are not limited to preliminary and final design, survey, geotechnical exploration/borings, mussel or other endangered species coordination and field work, wetland delineation, and utility coordination

***For Culvert projects a minimum Design (Preliminary & Final) cost is recommended as $150,000 - upstate, $180,000 downstate.

Other Funds Already Secured (This is not the Local Match. Local Match is calculated below)	$0

Description of Other Funds:

Bridge Projects

Total BridgeNY Funds Requested (95%)	$2,091,701
Total Local Match (5%)	$110,090

Suggested values for Design, Right of Way, and Construction Inspection costs are provided as a percentage of the total construction cost. These values are provided for reference only. The Sponsor is responsible for all costs input into the application.

	Low Range (% of Const. Cost)	High Range (% of Const. Cost)	Calculated Low Value (from user input)	User Input Value (repeated from above)	Calculated High Value (from user input)
Construction Inspection	12%	15%	$187,175	$292,000	$233,969
Right of Way	0%	5%	$0	$0	$77,990
Design (Preliminary & Final)***	20%	30%	$311,958	$350,000	$467,937

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BridgeNY 2021 Program Application

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PART D: EXISTING STRUCTURE INFORMATION

Input the following information. If a bridge application was chosen in Part B, only the bridge fields will be visible. If a culvert application was chosen in Part B, then only culvert fields will be visible.

Existing Bridge Information

*Bridge Identification Number (BIN) 5525300

Project Identification Number (PIN) (Input PIN number if applicable)

☒ Check the box if the bridge is owned by the sponsor applying for funds.

☐ Check the box after you download the Existing Bridge Information Worksheet (ExistingBridgeInfo.xlsx) from ***https://www.dot.ny.gov/bridgeny*** to obtain information on the bridge you are applying for. A copy of this information should be attached in PART G of the application.

Save Form

PART E: PROJECT NEEDS

*This project is needed to address the following (check all that apply)

- [x] Structural Condition
- [ ] Inadequate Structural Capacity/Load Rating
- [ ] Hydraulic Inadequacies
- [ ] Inadequate Vertical Clearance (under or over)
- [x] Other

If other, provide explanation. Space limited to visible field.

A temporary Mabey Bridge was installed in 2009, but the bridge is now intended to be permanent and the life span of the superstructure is not adequate and is anticipated to require replacement within 5 years. The current bridge is not properly rated for the industrial use.

***Project Scope** Superstructure Replacement

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BridgeNY 2021 Program Application

Describe the project/infrastructure need. Space is limited to the visible area.

*Project Needs Description:

The existing bridge crossing on Lock 8 Way is the only access point to the 80 acre industrial park in the town of Fort Edward, NY known as Canalside Energy Park. The existing superstructure is a Mabey bridge that was placed in 2009 as a temporary crossing to allow for the dredging operations that commenced from 2009-2015. Since that time, the area has been available as an industrial park, with the goal of bringing business to the Fort Edward area which is a designated Opportunity Zone. The industrial park has access to a wharf on the Champlain Canal and the railroad, one of only 3 locations with this type of access in the state. Providing a permanent structure along Lock 8 Way to access this site will allow economic development at this location.

Describe the project Scope. Space is limited to the visible area.

*Project Scope Description:

The project will include a full superstructure replacement with approach slabs and includes an increased profile to allow a standard bridge crossing without sacrificing the hydraulic opening. The proposed structure is a steel multi-girder structure with HP concrete composite deck. The span will match existing at approximately 96 ft and the out to out width is proposed at 33'-4" per the standard criteria from the NYSDOT Highway Design Manual. A hydraulic analysis will be performed to ensure that the proposed superstructure is designed to current hydraulic standards. The existing substructures have been evaluated for the proposed superstructure replacement to ensure they meet all current NYSDOT and AASHTO requirements. Some substructure work is anticipated to raise wingwall height, prepare the backwall for a jointless configuration, and incorporate pedestals for the proposed steel multi-girder structure. No in water work is anticipated at this time. Traffic will be maintained using an off site detour as shown in the attached WZTC plan.

Describe the project's special features. Space is limited to the visible area.

Project Special Features Description:

The project is located fully on Warren Washington County IDA property and will therefore not require any right-of-way acquisitions. The superstructure replacement proposed will have minimal environmental impacts and require little to no in water work. Replacing this critical piece of infrastructure will allow for the Canalside Energy Park to be developed to its full capacity as the current bridge is not intended for long duration industrial use. The Park is located in a designated Opportunity Zone (NY Tract 0880.00), which is a low income census tract with an individual poverty rate of at least 20 percent and a median family income no greater than 80 percent of the area median. Replacing the superstructure to a standard bridge design allows the park to be developed and bring substantial economic development to this area.

This bridge was just assigned a BIN number and no existing worksheet is available.

PART F: PROJECT DELIVERY

* Indicate the current project status: Planning Stage

*Estimated Month and Year of Letting: May 2023

Project Priority: 1 (Input project priority with respect to other BridgeNY applications by the same sponsor, if applicable)

Save Form

BridgeNY 2021 Program Application

*Number of anticipated ROW acquisitions: 0

Additional ROW information can be included as an attachment if the provided space is inadequate. See Notice of Funding Availability for ROW requirements.

Identify the property right(s) to be acquired and proof of right of way ownership: Ownership can be shown through surveys and clearance certificates, highway boundary line on a stamped plan, or record plans. Tax maps are not sufficient documentation.

Survey is attached that shows Warren Washington IDA owns all surrounding properties.

*Will the project have an effect on any district, site, building, structure or object that is listed, or may be eligible for listing on the National Register of Historic Places? No

*STATUS OF ENVIRONMENTAL REVIEWS:

State Environmental Quality Review Act (SEQR): Not Started

Explain: The project is anticipated as a SEQR Type II Action however, preliminary design has not started.

National Environmental Policy Act (NEPA): Not Started

Explain: The project is anticipated as a NEPA Class II Categorical Exclusion however, preliminary design has not started.

*In the Chart below, select the status that best represents the project deliverable:

Project Deliverables:	**Status**	**Anticipated Completion Date**
Design Report	Not Started	August 2022
Advanced Detail Plans (ADPs)	Not Started	December 2022
Plans, Specifications, and Estimates (PS&Es)	Not Started	February 2023
Bid Proposal Documents	Not Started	March 2023

Additional Information regarding Project Delivery (if applicable)

There is little to no anticipated delivery risk for this superstructure replacement. There are no ROW, environmental or historic concerns at this location and there are no railroad or utilities present within the limits of the bridge project. Environmental documentation has been attached.

Save Form

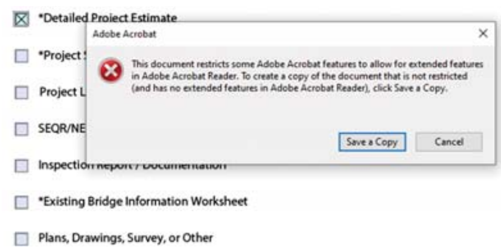
BridgeNY 2021 Program Application

New York State of Opportunity | Department of Transportation

PART G: ATTACHMENTS

Attach the following documents to the application:

NOTE - if you are using the free version of Adobe Reader you will not be able to attach documents to the application. If using the free version of Adobe Reader attach the following documents to the e-mail when submitting the application. If you are using a paid version of Adobe software save a copy of the form to your computer then open the saved form to be able to attach documents.



- [x] *Detailed Project Estimate
- [x] *Project Schedule
- [x] Project Location Map
- [ ] SEQR/NEPA Information
- [x] Inspection Report / Documentation
- [ ] *Existing Bridge Information Worksheet
- [x] Plans, Drawings, Survey, or Other
- [x] Letter certifying that a Quality Assurance review by a NYS Professional Engineer has been completed, including signature. (See Instructions on page 2 under Part G Project attachments)
- [x] Pre-Review Comment form. Provided to applicants that submitted a draft application for a pre-review. Sponsors are required to submit a draft application for pre-review for all culvert projects being designed by NYSDOT.
- [ ] Property rights to be acquired along with Sponsor's certification to undertake the property.
- [ ] Preliminary Hydraulic Analysis
- [x] Any other relevant documentation.
- [x] Any other relevant documentation.
- [x] Any other relevant documentation.
- [x] Any other relevant documentation.
- [ ] Any other relevant documentation.

Any additional attachments may be attached to the e-mail prior to submission.

Save Form

BridgeNY 2021 Program Application

NEW YORK STATE OF OPPORTUNITY. | Department of Transportation

PART H: APPLICATION SUBMISSION

***CERTIFICATION:**

I acknowledge that I have read the appropriate guidance for the program to which I am applying (BridgeNY) and understand the application instructions, the program requirements and the terms and conditions associated with the reimbursement program.

☒ Check this box if you have submitted a draft application for pre-review as described in the instructions on page 2 and have attached the comment sheet as an attachment to the application.

☒ Check this box if you have attached a signed certification letter from a NYS Professional Engineer stating they have reviewed the application. (Bridge projects only)

***ATTESTATION:**

By entering my name in the digital signature space below, I certify that I am authorized on behalf of the Sponsor and its governing body to submit this application. I further certify that all of the information contained in this application and in all statements, data and supporting documents which have been made or furnished for the purpose of receiving assistance for the project described in this application are true, correct and complete to the best of my knowledge and belief. I acknowledge that offering a written instrument knowing that the written instrument contains a false statement or false information, with the intent to defraud the State or any political subdivision, public authority, or public benefit corporation of the State, with the knowledge or belief that it will be filed with or recorded by the State or any political subdivision, public authority or public benefit corporation of the State, constitutes a crime under New York State Law.

DIGITAL SIGNATURE INFORMATION:

Entering your digital signature in the box below locks the fields above the signature. To remove your digital signature, click the right button on your mouse and select "Clear Signature" to release the fields. You can then correct any errors or add additional information. The document will need to be re-signed before it can be submitted.

If you cannot create a digital signature, include a scan of the final page of the application with a wet signature with your submission.

Signature:

Prior to submitting applications please rename the file as follows:

File Name for Bridge Application: B-R1-Warren and Washington IDA-5525300.pdf

Submit BridgeNY Application to NYSDOT
(BridgeNY@dot.ny.gov)
Application form and supporting documents must be received by the deadline posted on the BridgeNY website:
https://www.dot.ny.gov/bridgeny

Materials received after the application deadline will not be considered

Print Completed Application for Your Records

Save Form

APPENDIX C

Opportunity Analysis and Conclusion

C.1 OPPORTUNITY MATRIX

Canalside Energy Park Opportunity Matrix

					TRANSPORT UTILIZATION			NEEDED RESOURCES/UPGRADES						VALUE		
	Market Opportunity	Description	Requirements	Horizon 1 = Long Term (6+ Years) / 2 = Medium Term (3-5 years) / 3 = Short Term (1-3 years)	Highway Ranked 5 for high utilization, and 1 for low utilization	Rail	Canal (seasonal)	Water Ranking, with 10 reflecting the LOWEST capital cost.	Stormwater	Wastewater	Electrical	Subdivision Ranking, with 5 LEAST likely to be subdivided	Permitting Ranking, with 5 MOST likely to be permitted	Short Term Revenue Ranking, with 10 offering immediate payment	Long Term Revenue Ranking, with 10 offering the most stable long term revenue	Tax Liability Ranking, with 5 offering the highest reduction in tax liability
Green Energy	**Rewable Energy / Solar Production**	Solar array as a main or ancillary source of revenue	Identify Developer / Operator / Utility	3	0	0	0	10	10	10	5	1	5	10	10	5
	Renewable Energy / Biomass Energy Production	Generate X Megawatts	Identify Developer/Operator/Utility	3	0	0	0	3	3	3	3	2	5	6	8	2
	Industrial Waste Processing, Conversion and/or Disposal	Processing of wastewater, solid wastes, or biomass wastes (whey, starch) for conversion to other use	Space, proximity to Clients or a farming co-op that would utilize facility	3	5	3	0	4	7	8	9	2	3	6		3
	Composting - (yard, food, paper product, mortalities)	Processing waste for residential, commercial, government, private, and institutional users	Identify Developer/Operator/Utility	3	5	3	0	7	7	8	9	2	5	8		2
Food Production/Processing	**Food Processing**	Conversion of raw food into food products	Skilled and unskilled workers	2	5	3	3	10	8	3	5	2	5	5	5	3
	Cannabis Processing	Preparation of marijuana or its byproducts for commercial retail and/or wholesale.	Skilled and unskilled workers	2	5	0	0	10	10	10	8	3	1	5	8	4
	Aquaculture	The rearing of aquatic animals or the cultivation of aquatic plants for food.	Fishery (permitting based on fish type)	3	5	0	3	10	10	10	10	3	3	10		3
Manufacture	**Organic Material Processing (wood pulp, wood pellets, etc.)**	Supporting paper industry, possible connection with lumber mills or lumber from Canada	Low-cost methods for shipping materials, connection to paper manufacturers	2	5	3	0	3	10	8	5	2	3	4		4
	Manufacturing for renewable energy (i.e. for Offshore Wind Components)	Supplier base to support regional manufacturing (gears, insulators, etc. for turbines)	Fill a need for early step manufacturing or assembly, transit routes to Port of Albany	3	5	3	0	5	3	3	3	2	5	6	5	2
	Medical Device Manufacturing	Smaller, innovative companies supporting existing medical device industry cluster.	Skilled workers, clean lab/rooms, start-up capital, niche in the market	1	5	3	0	3	10	5	3	3	5	1		1
Innovation / Skills	**Agricultural Technology/Accelerator**	Supporting plant-tech companies, digital companies, and research institutions supporting ag innovation	Public-Private Partnerships/Universities/Research Institutions	2	5	0	0	4	8	5	5	3	5	5	5	3
	Hospitality Training	Builds off SUNY Adirondack programs and supports tourism and hospitality industry of entire region.	Educational/Administrative Agency	1	5	0	0	3	10	3	7	2	3	1		2
Transfer / Storage	**Warehouse/Storage**	Builds off current demands for storage and warehousing industry with boom of online retailing, ecommerce, logistics and shipping, and cold storage.	Space, low and high skill workers, easy trucking routes	3	5	5	3	7	10	5	6	2	5	7		3
	Transit Railyard	Transfer yard, storage location, short line rail potential		1	3	5	3	8	10	8	8	2	5	8		3

10 - Immediate Payme	10 - Stable Long Term	1
1 Long Term	- Unstable Long Term	

CO-BENEFITS			BUY-IN						
Co-Location	Regional Partnerships	Job Creation	Community/ Media	County Governments	Potential Grant Funders	Adjacent Neighborhoods	SUM	Pros	Cons
Ranking, with 10 providing the most benefit	*Ranking 1 to 10, with 10 meaning Partnerships are NOT required*	*Ranking, with 10 offering over 50 FTE, 1 offering few or no FTE*	*Ranking with 1-5, with 5 being the MOST LIKELY to be supported*						
5	10	3	4	5	5	4	105	Relatively quick installation, immediate tax production, synergy with other types of energy production	
5	10	3	5	5	3	3	72	Could fill regional need for waste disposal, produces energy for grid	Large scale biomass plants often require high capital costs that are not offset by production. Funding assistance may not be as prevalent as other renewable energy sources. Because of potential supply fluctuations (natural disaster, etc.), it can present higher risk than other renewables.
5	10	3	3	3	3	2	82	Could fill regional need for waste disposal, produces energy for grid	
5	10	3	4	5	1	3	90	Could fill regional need for waste disposal	
5	10	10	5	5	5	5	104	Ties into agriculture, could fill many different food manufacturing needs (slaughter, farm to table, wine/beer making, canning/bottling, etc.)	Need to identify desire or need for space and who would use it, who might pay for it and manage it
5	10	10	3	3	2	2	101	Existing demand for space and interested parties, could pay off tax liability quickly. Could tie in with Ag industry. May not be as hard to find workers.	Still against federal law.
5	10	7	5	5	5	5	112	Potential synergy between livestock and aquaculture	
5	5	7	4	4	3	3	80		Paper manufacturers may not need this. Transportation costs can be high because the product is low density (i.e. it includes a lot of air).
5	10	10	5	5	5	5	90	Ties in to existing regional industry sector	Could be difficult to pinpoint need, challenges with shipping, cost of shipping
1	5	8	5	5	5	5	74	Tie in to existing cluster, could encourage new employees to region	Requires someone to fund it and take a big chance, need skilled workers
5	10	7	5	5	5	5	92	Ties into regional strength of agriculture, high paying jobs, research that ag industry could use	Could be hard to fund, land companies, find workers
3	3	7	5	5	5	5	70	Tie in to regional economy, fills a training need for workers, tie back to SUNY Adirondack needs as well	Who would fund this
2	8	10	4	3	3	4	95	Buildings could be built quickly and fairly cheaply, could pay taxes more quickly	Takes up a lot of space, needs good trucking routes, other industrial land may be better fit for this
1	2	4	2	3	1	3	80	Utilizes existing rail line	

10 - Large Opprotunit	10 - Not Required	10 - over 50 FTE
1 - No Opportunity	1 - Required	1 - Few or no FTE

C.2 B&L REGIONAL BIOSOLIDS MANAGEMENT EVALUATION

Upper Hudson River Revitalization Plan

City of Glens Falls
Washington County Sewer District No. 2
Town of Kingsbury
Town of Moreau
Town of Queensbury

Regional Biosolids Management Evaluation

June 2016

Revised August 2017

This report was prepared with funds provided by the New York Department of State under the Local Government Efficiency Grant Program.

Upper Hudson River Revitalization Plan
Regional Biosolids Management Evaluation

June 2016
Revised August 2017

Prepared For:

City of Glens Falls
Washington County Sewer District No. 2
Town of Kingsbury
Town of Moreau
Town of Queensbury

Prepared By:

Barton & Loguidice, D.P.C.
Engineers • Environmental Scientists • Planners • Landscape Architects
10 Airline Drive, Suite 200
Albany, New York 12205

In collaboration with:
Camp Dresser Mckee & Smith
Gerhardt, LLC
Sustainable Operations Solutions, LLC
Harris Beach PLLC

This report was prepared with funds provided by the New York Department of State under the Local Government Efficiency Grant Program.

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Executive Summary

A group of member municipalities under the Adirondack Gateway Council (AGC) are seeking to develop a strategy to handle the region's municipal sludge biosolids and accept waste from haulers. The municipalities worked with Barton & Loguidice, D.P.C. (B&L), in collaboration with Camp Dresser Mckee & Smith, Gerhardt, L.L.C., Sustainable Operations Solutions, L.L.C. and Harris Beach P.L.L.C. to evaluate the area's biosolids handling needs in an effort to identify facility location, treatment and disposal alternatives for the proposed regional biosolids facility, as well as investigate alternative solutions.

Biosolids loading projections were completed for the municipal wastewater treatment plants (WWTP) in the area (Glens Falls and Washington County Sewer District #2). A high strength organic waste survey was completed to gauge the market potential for a Regional biosolids processing facility to serve as a merchant facility that could accept organic waste streams. Potential high strength imported organic waste quantities were estimated on the basis of treatment process sizing and for revenue estimation for waste acceptance. Several discussions took place with a number of potential private partners during the survey process. Generally, there was a high level of interest in this project from a public-private partnership perspective. There appears to be a demand for a biosolids acceptance facility in the region. A public-private partnership could involve any combination of the project being financed, built, owned or operated by the private entity. Potential private partners indicated that they could also provide marketing for the regional facilities acceptance and Class A disposal services. It is recommended that once the objectives of the regional facility are finalized that the municipalities issue a Request for Proposal (RFP) from potential private partners.

Six (6) treatment alternatives were screened and four (4) were chosen for further evaluation: composting, anaerobic digestion, lime stabilization and the Lystek™ process. Disposal alternatives were evaluated as well, and Class A disposal was identified as the most attractive option because it would allow the facility to operate independently of fluctuating transportation and landfill costs, can provide an additional source of revenue for the facility and is the option that would most likely attract private partners. Four (4) potential locations were evaluated for the regional biosolids facility. The Glens Falls WWTP offers the most attractive choice as this facility will have enough area to implement the proposed treatment alternatives, will not require any purchasing of additional property and offers reduced trucking costs when compared with other locations. However, an offsite property such as the GE Dewatering site or the Washington County Sewer District No. 2 composting facility may be attractive for the communities as it would provide more opportunity for growth of the regional facility and may ease negotiations in operation, management and ownership of the facility.

A public private partnership in which a private entity manages biosolids in the region has been determined ideal, because it avoids large capital investment, decreases required operational maintenance, and mitigates risk for the municipality. Therefore, it is suggested that a Request for Proposal (RFP) be issued. Proposals from perspective private partners should be evaluated on a financial and logistical basis. Once the superior private partner is determined, the municipalities will enter into a long-term contract for biosolids management, paying an established per-ton tipping fee.

If no partnership proposal is deemed suitable, then the Lystek™ alternative will be the most cost-effective and is recommended. The Lystek™ process has the lowest life cycle cost and is recommended if the municipalities’ goal is to own and operate the facility without a public private partnership, and treat and dispose of the municipally produced biosolids from Glens Falls and WCSD#2, along with some ability to continue some outside biosolids acceptance as a merchant facility.

1.0 Introduction

1.1 Authorization

The City of Glens Falls (City), a member community of the Adirondack Gateway Council (AGC), has retained Barton & Loguidice, D.P.C. (B&L) on behalf of communities (Washington County Sewer District No. 2, City of Glens Falls, Town of Queensbury, Town of Kingsbury, Town of Moreau) in the AGC to develop a Regional Biosolids Management Evaluation as a part of the Upper Hudson River Revitalization Project. B&L has evaluated a number of regional biosolids management alternatives and provides recommendations for proposed equipment, processes and facilities improvements. The AGC communities, through the City of Glens Falls, are the recipients of a NYS Department of State Local Government Efficiency Grant identified as Local Government Efficiency RAF#12-LGE-17 and bearing NYSDOS/City of Glens Falls Contract No. C1000389. This grant funded this biosolids management evaluation.

1.2 Background

Wastewater from the above mentioned communities in the AGC is treated at one of two wastewater treatment plants (WWTPs) within the region: City of Glens Falls WWTP and the Washington County Sewer District #2 (WCSD#2) WWTP. Both of these WWTPs are situated on the Hudson River, are fed from combined sewer systems and discharge treated water to the Hudson River. The WCSD#2 WWTP serves the Village of Hudson Falls, Village of Fort Edward and portions of the Towns of Kingsbury, Queensbury and Fort Edward. Anarchically digested Biosolids from the WCSD#2 WWTP are treated at the WCSD#2 regional composting facility. The New York State Department of Environmental Conservation (NYSDEC) mandated in 2011 that the WWTP increase its future capacity due to combined sewer overflows (CSOs) in the system which inundate the WWTP during heavy rain events. WCSD#2 has also been experiencing operational issues at the composting facility. The Glens Falls WWTP serves the

City of Glens Falls, Village of South Glens Falls and portions of the Town of Queensbury and Town of Moreau. Biosolids from the Glens Falls WWTP were incinerated; however, the City eliminated the incinerator in the first half of year 2016 and are disposing of the biosolids at an off-site incinerator until a permanent solution through the regional biosolids study is completed and implemented. The communities sending wastewater to Glens Falls and WCSD#2 are seeking a reliable, cost effective biosolids management solution that will harmonize with smart, regional growth.

1.3 Scope and Purpose

The scope of work included in the preparation of this Regional Biosolids Management Evaluation is as follows:

- Develop projected municipal sludge and high strength waste loadings and design parameters for the regional biosolids facility;
- Screen six (6) biosolids treatment alternatives for further evaluation including composting, sludge drying, anaerobic digestion with combined heat and power, incineration, lime stabilization and the Lystek™ process;
- Evaluate three (3) biosolids disposal alternatives including landfilling, contract disposal of Class A biosolids and contract disposal of Class B biosolids;
- Evaluate four (4) biosolids handling locations including the Glens Falls WWTP, WCSD#2 WWTP and two off-site locations;
- Evaluate four (4) final treatment alternatives;
- Recommendation of alternatives for improvements; and
- Preparation of opinions of probable project cost for each alternative.

1.4 AGC Communities Description

While the AGC consists of over twenty (20) municipalities and municipal organizations, this report focuses on the biosolids management infrastructure of the following entities:

- City of Glens Falls
- Town of Moreau
- Town of Queensbury
- Washington County Sewer District #2, which includes,
  - Village of Fort Edwards
  - Village of Hudson Falls
  - Town of Fort Edwards
  - Town of Kingsbury

An overall location map showing the boundaries of the communities listed above is included as Figure 1.

2.0 Existing Conditions

2.1 Glens Falls Biosolids Management

The Glens Falls WWTP has waste receiving, approximately 75% of which is septage. Waste received at the Glens Falls WWTP is fed into the plant liquid treatment train in the headworks. Sludge solids from the primary settling tanks are blended with thickened waste activated sludge from the secondary settling tanks. The primary sludge and thickened waste activated sludge have a solids content of 2.5% and 4%, respectively. The sludge is fed from the blended sludge tank to a belt filter press, which dewaters the sludge to approximately 17 – 21% solids. The dewatered sludge was incinerated until the early part of 2016, at which point, the incinerator was taken out of service. The dewatered sludge is being hauled off-site for incineration until the regional biosolids facility is constructed. Existing conditions costs were developed from 2015 budgetary data and reviewed with operators at the Glens Falls WWTP. Capital debt and operating costs were only included for processes "after the belt filter press". A breakdown of the costs are included as Table 14. The existing annual cost for sludge disposal at the Glens Falls WWTP is $813,000 and the existing annual cost for sludge disposal per wet ton is $70.47.

2.2 Washington County Sewer District #2 Biosolids Management

Sludge solids from the primary settling tanks are blended with thickened waste activated sludge from the secondary settling tanks. The primary sludge and thickened waste activated sludge have a solids content of 4% and 5 to 6%, respectively. The sludge is fed from the blended sludge well to the anaerobic digesters. Sludge is stabilized through the anaerobic digesters. The anaerobic digesters at the WCSD#2 WWTP are not decanted, and the anaerobic digester effluent has a solids content of approximately 1.9%. Following digestion, sludge is dewatered with belt filter presses to approximately 17% solids. The dewatered sludge is transported to the WCSD#2 Composting Facility, located in Kingsbury, NY. Biosolids at the composting facility are composted via an aerated static pile method, with a detention time of 51 days. The composting facility accepts biosolids from other municipalities in the area for a fee of $50 per wet ton. The biosolids have an average of 18% solids at the inlet of the composting process. A wood chip bulking agent is used to increase the solids percentage, add a carbon source and increase the porosity of the biosolids for better air distribution through the compost piles. Existing conditions costs were developed from 2015 budgetary data and reviewed with operators at the WCSD#2 WWTP. Capital debt and operating costs were only included for processes "after the belt filter press". A breakdown of the costs are included as Table 15. The existing annual cost for sludge disposal at the WCSD#2 Compost Facility is $263,070 and the existing annual cost for sludge disposal per wet ton is $138.02.

2.3 Existing Loads

Table 1 summarizes the existing production of biosolids and acceptance of waste at the Glens Falls WWTP and the WCSD#2 WWTP/Composting Facility. The existing production of biosolids at the WWTPs was estimated through a mass balance calculation from the existing flows and loads as reported in the October 2014 Sewer Infrastructure Assessment. These mass balance calculations are included as Appendix A.

3.0 Design Parameters

3.1 Projected Long Term Municipal Biosolids Production

An evaluation of long term municipal biosolids production was completed using the adjusted Conveyance Scenario #1 flows and loads from the October 2014 Sewer Infrastructure Assessment. Conveyance Scenario #1 was adjusted in December 2015 based on more recent data from the communities and is included as Table 2. Based on the existing and proposed flows and loads, mass balance calculations were completed for each plant process to estimate the final biosolids production values. These mass balance calculations are included as Appendix A. The proposed conditions loads from Conveyance Scenario #1 are based on a full developmental buildout of the Adirondack Gateway area, as described in the October 2014 Sewer Infrastructure Assessment. Due to the high numbers from the full developmental buildout, it is recommended that a 10% population growth figure be added to the existing loads for the initial design of the biosolids management facility. Space requirements for equipment to increase the system to the full buildout numbers should be taken into account during design so that the system could be expanded as needed. This will ensure that the municipalities do not incur costs associated with large equipment that may not be needed immediately or in the near future, and equipment installed can be used to the highest efficiency.

3.2 Survey of Regional Institutional Opportunities for High Strength Waste Streams

Approximately 150 potential producers and haulers of waste in the northern New York and eastern Vermont region were called to survey the potential for waste acceptance at a regional biosolids facility located in the Warren/Washington County area of New York State. A number of companies indicated that they already went to Glens Falls WWTP for septage tipping and expressed interest in the acceptance of fats, oils and greases (FOG) in the area again. Many of these businesses reduced their hauling of FOG due to Glens Falls eliminating their acceptance of FOG. Finch Paper and Irving Tissue expressed some interest in a nearby regional biosolids facility. Finch Paper is currently attempting to find a new environmentally friendly disposal alternative by the end of 2016 and is involved in a Biomass Boiler Microgrid Project in conjunction with nearby institutions/businesses. They mentioned that they may be interested in accepting any finished product from the regional biosolids handling facility for this boiler. Irving Tissue currently sends their biosolids to a landfill and would be interested in disposing at the regional facility. The physical and chemical characteristics of the paper waste from Finch Paper and Irving Tissue need to be evaluated to determine the suitability of their waste for acceptance at the regional biosolids handling facility. Therefore, the paper waste was not included in operation or equipment sizing calculations and cost estimations for the alternatives developed as a part of this evaluation. The high strength waste survey log is included as Appendix B. A summary of the assumed initial opportunities is provided as Table 3.

B&L also discussed options for biosolids management with potential private partners for the municipalities. Casella Waste Management, We Care Organics and Lystek International expressed a great deal of interest in a regional biosolids facility in the project area and indicated that they could work with the municipalities in a number of ways, including building the facility, operating the facility, managing the land application of any Class A or Class B products produced at the facility as well as sourcing high strength waste materials. Both Casella and We Care Organics would be able to work with different treatment alternatives. Anaerobic digestion and composting facilities were of great interest. We Care Organics expressed concern with a lime stabilization facility due to the significant amount of material that would be produced and predicted that it would be difficult to find land application opportunities for Class B materials in New York State. We Care Organics also expressed the potential value in pairing treatment alternatives together. Generally, no new landfills are being built in New York State currently and prices for disposal can only be expected to increase. We Care Organics stressed the importance of treatment alternatives that can either significantly reduce biosolids volume or produce a Class A product (or both). Lystek International expressed interest in an anaerobic digestion facility with a Lystek™ process. Lystek™ would be able to work with the municipalities in a number of ways for financing the construction and operation of their process. Previous Lystek™ installations have included Lystek leasing the land and financing the construction and operation of their process. They would then buy the municipalities’ biosolids and source other waste acceptance options. As discussions on the regional biosolids facility progress, each of these potential private partners should be kept involved. The Lystek™ product has not yet been approved for Class A disposal in New York State. Discussions with NYSDEC should be started as soon as possible to assess the feasibility of getting this product approved.

3.3 Projected Long Term Biosolids Needs Summary

Table 4 details the proposed biosolids loads to the regional biosolids facility. The table below summarizes the proposed flows to the regional biosolids facility.

Summary of Proposed Flows to Regional Biosolids Facility	
Waste Type	**Flow (GPD)**
WWTP Biosolids	47,300
High Strength Waste (Septage, FOG, etc.)	62,200
Industrial Waste (Argyle Cheese)	100
Industrial Paper Waste*	2,500*
Total	109,600

**Industrial Paper Waste was not included in the total.*

3.4 Sludge Quality

Sludge quality data from Glens Fall and WCSD#2 was reviewed against NYS regulations for pollutant limits for Class B sludge or Class A process inputs to determine the feasibility for the land application scenarios evaluated. Sludge data pollutant levels from Glens Falls and from WCSD#2 were evaluated and compared to the pollutant limits were taken from Table 4 of 6 NY-CRR 360-5.10. The biosolids from Glens Falls WWTP and WCSD#2 WWTP quality are acceptable for Class A or Class B land application.

3.5 Regulatory Environment

Organics management in New York State is expected to become an increasing priority for the state. At this time, there are no organic diversion mandates planned in any proposed regulations. However, nearby states have begun to adopt similar legislation and it can be expected that in coming years New York State will adopt legislation that will promote responsible organics management. Proposed Part 360 regulations will include provisions to ease the permitting of organics recycling facilities. Other initiatives that the proposed regional facility may be able to take advantage of in coming years are:

- NYSERDA funding program for installing and operating Anaerobic Digester Gas to Electricity Systems,
- Changes to the State Environmental Quality Review (SEQR) regulations to streamline environmental review of anaerobic digestion facilities,
- A Partnership between NYSDEC, NYSERDA, Empire State Development and NYS Pollution Prevention Institute to improve energy efficiency and reduce food waste of large generators by offering audits and capital funding for improvements, and;
- An initiative for state agencies to utilize organic waste derived products in their projects to help provide a steady market outlet for organic waste materials.

As New York State works to shift solid waste management towards organics diversion from landfills, it is expected that the market for acceptance of organics at municipal water resource recovery facilities will grow significantly.

3. 6 Market Opportunities

By reviewing the treatment and disposal alternatives, along with careful selection of private partner opportunities, the member municipalities have a unique opportunity to be on the forefront of the organics waste acceptance market by constructing a biosolids management facility that will accept and stabilize organic waste, produce a sellable Class A product for land application disposal, and provide a sustainable solution for biosolids management in the Saratoga/Warren/Washington County area. Market opportunities for acceptance include not only septage, grease trap waste and industrial wastes, but also yard waste and depackaging organics. If composting is pursued, yard waste acceptance could be utilized as a bulking agent source. As organics diversion regulations increase, a market for acceptance of packaged organics (such as food waste from grocery stores) is expected to grow. Installation of depackaging equipment would require a relatively small area (approximately 1,000 square feet) and could be installed on the front end of the biosolids management facility process to increase acceptance revenue.

4.0 Screening of Biosolids Treatment Alternatives

Stabilizing biosolids can: (1) reduce pathogens; (2) eliminate offensive odors; (3) inhibit, reduce and eliminate potential for putrefication (the decomposition of proteins); (4) reduce solids volume; and (5) improve dewaterability. Class A biosolids are biosolids that are stabilized to reduce pathogen levels, odors and vector attraction (such as flies, mosquitoes and rodents) as specified in the US EPA Part 503 Rule. Class A biosolids are able to be land applied in accordance with US EPA guidelines with no restrictions. Class A EQ (Exceptional Quality) is the term applied to Class A biosolids that meet and exceed all Class A pathogen reduction metals and vector attraction reduction requirements in accordance with the US EPA Part 503 Rule. Class B biosolids are biosolids that are stabilized to reduce pathogen levels prior to land application. However, pathogen reduction is less complete in Class B biosolids than in Class A biosolids and therefore limits and additional management practices are required to acquire permits for Class B land application. B&L discussed the feasibility of each of the alternatives with potential private partners to gauge interest in treatment methods that would attract private partners. Alternatives for the treatment of biosolids were screened for evaluation based on the following items:

- Hauling requirements/options;
- Feasibility of public/private partnership;
- Ability to develop revenue stream for waste acceptance;
- Permitting and testing requirements;
- Relative costs;
- Basic equipment requirements;
- Operator requirements;
- Environmental considerations; and,
- Disposal options.

A treatment feasibility scoring matrix was prepared for the screening of the six (6) alternatives. Each of the above items was assigned a relative importance factor and a score from 5 to 0 was assigned to each of the treatment alternatives for each item. The treatment alternatives with the highest total scores and/or lowest capital cost were selected for further evaluation. Relative costs for the scoring matrix were evaluated from research from past completed projects and sources such as the EPA Biosolids Technology Fact Sheets. Detailed opinions of probable project costs and life cycle costs analyses were developed only for alternatives selected for further evaluation and are discussed in Section 5. The treatment feasibility scoring matrix is included as Table 5.

4.1 Composting of Digested Sludge

Alternative 1, composting of digested sludge, will include a biosolids storage area, a composting area and equipment, an odor control unit and loaders for operational purposes. There a number of composting processes available: windrows, aerated static piles and in-vessel technologies. Numerous variations of these three processes exist. A process diagram for the composting alternative is included as Figure 2. Composting typically produces a Class A product and would enable the municipalities to accept organic solid waste to build a revenue stream. Other than biosolids, organic waste that can be accepted includes food waste from sources such as large cafeterias of educational institutions, food processing facilities or breweries. Additionally, a Class A composted material is expected to be sold to produce a revenue stream in the Warren/Washington/Saratoga County area of New York State (NYS). Permitting and testing requirements for the composting process are strict as the product will need to undergo stringent testing as a Class A product, but the permitting for the composting process is something that the municipalities do have experience with as Washington County Sewer District #2 has an existing composting facility. Additionally, as NYS increases regulation on landfilling, processes that produce a beneficial reuse are becoming more of a priority for NYS. Generally, capital costs for composting facilities are low compared to other biosolids treatment alternatives, while operation and maintenance costs tend to be on the high side. Advantages of the composting alternative include:

- Production of a Class A product and minimal energy use provides biosolids handling facility with independence from fluctuating fuel prices;
- Eliminate need for landfill disposal;
- Private partnership potential;
- Economics of composting expected to improve as landfilling, transportation and tipping fees increase;
- Production of Class A product has positive environmental impact through beneficial reuse; and,
- Expected feasibility of selling product in target region.

Disadvantages of the composting alternative include:

- Requires that accepted biosolids have been through a stabilization process such as anaerobic digestion;
- Potential lack of consistency in product quality as feed source varies; and,
- High operation and maintenance costs from loader and screen operation, particularly if an in-vessel system is not selected.

Based on the evaluation above, the composting alternative was given a score of 3.61 out of a possible 5 and was selected for further evaluation.

4.2 Sludge Drying

Alternative 2, sludge drying, will include a biosolids storage area, a sludge dryer, and an odor control unit. Through discussions with sludge dryer manufacturers, the importance of stabilizing sludge prior to drying was stressed. The required sizing of a sludge dryer is significantly higher for the same volume of sludge if the sludge is not stabilized. In discussing this option with manufacturers, if a stabilization process such as digestion is not implemented prior to the sludge dryer, the cost of the dryer could double to process the same volume of sludge. A process diagram for the sludge drying alternative is included as Figure 3. Sludge drying typically produces a Class A product. However, this alternative would not enable the municipalities to accept organic solid waste to build a revenue stream, unless a suitable stabilization alternative, such as digestion, is implemented prior to drying. Additionally, a Class A dried material is expected to be disposed of for no cost in the Warren/Washington/Saratoga County area of New York State (NYS). Additionally, the reduction in volume with drying is an added benefit, providing the municipalities with increased flexibility for biosolids handling. If unable to sell or give away the Class A product, the municipalities would have significantly reduced disposal costs compared with other stabilization alternatives. Permitting and testing requirements for the drying process are strict as the product will need to undergo stringent testing as a Class A product. Additionally, as NYS increases regulation on landfilling, processes that produce a beneficial reuse are becoming more of a priority for NYS. Generally, capital costs for drying facilities are high compared to other biosolids treatment alternatives, especially as an additional stabilization process is recommended to be implemented prior to the drying process. Operation, maintenance and energy costs tend to be high. However, if paired with anaerobic digestion, produced biogas may be used to offset the fuel consumption for drying. Advantages of the drying alternative include:

- Production of a Class A product;
- Volume reduction with product of greater than 92% solids beneficial if landfill disposal is needed;
- Economics of drying expected to improve as landfilling, transportation and tipping fees increase;
- Significantly reduces biosolids volume;
- Small footprint;
- Can be an advantageous process to utilize after a primary stabilization process;
- Positive environmental impact through beneficial reuse; and,
- Elimination/Significant Reduction of landfill disposal costs.

Disadvantages of the drying alternative include:

- Substantial capital and energy costs;
- Economics varies as fuel costs fluctuate;
- Dust Control will be required;
- Creates an explosive hazard;
- Risk of finished product odors for dried unstabilized sludge;
- Skilled labor is required for Operations and Maintenance (O&M) due to the complexity of the equipment; and,
- Has the potential to produce odor problems if a primary stabilization process is not utilized.

Based on the evaluation above, the sludge drying alternative was given a score of 3.07 out of a possible 5. It was not selected for further evaluation as a stand-alone alternative due to the low score compared with other alternatives.

4.3 Anaerobic Digestion with Combined Heat and Power

Alternative 3, mesophilic anaerobic digestion with combined heat and power, will include a biosolids/high strength waste equalization tank, digesters, gravity belt thickeners, belt filter presses and a processed sludge storage area. Variations of this alternative include implementing the Lystek process following digestion; and eliminating combined heat and power and utilizing all gas to heat the digesters and/or a sludge dryer. Process diagrams for the anaerobic digestion alternative is included as Figure 4A and Figure 4B. Anaerobic Digestion typically produces a Class B product and would enable the municipalities to accept organic solid waste to build a revenue stream. However, if the Lystek process or sludge drying was implemented after the digestion process, a Class A product could be produced, giving the municipalities increased flexibility and independence from fluctuating landfill disposal and transportation costs. Other than biosolids, organic waste that can be accepted includes food waste from sources such as food processing facilities or dairies. Additionally, a Class A material is expected to be sold to produce a revenue stream in the

Warren/Washington/Saratoga County area of New York State (NYS). A Class B product is not expected to produce any revenue in this area and will likely need to be landfilled. Permitting and testing requirements for the anaerobic digestion process are not strict if the biosolids are going to be landfilled. If a Class A material is produced, it will need to undergo stringent testing. Generally, capital costs for anaerobic digestion facilities are high compared to other biosolids treatment alternatives, while operation and maintenance costs tend to be comparable. Skilled operators will be required for the operation of the anaerobic digestion process. Energy costs tend to be low as energy can be recaptured for offsetting costs. Advantages of the anaerobic digestion alternative include:

- Potential production of a Class A product;
- Flexibility to pair with variation alternatives to eliminate the need for landfilling;
- Ability to accept a wide variety of waste for revenue;
- Private partnership potential;
- Economics of anaerobic digestion expected to improve as electricity costs and natural gas costs increase;
- Reduction in volatile solids and reduction of overall biosolids quantities;
- Anaerobic digestion generally provides good odor control;
- Energy production and pairing with Class A alternatives will enable the biosolids handling facility to operate independent of fluctuating fuel and landfill disposal prices;
- Positive environmental impact through energy production and beneficial reuse (if Class A option is pursued); and,
- Expected ease of selling product in target region (if Class A option is pursued).

Disadvantages of the anaerobic digestion alternative include:

- Potential for explosion;
- Requirement for biogas treatment prior to use;
- Significant space requirements for the tankage, building and equipment;
- Recycle streams are produced that require treatment;
- Skilled operators will be required as anaerobic digestion is a complex process; and,
- High capital, operation and maintenance costs.

Based on the evaluation above, the anaerobic digestion alternative was given a score of 3.74 out of a possible 5 and was selected for further evaluation.

4.4 Incineration

Alternative 4, incineration, includes a biosolids storage area, incineration equipment, an air treatment unit, and air monitoring equipment in compliance with the most recent EPA Clean Air Act regulations. A process diagram for the incineration alternative is included as Figure 5. Incineration typically produces a reduced volume of ash. This alternative would enable the municipalities to accept an organic solid waste to build a revenue stream. Permitting and testing requirements for the incineration process are strict due to compliance with emissions standards. Monitoring requirements of the process include continuous monitoring of the feed rate, stack gas oxygen content and stack gas moisture content. Due to the new EPA Part 503 regulations, operation costs have significantly increased in recent years. Additionally, the City of Glens Falls is concerned with mercury emissions control difficulties that may occur even if all equipment is installed to comply with the new EPA regulations. Generally, capital costs for new incineration facilities are high compared to other biosolids treatment alternatives. Advantages of the incineration alternative include:

- Significant volume reduction;
- Infrastructure already in place at the Glens Falls WWTP;

- Potential energy recovery; and,
- Relatively small land area required when compared to other biosolids treatment alternatives.

Disadvantages of the incineration alternative include:

- High technology instrumentation required for compliance with air pollution control permits;
- No potential for private partnership;
- Energy costs subject to fluctuating fuel costs; and,
- High capital, operation and maintenance costs.

Based on the evaluation above, the incineration alternative was given a score of 1.84 out of a possible 5. Due to the eliminated potential for a public/private partnership as well as the difficulties in compliance with air pollution control permitting, this alternative was eliminated from further evaluation.

4.5 Lime Stabilization

Alternative 5, lime stabilization, will include a biosolids storage area, lime storage silos, a mixing pug mill, an air treatment unit and a product storage area. A process diagram for the lime stabilization alternative is included as Figure 6. Lime stabilization typically produces a Class B product. It would not enable the municipalities to accept organic solid waste to build a revenue stream. Permitting and testing requirements for the lime stabilization process are fairly simple. Generally, capital costs for lime stabilization facilities are low compared to other biosolids treatment alternatives. The lime stabilization process is easy to operate, resulting in low operation and maintenance costs. However, the cost of lime chemical supply and the increased volume produced requiring landfilling can drive operation costs up. Advantages of the lime stabilization alternative include:

- Simple technology requiring little skilled operation;
- Low capital and energy costs;
- Generally small land area required; and,

- No recycle streams.

Disadvantages of the lime stabilization alternative include:

- Potential for odor production during stabilization process and at end use site would likely require an offsite location;
- Dust production;
- Operation costs dependent on chemical costs of lime; and,
- Production of Class B product may be difficult to sell in target area and landfilling of increased volume may be required.

Based on the evaluation above, the lime stabilization alternative was given a score of 2.87 out of a possible 5. This alternative is recommended to be further evaluated due to the potential to be the most cost-effective treatment alternative as the capital cost of this alternative appears to be the least expensive of all the alternatives.

4.6 Lystek™ Process

Alternative 6, a stand-alone Lystek™ process, will include a biosolids acceptance area, a process tank, chemical feed systems, steam generation system and a processed sludge storage area. A process diagram for the Lystek™ process alternative is included as Figure 7. Lystek™ typically produces a Class A EQ product, would enable the municipalities to accept organic solid waste to build a revenue stream and would give the municipalities increased flexibility and independence from fluctuating landfill disposal and transportation costs. Permitting and testing requirements for the Class A product are significant. The capital cost for Lystek™ is low compared to other biosolids treatment alternatives, while operation and maintenance costs tend to be moderate. If installed at an existing plant, the Lystek™ equipment would require approximately 1 hour of operator attention per 8-hours of operation. Energy costs tend to be moderate as the process requires the use of chemical feed, steam generation and pumping equipment. Advantages of the Lystek™ alternative include:

- Production of a Class A product;
- Low capital cost;
- Flexibility to pair with variation alternatives to eliminate the need for landfilling;
- Private partnership potential;
- Ability to add units and anaerobic digestion to allow for future growth/variability in waste acceptance;
- Allow the region to ease into regional acceptance on a step-by-step basis;
- Class A alternatives will enable the biosolids handling facility to operate independent of fluctuating fuel and landfill disposal prices;
- Positive environmental impact through beneficial reuse; and,
- Expected ability of selling product in target region.

Disadvantages of the Lystek™ alternative include:

- Limits acceptance of materials to 15%-19% solids unless anaerobic digestion alternative is implemented prior to the Lystek process; and,
- Large space requirements for storage of the Lystek™ product.

Based on the evaluation above, the Lystek™ alternative was given a score of 3.57 out of a possible 5. This alternative was selected for further evaluation.

5.0 Biosolids Treatment Alternatives Analysis

Alternatives were selected for improvements to address the biosolids handling needs of the Warren/Washington/Saratoga County region of NYS. Alternatives for improvements were evaluated for a life cycle cost and a disposal cost per wet ton. Life cycle cost is the annual cost of the improvement assuming a 30-year loan period at an interest rate of 3.0% and the annual operation and maintenance (O&M) expenses, based on a traditional design-bid-build project funded by the municipalities. The disposal cost is an adjusted life cycle cost for improvements completed on the process after the belt filter press outlet per wet ton of sludge disposed. The alternatives identified for further evaluation were selected for their relative potential to provide a sustainable and cost-effective solution. Each alternative was evaluated based on constructability, capital costs, operation and maintenance costs, energy costs and savings, performance data, reliability, and applicability of waste receiving to the treatment alternative. Life cycle costs were evaluated for inclusion of revenue streams, no inclusion of revenue streams, and cost separation between the City of Glens Falls and WCSD#2. Refer to Tables 16 and 17 for summaries of the life cycle cost analyses.

5.1 Composting of Digested Sludge

This alternative was evaluated on the basis of implementing a new in-vessel system or an aerated static pile system, similar to the existing process at the Washington County Sewer District #2 Compost Facility. Assumptions used for the preliminary design and costing of the composting alternative are as follows:

- Loading of 10,105 wet tons/year for municipal biosolids from the study area and biosolids currently accepted at the WCSD#2 Compost Facility;
- Process located at either the Glens Falls WWTP or the WCSD#2 Compost Facility; and,
- All biosolids were anaerobically digested prior to acceptance at the compost facility;

The aerated static pile process utilizes forced positive aeration through trapezoidal compost piles. A bulking agent such as wood chips is required to provide pile porosity and a carbon source for the composting feed material. Static piles are not turned frequently and therefore are not typically used for materials that need to breakdown physically as well as biologically. The proposed static pile process consists of primary composting in aerated static piles for a retention time of 22-days, and curing in static piles for a retention time of 30-days. A life cycle cost analysis for aerated static pile composting is included as Table 6. An evaluation of the life cycle costs for unit charges, separation between the communities and comparing the alternative costs against the existing costs is included as Table 21. Information on the proposed aerated static pile system is included as Appendix C.

The in-vessel process utilizes forced negative aeration through compost in concrete bays that are mechanically agitated. A bulking agent such as wood chips is required to provide pile porosity, but due to the routine mixing, the bulking agent is not limited to minimum sizing requirements, unlike the aerated static pile process. This enables flexibility in bulking agent use, which can be beneficial if a municipal yard waste composting program is to be relied upon for bulking material sourcing. The compost would gradually be moved down the concrete bays and would undergo primary composting for a retention time of 21 days. The compost would then be removed from the bays and cured for a period of 30 days in windrows. The negative aeration system would include a biofilter for odor control, and would give the facility the flexibility to utilize heat capture to reduce heating costs of the primary composting building. A life cycle cost analysis for in-vessel composting is included as Table 7. An evaluation of the life cycle costs for unit charges, separation between the communities and comparing the alternative costs against the existing costs is included as Table 22. Information on the proposed in-vessel composting system is included as Appendix D.

Composting of raw sludge is possible but may lead to odor problems and vector issues (inadequate pathogen destruction). It is recommended that composting is not implemented as a stand-alone option, but implemented following a stabilization process such as anaerobic digestion (AD). Therefore, anaerobic digestion costs were included in the life cycle cost analyses of the composting alternatives. The table below summarizes the life cycle cost analyses of the composting alternatives.

Summary of Composting Life Cycle Cost Analyses					
Alternative	**Capital Cost**	**Annual Electrical Operation Cost**	**Annual Operation & Maintenance Cost**	**Annual Product Revenue**	**Annual Life Cycle Cost**
Aerated Static Pile w/ AD	$ 25,700,000	$ 152,000	$ 929,000	$ 1,110,000	$ 1,290,000
In-Vessel w/ AD	$ 27,500,000	$ 163,000	$ 910,000	$ 1,100,000	$ 1,380,000

5.2 Anaerobic Digestion with Combined Heat and Power

This alternative was evaluated on the basis of implementing a traditional anaerobic digestion process, similar to the existing process at the WCSD#2 WWTP, or an anaerobic digestion process following by a Lystek™ process. The anaerobic digestion process utilizes microorganisms to break down organic and inorganic matter within a heated reactor in the absence of oxygen. Three (3) principle reactions occur in this process: hydrolysis, acidogenesis and methanogenesis. The digestion process begins with bacterial hydrolysis of the source materials in order to break down insoluble organic polymers such as carbohydrates and make them available for other bacteria. Acidogenic bacteria then convert the sugars and amino acids into carbon dioxide, hydrogen, ammonia, and organic acids. Next, acetogenic bacteria convert the resulting organic acids into acetic acid, along with additional ammonia, hydrogen and carbon dioxide. A two-stage high-rate mesophilic anaerobic digestion process has been evaluated for the regional biosolids handling facility.

The proposed traditional anaerobic digestion process will consist of a high strength waste receiving station, a 300,000 gallon waste equalization tank, 1.25

MG primary digester, a 1.25 MG secondary digester, recuperative gravity belt thickeners, dual fuel heat exchangers and boilers, belt filter presses, a combined heat and power (CHP) system, gas safety equipment and a membrane biogas holder for 12-hours of storage. Received waste will be mixed with municipal biosolids in the equalization tank. It should be noted that one potential configuration of an anaerobic digestion system was selected for preliminary design and costing. There are many options for digester configurations and depending on the selected biosolids handling process, digester configuration and sizing should be revisited for final design. Assumptions used for the preliminary design and costing of the anaerobic digestion alternative are as follows:

- Loading of 16,690 wet tons/year for municipal biosolids from the Glens Falls WWTP study area and biosolids currently accepted at the Glens Falls WWTP and WCSD#2 Compost Facility;
- Biosolids from WCSD#2 were not included in sizing for the anaerobic digestion alternative because the WCSD#2 WWTP already has digestion in place and has indicated a willingness to continue to operate their digesters as this regional facility is constructed;
- Process is located at the Glens Falls WWTP; and,
- Recycle streams are able to be treated through the Glens Falls WWTP wet stream process.

Therefore, the initial projected loading of the anaerobic digestion facility would be 101,000 GPD. Mixed waste will be piped to the primary digester. Any acid whey received will be piped directly to the primary digester to maximize the energy capture from this waste. A gravity belt thickener will be used to take sludge from the primary digester, thicken it to 3-4% solids, and return the sludge to the digester. This recuperative thickening process will enable the facility to treat an increased capacity through the digesters and have better stabilization efficiency. Through recuperative thickening, the volume of sludge that needs to be digested will decrease as water is removed as filtrate and the solids retention time is increased. It is projected approximately 22,700 GPD of water will be removed through the gravity belt thickeners, leaving approximately 78,000 GPD of sludge to be digested. The majority of the biogas captured will be in the primary digester. Each digester will have a minimum retention time of 15 days. Following digestion, the sludge will be pressed to 20% solids through a belt filter press.

A life cycle cost analysis for anaerobic digestion with CHP is included as Table 8. An evaluation of the life cycle costs for unit charges, separation between the communities and comparing the alternative costs against the existing costs is included as Table 23. Information on the proposed anaerobic digestion process is included as Appendix E. A life cycle cost analysis for anaerobic digestion without a CHP system was completed as well and is included as Table 9. An evaluation of the life cycle costs for unit charges, separation between the communities and comparing the AD w/out CHP alternative costs against the existing costs is included as Table 20. Without a high strength waste agreement, a CHP system is not economically favorable, as all biogas can be used to heat the digester sludge. The anaerobic digestion process provides flexibility for the regional biosolids facility to accept various types of waste for treatment and allows energy to be recaptured to reduce operating costs. When paired with a secondary stabilization process, such as composting or the Lystek™ process, additional opportunities for disposal are available for the facility. Utilizing a secondary stabilization process for the production of a Class A material or for the reduction of volume will allow this regional biosolids facility to achieve disposal of the stabilized product for some revenue and operate with increased independence of fluctuating fuel prices and landfill disposing costs. A life cycle cost analysis for following the anaerobic digestion process with a Lystek™ process was completed and is included as Table 10. An evaluation of the life cycle costs for unit charges, separation between the communities and comparing the alternative costs against the existing costs is included as Table 24. This alternative produces a Class A EQ product that the regional facility would be able to dispose of as a revenue source. The Lystek™ process also increases biogas production and solids reduction efficiency in the digesters. Several discussions with Lystek™ representatives occurred throughout the development of this project. Lystek™ would be flexible in discussing financing alternatives of the regional facility. In previous Lystek™ installations, Lystek™ has financed, built and operated their technology, and leased the space required to do so from the land owner. A summary of the life cycle cost analyses is included in the table below:

Summary of Anaerobic Digestion Life Cycle Cost Analyses					
Alternative	**Capital Cost**	**Annual Electrical Operation Cost**	**Annual Operation & Maintenance Cost**	**Annual Product Revenue/Energy Recovery**	**Annual Life Cycle `Cost**
AD & CHP	$23,100,000	$55,000	$1,220,000	$960,000	$1,500,000
AD w/out CHP	$18,800,000	$55,000	$1,220,000	$910,000	$1,330,000
AD & CHP w/ Lystek	$37,300,000	$68,000	$525,000	$ 1,080,000	$1,420,000

5.3 Lime Stabilization

Stabilization of sludge through the addition of alkaline material such as lime renders the sludge unsuitable for the survival of microorganisms. In the lime stabilization process, lime is added to untreated sludge in sufficient quantity to raise the pH to 12 or higher. The high pH substantially reduces the microbial reactions that lead to odor production and vector attraction. The sludge will not putrefy, create odors or pose a health hazard as long as the pH is maintained at or above 12. Lime stabilization can inactivate viruses, bacteria and other microorganisms present in the sludge. Hydrated lime is recommended for this alternative due to the relative ease of operation of the chemical storage and feed systems. However, if this alternative is implemented, a detailed economic review of quicklime versus hydrated lime should be completed to determine the most cost-effective option. Hydrated lime is typically more expensive, but comes with less operating and capital costs, as the lime does not need to be slaked onsite.

The proposed hydrated lime process consists of two lime silos, truck unloading operator station, bin vent filter, vibrating bin activator, volumetric screw feeder, lime and sludge pug mill blender, stabilized lime storage area, compressed air system and lime system control panel. Assumptions used for the preliminary design and costing of the lime stabilization alternative are as follows:

- Loading of 9,900 wet tons/year for municipal biosolids from the study area; and,
- Process is located at the Glens Falls WWTP.

The lime silos each would be sized for a 30-day storage time, with one hydrated lime delivery every other week. Biosolids would be delivered to the site thickened and dewatered. Hydrated lime would be fed via a dry chemical conveyance system to a pug mill, where it would be mixed with the dewatered sludge cake. A pug mill is a continuous mixing device designed to completely mix materials of varying solids content into a homogeneous mixture. As the lime system is operating a dust collector and exhaust fan will be operating to ensure proper conditions within the silo and prevent dust generation outside the silo. Dust production is a health hazard as the lime particles are extremely small. A vibrating bin activator will be utilized to obtain even lime distribution by reducing particle segregation. Following the pug mill, the stabilized sludge would then be conveyed to a dewatered sludge container prior to disposal. It is possible the lime stabilization system would be required to be at an off-site location due to the potential for odor issues. An odor control system would be included with this alternative as well. A life cycle cost analysis for lime stabilization is included as Table 11. An evaluation of the life cycle costs for unit charges, separation between the communities and comparing the alternative costs against the existing costs is included as Table 19. Information on the proposed lime stabilization process is included as Appendix F. It should be noted that lime stabilized sludge requires relatively quick disposal to eliminate the chance for destabilization, which can lead to odors and vector attraction. The table below summarizes the life cycle cost analyses of the lime stabilization alternative.

Summary of Lime Stabilization Life Cycle Cost Analysis					
Alternative	**Capital Cost**	**Annual Electrical Operation Cost**	**Annual Operation & Maintenance Cost**	**Annual Product Revenue**	**Annual Life Cycle Cost**
Lime Stabilization	$ 4,500,000	$ 9,000	$ 1,000,000	$ 0	$ 1,260,000

5.4 Lystek™ Process

This alternative was evaluated on the basis of implementing a cost-effective solution that would treat the municipal biosolids loadings in a small footprint. The Lystek™ Process utilizes low pressure steam and alkalinity addition and high shear mixing to hydrolyze, or break down the complicated organic molecules and organisms. The process takes dewatered biosolids (15-19% solids) and produces a molasses-like Class A EQ product that can be injected into land as a fertilizer.

The proposed Lystek™ process consists of one 1,200-gallon reactor, potassium hydroxide (KOH) feeding system, biosolids storage tank, progressive cavity transfer pumps, low pressure steam boiler, and applicable control panels, instrumentation and VFDs. Assumptions used for the preliminary design and costing of the Lystek™ Process alternative are as follows:

- Loading of 10,105 wet tons/year for municipal biosolids from the study area and biosolids accepted at the WCSD#2 Compost Facility; and,
- Process is located at the Glens Falls WWTP.

A life cycle cost analysis for the Lystek™ Process is included as Table 12. An evaluation of the life cycle costs for unit charges, separation between the communities and comparing the alternative costs against the existing costs is included as Table 18. Information on the Lystek™ process is included as Appendix G. The Lystek™ process can be installed in the existing area of the incinerator building of the Glens Falls WWTP, and the Lystek™ product can be stored in the existing ash lagoon area. A storage volume of six months of product generation will be required, which equates to 3.4 million gallons. The ash lagoons may be improved to store the Lystek product, however further soils and groundwater data are needed to confirm the feasilbility of this. Alternatively, two (2) glass fused to steel tanks (87 feet in diameter and 38 feet high) could be used to store the Lysek™ product. Due to the unknown feasibility of using the existing ash lagoons, for preliminary design and costing it was assumed that glass fused to steel tanks were used to store the Lystek™ product.This alternative would be the best solution for the municipalities to most cost effectively handle their biosolids along with accepting the cake that currently is accepted at the WCSD#2 Compost Facility. This alternative produces a Class A EQ product that the regional facility would be able to dispose of as a revenue source. Several discussions with Lystek™ representatives occurred throughout the development of this project. Lystek™ would be flexible in discussing financing alternatives of the regional facility. In previous Lystek™ installations, Lystek™ has financed, built and operated their technology, and leased the space required to do so from the land owner. A summary of the life cycle cost analyses is included in the table below:

Summary of Lystek™ Process Life Cycle Cost Analysis					
Alternative	Capital Cost	Annual Electrical Operation Cost	Annual Operation & Maintenance Cost	Annual Product Revenue/Energy Recovery	Annual Life Cycle Cost
Lystek	$14,300,000	$26,000	$368,000	$777,000	$349,000

6.0 Biosolids Disposal Alternatives

B&L examined methods of disposal for each of the alternatives. The method of disposal represents a significant operating cost for the proposed regional biosolids facility.

6.1 Landfill

Based on a recent bid price in a nearby area, a disposal fee of $75 per ton was assumed for life cycle cost analyses. Landfilling represents the simplest form of disposal because requirements for the sludge to be disposed are minimal compared to other options. While requirements vary from landfill to landfill, typically landfills only require that a minimum solids percentage is obtained (minimum 20%). Through discussions with potential private partners, it was indicated that the available landfilling capacity can only be expected to decrease in the future, as increasingly strict environmental regulation does not promote the addition of new landfills in New York State. Eliminating dependency on landfills will likely be a cost-effective method as the regional facility’s pricing can be expected to stabilize while other disposal facilities’ pricing will have to increase, bringing additional receiving revenue to the regional facility.

6.2 Contract Disposal Class A/Class A EQ Biosolids

Contract Disposal of Class A Biosolids is a viable option in the Warren/Washington/Saratoga County region of New York State. Disposal of Class A biosolids requires additional testing and permitting for the regional biosolids facility, but provides a potential revenue source. The compost, Lystek™, and anaerobic digestion with Lystek™ alternatives produce Class A biosolids. Washington County Sewer District #2 is familiar with disposal of compost product. A number of potential private partners are interested in the disposal of a Class A product and have indicated that they would be interested in completing some of the work for the Contract disposal of a Class A product, such as sourcing organic wastes to be accepted, taking ownership of the Class A product and managing the marketing and selling of the product. Opting for production of a Class A product would allow the regional biosolids facility to stabilize operating prices as transportation and disposal costs for the processed sludge would be eliminated. This would enable the facility to offer increasingly competitive prices against other acceptance facilities, and grow the business as additional waste sources are secured.

6.3 Contract Disposal Class B Biosolids

Through discussions with potential private partners, the likelihood of finding a contract disposal of Class B biosolids is small. This is partially due to the nature of farming in this area, which requires land application of fertilizer products twice per year. Since Class B products cannot be stored at the land application sites, a large amount of storage area will be required to store the Class B material and provisions to prevent any unstabilization will have to be taken into consideration. It is likely that some of the Class B product would need to be landfilled because it cannot be removed from the site immediately. Additionally, Class B paper waste materials such as paper waste were land applied in the past in the northern NYS area and were harmful to the environment, leading to a negative public perception. Generally, disposing of Class B biosolids in NYS can be difficult and a best case scenario for disposal of Class B material is at no cost. A revenue for the Class B material cannot be expected and provisions for landfilling should be made in case a contract disposal cannot be acquired. Treatment alternatives that produce Class B biosolids include lime stabilization and anaerobic digestion. For the lifecycle analyses for these alternatives, it was assumed that landfilling disposal would be required and was included in the estimation of the facility operating costs.

7.0 Biosolids Handling Location Alternatives

Four (4) locations were evaluated for the regional biosolids handling facility. Location alternatives were screened for evaluation based on the following items:

- Proximity to organic waste generators;
- Zoning and Proximate Land Uses;
- Proximity to Potential Energy Users;
- Relative Site Development Costs;
- Environmental Site Factors;
- Site Development and Impact on Operations Costs;
- Sidestream Management Requirements;
- Transportation Impacts and,
- Regulatory and Permitting Requirements.

A location alternative scoring matrix was prepared for the screening of the four (4) location alternatives. Each of the above items was assigned a relative importance factor and a score from 5 to 0 was assigned to each of the location alternatives for each item. The location alternatives with the highest total scores were selected for further evaluation through the combination treatment, disposal and location alternatives. The location alternative scoring matrix is included as Table 13.

7.1 Glens Falls WWTP

Construction of the regional biosolids facility at the Glens Falls Wastewater Treatment Plant offers a number of benefits:

- The facility could be constructed on land already owned by the municipality, eliminating any land purchasing requirements.
- The site would be able to accommodate any of the evaluated alternatives.
- The majority of the biosolids the regional facility would handle are already produced by Glens Falls WWTP or delivered to Glens Falls WWTP, minimizing additional transportation costs.

- The Glens Falls WWTP is located in an industrial area, providing nearby energy users and elimination of land use conflicts with proximate land parcels. The Glens Falls WWTP is also central to many potential waste generators.
- The capital cost to implement biosolids handling processes at this site is limited when compared to a vacant site as some of the infrastructure is already in place. Sidestream management would likely not be required as any sidestreams could be brought back to the head of the WWTP. If this location is selected, an evaluation of the projected sidestream production should be completed to determine the effect the sidestream would have on the existing operations of the plant.

Potential negative impacts of utilizing the Glens Falls WWTP site are:

- If lime stabilization is implemented, an offsite location or an enclosed process may be preferable due to odor issues.

7.2 Washington County Sewer District #2

Construction of the regional biosolids facility at the Washington County Sewer District #2 Wastewater Treatment Plant or the existing Washington County Sewer District #2 Compost Facility offers a number of benefits:

- The facility could be constructed on land already owned by the municipality, eliminating any land purchasing requirements.
- The WCSD#2 WWTP is also central to many potential waste generators. The WCSD#2 Compost Facility is located in an agricultural area, in close proximity to potential Class A product customers.
- The capital cost to implement biosolids handling processes at this site is limited when compared to a vacant site as some of the infrastructure is already in place. Sidestream management would likely not be required as any sidestreams could be brought back to

the head of the WWTP. If this location is selected, an evaluation of the projected sidestream production should be completed to determine the effect the sidestream would have on the existing operations of the plant.

- If the composting alternative was selected, some of the infrastructure is already in place at the WCSD#2 Composting Facility, significantly reducing the estimated capital costs.

Potential negative impacts of utilizing the WCSD#2 WWTP or WCSD#2 Composting Facility site are:

- The WWTP site would not be able to accommodate any of the composting alternatives.
- The WWTP site may be able to accommodate the anaerobic digestion and lime stabilization alternatives, but would take up any space the property has for future growth.
- There would be limited space for growth of the facility as the WWTP expands.
- The WCSD#2 Composting Facility does not have the infrastructure to treat any sidestreams produced. Additional infrastructure would be required.
- Use of the existing composting facility for the treatment of the region's biosolids would increase transportation costs as very little of the biosolids are produced at that site.
- There would be limited space for storage of stabilized sludge. If lime stabilization were utilized, an offsite location should be considered due to odor issues.
- Trucking costs for transport of biosolids from Glens Falls WWTP to WCSD #2 would be significant.

7.3 Off Site Location #1 – Ciba Geigy

Construction of the regional biosolids facility at the Ciba Geigy site offers a number of benefits:

- The majority of the biosolids the regional facility would handle are already produced by Glens Falls WWTP or delivered to Glens Falls WWTP, which is located close to the Ciba Geigy location.
- The Ciba Geigy property is located in an industrial area, providing nearby energy users and elimination of land use conflicts with proximate land parcels. This location is also central to many potential waste generators.
- An off-site location offers significant opportunities for growth of the regional biosolids facility.

Potential negative impacts of utilizing the Ciba Geigy site are:

- The site is a brownfield site, which may cause capital costs for development to increase. Limited excavation will be allowed and fill would likely have to be brought in for successful construction.
- Additional infrastructure for sidestream management would be required. It may be possible that the sidestreams could be piped to the Glens Falls WWTP.
- Additional costs for operations and manpower would likely be required as a separate site would need additional labor for the management and surveillance of the site and its processes.
- Purchasing of this property would be required and interest in selling the property is unknown.
- Trucking costs for transport of biosolids from Glens Falls WWTP and WCSD #2 to the regional facility would be significant.

7.4 Off Site Location #2

A generic off site location was considered as an alternative to the Ciba Geigy and WWTP sites. The generic site would require approximately 3.5 to 4.0

acres of usable space for construction, an area for construction of a sidestream outfall for discharges and access for large trucks to reach the site. A potential offsite location for construction of the regional biosolids facility would the the GE Dewatering site in Fort Edward. Construction of the regional biosolids facility at a generic off-site location offers a number of benefits:

- The facility could be constructed on a third-party property, lending to simpler operations, ownership and management negotiations.
- This location could be controlled so that it is central to many potential waste generators, energy users and consistent with proximate land uses.
- An off-site location offers significant opportunities for growth of the regional biosolids facility.

Potential negative impacts of utilizing the generic off-site location are:

- Additional infrastructure for sidestream management would be required as there may not be a sewer connection at the site.
- Additional costs for operations and manpower would likely be required as a separate site would need additional labor for the management and surveillance of the site and its processes.
- Trucking costs for transport of biosolids from Glens Falls WWTP and WCSD #2 to the regional facility would be significant.

8.0 Public Private Partnership Opportunities

Rather than constructing new infrastructure to be owned by the municipalities, the AGC could enter into a public private partnership for biosolids management. In such a partnership, the private entity would be responsible for biosolids management from the end of belt filter press through disposal. Instead of financing, building, owning, and operating new biosolids management equipment, the municipalities would enter into a contract with a private partner who would do so. This private partner would be responsible for disposing of the biosolids and the municipalities would pay a tipping fee for that service. Such a partnership would likely be economically favorable for the municipalities. The costs, risks, and revenue streams associated with the regional biosolids facility would be divided between the private partners and the municipalities – thereby improving regional resiliency. Four viable perspective private partners for biosolids management have been identified as part of this evaluation: Wheelabrator Hudson Falls, LLC, Lystek International, Inc., ESMI Companies, and Casella Waste Management.

8.1 Wheelabrator

The Glens Falls biosolids are currently being hauled off-site for incineration at the Wheelabrator facility in Hudson Falls, NY. The Wheelabrator energy-from-waste facility accepts biosolids and other waste sources as feedstock in their boilers. The flue gas from the boilers heats pressurized steam which is used to turn a turbine and generate electricity. Waste volumes are reduced by 90% via this process. The energy-from-waste facility has been operating in Hudson Falls since 1991.

The Wheelabrator facility in Hudson Falls accepts municipal biosolids waste, but a private hauler must be hired to transport biosolids to the incinerator. While Glens Falls is currently utilizing the Wheelabrator facility as their biosolids solution, they offer long-term contracts. The Wheelabrator offers a local, environmentally conscience method of disposing of biosolids that could be employed by AGC member communities if Wheelabrator has excess capacity which could be limited.

8.2 Lystek™

The Lystek™ process was extensively described in sections 4.6 and 5.4 as a municipal-owned infrastructure option for biosolids management. Alternatively, a partnership with Lystek™ would allow utilization of this innovative process without municipality ownership or operation. Lystek™ has a public private partnership with Fairfield-Suisun Sewer District (FSSD) in California to provide biosolids solution to the region. Lystek™ designed, built, and operates a large commercial biosolids processing facility which was self-financed through their ownership group. Under-utilized buildings at the FSSD WWTP were converted to house the equipment. The municipality owns the site and Lystek™ owns and maintains the equipment. This California facility started receiving materials in the fall of 2016.

To implement this type of partnership, Lystek™ could use a similar agreement structure. A long-term, renewable agreement would first be established. Lystek™ could own and operate the equipment at the Glens Falls WWTP or another selected site. Lystek™ would pay a host mitigation fee for use of the site. The municipalities would be responsible for the required permitting. Lystek™ could own and maintain the equipment, pay for associated electrical and chemical costs, operate the equipment, and sell the fertilizer product. For these services, the municipalities would pay a tipping fee to Lystek™.

8.3 ESMI

The Environmental Soil Management of New York, LLC, or ESMI, owns and operates a thermal treatment facility in Fort Edward, NY. ESMI has over 25 years of experience in contaminated soil remediation via thermal desorption. In thermal desorption treatment, solid media is heated to the point of contaminant volatilization, but before combustion of media. This volatilization is accomplished in a rotary drum dryer which heats the media to 450 – 950 degrees Fahrenheit.

The volatilized contaminants are then carried within the process air stream and destroyed by thermal oxidation. Their thermal desorption process has a 99.9% removal destruction efficiency.

ESMI has not currently developed parameters for accepting biosolids, but are interested in pursuing this new waste stream. The Fort Edward facility has the current operational capacity to accept proposed biosolids from AGC and would only require modification to their existing permit with NYSDEC. To accept biosolids, ESMI would engage in a term contract with a minimum of 5 years. Partnering with ESMI offers another local and cost effective option for regional biosolids management.

8.4 Casella Waste Management

Casella is a waste management company based in Vermont. Casella has vast experience in handling organic waste streams. Annually, they transform over 400,000 tons of food scraps, paper mill by-products, biosolids, and other organics into nutrient rich soil amendments. Biosolids are transported from partner wastewater treatment plants to Casella's composting facilities. Casella has a well-established facility in Chateaugay, NY which takes in 40,000 tons of organic waste per year. This organic material is processed via in-vessel composting to produce a Class A product which is then land applied to farmland. The Casella Chateaugay facility has room for growth, as it is permitted to accept 70,000 tons per year. Sludge must be tested before setting a precise tipping fee.

In order to gather specific details and pricing on each potential partnership, as well as to better compare these options, it is suggested that a Request for Proposals (RFP) be issued. Proposals from each perspective partner should include details on ownership and operation of equipment, transportation of biosolids, and tipping fees. This information is essential to determine which partnership is ideal, or if no partnership are financially beneficial or logistically sound at this time. The RFP will seek biosolids management from the end of the conveyor of the belt press through disposal. Results from the RFP will be compared with the municipality financing, constructing, and operating option to determine what the best option is for the regional facility.

9.0 Recommended Improvements

A public private partnership in which a private entity manages biosolids in the region has been determined ideal, because it avoids large capital investment, decreases required operational maintenance, and mitigates risk for the municipality. Therefore, it is suggested that a Request for Proposal (RFP) be issued. Proposals from perspective private partners should be evaluated on a financial and logistical basis. Once the superior private partner is determined, the municipalities will enter into a long-term contract for biosolids management, paying an established per-ton tipping fee.

If no partnership proposal is deemed suitable, the AGC has the option to finance, construct, own, and operate a regional biosolids facility to treat the municipally produced biosolids in the region. If constructing a regional biosolids facility, then the Lystek™ alternative will be the most cost-effective and is recommended. The cost of this alternative was estimated assuming that it was installed at the Glens Falls WWTP. When used as a stand-alone process, Lystek™ is limited in its ability to accept wastes compared with an anaerobic digestion process because the biosolids loading into the Lystek™ process are required to have a solids content of 15-19%. When paired with anaerobic digestion followed by belt filter presses, the acceptance ability of the Lystek™ process is improved. Anaerobic digestion can be implemented as later phases at the Glens Falls WWTP in coordination with the Lystek™ process to maximize revenue by accepting biosolids from a number of haulers and industrial sources in the area.

10.0 Funding

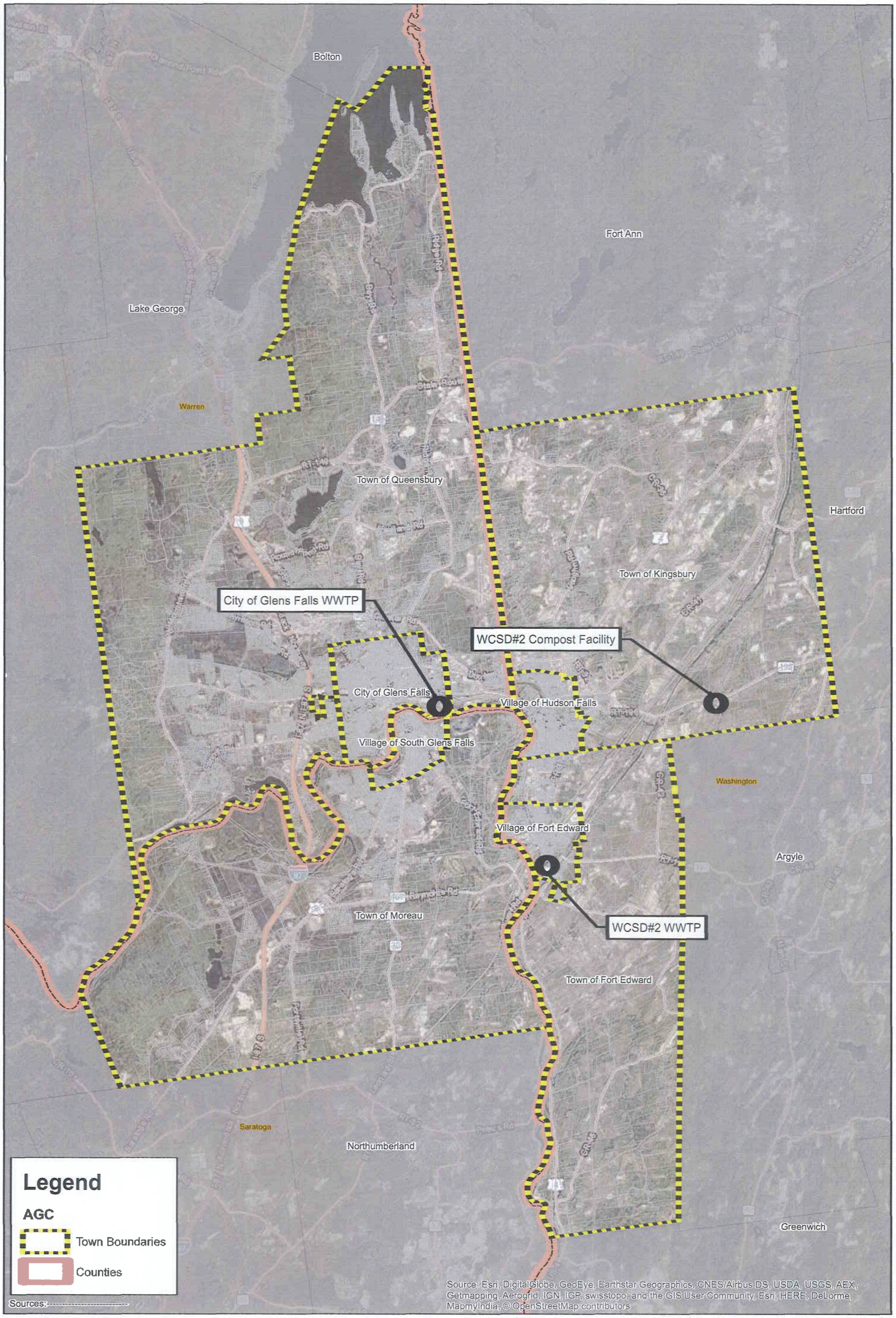
B&L has identified a number of possible funding sources for the construction of a regional facility. If a public private partnership is pursued, there are potential grant funding opportunities if ESMI needs to expand its operation, or for Lystek™ construction. Such funding would be secured by the parties constructing the facility. If the municipalities build a facility, there are several possible municipal funding sources available.

Funding opportunities may be pursued through NYSERDA if the anaerobic digestion alternative is pursued. NYSERDA offers grants for the construction of anaerobic digester use to generate electricity. Currently, these grant programs are closed, but are expected to reopen soon. If the municipalities decide to pursue this option, costs for the construction of the digesters, gas conditioning equipment and CHP system may be eligible for coverage under these grant programs.

A variety of funding programs are available under the NYS Consolidated Funding Application (CFA). CFA programs that the municipalities may be able to take advantage of are the Empire State Development Grant Funds ($175 million available) and the Climate Smart Communities Grant Program ($11 million available). The Empire State Development Grant Funds is available for economic development projects, including infrastructure investment and awards are offered as an incentive to undertake a project. Any amount of the project costs could be covered under this program and if awarded, the municipalities would be notified of their award amount. Organics acceptance facilities are a funding target of the Climate Smart Communities Grant Program. This program could offer a maximum award of $100,000. Additional funding for the proposed improvements may come from a variety of Federal and State programs and be in the form of loans and grants. The eligibility criteria differs between each program, but protection of the public health, protection of the environment, energy conservation, and/or economic development are key factors in many applications. It is recommended that the municipalities submit a Consolidated Funding Application (CFA) to apply for a variety of funding programs.

The municipalities may be able to secure low interest financing through the NYS Environmental Facilities Corporation (NYS EFC)'s Clean Water State Revolving Fund (CWSRF). NYS EFC scores projects based on merits as outlined above. It is recommended that the municipalities submit the project for funding from this source to receive project scoring and funding availability.

Figures

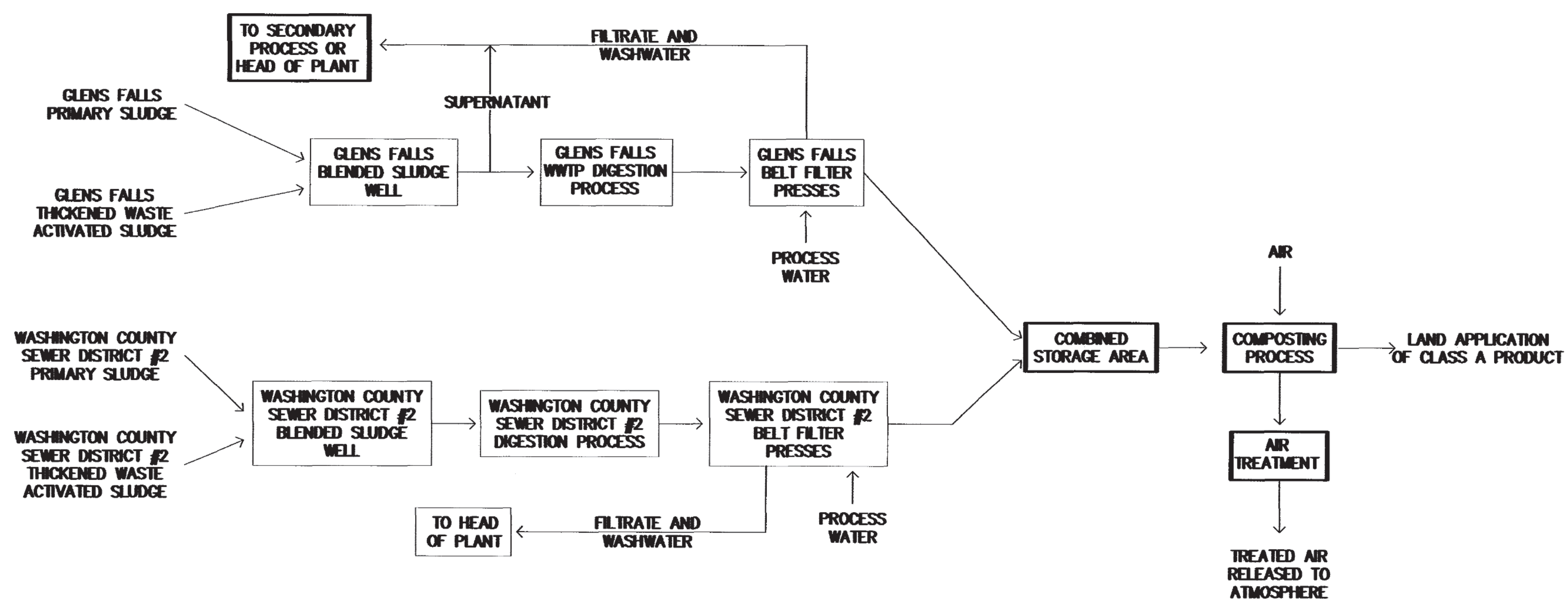


Barton & Loguidice, D.P.C.
Engineers • Environmental Scientists • Planners • Landscape Architects

1 inch = 12,000 feet

City of Glens Falls
Regional Biosolids Management Evaluation
Project Location Map
Warren County March 2016 New York

Figure 1
Project No. 1338.011



LEGEND

☐ EXISTING

■ PROPOSED

CITY OF GLENS FALLS
REGIONAL BIOSOLIDS MANAGEMENT EVALUATION

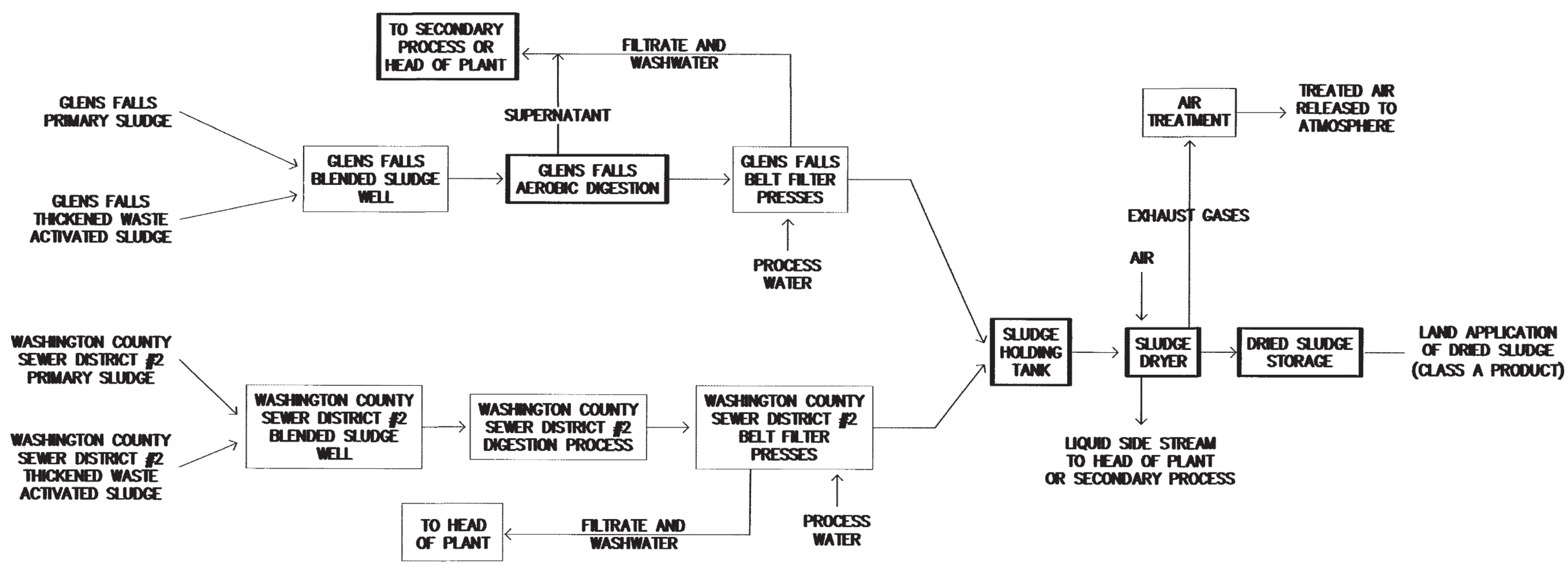
ALTERNATIVE 1:
COMPOSTING

WARREN COUNTY, NEW YORK

Barton & Loguidice, D.P.C.

Date	JUNE 2016
Scale	NO SCALE
Figure Number	2
Project Number	1338.011.001

File Name: AGC FLOWCHARTS (ID 943388).dwg.dwg Project No.: 1338.011.001 Project Name: UPPER HUDSON RIVER REVITALIZATION PROJECT
Checked by: JAB Drawn by: CEP Designed by: AJM In Charge of: DHF Last Saved: 6/23/2016



LEGEND

☐ EXISTING

☐ PROPOSED

CITY OF GLENS FALLS

REGIONAL BIOSOLIDS MANAGEMENT EVALUATION

ALTERNATIVE 2: SLUDGE DRYING

WARREN COUNTY, NEW YORK

Barton & Loguidice, D.P.C.

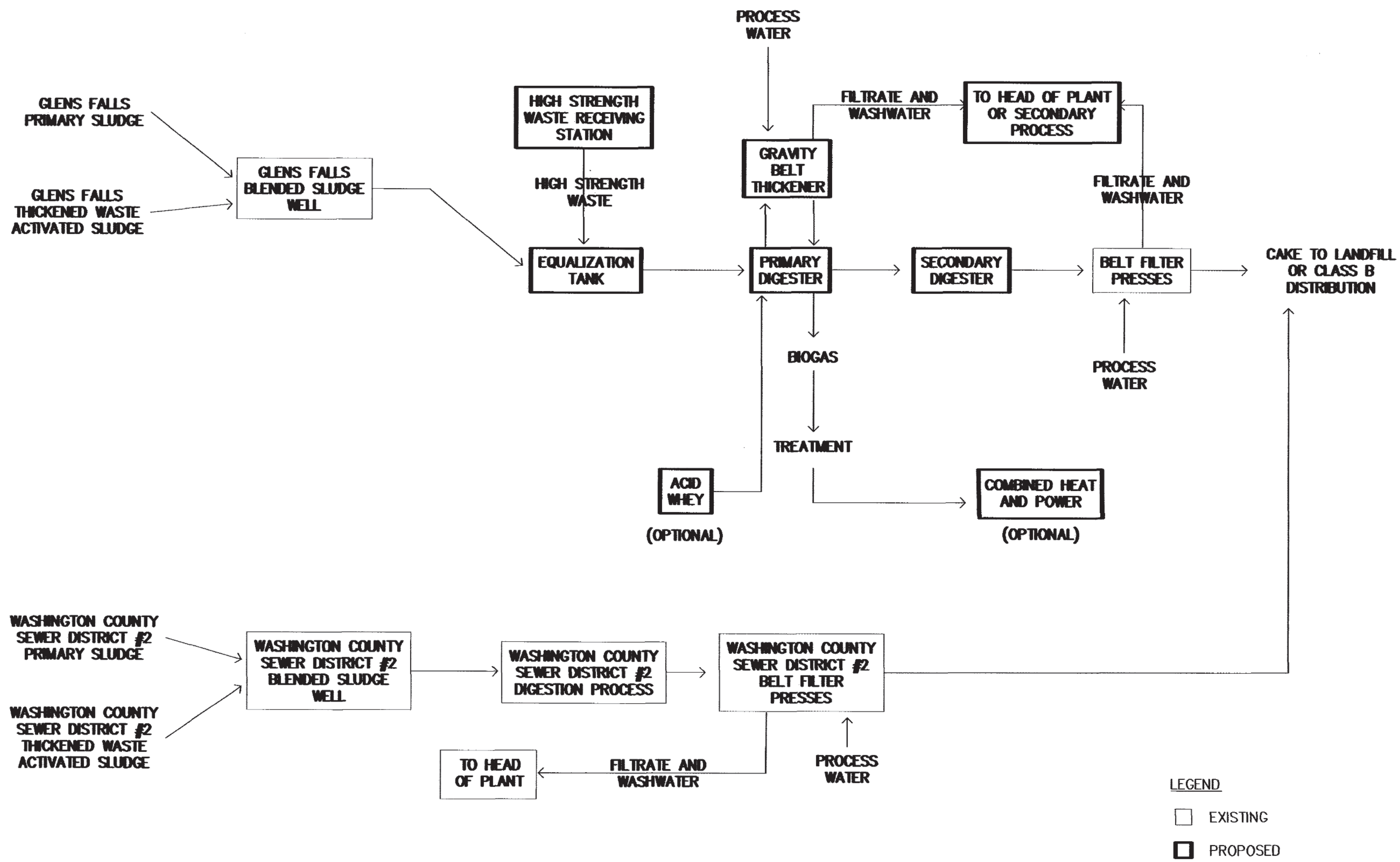
Date	JUNE 2016
Scale	NO SCALE
Figure Number	3
Project Number	1338.011.001

File Name: AGC FLOWCHARTS (ID 943388).dwg.dwg   Project No.: 1338.011.001   Project Name: UPPER HUDSON RIVER REVITALIZATION PROJECT
Checked by: JAB   Drawn by: CEP   Designed by: AJM   In Charge of: DHF   Last Saved: 6/23/2016

CITY OF GLENS FALLS
REGIONAL BIOSOLIDS MANAGEMENT EVALUATION

ALTERNATIVE 3A: ANAEROBIC DIGESTION

WARREN COUNTY, NEW YORK



Barton & Loguidice, D.P.C.

Date	JUNE 2016
Scale	NO SCALE
Figure Number	4A
Project Number	1338.011.001

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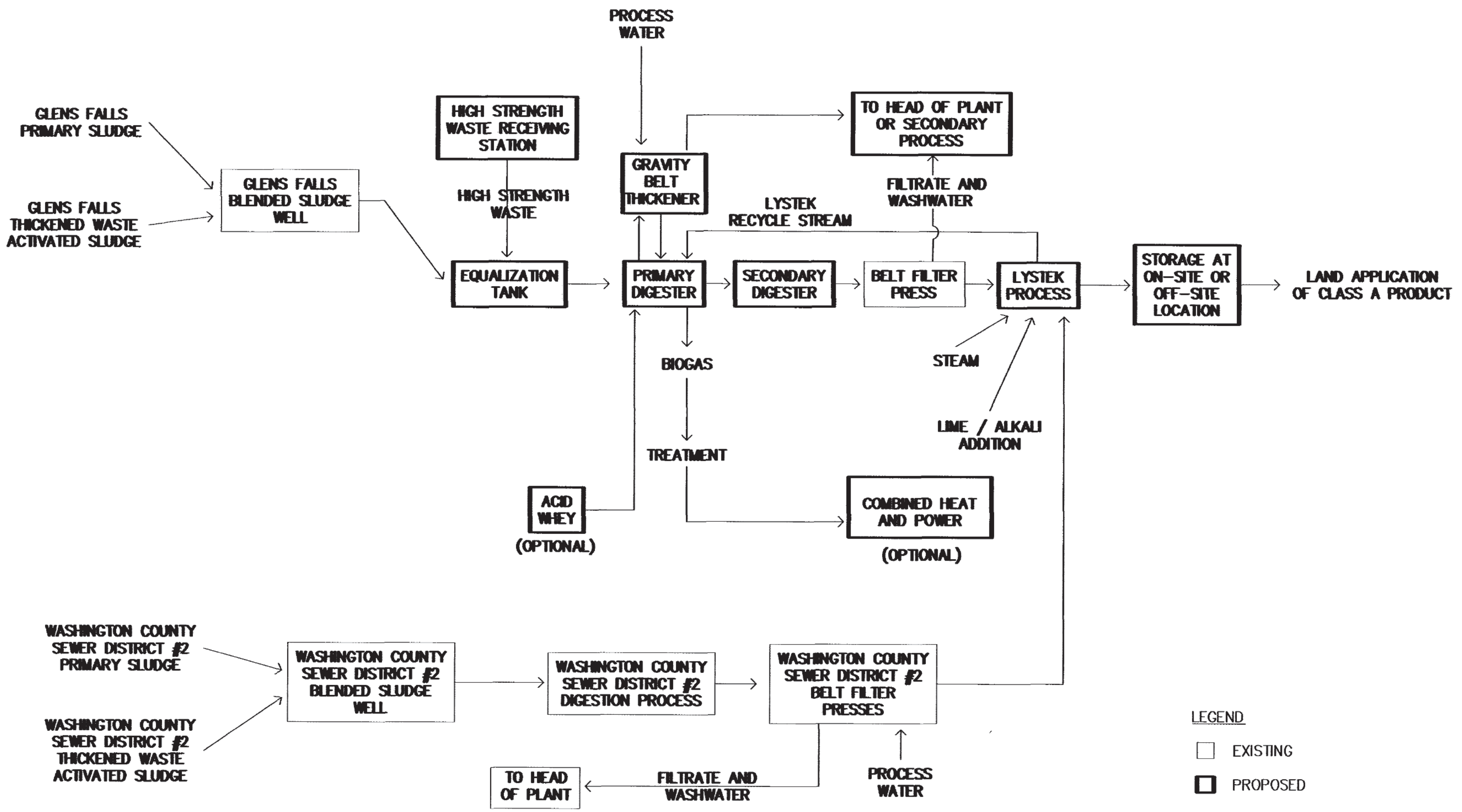
Checked by: JAB   Drawn by: CEP   Designed by: AJM   In Charge of: DHF   Last Saved: 6/23/2016



CITY OF GLENS FALLS

REGIONAL BIOSOLIDS MANAGEMENT EVALUATION

ALTERNATIVE 3B: ANAEROBIC DIGESTION WITH LYSTEK PROCESS

WARREN COUNTY, NEW YORK

Barton & Loguidice, D.P.C.

Date	JUNE 2016
Scale	NO SCALE
Figure Number	4B
Project Number	1338.011.001

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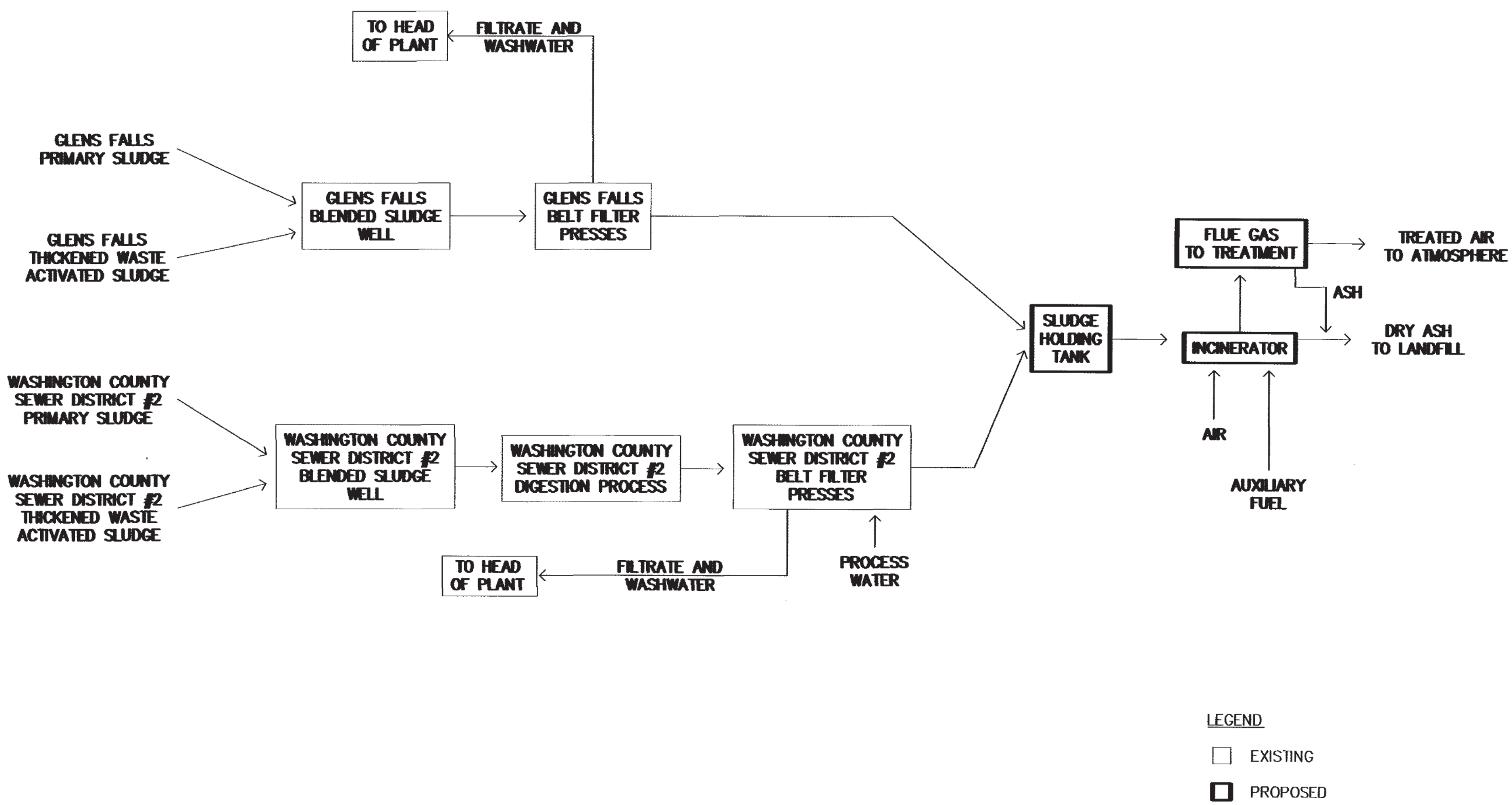


CITY OF GLENS FALLS
REGIONAL BIOSOLIDS MANAGEMENT EVALUATION

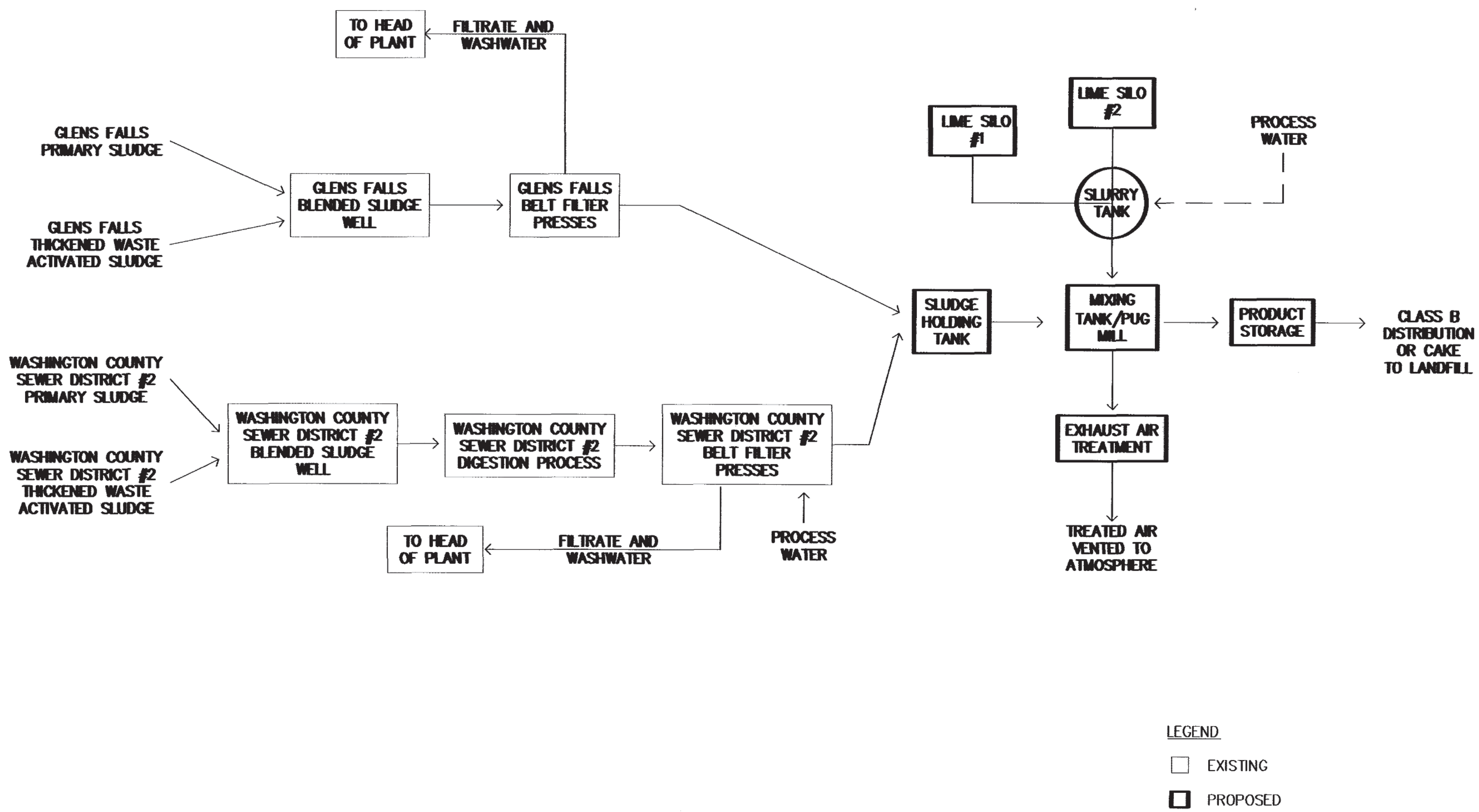
ALTERNATIVE 4:
INCINERATION

WARREN COUNTY, NEW YORK

Barton & Loguidice, D.P.C.

Date	JUNE 2016
Scale	NO SCALE
Figure Number	5
Project Number	1338.011.001

File Name: AGC FLOWCHARTS (ID 943388).dwg.dwg Project No.: 1338.011.001 Project Name: UPPER HUDSON RIVER REVITALIZATION PROJECT
Checked by: JAB Drawn by: CEP Designed by: AJM In Charge of: DHF Last Saved: 6/23/2016



CITY OF GLENS FALLS
REGIONAL BIOSOLIDS MANAGEMENT EVALUATION

ALTERNATIVE 5: LIME STABILIZATION

WARREN COUNTY, NEW YORK

Barton & Loguidice, D.P.C.

Date	JUNE 2016
Scale	NO SCALE
Figure Number	6
Project Number	1338.011.001

File Name: AGC FLOWCHARTS (ID 943388).dwg.dwg Project No.: 1338.011.001 Project Name: UPPER HUDSON RIVER REVITALIZATION PROJECT
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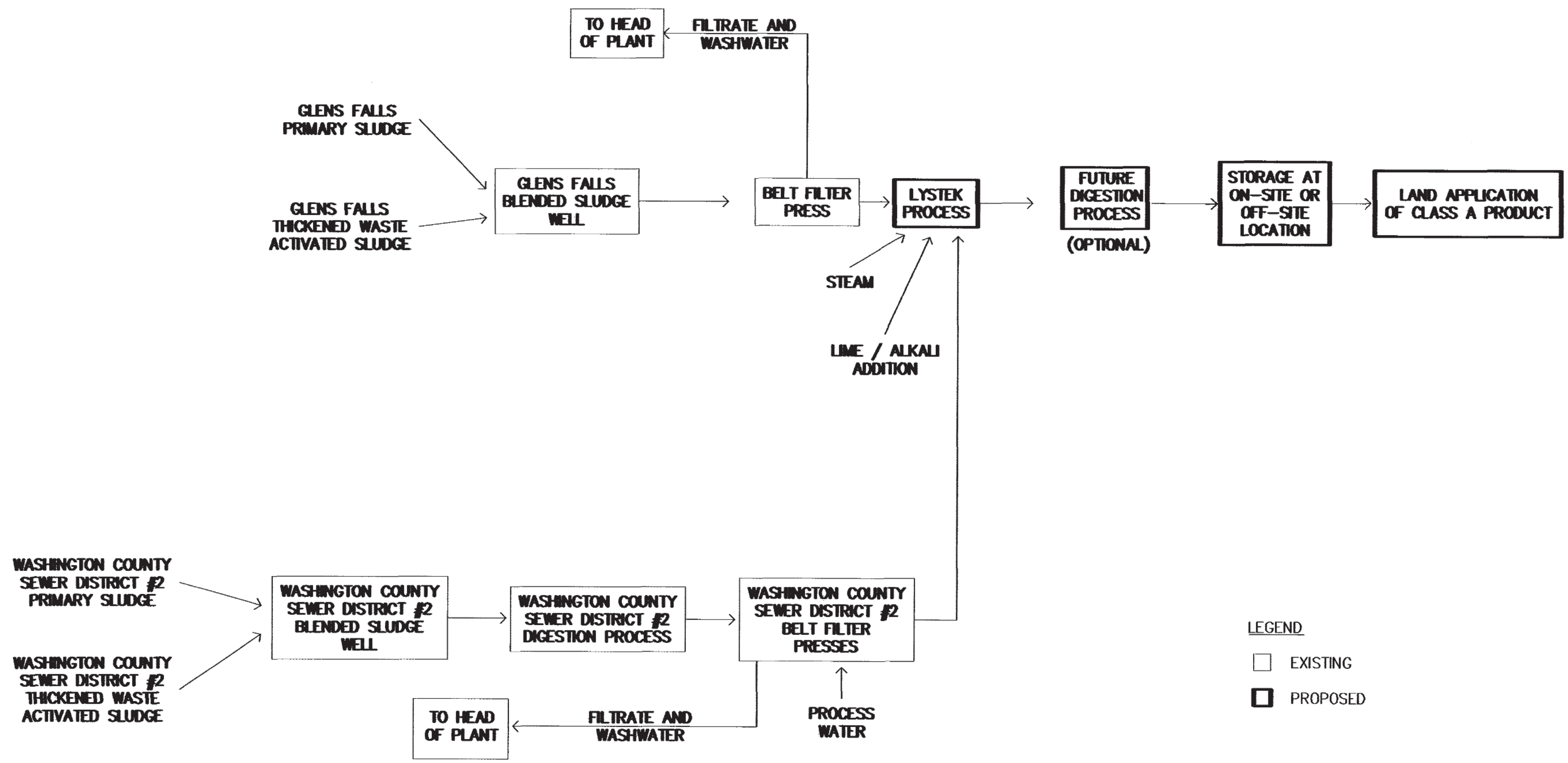

CITY OF GLENS FALLS
REGIONAL BIOSOLIDS MANAGEMENT EVALUATION

ALTERNATIVE 6:
LYSTEK PROCESS

WARREN COUNTY, NEW YORK

Barton & Loguidice, D.P.C.

Date	JUNE 2016
Scale	NO SCALE
Figure Number	7
Project Number	1338.011.001

File Name: AGC FLOWCHARTS (ID 943388).dwg.dwg Project No.: 1338.011.001 Project Name: UPPER HUDSON RIVER REVITALIZATION PROJECT
Checked by: JAB Drawn by: CEP Designed by: AJM In Charge of: DHF Last Saved: 6/23/2016

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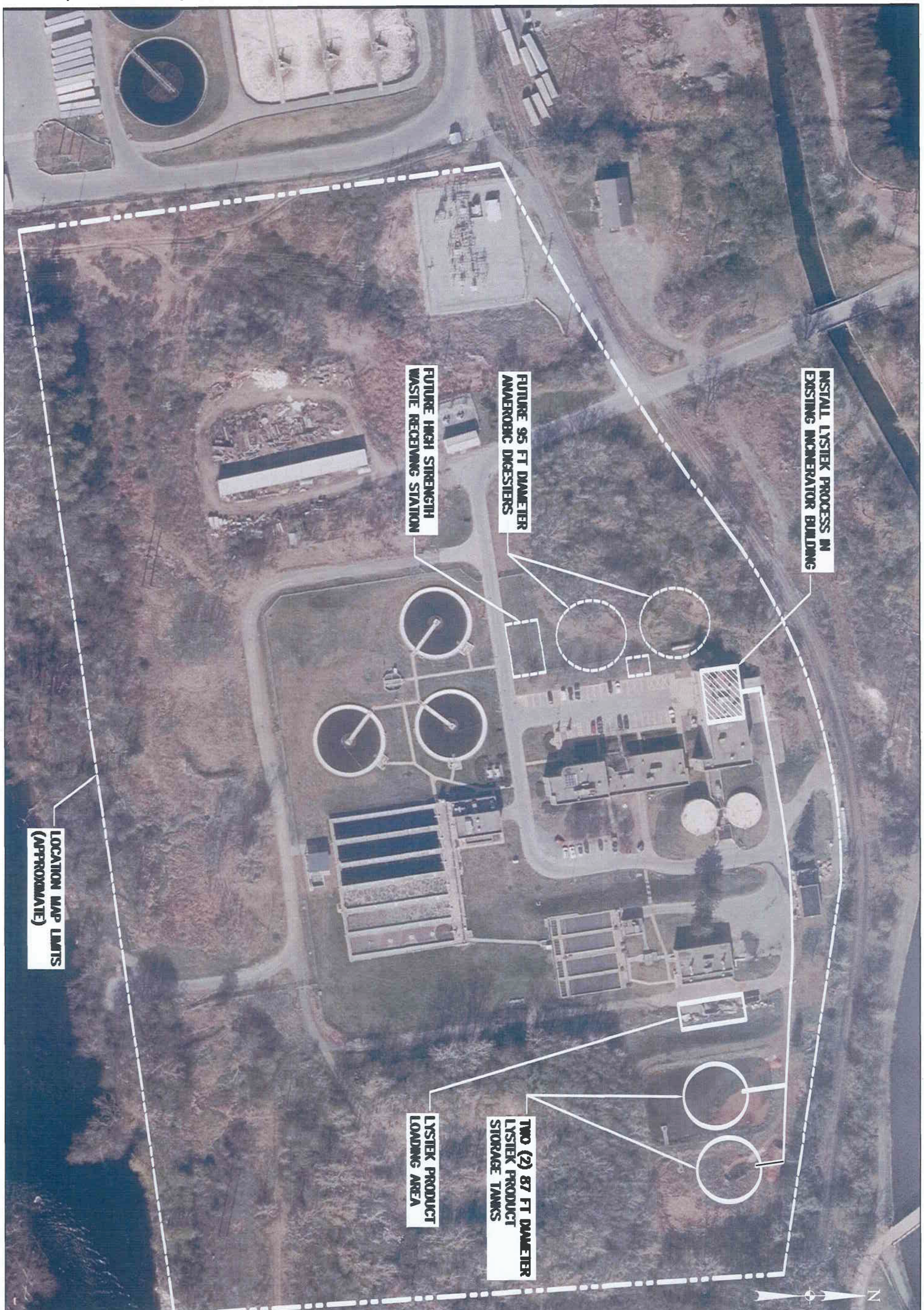

Project Number 1338.011.001	Figure Number 8	Scale NO SCALE	Date JUNE 2016	Barton & Loguidice, D.P.C.

CITY OF GLENS FALLS
REGIONAL BIOSOLIDS MANAGEMENT EVALUATION

RECOMMENDED ALTERNATIVE
CONCEPT SITE PLAN

WARREN COUNTY, NEW YORK

Appendix A

Biosolids Production Mass Balance Calculations

Barton & Loguidice
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JOB	1626.001.001		
SHEET NO.	1	OF	1
CALCULATED BY	AJM	DATE	2/14/2016
CHECKED BY	JAB	DATE	
SUBJECT	Glens Falls Sludge Production		

Data - compare

Parameter	Value	Source
Total Biosolids Disposal in 2012 (metric ton/yr)	2,343	DMR Data 12/31/2012
Total Biosolids Disposal in 2012 (lbs/yr)	5,165,472	calc
Average Biosolids Disposal in 2012 (lb/d)	14,152	calc

Flows and Loads

	CDM Smith Existing	Existing	Proposed
ADF to WTP (MGD)	5.3	4.04	6.51
Ciba-Geigy (joins downstream of PSTs)	0.08		
Peak 6-Hour Flow to WWTP (MGD)		13.1	18.04
BOD Loading (lb/d)	6429	4646	16508
TSS Loading (lb/d)	8850	6146	14371
TKN Loading (lb/d)	920	701	1928
TKN Loading (mg/L)	20.8	20.8	20.8

SPDES Permit Limits	
Flow (MGD)	9.5
BOD Monthly Avg (mg/L)	25
BOD Monthly Avg (lb/d)	1981
TSS Monthly Avg (mg/L)	30
TSS Monthly Avg (lb/d)	2377
Plant Effluent TSS (lb/d) Average	*162.6*
Plant Effluent BOD (mg/L) Average	*3.91*

Calculation

Process	CDM Smith Existing	B&L Existing	B&L Future	Notes
Sludge Receiving				
Volume (GPD)	7,000	51,930	51,930	*From 2015 Acceptance Data, 71% septage*
BOD (lb/d)	350	2,599	2,599	*Assume typical value for septage of 6,000 mg/L per Table 3-17 from Metcalf & Eddy, 3rd Edition.*
TSS (mg/L)	20,000.00	15,000.00	15,000.00	*LTCP assumed 2% solids, similar to existing plant sludge. B&L assumed 15000 mg/L from Table 3-17 of Metcalf and Eddy, 3rd Edition.*
TSS (lb/d)	1,103	6,496	6,496	
VSS (lb/d)	515	3,032	3,032	*Assume 7000 mg/L from Table 3-17 of Metcalf and Eddy, 3rd Edition.*
TKN (lb/d)	41	303	303	*Assume typical value for septage of 700 mg/L per Table 3-17 from Metcalf & Eddy, 3rd Edition.*
Percent Solids	1.85%	1.49%	1.49%	*Assumed 2% solids.*
Total Mass (lbs)	59,499	435,295	435,295	
Total Municipal Wastewater and Sludge Flows/Loads to Headworks				
Volume (MGD)	5.3	4.1	6.6	
BOD (lb/d)	6,779	7,245	19,107	
TSS (lb/d)	9,953	12,642	20,867	
TKN (lb/d)	960	1,004	2,231	
Primary Sludge				
Volume (GPD)	30,733	44,573	73,571	*Assume 1.02 for specific gravity of sludge from Table 12-7 of Metcalf and Eddy, 3rd Edition.*
TSS (lb/d)	6,669	9,482	15,651	*Assume 3/4 of TSS taken out through PS. Plant data from 2007-2009 shows TSS remval of 67% in primary settling, per LTCP.*
VSS (lb/d)	4,335	6,163	10,173	*Assume 65% for percent volatile soilids (of TS) from Table 12-4 of Metcalf and Eddy, 3rd Edition.*
Percent Solids	2.5%	2.5%	2.5%	*Per Operator, 2.5%.*
Total Mass (lbs)	261,510	379,275	626,025	
WAS				
WAS Volume (GPD)	29,012	30,329	81,272	*Assume 1.005 for specific gravity of sludge from Table 12-7 of Metcalf and Eddy, 3rd Edition.*
AT Influent TSS (lb/d)	3,122	2,998	5,054	*Assume Remainder of TSS minus SPDES Permit Limit*
AT Influent VSS (lb/d)	2,295	2,204	3,715	*Assume average of range (59-88%) from Table 12-4 of Metcalf and Eddy, 3rd Edition = 73.5%*
WAS Percent Solids	1.2%	1.2%	1.2%	*Per Operator, 1.2%*
WAS Total Mass (lbs)	242,145	253,142	678,332	
BOD to Aeration Tanks (mg/L)	104	142	233	*Assume Primary Settling removes 1/3 of BOD. LTCP assumes 31%.*
Yobs, VSS Yield	0.482	0.482	0.482	*EQN 8-44, Metcalf and Eddy on pg 593, 3rd Edition: assumed Y=0.6 and kd =0.06 from Table 8-7. Assumed SRT = 4.1 days from LTCP*
Total Yield, lb/lb BOD	0.655	0.655	0.655	*Assume average of range (59-88%) from Table 12-4 of Metcalf and Eddy, 3rd Edition = 73.5%*
WAS TSS, lb/d	2,906	3,038	8,140	*Difference most likely accounted for in Ciba-Geigy Flow. CDM Smith calculated WAS TSS based on Operating Data, not Yield. CDM Smith calculated WAS TSS at 4,271 lb/d. Ciba-Geigy load estimated based on difference.*
WAS TSS, lb/d	4,416	4,636	-	*Averages from 2012 - 2013 DMRs for Glens Falls*
Est. Ciba Geigy TSS to WAS, lb/d	1,510	1,598	1,598	*Assume Ciba Geigy Flow does not increase, therefore solids from Ciba Geigy do not increase*
Total WAS TSS, lb/d	4,416	4,636	9,738	*WAS TSS + Ciba Geigy WAS TSS*
Thickening Effluent				
Solids Capture Rate	97%	97%	97%	*From BDP as noted in CDM Smith LTCP*
TWAS Concentration	4%	4%	4%	*Assume 4% per CDM Smith LTCP*
Volume (gal)	12,830	13,468	28,293	
TSS (lb/d)	4,284	4,497	9,446	
VSS (lb/d)	3,148	3,305	6,943	*Assume average of range (59-88%) from Table 12-4 of Metcalf and Eddy, 3rd Edition = 73.5%*
Percent Solids	4%	4%	4%	
Total Mass (lbs)	111,318.00	116,853.04	245,470.97	
Blended Sludge Tank				
Sludge Solids to BFP, lb/d	*10,952*	*13,978*	*25,096*	
Sludge to BFP, GPD	*43,563.45*	*58,041.24*	*101,864.03*	
Sludge to BFP, Solids Percent	*4.50%*	*4.50%*	*4.50%*	
VSS% of Sludge to BFP	*68.3%*	*67.7%*	*68.2%*	
BFP				
Solids Capture Rate	95%	95%	95%	*From BDP as noted in CDM Smith LTCP*
Total Solids Mass (Dry), lb/d	10,404	13,279	23,842	
BFP Cake Concentration	18.9%	18.9%	18.9%	*As Noted in LTCP*
Total Mass (Wet), lb/d	55,050	70,262	126,146	
VSS, lb/d	7,483	9,468	17,116	
ISS, lb/d	2,922	3,811	6,726	
Total Volume, CFD	854	1,089	1,957	
Total Volume, GPD	6,389	8,148	14,638	
Specific Gravity of Solids	1.20	1.21	1.20	*Assumed*
Specific Gravity of Sludge	1.03	1.03	1.03	*Assumed*
Blended Sludge Tank (w/out Sludge Receiving)				
Sludge Solids to BFP, lb/d	*10,213*	*9,106*	*20,249*	
Sludge to Belt Filter Press, GPD	*40,158*	*35,137*	*79,035*	
Sludge to Digester, Solids Percent	*2.54%*	*1.56%*	*2.12%*	
VSS% of Sludge to Digester	*68.57%*	*69.20%*	*68.98%*	
BFP (w/out Sludge Receiving)				
Solids Capture Rate	95%	95%	95%	*From BDP as noted in CDM Smith LTCP*
Total Solids Mass (Dry), lb/d	9,702	8,651	19,237	
BFP Cake Concentration	18.9%	18.9%	18.9%	*As Noted in LTCP*
Total Mass (Wet), lb/d	***51,335***	***45,771***	***101,781***	
VSS, lb/d	7,003	6,301	13,967	
ISS, lb/d	2,700	2,350	5,270	
Total Volume Hauled, CFD	797	711	1,580	
Total Volume Incinerated, GPD	***5,959***	***5,318***	***11,822***	
Specific Gravity of Solids	1.20	1.19	1.20	*Assumed*
Specific Gravity of Sludge	1.03	1.03	1.03	*Assumed*

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JOB	1626.001.001		
SHEET NO.	1	OF	1
CALCULATED BY	AJM	DATE	3/28/16
CHECKED BY	JMB	DATE	
SUBJECT	WCSD#2 Sludge Production		

Data - compare

Parameter	Value	Source
Total Biosolids Disposal in 2014 (metric ton/yr)	174	DMR Data
Total Biosolids Disposal in 2014 (lbs/yr)	382,726	calc
Average Biosolids Disposal in 2014 (lb/d)	1,049	calc

Flows and Loads

	CDM Smith Existing	Existing*	Future
ADF to WTP (MGD)	2.2	1.89	3.18
Peak 6-Hour Flow to WWTP (MGD)		6.12	8.70
BOD Loading (lb/d)	3769	2183	7,083
TSS Loading (lb/d)	5614	2771	7,640
TKN Loading (lb/d)		403	1,119

SPDES Permit Limits	
Flow (MGD)	2.5
BOD Monthly Avg (mg/L)	30
BOD Monthly Avg (lb/d)	626
TSS Monthly Avg (mg/L)	30
TSS Monthly Avg (lb/d)	626
Plant Effluent TSS (lb/d) Average	*134*
Plant Effluent BOD (mg/L) Average	*12.64*

Calculation

Process	CDM Smith Existing	B&L Existing	B&L Future	Notes
Primary Sludge				
Volume (GPD)	13,098	6,106	16,835	*Assume 1.02 for specific gravity of sludge from Table 12-7 of Metcalf and Eddy, 3rd Edition.*
TSS (lb/d)	4,547	2,078	5,730	*Assume 3/4 of TSS taken out through PS. Plant data from 2007-2009 shows TSS remval of 81% in primary settling, per LTCP.*
VSS (lb/d)	2,956	1,351	3,725	*Assume 65% for percent volatile soilids (of TS) from Table 12-4 of Metcalf and Eddy, 3rd Edition.*
Percent Solids	4%	4%	4%	*Assume 4% per JB comment (<5%).*
Total Mass (lbs)	111,454	51,956	143,250	
WAS				
WAS Volume (GPD)	16,302	15,000	36,543	*Assume 1.005 for specific gravity of sludge from Table 12-7 of Metcalf and Eddy, 3rd Edition. Existing, data from Operator used.*
AT Influent TSS (lb/d)	933	N/A	1,776	*Assume Remainder of TSS minus SPDES Permit Limit*
AT Influent VSS (lb/d)	686	N/A	1,305	*Assume average of range (59-88%) from Table 12-4 of Metcalf and Eddy, 3rd Edition = 73.5%*
WAS Percent Solids	0.995%	0.995%	0.995%	*Assume average of range (0.83-1.16%) from Table 12-4 of Metcalf and Eddy, 3rd Edition = 0.995%*
Ss		1.189		
Ssl		1.002		
WAS Total Mass (lbs)	136,065	125,332	305,003	
BOD to Aeration Tanks (mg/L)	103	N/A	178	*Assume Primary Settling removes 1/3 of BOD. CDM Smith assumed 1/2.*
Yobs, VSS Yield	0.639	N/A	0.508	*EQN 8-44, Metcalf and Eddy on pg 593, 3rd Edition: assumed Y=0.6 and kd =0.06 from Table 8-7. Assumed SRT = 3 days from LTCP*
Total Yield, lb/lb BOD	0.819	N/A	0.692	*Assume average of range (59-88%) from Table 12-4 of Metcalf and Eddy, 3rd Edition = 73.5%*
WAS TSS, lb/d	1,354	1,247	3,035	
Thickening Effluent				
Solids Capture Rate	95%	95%	95%	*Assume 95% capture rate from BDP GBT*
TWAS Concentration	4%	5.5%	5.5%	*Assume 5-6% per JB comment.*
Volume (GPD)	3,852.41	2,581	6,280	
TSS (lb/d)	1,286	1,185	2,883	
VSS (lb/d)	945.32	871	2,119	*Assume average of range (59-88%) from Table 12-4 of Metcalf and Eddy, 3rd Edition = 73.5%*
Percent Solids	4%	6%	6%	
Total Mass (lbs)	33,423.91	22,714	55,276	
Blended Sludge Well				
Sludge Solids to Digester, lb/d	***5,833***	***2,833***	***8,613***	*From Plant Operation Data for 2014-2015**
Sludge to Digester, GPD	***16,951***	***7,856***	***23,115***	*From Plant Operation Data for 2014-2015*
Sludge to Digester, Solids Percent	***4.77%***	***4.31%***	***4.73%***	*From Plant Operation Data for 2014-2015*
VSS% of Sludge to Digester	***77.0%***	***84.8%***	***67.85%***	*From Plant Operation Data for 2014-2015*
Digesters				
VSS to Digester, lb/d	4,492	2,402	5,844	
ISS to Digester, lb/d	1,342	431	2,770	
VSS Reduction	52%	76%	40%	*Assume 40% per JB comment for future, for existing use 76%, average of 2014 and 2015 data.*
VSS to BFP, lb/d	2,156	577	3,506	
Total Solids to BFP, lb/d	3,498	1,007	6,276	
Flow to BFP, gpd	16,951	7,856	23,115	*Assume no decanting per discussions with Operator.*
Percent Solids	2.41%	1.90%	3.15%	*Assume 1.9% from 2014 to 2015 average data for existing. For Future, calculated value.*
Total Mass (lbs)	144,905	66,544	199,110	*Assume specific gravity of 1.02*
BFP				
Solids Capture Rate	95%	95%	95%	*From BDP as noted in CDM Smith LTCP*
Solids Hauled, lb/d	3,323	600	5,962	*From 2015 average for Existing, calculated for Future.*
BFP Cake Concentration	17.0%	17.0%	17.0%	*From 2014-2015 average*
Total Mass Hauled, lb/d	19,546	3,520	35,070	*From 2015 average for Existing, calculated for Future.*
VSS, lb/d	2,156	415	3,506	From 2015 average for Existing, calculated for Future.
ISS, lb/d	1,167	185	2,456	
Total Volume Hauled, CFD	302	55	538	
Total Volume Hauled, GPD	2,259	409	4,027	
Specific Gravity of Solids	1.27	1.23	1.33	*Assumed*
Specific Gravity of Sludge	1.04	1.03	1.04	*Assumed*

**Note: Existing loads from Sewer Infrastructure Assessment were based on 2012 data. The most recent data for the digesters (2014-2015) was utilized in lieu of solids projections from the existing loads developed in the Sewer Infrastructure Assessment.*

Appendix B

High Strength Waste Survey Log

Potential High Strength Waste Client Survey Results

Business	Business Type		Phone Number	Account	Caller	Contact Information (who was talked to,when did you call, did you leave a voicemail?)	Yes/No	Notes/Results	Assumption Basis	Amount of Septage (GPD)	Amount of Fats, Oils and Grease (FOG) (GPD)	Amount of Whey (Cheese or Yogurt) (GPD)	Status
Word of Life	?	?	?	SH093									
A Ameri-can Rental	?	?	?	SH022									Inactive
Cross Brothers Industries	?	?	?	SH039									Inactive
Marlin Environmental, Inc.	?	3935 Commerce Drive St. Charles, IL 60714	(603)444-1933	SH006	AJM	left message							Inactive
Mr. Yogi Garcia	?	?	?	SH090									Inactive
Waste Stream Environmental	2 results, one in Jordan NY, one i	640 Bridge Street Holyoke, MA 01040	(413)534-0666	SH019	AJM	Not in Service	No						Inactive
Cooper's Cave Ale Company	Beer & Ale	2 Sagamore St Glens Falls, NY	(518) 792-0007		ARD	Patty	No	Goes to Farmer for Biodiesel					
Paradox Brewery	Beer & Ale	154 US Route 9 Schroon Lake, NY	(518) 351-5036		JCM, AJM		No	Spent Grain Hauled to Farmers for Free					
American Brewers Guild	Beer & Ale-Wholesale & Manufacturers	1001 Maple St Salisbury, VT 05769	(802) 352-4200		JCM, AJM	Christine	No	This is a school, no brewing done on site					
Common Roots Brewing Co	Beer & Ale-Wholesale & Manufacturers	58 Saratoga Ave South Glens Falls, NY 12803	(518) 409-8248		JCM	Bert.	No	Spent Grain - Dairy Farmer					
Foley Brothers Brewing Co	Beer & Ale-Wholesale & Manufacturers	79 Stone Mill Dam Rd Brandon, VT 05733	~~(802) 247-8002~~, 802-465-8413		JCM, AJM	Patrick	Maybe	Hops and yeast are produced: approx. 150-180 gallons per week. Would be interested in we would send someone to pick up, but they probably would not be interested if he would have to hire someone to take it. He will run it by his operations team and will contact us if they are interested.		0	0	0	
Northshire Brewery	Beer & Ale-Wholesale & Manufacturers	108 County St Bennington, VT 05201	(802) 681-0201		JCM		No	not interested					
Otter Creek Brewing Inc	Beer & Ale-Wholesale & Manufacturers	793 Exchange St Middlebury, VT 05753	(802) 388-0727		JCM, AJM	Ext. 311, left message							
Saratoga Eagle Sales & Service	Beer & Ale-Wholesale & Manufacturers	45 Duplainville Rd Saratoga Springs, NY 12866	(518) 581-7377		JCM		No	Warehouse/Distribution					
Argyle Brewing Company	Beverages	1 Main St Greenwich, NY	(518) 692-2585		JCM, AJM	Left message							
Olde Saratoga Brewing Co Olde Saratoga Brewing Co	Beverages	131 Excelsior Ave Saratoga Springs, NY	(518) 581-0492		JCM, AJM	Bill, 302, left message							
Davidson Brothers Brewing	Brew Pubs	184 Glen St Glens Falls, NY	(518) 743-9026		JCM	Ella, 223-0372	No	Call Brewery, No Need for it					
Druthers Brewing Co	Brew Pubs	381 Broadway Saratoga Springs, NY	(518) 306-5275		JCM	Matt	No	Sewage to Mun. Grains to Dairy					
Champlain Beef	Butchering	9679 US Rt 4 Whitehall, NY 12887	(518) 499-1895		JCM	Secretive	No	not interested					
Chapparals Farm	Butchering	543 Lamb Hill Rd Wells, VT 05774	(802) 325-2461		JCM	did not know much	No	scrap hauled away/liquid manure					
Edward's Market	Butchering	11 W Main St Granville, NY 12832	(518) 642-2224		JCM		No	garbage to waste management					
Meat House	Butchering	3057 Route 50 Ste 7 Saratoga Springs, NY 12866	(518) 583-4027		JCM, AJM		No	They have no waste					
Oscar's Smokehouse	Butchering	22 Raymond Ln Warrensburg, NY 12885	(518) 623-3431		JCM	Paul	No	Grease pumped 2 weeks, hauled away					
Saratoga Primal Your Local Butcher	Butchering	3057 Route 50 Saratoga Springs, NY 12866	(518) 306-4971		JCM		No	Carcus disposal/no liquid blood, down drain					
The Vermont Butcher	Butchering	4764 Main St Manchester Center, VT 05255	(802) 768-8390		JCM, AJM	Left message							
Plymouth Artisan Cheese	Cheese	106 Messer Hill Rd Plymouth, VT	(802) 672-3650		AJM		No	They dispose of cheese whey on site, they have a land application permit. They suggested we call Grafton Village Cheese or Cabot, as both are larger operations and may have disposal needs.					
Taylor Farm	Cheese	825 Vt Route 11 Londonderry, VT	(802) 824-3600		AJM		No	They dispose of cheese whey. It does not cost them, they either feed it to their pigs or put it down the drain.					
Adirondack Community College	Colleges & Universities	410 Bay Rd Queensbury, NY 12804	(518) 743-2273										
Adirondack Community College Saratoga County Extension Ctr	Colleges & Universities	696 Saratoga Rd Gansevoort, NY 12831	(518) 584-3959										
Empire State College	Colleges & Universities	2 Union Ave Saratoga Springs, NY 12866	(518) 587-2100										
Green Mountain College	Colleges & Universities	1 Brennan Cir Poultney, VT 05764	(802) 287-4268										
Skidmore College	Colleges & Universities	815 N Broadway Saratoga Springs, NY 12866	(518) 580-5000										
Suny College At Pittsburgh	Colleges & Universities	640 Bay Rd Queensbury, NY 12804	(518) 792-5425		JCM	same as SUNY ADK		(ace)					
Adirondack Community College	Colleges & Universities	640 Bay Rd Queensbury, NY 12804640 Bay Rd	(518) 743-2200										
Cornell Cooperative Extension Warren County	County & Parish Government	17 Hudson St Warrensburg, NY 12885	(518) 623-3291										
Blissful Dairy	Dairies	1480 Middle Rd Bridport, VT 05734	(802) 758-2191		AJM	busy signal (2 calls)							
King Brothers Dairy	Dairies	311 King Rd Schuylerville, NY 12871	(518) 695-6455		AJM		No	They do not generate					
Thomas Dairy	Dairies	RR 7 Rutland, VT 05701	(802) 773-6788		AJM	left message	No	They do not generate					

Potential High Strength Waste Client Survey Results

Business	Business Type		Phone Number	Account	Caller	Contact Information (who was talked to,when did you call, did you leave a voicemail?)	Yes/No	Notes/Results	Assumption Basis	Amount of Septage (GPD)	Amount of Fats, Oils and Grease (FOG) (GPD)	Amount of Whey (Cheese or Yogurt) (GPD)	Status
Vermont Milk & Cream Co Inc	Dairies	60 Prospect St Fair Haven, VT 05743	(802) 265-4918		AJM	called, no answering machine							
Garrison Frank O Dairy	Dairies	247 Middleline Rd Ballston Spa, NY 12020	(518) 885-9500		AJM	called, no answering machine							
Mill Brook Dair Y Farms Ll	Dairies	65 Master St Valley Falls, NY 12185	(518) 753-2048		AJM	busy signal							
Skiff's Dairy	Dairies	188 County Highway 106 Johnstown, NY 12095	(518) 762-1456		AJM		NO	they do not dispose off site					
Argyle Cheese Farmer	Dairy Products	990 Coach Road Argyle, NY 12809	(518)638-8966		AJM	very interested	YES	moving to a new location this year, at which point they would be interested in disposing their waste (yogurt whey, cheese whey and gray water). Contact information was acquired. They estimated 550 gallons/week, but it could double as their business expands.		0	0	79	
Battenkill Valley Creamery	Dairy Products	691 County Route 30 Salam, NY 12865	(518) 854-9400		AJM		NO	they do not have any waste streams, pull fat from milk and use it to make the heavy cream					
Cabot Creamery	Dairy Products	Middlebury, VM, Cabot VM, West Springfield, MA and Chateaugay, NY	802-388-6731		AJM	left message							
Grafton Village Cheese	Dairy Products	Brattleboro, VT	800-472-3866		AJM		No	They do not generate					
G E Foster Bulk Milk Transpo	Dairy Products	54 Foster Ln Shushan, NY 12873	(518) 854-3797		ARD, AJM	Kept ringing for over a minute							
Nettle Meadow	Dairy Products	484 S Johnsburg Rd Warrensburg, NY 12885	(518) 623-3372		ARD, AJM	Left Message							
Stewart's Ice Cream Plant	Dairy Products	461 Church St Saratoga Springs, NY 12866	(518) 581-1300		ARD, AJM	LM with John							
Vermont Milk & Cream	Dairy Products	2474 Vt Route 22A Fair Haven, VT 05743	(802) 265-9040		ARD	Not in Service							
Richview Farms	Dairy Products	4424 State Route 40 Argyle, NY 12809	(518) 638-8357		ARD	Owner	No	Does not apply, Local Dairy Farmer					
Precision Industrial Main	Enviromental Program	1710 Erie Blvd. Schenectady, NY 12308	(518)346-5800	SH003	ARD, AJM	LM with Lynn Ferrial							Inactive
Bradley's Septic Service	Excavation Contractors	47 Hack Rd Corinth, NY 12822	(518) 654-6318		ARD, AJM	left message							
~~Beech-Nut Nutrition Corp~~	~~Food Processing & Manufacturing~~	~~100 Hero Dr Amsterdam, NY 12010~~	~~(518) 595-6600~~										
Damn Good Foods	Food Processing & Manufacturing	1002 Hudson Ave Stillwater, NY 12170	(518) 664-1414		AJM		No	They do not generate					
Green Sugar House	Food Processing & Manufacturing	1846 Finel Hollow Rd Poultney, VT 05764	(802) 287-9433		AJM	Left message							
Greenfield's Greatest Food Co	Food Processing & Manufacturing	39 Northern Pines Rd Gansevoort, NY 12831	(518) 584-4036		AJM	Left message							
Old Cavendish Products	Food Processing & Manufacturing	93 Densmore Rd Cavendish, VT 05142	(802) 226-7783		AJM	Left message							
Vermont Fresh	Food Processing & Manufacturing	2568 Route 103 Cavendish, VT 05142	(802) 226-7580		AJM		No	They do not generate					
Kraft Foods	Food Processing & Manufacturing	6 Wayne Ct Queensbury, NY 12804	(518) 743-9016		AJM	Not in Service	no						
Cargill Inc	Food Products-Wholesale	10 Peabody Pl Gansevoort, NY 12831	(518) 587-5251		AJM	Not in Service	no						
Dobert's Dairy	Food Products-Wholesale	68 3rd St Glens Falls, NY 12801	(518) 792-3415		AJM		No	They do not generate					
Frito-Lay	Food Products-Wholesale	14 Morse Rd Bennington, VT 05201	(802) 447-0071		AJM	Not in Service	No						
Tropical Aquaculture Products Inc	Food Products-Wholesale	63 Grove St Rutland, VT 05701	(802) 747-6311		AJM		No	They do not generate					
Vermont Organic Baby Food	Food Products-Wholesale	150 Main St Poultney, VT 05764	(802) 884-8128		AJM	Left message							
Windswept Wholesale Foods	Food Products-Wholesale	1105 Lower Michigan Rd Pittsfield, VT 05762	(802) 746-7913		AJM		No	They do not generate					
Ben & Jerry's Homemade In	Ice Cream Maker	1281 Waterbury-Stowe Road, Route 100 Waterbury, VT 05676	(866)258-6877	SH200	ARD	Chris	No	Treat on site at WWTP to handle their high strenght waste. Called back on 2/11 to see method of treatment and what they do to their biosolids, Left Voice mail with Chris.					Inactive
Washington Correctional F	Institution	72 Lock 11 Rd Comstock, NY 12821	(518)639-4486	SH210	ARD	Operations and Maintenance		Cannot give information over phone					
Bolton Town Landfill	Landfill		518-644-2973		AJM	busy signal							
Chester Town Landfill	Landfill		518-494-3952		AJM	John West, left message							
Colonie Landfill	Landfill		518-783-2827		AJM	Left message							
Hague Town Landfill	Landfill		800-388-2915		AJM	left message		mangaged by Casella Waste Management					
Horicon Landfill	Landfill		518-494-7906		AJM	Kept ringing for over a minute							
Johnstown Landfill	Landfill		518-736-5501		AJM	Kept ringing for over a minute							
Nessle Bros	Meat Markets	2945 County Route 74 Greenwich, NY	(518) 692-9366		AJM		No	They do not generate					

Potential High Strength Waste Client Survey Results

Business	Business Type		Phone Number	Account	Caller	Contact Information (who was talked to, when did you call, did you leave a voicemail?)	Yes/No	Notes/Results	Assumption Basis	Amount of Septage (GPD)	Amount of Fats, Oils and Grease (FOG) (GPD)	Amount of Whey (Cheese or Yogurt) (GPD)	Status
Yushak's Supermarket	Meat Markets	3 Main St Shushan, NY	(518) 854-7519		AJM	talked with cashier, said to call back any day but a Thursday							
Adirondack Meat Co Inc	Meat Packers	133 State Route 9N Ticonderoga, NY 12883	(518) 585-2333		AJM		No	They produce bones/organs/meat scraps/etc. They send this to a rendering facility. Sometimes they profit, other times the rendering facility charges them, based on the market.					
Wing John & Nancy	Meat Packers	502 Stage Rd Fair Haven, VT 05743	(802) 537-2811		AJM	Left message							
Wing Shelbie	Meat Packers	502 Stage Rd Fair Haven, VT 05743	(802) 537-2811		AJM	Left message							
Adirondack Cigar Shoppe	Meat Processing	63 Putnam Ln Saratoga Springs, NY 12866	(518) 306-5551		JCM		No						
Noels Smoke Hut	Meat Processing	18 Evelyn St Rutland, VT 05701	(802) 779-0119		AJM	busy							
Smoke Inc	Meat Processing	489 Broadway Saratoga Springs, NY 12866	(518) 581-0013		AJM	Not in Service	No						
City of Saratoga Springs	Municipality	City of Saratoga Springs 474 Broadway Saratoga Springs, NY 12866	(518)587-3550	SH082	DO NOT CALL								Inactive
Duanesburg, Town of	Municipality	5853 Western Turnpike Duanesburg, NY 12056	(518)895-8171	SH035	DO NOT CALL								Inactive
Ludlow, Village of	Municipality	PO Box 359 37 Depot Street Ludlow, VT 05149	(802)228-2841	SH062	DO NOT CALL								Inactive
Finch Paper	Paper Mill	1 Glen Street Glens Falls, NY 12801	518-793-2541		AJM	Originally spoke with Sandy LaBaren, who put B&L in touch with Derek Basile, CFO (793-2591, cell)	Yes	They currently send some of their paper waste to Syracuse Fiber for animal bedding and some of it to a compost facility. The remainder of their paper waste (60-80 tons/day), they landfill. The paper waste is lime stabilized and does not require any further treatment, it is good for land application as is. A Non-Disclosure Agreement needs to be signed to acquire further information on their paper waste. They mentioned that they do have a biomass boiler and may be interested in taking treated biosolids from the regional facility to run their boiler.	nothing at this time, waiting for more information to evaluate once NDA is processed.				
Irving Tissue	Paper Mill	1 Eddy Street Fort Edward, NY 12828	518-747-4151		AJM	Spoke with Tom Nash	Yes	They have a wastewater treatment plant onsite, and they currently landfill the biosolids produced (approx. 4000 - 5000 wet tons/year). They dewater prior to sending to landfill (to 20-30% solids). Their current cost of landfilling is $35/wet ton. A Non-Disclosure Agreement is required before any further information on the waste charactersitics is given.	nothing at this time, waiting for more information to evaluate once NDA is processed.				
Dundon Plumbing Heating & Portable Restrooms	Plumbers	344 Route 22A Orwell, VT 05760	(802) 948-2082		ARD	Laurie	NO	Delivers locally to VT (Orwall, Rutland, Middlebury), too far to travel, would not go to NY					
Jim Manley Plumbing & Heating	Plumbers	782 Main St West Rutland, VT 05777	(802) 438-2363		ARD	Jim	NO	Doesn't haul					
Rooter-Man	Plumbers	314 Glen St Glens Falls, NY 12801	(518) 798-1488		ARD	Tammy	No	Don't have an office in the area					
Uncle Bob's Septic	Plumbing	204 South Street Bennington, VT 05201	(802)232-2222	SH102	ARD	Left Message		Left 2 messages (2/11)					
Town & Country Construction	Plumbing, Contractors	2762 River Rd Melrose, NY 12121	(518)664-9903	SH100	ARD	Jen	Yes	If it comes from that county, returned phone call to discuss quantities but LM	Assume 2 (2000 gal) truck loads per week for septage and 1 (2000 gal) truck load of FOG	800	400	0	
Stone Industries	Plumbing-Drain & Sewer Cleaning	4305 Route 50 Saratoga Springs, NY 12866	(518) 584-1048	SH042	ARD	Zach	Yes	Currently deliver to Glens Falls, Saratoga County, and Albany County for grease collected outside Saratoga County. On a daily basis they haul 20,000-30,000 gpd of septage and ± 4,000 gpd of FOG. Tipping Fees between $35-$60 per thousand gallons.	Assume 10,000 GPD of septage goes to Glens Falls and 2,000 GPD of FOG to Glens Falls.	10,000	2,000	0	
Adirondack Outhouses By Tyler	Portable Toilets	963 Nys Route 9N Ticonderoga, NY 12883	(518) 668-2224		ARD	Receptionist	No	Currently deliever to only Ticonderoga and would not switch					
Bobby's Boxes	Portable Toilets	963 Nys Route 9N Ticonderoga, NY 12883	(518) 585-2224		ARD	Receptionist	No	Currently deliever to only Ticonderoga and would not switch					
Ted Hubbard Sr Farms	Portable Toilets	67 Dailey Pl Rutland, VT 05701	(802) 775-5322	SH028	ARD	LM with receptionist		Keep playing phone tag, Pager number is 802-742-5876					
Clark Septic Service	Septic Hauler	1555 Buree Road Bristol, VT 05443	(802)543-3108	SH018	ARD	Not in Service							Inactive
A-1 Sewer & Drain Cleaning Service	Septic Tank & System Cleaning	335 Gravel Pit Rd West Rutland, VT 05777	(802) 438-5722		ARD	LM with receptionist							
Charlton Septic Service Inc	Septic Tank & System Cleaning	4015 Jockey St Ballston Lake, NY 12019	(518) 399-1323		ARD	Kevin	NO	Too Far away, he only delivers to Schenectady and grease goes to Mechanicville					
Charlton Septic Svc	Septic Tank & System Cleaning	4015 Jockey St, Charlton, NY 12019	(518) 399-1323		ARD	Kevin	NO	Too Far away, he only delivers to Schenectady and grease goes to Mechanicville					
Condon's Septic	Septic Tank & System Cleaning	2 Lower Warren St Queensbury, NY 12804	(518) 798-8542	SH015	ARD	Spoke to receptionist	Yes	Currently deliver to Glens Falls, grease goes to Albany. About 1 million gallons per year of septage and 150,000 gallons per year of FOG.	Assume 3,500 GPD of septage to Glens Falls and 550 GPD of FOG to Glens Falls	3,500	550	0	Inactive
Cook's Septic Service	Septic Tank & System Cleaning	194 Hall Hill Rd Lake Luzerne, NY 12846	(518) 696-4500		ARD	Owner	Yes	Currently deliver to Glens Falls	Assume 2 (2000 gal) truck loads per week for septage.	800	0	0	
Dejong Septic	Septic Tank & System Cleaning	717 Ridge Rd Broadalbin, NY 12025	(518) 842-1540		ARD	LM with receptionist							
Dimmick Wastewater Services	Septic Tank & System Cleaning	11 Hedding Dr, Randolph, VT 05060	(802) 728-3805		ARD	Rob, Call was lost		In florida with bad reception, try back tomorrow?					

Potential High Strength Waste Client Survey Results

Business	Business Type		Phone Number	Account	Caller	Contact Information (who was talked to,when did you call, did you leave a voicemail?)	Yes/No	Notes/Results	Assumption Basis	Amount of Septage (GPD)	Amount of Fats, Oils and Grease (FOG) (GPD)	Amount of Whey (Cheese or Yogurt) (GPD)	Status
Doran Bros Inc	Septic Tank & System Cleaning	634 West St Fair Haven, VT 05743	(802) 265-1101		ARD, Aidan Murphy	Owner	Yes	They used to dispose to Glens Falls, currently dispose at Rutland County. Daily haul varies, 6,000-10,000 gpd of septage. Tipping Fees are $0.30-$0.40 per gallon; Doran had been taking FOG waste to Glens Falls for 30 years, they haul 50,000 to 75,000 per year but have back away from any additional work because they have to go to Albany. They would love to go back to Glens Falls.	Assume 200 GPD of FOG to Glens Falls	0	300	0	
Drain Care	Septic Tank & System Cleaning	2762 River Rd Melrose, NY 12121	(518) 664-9903	SH100	ARD	Same as Town and Country							dup?
Hartigan Company	Septic Tank & System Cleaning	31 Walch Park Middlesex, VT 05602	802-223-3452		Aidan Murphy		Yes	Spoke to Carl on the telephone who was very secretive about what they are currently doing. He was unwilling to share volume information or his arrangements since the Incinerator closed but he said he would be very interested in coming back to Glens Falls if they decide to take FOG waste again	Assume 2 (2000 gal) truckloakds of FOG per week.	0	800	0	
IBS Septic & Drain Service	Septic Tank & System Cleaning	2 Lower Warren St Queensbury, NY 12804	(518) 798-8194		Aidan Murphy		Yes	Before the incinerator went away they were hauling between 110,000-125,000 gallons a year and paying between $0.035 and $0.055 per gallon. Since Glens Fall stopped taking FOG they had to get a permit to haul grease into Albany County. He said they would come back to Glens Fall if they started to take FOG again. He also thought they could increase their business 10 to 15 percent with a stable dumping option.	Assume 500 GPD of FOG	0	500	0	
Imperial Septic Tank Service	Septic Tank & System Cleaning	713 Arnold Street Ballston Spa, NY 12020	518-309-8648		Aidan Murphy	left message							
J H Schrade Enterprises Inc	Septic Tank & System Cleaning	114 State Route 28N North Creek, NY 12853	(518) 251-3115		ARD	LM with receptionist							
Naylor Wells Septc	Septic Tank & System Cleaning	267 Route 28 Warrensburg, NY 12885	518-623-2453		Aidan Murphy		Yes	Before the incinerator went away they were hauling between 100,000-115,000 gallons a year and paying between $0.035 and $0.055 per gallon. Since Glens Fall stopped taking FOG they have abandoned that part of the business. Naylor was very interested in hearing what happens. He said he would go back into the FOG business and would probably pick up an additional 25-40 percent in volume	Assume 500 GPD of FOG	0	500	0	
Sanitary Sewer Service	Septic Tank & System Cleaning	144 Luzerne Rd Queensbury, NY 12804	(518) 792-7257		ARD, AJM	George Drellos	Yes	They currently dispose of septage and some FOG. They send 90-95% of their current load to Glens Falls. They do accept some FOG, but they have to bring it down to Albany. They would be very interested in dropping the FOG at Glens Falls. They have approx. 50,000 to 70,000 gallons per year of FOG and approximately 100,000 gallons per month of septage. IF Glens Falls were to accept FOG again, they would increase their FOG business. Glens Falls tipping fees is per truckload. He currently pays $45-$50 per 1,000 gallons at Glens Falls.	Assume 5000 GPD of septage to Glens Falls and 250 GPD of FOG	5,000	250	0	
Scribner's Septic Svc	Septic Tank & System Cleaning	704 Hier Rd West Rutland, VT 05777	(802) 438-5358		ARD	Receptionist	No	Does not apply to their work					
Snell Septic Service	Septic Tank & System Cleaning	155 Bulson Rd Greenwich, NY 12834	(518) 692-7477		ARD	No Answer							
Ten Eyck Septic Tank Svc Inc	Septic Tank & System Cleaning	669 Rock City Rd Ballston Spa, NY 12020	(518) 885-7324	SH094	ARD	Left Massage		Dispose of at Saratoga County, Left two messages to inquire about quanities					
Septic Drainer Inc	Septic Tank & System Cleaning	4 Jay Rd Lake George, NY 12845	(518) 812-0000		ARD	Receptionist	No	Does not apply to their work					
Action Septic & Sewer Svc SERVICES	Septic Tanks & Systems	87 Saratoga Ave South Glens Falls, NY 12803	(518) 587-4444		ARD	Eileen,		Call back Morning 2/12					
Action Septic & Sewer Svce SERVICES	Septic Tanks & Systems	246 Reservoir Rd Fort Edward, NY 12828	(518) 793-4949		ARD	LM with receptionist							
Dorr Septic Systems Co	Septic Tanks & Systems	209 Riverside Hts Manchester Center, VT 05255	(802) 362-2344		ARD	LM with Debra							
Empire Septic Svc	Septic Tanks & Systems	72 Dick Hill Rd Granville, NY 12832	(518) 232-4481		ARD	Left Message							
Harold J Snell	Septic Tanks & Systems	155 Bulson Rd Greenwich, NY 12834	(518) 692-7477		ARD	See above, Snell Septic							
Morning Star Septic Service	Septic Tanks & Systems	107 Jewell Rd Gansevoort, NY 12831	(518) 793-2290		ARD, Aidan Murphy	Sherri	Yes	Currently goes to Glens Falls, December disposal 95,000 gal.; Frank was hauling grease trap waste but has stopped hauling anything outside of Saratoga County because the waste water plant will not accept it. He said he hauls 75,000 gallons a year but thought he would have more than 100,000 gallons if there was a stable place to dump, with stable pricing, no capacity issues or origin issues.	Assume 5000 GPD of septage and 400 GPD of FOG	5,000	400	0	
Northeast Septic Solutions Inc	Septic Tanks & Systems	107 Jewell Rd Gansevoort, NY 12831	(518) 761-0705		ARD	Sherri	No	Does not apply to their work					

Potential High Strength Waste Client Survey Results

Business	Business Type		Phone Number	Account	Caller	Contact Information (who was talked to,when did you call, did you leave a voicemail?)	Yes/No	Notes/Results	Assumption Basis	Amount of Septage (GPD)	Amount of Fats, Oils and Grease (FOG) (GPD)	Amount of Whey (Cheese or Yogurt) (GPD)	Status
Spa Septic Tank Co	Septic Tanks & Systems	11 Jones Rd Saratoga Springs, NY 12866	(518) 584-5479		ARD, Aidan Murphy		Yes	Currently goes to Malta, Mechanicville, and Glens Falls. Does not go to Glen Falls often because it is too expensive.; William was hauling grease trap waste but has stopped hauling anything except for his largest customers because Gens Falls stopped taking it. He said he was hauling 35,000 gallons a year but now that he has to take the waste to Albany he is down to about 10,000 gallons because it is not cost effective. He would love to come back to Glens Falls and thought his business would pick up if there was a stable place to dump, with stable pricing, no capacity issues or origin issues.	Assume 35,000 gal/year of FOG -> ~150 GPD	0	150	0	
Straight's Septic Service	Septic Tanks & Systems	72 Sisson Rd South Glens Falls, NY 12803	(518) 480-4883	SH075	ARD	LM with receptionist		Delivers to Glen Falls, does not know any more. Try back at 6pm	Assume 2 (2000 gal) truck loads per week of septage and 1 (2000 gal) truck load per week of FOG	800	400	0	
Saratoga Garlic	Spices	15 Gailor Ln Saratoga Springs, NY	(518) 581-7255		ARD	No Voice Mail set up							
Zters Waste Value	Trash Containers & Dumpsters	Serving Your Area.	(877) 808-4694		ARD	Left Message							
We Care Organics, LLC	Waste Management	9289 Bonta Bridge Road Jordan, NY	(315)374-4635	SH004	ARD	Left Message							
West Central Enviroment	Waste Management	250 Watervliet Shaker Road Watervliet, NY 12189	(518)272-6891	SH045	ARD	LM with receptionist		On vacation out of country					
Casella Waste Management	Waste Management	25 Greens Hill Lane Rutland, VT 05701	(888)485-1469	SH067	AJM	called Glen Knecht, left message	YES	They would be interested in building and operating an anaerobic digester in the Glens Falls area at an offsite location. They would manage the sourcing and distribution of the Class B product. They would also be interested in accepting the biosolids from the region at their Schwing-Bioset facility in Chateaugey, NY.		0	0	0	Inactive
Collins' Meadowbrook Diary	Wholesale Dairy Products	148 Ruckytucks Rd Stillwater, NY 12170	(518) 587-0003		ARD	Left Message							
Monument Farms Dairy	Wholesale Dairy Products	2107 James Rd Middlebury, VT 05753	(802) 545-2119		ARD	Receptionist	No	Does not apply to their work					
Thomas Dairy Dairy Products	Wholesale Dairy Products	2096 US Route 7 N Rutland, VT 05701	(802) 773-8685		ARD	Receptionist	No	Does not apply to their work					
Van Aernem's Dairy	Wholesale Dairy Products	662 County Route 41 Hudson Falls, NY 12839	(518) 747-5976		ARD	Not in Service							
Van Aernem's Dairy	Wholesale Dairy Products	NOTRE Dame St Ext Hudson Falls, NY 12839	(518) 747-5976		ARD	Not in Service							
West Street Dairies	Wholesale Dairy Products	2367 West St Middlebury, VT 05753	(802) 462-3652		ARD	Not in Service							
Glen Mar Dairy	Wholesale Dairy Products	3794 E Hubbardton Rd Castleton, VT 05735	(802) 273-3260		ARD	Busy							
Double A Provisions Inc	Wholesale Meat	64 Main St Queensbury, NY 12804	(518) 792-2494		ARD	Not in Service							
Fortuna's Sausage & Italian Market	Wholesale Meat	PO Box 130 Arlington, VT 05250	(802) 375-0200		ARD	Receptionist	No	Does not apply to their work					
Jacobs & Toney IGA	Wholesale Meat	3872 Main St Warrensburg, NY 12885	(518) 623-3850		ARD	Receptionist	No	Does not apply to their work					
Parillo Sausage Co	Wholesale Meat	90 Washington St Saratoga Springs, NY 12866	(518) 587-5040		ARD	Receptionist	NO	Does not apply to their work					
Washington County Sewer (District #2?)	WWTP	P.O. Box 288 Fort Edward, NY 12828	(518)747-6967	SH027	DO NOT CALL								
Ten Eyck Septic				SH108	ARD	See above, Ten Eyck Septic Tank Services Inc							
T and B Septic Services		2912 Rt 22 Cambridge, NY 12816	(518)791-9823	SH105	ARD	Left Message							
Environmental Products & (services of Vermont?)		40 Hamilton Way Glenmont, NY 12077	(518)465-4000	SH034	ARD	Jim	Yes	Currently dispose of out of state, but are interested. Returned call to get more information and LM	Assume 2 (2000 gal) truck loads per week of septage and 1 (2000 gal) truck load per week of FOG	800	400	0	Inactive
Fibermark North America		161 Wellington Road Brattleboro, VT 05301	(802)257-0365	SH095	ARD	No Answer, Kept Ringing							Inactive
Fort Edward Express		1402 U.S. 9 Fort Edward, NY	(518)792-6571	SH201	ARD	Feight Company??		No answer					Inactive
G W Septic		142 Dix Ave Glens Falls, NY 12801	(518)793-7867	SH088	ARD	Receptionist	No	Paving company now, no longer do septic					Inactive
HB Septic Services LLC		132 Bridge Street Springfield, VT 05156	(802)885-2300	SH079	ARD	Julie	No	They deliver locally in Springfield, VT					Inactive
Jones Septic Services		Poughkeepsie, NY	(845)452-1123	SH023	ARD	LM with receptionist							Inactive
Marcor Remediation, Inc.		3900 Vero Rd Halethorpe, MD 21227	(410)247-5031	SH047	ARD	LM with Christine							Inactive
Schuylerville, Village of		35 Spring Street Schuylerville, NY 12871	(518)695-3881	SH074									Inactive
Stearns Septic Service, Inc.		67 Grantham Ln Enfield, NY 03748	(603)442-9500	SH046	ARD	LM, Call was returned	No	Too Far away					Inactive
Synagro		199 Municipal Rd. Waterbury, CT 06708	(203)754-9337	SH043	ARD	Randy ext. 729	No	Operation Manager, They manage their own plant and incenerate onsite					Inactive

Potential High Strength Waste Client Survey Results

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Synagro Northeast, Inc.		15 Cumberland Hill Rd Woonsocket, RI 02895	(401)765-6764	SH071	ARD	LM with Naiomi, Receptionist							Inactive
Town of Indian Lake Sewer		5 Pelon Rd. Indian Lake, NY 12842	(518)648-5211	SH072									Inactive
Tymetal Corp		2549 NY-40 Greenwich, NY 12834	(518)692-9930	SH014	ARD	LM with President's Secretary		Second call number was not available.					Inactive
Village of Granville		51 Quaker Street PO Box 208 Granville, NY 12832	(518)642-2640 (518)642-1815 (WWTP)	SH085									Inactive
Village of Hoosick Falls		24 Main Street Hoosick Falls, NY 12090	(518)686-7072	SH077									Inactive
Total Waste (GPD)										*26700*	*6650*	*79*	

Appendix C

Aerated Static Pile Composting Proposal

engineered compost systems

Amanda J. Mattingly, I.E.
Barton & Loguidice, D.P.C.
10 Airline Drive, Suite 200
Albany, NY 12205

February 23, 2016

Subject: **Budgetary Estimates for Composting at Glen Falls, NY**
Upper Hudson River Revitalization Project

Amanda,
Per your request I've provided two process options that I consider appropriate technology for processing 15,000 wet tons/year of biosolids cake at an average of 19% solids and at the current location in Kingsbury, NY.

The ECS process options included in this high-level budgetary estimate are:

1. SV Composter™ (Stationary In-vessel tunnel system) with reversing aeration
2. Aerated Static Pile (ASP) w/ bunker-wall configuration with reversing aeration and considering the winter climate an optional roof should be considered.


1. SV Composter™ - Stationary in-vessel – 2. ASP w/ bunker-wall configuration

Our recommendation for secondary composting is a mass-bed ASP and for the purposes of this estimate we have included positive aeration. ECS suggests using our preliminary design study including business pro forma and odor risk analysis to make a final determination on primary and secondary process selection.

Assuming there is a Best Management Practices mix, a retention time of 22-days primary and 22 days secondary composting is a conservative approach for controlling odors. It will produce a Class A compost product that is well stabilized, nearly mature and with a low odor generating capability.

The following high-level Budgetary Estimates for the primary and secondary compost process are based on similar previous projects.

Please note that the estimate includes ECS process equipment installed (concrete aeration floors, aeration system, aeration control and monitoring system, biofilter, labor, construction and materials); and, ECS services (preliminary and detailed M&E design drawings, facility start-up, operator training and ongoing technical support).

The estimate does not include civil engineering, permitting, site preparation, roads, buildings, fences, lighting, roofs, scales, rolling stock, taxes, fees or freight etc.

ECS Process Options based on processing an annual tonnage of ~31,000 tons/year (biosolids and bulking agent to meet BMP mix); an annual processing volume of ~68,000 yd3/year; and producing ~40,000 yd3/year of Class A compost product.

1. SV Composter™ In-vessel Composting

• Primary Composting – In-vessel	$3,400,000
• Secondary Composting – ASP w/positive aeration	$840,000
• ECS-Luck/Now Compost Mixer & discharge conveyor	$150,000
Estimated Total Constructed	$4,390,000

2. ASP w/ Bunker-Wall CASP

• Primary Composting – ASP w/Bunker reversing air	$2,000,000
• Secondary Composting – ASP w/positive aeration	$840,000
• ECS-Luck/Now Compost Mixer & discharge conveyor	$150,000
Estimated Total Constructed	$2,990,000
• Optional roof over Primary Composting ASP	$350,000

The total estimated area required for primary & secondary compost processing, 150 days of product storage, and 60 days of overs and amendment storage is approximately 3 acres. Adding access roads etc adds approximately 1 more acre.

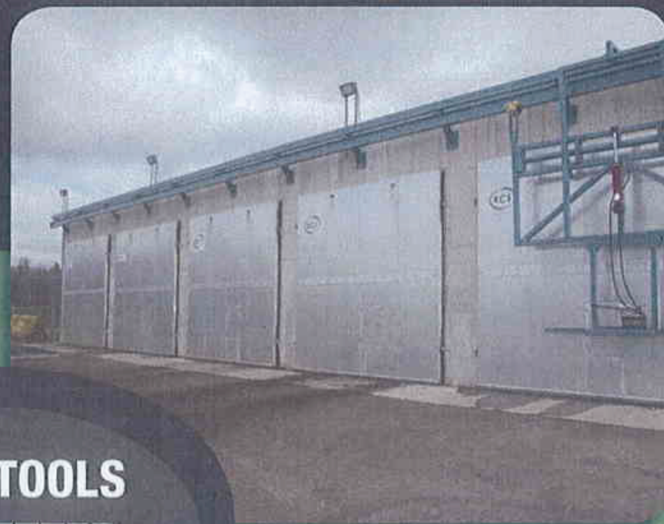
For more information:

- In-vessel: http://www.compostsystems.com/systems/sv-composter
- Bunker Wall ASP: http://www.compostsystems.com/systems/standard-asp
- Mixers: http://www.compostsystems.com/components/compost-mixers

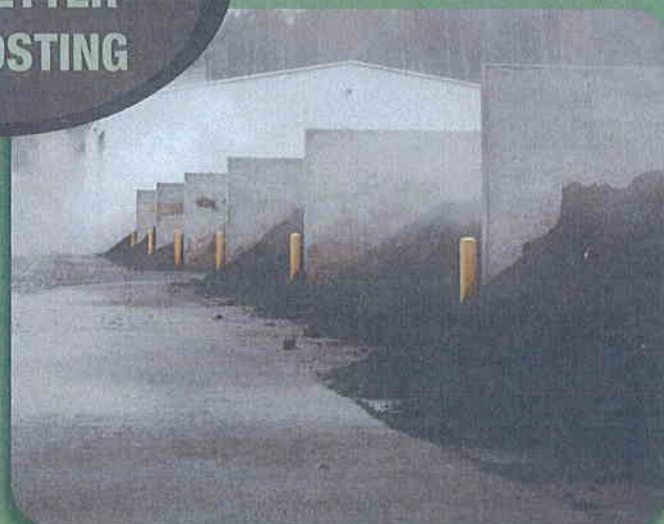
Thank you for this opportunity to showcase and provide cost information on ECS products and services…please contact me when you have comments and questions.

Sincerely,

Steve Diddy
Business Development
360-280-8985
steve@compostsystems.com



MORE TOOLS FOR BETTER COMPOSTING



ECS

engineered COMPOST systems

No two compost facilities have the same operating requirements and feedstocks. That is why ECS is committed to providing each of our clients with a solution that is tailored to meet their economic, regulatory and market driven needs. We begin by listening. Then using a rigorous Pro Forma analysis approach we've developed over the past decade, combined with our unparalleled range of experience and product offerings, we provide ECS clients with an analysis of their best suited composting options. Our clients are then better able to make an informed decision on whether or not to proceed, and which process approach will best meet their needs.

AC Composter™

Fabric Covered ASP

The ECS **AC Composter™** is an aerated static system that employs a fabric cover to control odor and VOC emissions and limit moisture loss. Unlike other limited permeability fabric covers, the AC Composter allows high aeration rates so piles produce less odor and stabilize faster. It can be configured for discrete piles, bunkers, and for a variety of aeration floor designs.

Standard Features

- Very low fugitive emissions
- Energy efficient aeration
- ECS CompTroller™ automated control and monitoring
- Operates in suction so can be used without cover edge-weights
- Two styles of cover-winders available

AP Composter™

Aerated Pile Systems

The ECS **AP Composter™** is a very versatile composting tool. It has been successfully implemented at ***Static*** and ***Turned*** operations, at small & large indoor and outdoor facilities, and for a wide range of feedstocks.

Standard Features

- Low maintenance and easy to operate
- Energy efficient aeration, reversing or single direction
- ECS CompTroller™ automated control and monitoring
- Very long service life

MORE TOOLS FOR BETTER COMPOSTING

- PRO FORMA ANALYSIS
- FACILITY DESIGN
- MIXING SYSTEMS
- CONTROL SYSTEMS
- MONITORING SYSTEMS
- AERATION SYSTEMS
- AERATION FLOORS
- AERATED STATIC PILE SYSTEMS
- IN-VESSEL SYSTEMS
- BIOFILTER SYSTEMS
- TECHNICAL SUPPORT

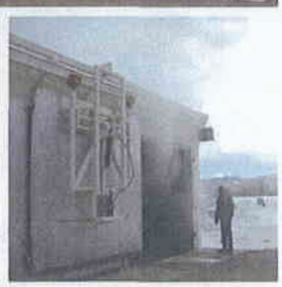
SV Composter™

Stationary In-vessel Composting System

The ECS **SV Composter™** is a high aesthetic value system that provides unsurpassed levels of process and odor control in all environmental conditions.

Standard Features

- Low maintenance and easy to operate
- *Complete capture of condensate and leachate*
- Energy efficient aeration
- ECS CompTroller™ automated control and monitoring
- Very long service life



CV Composter™

Containerized In-vessel Composting System

The ECS **CV Composter™** is a modular in-vessel system for small and medium-scale facilities that require a high level of process and environmental control. It can be rapidly installed with minimal site development and can be readily moved; it is a good candidate for intermediate term facilities. The modular design easily accommodates growth.

Standard Features

- Adaptable to all styles of roll-off lifts
- Complete capture of condensate and leachate
- Available in standard and cold-weather packages
- ECS CompTroller™ automated control and monitoring
- Available with integrated mixer and loading conveyor

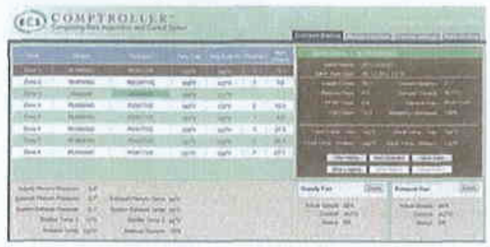
MORE TOOLS FOR BETTER COMPOSTING

Pro Forma Analysis

Facility Design

Mixing Systems

Control Systems



Monitoring Systems

Aeration Floors

Biofilter Systems

Technical Support

Client-driven solutions based on sound science and proven products since 1999.

ECS

engineered COMPOST systems

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SV Composter™

engineered COMPOST systems

Stationary In-vessel Composting System

The ECS SV Composter™ (Stationary In-Vessel) is designed for small, to large-scale composting facilities with higher tipping fees; and is ideal for locations with hot and cold ambient temperatures (+40° to –40° C). The SV Composter™ has the best odor control, process control, and the smallest footprint compared with ASP or windrow systems. In addition, it features the aeration control and monitoring technology, and ease of operation, that is found in all ECS systems.

Standard Features

- Excellent odor control with completely sealed aeration design and biofilters
- A batch system accepts a broad variety of feedstocks at irregular loading rates
- Constructed for a 20+ year service life
- Built-in condensate/leachate management system
- Semi-automated vessel loading conveyor systems
- Integrated horizontal or vertical compost mixers

Vessels

The vessels are made of concrete that is either site-poured or panelized. Vessel sizes vary to conform to the client's site and process. The vessel walls and ceilings are well insulated; doors are fully gasketed, weatherproof, and insulated. All door surfaces exposed to the process air are stainless steel. The aeration floor provides uniform air distribution. Condensate/leachate is collected in the aeration floor and drained to a sealed sump.

Aeration

The aeration system provides reversing and recirculating process airflow to control and maintain uniform biomass temperatures. Process air is scrubbed through an ECS designed biofilter built on site. All components in contact with the compost's corrosive airstream are made from either stainless steel or polymeric materials. The aeration system is designed to conserve energy with variable speed fans, a unique low-friction aeration floor, and adaptive control strategies. Motorized dampers control airflow and direction to each vessel. Damper positions are automatically set by the control system.

Control

ECS' CompTroller™ is an automated aeration control and monitoring system that is operating at all ECS compost installations. It is designed to achieve regulatory compliance; offers operators a broad range of process options; and provides each vessel with independent and automatic control for achieving process goals. The CompTroller™ is remotely accessible via the web and is flexible, robust, and keeps your data safe.

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- Facility Design
- In-Vessel
- ASP
- Automated Controls
- Client Support

ECS Aeration & Aeration Floors

engineered**COMPOST**systems

Aeration

ECS offers the broadest range of aeration systems to the composting industry. Our systems are built to match the specific biological needs of each application, as well as the functional and economic requirements of an individual client. Our designs are based on published science, rigorous engineering principals, and our own extensive experience.

We offer negative, positive and automatically reversing aeration configurations. Through smart design and adaptive control strategies, our systems achieve energy efficiencies far above industry standards. These systems are integrated with the ECS **CompTroller**™ to provide operators with a powerful tool to access, tune and automatically control their composting process.

Aeration Floors

ECS offers several different below and above grade aeration floor options that are compatible with loading and unloading using front- end loaders; and are suitable for a wide variety of feedstocks and project budgets.

Our below grade options include our In-Slab Low- Friction Trench, a High-Pressure Sparger, and a Suspended Floor for biofilters.

The Trench and Sparger floors can be used in conjunction with either solid-block or straddle type compost turners.

All options collect condensate/leachate, are plug-resistant, and are easily maintained.

Our above grade systems include the **CompDog**™ and HDPE Pipe-on-Grade.

The CompDog™ uses an inflatable form to create aeration vaults under an ASP pile. The CompDog™ system includes inflation & deflation and deploying & retrieval equipment.

- Facility Design
- In-Vessel
- ASP
- Automated Controls
- Client Support

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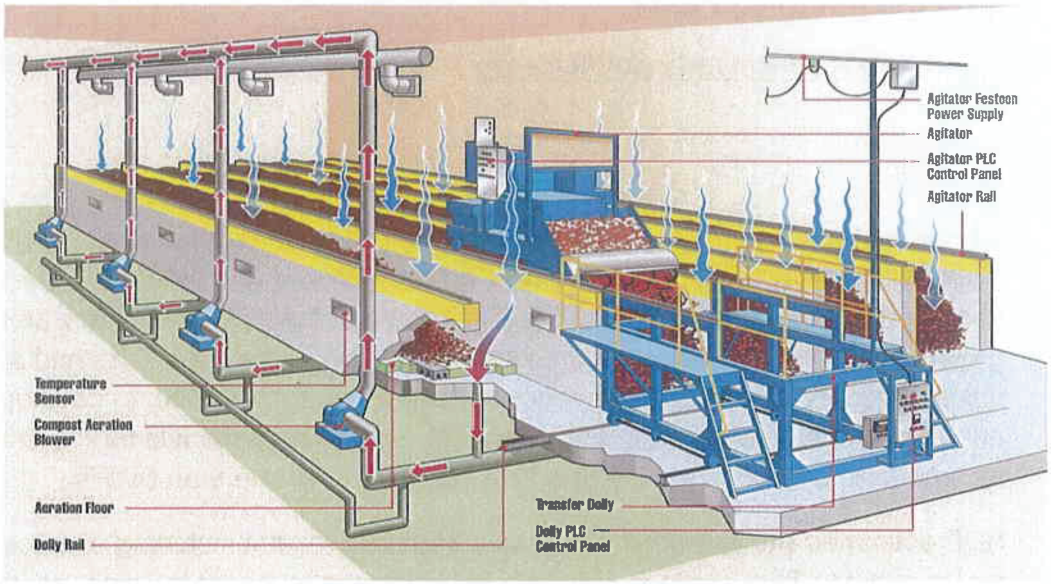
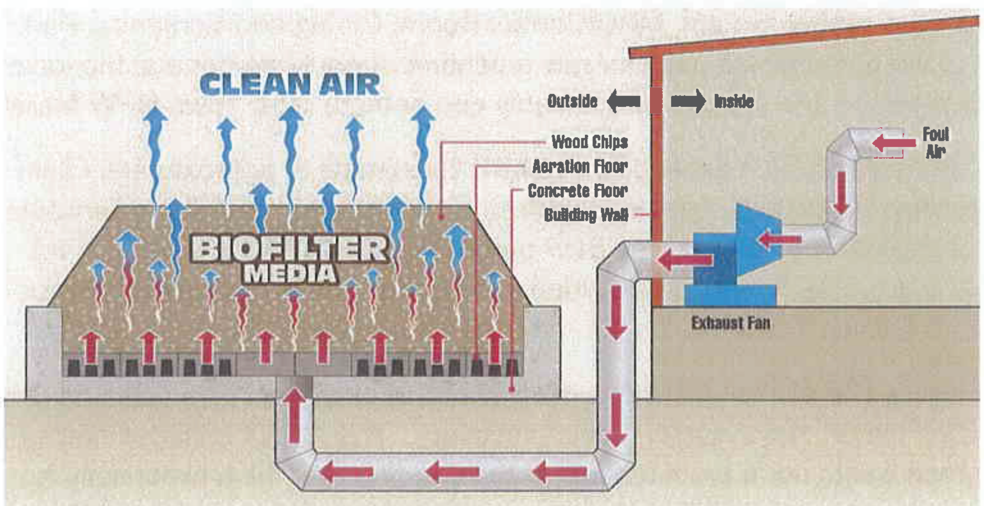
Appendix D

In-Vessel Composting Proposal

BDP INDUSTRIES

Washington County, NY Study – 14,050 WTPY Biosolids ICS Compost Facility - (5) Bays at 235 Ft long





SUBMITTED TO: *Barton and Loguidice*

Albany, New York

19 February 2016

Barton and Loguidice (B&L)
Ms. Amanda Johansen Mattingly – Project Engineer
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Amanda

BDP Industries is pleased to supply this *preliminary* technical proposal and turnkey budgetary estimate for a Composting Facility utilizing our agitated and aerated In-vessel Composting System (ICS) to co-compost 14,050 Wet Tons per Year (WTPY) of dewatered biosolids with ground green waste (trees, shrubs and yard waste). Once B&L has had a chance to review this preliminary estimate, BDP would be happy to work with B&L to develop a more detailed and accurate budgetary estimate using B&L's estimating models for generic components such as concrete, ductwork, etc.. which may be more accurate than BDP's.

BDP estimates **the required site** is less than 2 acres not including setbacks or buffer requirements. This would incorporate the enclosed compost building, amendment and recycle storage shed, biofilter odor control system, MCC/Control Room, Curing and Screening Pad. It is assumed grinding of the green waste used for raw amendment would be done at the location where this material is received and stored – presumably one or more local Town DPW facilities.

BDP has developed an overall capital expenditure **(CAPEX**) estimate of approximately $8M for the entire facility including rolling stock, engineering design services and permitting services. This CAPEX does not include cost of land. The BDP portion of this CAPEX is about $1.4M. A detailed CAPEX table is provided herein. I have tried to be conservative in all estimates for this budgetary effort.

The Operating expenditure **(OPEX)** estimate is in the $20/WT of combined biosolids and green waste range, as detailed herein, not including capital recovery. This OPEX includes neither a cost for the ground green waste nor a profit for sale of the end product which historically is a reasonable approach. It is presumed the ground green waste is something the local Towns do not sell currently and most likely would welcome a consistent disposal outlet for. Perhaps there would be a transport cost to the compost facility site. Sale of the finished compost product varies geographically but in talking with a local compost broker, he indicates he would buy this compost in the $5 -$10/yd3 range which should more than offset the transport cost of green waste at a production rate of 25,000 yds per year of compost.

1) BDP ICS Composting System Features

The BDP ICS composting technology is one of the few large scale commercial composting systems that incorporates *both* mechanical enhancements available to expedite the composting process – agitation and forced aeration.

Daily agitation of the compost material provides a number of advantages:

- The feedstock does not have to be thoroughly pre-mixed as it does for a static system to ensure proper homogeneity throughout the pile. The agitation process re-mixes the material ensuring homogeneity and optimized microbial access to carbon and nutrient sources. Thus BDP does not require a dedicated mixer ahead of composting. Floor mixing with the loader will suffice.

- The feedstock does not have to have a certain minimum size bulking agent to ensure proper porosity to maintain appropriate aerobic conditions as does a static system. The agitation process re-establishes porosity and consequently the ICS technology can accept feedstock blends using sawdust sized material as bulking agent thus maximizing facility capacity.

- The feedstock does not have to have a certain minimum amount of bulking agent to ensure proper porosity to maintain appropriate aerobic conditions as does a static system. The agitation re-established porosity and consequently the ICS technology can accept wetter feedstock blends (38% solids is standard) with lower amounts of bulking agent thus maximizing facility capacity.

- The physical action of the agitator tines physically breaks down larger particles maximizing the amount of high quality fine compost produced.

- Inherent in the composting process is a loss of volume over time in the range of 40% - 50% volume loss. Static type processes have to be designed based on initial volume. The BDP agitator has the ability to maintain a uniform compost pile height down the length of the bay by adjusting conveyor throw thereby maximizing the facility capacity for a give space.

Forced aeration of the compost material also provides a number of advantages:

- When a *negative* type forced aeration process is used, as BDP does, it best enables for capture and treatment of odorous gasses in comparison to positively aerated systems that blow air up thru the compost material into the building or enclosure cavity. Negative aeration also provides the ability to capture the concentrated heat in the exhausted process air to preheat the building make up air via the use of a heat exchanger. In colder climates this can be of value during winter months to maintain relative warm conditions inside the facility and reduce fogging. This is not effectively possible in a positively aerated facility as the heat is too diluted by the building cavity air.

- It aids in keeping the compost material aerobic which is critical to healthy microbial action and optimized composting. When combined with daily agitation, BDP can say with certainty that the compost material will be uniformly aerobic at all times.

- It aids in keeping the compost pile temperature in an appropriate range to optimize microbial activity while ensuring required pathogen destruction (PFRP) and vector attraction reduction (VAR) as per the USEPA. The microbes flourish best when temperatures are maintained below 60C. An unaerated compost pile can reach temperatures well in excess of 60C which not only is unhealthy for the microbes but can be a risk for compost fires.

- It aids in convective drying of the compost material such that a screenable (>= 55% dry solids) finished compost is produced.

2) Facility Design Approach and Assumptions

The Co-Compost facility concept was designed based on the following assumptions:

- Per the materials balance below 14,050 WTPY of dewatered biosolids will be processed by the compost facility. The biosolids will be approximately 18.9% dry solids content with a density of about 0.8 tons per cubic yard.

- Ground green waste is the raw amendment material to add to the sludge. It is presumed that the waste is ground to 2" minus size which is standard and would have a solids content in the 50% - 60% range. Density of this material is about 0.25 tons/yd3.

- The more fibrous/woody material in the ground green waste will not fully decompose in one pass through the compost system. BDP has included provisions for a screening operation to recover these chips that have not fully decomposed for recycle through the compost system to limit the amount of fresh wood chips used. The typical split thru a 3/8" screen for the finished compost is about 1/3rd recycle ("overs") and 2/3rds fine compost which is what I have used in the Materials balance below.

Thus the compost feedstock blend will include biosolids, fresh ground green waste and recycled screening overs.

- The Compost Facility is designed to operate 6 days per week and 8 hours per day.

- The (5) 10ft wide x 235ft long bays are designed to retain the material in the bays for 21 days to achieve appropriate pathogen destruction (3 days at 55C) and Vector Attraction Reduction (VAR = 14 days at 45C avg) per USEPA CFR 503 guidelines.

- The design assumes a 45 ft long x 71 ft wide enclosed clear space across the front of the bays to allow for floor mixing of the 3 feedstock components and appropriate loader access and movement.

- The agitator transfer dollies would be located at the rear end of the bays. The design assumes a 40 ft long space along the back end of the bays for the dolly as well as for loader access to unload the bays and move the material to the adjacent outdoor Curing pad.

- The biofilter size of @ 5,500 SF (active area) is based on using a natural wood chip type media easily produced locally.

Table 1 – Materials Balance

MATERIALS BALANCE

ICS Composting Facility

Washington County, NY

14,050 WTPY 21 Days Detention

MATERIALS	WET TONS PER DAY	PERCENT DRY SOLIDS	DRY TONS PER DAY	VOLUME CY	BULK DENSITY TONNES/CY
Digested Biosolids	45.0	19%	9	56	0.80
Green Waste	32.7	55%	18	131	0.25
Recycled Overs	10.5	65%	7	35	0.30
INPUT TO BAYS	**88**	**38%**	**33**	**196**	**0.45**
OUTPUT to CURING	**47**	**60%**	**28**	**118**	**0.40**
RECYCLE	**11**	**65%**	**7**	**35**	**0.30**
STORAGE or DISTRIBUTION	**33**	**65%**	**21**	**82**	**0.40**

Design Criteria and Assumptions

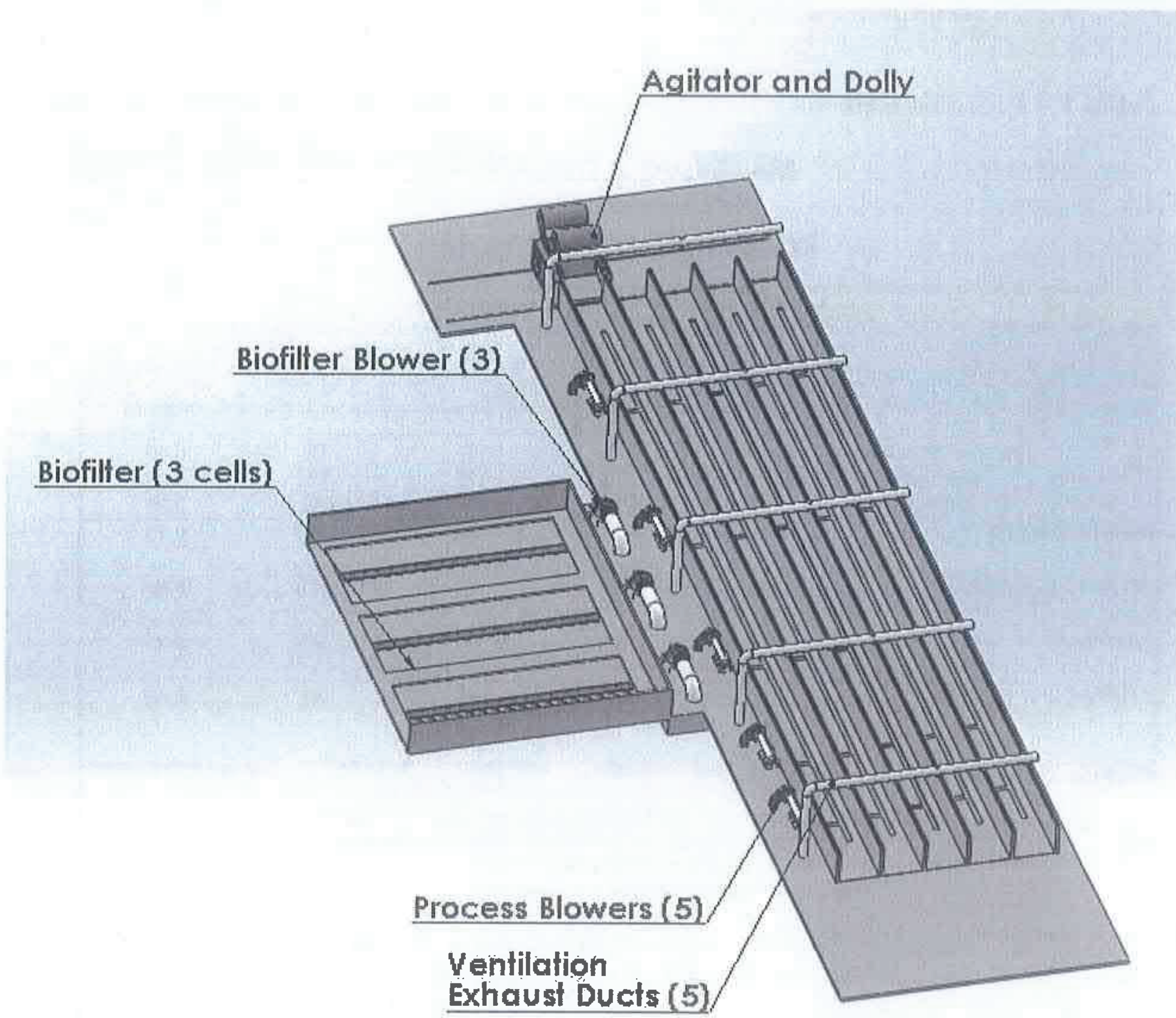
1. 5 Wide bays – each 10 ft wide X 8 ft deep X 235 ft long.
2. 40.5 Cubic ft loading capacity per bay per loading charge
3. Waste delivered 6 days per week
4. Each bay agitated 5.8 times per week
5. Retention time will be 21 days active processing
6. Each workday will require about 5 hours of agitator runtime
7. 40% volume loss in active processing

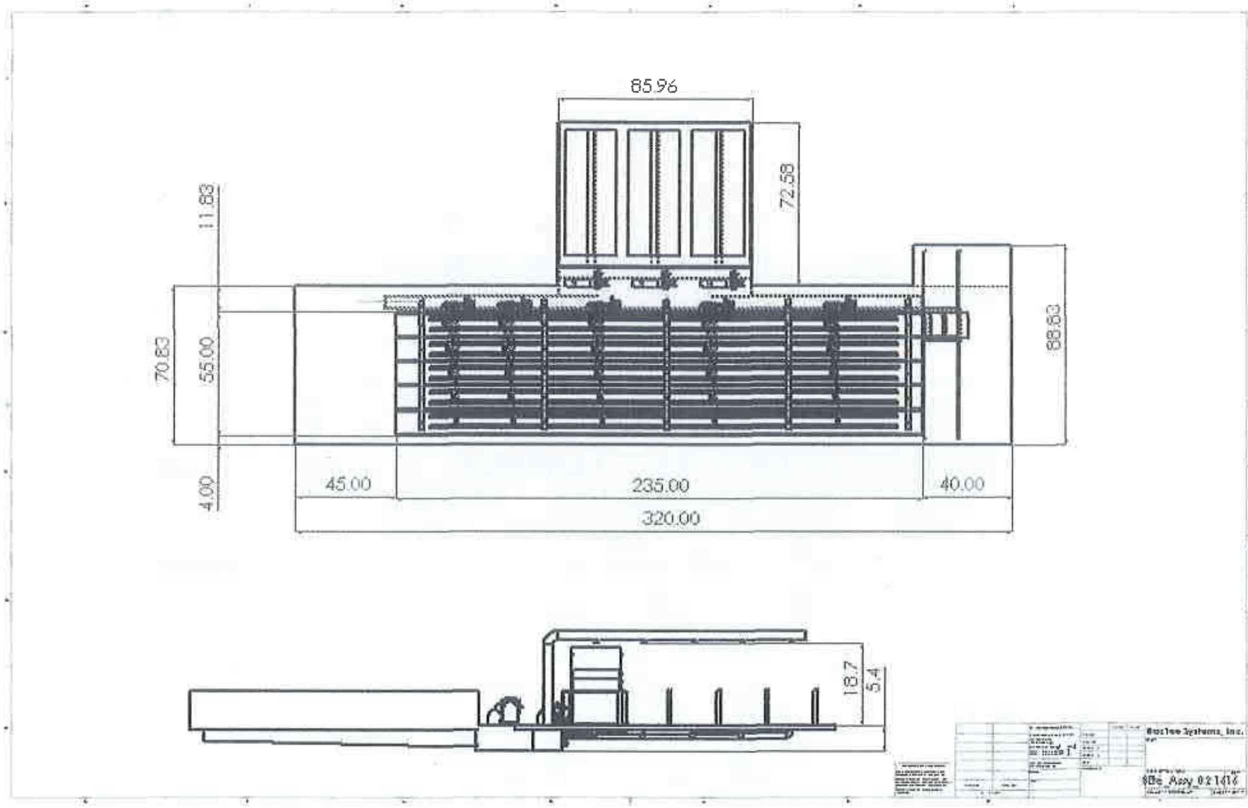
Digested Biosolids	14,050	(WTPY)
	17,562	(CYPY)
Green Waste	10,202	(WTPY)
	40,810	(CYPY)
Compost Product =	10,276	(WTPY)
	25,691	(CYPY)

3) Facility Conceptual layout and Space Requirements

Based on the design criteria above, the Active Enclosed Compost portion of the facility is presumed to be approximately 70 ft wide x 320 ft long as shown below.

Washington County Compost Facility Conceptual Layout





The building is presumed to be steel with a foam/epoxy type interior coating which acts as both insulation as well as corrosion protect. (Google *Preferred Solutions Inc* for example) The building will be maintained at negative air pressure to minimize odor release. Also BDP proposes to utilize negative aeration in the bays to further contain and control odorous emissions. The (5) bay group will be served by (1) 100HP BDP ICS agitators. The agitator will require about 5 hrs/day to process all 5 bays.

Each bay will have (5) separate aeration zones (A – E) with dedicated RTD probes for process control for a total of 25 aeration zones with RTDs. Each of the 5 aeration zones will have a blower associated with it to serve that zone across all 5 bays for a total of (5) bay aeration blowers. Zones A and B will be 15HP blowers, Zone C will be 10HP and Zones D & E will be 7.5HP. These blowers will be VFD driven and are expected to run at 80% capacity. Although not included herein, the negative aeration system also supplies the ability to capture the heat in the exhausted process air to preheat the building make up air via the use of a heat exchanger. In colder climates this can be of value during winter months to maintain relative warm conditions inside the facility and reduce fogging. If B&L is interested in this option, BDP can discuss.

The building will have an adjacent @ 5,500 sf (active area) Bactee Odor Control Biofilter system. The foul air will be exhausted to the biofilter by the (2) 50 HP Ventilation fans as shown in the attached drawing. We have also included an installed spare 50HP fans to minimize the potential for odor issues due to a fan being out of service. These ventilation fans are expected to run about 80% of the time.

Following 21 days in the enclosed active compost bays, an estimated 120 yds/day of compost material will be removed from the bays and moved to the outdoor Curing pad. At the end of 30 days Curing, the material would be ready for screening. BDP has presumed screening would occur 1 days per week. Each week it is estimated about 650 yds of material will be ready for screening. About 220 yds/week of this material will be screening overs (>3/8") to be recycled back to front of the compost facility to be used in lieu of raw amendment and 430 yards per week of fine (<= 3/8") finished compost will be ready for distribution off site. BDP estimates the combined screening and curing pad will be on the order of 20,000 SF

Also included with this proposal is a one week @4,000 SF storage shed for storing ground raw amendment and recycled overs.

Table 2 – Land Requirements

LAND AREA REQUIREMENTS

ICS COMPOSTING FACILITY

Washington County, NY

5 Wide Bays

Item	(Dimensions)		Square Feet
Compost Process Building	(71 ft x 320 ft)	=	23,000
Agitator Stroage Shed	(40 ft x 40 ft)	=	1,600
MCC/Office/Lab/Locker Rooms	(20 ft x 40 ft)	=	800
Amendment/Recycle Shed	(50 ft x 70 ft)	=	3,000
Curing Pad	(71 ft x 220 ft)	=	20,000
Screening Pad	(20 ft x 220 ft)	=	4,000
Odor Control Biofilter	(20 ft x 235 ft)	=	6,000
Paved Drives and Parking	(20 ft x 230 ft)	=	5,000
TOTAL SITE AREA REQ'D =	**63,400**		
	1.5 Acres + buffer		

4) CAPEX and OPEX Estimates

Table 3: Turnkey Compost Facility CAPEX

ITEM	NOTES	VALUE						
SITEWORK	Clearing and Excavation of 3 acres total	$ 150,000			$ 50,000	per Acre		
STRUCTURES & PADS		$ 3,730,304						
Compost Building	Steel Building with PSI Coat	$ 1,135,680	22714	ft2	50	$/ft2		
Building Concrete Work	Inside Building Only - not incl biofilter	$ 539,378	From Sizing page					
Internal Ductwork	Ventilation and Process Air	$ 408,845	22,714	ft2	18	$/ft2		
Misc Compost Building Eq.	Lights, Water, Piping, etc	$ 283,920	25% of Building Cost					
MCC (Equipped)	Painted Steel Building	$ 500,000	400	ft2	1250	$/ft2		
Office/Storage (Equipped)	Painted Steel Building	$ 400,000	400	ft2	1000	$/ft2		
Curing	Outdoor on asphalt	$ 234,415	15628	ft2	15	$/ft2		
Agitator Storage Shed	40 x 40 concrete/asphalt	$ 40,000	1,600	ft2	25	$/ft2		
Amendment grinding/storage	Shed on Asphalt. Amend pre-ground	$ 67,149	3,357	ft2	20	$/ft2		
Screening	Outdoor on asphalt	$ 52,776	3,518	ft2	15	$/ft2		
Parking/Drives		$ 68,141	4543	ft2	15	$/ft2		
Other		$ -	0	ft2	0	$/ft2		
ODOR CONTROL		$ 312,778						
	Pull AC/Hr from Facility Sizing							
Biofilter	5500	SF Estimate						
Exhaust Fans		$ 120,000	40,000	Unit Cost	1000	$/HP	Fans	3
Concrete		$ 82,500	5500	Total ft2	15	$/ft2	Calc HP/EA	50.00
Floor and Misc	BacTee Floor (in BDP's number below)	$ -	5500	Total ft2	0	Unit Price:	From BacTe	
Media	Local Wood Chips	$ 15,278	611	YDS	25	Unit Price:		
External Ductwork	Valves, Manifold	$ 75,000	3	Qty	25000	Unit Price:		
Condenasate Collection	Tank, pump, piping, etc...	$ 20,000	1	Qty	20000	Unit Price:		
EQUIPMENT		$ 2,750,000						
Mixing	Mix on Floor			$ -				
Compost Building Process								
BDP Package	Calculate from IPS Spreadsheet	$ 1,400,000	Including Biofilter Floor					
Loader		$ 275,000	1	Qty	$ 275,000	Unit Price:		
Aeration Blowers	(2) 15HP, (1) 10HP (2) 7.5HP	$ 50,000	5	Qty	$ 10,000	Unit Price:		
Screening/Refining								
Screen	Medium Screen	$ 500,000	1	Qty	$ 500,000	Unit Price:		4
Curing								
Loader	250HP	$ 275,000	1	Qty	$ 275,000	Unit Price:		10
Miscellaneous	Sewer, Outdoor Lights, Fence, etc..	$ 250,000	5	Bays	$ 50,000	per Bay		
Other		$ -	0	Qty	$ 50,000	Unit Price:		
DESIGN/CONSTRUCTION SUPPORT		$ 1,059,739						
Design	Engineering	$ 543,447	8	percentage of all costs				
Permitting	Legal	$ 203,792	3	percentage of all costs		1	Qty	
Contruction Support	Construction Management	$ 312,500	125	$/hr		2500	Hrs	
TOTAL		$ 8,002,820						

Table 4: BDP Scope of Supply Estimate

BDP SCOPE of SUPPLY
ICS COMPOSTING FACILITY
Washington County, NY

5 WIDE BAYS

ITEM	QUANTITY
EQUIPMENT	
Agitator & Dolly - 100HP with Level Bed Device	1 Each
Agitator Bay Wall Rails with Wall Embeds and all Hardware	1,475 FT
Agitator Retreival Unit/Filtration Cart	1 Each
Agitator Wear Parts Package	1 Lot
Transfer Dolly Rails	150 FT
Mobile Power to dolly festoon system	1 Each
RTD Sensors for measuirng compost air temp	25 Each
Moisture Addition System - 1 per bay	5 Each
Negative Aeration Floors with Drain Spigots	25 Each
BDP Compost Process Control System	1 Each
Biofilter Aeration Floor (Included in CAPEX estimate under "Odor Control")	5,500 SF
ENGINEERING AND SERVICES	
Internal Engineering Support	As Required
Design Engineering Support	10 Days/3 Trips
Construction Support	3 Days/3 Trips
Start Up Commissioing and Process Support	35 Days/8 Trips
Post Start Up Support	3 Days/1 Trips
ESTIMATED BDP PRICE INCLUDING FREIGHT: $	**1,400,000**

Table 5: Compost Facility Yearly Operations Estimate (OPEX)

ITEM	NOTES	VALUE					
				Facility operates:		6 days/week	
LABOR		$ 226,800					
Fringe Factor		40%					
Manager	and Maintenance	$ 72,800	2,080 hrs/yr	25 $/hr		QTY: 1	
Operator	Loader Operators	$ 140,000	2,500 hrs/yr	20 $/hr		QTY: 2	
OT/Vacation	% of the total labor force time	$ 14,000	10%				
			Note:				
ENERGY & UTILITIES		$ 161,256					
Electrical		$ 107,676		0.1 $/kwhr	1,076,755.68		
Exhaust Fans	80%	$ 52,051	134 hrs/wk	QTY: 2		50 HP	
Aeration Blowers	80%	$ 26,025	134 hrs/wk	QTY: 5		10 HP	
Agitators	5 hrs per day	$ 11,653	30 hrs/wk	QTY: 1		100 HP	
Lights and Misc	% of total power used	$ 17,946	20 %				
Fuel		$ 48,900					
Diesel							
	250 HP Loader	$ 45,000	25 gals/day	3 $/gal		300 days/yr	QTY:
	Screen	$ 3,900	25 gals/day	3 $/gal		52 days/yr	QTY:
Other		$ 4,680					
Water	Recycle Condensate	$ -	750 gals/day/bay	0.01 $/gal		312 days/yr	BAYS
Sewer		$ 4,680	50 gals/day/user	0.1 $/gal		312 days/yr	USERS
AMENDMENT	Green Waste prepared off site - $ offset by sales	$ -	0 yds/day	5 $/yd		365 days/yr	
MAINTENANCE		$ 88,000					
EQUIPMENT		$ 63,000					
BUILDING		$ 25,000	5000 $/bay/yr	Bays	5		
COMPOST SALES	$5 - $10/yd range	$ -	0 $/yd	yards/yr	25,691		
TOTAL	Yearly O&M	$ 476,056	PER YEAR				
WASTE PROCESSED							
Biosolids		14,050	TONS PER YEAR	(wet)			
Green Waste		10,202	TONS PER YEAR				
TOTAL/TON		20	$ PER TON PROCESSED.				

NOTE: Electrical rate of $0.1/kwhr from US Energy Information Agency (USEIA) rate for NY Industrial.

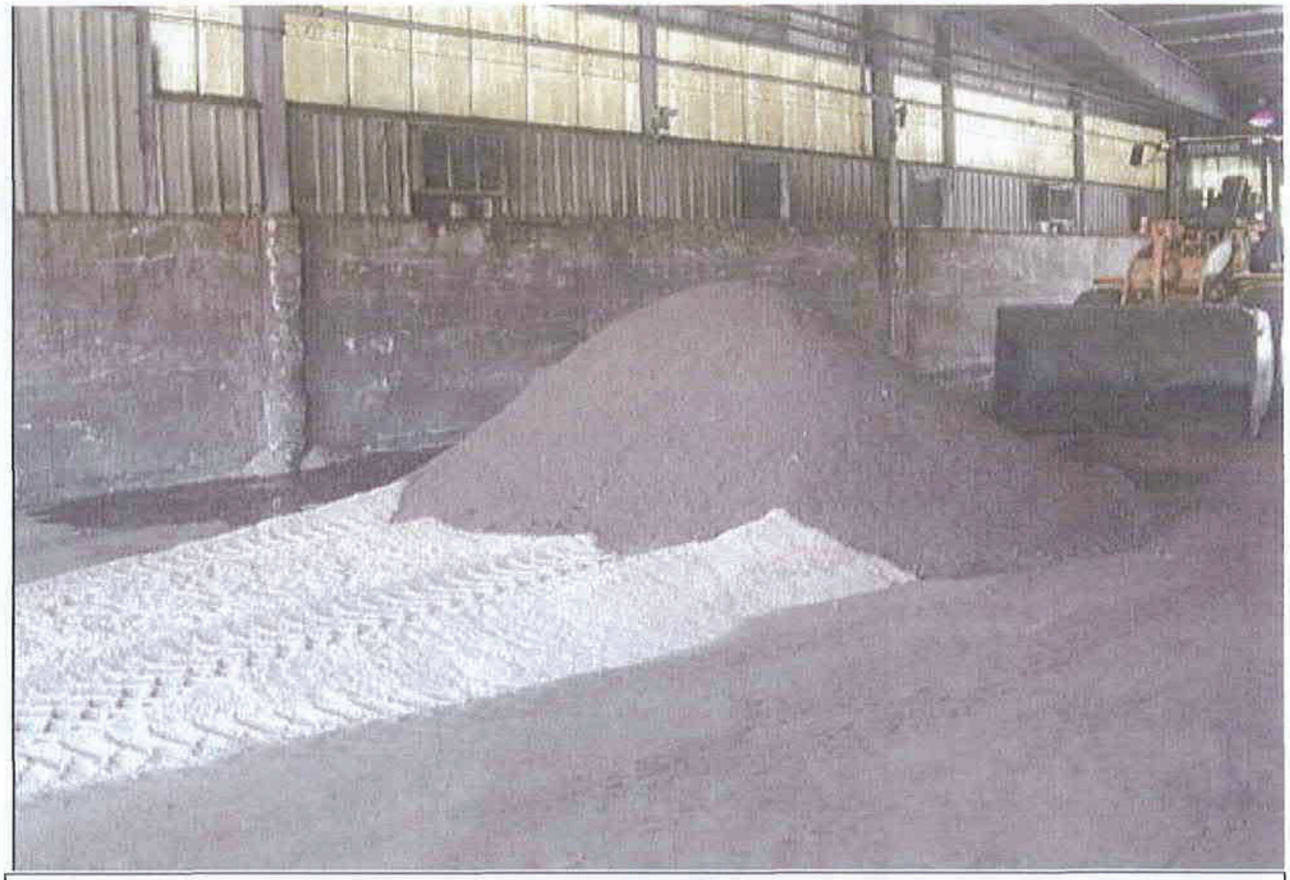
5) Detailed BDP ICS Process Description

Each of the six working days per week, it is presumed that dewatered biosolids will be delivered to the site via truck. The Material Receipt/Mixing area and Active Compost Bays are housed under one contiguous fully enclosed structure. (Reference Figures 1 &2) The structure will be situated with the Material Receipt/Mixing and bay loading area at the 'fill end' of the process bays. Ground green waste and recycled screening overs will be blended with the wet biosolids to form an appropriate infeed mixture. The feedstock material is loaded into the process bays; then translated along the bay by the agitator; subsequently removed from the discharge end of the tunnels into outdoor wind row curing piles. Following approximately 30 days of Curing, the finished compost will be screened. A front end loader will be used to deliver the ground yard trimmings and recycle to the Receipt/Mixing area and floor mix with the biosolids. The loader will also move the discharged compost material into the curing area and perform the screen loading.

The individual process steps include:

1. **Receiving –** ground green waste, recycle and dewatered biosolids are delivered to the 70ft wide x 45ft long mixing area portion of the compost building in front of the bays.
2. **Mixing –** Floor mixing is done by the loader in this same area.
3. **Charging** or loading @ 40yds of feedstock into the process bays in the front 18ft of the bays
4. **Active Composting** by agitating and aerating the material along the 235ft bay length
5. **Discharging** or unloading the processed material from the bays in the final 70ft wide x 40ft long area at the end of the bays
6. **Curing/Screening** the processed material for additional product stability for 30 days in wind rows.
7. **Odor control** – 5,500 sf biofiltration – for air from Receiving and Active Composting.

Step 1 Receiving – It is presumed that the dewatered biosolids will be delivered via dump truck. Prior to delivery of the biosolids, the loader will move from the Amendment Storage shed to the Receiving Area, a suitable amount of ground green waste and recycled overs and spread them out on the floor as shown below. The dump truck will deposit the biosolids on the yard trimmings as shown in the photo below.



Fresh Ground Green Waste and Recycle spread on Receiving Area floor.

The BDP compost process is able to accept relatively small particle size material (sawdust e.g.) unlike static or wind row type systems which need bulking agents in the 2" – 4" range. This is due to the combination of the frequency of which the bays are agitated along with the forced aeration of the bays. Being able to utilize smaller material in the bays means the bay capacity is optimized as the finer material is higher density than coarser material. Also there will be a larger percentage of finer compost in the end product. Finer compost is worth more than coarser mulch type products.

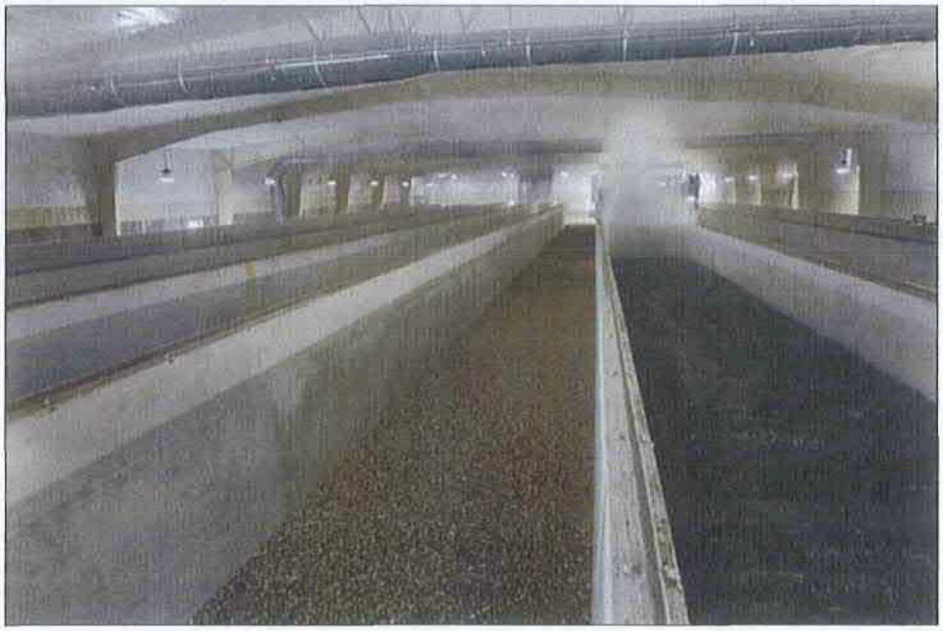
Step 2 – Mixing – An approximate 8ft high 'push-wall' will be required in the Material Receipt and Loading Area (Fig. 6). A front-end loader alternately layers appropriate amounts of wet feedstock and dry screening overs (from the Screening Building) on the mixing area floor and combines the mixture. The desired goal is to achieve a blended feedstock mix with solids content of nominally 35% - 45%. The agitator will continue the mixing within the bays to ensure a homogeneous blend.

Front End Loader Mixing Input Feedstocks and Loading Bay

Step 3 – Bays Charging or Loading - The bays are designed to receive nominally 40 yds^3 of feedstock (or "charge") following an agitation. The front 18 ft of each bay is a non-aerated concrete pad designated as the Loading Area of the bays (Figs. 2 and 7).

Step 4 – Active Composting - For this application, the bays are 10 ft wide x 8 ft high x 235 ft long for a retention time of 21 days. The five (2) bays are contiguous. Equipment and personnel access aisles are on each side of the bays. With each pass of the agitator along the length of the bay, the process material will be mixed and translated towards the tunnel discharge end an average of 12.5 ft with the bay leveling device automatically modulating the agitator conveyor discharge throw between 11 ft and 15 ft to offset pile height loss as the material composts.

Agitator on Dolly – Discharge end transfer



Agitator working in bay next to empty bay *i.* ***Aeration System*** - Each of the (5) bays is divided into five (5) separate aeration zones A – E for a total of 25 Aeration Zones (i.e. 5 aeration zones/bay x 5 bays) designed and equipped by BDP's partner BacTee Systems. BacTee incorporates an aeration floor system that enables the benefits of negative aeration by which ambient air is drawn down through the process material under negative pressure from the aeration blower. The aeration system provides sufficient oxygen to the process between agitation cycles, captures the odorous compounds for subsequent treatment by biofiltration, and removes condensate from the process bays. The BDP control system allows continuous modulation of process air based on temperature feedback from the process material.

The aeration zones in each set of bays are linked by a common below-grade manifold to a blower for that particular zone. Thus for the (5) total aeration zones, (5) aeration blowers are being supplied.

Under negative aeration, the airflow moves downward from the top of the bays, through the process material, and then through the BacTee aeration floor system that is embedded in the concrete floor of the bays. The BacTee floor system consists of BacTee's polymeric baseplates as shown below that are encased in the floor (Fig. 5) but can be removed for periodic full-access cleaning. The baseplates are adjacently located to a Cross-Arm which provides a plenum cavity between the baseplates and a spigot that transports air downward to a below-grade manifold pipe (Fig. 12).

BacTee Polymeric HT Baseplate

Fig 5: Baseplate embedded in the tunnel floor

Process material temperature is continuously monitored and supplied to the control system from temperature sensors mounted in the piping of each aeration zone in each bay (Fig. 7). The temperature inputs from the same aeration zone in each of the two (2) bays are averaged by the control system to drive the blower drawing air from the respective zone. All blowers are operated through a variable frequency drive (VFD) to provide continuous modulation of the air flow to precisely maintain process material temperature about a floating set point within the control system.

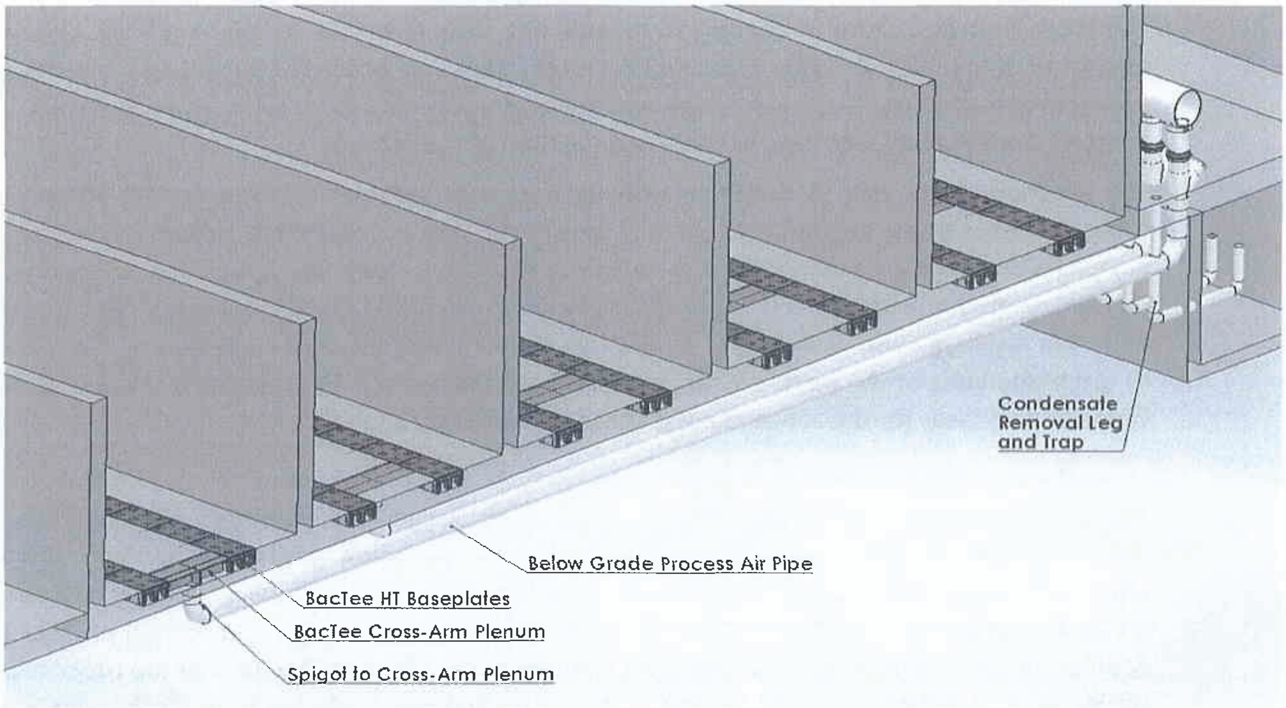


Fig 6: Compost Aeration Floor Components

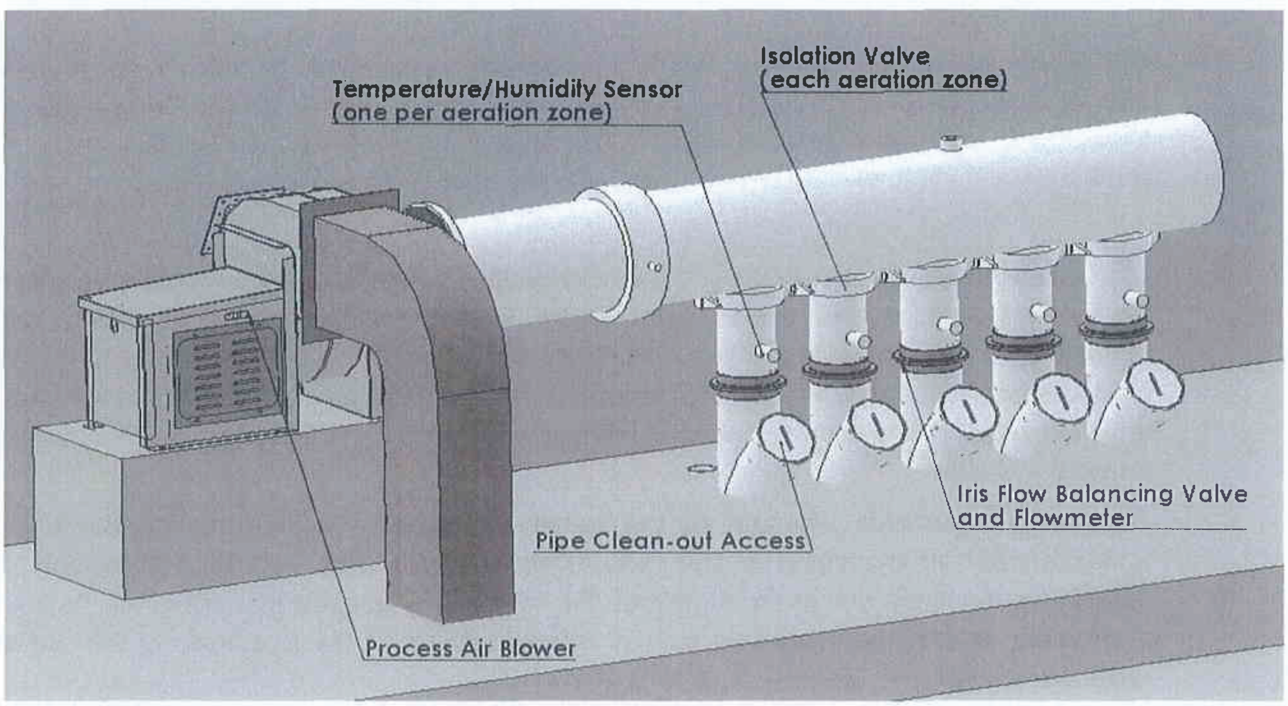


Fig 7: Temperature probe in Aeration Zones

The BDP Control System incorporates a sequence that responds to the available biological energy of the material. The CompAeR™ system seeks to preserve the limited biologically-available energy of the feedstock to achieve optimal temperatures for pathogen destruction and compost stabilization over the 21 day residence time of the process.

The aeration zones vary in length to provide adequate aeration throughout the composting process. Zones at the beginning of the bay are shorter and provide more airflow to support the higher level of biological activity that produces temperatures that are higher than in those zones nearer the discharge end of the bays. The aeration zones become progressively longer from the fill to the discharge end of the bays. In addition to the aeration zone length varying from the fill to discharge ends of the bays, the air flow rates are decreased. Consequently, blower air flow capacity decreases for the zones nearest the discharge end.

All aeration plenum and manifold units (i.e. pipe) are designed to transport condensate water away from the process tunnels. The low point of the below-grade aeration manifolds is equipped with a U-trap to prevent short-circuiting of air flow while allowing disposal of water to a below-grade drain manifold. In this case, the drain manifold is also the central process and ventilation exhaust plenum. . A collection sump incorporated into the floor of the process area serves as a collection reservoir for the water. The water collected will be discharged to the wastewater treatment plant for processing or recycled for other areas of the facility if permitted.

The system allows manual operation of the blowers and a default mode of timed blower operation, as required. The system seeks to assure that temperatures are maintained at or above 55ºC to achieve pasteurization if the compost material has sufficient energy. The combination of aeration and agitation minimizes the occurrence of "hot spots".

ii. BDP Process Control System - Temperature signals from temperature sensors installed in the aeration piping are fed to the Control System, which modulates the process blower speed, as needed, to allow the process temperatures to stay within a limited range. The desired range of process temperature is determined by input parameters that may be varied by simple menu-driven changes to the control system if feedstock properties and the objective final material properties change.

The BacTee CompAeR™ Computer Control System automatically controls the aeration blowers to furnish the air necessary for the composting process. Both process control and data acquisition functions are provided within the system. The controller furnishes field data acquisition, control logic and field control actions related to the operation of the aeration system as follows:

- For the aeration system, the controller is designed to maintain desired compost process temperature ranges along the (5) longitudinal bay zones. The temperature of each zone is sensed through a temperature sensor mounted in the suction side aeration piping prior to reaching the blower manifold. The aeration blower for each zone is automatically modulated to maintain a desirable average temperature for each zone.
- Both process control and data collection functions are accessible through the Master Control unit, which is located in the operator control room - a separate motor control center (MCC) room is presumed. The operator has the ability to adjust parameters based on feedstock variability, initiate operation modes, and monitor and trend process data during commissioning of the system and initial operation. However, once a desired set of operational process temperatures have been determined for a given feedstock, the aeration function can be automatically controlled by the control system.
- With a high-speed internet connection provided to the site, the control system can be operated remotely by qualified operators. The master display provides real time operating information feature that allows BDP to provide remote support to the local operators during start-up and to assist in optimization of the process.
- The control system provides current operating information including instantaneous and trending temperature set points, bay aeration blower status, control mode for temperature selection, bay moisture addition system, curing blower control and agitator location. In addition, a trend chart displays temperatures and aeration blower demand recorded in each aeration zone during the pre-selected time periods.
- Process data will be formatted to meet regulatory requirements and other functions as required by the specifications.

The BacTee Composting System is an agitated, aerated, automated process. The BacTee process follows guidelines designed to meet US Environmental Protection Agency (USEPA) standards CFR 503 rules.

iii. Bay Moisture Addition – As the compost material progresses down the length of the bays over time it will lose moisture by design. Some of that moisture is collected as condensate in the aeration system as discussed above. The balance of the moisture lost will be evaporative and exhausted directly to the biofilter by the ventilation fans. In some cases, depending on facility location and feedstock, the compost process begins to suffer due to moisture depletion in the bays. Essentially the compost microbes become starved for water. This tends to occur towards the end of the bays as the compost begins to exceed 65% solids. Therefore BDP supplies a moisture addition system to add moisture back into the bays. It uses PVC pipe with spray nozzles nested in the rail that runs along the top of the bay walls as shown in figure 15. This moisture addition system is controlled by the BDP Control System and usually runs for prescribed time period based on operator experience. The water supply for the moisture addition should be designed to supply 1000 gals/day/bay.

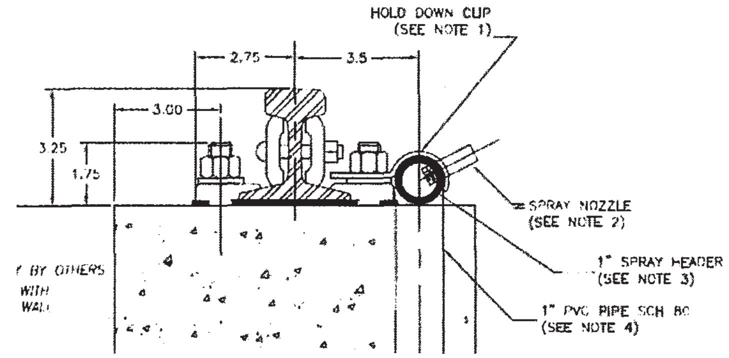


Figure 11 - Bay Irrigation System.

iii. Ventilation – The fully-enclosed Receiving & Composting facility is maintained under a slight negative pressure by the biofilter blowers that draw both ventilation and process air from the building. Fresh air is drawn into the structure through louvered grilles in the sidewalls of the building. A ventilation air duct receives discharged process air from the aeration zones of the compost bays. The negative pressure maintained within the duct draws air through a series of intakes located in the Receiving and Composting areas. Both process air and room ventilation exhaust air are delivered to the biofilter for treatment prior to release to the atmosphere.

Step 5 – Composting Material Discharge – After approximately 21 days in the bays the compost material is moved by the agitator into the final 16 ft discharge zone of the bays. Like the loading Zone at the front of the bays, the discharge zone is a solid concrete floor with no aeration. The compost is removed from the bay by the loader. At this point the compost is expected to have a solids content in the range of 60% and a density of about 0.4 tons/yd^3. Approximately 24 yd^3 of material are removed from each bay after each agitation and transferred to the Curing area for further drying and stabilization.

Step 6 – Curing. It is estimated that there will be approximately 700 yds/week of compost material discharged from the facility. This material will be moved to the adjacent outdoor 20,000 SF curing/screeening pad for 30 days curing minimum in wind rows as shown below.

Outdoor windrow type Curing piles adjacent to enclosed Compost Facility (left). Typical Trommel Screen operation (below)

Following the Curing phase, the finished compost will be screened with larger fraction (overs) being recycled to the front of the facility for reprocessing thru the compost facility and the smaller fraction (unders) being ready for distribution. It is estimated that approximately 1/3rd (by volume) of the finished compost will be recycled.

Step 7 – Odor Control – Biofiltration

A biofilter odor control system treats all process and ventilation air from the building. Room air is drawn under negative pressure, created by the suction side of the biofilter blowers, into the main duct. Process air exhaust blowers supply process air from the respective aeration zones into this same main duct in which the room ventilation air and process air are mixed prior to entering the biofilter.

Two blowers are located at the entrance to the biofilter bays and maintain a constant, slightly-negative air pressure within this duct under the control of the CompAeR™ system. The biofilter blowers transport the air through the biofilter bays and media.

The biofilter bays will be equipped with the BacTee biofilter aeration floor components. The biofilter media will be a standard wood chips type material which can be supplied by pre-screening the ground yard trimmings and utilizing the subsequent screening overs.

Condensate may form in all air manifolds before and within the air passageways of the biofilter. A condensate leg and trap conveys condensate formed in the aeration zone piping and can be removed via a condensate drain to appropriate storage or disposal. In addition, heavy rains may potentially permeate through the biofilter media. Consequently, condensate collection and drain piping is provided to remove water from the biofilter unit for re-use/disposal. Condensate is removed from both the biofilter and duct via ports at low points in the respective plenums.

Sample Biofilter related drawings:

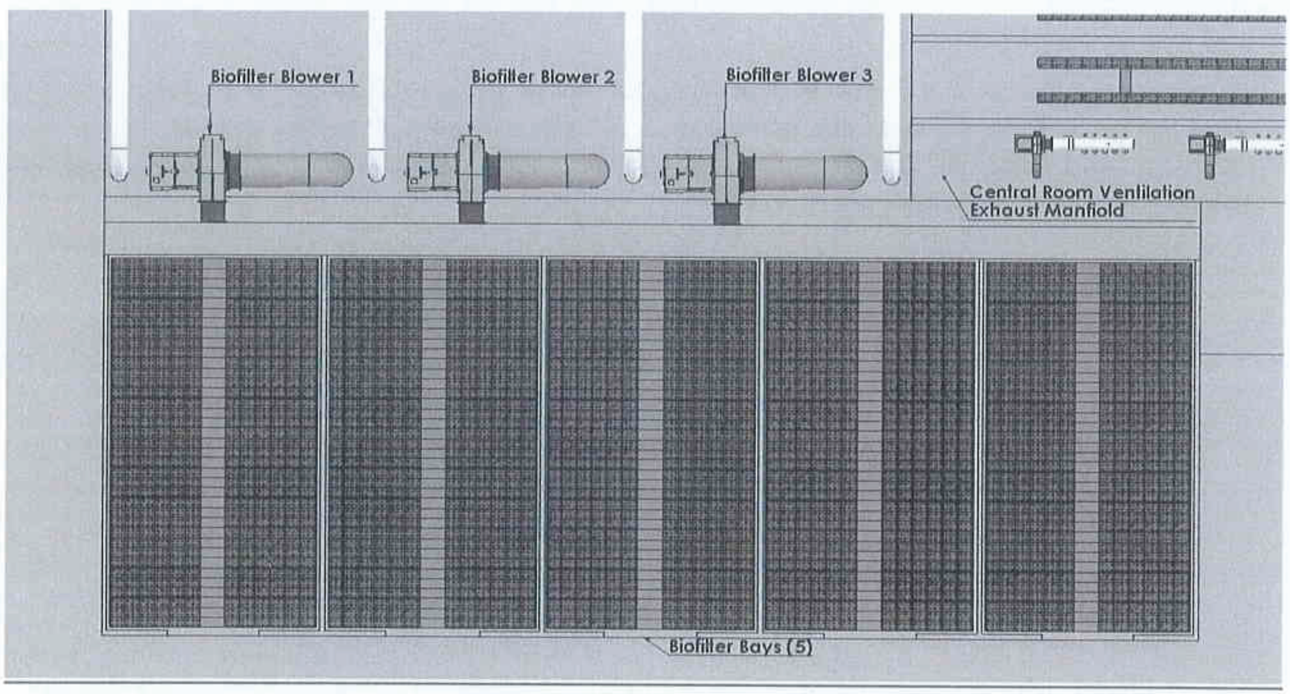


Figure 8: Conceptual Biofilter

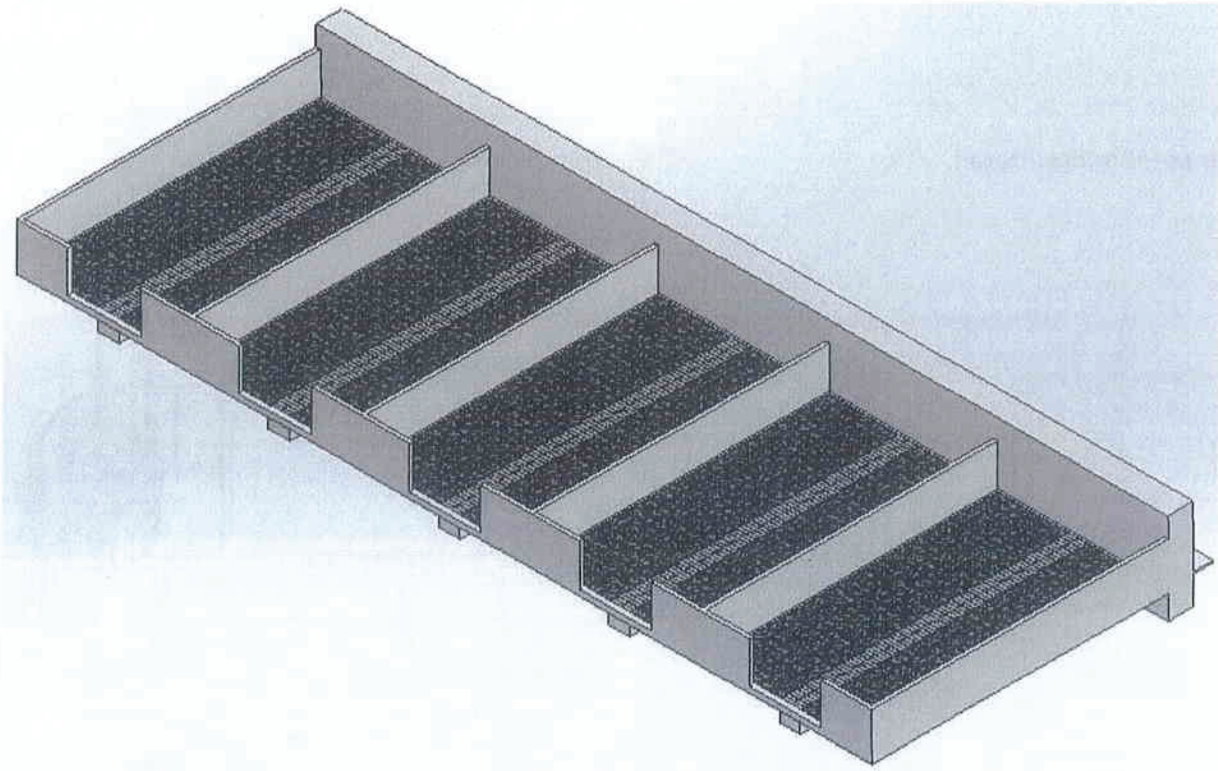


Fig 9 Conceptual Biofilter showing concrete details for media placement access

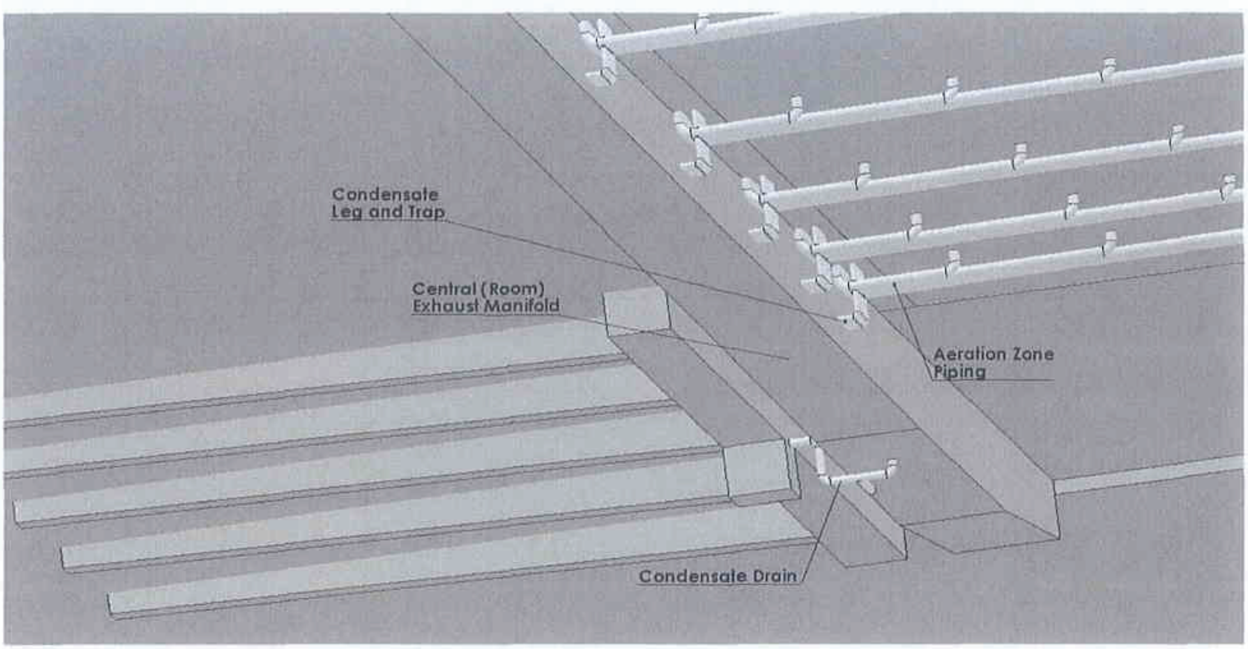
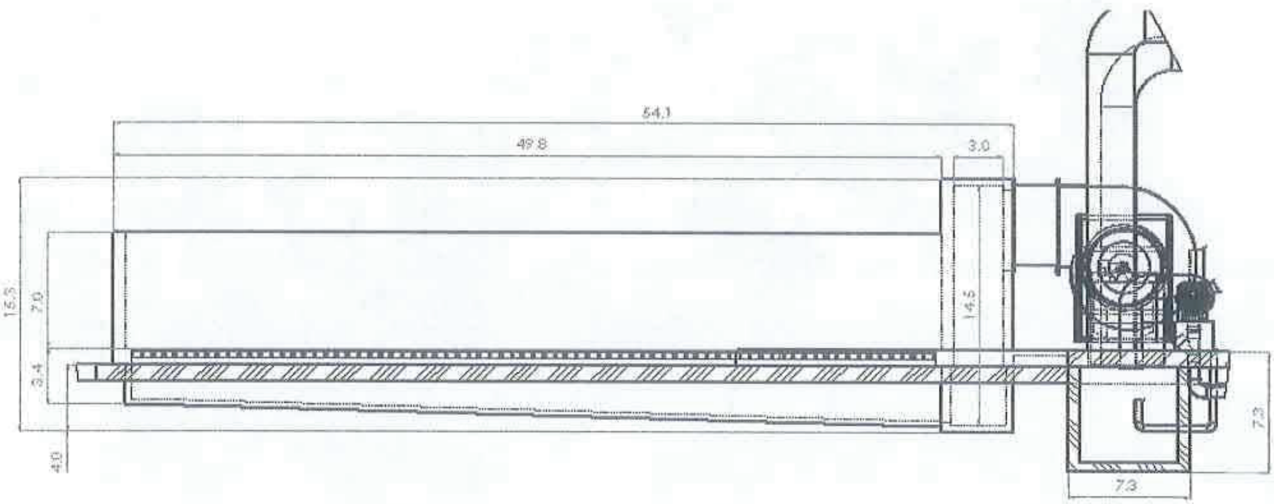


Fig. 10: Biofilter Drain Piping (typical)

Fig 11 – Biofilter Detail



I trust you will find this Estimate useful and look forward to working with B&L in the future on this project.

Sincerely,

Richard Nicoletti, PE

BDP Compost Systems Manager

cc. Peter Koester – Koester Associates.

Appendix E

Anaerobic Digestion Process Calculations and Proposal Information

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JOB 1338.011.001
SHEET NO. 1 OF 1
CALCULATED BY AJM DATE 3/30/2016
CHECKED BY JAB DATE
SUBJECT High Strength Waste Receiving Station Sizing

Design Parameters (per 10 States Standards for Wastewater 2014 and TR-16)

N/A

Design Flow and Loading:

High Strength Waste (HSW) processed through HSW Receiving Station is approx. 62,240 gpd.

See table below summarizing input for HSW EQ Tank.

Feed Source	Volume Delivered (GPD)	Percent Solids
Septage	55,240	1.5%
FOG	7,000	4.0%
Acid Whey	0	3.5%
Total	62,240	1.8%

** Assume Deliveries 5 days/ week.*

ReceivingStation Design Flow Rate

Assumed Maximum Truck Load, gal:	5,000	
Maximum Time to Unload, min:	30	
Minimum Pump Rating, gpm:	166.67	
Set Pump Rate, gpm:	400	per truck unload
Time to Unload, min:	13	
SAY Time to Unload, min:	20	(includes connecting to HSW Receiver, payment transaction, etc)

Number of Deliveries/Day: 2500 gal truck	25	
Hours/day operation, 1 inlet:	8.3	hours
Hours/day operation, 2 inlets:	4.2	hours

Wet Well Sizing

Assume wet well contains two (2) submersible 400 gpm pumps.

Assume 5,000 gallon wet well, equal to maximum projected truck load.

Required Volume:	5,000	gal
Set SW Depth:	8	ft
Required Diameter:	10.31	ft
Set Diameter:	11	ft
Total Volume:	5687	gal
Time to Empty:	12.50	min

Provide one (1) Enviro-Care Beast HSW Receiving Station

Enviro-Care Septage Receiving Station will have a peak capacity of 875 gpm, with two (2) inlet pipe connection points.

Provide one (1) precast concrete HSW Receiving Wet Well

Wet well will have a diameter of 11 feet and a SWD of 8 feet.

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JOB 1338.011.001
SHEET NO. 1 OF 1
CALCULATED BY AJM DATE June 2, 2016
CHECKED BY JAB DATE
SUBJECT Anaerobic Digester Operation Calculations

From Biosolids Production Calculations and Assumed Initial High Strength Waste Opportunities

Waste Type	Wet Mass (lb/d)	Dry Solids (lb/d)	Solids Concentration (%)	Flow (GPD)	VSS (lb/d)	BOD (lb/d)*
Glens Falls Muncipal Biosolids	668,000	10,020	1.5%	38,650	7,315	1,686
WCSD#2 Municipal Biosolids**	0	0	0	0	0	0
Waste Receiving (Septage, FOG, etc.) at GF WWTP	431,477	7,710	1.8%	61,000	4,048	9,906
Waste Receiving (Municipal Biosolids) at WCSD#2 Compost Facility	11,525	2,040	17.7%	1,240	1,448	54
Industrial Waste (Argyle Cheese)	651	23	3.5%	79	23	21
Total Biosolids	***1,111,653***	***19,793***	***1.9%***	***100,969***	**12,834**	***11,667***

**BOD for Waste Receiving assumed 6,000 mg/L for septage (54,000 GPD) and 123,661 mg/L for FOG (7,000 GPD). The Septage BOD concentration is from Metcalf and Eddy, Table 3-17. The FOG BOD concentration is from the grease trap waste characteristic data used in similar studies.*

*** WCSD#2 has anaerobic digestion already implemented at the WCSD#2 WWTP, and will not contribute to the biosolids requiring treatment at the regional handling facility.*

Recuperative Thickening

Assume influent flow each day required thickening from 1.9% to 3% and thickening operations 5 days/wk, 8 hrs/day.

GBT Loading Rate is 100,969 GPD * 7 days/5 days of thickening = 141,356 GPD = 294 GPM

From BDP Brochure: GBT loading capacity at approx. 165 GPM/m belt width.

Required Belt Width: 1.785 m

Provide two (2) 2.0-meter belt GBTs for recuperative thickening.

Assumes 12 hours of GBT Operation per day.

GBT Filtrate To Drain (GPD)	Thickened Sludge Wet Mass at 3%	Target Solids Concentration (%)	Thickened Sludge Volume (GPD)
22,665	659,759	3.0%	78,304

Assume 8 lbs polymer/dry ton based on discussion with Koester Associates, representative for BDP.

Polymer used/day: 79 lbs/day

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JOB	1338.011.001		
SHEET NO.	1	OF	3
CALCULATED BY	AJM	DATE	February 16, 2016
CHECKED BY	JAB	DATE	
SUBJECT	Proposed Anaerobic Digester Sizing - BOD Destruction		

***Anaerobic Digester Sizing**

Assumed/Given Values

Qi (Inflow)	78,304	GPD
BOD	11,667	lb/day
Kd (Endogenous Coefficient)	0.03	1/day
Y (Yield)	0.05	lb VSS/lb BOD
E (Utilization Efficiency)	0.60	
SG (Specific Gravity) at 3% solids	1.01	
SRT (Solids Retention Time)	15	days

***References:**

Metcalf & Eddy, 4th Edition pgs 984 -1005 and 1505 - 1515 (M&E)

Ten States Standards for Wastewater Treatment Facilities (10 States)

TR-16 Guides for the Design of Wastewater Treatment Works

***Assumptions:**

i. Influent sludge has been thickened to approximately 3% solids by weight

ii. Specific gravity at 3% is 1.01 (solids have SG of approx. 1.4) (Table 14-7, page 1456, M&E)

iii. Hydraulic regime of the reactor is complete mix

iv. Hydraulic sludge retention time is 15 days @ 35 degrees Centigrade.

v. Mesophilic digestion @ 35 Centigrade

vi. Waste utilization efficiency (E) is approximately 0.60.

vii. Sludge contains sufficient nitrogen and phosphorous for biological growth.

viii. Y = 0.05 lb VSS per lb of BOD

ix. Kd = 0.03/day

x. All constants are for 35 Centigrade (95 Fehrenheit)

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1) Required Digester Volume:

Volume = Residence Time x Sludge Flow
= SRT * Qi
= 15 days * 78,304 GPD
= 1,174,553 gal
= 157,026 CF

2) Volumetric Loading:

$$\text{Loading} = \frac{\text{lb BOD}}{\text{CF*d}} = \frac{11{,}667\ \text{lb/d}}{157{,}026\ \text{CF}} = 0.0743\ \text{lb/d-cf}$$

= 74.3 lb/10^3-cf-d

3) Quantity of Volatile Solids Produced per Day:

$$Px = \frac{Y * (Mo - M)}{1 + Kd * SRT}$$

(Eq. 14-13, page 1510, M&E) where,

Px = Mass of cells produced per day
Y = Yield Coefficient
Mo = Mass of bCOD in influent
M = Mass of bCOD in effluent
Kd = Endogenous Coefficient
SRT = Solids Retention Time
E = Utilization Efficiency

→ S = So * (1 - E)
= 11,667 lb/d * (1 - 0.60)
= 4,666.90 lb/d

$$Px = \frac{(0.05\ \text{lb/lb}) * (11{,}667\ \text{lb/d} - 4{,}667\ \text{lb/d})}{1 + (0.03/\text{day} * 15\ \text{days})}$$

= 241.39 lb/d

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4) Percent Stabilization:

$$\% = \frac{(Mo - M) - 1.42 * (Px)}{Mo}$$

$$= \frac{(11{,}667 \text{ lb/d} - 4{,}667 \text{ lb/d}) - 1.42 * 241.39 \text{ lb/d}}{11{,}667 \text{ lb/d}}$$

= 57.1% stabilization

*Where 1.42 is an experimental constant for mesophilic anaerobic sludge digestion

*Other terms defined on page 2 of this calculation

5) Methane Production per day - calculated based on BOD Destruction

(Eq. 14-12, page 1510, M&E)

Vol CH4 = 5.62 * [(Mo - M) - 1.42 * Px]

= 5.62 *[(11,667 lb/d - 4,667 lb/d) - 1.42 * 241.39 lb/d]

= 37,416 cf of CH4 per day

* Where 5.62 is an experimental constant for methane production for mesophilic anaerobic sludge digestion

*Other terms defined on page 2 of this calculation

6) Total Digester Gas Volume - calculated based on BOD Destruction

*Approximately 65% of Digester gas is Methane

$$\text{Total Gas Production} = \frac{37{,}416 \text{ CF}}{0.65}$$

= 57,562 cf of digester gas per day

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JOB	1338.011.001		
SHEET NO.	1	OF	2
CALCULATED BY	AJM	DATE	2/17/2016
CHECKED BY	JAB	DATE	
SUBJECT	Proposed Anaerobic Digester Sizing - VSS Destruction		

Assumptions

1. WW Sludge and Septage characteristics are taken from the Biosolids Production Calculations located in Appendix A.
2. Acid Whey characteristics are assumed to be similar to the Acid Whey used in similar Anaerobic Digestion Feasibility Study.
3. FOG characteristics are assumed to be similar to the Grease Trap Waste used in the similar anaerobic Digestion Feasibility Study.

Sludge Digestion	WW Sludge +Septage	Acid Whey	FOG	
Total Sludge Production	93,890	79	7,000	gpd
Total Sludge Production (Dry)	17,387	23	2,383	ppd
Sludge Concentration	1.5%	3.5%	4.0%	
Thickened Sludge Concentration	3.0%	3.5%	4.0%	
Thickened Sludge Specific Gravity	1.01	1.02	1.02	
Thickened Sludge Volume	68,788	79	7,000	gpd
Volatile Solids %	60%	90%	90%	
Volatile Reduction	45%	60%	60%	
Total Volatile Solids	10,432	21	2,144	ppd
Total Inert Solids	6,955	2	238	ppd
Volatile Reduction	4,695	13	1,287	ppd
Volatile Portion Remaining	5,738	8	858	ppd
Inert Remaining	6,955	2	238	ppd
Total Sludge Solids Remaining	12,693	11	1,096	ppd
Digested Sludge Specific Gravity	1.02	1.02	1.02	
Digested Sludge Volume	68,788	79	7,000	gpd
Volatile Fraction Remaining	45%	78%	78%	
Non-Volatile	55%	22%	22%	
Digested Sludge Concentration	2.2%	1.6%	1.8%	
Dewatered Sludge Concentration	21.5%	21.5%	21.5%	
Annual Sludge Production	2,316	2	200	dry tons per year
Annual Sludge Production	10,774	9	930	wet tons per year

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SHEET NO.	2	OF	2
CALCULATED BY	AJM	DATE	2/17/2016
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SUBJECT	Proposed Anaerobic Digester Sizing - VSS Destruction		

Biogas Production

	WW Sludge +Septage	Acid Whey	FOG	
Biogas Production Rate	15	15	15	cf/day/lb-VSS
Biogas Produced	70,419	190	19,299	cfd
	48.90	0.13	13.40	cfm
Methane Content	65%	65%	65%	
Methane Produced	45,772	123	12,544	cfd
Heating Value of Methane	960	960	960	BTU/cf
BTU Value of Biogas	43,941,575	118,273	12,042,338	BTU/day
BTU Value of Biogas	1,830,899	4,928	501,764	BTU/hr
kW Value of Biogas	537	1	147	kW
Electrical Energy Available Through CHP	161	0	44	kW (30% recovered)
Heat Energy Available Through CHP	732,360	1,971	200,706	BTU/hr (40% recovered)

Solids Loading Rate

Primary Digester No. 1 Volume	1,250,000	gallons
Secondary Digester Volume	1,250,000	gallons
Total Primary Digester Volume	1,250,000	gallons
Total Primary Digester Volume	167,112	cf
Volatile Solids Loading	12,598	ppd
Volumetric Volatile Solids Loading	0.08	ppd/cf
Volumetric Volatile Solids Loading	75.39	ppd/1000 cf
TR-16 Guide	*0.12-0.16*	*ppd/cf*
10 States Standards	*80*	*ppd/1000 cf*

Solids Retention Time

Thickened Sludge Volume	75,866	gpd
Solids Retention Time	16	days
Min. Retention Time, Well Mixed	15	days

Primary Digester Sizing

Per VSS Loading (10 States)		1,177,897		Gal
Per Sludge Volume (10 States)		1,137,993		Gal
Sludge Volume Rules				
Sludge Volume from Primary Digesters	68,788	79	7,000	gpd
Digested Sludge Concentration	2.2%	1.6%	1.8%	
7 Day Sludge Storage Volume	481,513	550	49,000	gpd
Secondary Digester Volume Provided		1,250,000		gallons
Thickened Sludge Concentration	2.5%	2.5%	2.5%	
Supernatant to Recycle	9,286	29	1,884	gpd
Thickened Sludge to Belt Press	59,501	50	5,116	gpd

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JOB 1338.011.001
SHEET NO. 1 OF 1
CALCULATED BY AJM DATE Februray 17, 2016
CHECKED BY JAB DATE
SUBJECT Digester Gas Analysis

***Gas Heating Available**

Calc Source	Methane Production (CFD)	Biogas Production (CFD)
BOD Destruction	37,416	57,562
VSS Destruction	58,440	89,907

The BOD loading relative to the VSS loading is lower than typical wastewaters, explaining the difference in methane production calculated.

The methane production estimated from BOD Destruction will be used for energy projections.

Energy Projections	Conventional	GE ATD	Lystek	
Biogas Production Rate	15	15	15	cf/day/lb-VSS
Biogas Produced	57,562	71,953	77,709	cfd
	39.97	49.97	53.96	cfm
Methane Content	65%	65%	65%	
Methane Produced	37,416	46,769	50,511	cfd
Heating Value of Methane	960	960	960	BTU/cf
BTU Value of Biogas	35,918,935	44,898,669	48,490,562	BTU/day
BTU Value of Biogas	1,496,622	1,870,778	2,020,440	BTU/hr
kW Value of Biogas	439	548	592	kW
Electrical Energy Available Through CHP	132	164	178	kW (30% recovered)
Heat Energy Available Through CHP	598,649	748,311	808,176	BTU/hr (40% recovered)

Storage Volume Required for 4 Hours:	9,600	12,000	12,960	CF
Storage Volume Required for 8 Hours:	19,190	23,990	25,910	CF
Storage Volume Required for 12 Hours:	28,790	35,980	38,860	CF

* GE ATD is GE Advanced Digestion Technology. This involves a biological hydrolysis process prior to the anaerobic digesters. Per GE ADT cut sheet, biogas production increases by approx. 25%. This was assumed to estimate the

* Lystek is a hydrolysis process that is installed after the digestion process, with a recycle stream going to the anaerobic digesters. Per the Lystek proposal for Glens Falls, biogas production is typically increased 30 - 40% due to the installation of the Lystek proposal. A value of 35% was assumed for the above calculations.

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JOB	1338.011.001		
SHEET NO.	1	OF	1
CALCULATED BY	AJM	DATE	February 17, 2016
CHECKED BY	JAB	DATE	
SUBJECT	Digester Tank Design		

***Tank Design**

Volume	=	Residence Time x Sludge Flow		Volume (Req. per VSS Loading) = VSS Loading/80 lb/d/1000 CF		
	=	15 days * 78,304 gal/day		=	12,834 lb/d / 80 lb/d/1000CF	
	=	1,174,553	gal	=	1,199,982	gal
	=	157,026	CF	=	160,425	CF

*Per Ten States Standards, minimum sidewater depth should be minimum 20 ft

*Per Ten States Standards, bottom should have 1:4 slope

*Per Ten States Standards, the tanks may be loaded up to 80 lbs of volatile solids per 1,000 CF per day.

* Per TR-16, the tanks may be loaded up to 0.12 - 0.16 lbs of volatile soilds per CF per day.

*Per Metcalf & Eddy, minimum diamter should be 20 ft

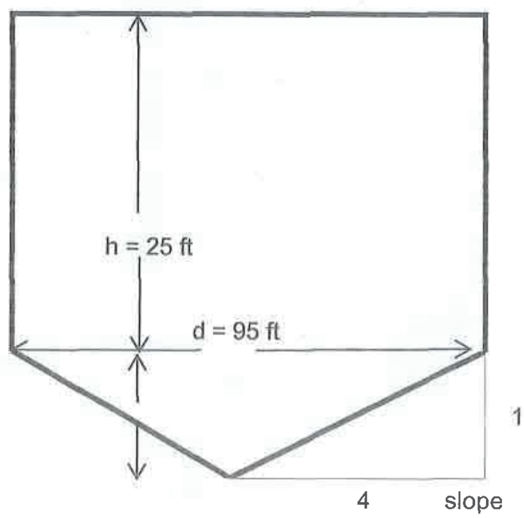
Assumptions:

26 ft sidewater depth

VSS Loading Volume Rules.

$$V = \frac{pi * h * d^2}{4}$$

Min. Diameter:	63	ft
Diameter:	90	ft
Center Depth:	12	ft
Volume:	190,852	cf
Volume:	1,427,570	gal



Design:

Two tanks, 90 ft diameter, 26 ft sidewater depth, 12 ft center depth, one primary and one secondary

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JOB 1338.011.001
SHEET NO. 1 OF 3
CALCULATED BY AJM DATE 3/29/2016
CHECKED BY JAB DATE
SUBJECT Digester Heating Requirements - Design Capacity

Design Parameters

Assume heating for both primary and secondary digesters.

Design Flow and Loading:

Specific Heat of Sludge: 1 BTU/lb-degree F

Temperatures (degrees F):

Earth next to tank wall =	32
Sludge in digester =	98
Earth below floor =	42
Air =	5
Incoming Sludge =	50

Primary Digester Sludge Loadings:

AGC Regional Biosolids Handling Facility
Primary Digesters Sludge Loading

Sludge Type	Wf	Wv	Sf	Sv	Percent Solids	Ss	Ssl	Dry Solids (lb/d)	Total Sludge Volume (GPD)	Total Sludge Mass Loading (lbs/d)	Heat Req. (BTU/hr)
Municipal Biosolids	0.27	0.73	2.5	1	3.0%	1.1933	1.0049	10,020	39,843	334,000	668,000
HSW	0.48	0.52	2.5	1	3.0%	1.4039	1.0087	9,750	38,622	325,000	650,000
Acid Whey	0.05	0.95	2.5	1	3.5%	1.0309	1.0011	23	78	651	1,302
Total								***19,793***	***78,543***	***659,651***	***1,319,302***

Assumptions:

Assume specific gravity of fixed solids is 2.5
Assume all waste has been thickened (through Recuperative Thickening) to 3% solids.
Wf and Wv for Acid Whey from waste characteristics in similar Anaerobic Digestion Feasibility Study.
Wf and Wv for HSW and Municipal Biosolids from Biosolids Production Calculations.

Heat Requirements for Sludge in Tank

q = (wet mass lb/day)*(98 - 50 degrees F) * (1 BTU/lb-F)

q = 1,319,302 BTU/hr

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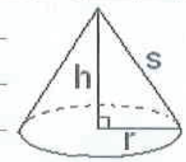
JOB 1338.011.001
SHEET NO. 2 OF 3
CALCULATED BY AJM DATE 3/29/2016
CHECKED BY JAB DATE
SUBJECT Digester Heating Requirements - Design Capacity

Calculate Areas for Tank Surfaces



Primary Digester:

Wall Area = pi*d*h = pi*75*25 = 7634.0637 SF

Floor Area = pi*r*s+pi*r^2 +pi*rcol^2 (assume 5 ft cone height and 9 ft wide central column)

s = (h^2+r^2)^0.5 = 40.807475 LF

Floor Area = 10408.725 SF

Roof Area (assume dome with base 90 ft diameter and 6 ft height) = pi(b^2 + h^2) = 6474.817 SF

Secondary Digester:

Wall Area = pi*d*h = pi*75*25 = 7634.0637 SF

Floor Area = pi*r*s+pi*r^2 +pi*rcol^2 (assume 5 ft cone height and 9 ft wide central column)

s = (h^2+r^2)^0.5 = 40.807475 LF

Floor Area = 10408.725 SF

Roof Area (assume dome with base 90 ft diameter and 6 ft height) = pi(b^2 + h^2) = 6474.817 SF

Heat Losses

Walls (Primary Digester - Insulated):

Heat Transfer Coefficient for 12" Thick Concrete with Insulation: 0.12 BTU per SF-hr-deg. F (Metcalf & Eddy)

q = (0.12 BTU/SF-hr-deg. F) * (7634.06 SF) * (98 - 32 deg. F)

q = 60,461.8 BTU/hr

Walls (Secondary Digester - Insulated):

Heat Transfer Coefficient for 12" Thick Concrete with Insulation: 0.12 BTU per SF-hr-deg. F (Metcalf & Eddy)

q = (0.12 BTU/SF-hr-deg. F) * (7634.06 SF) * (98 - 32 deg. F)

q = 60,461.8 BTU/hr

Roofs:

Heat Transfer Coefficient for fixed steel cover (1/4" thick): 0.83 BTU per SF-hr-deg. F (Metcalf & Eddy)

q = (0.83 BTU/SF-hr-deg.F)* (6474.82 SF + 6474.82 SF)*(98-5 deg. F)

q = 999,582 BTU/hr

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JOB	1338.011.001		
SHEET NO.	3	OF	3
CALCULATED BY	AJM	DATE	3/29/2016
CHECKED BY	JAB	DATE	
SUBJECT	Digester Heating Requirements - Design Capacity		

Floors:

Heat Transfer Coefficient for 12-inch thick plain concrete floor in contact with moist earth: 0.12 BTU per SF-hr-deg. F (Metcalf & Eddy)

q = (0.12 BTU/SF-hr-deg.F)*(10408.7 SF + 10408.7 SF) * (98-42 deg. F)

q = 139,893.26 BTU/hr

Heat Requirements for Primary Digesters

Primary Digester @ 5 degree F Day

Sludge Heat:	1,319,302	BTU/hr
Heat Losses:	630,200	BTU/hr
Total Heat Required:	1,949,502	BTU/hr

Secondary Digester @ 5 degree F Day

Sludge Heat:	1,319,302	BTU/hr
Heat Losses:	630,200	BTU/hr
Total Heat Required:	1,949,502	BTU/hr

Total Heat Required at 5 degree F Day (Average Low Temperature in January 2014):

Sludge Heat:	1,319,302	BTU/hr	
Heat Losses:	1,260,399	BTU/hr	
Total Heat Required:	2,579,701	BTU/hr	
Heat Recovered:	598,854	BTU/hr	*assume 40% heat recovery through CHP System
Heat Transferred:	432,672	BTU/hr	*assume through 2 Heat Exchangers at 85% Eff.
Heat Required:	2,147,029	BTU/hr	

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JOB 1338.011.001
SHEET NO. 1 OF 3
CALCULATED BY AJM DATE 3/29/2016
CHECKED BY JAB DATE
SUBJECT Digester Heating Requirements - Avg. January Op.

Design Parameters

Assume heating for both primary and secondary digesters.

Design Flow and Loading:

Specific Heat of Sludge: 1 BTU/lb-degree F

Temperatures (degrees F):

Earth next to tank wall =	32
Sludge in digester =	98
Earth below floor =	42
Air =	18
Incoming Sludge =	50

Primary Digester Sludge Loadings:

AGC Regional Biosolids Handling Facility
Primary Digesters Sludge Loading

Sludge Type	Wf	Wv	Sf	Sv	Percent Solids	Ss	Ssl	Dry Solids (lb/d)	Total Sludge Volume (GPD)	Total Sludge Mass Loading (lbs/d)	Heat Req. (BTU/hr)
Municipal Biosolids	0.27	0.73	2.5	1	3.0%	1.1933	1.0049	10,020	39,843	334,000	668,000
HSW	0.48	0.52	2.5	1	3.0%	1.4039	1.0087	9,750	38,622	325,000	650,000
Acid Whey	0.05	0.95	2.5	1	3.5%	1.0309	1.0011	23	78	651	1,302
Total								***19,793***	***78,543***	***659,651***	***1,319,302***

Assumptions:
Assume specific gravity of fixed solids is 2.5
Assume all waste has been thickened (through Recuperative Thickening) to 3% solids.
Wf and Wv for Acid Whey from waste characteristics in similar Anaerobic Digestion Feasibility Study.
Wf and Wv for HSW and Municipal Biosolids from Biosolids Production Calculations.

Heat Requirements for Sludge in Tank

q = (wet mass lb/day)*(98 - 50 degrees F) * (1 BTU/lb-F)

q = 1,319,302 BTU/hr

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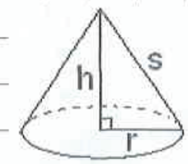
Calculate Areas for Tank Surfaces



Primary Digester:

Wall Area = pi*d*h = pi*75*25 = 7634.0637 SF

Floor Area = pi*r*s+pi*r^2 +pi*rcol^2 (assume 5 ft cone height and 9 ft wide central column)

s = (h^2+r^2)^0.5 = 40.807475 LF

Floor Area = 10408.725 SF

Roof Area (assume dome with base 90 ft diameter and 6 ft height) = pi(b^2 + h^2) = 6474.817 SF

Secondary Digester:

Wall Area = pi*d*h = pi*75*25 = 7634.0637 SF

Floor Area = pi*r*s+pi*r^2 +pi*rcol^2 (assume 5 ft cone height and 9 ft wide central column)

s = (h^2+r^2)^0.5 = 40.807475 LF

Floor Area = 10408.725 SF

Roof Area (assume dome with base 90 ft diameter and 6 ft height) = pi(b^2 + h^2) = 6474.817 SF

Heat Losses

Walls (Primary Digester - Insulated):

Heat Transfer Coefficient for 12" Thick Concrete with Insulation: 0.12 BTU per SF-hr-deg. F (Metcalf & Eddy)

q = (0.12 BTU/SF-hr-deg. F) * (7634.06 SF) * (98 - 32 deg. F)

q = 60,461.8 BTU/hr

Walls (Secondary Digester - Insulated):

Heat Transfer Coefficient for 12" Thick Concrete with Insulation: 0.12 BTU per SF-hr-deg. F (Metcalf & Eddy)

q = (0.12 BTU/SF-hr-deg. F) * (7634.06 SF) * (98 - 32 deg. F)

q = 60,461.8 BTU/hr

Roofs:

Heat Transfer Coefficient for fixed steel cover (1/4" thick): 0.83 BTU per SF-hr-deg. F (Metcalf & Eddy)

q = (0.83 BTU/SF-hr-deg.F)* (6474.82 SF + 6474.82 SF)*(98-18 deg. F)

q = 859,856 BTU/hr

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Floors:

Heat Transfer Coefficient for 12-inch thick plain concrete floor in contact with moist earth: 0.12 BTU per SF-hr-deg. F (Metcalf & Eddy)

q = (0.12 BTU/SF-hr-deg.F)*(10408.7 SF + 10408.7 SF) * (98-42 deg. F)

q = 139,893.26 BTU/hr

Heat Requirements for Primary Digesters

Primary Digester @ 5 degree F Day

Sludge Heat:	1,319,302	BTU/hr
Heat Losses:	560,336	BTU/hr
Total Heat Required:	1,879,638	BTU/hr

Secondary Digester @ 5 degree F Day

Sludge Heat:	1,319,302	BTU/hr
Heat Losses:	560,336	BTU/hr
Total Heat Required:	1,879,638	BTU/hr

Total Heat Required at 5 degree F Day (Average Low Temperature in January 2014):

Sludge Heat:	1,319,302	BTU/hr	
Heat Losses:	1,120,673	BTU/hr	
Total Heat Required:	2,439,975	BTU/hr	
Heat Recovered:	598,854	BTU/hr	*assume 40% heat recovery through CHP System
Heat Transferred:	432,672	BTU/hr	*assume through 2 Heat Exchangers at 85% Eff.
Heat Required:	2,007,303	BTU/hr	

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CALCULATED BY AJM DATE 3/29/2016
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SUBJECT Digester Heating Requirements - Avg. April Op.

Design Parameters

Assume heating for both primary and secondary digesters.

Design Flow and Loading:

Specific Heat of Sludge: 1 BTU/lb-degree F

Temperatures (degrees F):

Earth next to tank wall =	40
Sludge in digester =	98
Earth below floor =	50
Air =	45
Incoming Sludge =	50

Primary Digester Sludge Loadings:

AGC Regional Biosolids Handling Facility Primary Digesters Sludge Loading											
Sludge Type	Wf	Wv	Sf	Sv	Percent Solids	Ss	Ssl	Dry Solids (lb/d)	Total Sludge Volume (GPD)	Total Sludge Mass Loading (lbs/d)	Heat Req. (BTU/hr)
Municipal Biosolids	0.27	0.73	2.5	1	3.0%	1.1933	1.0049	10,020	39,843	334,000	668,000
HSW	0.48	0.52	2.5	1	3.0%	1.4039	1.0087	9,750	38,622	325,000	650,000
Acid Whey	0.05	0.95	2.5	1	3.5%	1.0309	1.0011	23	78	651	1,302
Total								*19,793*	*78,543*	*659,651*	*1,319,302*

Assumptions:

Assume specific gravity of fixed solids is 2.5

Assume all waste has been thickened (through Recuperative Thickening) to 3% solids.

Wf and Wv for Acid Whey from waste characteristics in similar Anaerobic Digestion Feasibility Study.

Wf and Wv for HSW and Municipal Biosolids from Biosolids Production Calculations.

Heat Requirements for Sludge in Tank

q = (wet mass lb/day)*(98 - 50 degrees F) * (1 BTU/lb-F)

q = 1,319,302 BTU/hr

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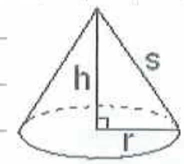
SUBJECT Digester Heating Requirements - Avg. April Op.

Calculate Areas for Tank Surfaces



Primary Digester:

Wall Area = pi*d*h = pi*75*25 = 7634.0637 SF

Floor Area = pi*r*s+pi*r^2 +pi*rcol^2 (assume 5 ft cone height and 9 ft wide central column)

s = (h^2+r^2)^0.5 = 40.807475 LF

Floor Area = 10408.725 SF

Roof Area (assume dome with base 90 ft diameter and 6 ft height) = pi(b^2 + h^2) = 6474.817 SF

Secondary Digester:

Wall Area = pi*d*h = pi*75*25 = 7634.0637 SF

Floor Area = pi*r*s+pi*r^2 +pi*rcol^2 (assume 5 ft cone height and 9 ft wide central column)

s = (h^2+r^2)^0.5 = 40.807475 LF

Floor Area = 10408.725 SF

Roof Area (assume dome with base 90 ft diameter and 6 ft height) = pi(b^2 + h^2) = 6474.817 SF

Heat Losses

Walls (Primary Digester - Insulated):

Heat Transfer Coefficient for 12" Thick Concrete with Insulation: 0.12 BTU per SF-hr-deg. F (Metcalf & Eddy)

q = (0.12 BTU/SF-hr-deg. F) * (7634.06 SF) * (98 - 40 deg. F)

q = 53,133.1 BTU/hr

Walls (Secondary Digester - Insulated):

Heat Transfer Coefficient for 12" Thick Concrete with Insulation: 0.12 BTU per SF-hr-deg. F (Metcalf & Eddy)

q = (0.12 BTU/SF-hr-deg. F) * (7634.06 SF) * (98 - 40 deg. F)

q = 53,133.1 BTU/hr

Roofs:

Heat Transfer Coefficient for fixed steel cover (1/4" thick): 0.83 BTU per SF-hr-deg. F (Metcalf & Eddy)

q = (0.83 BTU/SF-hr-deg.F)* (6474.82 SF + 6474.82 SF)*(98-45 deg. F)

q = 569,654 BTU/hr

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Floors:

Heat Transfer Coefficient for 12-inch thick plain concrete floor in contact with moist earth: 0.12 BTU per SF-hr-deg. F (Metcalf & Eddy)

q = (0.12 BTU/SF-hr-deg.F)*(10408.7 SF + 10408.7 SF) * (98-50 deg. F)

q = 119,908.51 BTU/hr

Heat Requirements for Primary Digesters

Primary Digester @ 5 degree F Day

Sludge Heat:	1,319,302	BTU/hr
Heat Losses:	397,915	BTU/hr
Total Heat Required:	1,717,217	BTU/hr

Secondary Digester @ 5 degree F Day

Sludge Heat:	1,319,302	BTU/hr
Heat Losses:	397,915	BTU/hr
Total Heat Required:	1,717,217	BTU/hr

Total Heat Required at 5 degree F Day (Average Low Temperature in January 2014):

Sludge Heat:	1,319,302	BTU/hr	
Heat Losses:	795,829	BTU/hr	
Total Heat Required:	2,115,131	BTU/hr	
Heat Recovered:	598,854	BTU/hr	*assume 40% heat recovery through CHP System
Heat Transferred:	432,672	BTU/hr	*assume through 2 Heat Exchangers at 85% Eff.
Heat Required:	1,682,459	BTU/hr	

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Design Parameters

Assume heating for both primary and secondary digesters.

Design Flow and Loading:

Specific Heat of Sludge: 1 BTU/lb-degree F

Temperatures (degrees F):

Earth next to tank wall =	55
Sludge in digester =	98
Earth below floor =	50
Air =	69
Incoming Sludge =	50

Primary Digester Sludge Loadings:

AGC Regional Biosolids Handling Facility
Primary Digesters Sludge Loading

Sludge Type	Wf	Wv	Sf	Sv	Percent Solids	Ss	Ssl	Dry Solids (lb/d)	Total Sludge Volume (GPD)	Total Sludge Mass Loading (lbs/d)	Heat Req. (BTU/hr)
Municipal Biosolids	0.27	0.73	2.5	1	3.0%	1.1933	1.0049	10,020	39,843	334,000	668,000
HSW	0.48	0.52	2.5	1	3.0%	1.4039	1.0087	9,750	38,622	325,000	650,000
Acid Whey	0.05	0.95	2.5	1	3.5%	1.0309	1.0011	23	78	651	1,302
Total								*19,793*	*78,543*	*659,651*	*1,319,302*

Assumptions:
Assume specific gravity of fixed solids is 2.5
Assume all waste has been thickened (through Recuperative Thickening) to 3% solids.
Wf and Wv for Acid Whey from waste characteristics in similar Anaerobic Digestion Feasibility Study.
Wf and Wv for HSW and Municipal Biosolids from Biosolids Production Calculations.

Heat Requirements for Sludge in Tank

q = (wet mass lb/day)*(98 - 50 degrees F) * (1 BTU/lb-F)

q = 1,319,302 BTU/hr

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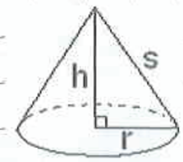
SUBJECT Digester Heating Requirements - Avg. July Op.

Calculate Areas for Tank Surfaces



Primary Digester:

Wall Area = pi*d*h = pi*75*25 = 7634.0637 SF

Floor Area = pi*r*s+pi*r^2 +pi*rcol^2 (assume 5 ft cone height and 9 ft wide central column)

s = (h^2+r^2)^0.5 = 40.807475 LF

Floor Area = 10408.725 SF

Roof Area (assume dome with base 90 ft diameter and 6 ft height) = pi(b^2 + h^2) = 6474.817 SF

Secondary Digester:

Wall Area = pi*d*h = pi*75*25 = 7634.0637 SF

Floor Area = pi*r*s+pi*r^2 +pi*rcol^2 (assume 5 ft cone height and 9 ft wide central column)

s = (h^2+r^2)^0.5 = 40.807475 LF

Floor Area = 10408.725 SF

Roof Area (assume dome with base 90 ft diameter and 6 ft height) = pi(b^2 + h^2) = 6474.817 SF

Heat Losses

Walls (Primary Digester - Insulated):

Heat Transfer Coefficient for 12" Thick Concrete with Insulation: 0.12 BTU per SF-hr-deg. F (Metcalf & Eddy)

q = (0.12 BTU/SF-hr-deg. F) * (7634.06 SF) * (98 - 55 deg. F)

q = 39,391.8 BTU/hr

Walls (Secondary Digester - Insulated):

Heat Transfer Coefficient for 12" Thick Concrete with Insulation: 0.12 BTU per SF-hr-deg. F (Metcalf & Eddy)

q = (0.12 BTU/SF-hr-deg. F) * (7634.06 SF) * (98 - 55eg. F)

q = 39,391.8 BTU/hr

Roofs:

Heat Transfer Coefficient for fixed steel cover (1/4" thick): 0.83 BTU per SF-hr-deg. F (Metcalf & Eddy)

q = (0.83 BTU/SF-hr-deg.F)* (6474.82 SF + 6474.82 SF)*(98-69 deg. F)

q = 311,698 BTU/hr

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Engineers • Environmental Scientists • Planners • Landscape Architects
290 Elwood Davis Road • Box 3107 • Syracuse, NY 13220
Telephone: 315-457-5200 • Facsimile: 315-451-0052

CALCULATED BY AJM DATE 3/29/2016
CHECKED BY JAB DATE
SUBJECT Digester Heating Requirements - Avg. July Op.

Floors:

Heat Transfer Coefficient for 12-inch thick plain concrete floor in contact with moist earth: 0.12 BTU per SF-hr-deg. F (Metcalf & Eddy)

q = (0.12 BTU/SF-hr-deg.F)*(10408.7 SF + 10408.7 SF) * (98-50 deg. F)

q = 119,908.51 BTU/hr

Heat Requirements for Primary Digesters

Primary Digester @ 5 degree F Day

Sludge Heat:	1,319,302	BTU/hr
Heat Losses:	255,195	BTU/hr
Total Heat Required:	1,574,497	BTU/hr

Secondary Digester @ 5 degree F Day

Sludge Heat:	1,319,302	BTU/hr
Heat Losses:	255,195	BTU/hr
Total Heat Required:	1,574,497	BTU/hr

Total Heat Required at 5 degree F Day (Average Low Temperature in January 2014):

Sludge Heat:	1,319,302	BTU/hr	
Heat Losses:	510,390	BTU/hr	
Total Heat Required:	1,829,692	BTU/hr	
Heat Recovered:	598,854	BTU/hr	*assume 40% heat recovery through CHP System
Heat Transferred:	432,672	BTU/hr	*assume through 2 Heat Exchangers at 85% Eff.
Heat Required:	1,397,020	BTU/hr	

City of Glens Falls Alternative 3 - Anaerobic Digestion & CHP Digester Heating Requirement Summary				
Month	**Design**	**January**	**April**	**July**
Earth Next to Tank Wall (deg. F)	32	32	40	55
Sludge in Digester (deg. F)	98	98	98	98
Earth Below Floor (deg. F)	42	42	50	50
Air (deg. F)	5	18	45	69
Incoming Sludge (deg. F)	50	50	50	50
Heat Requirement (BTU/hr)	2,579,701	2,439,975	2,115,131	1,829,692

City of Glens Falls Alternative 3 - Anaerobic Digestion & CHP Annual Digester Heating Requirement Summary				
Month	**BTU/Hr**	**Days**	**BTU/month**	**MMBTU**
January	2,439,975	31	1,815,341,043	1,815
February	2,331,693	28	1,566,897,944	1,567
March	2,223,412	31	1,654,218,691	1,654
April	2,115,131	30	1,522,894,370	1,523
May	2,019,985	31	1,502,868,559	1,503
June	1,924,838	30	1,385,883,487	1,386
July	1,829,692	31	1,361,290,648	1,361
August	1,924,838	31	1,432,079,604	1,432
September	2,019,985	30	1,454,388,929	1,454
October	2,115,131	31	1,573,657,515	1,574
November	2,223,412	30	1,600,856,798	1,601
December	2,331,693	31	1,734,779,867	1,735
Total	-	***365***	-	***18,605***

City of Glens Falls Alternative 3 - Anaerobic Digestion & CHP w/ Lystek Digester Heating Requirement Summary				
Month	Design	January	April	July
Earth Next to Tank Wall (deg. F)	32	32	40	55
Sludge in Digester (deg. F)	98	98	98	98
Earth Below Floor (deg. F)	42	42	50	50
Air (deg. F)	5	18	45	69
Incoming Sludge (deg. F)	50	50	50	50
Heat Requirement (BTU/hr)	2,579,701	2,439,975	2,115,131	1,829,692

City of Glens Falls Alternative 3 - Anaerobic Digestion & CHP w/ Lystek Annual Digester Heating Requirement Summary				
Month	BTU/Hr	Days	BTU/month	MMBTU
January	1,879,638	31	1,398,450,864	1,398
February	1,825,498	28	1,226,734,443	1,227
March	1,771,357	31	1,317,889,688	1,318
April	1,717,217	30	1,236,395,904	1,236
May	1,669,643	31	1,242,214,622	1,242
June	1,622,070	30	1,167,890,462	1,168
July	1,574,497	31	1,171,425,667	1,171
August	1,622,070	31	1,206,820,145	1,207
September	1,669,643	30	1,202,143,183	1,202
October	1,717,217	31	1,277,609,100	1,278
November	1,771,357	30	1,275,377,118	1,275
December	1,825,498	31	1,358,170,276	1,358
Total	-	***365***	-	***15,081***

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JOB	1338.011.001		
SHEET NO.	1	OF	1
CALCULATED BY	AJM	DATE	3/27/2016
CHECKED BY	JAB	DATE	
SUBJECT	Belt Filter Presses Design Basis - After AD		

Design Parameters (per 10 States Standards for Wastewater 2014)

Provisions shall be made to maintain sufficient continuity of service. The number of belt filter presses shall be sufficient to dewater the sludge with the largest unit out of service.

Design Flow and Loading:

Assume operation 8 hours per day, 5 days per week.

Flow (GPD):	90,535		
Percent Solids:	2.5%		
TSS (lb/d):	19,319		
VSS (lb/d):	9,246		
Specific Gravity of Solids:	1.4553		
Specific Gravity of Sludge:	1.0079		
Total Sludge Weight (lb/d)	761,217		
Solids Loading Rate (lbs/hr)	2,415		
Belt Width Required (m)	3.4	*From minimum of 700 lbs/hr per m belt width for anaerobically digested sludge from BDP representative*	
Sludge Cake Solids Percent:	20.0%		
Solids Capture:	95.0%		
Sludge Cake Dry Solids (lb/d)	18,353.44		
Sludge Cake Volatile Solids (lb/d):	8,783.32		
Specific Gravity of Solids:	1.4553		
Specific Gravity of Cake:	1.0667		
Total Weight of Cake (lb/d):	91,767		
Total Volume of Cake (gpd):	10,312	255.3	CY/week
Filtrate to Drain (gpd):	80,132		

Assume 10 lbs polymer/dry ton based on 3DP brochure.

Polymer used/day: 97 lbs/day

Provide (3) 3DP Belt Filter Presses: All with 2.0m belt width

One unit will allow for redundancy to continue dewatering operations if one unit is offline for maintenance.

Appendix F

Lime Stabilization Process Calculations and Proposal

Barton & Loguidice
Engineers • Environmental Scientists • Planners • Landscape Architects
10 Airline Drive · Suite 200 · Albany, New York 12205
Telephone: (518) 218-1801 · Fax: (518) 218-1805

Design Parameters

Feed and slaking equipment shall be sized to handle a minimum of 150% of the peak sludge flow rate including sludge that may need to be retreated due to pH decay (per 10 States Standards for Wastewater 2014).

Duplicate units shall be provided (per 10 States Standards for Wastewater 2014).

Storage facilities shall be sized to provide a minimum 30-day supply (per 10 States Standards for Wastewater 2014).

Sludge pH shall be a minimum of 12 for a minimum of 2 hours (per WEF MOP 8).

Design Flow and Loading:

Glens Falls Dry Solids, lb/d:	10,020
WCSD#2 Dry Solids, lb/d:	660
Total Dry Solids, lb/d:	10,680

Typical Lime Dosage - WEF MOP 8

Assume typical dosages from Table 18.19 from WEF MOP 8. Higher end of ranges assumed to reach pH of 12.5 for 2 hours.

Primary Sludge: 0.18 lb Ca(OH)2 per lb dry solids

WAS: 0.43 lb Ca(OH)2 per lb dry solids

Anaerobic Digested: 0.25 lb CA(OH)2 per lb dry solids

Assume 3/4 of Glens Falls is Primary Sludge and 1/4 of Glens Falls is WAS. WCSD#2 is anaerobically digested.

Sludge	Dry Solids, lb/d	lb Ca(OH)2 Required/d
GF Primary Sludge	**7,515**	**1,353**
GF WAS	**2,505**	**1,077**
WCSD#2 Anaerobically Digested	**660**	**165**
Total	***10,680***	***2,595***

Note: The above dosage rate is assumed based on typical values. If this alternative is chosen, final design should include chemical analysis of the sludge and dosage calculation based on reaction kinetics.

Typical Lime Dosage - Operation Values from Local Chemical Suppliers

Per Surpass Chemical, typical lime stabilization dosages range from 500 - 800 lbs Ca(OH)2 per ton dry sludge solids.

Dosage (500 lbs lime/ton/d):	2,670	lbs Ca(OH)2/day
Dosage (800 lbs lime/ton/d):	4,272	lbs Ca(OH)2/day
Assume average value of 650 lbs lime/ton/d:	***3,471***	***lbs Ca(OH)2/day***

Operation Value Dosage Rate (5,212 lb/d) is greater than WEF MOP 8 calculated dosage (3,894 lb/d).

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JOB 1338.011.001
SHEET NO. 2 OF 2
CALCULATED BY AJM DATE 3/28/2016
CHECKED BY JAB DATE
SUBJECT Lime Dosage Calculations

Storage Requirements

Lime Dosage Rate from Typical Operation Values (greater of the two methods): 3,471 lbs Ca(OH)2/d

Storage Size required for 30-day supply:	104,130	lbs hydrated lime
Storage Size required for 30-day supply:	52	tons hydrated lime
Storage Size required for 30-day supply:	78,886	lbs quicklime
Storage Size required for 30-day supply:	39	tons quicklime
Storage Size required for 30-day supply*:	1,500	CF quicklime (55 pcf density from Lime Handling Systems, Stanco Projects LTD)
Storage Size required for 30-day supply:	4,200	CF hydrated lime (25 pcf density from Lime Handling Systems, Stanco Projects LTD)

**Assumes 1 lb of CaO (quicklime) combines with 0.32 lbs water to form 1.32 lbs Ca(OH)2 (hydrated lime).*

Operation Parameters - Hydrated Lime

Per Surpass Chemical, max load of carrier is 22-25 tons.

Weekly usage is 13 tons/week of hydrated lime.

- > Two Deliveries per month, Assume Bolted Steel Factory Coated Coated Steel Silo, assembled on site

Silo Diameter:	12	ft	

Ratio straight side to diameter between 3:1 and 4:1

Straight Side:	36	ft	
Storage Vol:	4072	CF	
No. Silos:	1	EA	Provide (1) Redundant System.

Operation Parameters - QuickLime

Per Surpass Chemical, max load of carrier is 22-25 tons.

Weekly usage is 10 tons/week.

- > Three Deliveries per month, Assume Bolted Steel Factory Coated Coated Steel Silo, assembled on site

Silo Diameter:	12	ft	

Ratio straight side to diameter between 3:1 and 4:1

Straight Side:	36	ft	
Storage Vol:	4072	CF	
No. Silos:	1	EA	Provide (1) Redundant System.

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JOB 1338.011.001
SHEET NO. 1 OF 1
CALCULATED BY AJM DATE 3/28/2016
CHECKED BY JAB DATE
SUBJECT Lime Process Storage/Hauling

Biosolids Production:	10,680	lb/d
Lime Solids Added	3,471	lb/d
Biosolids % Solids	19%	(assumed)
Water Mass	45,531	lb/d
Total Mass	59,682	lb/d
Final % Solids	24%	
Wet ton/year	10,892	ton/year

CHEMCO Systems, L.P.
1500 Industrial Drive
Monongahela, PA 15063

CHEMCO
SYSTEMS, L.P.

• Tele.: (724) 258-7333 • Fax.: (724) 258-7350
• E-mail: sales@chemcosystems.net

February 23, 2016

Amanda Mattingly
Barton & Loguidice
10 Airline Drive, Suite 200
Albany, NY 12205

RE: Glens Falls, NY
Sludge Stabilization System
Chemco Proposal No. 60212

Dear Amanda,

CHEMCO Systems, L.P. proposes to supply one hydrated lime silo system for the above referenced project. All components located in the silo support skirt will be installed unless noted in the Scope below.

Please do not hesitate to contact Mr. Jeff Tennant or myself with any questions you may have on this bid. An Equipment Description and Terms and Conditions sheets are enclosed for your review and reference.

Sincerely,

CHEMCO SYSTEMS, L.P.

Rich DeGennaro

Rich DeGennaro

Cc: Mr. Jeff Tennant, VP Sales, Chemco Systems

TERMS & CONDITIONS	
SUBMITTALS / DELIVERY:	Drawings submitted 12 to 14 weeks after receipt of a Purchase Order. Equipment delivery 20 to 24 weeks after receipt of approved drawings. The durations provided are estimated and would be re-evaluated at time of contract based on current engineering and shop loading.
BUDGET PRICING:	$406,300.00 F.C.A. Factory, Monongahela, PA. No freight included in Chemco scope. There may be a discount if two units are purchased. This would be decided at a later date based on actual layout and engineering time required for second unit.
TERMS:	30% with approval drawings, net 30 70% Upon shipment net 30
NOTE:	Shipments delayed by the Purchaser for more than one year from purchase order date are subject to billing at the prevailing rate, unless specifically addressed elsewhere in this proposal.
	Due to limited storage space CHEMCO is unable to store the equipment beyond the scheduled shipping date. CHEMCO will invoice for the equipment based on the original schedule even though the equipment is not shipped, as long as the equipment is ready for shipping. If the Customer's construction site is not prepared to receive the equipment on the schedule ship date, **then the Customer must designate an alternate site**. CHEMCO will then ship the equipment to the designated alternate site. • If the Customer does not designate an alternate site at least one week prior to the scheduled ship date, then CHEMCO will choose a storage facility and inform the Customer of the selection and the associated costs. The Customer will be billed for the following charges: • Labor & materials for long-term horizontal storage, • Freight from CHEMCO to a Subcontractor's storage facility, • Subcontractor's storage fee, • Crane rental to load and unload the equipment, • CHEMCO shipper's labor to arrange for storage, • Labor to clean the equipment & to put it in "as new" condition when the Customer is ready for delivery.

TERMS & CONDITIONS	
	These charges will be billed to the Customer "at cost".
START-UP/SUPERVISION:	CHEMCO start-up is available for installation checkout and operator instruction. This service would be performed after the equipment is installed, utilities are connected, and the chemicals are on hand. Start-up service will be provided at the per diem per day rate of $1,600 plus living and travel expense. **NOTE:** To comply with CHEMCO's guarantees and warranties CHEMCO personnel must perform start-up.
WARRANTY:	CHEMCO will warrant the system for twelve (12) months from initial operation, not to exceed eighteen (18) months from shipment. This will be limited to the supply of parts and materials only. Defective parts must be returned to CHEMCO for inspection and evaluation. Parts, which fail due to abnormal operating conditions, which were not known at the time of bid or system design, are not covered under this warranty. **Consequential damages as a result of equipment failure are excluded from this warranty** **This is an equipment only warranty**

EQUIPMENT DESCRIPTION

ITEM	QUANTITY	DESCRIPTION

01	1	Hydrated lime storage silo
		• 12' dia x 36' storage cylinder height x 53' eave height
		• 4,100 ft^3 storage capacity
		• Factory welded, carbon steel construction
		• One 10° sloped roof
		• One 24" diameter roof manway with pressure/vacuum relief valve
		• One dust collector flange
		• One roof mounted level switch opening
		• Two sidewall level switch openings
		• Two roof mounted lifting lugs
		• One target box mounting flange
		• Lot of silo fill line mounting brackets
		• Discharge cone with 5' diameter flanged outlet
		• Exhaust fan opening
		• Lot of internal hold-downs
		• One 6' x 6'– 8" double door assembly
		• One galvanized ladder and cage assembly for access to the silo roof from grade with safety gate at silo roof per OSHA
		• One 1-1/2" Schedule 40 galvanized handrail assembly with angle posts provided around the perimeter of the silo roof per OSHA
		• One painted steel toe plate assembly provided around the perimeter of the silo roof
		• The silo will be painted as follows:
		  • The storage interior will be unpainted
		  • The silo exterior and skirt interior will be sandblasted to SSPC SP6
		  • The silo exterior and skirt interior will be primed with a 4-6 mil DFT coat of epoxy primer
		  • The silo exterior and skirt interior will be finish painted with a 4-6 mil DFT coat aliphatic urethane
		• Designed for storing hydrated lime with a density of 30 lb/cf
		• NOTE: All site conditions to be verified at time of firm pricing
		• **Silo factory built and would ship in one piece**

EQUIPMENT DESCRIPTION

ITEM	QUANTITY	DESCRIPTION
02	1	Silo fill line assembly • 4" Schedule 40 carbon steel pipe • One target box with clean-out port • One 90° long radius wear-back elbow • One malleable iron truck fill adapter with dust cap • One NEMA 4 limit switch • **Field installation and wire terminations by the installing contractor**
03	1	Truck unloading operator station • NEMA 4X stainless steel enclosure • Indicating lights • Selector switches • Alarm horn • beacon • Push button • Terminal blocks • Relays to control the bin vent pulse solenoids • **Field installation and wire terminations by contractor**
04	3	Silo point level switch • Rotating paddle type • Stainless steel paddle • One roof located and two on side • NEMA 4 polyester-coated aluminum housing and cover • One single-pole, double-throw switch • 120 volt, 1 phase, 60 hertz, low torque slow speed synchronous motor • Conduit run at factory with wires pulled. • **Field installation and wire terminations by the installing contractor**
05	1	Silo Bin Vent • Pulse jet type • Carbon steel housing • 300 square feet of polyester filter cloth • Solenoid valve wired to local NEMA 4X junction box • Pressure differential indicator and switch • Sequence timer • 2 HP, 460 volt, 3 phase, 60 hertz, blower motor • Instrument air supplied by others • **Field installation, airline connection, and wire terminations by the installing contractor**

EQUIPMENT DESCRIPTION

ITEM	QUANTITY	DESCRIPTION
06	1	Dust collector airline assembly • One manually operated ball valve • One combination filter/regulator • Lot of 1" carbon steel pipe • **Factory installed and piped**
07	1	Bin activator • 5' diameter • Carbon steel mounting ring • Carbon steel hanger arms with bushings • Continuous flexible rubber sleeve • Two stainless steel retaining bands • 60° lower cone assembly • 8" diameter flanged outlet • Inverted head assembly • 1-1/2 HP, 460 volt, 3 phase, 60 hertz, variable force vibrator • **Factory installed and wired**
08	1	Silo discharge isolation knife gate valve • 8" diameter manually operated • Cast stainless steel • 304 stainless steel gate • 304 stainless steel metal seat • Teflon packing • Manual chain wheel operator • **Factory installed**

09	1	Knife gate to screw feeder transition assembly
		• One carbon steel fabricated knife gate adapter flange
		• One flexible connection
		  ▪ Pure gum rubber construction
		  ▪ 1 ply nylon reinforcement
		• Two stainless steel band clamps
		• One carbon steel fabricated screw feeder adapter flange
		• **Factory installed**

EQUIPMENT DESCRIPTION		
ITEM	**QUANTITY**	**DESCRIPTION**
10	1	CHEMCO screw type feeder • Capable of feeding 852 lb/hr max • 304 stainless steel trough • 304 stainless steel discharge spout • 3" Solid flight feed screw with material conditioning plows • 1.5 HP, 460 volt, 3 phase, 60 hertz, TEFC motor • Variable speed VFD • Manufacturer: Chemco Systems • **Factory installed and wired**
11	1	Lime transfer conveyor • Conveyor charging adapter • 3" diameter x 25' (approx.) long conveyor • Constant speed, 3/4 HP, 230/460 volt, 3 phase, 60 hertz, TEFC, motor • **Shipped loose for field installation and wiring by the installing contractor**

12	1	Conveyor to blender transition assembly
		• One flexible connection
		  ▪ Pure gum rubber construction
		  ▪ 1 ply nylon reinforcement
		• Two stainless steel band clamps
		• One 304 stainless steel fabricated, conveyor inlet transition
		• **Shipped loose for field installation by the installing contractor**

EQUIPMENT DESCRIPTION

ITEM	QUANTITY	DESCRIPTION
13	1	WillowTech D-270 lime and sludge plow blender • Stainless steel dual trough mixing chamber • Estimated throughput capacity of 3,000 pounds per hour of sludge and lime • T-1 steel, replaceable, fixed, open plow mixing elements • Carbon steel shafting • Carbon steel gasketed cover with inspection door and limit switches • Top flanged inlet opening • Manually adjustable slide gate for variable retention time • Bottom flanged outlet opening • Self-aligning flanged housed bearings • Stuffing box with lubricated braided packing • Externally mounted spur gears • 5 HP, 460 volt, 3 phase, 60 hertz, TEFC motor • Zero speed switch • Carbon steel support stand • **Shipped separate for field installation and wire terminations by the installing contractor.**
14	1	Silo exhaust fan • 16" diameter • Automatic shutter • Wire guard • 1/20 hp, totally enclosed motor • Adjustable thermostat • 120 Volt, 1 phase, 60 Hertz • **Factory installed and wired**
15	1	Silo heavy duty electric heater • 10 kW • Adjustable outlet louver • Built-in thermostat • Mounting bracket for horizontal installation • 460 Volt, 3 phase, 60 Hertz • **Factory installed and wired**
16	Lot	Silo skirt insulation • 1-1/2" thick • Extruded polystyrene closed cell foam • Painted with white latex • **Factory installed on the interior skirt walls**

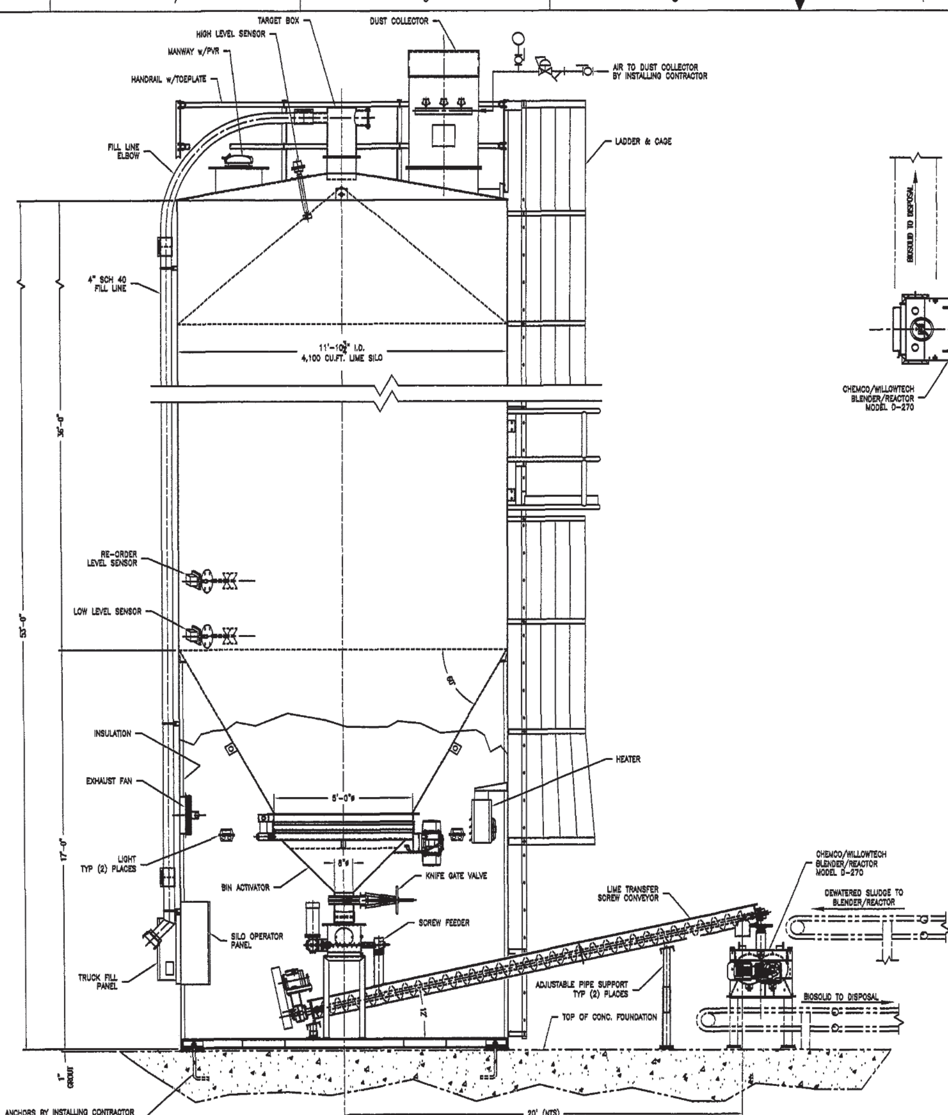
EQUIPMENT DESCRIPTION		
ITEM	**QUANTITY**	**DESCRIPTION**
17	2	Silo interior light fixtures • Fluorescent type • 4' long • Completely sealed and fully gasketed to resist dust and moisture • **Factory installed and wired**
18	1	Electrical outlet • Duplex type • 120 volt • 20 amp • **Factory installed and wired.**
19	Lot	Stainless steel tags for equipment
20	1	Lime system control panel • NEMA 4X stainless steel enclosure • IEC motor starter/protector • Transformer • Main disconnect switch • Fuses • Allen-Bradley CompactLogix PLC • Operator interface touch screen • Alarm siren • Push button • Terminal blocks • **Factory installed and wired**
21	Lot	Operation & Maintenance Manual Final copy – 2 hard copies and 1 electronic (two weeks prior to erection)
22	Lot	Factory assembly, piping, wiring and testing of components • As noted above with some items removed for shipment • All exterior ladders, railings, fill lines, level indicators, dust collector, fill panel and related items will be shipped loose for field installation by others • Conduit will be run on the silo exterior and wires will be pulled for the fill panel, level indicators and dust collector prior to shipment from our shop • Re-connection and wiring terminations for items shipped loose will be the responsibility of the installing contractor

EQUIPMENT DESCRIPTION

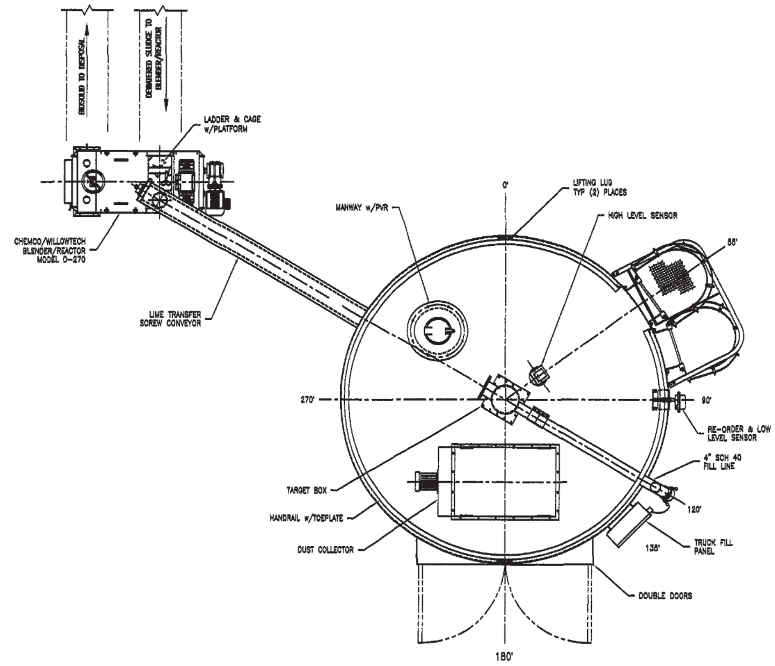
ITEM	QUANTITY	DESCRIPTION

SERVICES AND ITEMS NOT INCLUDED IN CHEMO'S PROPOSAL

- Unloading
- Erection
- Installation
- Design or supply of anchor bolts
- Design or supply of concrete foundations
- Hook-up of utilities
- Supply of chemicals
- Supply of any conduit or wire past the silo skirt
- Supply of clean, dry compressed air
- Light bulbs
- Touch up painting
- Supply of any other materials or services unless specifically mentioned above



ELEVATION



ROOF PLAN

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CHEMCO SYSTEMS

DATE	REV	ZONE	REMARKS
SCALE:			1/2" = 1'-0"
DATE:			FEBRUARY 16, 2016
DRWN BY:			J. DAVIS

CHEMCO SYSTEMS, L.P.
1500 INDUSTRIAL DRIVE MONONGAHELA, PA

SHT. DESCRIPTION: GENERAL ARRANGEMENT

DWG. DESCRIPTION: BARTON & LOGUIDICE
SLUDGE STABILIZATION SYSTEM
GLEN FALLS, NEW YORK

CHECKED BY:
APPROVED BY:

D DWG NO.: P021816
SHEET NO. 1

Appendix G

Lystek™ Process Proposal

Lystek Budget Costing – Glens Falls, NY – Washington County, NY

Prepared by: Jim Belcastro (jbelcastro@lystek.com 508-463-5444) April 26th[th] 2016
Consulting Engineer: Barton & Loguidice, Amanda Mattingly – Jason Ballard

Project Summary – Lystek proposes to install the below listed Reactor system to process biosolids from Glens Falls, NY & Washington County, NY.

Budget proposal based upon information provided in conference February 4[th] 2016 and is subject to change upon further discussion.

Lystek Biosolids & Organics System (KoH/NaOH or Lime CaO)

	Future Max Month
Dry Tons/Day to be processed in 24 hours	6.6
Solids Lystek product	20%
Number of 1200 Gallon Reactors	1
Floor Space Required (ft2)	800 ft2
	Cost
Capital Cost incl KOH feeding (See Note 1)	$3,000,000
Option: CAO feeding; Lime silo and dosing instead of alkali	$450,000
Installation (See Note 2)	$400,000
Operating Costs	**Cost / Dry Ton (USD)**
Liquid Alkali (185 lbs/DT @ $.38/lb)	$70.30
A) Or alternatively lime option: alternatively lime: (.21 tons @ $175/ton)	$36.75
Electricity (58 kWh at $.07/kWh)	$4.06
Natural Gas (5.3 Therms at $ 0.20/Therms)	$1.06
Maintenance Costs	$10.00

Notes:

1. All budget pricing is in US Dollars (April 2016). It includes the supply and delivery of the dewatered biosolids storage tank, progressive cavity transfer pumps from the storage tank to the Lystek reactor, the Lystek c/w high shear mixer, progressive cavity transfer pumps to storage, low pressure steam boiler, liquid alkali (potassium hydroxide / sodium hydroxide) tank and dosing system, control panel c/w VFD, instruments, commissioning and start-up assistance. Detailed proposal, as well as discussion of LysteGro material storage to follow upon further discussion and tour of site. Standard: KOH option; CAO optional instead of KOH option.

2. Price includes mechanical and electrical installation using a non-union workforce working straight time under a normal construction schedule. Assumes adequate utilities are within 100 feet of the installation and access into the building (ex. garage door) to allow a clear and unencumbered access to the construction area. (Assumes installation in existing building or building supplied by others).

3. The Lystek equipment is easy to operate. The system is typically operated by existing plant staff at a WRRF that also manages the dewatering equipment. No additional staff has been required to operate the Lystek process that have been installed at a wastewater recovery facilities. A two (2) reactor system will require about 1 hour of operator attention per day.

4. The proposed Lystek system will be able to process the biosolids & organics discussed in February 4th 2016 meeting.

Tables

City of Glens Falls
Existing Conditions Biosolids Production and Acceptance
Table 1

Municipality	Description	Total Dry Solids (lb/d)	Wet Volume Before Belt Filter Press (if applicable)(GPD)	Total Wet Mass After Belt Filter Press (if applicable) (lb/d)
Glens Falls WWTP	Municipal wastewater is treated through the plant to produce primary sludge and thickened waste activated sludge (TWAS). The primary sludge and TWAS are pressed to a solids concentration of 17-21% (19% used for calculation).	9,110	35,140	45,770
Glens Falls WWTP	Accepted Waste at the Glens Falls WWTP. Accepted waste is 75% septage, with the remainder being a mix of fats, oils and grease (FOG), Liquid Sludge from Other Plants, Cake and Industrial. A solids content of 1.5% was used.	6,500	51,930	24,490
WCSD#2 WWTP	Municipal wastewater is treated to produce primary sludge and waste activated sludge. Both sludges are mixed and treated via anaerobic digestion. The digested sludge is pressed to a solids concentration of 17-21% (17% used for calculation).	600	7,860	3,520
WCSD#2 WWTP	Biosolids from other municipalities are accepted at the WCSD#2 Compost Facility. Data from 2015 records. Average solids content is 17.7% and average volatile content is 70.6% of total solids.	1,850	1,130	9,720
Total Biosolids		***18,060***	***96,060***	***83,500***
Total Biosolids + 10% 20-year Population Growth		***19,870***	***105,670***	***91,850***

City of Glens Falls

Conveyance Scenario #1 - Flow and Loading Projection

Table 2

Community	Destination	Average Daily Flow (MGD)	Peak 6-Hour Flow (MGD)	BOD (lb/day)	TSS (lb/day)	TKN (lb/day)
(T) Fort Edward	WCSD #2 WWTP	0.45	1.1	1,332	1,344	197
(V) Fort Edward	WCSD #2 WWTP	0.5	1.46	918	1,099	161
(V) Hudson Falls	WCSD #2 WWTP	1.18	3.76	1,416	1,797	262
(T) Moreau	WCSD #2 WWTP	0.35	0.69	1,611	1,107	166
(T) Kingsbury	WCSD #2 WWTP	0.7	1.69	1,806	2,293	333
Total Proposed Flows and Loads to WCSD #2		3.18	8.7	7,083	7,640	1,119
(C) Glens Falls	Glens Falls WWTP	3.19	10.06	4,319	5,395	645
(V) South Glens Falls	Glens Falls WWTP	0.38	1.14	512	669	82
(T) Queensbury	Glens Falls WWTP	2.03	4.95	6,967	5,266	751
(T) Moreau	Glens Falls WWTP	0.25	0.53	759	964	139
(T) Kingsbury	Glens Falls WWTP	0.66	1.35	3,052	2,077	310
Total Proposed Flows and Loads to Glens Falls		6.51	18.04	15,608	14,371	1,928

Notes:

Average Daily Flows Based on Equivalent Dwelling Unit (EDU) Count plus estimated Inflow & Infiltration (I&I).

City of Glens Falls
Summary of Assumed Initial Opportunties
Table 3

Waste Type	Description	Gallons per Day	Gallons per Year
Septage	It is assumed that the septage receiving market may increase slightly, but that septage received at Glens Falls would be approximately the same as currently. A number of the septage haulers we talked to already go to Glens Falls.	54,000	14,040,000
Fats, Oils and Greases (FOG)	There is a significant need for Fats, Oils and Grease acceptance in the Washington/Warren/Saratoga County region. A number of haulers have stopped hauling FOG because Glens Falls no longer accepts it, and said that they would increase their hauling of it if Glens Falls begins to accept it again.	7,000	1,820,000
Cheese/Yogurt Whey and Washwater	We contacted a number of dairies in the region. Argyle Cheese is very interested in conveying their cheese and yogurt whey and gray water to a municipal biosolids handling facility. They are unsure of their projected quantity, but said they would run some numbers and follow up with us.	80	28,600
Industrial Paper Waste	Irving Tissue expressed interest in disposing at a regional biosolids facility. Further evaluation of the physical and chemical characteristics of the paper waste is required to assess the feasibility and economics of accepting the paper waste.	2,500	900,000
Total		***63,580***	***15,888,600***

City of Glens Falls
Summary of Projected Biosolids Loads
Table 4

Waste Type	Description	Proposed Conditions Wet Mass (ton/year)	Proposed Conditions Wet Volume (GPD)	Proposed Conditions Dry Solids (lb/d)
Glens Falls Muncipal Biosolids	A mix of municipal wastewater is treated through the plant to produce primary sludge and thickened waste activated sludge (TWAS). The primary sludge and TWAS are pressed to a solids concentration of 17-21%. Wet Mass at 19% solids. Wet Volume at 1.5% solids.	9,190	38,650	10,020
WCSD#2 Municipal Biosolids	Municipal wastewater is treated to produce primary sludge and waste activated sludge. Both sludges are mixed and treated via anaerobic digestion. The digested sludge is pressed to a solids concentration of 17-21%.Wet Mass at 17% solids. Wet Volume at 4.7% solids.	710	8,640	660
Waste Receiving (Septage, FOG, etc.) at Glens Falls WWTP	Existing Waste Receiving + 10% + Projected FOG Receiving from Assumed Initial Opportunity Survey. Wet volume at 1.5% solids.	7,445	61,000	7,710
Waste Receiving (Municipal Biosolids) at WCSD#2 Compost Facility	Existing Waste Receiving + 10%. Wet volume at 17.7% solids.	1,775	1,240	2,040
Industrial Waste (Argyle Cheese)	Argyle estimates that they will be producing 550 Gallons per week of Cheese and Yogurt Whey once they move, but as business picks up that number could double.	120	80	25
Industrial Paper Waste*	Irving Tissue expressed interest in disposing at a regional biosolids facility. Additional physical and chemical data will need to be evaluated to further assess the feasibility and economics of accepting their waste, therefore, the industrial paper waste was not included in the projected biosolids loads for treatment equipment sizing purposes.	4,000	2,500	6,575
Total Biosolids	***Glens Falls and WCSD#2 Municipal Biosolids, Waste Receiving at Glens Falls and WCSD#2, and Industrial Cheese Waste***	***19,240***	***109,610***	***20,455***

** See Description, not included in total projected biosolids load.*

City of Glens Falls
Biosolids Treatment Feasibility Scoring Matrix
Table 5

Item	Description	Relative Importance Factor	Scoring	Composting of Digested Sludge	Sludge Drying	Anaerobic Digestion w/CHP	Incineration	Lime Stabilization	Lystek Process
1	Concept Equipment Sizing	5%	0 - 5, (5) is limited sizing that can be completed in existing buildings,(4) is limited sizing that can fit on one of the existing WWTP sites, (3) is significant sizing requirements that would require both existing WWTP sites, (2) would require both sites and takes up space for future improvements, (1) is sizing that would require a new site	4	5	4	5	2	5
2	Concept Site Requirements	2%	0 - 5, (5) is treatment method will require little site development at WWTP or off-site locations, (3) is treatment method may require some additional improvements to offsite locations (such as process water connections) but will require little development from WWTP locations, (1) is the treatment method will require significant area and/or site improvements at any location	3	4	3	3	1	3
3	Sidestream Management Infrastructure Required	5%	0 - 5, (5) is biosolids sidestream will require no additional infrastructure for treatment, (3) is biosolids will require some sidestream treatment (if at WWTP, can be brought back to head of plant) or can be hauled if at an off-site location, (1) is biosolids sidestream will require significant additional infrastructure for effective treatment and disposal	4	3	3	2	5	3
4	Regulatory/Permitting Requirements	5%	0 - 5, (5) is no increase is permitting/regs, (1) is a significant increase in permitting/regulatory work,(0) is unable to acquire required permitting	3	3	3	0	3	2
5A	Capital Cost	13%	0 - 5, (5) is least amount, (1) is greatest amount	4	3	1	2	5	5
5B	Operations and Maintenance Cost	13%	0 - 5, (5) is least amount, (1) is greatest amount	4	3	4	1	2	3
5C	Energy Cost	13%	0 - 5, (5) is least amount, (1) is greatest amount	3	2	4	1	5	2
5D	Revenue	13%	1 - 5, (5) is greatest amount, (1) is least amount	3	2	5	2	2	3
6	Environmental Impact	5%	0 - 5, (5) is minimal impact on environment/surrounding area, (3) is moderate impact (such as occasional odors and/or loud noise), (1) is signficant impact (such as regular odors and/or loud noises)	4	3	4	1	1	4
7	Operations Impact	5%	0 - 5, (5) is no increase in operator labor (if located at the WWTPs)/no increase in existing operations requirements, (4) is minimal impact on operations requirements (a few extra hours per week), (3) is moderate impact on operations (new process has difficult operations learning curve and/or 1-2 additional employees required), (1) is significant impact on operations (another team of operators required, if at an offsite location)	3	4	3	5	1	3
8	Transportation Impact	2%	0 - 5, (5) is little increase from existing transportation requirements for biosolids (hauling sludge), (3) is moderate increase from existing transportation requirements (new regular chemical deliveries or HSW deliveries 1-4 times per month), (1) is significant increase from existing transportation requirements (new regular chemical of HSW deliveries 5 - 8 times per month),(0) is significant increase from existing transportation requirements (regular chemical or HSW deliveries > 8 times per month)	4	5	3	4	1	5
9A	Public/Private Partnership Potential: Contract Hauling	6%	0 - 5, (5) is cost-effective opportunity to implement waste receiving for profit, (0) is treatment method is not able to effectively treat HSW or accepted waste and therefore eliminates contract hauling revenue opportunities	3	2	5	2	2	5
9B	Public/Private Partnership Potential: Contract Treatment	4%	0 - 5, (5) is cost-effective opportunity to contract treatment of municipal sludge and accepted HSW to private entity to eliminate operation costs, (3) is cost-effective opportunity to contract treatment of municipal sludge only to private entity to eliminate operation costs, (0) is no opportunity to contract treatment to private entity	3	3	5	0	3	3
10A	Disposal: Options	4%	0 - 5, (5) is treatment method is able to produce Class A Biosolids, (3) is treatment method is able to produce Class B biosolids, (0) is treatment method requires landfilling	5	5	5	0	3	5
10B	Disposal: Costs	5%	0 - 5, (5) is treatment method biosolids can be disposed of for nothing or some money to municipalities, (3) is treatment method biosolids can be disposed of for fee less than what WWTPs are paying now per ton, (0) is treatment method biosolids can be disposed of for fees greater than what WWTPs are paying now per ton	5	5	5	3	1	5
Total		***100%***		***3.61***	***3.07***	***3.74***	***1.84***	***2.87***	***3.57***

City of Glens Falls
Life Cycle Cost Analysis - Biosolids Treatment Alternative 1 - Composting (Aerated Static Pile)
Table 6

BIOSOLIDS TREATMENT ALTERNATIVE 1 - COMPOSTING (AERATED STATIC PILE) - CAPITAL COSTS

Item	Unit	Quantity	Unit Price	Total Cost
AST Compost Facility Equipment	LS	1	$ 2,990,000.00	$ 2,990,000.00
Roof over Primary Composting Aerated Static Piles	LS	1	$ 350,000.00	$ 350,000.00
Tanker Scale	LS	1	$ 100,000.00	$ 100,000.00
Miscellaneous Site Work	LS	1	$ 150,000.00	$ 150,000.00
MCC/Office/Storage Buildings	LS	1	$ 900,000.00	$ 900,000.00
Amendment Grinding and Storage Pad	LS	1	$ 67,000.00	$ 67,000.00
Screening Area	LS	1	$ 53,000.00	$ 53,000.00
Parking/Driveways	LS	1	$ 68,000.00	$ 68,000.00
Anaerobic Digestion	LS	1	$ 12,591,000.00	$ 12,591,000.00
			Subtotal:	*$ 17,269,000.00*
			Misc. and Contingencies (20%):	$ 3,453,800.00
			General Conditions (Bonds, Insurance, Mobilization/Demobilization, etc.) (4%):	$ 690,800.00
			Estimated Total Construction Cost:	*$ 21,413,600.00*
			Engineering, Legal, Construction Administration, etc. (20%)	$ 4,282,800.00
			Estimated Capital Cost:	***$ 25,700,000.00***

BIOSOLIDS TREATMENT ALTERNATIVE 1 - COMPOSTING (AERATED STATIC PILE) - ELECTRICAL OPERATION COSTS

Electrical Cost	Nominal Horsepower	Pump/Blower Efficiency	Motor Efficiency	Delivered Horsepower per Unit	Number of Units	Conversion (kW)	Avg. Run Time (h/day)	Avg. Run Days per Year	Annual Energy Use (kWh/yr)	Estimated Yearly Electric Cost ($0.10/kWh)
Exhaust Fans	50	N/A	100%	50.00	2	74.57	22.3333333	313	521,031	$ 52,103.12
Aeration Blowers	10	N/A	100%	10.00	5	37.29	22.3333333	313	260,516	$ 26,051.56
Discharge Conveyors	3	N/A	100%	3.00	1	2.24	12	313	8,399	$ 839.87
Lights, Misc Facility Power	From BDP OPEX								180,000	$ 18,000.00
Anaerobic Digestion	From Table 9								550,178	$ 55,017.75
									Total Yearly Electrical Costs:	***$ 152,000.00***

BIOSOLIDS TREATMENT ALTERNATIVE 1 - COMPOSTING (AERATED STATIC PILE) - OTHER OPERATION AND MAINTENANCE COSTS

Yearly Maintenance Costs	Description	Number of Units	Frequency per Year	Unit Cost	Estimated Yearly Maintenance Cost
Fuel	For Loader Operation (assumes 2 loaders) (units in gallons/day)	100	300	$ 3.00	$ 90,000.00
Fuel	For Screen Operation (units in gallons/day)	25	52	$ 3.00	$ 3,900.00
Labor	Assume 1 Facility Manager and 2 Operators at $226,800 from BDP OPEX				$ 226,800.00
Amendment Supply	In cubic yards per year	40,000	1	$ 5.00	$ 200,000.00
Equipment/Building Maintenance	Assume equipment maintenance at $63,000				$ 63,000.00
Anaerobic Digestion	From Table 9 (Heating and Operation Costs subtracting Landfill Disposal Costs)				$ 344,952.12
				Total Yearly Maintenance Costs:	***$ 928,652.12***

BIOSOLIDS TREATMENT ALTERNATIVE 1 - COMPOSTING (AERATED STATIC PILE) - REVENUE

Revenue Sources	Description	Number of Units	Frequency per Year	Unit Cost	Estimated Yearly Maintenance Cost
Compost Product	In cubic yards per year	40,000	1	$ 5.00	$ 200,000.00
Tipping Fees from Waste Receiving	Tipping Fees from Waste Receiving, assume $40/1000 gallons	16,203,200	1	$ 40.00	$ 648,128.00
Anaerobic Digestion	From Table 9 (Energy Savings)				$ 100,294.65
				Total Yearly Revenue:	***$ 948,422.65***

Notes:

[1] A 30-year Life Cycle @ 4.5% annual interest was assumed.

[2] Life Cycle Cost Calculated with the formula provided below:

A + 0.06145*B = Life Cycle Cost

Where: A is Total Yearly O&M and Electrical Costs

B is Total Capital Cost

0.06145 is the multiplier to determine annual payments on debt @ 4.5% over 30 years

Life Cycle Cost Analysis

Capital Cost	*$ 25,700,000.00*
Yearly Electrical Cost	*$ 152,000.00*
Yearly Operation & Maintenance Cost	*$ 928,652.12*
Yearly Revenue	*$ 948,422.65*
Life Cycle Cost per Year	***$ 1,711,494.48***

City of Glens Falls
Life Cycle Cost Analysis - Biosolids Treatment Alternative 1 - Composting (In - Vessel)
Table 7

BIOSOLIDS TREATMENT ALTERNATIVE 1 - COMPOSTING (IN-VESSEL) - CAPITAL COSTS

Item	Unit	Quantity	Unit Price	Total Cost
ICS Compost Facility Equipment	LS	1	$ 1,400,000.00	$ 1,400,000.00
Tanker Scale	LS	1	$ 100,000.00	$ 100,000.00
Miscellaneous Site Work	LS	1	$ 150,000.00	$ 150,000.00
Compost Building	LS	1	$ 2,368,000.00	$ 2,368,000.00
MCC/Office/Storage Buildings	LS	1	$ 900,000.00	$ 900,000.00
Curing Pad	LS	1	$ 234,400.00	$ 234,400.00
Agitator Storage Shed	LS	1	$ 40,000.00	$ 40,000.00
Amendment Grinding and Storage Pad	LS	1	$ 67,100.00	$ 67,100.00
Screening Area	LS	1	$ 52,800.00	$ 52,800.00
Parking/Driveways	LS	1	$ 68,100.00	$ 68,100.00
Odor Control System	LS	1	$ 312,800.00	$ 312,800.00
Miscellaneous Facility Equipment	LS	1	$ 1,350,000.00	$ 1,350,000.00
Anaerobic Digestion	LS	1	$ 12,591,000.00	$ 12,591,000.00
Subtotal:				*$ 19,634,200.00*
Misc. and Contingencies (5% for Compost Equipment and 20% for Anaerobic Digestion Equipment):				$ 2,870,000.00
General Conditions (Bonds, Insurance, Mobilization/Demobilization, etc.) (4%):				$ 785,400.00
Estimated Total Construction Cost:				*$ 23,289,600.00*
Engineering, Legal, Construction Administration, etc.				$ 4,182,700.00
Estimated Capital Cost:				***$ 27,480,000.00***

BIOSOLIDS TREATMENT ALTERNATIVE 1 - COMPOSTING (IN-VESSEL) - ELECTRICAL OPERATION COSTS

Electrical Cost	Nominal Horsepower	Pump/Blower Efficiency	Motor Efficiency	Delivered Horsepower per Unit	Number of Units	Conversion (kW)	Avg. Run Time (h/day)	Avg. Run Days per Year	Annual Energy Use (kWh/yr)	Estimated Yearly Electric Cost ($0.10/kWh)
Exhaust Fans	50	N/A	100%	50.00	2	74.57	22.3333333	313	521,031	$ 52,103.12
Aeration Blowers	10	N/A	100%	10.00	5	37.29	22.3333333	313	260,516	$ 26,051.56
Agitators	100	N/A	100%	100.00	1	74.57	5	313	116,649	$ 11,664.88
Lights, Misc Facility Power	From BDP OPEX								179,460	$ 17,946.00
Anaerobic Digestion	From Table 9								550,178	$ 55,017.75
Total Yearly Electrical Costs:										***$ 162,800.00***

BIOSOLIDS TREATMENT ALTERNATIVE 1 - COMPOSTING (IN-VESSEL) - OTHER OPERATION AND MAINTENANCE COSTS

Yearly Maintenance Costs	Description	Number of Units	Frequency per Year	Unit Cost	Estimated Yearly Maintenance Cost
Fuel	For Loader Operation (assumes 2 loaders) (units in gallons/day)	50	300	$ 3.00	$ 45,000.00
Fuel	For Screen Operation (units in gallons/day)	25	52	$ 3.00	$ 3,900.00
Labor	Assume 1 Facility Manager and 2 Operators at $226,800 from BDP OPEX				$ 226,800.00
Amendment Supply	In cubic yards per year	40,810	1	$ 5.00	$ 204,050.00
Equipment/Building Maintenance	From BDP OPEX, assume building maintenance at $5,000 per bay and equipment maintenance at $63,000				$ 88,000.00
Anaerobic Digestion	From Table 9 (Heating and Operation Costs subtracting Landfill Disposal Costs)				$ 344,952.12
Total Yearly Maintenance Costs:					***$ 912,702.12***

BIOSOLIDS TREATMENT ALTERNATIVE 1 - COMPOSTING (IN-VESSEL) - REVENUE

Revenue Sources	Description	Number of Units	Frequency per Year	Unit Cost	Estimated Yearly Maintenance Cost
Compost Product	In cubic yards per year	25,692	1	$ 7.50	$ 192,690.00
Tipping Fees from Waste Receiving	Tipping Fees from Waste Receiving, assume $40/1000 gallons	16,203,200	1	$ 40.00	$ 648,128.00
Anaerobic Digestion	From Table 9 (Energy Savings)				$ 100,294.65
Total Yearly Revenue:					***$ 941,112.65***

Notes:

[1] A 30-year Life Cycle @ 4.5% annual interest was assumed.

[2] Life Cycle Cost Calculated with the formula provided below:

A + 0.06145*B = Life Cycle Cost

Where: A is Total Yearly O&M and Electrical Costs

B is Total Capital Cost

0.06145 is the multiplier to determine annual payments on debt @ 4.5% over 30 years

Life Cycle Cost Analysis

Capital Cost	$	27,480,000.00
Yearly Electrical Cost	$	162,800.00
Yearly Operation & Maintenance Cost	$	912,702.12
Yearly Revenue	$	941,112.65
Life Cycle Cost per Year	***$***	***1,823,035.48***

City of Glens Falls
Life Cycle Cost Analysis - Biosolids Treatment Alternative 3 - Anaerobic Digestion & CHP
Table 8

BIOSOLIDS TREATMENT ALTERNATIVE 3 - ANAEROBIC DIGESTION & CHP - CAPITAL COSTS

Item	Unit	Quantity	Unit Price	Total Cost
High Strength Waste Receiving Station	LS	1	$ 1,840,200.00	$ 1,840,200.00
1.25 MG Primary Digester	LS	1	$ 3,575,000.00	$ 3,575,000.00
1.25 MG Secondary Digester	LS	1	$ 2,240,000.00	$ 2,240,000.00
Sludge Thickening and Dewatering Building	LS	1	$ 1,945,000.00	$ 1,945,000.00
Dual Membrane Gas Storage	LS	1	$ 435,000.00	$ 435,000.00
Pressed Sludge Storage/Distribution Loading Area	LS	1	$ 160,000.00	$ 160,000.00
Combined Heat and Power System	LS	1	$ 1,980,000.00	$ 1,980,000.00
Site Work	LS	1	$ 730,000.00	$ 730,000.00
HVAC/Electrical Work	LS	1	$ 2,580,000.00	$ 2,580,000.00
			Subtotal:	$ *15,486,000.00*
			Misc. and Contingencies (20%):	$ 3,098,000.00
			General Conditions (Bonds, Insurance, Mobilization/Demobilization, etc.) (4%):	$ 620,000.00
			Estimated Total Construction Cost:	$ *19,204,000.00*
			Engineering, Legal, Construction Administration, etc. (20%)	$ 3,841,000.00
			Estimated Capital Cost:	$ ***23,100,000.00***

BIOSOLIDS TREATMENT ALTERNATIVE 3 - ANAEROBIC DIGESTION & CHP - ELECTRICAL OPERATION COSTS

Electrical Cost	Nominal Horsepower	Pump/Blower Efficiency	Motor Efficiency	Delivered Horsepower per Unit	Number of Units	Conversion (kW)	Avg. Run Time (h/day)	Avg. Run Days per Year	Annual Energy Use (kWh/yr)	Estimated Yearly Electric Cost ($0.1/kWh)
HSW Receiving Station	4	N/A	85%	4.00	1	2.98	8	261	6,228	$ 622.81
HSW Wet Well Pumps	15	70%	85%	13.45	1	10.03	8	261	20,935	$ 2,093.47
EQ Tank Mixing System	15	70%	85%	13.45	1	10.03	8	261	20,935	$ 2,093.47
Primary Digester Feed Pumps	5	63.1%	95%	5.00	1	3.73	24	365	32,662	$ 3,266.17
Digester Recirculation Pumps	5	63.1%	95%	5.00	1	3.73	24	365	32,692	$ 3,269.16
Cover Mounted Mixer	10	N/A	N/A	7.50	1	5.59	24	365	48,992	$ 4,899.25
Recuperative Thickening Pumps	25	N/A	N/A	25.00	2	37.29	12	312	139,595	$ 13,959.50
Polymer Mixing/Injection System - GBT	0.5	N/A	N/A	0.50	1	0.37	8	261	779	$ 77.85
Hydraulic Power Unit - GBT	1	N/A	N/A	1.00	1	0.75	8	261	1,557	$ 155.70
Wash Water Booster Pump - GBT	10	N/A	N/A	10.00	1	7.46	8	261	15,570	$ 1,557.02
Gravity Belt Thickener	5	N/A	N/A	5.00	1	3.73	8	261	7,785	$ 778.51
Secondary Digester Feed Pumps	5	63%	95%	5.00	1	3.73	24	365	32,662	$ 3,266.17
Belt Filter Press Feed Pumps	25	N/A	N/A	22.80	1	17.00	8	261	35,500	$ 3,550.01
Hydraulic Power Unit - BFP	2	N/A	N/A	2.00	1	1.49	8	261	3,114	$ 311.40
Wash Water Booster Pump - BFP	20	N/A	N/A	20.00	1	14.91	8	261	31,140	$ 3,114.04
Polymer Mixing/Injection System - BFP	0.5	N/A	N/A	0.50	1	0.37	8	261	779	$ 77.85
Belt Filter Press	15.33	N/A	N/A	15.33	1	11.43	8	261	23,869	$ 2,386.91
Conveyors	3	N/A	N/A	3.00	2	4.47	8	261	9,342	$ 934.21
Control Panels	N/A	N/A	N/A	N/A	8	9.60	24	365	84,096	$ 8,409.60
Sidestream Pump	5	N/A	N/A	5.00	1	3.73	2	261	1,946	$ 194.63
									Total Yearly Electrical Costs:	$ ***55,017.75***

BIOSOLIDS TREATMENT ALTERNATIVE 3 - ANAEROBIC DIGESTION & CHP - HEATING OPERATION COSTS

Item	Description	Number of Units	Total Heat per Year (MMBTU)	Unit Cost	Estimated Yearly Maintenance Cost
Digester	From Digester Heating Calculation	1	18,605	$ 10.00	$ 186,051.57
Building Ventilation Heat	Assumed Typical Air Changes (1.5 ACH) for Digester Building, Sludge Dewatering Builing and CHP Building	3	75	$ 10.00	$ 2,250.00
				Total	$ ***188,301.57***

BIOSOLIDS TREATMENT ALTERNATIVE 3 - ANAEROBIC DIGESTION & CHP - ENERGY PRODUCTION/RECEIVING REVENUE

Item	Description	Wet Volume (gallons) /Year	Energy Produced	Unit Cost	Estimated Yearly Revenue
Combined Heat and Power Electrical Energy (kW)	Assume 30% of Biogas Energy and CHP System in Operation 90% of the Time		130	$ 0.10	$ 102,492.00
Combined Heat and Power Heating Energy (MMBTU/year)	Assume 40% of Biogas Energy and CHP System in Operation 90% of the Time		5,244	$ 10.00	$ 47,197.49
Waste Receiving	Tipping Fees from Waste Receiving, assume $40 per 1000 Gal	16,203,200	N/A	$ 40.00	$ 648,128.00
Land Application of Class B Biosolids	Assume unable to dispose for revenue	N/A	N/A	$ -	$ -
				Total	$ ***797,817.49***

BIOSOLIDS TREATMENT ALTERNATIVE 3 - ANAEROBIC DIGESTION & CHP - MAINTENANCE COSTS

Yearly Maintenance Costs	Description	Number of Units	Frequency per Year	Unit Cost	Estimated Yearly Maintenance Cost
Additional Operators Required	Assumed at Glens Falls WWTP	1	1	$ 65,000.00	$ 65,000.00
Polymer Supply	For GBT & BFP, lbs of polymer per day	176	261	$ 2.00	$ 91,650.55
Landfill Disposal of Class B Product	Wet tons/year	11,710	1	$ 75.00	$ 878,250.00
				Total Yearly Maintenance Costs:	$ ***1,034,900.55***

Notes:

[1] A 30-year Life Cycle @ 4.5% annual interest was assumed.

[2] Life Cycle Cost Calculated with the formula provided below:

A + 0.06145*B = Life Cycle Cost

Where: A is Total Yearly O&M and Electrical Costs

B is Total Capital Cost

0.06145 is the multiplier to determine annual payments on debt @ 4.5% over 30 years

Life Cycle Cost Analysis

Capital Cost	$	*23,100,000.00*
Yearly Electrical Cost	$	*55,017.75*
Yearly Heating Cost	$	*188,301.57*
Yearly Maintenance Cost	$	*1,034,900.55*
Revenue/Energy Production	$	*797,817.49*
Life Cycle Cost per Year	$	***1,899,897.39***

City of Glens Falls

Life Cycle Cost Analysis - Biosolids Treatment Alternative 3 - Anaerobic Digestion w/out CHP

Table 9

BIOSOLIDS TREATMENT ALTERNATIVE 3 - ANAEROBIC DIGESTION W/OUT CHP - CAPITAL COSTS

Item	Unit	Quantity	Unit Price	Total Cost
High Strength Waste Receiving Station	LS	1	$ 1,840,200.00	$ 1,840,200.00
1.25 MG Primary Digester	LS	1	$ 3,575,000.00	$ 3,575,000.00
1.25 MG Secondary Digester	LS	1	$ 2,240,000.00	$ 2,240,000.00
Sludge Thickening and Dewatering Building	LS	1	$ 1,945,000.00	$ 1,945,000.00
Pressed Sludge Storage/Distribution Loading Area	LS	1	$ 160,000.00	$ 160,000.00
Site Work	LS	1	$ 730,000.00	$ 730,000.00
HVAC/Electrical Work	LS	1	$ 2,100,000.00	$ 2,100,000.00
			Subtotal:	*$ 12,591,000.00*
			Misc. and Contingencies (20%):	$ 2,519,000.00
			General Conditions (Bonds, Insurance, Mobilization/Demobilization, etc.) (4%):	$ 504,000.00
			Estimated Total Construction Cost:	*$ 15,614,000.00*
			Engineering, Legal, Construction Administration, etc. (20%)	$ 3,123,000.00
			Estimated Capital Cost:	***$ 18,800,000.00***

BIOSOLIDS TREATMENT ALTERNATIVE 3 - ANAEROBIC DIGESTION W/OUT CHP - ELECTRICAL OPERATION COSTS

Electrical Cost	Nominal Horsepower	Pump/Blower Efficiency	Motor Efficiency	Delivered Horsepower per Unit	Number of Units	Conversion (kW)	Avg. Run Time (h/day)	Avg. Run Days per Year	Annual Energy Use (kWh/yr)	Estimated Yearly Electric Cost ($0.1/kWh)
HSW Receiving Station	4	N/A	85%	4.00	1	2.98	8	261	6,228	$ 622.81
HSW Wet Well Pumps	15	70%	85%	13.45	1	10.03	8	261	20,935	$ 2,093.47
EQ Tank Mixing System	15	70%	85%	13.45	1	10.03	8	261	20,935	$ 2,093.47
Primary Digester Feed Pumps	5	63.1%	95%	5.00	1	3.73	24	365	32,662	$ 3,266.17
Digester Recirculation Pumps	5	63.1%	95%	5.00	1	3.73	24	365	32,692	$ 3,269.16
Cover Mounted Mixer	10	N/A	N/A	7.50	1	5.59	24	365	48,992	$ 4,899.25
Recuperative Thickening Pumps	25	N/A	N/A	25.00	2	37.29	12	312	139,595	$ 13,959.50
Hydraulic Power Unit - GBT	1	N/A	N/A	1.00	1	0.75	8	261	1,557	$ 155.70
Wash Water Booster Pump - GBT	10	N/A	N/A	10.00	1	7.46	8	261	15,570	$ 1,557.02
Polymer Mixing/Injection System - GBT	0.5	N/A	N/A	0.50	1	0.37	8	261	779	$ 77.85
Gravity Belt Thickener	5	N/A	N/A	5.00	1	3.73	8	261	7,785	$ 778.51
Secondary Digester Feed Pumps	5	63%	95%	5.00	1	3.73	24	365	32,662	$ 3,266.17
Belt Filter Press Feed Pumps	25	N/A	N/A	22.80	1	17.00	8	261	35,500	$ 3,550.01
Hydraulic Power Unit - BFP	2	N/A	N/A	2.00	1	1.49	8	261	3,114	$ 311.40
Wash Water Booster Pump - BFP	20	N/A	N/A	20.00	1	14.91	8	261	31,140	$ 3,114.04
Polymer Mixing/Injection System - BFP	0.5	N/A	N/A	0.50	1	0.37	8	261	779	$ 77.85
Belt Filter Press	15.33	N/A	N/A	15.33	1	11.43	8	261	23,869	$ 2,386.91
Conveyors	3	N/A	N/A	3.00	2	4.47	8	261	9,342	$ 934.21
Control Panels	N/A	N/A	N/A	N/A	8	9.60	24	365	84,096	$ 8,409.60
Sidestream Pump	5	N/A	N/A	5.00	1	3.73	2	261	1,946	$ 194.63
									Total Yearly Electrical Costs:	***$ 55,017.75***

BIOSOLIDS TREATMENT ALTERNATIVE 3 - ANAEROBIC DIGESTION W/OUT CHP - HEATING OPERATION COSTS

Item	Description	Number of Units	Total Heat per Year (MMBTU)	Unit Cost	Estimated Yearly Maintenance Cost
Digester	From Digester Heating Calculation	1	18,605	$ 10.00	$ 186,051.57
Building Ventilation Heat	Assumed Typical Air Changes (1.5 ACH) for	3	75	$ 10.00	$ 2,250.00
				Total	***$ 188,301.57***

BIOSOLIDS TREATMENT ALTERNATIVE 3 - ANAEROBIC DIGESTION W/OUT CHP - ENERGY PRODUCTION/RECEIVING REVENUE

Item	Description	Wet Volume (gallons) /Year	Energy Produced	Unit Cost	Estimated Yearly Revenue
Combined Heat and Power Electrical Energy (kW)	Assume 30% of Biogas Energy and CHP System in Operation 90% of the Time		0	$ 0.10	$ -
Recovered Heating Energy (MMBTU/year)	Assume 85% Transfer Efficiency of Heat Exchanger		11,144	$ 10.00	$ 100,294.65
Waste Receiving	Tipping Fees from Waste Receiving, assume $40 per 1000 Gal	16,203,200		$ 40.00	$ 648,128.00
Land Application of Class B Biosolids	Assume unable to get rid of Class B in Glens	N/A	N/A	$ -	$ -
				Total	***$ 748,422.65***

BIOSOLIDS TREATMENT ALTERNATIVE 3 - ANAEROBIC DIGESTION W/OUT CHP - MAINTENANCE COSTS

Yearly Maintenance Costs	Description	Number of Units	Frequency per Year	Unit Cost	Estimated Yearly Maintenance Cost
Additional Operators Required	Assumed at Glens Falls WWTP	1	1	$ 65,000.00	$ 65,000.00
Polymer Supply	For GBT & BFP, lbs of polymer per day	176	261	$ 2.00	$ 91,650.55
Landfill Disposal of Class B Product	Wet tons/year	11,710	1	$ 75.00	$ 878,250.00
				Total Yearly Maintenance Costs:	***$ 1,034,900.55***

Notes:

[1] A 30-year Life Cycle @ 4.5% annual interest was assumed.

[2] Life Cycle Cost Calculated with the formula provided below:

A + 0.06145*B = Life Cycle Cost

Where: A is Total Yearly O&M and Electrical Costs

B is Total Capital Cost

0.06145 is the multiplier to determine annual payments on debt @ 4.5% over 30 years

Life Cycle Cost Analysis

Capital Cost	$ 18,800,000.00
Yearly Electrical Cost	$ 55,017.75
Yearly Heating Cost	$ 188,301.57
Yearly Maintenance Cost	$ 1,034,900.55
Revenue/Energy Production	$ 748,422.65
Life Cycle Cost per Year	***$ 1,685,057.23***

City of Glens Falls

Life Cycle Cost Analysis - Biosolids Treatment Alternative 3 - Anaerobic Digestion & CHP W/ Lystek ™

Table 10

BIOSOLIDS TREATMENT ALTERNATIVE 3 - ANAEROBIC DIGESTION & CHP W/ LYSTEK - CAPITAL COSTS

Item	Unit	Quantity	Unit Price	Total Cost
High Strength Waste Receiving Station	LS	1	$ 1,840,200.00	$ 1,840,200.00
1.25 MG Primary Digester	LS	1	$ 3,705,000.00	$ 3,705,000.00
1.25 Secondary Digester	LS	1	$ 2,540,000.00	$ 2,540,000.00
Lystek Process	LS	1	$ 3,750,000.00	$ 3,750,000.00
Lystek Process Building Retrofit	LS	1	$ 500,000.00	$ 500,000.00
Dual Membrane Gas Storage	LS	1	$ 435,000.00	$ 435,000.00
Sludge Thickening and Dewatering Building	LS	1	$ 1,945,000.00	$ 1,945,000.00
Pressed Sludge Storage/Distribution Loading Area	LS	1	$ 160,000.00	$ 160,000.00
Lystek Product Storage/Distribution Loading Area	LS	1	$ 3,000,000.00	$ 3,000,000.00
Combined Heat and Power System	LS	1	$ 1,980,000.00	$ 1,980,000.00
Site Work	LS	1	$ 980,000.00	$ 980,000.00
HVAC/Electrical Work	LS	1	$ 4,170,000.00	$ 4,170,000.00
			Subtotal:	$ *25,006,000.00*
			Misc. and Contingencies (20%):	$ 5,002,000.00
			General Conditions (Bonds, Insurance, Mobilization/Demobilization, etc.) (4%):	$ 1,001,000.00
			Estimated Total Construction Cost:	$ *31,009,000.00*
			Engineering, Legal, Construction Administration, etc. (20%)	$ 6,202,000.00
			Estimated Capital Cost:	$ ***37,300,000.00***

BIOSOLIDS TREATMENT ALTERNATIVE 3 - ANAEROBIC DIGESTION & CHP W/ LYSTEK - ELECTRICAL OPERATION COSTS

Electrical Cost	Nominal Horsepower	Pump/Blower Efficiency	Motor Efficiency	Delivered Horsepower per Unit	Number of Units	Conversion (kW)	Avg. Run Time (h/day)	Avg. Run Days per Year	Annual Energy Use (kWh/yr)	Estimated Yearly Electric Cost ($0.1/kWh)
HSW Receiving Station	4	N/A	85%	4.00	1	2.98	8	312	7,445	$ 744.51
HSW Wet Well Pumps	15	70%	85%	13.45	1	10.03	8	312	25,025	$ 2,502.54
EQ Tank Mixing System	15	70%	85%	13.45	1	10.03	8	312	25,025	$ 2,502.54
Primary Digester Feed Pumps	5	63.1%	95%	5.00	1	3.73	24	365	32,662	$ 3,266.17
Digester Recirculation Pumps	5	63.1%	95%	5.00	1	3.73	24	365	32,692	$ 3,269.16
Cover Mounted Mixer	10	N/A	N/A	7.50	1	5.59	24	365	48,992	$ 4,899.25
Recuperative Thickening Pumps	25	N/A	N/A	25.00	2	37.29	12	312	139,595	$ 13,959.50
Polymer Mixing/Injection System - GBT	0.5	N/A	N/A	0.50	1	0.37	12	312	1,396	$ 139.60
Gravity Belt Thickener	5	N/A	N/A	5.00	1	3.73	12	312	13,960	$ 1,395.95
Hydraulic Power Unit - GBT	1	N/A	N/A	1.00	1	0.75	8	261	1,557	$ 155.70
Wash Water Booster Pump - GBT	10	N/A	N/A	10.00	1	7.46	8	261	15,570	$ 1,557.02
Secondary Digester Feed Pumps	5	63%	95%	5.00	1	3.73	24	365	32,662	$ 3,266.17
Belt Filter Press Feed Pumps	25	N/A	N/A	22.80	1	17.00	8	261	35,500	$ 3,550.01
Hydraulic Power Unit - BFP	2	N/A	N/A	2.00	1	1.49	8	261	3,114	$ 311.40
Wash Water Booster Pump - BFP	20	N/A	N/A	20.00	1	14.91	8	261	31,140	$ 3,114.04
Polymer Mixing/Injection System - BFP	0.5	N/A	N/A	0.50	1	0.37	8	261	779	$ 77.85
Belt Filter Press	15.33	N/A	N/A	15.33	1	11.43	8	261	23,869	$ 2,386.91
Lystek Process & Pumps	Per Lystek Proposal, assume 58 kWh per Dry Ton, 2,520 dry tons/year								146,160	$ 14,616.00
Control Panels	N/A	N/A	N/A	N/A	6	7.20	24	365	63,072	$ 6,307.20
Sidestream Pump	5	N/A	N/A	5.00	1	3.73	2	312	2,327	$ 232.66
									Total Yearly Electrical Costs:	$ ***68,254.19***

BIOSOLIDS TREATMENT ALTERNATIVE 3 - ANAEROBIC DIGESTION & CHP W/ LYSTEK - HEATING OPERATION COSTS

Item	Description	Number of Units	Total Heat per Year (MMBTU)	Unit Cost	Estimated Yearly Maintenance Cost
Digester	From Digester Heating Calculation	1	15,081	$ 10.00	$ 150,811.21
Lystek Process Heat Requirements	Assume 5.3 Therms per Dry Ton, 2,520 dry	1	1,336	$ 10.00	$ 13,356.00
Building Ventilation Heat	Assumed Typical Air Changes (1.5 ACH) for	3	75	$ 10.00	$ 2,250.00
				Total	$ ***166,417.21***

BIOSOLIDS TREATMENT ALTERNATIVE 3 - ANAEROBIC DIGESTION & CHP W/ LYSTEK - ENERGY PRODUCTION/RECEIVING REVENUE

Item	Description	Wet Volume (gallons) OR Wet Tons /Year	Energy Produced	Unit Cost	Estimated Yearly Revenue
Combined Heat and Power Electrical Energy (kW)	Assume 30% of Biogas Energy and CHP System in Operation 90% of the Time		180	$ 0.10	$ 141,912.00
Combined Heat and Power Heating Energy (MMBTU/year)	Assume 40% of Biogas Energy and CHP System in Operation 90% of the Time		7,080	$ 10.00	$ 63,716.60
Waste Receiving	Tipping Fees from Waste Receiving, assume unit cost per 1,000 gallons	16,203,200		$ 40.00	$ 648,128.00
Land Application of Class A Lystek Product	Per Lystek, assume $5.75 per wet ton of product	11,700	N/A	$ 5.75	$ 67,275.00
				Total	$ ***921,031.60***

BIOSOLIDS TREATMENT ALTERNATIVE 3 - ANAEROBIC DIGESTION & CHP W/ LYSTEK - MAINTENANCE COSTS

Yearly Maintenance Costs	Description	Number of Units	Frequency per Year	Unit Cost	Estimated Yearly Maintenance Cost
Additional Operators Required	Assumed at Glens Falls WWTP	1	1	$ 65,000.00	$ 65,000.00
General Equipment Maintenance	Assume $10/dry ton from Lystek Proposal	2520	1	$ 10.00	$ 25,200.00
Polymer Supply	For GBT, lbs of polymer per day	176	261	$ 2.00	$ 91,650.55
KOH Chemical Supply	Assume 185 lbs/Dry Ton	466,200	1	$ 0.38	$ 177,156.00
				Total Yearly Maintenance Costs:	$ ***359,006.55***

Notes:

[1] A 30-year Life Cycle @ 4.5% annual interest was assumed.

[2] Life Cycle Cost Calculated with the formula provided below:

A + 0.06145*B = Life Cycle Cost

Where: A is Total Yearly O&M and Electrical Costs
B is Total Capital Cost
0.06145 is the multiplier to determine annual payments on debt @ 4.5% over 30 years

[3] Costs for marketing and land application are to be defined upon issuance of an RFP and are not included.

Life Cycle Cost Analysis

Capital Cost	$	*37,300,000.00*
Yearly Electrical Cost	$	*68,254.19*
Yearly Heating Cost	$	*166,417.21*
Yearly Maintenance Cost	$	*359,006.55*
Revenue/Energy Production	$	*921,031.60*
Life Cycle Cost per Year	$	***1,964,731.36***

City of Glens Falls
Life Cycle Cost Analysis - Biosolids Treatment Alternative 5 - Lime Stabilization
Table 11

BIOSOLIDS TREATMENT ALTERNATIVE 5 - LIME STABILIZATION - CAPITAL COSTS

Item	Unit	Quantity	Unit Price	Total Cost
Furnish and Install Lime Addition System	EA	2	$ 609,450.00	$ 1,218,900.00
Sludge Holding Area/Office Space/MCC	LS	1	$ 900,000.00	$ 900,000.00
Compressed Air System	LS	2	$ 15,000.00	$ 30,000.00
Excavation and Clearing	LS	1	$ 10,000.00	$ 10,000.00
Anchor Bolts	EA	40	$ 50.00	$ 2,000.00
Structural Fill	CY	150	$ 35.00	$ 5,250.00
Concrete	CY	100	$ 1,000.00	$ 100,000.00
Ammonia Odor Control System	LS	1	$ 312,800.00	$ 312,800.00
Miscellaneous Mechanical and Electrical Improvements	LS	1	$ 453,000.00	$ 453,000.00
			Subtotal:	*$ 3,032,000.00*
			Misc. and Contingencies (20%):	$ 606,400.00
			General Conditions (Bonds, Insurance, Mobilization/Demobilization, etc.) (4%):	$ 121,300.00
			Estimated Total Construction Cost:	*$ 3,759,700.00*
			Engineering, Legal, Construction Administration, etc. (20%)	$ 752,000.00
			Estimated Capital Cost:	***$ 4,520,000.00***

BIOSOLIDS TREATMENT ALTERNATIVE 5 - LIME STABILIZATION - ELECTRICAL OPERATION COSTS

Electrical Cost	Nominal Horsepower	Pump/Blower Efficiency	Motor Efficiency	Delivered Horsepower per Unit	Number of Units	Conversion (kW)	Avg. Run Time (h/day)	Avg. Run Days per Year	Annual Energy Use (kWh/yr)	Estimated Yearly Electric Cost ($0.10/kWh)
Screw Conveyor Drive - Lime System	1.5	N/A	84%	1.5	3	3.3557	3	260	2,617	$ 261.74
Silo Bin Vent and Exhaust Fan - Lime System	2.05	N/A	85%	2.05	1	1.5287	3	365	1,674	$ 167.39
Silo Electric Heater - Lime System	13.4	N/A	N/A	13.4	1	10.0000	24	182	43,680	$ 4,368.00
Silo Light Fixtures - Lime System	0.4	N/A	N/A	0.4	1	0.2983	8	260	620	$ 62.04
Lime/Sludge Blender - Lime System	5	N/A	N/A	5	1	3.7285	8	260	7,755	$ 775.53
Bin Activator - Lime System	1.5	N/A	85%	1.5	1	1.1186	8	260	2,327	$ 232.66
Channel Monster	5	N/A	86.5%	5	2	7.4570	12	365	32,662	$ 3,266.17
Auger Monster	2	N/A	82.5%	2	2	2.9828	2	365	2,177	$ 217.74
									Total Yearly Electrical Costs:	***$ 9,351.27***

BIOSOLIDS TREATMENT ALTERNATIVE 5 - LIME STABILIZATION - OPERATION AND MAINTENANCE COSTS

Yearly Maintenance Costs	Description	Number of Units	Frequency per Year	Unit Cost	Estimated Yearly Maintenance Cost
Landfill Disposal of Class B Product	Wet tons/year	10,892	1	$ 75.00	$ 816,890.89
Lime Chemical	Tons of lime per day	1.74	365	$ 216.66	$ 137,244.90
Additional Operators Required	Assume 1 Operator Required	1	1	$ 65,000	$ 65,000.00
				Total Yearly Maintenance Costs:	***$ 1,019,135.79***

Notes:

[1] A 30-year Life Cycle @ 4.5% annual interest was assumed.

[2] Life Cycle Cost Calculated with the formula provided below:

A + 0.06145*B = Life Cycle Cost

Where: A is Total Yearly O&M and Electrical Costs

B is Total Capital Cost

0.06145 is the multiplier to determine annual payments on debt @ 4.5% over 30 years

Life Cycle Cost Analysis

Capital Cost	$	*4,520,000.00*
Yearly Electrical Cost	$	*9,351.27*
Yearly Maintenance Cost	$	*1,019,135.79*
Life Cycle Cost per Year	$	***1,306,241.06***

City of Glens Falls

Life Cycle Cost Analysis - Biosolids Treatment Alternative 6 - Lystek™ Process

Table 12

BIOSOLIDS TREATMENT ALTERNATIVE 6 - LYSTEK PROCESS - CAPITAL COSTS

Item	Unit	Quantity	Unit Price	Total Cost
Biosolids Accepting Station	LS	1	$ 300,000.00	$ 300,000.00
Lystek Process	LS	1	$ 3,750,000.00	$ 3,750,000.00
Building Retrofit/New Building	LS	1	$ 500,000.00	$ 500,000.00
Pressed Sludge Storage/Distribution Loading Area	LS	1	$ 160,000.00	$ 160,000.00
Lystek Product Storage/Distribution Loading Area	LS	1	$ 3,000,000.00	$ 3,000,000.00
Site Work	LS	1	$ 250,000.00	$ 250,000.00
HVAC/Electrical Work	LS	1	$ 1,590,000.00	$ 1,590,000.00
			Subtotal:	$ *9,550,000.00*
			Misc. and Contingencies (20%):	$ 1,910,000.00
			General Conditions (Bonds, Insurance, Mobilization/Demobilization, etc.) (4%):	$ 382,000.00
			Estimated Total Construction Cost:	$ *11,842,000.00*
			Engineering, Legal, Construction Administration, etc. (20%)	$ 2,369,000.00
			Estimated Capital Cost:	***$ 14,300,000.00***

BIOSOLIDS TREATMENT ALTERNATIVE 6 - LYSTEK PROCESS - ELECTRICAL OPERATION COSTS

Electrical Cost	Nominal Horsepower	Pump/Blower Efficiency	Motor Efficiency	Delivered Horsepower per Unit	Number of Units	Conversion (kW)	Avg. Run Time (h/day)	Avg. Run Days per Year	Annual Energy Use (kWh/yr)	Estimated Yearly Electric Cost ($0.1/kWh)
HSW Receiving Conveyor	5	N/A	85%	5.00	1	3.73	8	312	9,306	$ 930.63
Lystek Process & Pumps	Per Lystek Proposal, assume 58 kWh per Dry Ton, 2,520 dry tons/year								146,160	$ 14,616.00
Control Panels	N/A	N/A	N/A	N/A	6	7.20	24	365	63,072	$ 6,307.20
									Total Yearly Electrical Costs:	***$ 21,853.83***

BIOSOLIDS TREATMENT ALTERNATIVE 6 - LYSTEK PROCESS - HEATING OPERATION COSTS

Item	Description	Number of Units	Total Heat per Year (MMBTU)	Unit Cost	Estimated Yearly Maintenance Cost
Lystek Process Heat Requirements	Assume 5.3 Therms per Dry Ton, 2,520 dry	1	1,336	$ 10.00	$ 13,356.00
Building Ventilation Heat	Assumed Typical Air Changes (1.5 ACH) for	3	75	$ 10.00	$ 2,250.00
				Total	$ 15,606.00

BIOSOLIDS TREATMENT ALTERNATIVE 6 - LYSTEK PROCESS - ENERGY PRODUCTION/RECEIVING REVENUE

Item	Description	Wet Volume (gallons) OR Wet Tons /Year	Energy Produced	Unit Cost	Estimated Yearly Revenue
Waste Receiving	Tipping Fees from Waste Receiving, assume unit cost per 1,000 gallons	322,400	N/A	$ 40.00	$ 12,896.00
Land Application of Class A Lystek Product*	Per Lystek, assume $5.75 per wet ton of product	11,700	N/A	$ 5.75	$ 67,275.00
				Total	***$ 80,171.00***

BIOSOLIDS TREATMENT ALTERNATIVE 6 - LYSTEK PROCESS - MAINTENANCE COSTS

Yearly Maintenance Costs	Description	Number of Units	Frequency per Year	Unit Cost	Estimated Yearly Maintenance Cost
General Equipment Maintenance	Assume $10/dry ton from Lystek Proposal	2520	1	$ 10.00	$ 25,200.00
Polymer Supply	For GBT, lbs of polymer per day	176	261	$ 2.00	$ 91,650.55
KOH Chemical Supply	Assume 185 lbs/Dry Ton	466,200	1	$ 0.38	$ 177,156.00
				Total Yearly Maintenance Costs:	***$ 294,006.55***

Notes:

[1] A 30-year Life Cycle @ 4.5% annual interest was assumed.

[2] Life Cycle Cost Calculated with the formula provided below:

A + 0.06145*B = Life Cycle Cost

Where: A is Total Yearly O&M and Electrical Costs

B is Total Capital Cost

0.06145 is the multiplier to determine annual payments on debt @ 4.5% over 30 years

[3] Costs for marketing and land application are to be defined upon issuance of an RFP and are not included.

Life Cycle Cost Analysis

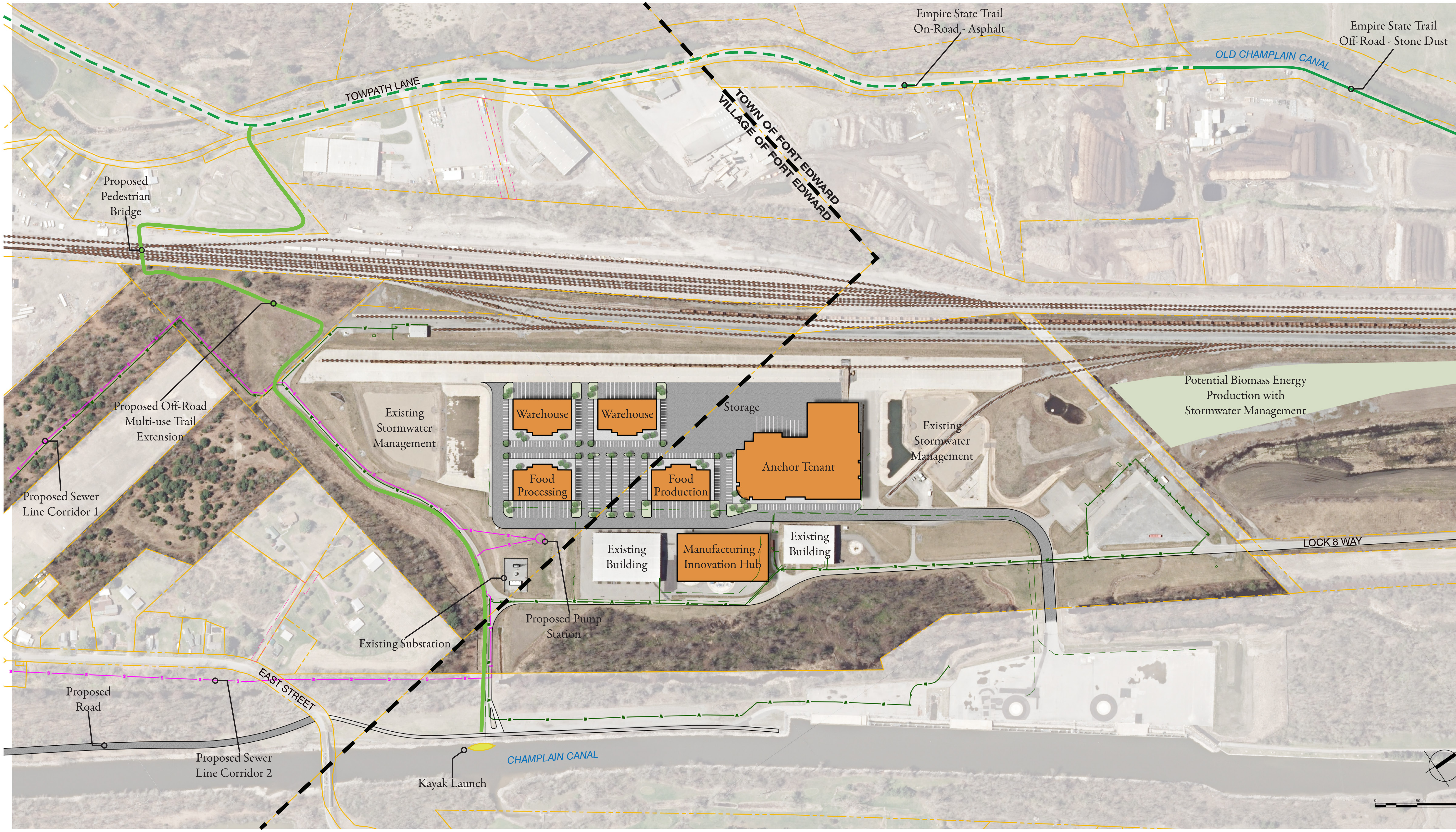
Capital Cost	$ *14,300,000.00*
Yearly Electrical Cost	$ *21,853.83*
Yearly Heating Cost	$ *15,606.00*
Yearly Maintenance Cost	$ *294,006.55*
Revenue/Energy Production	$ *80,171.00*
Life Cycle Cost per Year	***$ 1,130,030.38***

City of Glens Falls
Biosolids Handling Facility Site Location Alternatives Scoring Matrix
Table 13

Item	Description	Relative Importance Factor	Scoring	Glens Falls WWTP	WCSD#2 WWTP/Compost Facility	Off Site Location #1 (Ciba Geigy)	Off Site Location #2 (TBD)
1	Proximity to Organic Waste Generators	3%	0 - 5, (5) is within 10 miles of organic waste generators and (1) is further than 100 miles away	5	5	5	5
2	Zoning and Proximate Land Uses	5%	0 - 5, (5) is biosolids management in line with proximate land uses and no zoning changes required	5	5	5	5
3	Potential Energy Users	10%	0 - 5, (5) is site is within 5 miles to potential energy users and (0) is site is not within a reasonable distance to any potential energy users	5	3	5	4
4	Relative Site Development Costs	10%	0 - 5, (5) is the least expensive development costs and (1) is the most expensive development costs	5	4	1	3
5	Environmental Site Factors	3%	0 - 5, (5) is non-limiting environmental site factors and no enviornmental impact to surrounding area (no odors, noise, etc.), (3) is some environmental site factors that will have to be dealt with but does not limit construction and occasional impact to surrounding area (noise, odors, etc.), (1) is significant environmental site factors that will affect construction and significant impact to surrounding area (regular odors, noise, etc.)	3	5	3	3
6	Capital Cost	30%	0 - 5, (5) is the least expensive capital cost and (1) is the most expensive capital cost	5	5	1	2
7	Impact on Operations - Cost/Manpower	15%	0 - 5, (5) is no increase in operator labor (if located at the WWTPs)/no increase in existing operations requirements, (4) is minimal impact on operations requirements (a few extra hours per week), (3) is moderate impact on operations (new process has difficult operations learning curve and/or 1-2 additional employees required), (1) is significant impact on operations (another team of operators required, if at an offsite location)	4	4	1	1
8	Sidestream Management Requirements	2%	0 - 5, (5) is biosolids sidestream will require no additional infrastructure for treatment, (3) is biosolids will require some sidestream treatment (if at WWTP, can be brought back to head of plant) or can be hauled if at an off-site location, (1) is biosolids sidestream will require significant additional infrastructure for effective treatment and disposal	3	3	1	1
9	Transportation Impacts	2%	0 - 5, (5) is little increase from existing transportation in area, (3) is moderate increase from existing transportation in area, (1) is significant increase from existing transportation in area	3	2	2	2
10	Regulatory/Permitting	10%	0 - 5, (5) is no increase is permitting/regs, (1) is a significant increase in permitting/regulatory work,(0) is unable to acquire required permitting	3	4	1	2
11	Opportunity for Growth	10%	0 - 5, (5) is opportunity for growth of regional facility as region's demands grow, (3) is limited opportunity for growth of regional facility as region's demands grow, (1) is no opportunity for growth of regional facility as region's demands grow (therefore limiting revenue), (0) is no opportunity for growth of regional facility as region's demands grow (therefore limiting revenue) and preventing WWTP's ability to grow	4	4	3	5
Total		*100%*		*4.41*	*4.25*	*2.00*	*2.70*

C.3 CONCEPTUAL SITE PLAN

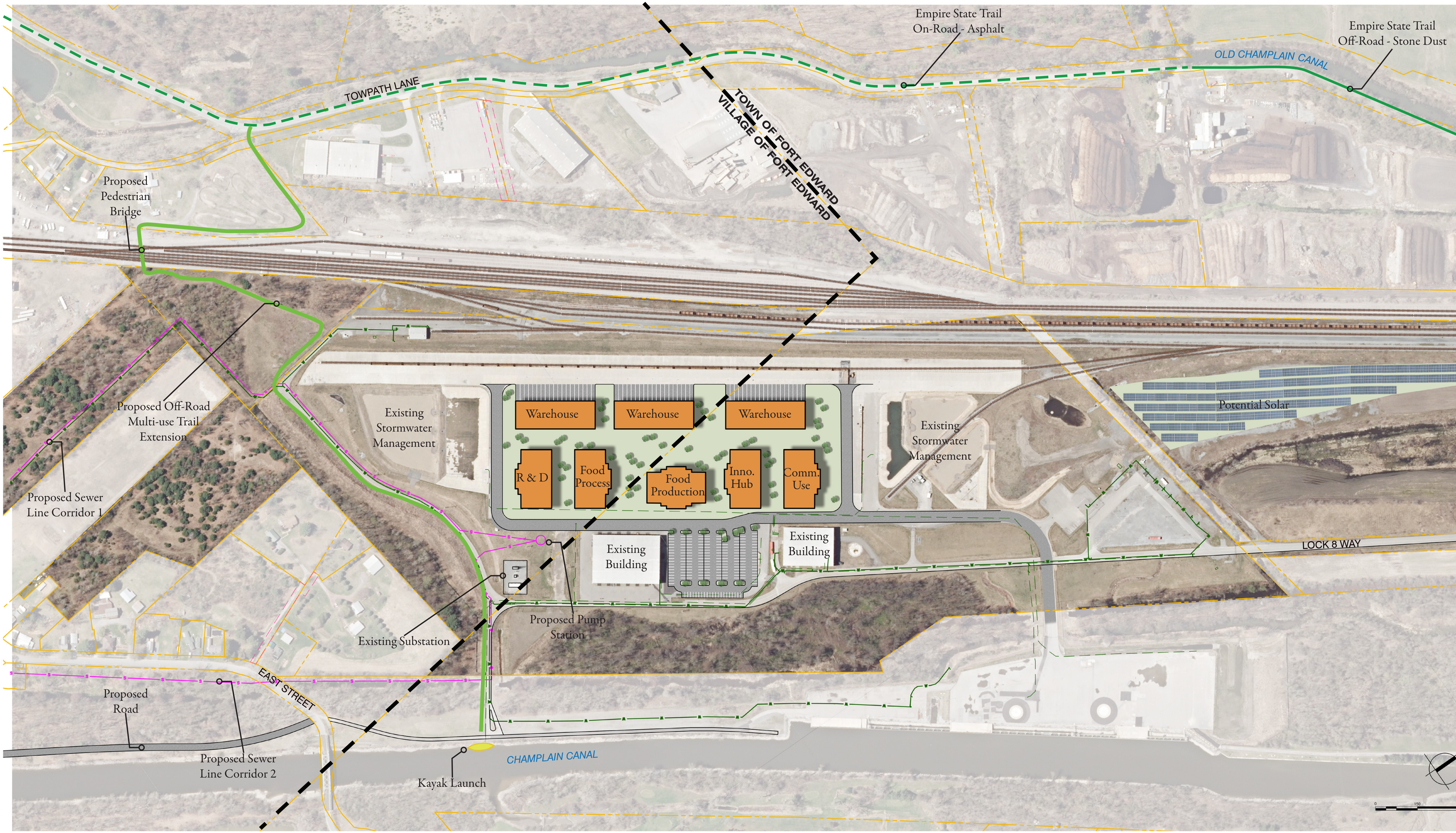
CONCEPT PLAN 1 ENLARGEMENT



Parking Statistics:
Vehicular: 383 spaces
Trailer: 40 spaces

Weston & Sampson

CONCEPT PLAN 2 ENLARGEMENT



Parking Statistics:
Vehicular: 193 spaces
Trailer: 57 spaces