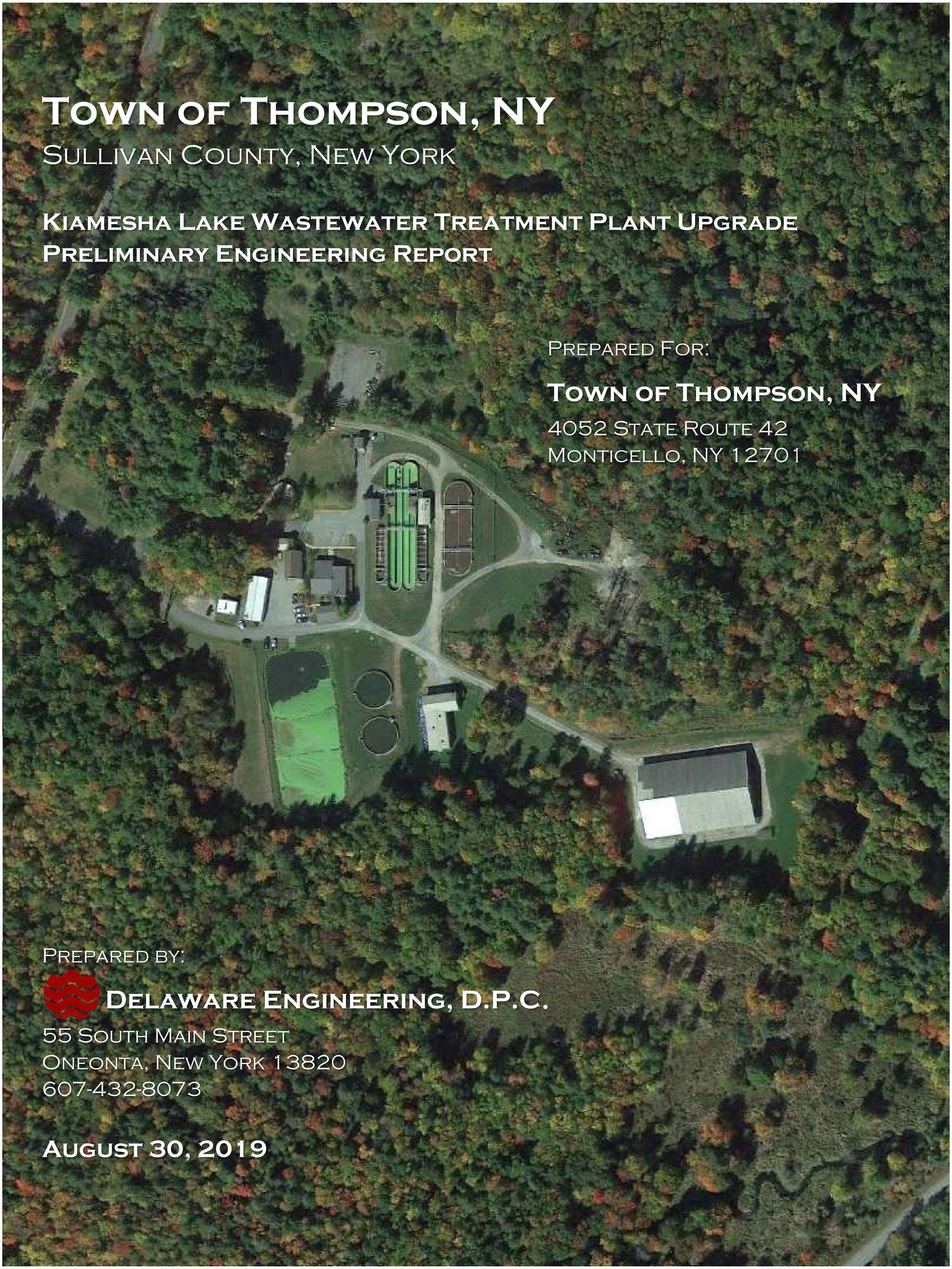

Town of Thompson, NY

Sullivan County, New York

Kiamesha Lake Wastewater Treatment Plant Upgrade
Preliminary Engineering Report

Prepared For:

Town of Thompson, NY

4052 State Route 42
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August 30, 2019

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1.0 EXECUTIVE SUMMARY

The Town of Thompson desires to upgrade its aging Kiamesha Lake wastewater treatment plant (WWTP) in order to meet updated SPDES permit discharge limits for fecal coliform and total chlorine residual and to ensure the plant's long-term viability.

A site visit and comprehensive review of the plant conditions was conducted with Town staff to identify all possible improvements that would be necessary to ensure 25 years of future operation and compliance with flow up to the permit limit of 2 million gallons per day (MGD).

A comprehensive scope of improvements with associated costs was prepared. Following a review of the proposed improvements and costs, the Town Board determined that it would be feasible to move forward with upgrading the existing facilities to handle flow and loads up to the current permit limits.

The recommended project includes that following upgrades:

- Influent Channel and Flow Splitter Box Improvements
- Oxidation Ditch 1 & 2 Improvements
- Oxidation Ditch 3 Improvements
- Process Air Supply Blower Improvements
- Sand Filter Improvements
- Post Aeration Improvements
- UV Disinfection Process Improvements
- Sludge Holding Tank Improvements
- RAS/WAS Pump Improvements
- Aerobic Sludge Digester Process Improvements
- Sludge Press Improvements
- Sludge Drying Bed Improvements
- Pump Station Process Improvements
- Control Building Improvements
- Grit Removal Building Improvements
- Filter Building Improvements
- Storage Building Improvements
- Blower Building Improvements
- Work Shop and Maintenance Building Improvements
- Generator Building Improvements
- Yard Piping Improvements
- Site Work Improvements
- SCADA Improvements

- Instrumentation Improvements

The estimated total project cost, including issuance costs for the recommended upgrades, is $27 million.

The Town will seek funding through the Clean Water State Revolving Fund (CWSRF) program, as administered by the New York State Environmental Facilities Corporation (NYSEFC) for short-term and long-term financing. In addition, the Town intends to apply for grant funding through the Water Grants Program under the Water Infrastructure Improvement Act (WIIA) with a maximum possible grant of $5 million. The feasibility of seeking funding, or co-funding, from other sources (e.g., USDA RD, etc.) may also be considered in the future.

Final costs to the typical single-family home will ultimately depend upon the terms of the financing package received by the Town. If the Town is able to secure the maximum $5 million NYSEFC-based grant award and hardship financing (0%), annual cost increases are estimated to be $279 (42%).

The above cost increase does not include possible user fee contributions from outside users, primarily the Adelaar and Anawana sewer districts, or cost sharing from other Town districts for certain shared services (e.g., biosolids processing).

Based on the current plan forward, if a favorable funding determination is reached in November 2019, and the Town decides to move forward as planned, construction for this project could begin in early 2022 and be completed near the middle of 2023.

The SPDES permit requires disinfection improvements to be implemented by May 1, 2022. In order to work through the NYSEF funding process, including compliance with Town Law 202 (b) proceedings, construction is not anticipated to commence before January of 2022. As such, the schedule to complete the disinfection improvements as part of the overall upgrade project (rather than as an individual upgrade project) will need to be renegotiated with NYSDEC.

2.0 STATEMENT OF PURPOSE

This Engineering Report has been prepared to assist the Town in receiving Clean Water State Revolving Fund (CWSRF) financial assistance, administered by the New York State Environmental Facilities Corporation (NYSEFC). This report will recommend options to upgrade the facility in order to satisfy the SPDES discharge limitations and replace or upgrade equipment which has reached its useful life.

The CWSRF Engineering Report Outline (2018) was used in the preparation of this engineering report.

3.0 ENGINEERING REPORT PREPARATION STANDARDS

This Engineering Report has been developed in accordance with the followings standards whenever applicable:

- *Recommended Standards for Wastewater Facilities*, 2014, Policies for the Design, Review, and Approval of Plans and Specifications for Wastewater Collection and Treatment Facilities (commonly known as the *10 States Standards*)
- *TR-16 Guides for the Design of Wastewater Treatment Work*, 2016, New England Interstate Water Pollution Control Commission
- *New York State Design Stormwater Management Design Manual*, 2015
- *Wastewater Engineering Treatment and Resource Recovery, 5th Edition*, Metcalf & Eddy / EACOM, 2014, referred to as *Metcalf & Eddy*

4.0 PROJECT BACKGROUND & HISTORY

4.1 Site Information

4.1.1 Location

The Town of Thompson, Sullivan County, is located in the Catskill foothills region of New York State. The Town owns and operates the Kiamesha Lake wastewater treatment plant (WWTP) which is located on a 48.3-acre parcel on the Eastern side of NY Route 17, just south of the Route 17/42 interchange, in the Town of Thompson. A United States Geological Survey (USGS) Location Map identifying the Kiamesha Lake WWTP site is included as **Figure 1 – Location Map**.

The plant lies within the Neversink River watershed of the Delaware River Mid Delaware-Mongaup drainage basin. The WWTP has a permitted capacity of 2 million gallons per day (MGD). Outflows from the plant are received by an unnamed tributary of the Kiamesha Creek. The location of Outfall 001 is: Latitude: 41° 39’ 45” and Longitude: 74° 39’ 46”.

4.1.2 Geologic Conditions

Improvements to the plant will involve limited ground disturbance in areas that have previously been disturbed. Geotechnical evaluations at the project site have not been conducted to date and will be conducted during the design phase of the project, as applicable.

According to the United State Department of Agriculture web soil survey map, included within **Appendix A – Project Background Information**, there are two predominate soil types found on the project site and in the areas of proposed ground disturbance; Neversink loam (Ne) and Wellsboro and Wurtsboro (WIC) soils.

Ne soils are characterized as very deep, moderately coarse to medium textured, brownish soils formed in glacial till derived from sandstone, siltstone, and shale. The soils are somewhat poorly drained to very poorly drained and are found in flat or slightly depressed areas of glacial till plains or along small drainage ways. Slopes range from 0-3%. The seasonal high-water table in low lying areas of the site are at or near the surface, resulting in high frost action and slow permeability.

WIC soils formed in glacial till and are characterized as very deep, strongly sloping, and extremely stony. They are moderately-well drained and permeability is moderate above the fragipan but slow in the fragipan. Depth to bedrock is typically 60” or more. WIC soils are not suited for cultivated crops and are known for seasonal high-water tables making them vulnerable to frost action.

Examination of the NYSDEC Environmental Resource Mapper, included within **Appendix A – Project Background Information**, determined that there are no identified unique geological features on or near the project site.

4.1.3 Environmental Resources

The project site is located in the Middle Delaware-Mongaup River Sub-Basin, in the Neversink River watershed and outflows from the plant are received by an unnamed tributary of the Kiamesha Creek.

According to the NYSDEC Environmental Resource Map (ERM) for the project site, included within **Appendix A – Project Background Information**, the Kiamesha Creek and its tributary streams are classified as Class C, indicating a best usage for fishing. The Creek and its tributaries have no known use impairments.

Approximately 23 of the project parcel’s 48 acres are recognized wetlands. All proposed work will occur outside of all wetland areas and beyond wetland check zones.

According to the NYS Department of Agriculture and Markets Sullivan County Agricultural District Map, included within **Appendix A – Project Background Information**, neither the project site, nor any of the lands adjoining the site are located in an agricultural district.

4.2.4 Flood Plain Considerations

According to the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) panel 36105C0470F, included within **Appendix A – Project Background Information**, the western and part of the southern portion of the 48-acre parcel is located in a special flood hazard area (SFHA). However, the entire WWTP, including all buildings, roads, and equipment is located outside of the floodplain and no work is proposed in SFHAs.

4.1.5 Archaeological Resources

There are no identified archaeological or historic resources associated with the project site. The NYS Office of Parks, Recreation and Historic Preservation has reviewed the project and a "Letter of No Effect" was issued. Coordination with NYSOPRHP will be ongoing as the project enters the design phase.

4.2 Ownership & Service Area

The Kiamesha Lake WWTP, which serves approximately 1,100 residents through 378 service connections, is one of four treatment plants owned and operated by the Town of Thompson. The 2017 median household income (MHI) for the Town was $42,175.

The most recent (2010) U.S. Census shows a Town-wide population of 15,308. In the last 30 years, the Town of Thompson has experienced a 10% population increase. The 2013 - 2017 American Community Survey 5-Year Population is forecasting a small population decrease of approximately 274 residents from 2010 census data.

Table 4.1 Population Trend

Year	Population	% CHANGE
1960	8,792	
1970	11,418	+30%
1980	13,479	+18%
1990	13,711	+2%
2000	14,189	+3.4%
2010	15,308	+8%
2013 – 2017 5-year projection	15,034	-2%

Recent developments, including the casino, are anticipated to have a positive effect on Town population.

The plant is currently utilizing about 50% of its available hydraulic capacity. As such, adequate capacity remains for growth, should it occur, without requiring a change to the SPDES permit.

4.3 Existing Facilities & Present Condition

4.3.1 General Description & History of Major System Components

The Kiamesha Lake WWTP was originally constructed in 1958, and underwent upgrades in 1983, 1989, 1996, and 2016.

Some past improvements to the original plant include:

- 1983 – The original trickling filter treatment process was replaced by two new extended aeration oxidation ditches with adjacent rectangular clarifiers. The Control Building and original Blower Building were constructed. The original influent channel was constructed. The polishing lagoon, and sludge lagoons were refurbished.
- 1989 – Oxidation Ditch 3 was constructed and Oxidation Ditch 1 and 2 were modified and upgraded. A new, larger influent channel structure was constructed. Two new circular secondary clarifier tanks were constructed. The original rectangular clarifiers were converted for use as sludge holding tanks. A new Filter Building was constructed, and included a four-cell sand filter, a post-aeration clear well, recirculation pumps, and a mud well. The polishing lagoon was refurbished. The sludge lagoons were replaced with sludge drying beds, and a large structure was constructed to cover the new sludge drying beds.
- 1996 – A new plate and frame sludge press was installed in a new sludge press building which was constructed within the sludge drying bed structure.
- 2016 – The influent screen and grit equipment was replaced. The secondary clarifier equipment was replaced. The sand filters were refurbished. The sludge press was also refurbished.

A comprehensive evaluation of the existing facility has been completed, and the necessary improvements and upgrades are detailed below. The improvements and upgrades will encompass plant equipment, buildings, systems, and site conditions. The upgrade will occur within the current property limits, within previously disturbed areas, and involves improvements to existing facilities to address recent SPDES violations, as well as to add new UV disinfection facilities as required by the most recent SPDES permit. The upgrade will ensure continued compliance with SPDES permit requirements for the near term, as well as for the estimated loading conditions at 2 MGD.

The plant receives both domestic and some commercial wastewater. Treatment capabilities are based on two million gallons per day (MGD) permitted monthly average flow. Discharge limits to comply with conventional secondary treatment requirements are set forth in the facility's State Pollutant Discharge Elimination System (SPDES) permit, contained within **Appendix B – WWTP SPDES Permit**, including seasonal limits for coliform, residual chlorine, ammonia, and UOD. In addition, the SPDES permit dictates that the Town will comply with the Delaware River Basin Commission Docket (NO. D-1965-039 CP-3) which is attached as **Appendix C – DRBC Docket**.

The Kiamesha Lake WWTP is an extended aeration, oxidation ditch style, activated sludge treatment plant that achieves biological ammonia removal through nitrification. The secondary treatment process includes two clarification tanks, while tertiary treatment uses sand filtration units to meet discharge permit levels.

A brief overview of the treatment processes is presented below. Process schematics for current plant conditions and for the proposed upgrade conditions are shown in **Figure 4** and **Figure 5,** respectively.

Influent enters the facility through the influent channel structure where it passes through a mechanically cleaned bar screen, Parshall flume, grit chamber, and flow splitter box. At the flow splitter box, the incoming sewage is divided and conveyed to the three oxidation ditches.

Effluent from the oxidation ditch flows to the secondary clarifiers and then to the sand filter units for tertiary treatment. Tertiary effluent passes through the post aeration tank prior to discharge into the Kiamesha Creek. A summary of principal facility component characteristics is shown in Table 4-2:

Table 4.2 Principal Facility Components

Unit Process / Equipment	Description	Duty / Volume
Influent Mechanical Bar Screen (w/ manually cleaned bar rack on bypass channel)	Number	1 – 2" x 1/4" bar screen with clear spacing of 3/4" in main channel
Grit Equipment	No. Of Units	1
	Dimensions	5' x 31' x 10.5' deep
	Side Water Depth	8'
	Volume each	12,173 gallons
	Total Volume	24,346 gallons
Oxidation Ditches	No. Of Units	3
	Dimensions	Varies
	Side Water Depth	12' (D1 & D2) or 18' (D3)
	Tank #1 Volume	500,000 gallons
	Tank # 2 Volume	500,000 gallons
	Tank # 3 Volume	1,000,000 gallons
	Total Volume	2,000,000 gallons
Secondary Clarifiers	No. of Units	2
	Diameter	65'
	Depth	13'-6"
	Side Water Depth	12'
	Volume (each)	297,700 gallons
Sand Filter	No. of Cells	4
	Surface Area Per Cell	288 square feet
	Total Filter Surface Area	1,152 square feet
	Design Loading Rate	3.65 gpm/sf
Mud Well	No. of Units	1
	Dimensions	94'-8" x 14'-6" x 13'
	Side Water Depth	13'
	Volume	130,000 gallons
Sludge Holding Tanks	No. of Tanks	2
	Dimensions	77'-4" x 18' x 13'
	Side Water Depth	7' to 10' (avg. 8.5')
	Volume (each)	88,500 gallons
Sludge Decant Tanks	No. of Units	2
	Dimensions	14.5' x 18' x 13'
	Side Water Depth	7' to 10' (avg. 8.5')
	Volume (each)	16,594 gallons
Plate & Frame Sludge Press	No. of Units	1
	Size	1,200 millimeters
Sludge Drying Bed	No. of Beds	4
	Dimensions	32' x 130'
	Area (each)	4,160 ft^2
	Area (total)	16,640 ft^2

4.3.2 Permit Conditions & Effluent Discharge Limits

Table 4.3 lists the existing WWTP effluent limits for Outfall #1 as required by the SPDES Permit.

Table 4.3 SPDES Permit Limits – WWTP Discharge

Parameter	Limit
Flow (12 Month Rolling Average)	2,000,000 gpd
UOD (June 1 - October 31) (Daily Maximum)	15.3 mg/l, 260 lbs./day
UOD (November 1 - May 31) (Daily Maximum)	32 mg/l, 530 lbs./day
Total Suspended Solids (daily maximum)	10 mg/l, 170 lbs./day
Dissolved Oxygen (daily minimum)	7.0 mg/l
Ammonia (June 1 - October 31) (Monthly Average)	1.4 mg/l (as N)
Ammonia (November 1 - May 31) (Monthly Average)	2.1 mg/l (as N)
Solids, Settleable (daily maximum)	0.1 ml/l
pH (range)	6.0-9.0
Temperature	Monitor
*Coliform, Fecal (30-day geometric mean), in effect from May 1 – October 31	200 / 100 ml
*Coliform, Fecal (7-day geometric mean), in effect from May 1 – October 31	400 / 100 ml
*Chlorine, Total Residual (daily maximum)	20 ug/l, 0.33 lbs./day

* Indicates limits that are not in effect until May 1, 2022

There are no anticipated changes to the effluent limits for Outfall #1 required for the planned upgrade. A full copy of the permit is contained in **Appendix B – WWTP SPDES Permit**.

However, in order for the new disinfection system to be added as a part of this proposed upgrade, the implementation schedule dates will need to be renegotiated with permit regulator. The Town will be securing funding assistance which will control the project schedule. In order to comply with legal requirements (e.g., Town Law 202 (b)), as well as funding agency schedules, the implementation dates currently in the SPDES permit will need to be altered.

4.3.3 Compliance Issues

Based on a review of the plant performance between January 2017 and June 2019, the WWTP has had several instances of non-compliance with SPDES permit limits for TSS, Ammonia, and UOD as shown in Table 4.4.

Table 4.4 SPDES Permit Exceedances January 2017 – June 2019

Month, Year	Parameter	Recorded Value	Permit Limit,
April 2017	Effluent UOD	33 mg/L (Daily Max.)	32 mg/L (Daily Max.)
September 2017	Effluent TSS	18 mg/L (Daily Max.)	10 mg/L (Daily Max.)
February 2018	Effluent TSS	34 mg/L (Daily Max.)	10 mg/L (Daily Max.)
February 2018	Nitrogen, Ammonia	5.4 mg/L (Monthly Avg.)	2.1 mg/L (Monthly Avg.)
February 2018	Effluent UOD	96 mg/L (Daily Max.)	32 mg/L (Daily Max.)
July 2018	Effluent TSS	12 mg/L (Daily Max.)	10 mg/L (Daily Max.)
July 2018	Nitrogen, Ammonia	18.9 mg/L (Monthly Avg.)	1.4 mg/L (Monthly Avg.)
July 2018	Effluent UOD	113 mg/L (Daily Max.)	15.3 mg/L (Daily Max.)
August 2018	Nitrogen, Ammonia	9.0 mg/L (Monthly Avg.)	1.4 mg/L (Monthly Avg.)
August 2018	Effluent UOD	68 mg/L (Daily Max.)	15.3 mg/L (Daily Max.)
January 2019	Effluent TSS	21 mg/L (Daily Max.)	10 mg/L (Daily Max.)
April 2019	Nitrogen, Ammonia	4.0 mg/L (Monthly Avg.)	2.1 mg/L (Monthly Avg.)
May 2019	Nitrogen, Ammonia	3.9 mg/L (Monthly Avg.)	2.1 mg/L (Monthly Avg.)
June 2019	Nitrogen, Ammonia	2.3 mg/L (Monthly Avg.)	1.4 mg/L (Monthly Avg.)

4.3.4 Existing & Design Flows & Waste Loads

Under current flow conditions and loading for the past three years, the facility has been able to meet all SPDES permit limitations except as noted above in Table 4.4.

Table 4.6 lists the existing influent loading characteristics for the Kiamesha WWTP based on historical testing of the influent (January 2017 – June 2019).

Table 4.5 Historical Influent Loading (January 2017 – June 2019)

Parameter	Influent Concentration
Current Average Daily Flow (ADF)[1]	0.548 MGD
BOD_5	133 mg/l
TSS	265 mg/l
NH_3 (as N)[2]	15 mg/l
TKN (as N)[2]	26 mg/l

[1] ADF = Average of the monthly flows over a calendar year
[2] Assumed values (no influent sampling data is available)

4.3.5 Design Flows & Waste Loads (Average and Peak)

Under current flow conditions and loading, the facility, with the proposed upgrades, will be able to meet all SPDES permit limitations.

Table 4.5 (above) lists the design influent conditions based on January 2017 – June 2019 data, contained in **Appendix D – Historical WWTP Data Summary (January 2017 – June 2019)**.

Table 4.6 Summary of Annual Flow Data

Year	Average Daily Flow[1] (MGD)	Average Monthly Maximum Daily Flow[2] (MGD)	Ratio of Max Day to Average Monthly Flow	Peak Hour Flow (MGD)[3]
2017	0.493	0.969	2.04	NA
2018	0.584	1.227	2.18	NA
Jan.-June 2019	0.572	0.970	1.68	NA
Average	**0.548**	**1.072**	**2.00**	**NA**
Maximum	0.584	1.860	2.18	NA

[1] ADF = Average of the average monthly flows over a calendar year
[2] Average monthly maximum daily flow is the average of the maximum daily flows for each month over a calendar year
[3] Peak hour flow data not recorded

The average daily flow for the WWTP facility for the range of data available was 0.548 MGD, and the annual average peak day flow was 1.072 MGD. The ratio of average peak day to average daily flow (ADF) is 2. Therefore, using this factor, the Design Peak Day flow is estimated to be 4.0 MGD (2.0 MGD x 2). A factor of 1.5 was used to estimate the peak hourly flow (see above). Using this factor, the Design Peak Hour flow is estimated to be 6.0 MGD (4.0 MGD x 1.5).

Table 4.7 Design Influent Loading

Parameter	Design Average Influent Concentration
Permitted Annual Average Flow (ADF)	2.0 MGD
Peak Day/ADF Factor	2
Design Peak Day Flow	4.0 MGD
Peak Hour/Peak Day[1]	1.5
Peak Hour Flow	6.0 MGD
BOD_5	230 mg/L
TSS	284 mg/L
NH_3	15 mg/L
TKN	26 mg/L

[1] Table 2-8 of Metcalf & Eddy (Metcalf & Eddy, Inc Wastewater Engineering: Treatment, Disposal and Reuse: 3rd Edition, revised by G. Tchobanoglous and Franklin L. Barton, McGraw-Hill, Inc., New York 1991)

4.3.6 Existing Energy Consumption

The annual energy consumption for the facility in 2018 - 2019 was 1,522 MWh.

Table 4.8 Summary of Annual Electric Usage

Annual Electric Usage - Kiamesha WWTP				
	Meter 1 (kWh)	**Meter 2 (kWh)**	**Total (kWh)**	
Sep-18	48,750	64,250	113,000	
Oct-18	59,000	74,250	133,250	
Nov-18	63,500	81,750	145,250	
Dec-18	46,000	54,500	100,500	
Jan-19	62,000	85,250	147,250	
Feb-19	66,250	76,000	142,250	
Mar-19	54,250	67,750	122,000	
Apr-19	58,750	63,750	122,500	
May-19	55,500	74,000	129,500	
Jun-19	50,500	59,750	110,250	
Jul-19	57,750	76,500	134,250	
Aug-19	54,125	68,125	122,250	
		Total:	1,522,250	**kWh**
			1,522	**MWh**

4.3.7 Site Layout / Overall Schematic Drawing

The location map, existing and upgrade site plans, and existing and upgrade process flow schematics of the treatment facility are shown in **Figure 1** through **Figure 5**.

4.3.8 History of Damage Due to Storm or Flooding

Based on discussions with Town personnel, there have been no incidences of flooding that have caused damage to or interfered with the operation of the Kiamesha Lake Wastewater Treatment Plan. The Kiamesha Creek has not flooded enough to cause flow to back up to any plant processes, and no plant facilities are located within a flood plain. No storm damage to plant buildings or facilities has been noted in recent years.

4.3.9 Unit Process Evaluation

This section will conduct a comprehensive evaluation of the existing condition of all WWTP facilities, and indicate which items should be considered for improvement. See section 5.3 for descriptions of the recommended project improvements.

Appendix O contains a comprehensive basis of design with comparisons to applicable regulatory standard (i.e., Ten State Standards).

4.3.9.1 Influent Channel, Screening, and Influent Flow Metering

The plant is fed by a 24” diameter influent pipe, which delivers waste flow to the plant’s influent channel. The influent channel is located at the head of the plant, before any of the process units. The existing influent channel was constructed in 1989, and replaced the plant’s original headworks channel. The channel is in fair condition. An existing influent sampler is situated near the beginning of the channel, to allow for influent samples to be taken. The channel diverges into a primary channel, which directs flow through an existing mechanical bar screen, and a bypass channel which directs flow through a manually cleaned coarse bar rack. Flow is controlled by existing slide-gates with cast-in-place fiberglass reinforced polyester frames. The two channels then recombine and flow is directed through a Parshall flume and grit removal system, before entering a flow splitting box and being directed onward towards one of the three aeration basins. A second bypass channel allows the grit removal system to be bypassed for maintenance.

The **mechanical bar screen** is located near the beginning of the influent channel (at which point the channel is 3’ wide), and is the first treatment process unit of the plant. The screen is a Schloss Model Mark IX-A. The model is rated for hydraulic flow rates between 1 MGD and 15 MGD. The mechanical bar screen is relatively new, having been installed in the 2016 plant upgrade, and is in good condition. The mechanical screen is made up of rectangular bars, 2” wide by 1/4” thick, with 3/4” clear space between them, and is set at a 75° angle from horizontal. The screenings are deposited into a disposal bin located within the bar screen enclosure.


Influent Sampler


Mechanical Screen Enclosure

An electrical panel and control panel, with local disconnect, are installed next to the mechanical bar screen on the exterior wall of the plant's grit separation building. The mechanical screen is driven by a ½ HP, 480 V, 60 Hz motor. The screen and all associated mechanical equipment are housed in an insulated and heated enclosure which provides the freeze protection required by Ten State Standards. The insulation is 2" polystyrene, and the heat is provided by a 1 KW strip heater.


Mechanical Bar Screen Control Panel


Influent Channel

The **<u>coarse bar rack</u>**, located in the mechanical screen bypass channel, is comprised of 3/8" thick bars spaced at 2-1/2" center to center. The bars are set at an angle of 60° from horizontal. The bypass channel is 2'-6" wide. The existing bar rack was installed with no freeze protection. The bar rack is otherwise in fair condition.

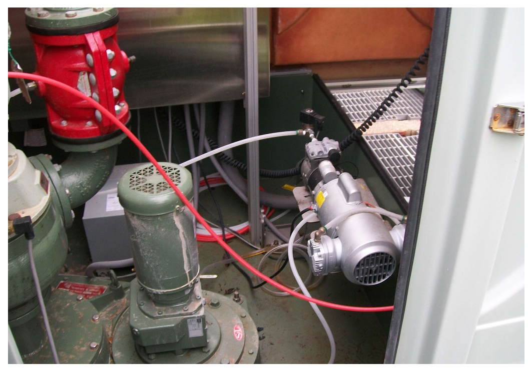
A **<u>Parshall flume</u>** is located downstream of the existing mechanical screen. The flume is a 12" fiberglass insertion flume, Model Type 10F, manufactured by Warminster Fiberglass Company. It is sized to be accurate at flow rates between 0.078 MGD and 10.4 MGD. There is, however, currently no ultrasonic level transducer or any other means for measuring flow installed with the flume.

After waste flow has passed the mechanical screen or manual bar rack, the bypass channel recombines with the primary channel. From that point, the flow continues on towards the grit chamber. After the grit chamber, waste flow enters a flow splitter box where weirs and slide-gates control flow and direct it to the plant's three oxidation ditches. The weirs and slide-gates are aging and should be considered for replacement.

4.3.9.2 Grit Removal Process

From the screen, the waste flow enters a circular grit chamber, of 10' in diameter. The grit chamber houses a **grit cyclone** unit, Smith & Loveless, Inc. Model 7.0 Pista Grit. The hydraulic capacity of this chamber ranges between 0.7 MGD and 7.0 MGD.

Grit Equipment Enclosure and Effluent Line



Grit Equipment Within Enclosure

Settleable grit separates from the waste flow within the grit chamber, and as the grit settles it is directed by a set of rotating paddles into the 3' diameter by 5'-6" deep grit storage chamber. The rotating paddles are part of the grit cyclone unit, and are driven by a 1 HP, 480 V, 60 Hz motor. From the grit storage chamber, the grit is pumped up through the grit equipment enclosure to the grit building.

The **grit pump** is a Smith & Loveless, Inc. Turbo grit removal pump with vacuum priming. The grit pump and grit cyclone unit are one integral mechanism and are housed within an insulated and heated fiberglass enclosure above the grit chamber. The enclosure provides the freeze protection required by Ten State Standards. The grit cyclone, grit pump, and enclosure are all relatively new, having been installed during the 2016 upgrade, and are all in good condition.

From the grit chamber the grit is pumped to the nearby grit building. The 4" diameter grit pump discharge line is run overhead at approximately 4'-10" above the top of the influent channel. The discharge line is insulated to prevent freezing. The grit line enters the grit building and is piped into the **grit classifier**. In the grit classifier, grit is accumulated in a hopper. A 12" diameter spiral conveyor further separates the solid grit from the wastewater that is pumped with the grit, and the classified grit is deposited into a disposal bin. The bin is accessible through an overhead door in the side of the grit building. The grit collected in the bin is then disposed of with biosolids in the sludge drying beds. The grit classifier is run by a 2 HP, 480 V, 60 Hz motor. The electrical and control panels for the grit classifier are installed on an interior/exterior wall of the grit building.

Grit Classifier in Grit Building

Grit Classifier and Bin

The grit building itself was constructed during the 1983 upgrade and is in generally fair condition. The grit classifier was installed during the 1989 upgrade. The grit classifier is operational, and is in good enough condition for continued use.

4.3.9.3 Oxidation Ditches

The principal biological treatment process for this plant is accomplished through extended aeration activated sludge treatment. The plant currently has three **extended aeration oxidation ditches**. Ditches 1 and 2 were constructed in 1983, during the first plant upgrade. Ditches 1 and 2 are of similar sizes to each other, and are built directly adjacent to each other. Ditch 3 was constructed in 1989, and is of equal volume to the other two combined. The total hydraulic capacity of the three ditches is 4 MGD. The total design organic loading capacity of the three ditches is 7,672 lb./day.

4.3.9.3.1 Oxidation Ditch 1 & 2

Oxidation Ditches 1 and 2 each have a channel width of 23' (11'-6" on each side of the center wall), a channel length of 231'-6", and a channel wall height of 15' (the design water depth is 12', with a design freeboard of 3'). The volume of each of these oxidation ditches is approximately 500,000 gallons (1,000,000 gallons total between ditches 1 and 2). The design MLSS (mixed liquor suspended solids) concentration is 4,000 mg/L. The organic loading capacity of each tank is 1,918 lb./day. The hydraulic loading capacity of each tank is 1.0 MGD.

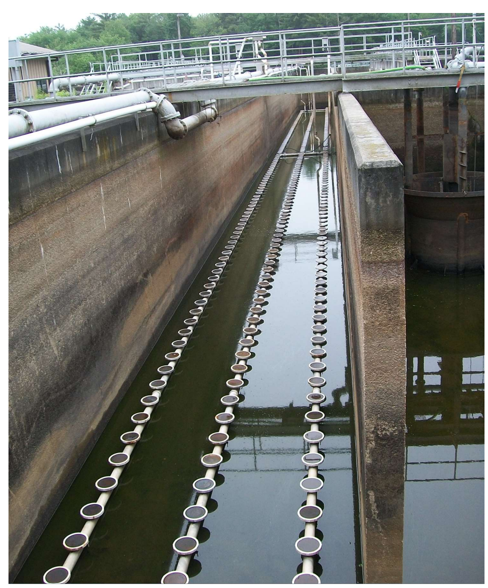
Oxidation Ditch 1 & 2

Oxidation Ditch Access Walkway

In order to treat the mixed liquor solution in the oxidation ditches, aeration of the solution is required. This aeration is supplied by blowers located in the plant's Blower Building. The Blower Building contains four blowers that supply much of the needed air for all plant processes. Two of these blowers provide the air for Oxidation Ditches 1 and 2. The air from the blowers is delivered to the oxidation ditches through forced air piping. The air headers are 6" pipe, with 4" drop lines that deliver air to the diffuser grids at the bottom of each tank.

Grids of fine bubble diffusers are installed at the bottom of each of the oxidation ditches. The diffusers are ceramic, and 9" in diameter. There are four diffuser grids per tank, with a total of 382 diffusers per tank. The diffusers can produce streams of fine bubbles that introduce dissolved oxygen into the mixed liquor of raw wastewater and activated sludge. The aeration allows for the growth and reproduction of microbes that help break down and treat the wastewater in the tanks. Activated sludge is introduced into the oxidation ditches from the secondary clarifiers. The rate of sludge return to each ditch varies between 43% and 75% of design influent flow (2 MGD), depending on operational conditions.

Empty Oxidation Ditch 1 with Mixer



Empty Oxidation Ditch 1 with Diffuser Grid

In addition to the aeration system, the oxidation ditches also have equipment for mixing. A draft tube mixer unit is installed in each oxidation ditch. The oxidation ditches are not continuous tanks, but are interrupted by a 19' thick structure of reinforced concrete and fill. A 72" diameter precast concrete pipe runs beneath each of the structures that divide the tanks. This pipe serves as a draft tube. The mixer units are located directly above the vertical inlet of each draft tube, and force water downward into the tubes. When water leaves the draft tubes at high velocity it induces flow around the tanks to achieve mixing. The draft tube mixers are Lightnin model DAT 140 units with 75 HP Two-speed motors and gear drives.

4.3.9.3.2 Oxidation Ditch 3

Oxidation Ditch 3 has a channel width of 47' (23'-6" on each side of the center wall), a channel length of 231' -6", and a channel wall height of 19'-6" (the maximum design water depth is 18', with a minimum design freeboard of 1'-6"). The volume of this oxidation ditch is approximately 1,000,000 gallons. The design MLSS concentration is 4,000 mg/L. The design organic loading capacity of this tank is 3,836 lb./day. The hydraulic loading capacity of this tank is 2.0 MGD.

Oxidation Ditch 3

Oxidation Ditch 3

Oxidation Ditch 3

Oxidation Ditch 3

Oxidation Ditch 3 also requires aeration to treat the mixed liquor solution. Two of the four blowers located in the Blower Building provide the air for Oxidation Ditch 3. The air from the blowers is delivered to the oxidation ditch through forced air piping. The air headers are 6" pipe, with 4" drop lines that deliver air to the diffusers in the tank.

Like Ditches 1 and 2, Oxidation Ditch 3 has grids of fine bubble diffusers installed at the tank bottom. The ditch has four diffuser grids, with a total of 648 diffusers. The diffusers are 9" diameter, ceramic, fine bubble diffusers. The diffusers can produce streams of fine bubbles that introduce dissolved oxygen into the mixed liquor of raw wastewater and activated sludge. The aeration allows for the growth and reproduction of microbes that help break down and treat the wastewater in the tanks. Activated sludge is introduced into the oxidation ditches from the secondary clarifiers. The rate of sludge return to each ditch varies between 43% and 75% of design influent flow (2 MGD), depending on operational conditions.

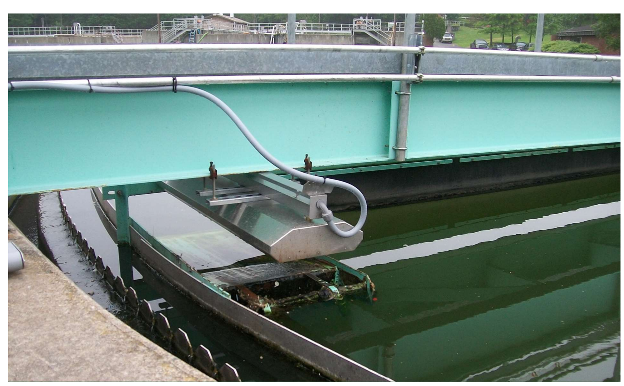
Unlike Ditches 1 and 2, Oxidation Ditch 3 is a continuous tank. The tank has steel baffles and 12' tall concrete baffle walls, but is not interrupted by any full-depth dividing structure. Mixing in this tank is currently accomplished by four groups of 22 coarse bubble diffusers which provide an air lift effect at the baffle walls and provide velocity to mix and move the MLSS throughout the tank. Additionally, diffusers direct air downward from approximately 6' above the tank bottom located at two baffles around the tank. This method of tank circulation is adequate, and the cost of structural modifications to tank geometry in order to facilitate an alternate method of mixing would be significant.

4.3.9.4 Secondary Clarifiers

The oxidation ditch effluent flow is directed to one of the two secondary clarifiers. The clarifiers are both circular tanks of similar size and construction. The clarifier tanks have diameters of 65', and normal side water depths of 12'. Each tank has a volume of approximately 297,700 gallons. Each clarifier has a peripheral effluent v-notch weir plate. The weir length of each tank is 200'. The clarifiers meet Ten State Standards at permitted flow.

Each clarifier has a walkway to its center, where the clarifier drive mechanisms are located. The clarifier drive mechanisms have 1 HP, 480 V, 3 phase, 60 Hz motors. Near the beginning of each walkway, there is an electric powered infrared heater, mounted to the bottom of the walkway beams. These heaters emit infrared radiation on the scum collection hopper, to prevent ice from forming during winter. Icing can cause the rotating scum collection mechanism to become caught, inhibiting or preventing the rotation of the mechanisms.

Secondary Clarifier



Secondary Clarifier with UV Heater

Originally constructed during the 1989 upgrade, the circular clarifier tanks replaced older rectangular clarifiers (which were converted into sludge holding tanks). All the clarifier equipment, including weir plates, center columns, drive mechanisms, scum collection boxes, sludge hopper, and sludge draw off piping was replaced during the 2016 upgrade. The infrared heaters were also installed during the 2016 upgrade. The two clarifier tanks and all the clarifier equipment are currently in good condition.

4.3.9.5 Sand Filtration

The tertiary treatment process for the plant is a **sand filter** housed within the plant's Filter Building. The sand filter is a four-cell unit with anthracite media that filters secondary clarifier effluent. Each of the four filter cells is 16' wide by 18' long for a filter area of 288 square feet per cell (1,152 square feet total). The design capacity of the filter is 4,200 gpm (6.05 MGD) at a loading rate of 3.65 gpm/square foot. Ten State Standards allows 5.0 gpm/square foot for sand filters (5,760 gpm maximum capacity for a 1,152 square foot filter). The design air wash rate is 4 cfm/ft^2 and the wash-water rate is 12 gpm/ft^2.

The functions of the filter system are controlled by a number of valves with double acting, pneumatic cylinder actuators. Each filter cell has a 10" filter inlet valve, a 16" backwash waste valve, a 20" isolation valve and an 8" air wash supply valve.

Sand Filter Room

Sand Filter Pneumatic Valves

The tertiary sand filters were originally constructed during the 1989 upgrade project. The backwash troughs and media separator baffles were replaced during the 2016 upgrades. In 2016, the original pneumatic cylinder actuated filter valves were replaced with new pneumatic cylinder actuated valves. These valves and actuators are new and in good condition. The sand filters are currently functional and have sufficient capacity to treat the secondary clarifier effluent at the design flow rate.

4.3.9.6 Post-Aeration Tank

The **post-aeration tank** was constructed during the 1989 upgrade project. This tank is located within the Filter Building and has a volume of approximately 57,760 gallons. The tank is approximately 18' wide by 33' long by 13' deep at design depth. Air is supplied to the tank by a 4" line that is tapped off the aeration header for the oxidation ditches. Airflow is controlled by a manual valve. 150 cfm is allocated to the post-aeration system. The post aeration tank has 100 fine bubble diffusers on five diffuser headers on the basin floor. The design dissolved oxygen concentration in the post aeration tank is 7 mg/l.

4.3.9.7 Polishing Lagoon

Another process unit that can be used for tertiary treatment is a three-cell aerated **polishing lagoon**. The lagoon is a man-made pond with a bentonite clay liner to prevent seepage of water into the surrounding soil. The lagoon is aerated by PVC forced air pipes that deliver air to the center of each cell. The forced air is provided by blowers located in the Blower Building. Streams of bubbles rise from the air pipes to the surface of the lagoon, introducing oxygen into the water, increasing the dissolved oxygen content, and providing vertical mixing as the bubbles rise towards the surface.


Existing Polishing Lagoon

The polishing lagoon has a total length of approximately 292' and a width of approximately 126'. The maximum depth of the lagoon is approximately 10'-6". The total volume of the lagoon is approximately 2.9 million gallons.

The polishing lagoon contains a series of floating baffles. These baffles direct the flow through the lagoon and prevent flow from short-circuiting from the lagoon inlet to the lagoon outlet without receiving adequate treatment. The lagoon inlet is a 24" pipe that can deliver flow from the secondary clarifiers. The lagoon outlet is an 18" pipe that directs flow to the plant effluent junction box, or to the Filter Building. From the 6" lagoon drain lines, water can be drained from the lagoon to the return pump station, and can be returned to the head of the plant directly after the grit chamber.

The polishing lagoon was part of the 1983 upgrade. Although the lagoon may be operable, it is currently not in use, with the inlet line shut off by a closed valve. Tertiary treatment is currently achieved through the use of the sand filter.

4.3.9.8 Site Pump Station

The pump station contains two submersible pumps, each with a capacity of 140 gpm at 55' TDH. The pump station is a 19' deep concrete vault, located north of the secondary clarifiers. The pump vault is a wet chamber. Water is pumped through a dry valve pit to control flow from the pump station. The pump station receives flow from the 6" polishing lagoon drain and from the 6" Control Building drain and returns the flow to the head of the plant (directly after the grit chamber). The pump station was constructed during the 1983 upgrade project. The pump station components have not been replaced since construction. The pump station is currently operable. The pump vault shows need of structural repair, and the pumps and valves are aging and should be considered for replacement.

4.3.9.9 Sludge Dewatering Process

The Kiamesha Lake WWTP receives and handles waste sludge from all plants within the Town of Thompson (a total of five treatment plants are currently located within, owned, and operated by the Town of Thompson). As such, the sludge handling and dewatering system is particularly critical. The plant currently has some trouble keeping up with the high volume of sludge loading it receives.

The plant's sludge dewatering system includes two sludge storage tanks, a plate and frame sludge press, and four sludge drying beds. The sludge is stored and thickened in the storage tanks, pressed, and then spread in the drying beds until sufficiently dewatered. The dried sludge is removed by truck and disposed of offsite.

4.3.9.9.1 Sludge Storage Tanks

The plant has two **sludge storage tanks,** constructed adjacent to Oxidation Ditch 1 and 2 during the 1983 upgrade. These sludge storage tanks were originally constructed to be rectangular clarifiers, but they were converted to sludge storage tanks after the circular clarifier tanks were constructed during the 1989 upgrade. The plant's sludge is stored and thickened in these tanks before being pumped to sludge press.

Sludge Storage Tank Adjacent to Ditch 1

Sludge Storage Tank Adjacent to Ditch 1

Each sludge storage tank is 80' long by 18' wide. The tank bottoms slope downward at 2" per foot towards the adjacent oxidation ditches. The normal sludge depth in the tanks is 7' at the shallowest point and 10' at the deepest. The design freeboard of the tanks is 3'. The normal sludge storage volume is approximately 88,500 gallons per tank (177,000 gallons total). Each sludge holding tank has a coarse bubble diffuser system installed during the 1989 upgrade. Each sludge storage tank has a 14’-5” by 18’ decant tank. The decant tanks are of equal depth to the sludge holding tanks. From the decant tanks, the sludge is directed to the sludge press or sludge drying beds as waste sludge.

4.3.9.9.2 Mud Well

The mud well is a 94’-8” by 14’-6” tank with a normal water depth of approximately 13’ (approximately 130,000 gallons) located next to the Filter Building. The mud well receives water from the sludge press, and from the sludge drying bed underdrains. Backwash from the sand filters is also sent to the mud well. The mud well also receives the activated sludge from the secondary clarifier tanks. This sludge can then be pumped to the oxidation ditches as return activated sludge, or can be pumped to the sludge storage tanks as waste sludge for subsequent dewatering and disposal. The mud well was constructed during the 1989 plant upgrade project, and is in good condition.

4.3.9.9.3 RAS & WAS Pumps

The RAS and WAS pumps are located in the mechanical room of the Filter Building. The RAS and WAS pumps draw sludge from the mud well adjacent to the Filter Building. They have separate suction lines and a combined discharge line. They can pump sludge to any of the three oxidation ditches or to either sludge storage tank.

RAS and WAS Pumps

There are four large pumps connected in parallel that can either recycle or waste sludge as needed per plant operations. Valves located under the Blower Building determine whether sludge is wasted or recycled. Additionally, pinch valves control recycle sludge to the three oxidation ditches.

Each of the four pumps is rated for 1,080 gpm at 31.5’ TDH. The pumps were installed during the 1989 upgrade project when the Filter Building was constructed. All four pumps should be considered for replacement.

4.3.9.9.4 Sludge Press

The plant has a **sludge press** located in the sludge handling building which is a part of the sludge drying bed structure. The sludge press unit was refurbished in 2016. The press is a 1,500-millimeter plate and frame unit manufactured by Evoqua, Inc. The press is currently operated such that it receives one batch per day.

A batch tank with a capacity of approximately 8,000 gallons is currently located in the sludge building. The current feed rate is approximately 125 gpm. The press discharges pressed sludge at 24% to 26% solids and requires 100 gpm of wash water. The press currently makes use of a dry polymer feed system. The current sludge press unit does not have any flow metering equipment associated with it. The unit is in good condition, but has difficulty keeping up with the plant's sludge demand. The sludge press should be considered for replacement with an upgraded unit.

Plate and Frame Sludge Press

4.3.9.9.5 Sludge Drying Beds

The existing **sludge drying beds** are located on the site of former sludge lagoons that were a part of the original wastewater treatment plant. The sludge drying beds were constructed during the 1989 upgrade project. The beds are covered by a fiberglass roof, supported by a steel frame structure. An enclosed room at one corner of the sludge drying bed structure houses the sludge press and associated equipment.

Sludge Drying Bed Structure

Sludge Drying Bed Structure

Storage Area Under the Structure

Sludge Drying Beds

The sludge drying bed structure covers four sludge drying beds, each 32’ wide by 130’ long. The area per sludge drying bed is 4,160 square feet (16,640 square feet total). The sludge drying beds are in good condition. The structural components of the sludge drying bed structure are also in good condition. The roof is aging, has minor leaks, and visible damage around the eves in some locations. The roof should be considered for replacement. The air under the sludge drying bed structure has a tendency to be very humid which inhibits the drying process. If the roof is replaced, the addition of ridge vents should be considered to reduce the humidity around the sludge drying beds.

4.3.9.10 Septage Receiving

The plant has a septage receiving system that is no longer in use. The septage receiving system includes a receiving hopper, a septage storage tank, and a septage pump station. The receiving hopper has a coarse screen for filtering out rags and large, inorganic solids. The septage storage tank was formerly a digester tank that was converted to a storage tank during the 1983 upgrade project. The pump station delivers septage to a manhole directly upstream of the influent channel. The existing septage receiving system is not currently in use, and has been essentially abandoned in place.

4.3.9.11 Control Building

The Control Building was constructed in 1983. The building is single story and has plan dimensions of approximately 65’ by 65’. The building houses the control equipment for the plant’s processes. The Control Building also houses most of the plant’s laboratory and testing equipment, office space and a small conference room for WWTP staff, and file storage space.

The Control Building is connected, through a covered walkway to a smaller building with a large conference room and testing equipment for DO and PH. This building was built in 1983 and was formerly a UV disinfection building, but was converted to its current use during the 1989 upgrade project. This building is approximately 22’-4” by 37’-4”. The building is generally in good condition. The covered walk way between the Control Building and conference building shows signs of roof leakage. The large conference room has areas that are missing floor tiles.

4.3.9.12 Grit Removal Building

The Grit Removal Building is a small brick and CMU building constructed in 1983, and modified in 1989. The single-story building is approximately 12'-4" by 18'-4" in plan. The grit building is located adjacent to the plant's influent channel. The Grit Removal Building houses the grit classifier and the grit disposal bin. The electrical and control panels for the mechanical bar screen and grit equipment are mounted on the outside of the grit building. The building is accessed through an 8' by 10' overhead door. The door opens to a small loading dock, from which the grit bin can be removed. The building is in good condition.

4.3.9.13 Filter Building

The Filter Building was constructed in 1989 and houses the tertiary sand filter units, the post-aeration basin, pumps, blowers, and compressors for the sand filter back-wash process, and the return activated sludge (RAS) pumps.

The building has a filter room, which houses the tertiary sand filters, a post-aeration room which houses the post-aeration basin, and a mechanical room which houses blowers and compressors for the sand filter backwash process, and pumps for returning activated sludge to the oxidation ditches. Adjacent to the mechanical room there is a small separate air handling room which opens into the mechanical room, containing the building's HVAC equipment. There was formerly a chlorine room which opened to the outside of the building and contained chlorine feed equipment and storage. The walls of this room were removed, and the space is now used for alkalinity addition equipment. Each main room of the Filter Building has a different floor level, although the building is single-story. There are below-grade tanks under the post-aeration and filter rooms.

The Filter Building is approximately 96'-3" in length. The mechanical room is at the front of the building and is approximately 60' wide by 30' long. The post-aeration room is approximately 36' by 20'. The filter room is approximately 36' by 46'.

The plant's mud well is adjacent to the building exterior along its west wall.

The Filter Building roof leaks and should be considered for replacement. The south wall of the building, which includes the building's main entrance, is showing visible signs of aging and should be considered for repairs.

4.3.9.14 Storage Building (Old Blower Building)

The Storage Building was formerly the plant's Blower Building, before the current Blower Building was constructed. The Storage Building was constructed during the 1983 upgrade project and was modified to its current configuration during the 1989 upgrade. The building houses much of the electrical equipment that serves the Oxidation Ditches. The building also contains storage space that is used by the WWTP staff and the Town's DPW department. The main structure is in good condition. The roof shows signs of aging, although no leaks have been identified.

4.3.9.15 Blower Building

The Blower Building was constructed during the 1989 upgrade to replace the older Blower Building. The previous Blower Building was modified to house electrical equipment and storage space for the Town's DPW department and Sewer department.

Oxidation Ditch Blowers (Four Total)

The current Blower Building is located in the space between oxidation ditch 2 and oxidation ditch 3. The Blower Building is approximately 17'-6 by 44' and has a main floor and a below-grade valve vault. The Blower Building houses the blowers that provide air to the three oxidation ditches, the aerated sludge holding tanks, the post-aeration tank, and the polishing lagoon (if needed). The building also has a polymer room and an HCL-gas cleaning system room.

The building is in good condition, but shows visible damage around the eves of the roof. No leaks have been identified, but it is believed the roof is near the end of its lifespan and should be considered for replacement.

4.3.9.16 Maintenance and Workshop Buildings

The maintenance and workshop buildings are located to the west of the Control Building. There are two metal buildings, near a paved parking area that make up the existing maintenance and workshop complex. The larger of the two buildings has five garage bays for storing or performing maintenance on vehicles or equipment. The smaller building has no garage bays, and is primarily used as workshop space. These buildings are shared between the WWTP staff and the Town's DPW department. The buildings are in poor shape, due to age, construction material, and heavy use. The two buildings should be considered for demolition and replacement.

4.3.9.17 Generator Building

The Generator Building was built as an addition to an older building which was part of the original plant. The Generator Building was constructed in 1989 and is approximately 30' by 18'. The building houses a 750 KW diesel generator and main electrical switch gear which were installed in 1989, at the time of the building's construction. The building is generally in good condition. The generator itself is aging and is frequently in need of repairs. It is a model that is no longer manufactured, and replacement parts are increasingly difficult and expensive to obtain. The generator and transfer switch should be considered for replacement with a new 750 KW diesel emergency power generator.

4.4 Definition of the Problem

The Kiamesha Lake WWTP has been in service for nearly 65 years. Many of the major components of the WWTP are approaching 35 to 30 years of service, exceeding the average expected WWTP lifespan of approximately 25 to 30 years. Many of the building and system components have reached the end of their useful lives. Parts needed to service some of the existing plant components, such as the existing emergency power generator, are becoming increasingly difficult to obtain.

The Kiamesha Lake WWTP does not have any disinfection limits in effect. However, these limits are in the plant's current SPDES permit. The disinfection limits, which include limits for fecal coliforms and residual chlorine, are scheduled to go into effect in May of 2022. The plant does not currently have any disinfection process equipment to address these future permit limits. These pending SPDES permit disinfection limitations, which will take effect within three years, require the addition of a new disinfection treatment process. Without this upgrade, the plant would no longer be able to maintain permit compliance after May of 2022.

The Town of Thompson currently owns and operates five wastewater treatment plants, including the Kiamesha Lake plant. Of these plants, Kiamesha Lake has the highest permitted flow capacity. Kiamesha Lake is also the only plant in the Town that has functional sludge handling equipment. Therefore, the Town trucks the sludge from all other plants to the Kiamesha Lake plant for handling. Receiving sludge from other Town plants puts strain on the plant's existing sludge handling equipment, making upgrades to the existing sludge handling system prudent. If the sludge handling system were to fail, it would adversely affect all of the Town's sewer districts, not only the ones that feed the Kiamesha Lake plant. Additionally, appropriate new sludge handling equipment could greatly increase the treatment process efficiency and lower the cost of sludge disposal borne by the Town.

A comprehensive overhaul of the treatment train equipment is required in order for the plant to maintain long-term compliance with the SPDES permit.

4.5 Financial Status

In 2018, the Town of Thompson collected a total of $637,790 in sewer rents from 378 sewer accounts in the Kiamesha Lake sewer district. Each account is assigned a rent points value and in 2018 district users were charged $80.59 per point. A single-family home in the Kiamesha sewer district is considered to have 7.5 rent points resulting in an annual water rent charge of $605 for a typical single-family home.

Additionally, in 2018, the Town collected $103,000 in debt payments from 486 properties to satisfy existing annual sewer district debt service. Each real property located in the sewer district is assigned a debt points value and in 2018, property owners were charged $5.23 per point. A single-family home located in the Kiamesha sewer district is considered to have 7.5 debt points resulting in an annual debt service charge of $40. Therefore, in 2018, the total water rent/debt service paid by a typical single-family home was $645.

The Kiamesha Sewer District receives additional fees from the Adelaar and Anawana sewer districts, outside users located within the Town. The Town is in the process of restructuring rates for all of the sewer districts. Outside user financial contributions to support this project will be determined following completion of a rate analysis and restructuring. The user impacts described below assume no additional financial contributions from outside users, or from other Town districts for shared services like sludge disposal.

Based on current property assessment and valuation information, without deducting long term debt, the Town has total debt power/debt capacity of approximately $88.6 million.

Based on the current long-term debt schedule, excluding water debt, the Town currently has a total of approximately $8.3 million in long term debt; exhausting 9.4% of the debt power/debt capacity. The unused debt capacity/contracting power remaining is approximately $80.2 million, 90.4% of the Town's total debt power/debt capacity.

The indebtedness analysis is contained in **Appendix F**.

5.0 ALTERNATIVE ANALYSIS

5.1 Alternatives Considered

Upgrade goals include providing reliable treatment for the next 25 years at monthly average flows ranging from 0.5 – 2.0 MGD and associated loads, with O & M costs at or near current levels.

To that end, there are three major parts of the plant process that needed to be considered: The principal biological treatment process (currently oxidation ditches), the disinfection process (currently non-existent), and the sludge handling process (currently a plate and frame press and sludge drying beds). Alternatives were considered for each of these three processes. All other portions of the plant were determined to have only repair and replace or no action as possible alternatives.

Alternatives considered to meet the needs of the Town include:

- No Action Alternative
- Upgrade Existing Facilities
- Construct New Treatment Process
- Green Infrastructure
- Regional Consolidation

Each of these alternatives is discussed in detail below as they pertain to the principal biological treatment, disinfection, and sludge handling processes of the Kiamesha Lake treatment plant.

5.1.1 No Action Alternative

The No Action alternative would not address any of the issues currently facing the plant. Some of the process equipment has reached the end of its useful life and requires replacement to continue with proper plant operations. This alternative is discussed below as it pertains to each of the three main plant processes involved in this upgrade project.

5.1.1.1 Principal Biological Treatment Process

If the plant is not upgraded to include improvements to the principal biological treatment process, the plant would be able to continue operating at its current level, but may not be adequate at permit flow. However, considering the aging condition of the aeration system in each of the existing oxidation ditches, the tendency of the diffusers to become clogged, and the numerous permit exceedances in recent years, this alternative is not recommended.

5.1.1.2 Disinfection Process

If the plant is not upgraded to include some form of disinfection process, it will be out of compliance with its SPDES permit by May of 2022. Therefore, this option is not feasible.

5.1.1.3 Sludge Handling Process

If the plant is not upgraded to include improvements to the sludge handling process, the plant would be able to continue operating at its current level. However, the plant is currently having trouble keeping up with the demand to its sludge handling system. The plant is currently only receiving approximately one third of its permitted hydraulic flow. If it were to see flows closer to its permitted limit, the demand on the sludge handling system would likely be even greater. This process is especially critical, as Kiamesha Lake currently receives and processes sludge from all five of the Town's operating wastewater treatment plants. This is not a recommended alternative.

5.1.2 Upgrade Existing Facilities

This alternative considers maintaining the existing plant processes as much as possible, while making necessary repairs and upgrades.

In 2016, the Town completed an upgrade to the plant, with costs approaching $3.5 million. Numerous previous upgrades have also been undertaken. The existing plant is generally capable of satisfying current SPDES permit limits and has some available hydraulic capacity for future growth. In addition, non-monetary factors favoring the continued upgrading of existing facilities include the following:

- Improvements could be completed within existing tanks, buildings, and previously disturbed areas, and will not require much work in undisturbed or undeveloped areas.
- Staffing could remain at current levels and staff members could continue working at present levels of certification
- Plant operation and maintenance procedures could continue with limited modifications

5.1.2.1 Principal Biological Treatment Process

The principal biological treatment process for the plant is currently a three-ditch activated sludge extended aeration system. The three oxidation ditch tanks are in good shape and represent a significant investment made by the Town during previous upgrades. The aeration and mixing equipment should be upgraded, as the existing equipment is aging and has shown signs of deficiencies. For example, the diffusers have a tendency to become clogged.

For this alternative the aeration and mixing equipment of the three oxidation ditches would be removed and replaced with new equipment. The aeration piping and diffuser grids would be replaced with little change in design, although some additional diffusers would be added to each tank. Improvements would be made to allow for easier and more effective cleaning of the diffusers to prevent future clogging. The existing blowers would be replaced with higher efficiency models with automated VFD's that would allow the new blowers to be controlled based on oxygen demand. The mixing equipment in ditches 1 and 2 would be replaced by rotary mixers to be located as appropriate to maximize mixing in the tanks.

The estimated cost of the proposed upgrades to the existing principal biological treatment process is $1.9 million, not including any other necessary or recommended plant improvements.

5.1.2.2 Disinfection Process

The plant currently does not have an existing disinfection process to improve or upgrade. A disinfection process is necessary if the plant is to meet the pending disinfection limits scheduled to take effect in May of 2022. Therefore, this option is not feasible, with regards to addressing disinfection process issues.

5.1.2.3 Sludge Handling Process

The existing sludge handling system primarily includes a plate and frame sludge press (1.5-meter) and large sludge drying beds. The existing system has difficulty keeping up with current demands from Kiamesha Lake and the other four plants that are owned and operated by the Town.

This alternative would involve replacing the existing press with one of two options. The first is a second 1.5-meter plate and frame sludge press and the second is a new, 2-meter belt filter press. Either option would more adequately handle current sludge loads. However, it is estimated that addition of a second plate and frame press would require modifying the existing sludge press structure to increase its size. It is believed that a new belt filter press would be able to fit within the existing structure. Therefore, the belt filter press was selected for this alternative.

The estimated cost of replacing the existing plate and frame press with a new 2-meter belt filter press is $924,400.

5.1.3 Construct New Treatment Process

This alternative would involve replacing one or more of the existing treatment processes with a new and different treatment process, or constructing a new treatment process that does not currently exist as a part of the Kiamesha Lake wastewater treatment plant.

5.1.3.1 Principal Biological Treatment Process

This alternative considers the possibility of replacing the principal treatment process with a new method of principal treatment. The principal treatment options considered were all activated sludge processes which would replace the plant's existing activated sludge oxidation ditch system.

New treatment technologies considered include a new sequencing batch reactor (SBR) system and a membrane bioreactor (MBR) activated sludge system. Both of these technologies would require the Town to make significant modifications to existing facilities, and would increase energy demands (and therefore O & M expenses) due to the necessity of larger aeration equipment.

The cost to convert to a new SBR activated sludge facility is estimated to exceed $4.5 million, not including any other necessary or recommended plant improvements. The cost to replace the existing oxidation ditch process and convert to a new MBR activated sludge facility, is estimated to exceed $15.2 million, not including any other necessary or recommended plant improvements. The MBR is the most expensive of the considered alternatives.

Conceptual cost estimates for the SBR and MBR alternatives have been provided in **Appendix G**.

Annual O & M costs for SBR and MBR technologies would be greater than the current system due principally to higher energy consumption for these activated sludge treatment processes.

Therefore, replacing current principal biological treatment facilities with other technologies would require higher capital costs and would result in higher O & M costs, as compared to upgrading the current treatment process.

5.1.3.2 Disinfection Process

This alternative would involve the installation of a new disinfection system at the plant. This upgrade is necessary for the plant to meet pending disinfection limits scheduled to take effect in May of 2022. Due to the pending seasonal disinfection permit limit of 20 micrograms per liter of total chlorine, it was determined that an ultraviolet disinfection system was the most consistent process available. Options include open-channel and pipeline (closed-channel) UV systems.

The hydraulics of the flow leaving the post-aeration tank were reviewed and it was determined that an open-channel UV system is not feasible. Additionally, with the nearness of the FEMA floodplain boundary in the area of the proposed UV equipment, an open-channel system was deemed inadvisable. A closed-channel UV system within a new building is hydraulically feasible. Therefore, a new closed-channel UV system is the selected option for this alternative.

The cost of constructing a new UV building, adjacent to the existing Filter Building, and providing a new closed-channel UV disinfection system is estimated to be $1.04 million.

5.1.3.3 Sludge Handling Process

This alternative would involve the installation of a new Autothermal Thermophilic Aerobic Digestion (ATAD) system. An ATAD system would provide a Class A biosolid suitable for reuse. This is also the Green Infrastructure alternative for this process. The ATAD process is discussed in greater detail in the section considering that alternative. The estimated cost of this improvement is $5.2 million.

Another option for new processes for sludge handling is anaerobic digestion. This option would require larger tankage and a greater area of disturbance. Anaerobic digestion would also result in Class A biosolids, but a greater detention time would be required to achieve this level of sludge digestion. Traditional anaerobic digestion typically requires 40 days of digestion to produce Class A biosolids, while an ATAD system can produce the same results within one day (approximately 6 hours per batch). The quality of the sludge received by the plant is such that anaerobic digestion would not likely yield significant quantities of methane. Any methane produced would most likely need to be burned off as waste, resulting in no benefit to the Town, and increased annual O & M costs associated with the regular maintenance of the necessary gas safety equipment.

5.1.4 Green Infrastructure

This alternative would involve installing new green infrastructure, or replacing existing processes, buildings, or facilities with new green infrastructure while maintaining the plant's ability to treat the waste flow delivered to it.

Several green alternatives were considered in regard to the general plant upgrade. The Town does not wish to utilize permeable asphalt, as they fear it will not hold up to DPW trucks and equipment, nor to sludge hauling trucks bringing waste sludge from other Town plants, or removing dewatered sludge from the Kiamesha plant. None of the existing buildings are designed to bear the added weight of green roof infrastructure without structural modifications.

Green infrastructure considerations specific to the three main plant processes involved in this upgrade are discussed below.

5.1.4.1 Principal biological Treatment Process

Of the considered options for principal biological treatment none truly fit into the category of green infrastructure. The considered options were to upgrade the existing extended aeration oxidation ditches, to construct a new SBR process, or to construct a new MBR process. Of these, the upgraded oxidation ditches would be the most energy efficient, and would require the least energy to operate.

5.1.4.2 Disinfection Process

Of the considered options for disinfection, none truly fit into the category of green infrastructure. The considered options were to install a new open-channel UV system and a closed-channel UV system. Neither of these options include feasible opportunities for inclusion of new green infrastructure.

5.1.4.3 Sludge Handling Process

For new sludge handling equipment, an ATAD system is being considered for installation under this project. This system would increase the energy efficiency of the plant, while also reducing the quantity and improving the quality of the biosolids produced by the plant.

The proposed ATAD, or autothermal thermophilic aerobic digestion, system would provide the plant with the ability to reduce by up to 75% the total volume of solids that would need to be disposed of. Through advanced digestion processes, the volatile solids would be broken down and eliminated. This decrease in solids mass would reduce the frequency with which waste sludge would need to be shipped from the plant. This would reduce the total disposal cost to the Town, and would reduce the amount of fuel expended to haul the plant's solid waste, increasing efficiency and reducing environmental impacts.

Additionally, the solid waste produced by an ATAD system is a pasteurized Class A biosolid. This type of biosolid can be much more readily disposed of than undigested solid waste. Currently, the Town has no choice but to dispose of the solid waste at a landfill at high cost to the Town. Class A biosolids produced by an ATAD system could be disposed of in many different ways, some of which might provide a source of income to the Town. At the very least, the cost to the Town to dispose of the biosolids in a landfill would decrease both due to the improved quality and reduced quantity of waste. Reduction of solid mass and production of pasteurized Class A biosolids will reduce the environmental impact caused by the plant.

Because the ATAD process is a thermophilic biological process, a large amount of heat is generated during operation. The temperature of the noncontact cooling water produced by the ATAD system would be high, and would need to be reduced to avoid impacting the temperature of the plant's effluent. In order to manage the temperature of the material in the ATAD process, heat exchanging equipment will be necessary. Although this represents an added cost, it also represents an opportunity to increase the efficiency of the plant and reduce operating costs in the future.

The heat from the ATAD system will be used to heat the new ATAD building, increasing the energy efficiency of that structure. The Town also wishes to consider using heat reclaimed from the ATAD system to help heat the other plant buildings. This would reduce heating costs, decrease the amount of fuel needed to heat the plant, and would utilize naturally produced heat in an efficient and useful manner. However, given the distance between the existing buildings of the plant, this may not be technically feasible. Further consideration will be given to this possibility during design.

The cost of this alternative is significant (estimated to be $5.2 million) but is under consideration due to its numerous potential benefits to plant operation, the Town, and the environment.

5.1.5 Regional Consolidation

Consolidation with other regional facilities was also considered. The nearby facilities include the Village of Monticello and other Town of Thompson plants. The nearest plant is the Village of Monticello plant, which is more than a mile away from the Kiamesha Lake WWTP. The Village of Monticello plant does not have sufficient excess capacity to accept the waste flow from the Kiamesha Lake plant. Additionally, the Village of Monticello is a separate political entity from the Town of Thompson, and such consolidation would require complicated intermunicipal agreements that might not be agreeable to both municipalities.

With a permitted flow of 2.0 MGD, Kiamesha lake has the highest permitted capacity of any plant within the Town. No other plant in the Town could accept a flow of 2.0 MGD.

Additionally, the Kiamesha Lake WWTP is the primary facility for sludge handling within the Town of Thompson. All four other Town plants haul their sludge to be processed at the Kiamesha Lake plant. If the Kiamesha Lake waste flow were to be consolidated with any other local plants, significant work would need to be done to construct new sludge handling facilities capable of addressing the needs of all area plants.

5.1.5 Conclusion

Based on the above described alternative analysis, the alternatives no action and regional consolidation were discounted as infeasible, and unable to solve the problems facing the plant. The remaining three alternatives were considered for each of the three major treatment processes, and the potential options were as follows:

- Principal biological Treatment:
  - Upgrade Existing Facilities - oxidation ditch upgrades with an estimated improvement cost of $1.9 million
  - Construct New Treatment Process - construct new SBR treatment process with an estimated improvement cost of $4.5 million
  - Construct New Treatment Process - construct new MBR treatment process with an estimated improvement cost of $15.2 million
  - Green Infrastructure - none
- Disinfection:
  - Upgrade Existing Facilities - not applicable
  - Construct New Treatment Process - closed-channel UV system with an estimated improvement cost of $1.0 million
  - Green Infrastructure - none
- Sludge Handling:
  - Upgrade Existing Facilities - replace the sludge press with an estimated cost of $0.9 million
  - Construct New Treatment Process - install a new anaerobic digestion system with an estimated improvement cost exceeding $10 million
  - Green Infrastructure - install a new ATAD system with an estimated improvement cost of $5.2 million

From the above listed alternatives, the most cost effective and beneficial options were selected. It is noteworthy that two options were selected for the sludge handling process. This will be discussed further in the recommended alternative section below.

5.2 Recommended Alternative/Planned Upgrade

The recommended alternatives were chosen based on ability to effectively address continued compliance with current SPDES requirements for the next 25 years, minimize site impacts, and minimize capital investment and O & M costs. Based on the review set forth above, the recommended alternatives are as follows:

- Principal biological Treatment:
    - Upgrade Existing Facilities - oxidation ditch upgrades with an estimated improvement cost of $1.9 million
- Disinfection:
    - Construct New Treatment Process - closed-channel UV system with an estimated improvement cost of $1.0 million
- Sludge Handling:
    - Upgrade Existing Facilities - replace the sludge press with an estimated cost of $0.9 million
    - Green Infrastructure - install a new ATAD system with an estimated improvement cost of $5.2 million

It is recommended that the existing plate and frame sludge press be replaced with a larger belt filter press, and that a new ATAD system be installed at the plant. A sludge press will still be required if the ATAD system is installed, and it is recommended that an upgraded belt filter press be installed to more adequately handle the current sludge loading. If the ATAD system were ever to be temporarily off line for maintenance or repairs, the upgraded belt filter press should be able to adequately handle the plant's sludge loading until the ATAD system could be returned to service. If the Town should choose not to install the ATAD system, it is recommended that the sludge press still be replaced.

A detailed cost estimate, which lists all recommended improvement costs, may be found in **Appendix J**.

A basis of design table detailing existing and proposed design, including sizing calculations, has been provided for all equipment and unit processes and is included in **Appendix O – Basis of Design.**

5.3 Facility Upgrades

Proposed upgrades to the existing WWTP may include:

- Influent Channel and Flow Splitter Box Improvements
- Grit Removal Improvements
- Oxidation Ditch 1 & 2 Improvements
- Oxidation Ditch 3 Improvements
- Process Air Supply Blower Improvements
- Secondary Clarifier Improvements

- Polishing Lagoon Improvements
- Sand Filter Improvements
- Post Aeration Improvements
- UV Disinfection Process Improvements
- Sludge Holding Tank Improvements
- RAS/WAS Pump Improvements
- Mud Well Improvements
- Aerobic Sludge Digester Process Improvements
- Sludge Press Improvements
- Sludge Drying Bed Improvements
- Pump Station Process Improvements
- Control Building Improvements
- Grit Removal Building Improvements
- Filter Building Improvements
- Storage Building Improvements
- Blower Building Improvements
- WWTP Work Shop and Maintenance Building
- Generator Building Improvements
- Yard Piping Improvements
- Site Work Improvements
- SCADA Improvements
- Instrumentation Improvements
- Other Improvements

5.3.1 Description

A description of the proposed project improvements to each of the plant processes and buildings follows (including proposed new processes and buildings).

5.3.1.1 Influent Channel and Flow Splitter Box Improvements

The influent channel will receive some minor improvements as a part of this project. The mechanical screening equipment is new and in good condition, and will not require replacement or improvements. The improvements to the influent channel will primarily involve weirs, grating, and slide gates and frames. These proposed improvements are listed below:

- Provide a new ULT at the existing Parshall flume
- Demolish, remove, and dispose of the existing flow splitter box weirs
- Provide new flow splitter box weir (2-Type 1, 5' wide x 2'-6" high), reuse existing slides
- Provide new flow splitter box weir (2-Type 2, 2'-2" wide x 5'-5" high), reuse existing slides

- Provide new flow splitter box gate (2-Type 4, 3' wide x 3' high), reuse existing slides
- Provide new flow splitter box gate (5-Type 5, 2'-6" wide x 3' high), reuse existing slides
- Provide new solid surface grating at the mechanical bar screen and manually cleaned coarse bar rack (for freeze protection)

5.3.1.2 Grit Removal Improvements

The grit removal equipment is new and in good condition. No improvements to the grit removal equipment are proposed as a part of this project.

5.3.1.3 Oxidation Ditch 1 & 2 Improvements

Oxidation Ditch 1 & 2 will receive numerous improvements as a part of this project. The improvements will mostly involve the aeration system and mixing equipment for the two oxidation ditches. The oxidation ditch lighting and electrical conduits and conductors will also be replaced. The proposed Oxidation Ditch 1 & 2 improvements are listed below:

- Provide repairs to the existing tank floor and walls
- Provide structure reconstruction work in each tank
- Reconfigure tank to install updated mixing system
- Provide updated mixing system
- Perform other miscellaneous tank work and any modifications required
- Provide new fine bubble diffusers
- Air distribution piping
    - Demolish, remove, and dispose of existing air distribution piping (ductile iron) to water level (exterior only)
    - Provide new air distribution piping (schedule 10 stainless steel)
    - Provide new oxidation ditch aeration system isolation valves (wafer style butterfly valves)
    - Provide new oxidation ditch aeration system modulating valves (electronically actuated, wafer style butterfly valves) and valve actuators
- Demolish, remove, and dispose of the existing chlorine feed system to diffusers
- Demolish, remove, and dispose of the existing gates
- Provide new gates
- Provide new maintenance receptacle
- Demolish, remove, and dispose of existing conduit, conductors, & receptables
- Provide new conduit, conductor, and receptables
- Demolish, remove, and dispose of existing lighting
- Provide new lighting

5.3.1.4 Oxidation Ditch 3 Improvements

Similar to Oxidation Ditch 1 & 2, Oxidation Ditch 3 will receive numerous improvements as a part of this project. The improvements will mostly involve the aeration system and mixing equipment. The oxidation ditch lighting and electrical conduits and conductors will also be replaced. The proposed Oxidation Ditch 3 improvements are listed below:

- Provide repairs to the existing tank floor and vertical walls
- Provide structure reconstruction work
- Provide new fine bubble diffusers
- Air distribution piping
  - Demolish, remove, and dispose of existing air distribution piping (ductile iron) to the water level, exterior only
  - Provide new air distribution piping (schedule 10 stainless steel)
  - Provide new oxidation ditch aeration system isolation valves (wafer style butterfly valves)
- Air lift equipment
  - Demolish, remove, and dispose of the existing air lift equipment
  - Provide new air lift equipment
- Other miscellaneous work
  - Clean, prepare, prime, and paint the existing steel baffle walls
- Provide new maintenance receptacle
- Demolish, remove, and dispose of existing conduit, conductor, & receptables
- Provide new conduit, conductor, and receptables
- Demolish, remove, and dispose of existing lighting
- Provide new lighting

5.3.1.5 Process Air Supply Blower Improvements

A major portion of this project will be to replace and upgrade the plant's process air supply system. This will include replacement of the four existing blowers located within the Blower Building, which supply the air for the three oxidation ditches and other plant processes. The proposed improvements to the air supply system are listed below:

- Demolish, remove, and dispose of the existing oxidation ditch blowers (four blowers in total)
- Piping modification and new piping (12" painted carbon steel)
- Provide new blowers (three rotary screw blower packages: turn-key with VFD & SC2 controls)
- Provide new blower isolation valves (wafer style butterfly valves)
- Valve pit area improvements:
  - Demolish, remove, and dispose of existing sludge control valves
  - Provide new flow control pinch valves (10")
  - Provide new plug valves (10") with electronic actuators

- Demolish, remove, and dispose of the existing chlorine feed equipment

5.3.1.6 Secondary Clarifier Improvements

The secondary clarifiers are in good condition, with all their components having been replaced during the most recent plant upgrade. Therefore, no improvements to the secondary clarifiers are proposed as a part of this project.

5.3.1.7 Polishing Lagoon Improvements

As the existing polishing lagoon is not currently used for tertiary treatment, there are no proposed improvements to that process.

5.3.1.8 Sand Filter Improvements

The sand filter is generally in good condition, but some improvements are proposed, including pump and piping replacements. The sand filter improvements are summarized below:

- Demolish, remove, and dispose of existing backwash pump and control panel
- Provide new backwash pump (submersible) and control panel
- Demolish, remove, and dispose of existing non-potable water pump and control panel
- Provide new non-potable water pumps and control panel
- Provide new 4" DIP piping and connections for new non-potable water pumps

5.3.1.9 Post-Aeration Improvements

As discussed in section 4.3.9.6, the air from the post-aeration tank is currently supplied by the blowers located in the Blower Building that also supply the air to the existing oxidation ditches. Not only do these blowers have insufficient capacity to supply air to all the aeration systems of the plant, but they are also a significant distance away from the Filter Building, and there is limited ability to control the airflow. It is proposed that the improvements for this project include installation of two new dedicated post-aeration blowers (one duty, one standby) with control valves and VFD's to control the air supply more efficiently. The proposed post-aeration improvements are listed below:

- Demolish, remove, and dispose of existing diffusers and piping
- Provide new fine bubble diffusers, and piping
- Provide new post-aeration blowers and associated piping and appurtenances
- Provide new post-aeration blower VFD

5.3.1.10 UV Disinfection Process Improvements

The Kiamesha Lake plant currently does not have any UV disinfection equipment. During the 1989 plant upgrade project, the plant's UV system was demolished and removed. The former UV building was converted to laboratory space and a conference area for WWTP staff.

The plant's SPDES permit includes pending disinfection requirements, in the form of fecal coliform limits scheduled to take effect in May of 2022. In order to meet these limits, a disinfection system is required. The pending permit limits also include residual chlorine limits. For this reason, the Town would prefer to install a new UV disinfection system, rather than a chlorination disinfection system, to eliminate any concerns about residual chlorine levels.

It is proposed that, in order to meet pending future permit limits, a UV disinfection system be reintroduced into the plant's treatment process. This improvement to the plant's treatment process would include construction of a new building space (adjacent to the existing Filter Building) to house the new UV equipment. The proposed UV system improvements are listed below:

- Provide new structure foundation
- Provide new UV building structure
- Provide new UV disinfection system
- Provide temporary support for existing 24" ductile iron pipe during construction
- Provide new process piping
- Miscellaneous metals
- Provide new electrical panel, disconnects, switches, etc.
- Provide new conduit and conductor, and electrically connect
- Provide new lighting within the new UV building
- Provide new HVAC system for the new UV building

5.3.1.11 Sludge Holding Tank Improvements

The existing sludge holding tanks were formerly rectangular clarifiers that were constructed during the first major plant upgrade in 1983. They were converted to their current use during the subsequent 1989 upgrade. The tanks are functional, but some attention should be paid to minor miscellaneous repairs. Additionally, the air feed system in the sludge holding tanks is currently supplied by the same four blowers that supply air to the oxidation ditches and most of the other aerated processes in the tank. In order to improve control and efficiency of operation, it is proposed that the air supply system be replaced with two new dedicated sludge holding tank aeration blowers. The proposed sludge holding tank improvements are listed below:

- Miscellaneous tank work for both tanks
- Provide new sludge holding tank blowers (three), located near the tanks
- Provide new sludge holding tank blower VFD's
- Provide new air piping (stainless steel) and valves
- Provide new course bubble diffuser systems for both tanks

5.3.1.12 RAS/WAS Pump Improvements

The existing RAS/WAS pumps, located in the mechanical room of the Filter Building, were installed during the 1989 plant upgrade. They are aging and should be considered for replacement. The proposed RAS/WAS pump improvements are listed below:

- Demolish, remove, and dispose of existing Smith & Loveless pumps
- Provide new RAS/WAS pumps
- Provide new RAS/WAS isolation plug valves (10"), located in the Filter Building
- Provide new RAS/WAS check valves (10")
- Provide disconnection of the existing RAS/WAS pumps and reconnection of the new RAS/WAS pumps
- Demolish, remove, and dispose of existing conduit, conductors, and disconnects
- Provide new conduit, conductors, and receptacles
- Provide new disconnects (NEMA 3R)

5.3.1.13 Mud Well Improvements

The mud well was constructed during 1989 and is good condition. There are no proposed improvements to the existing mud well, other than those required to replace the existing RAS/WAS pumps.

5.3.1.14 Aerobic Sludge Digester Process Improvements

The Kiamesha Lake plant currently receives and handles the sludge from all four other wastewater treatment plants in the Town of Thompson. The result is a backlog of sludge that the plant's current sludge handling facilities are struggling to keep up with. The plant currently has sludge holding tanks where thickening takes place, a mud well for temporary storage and recirculation, large sludge drying beds, and a plate and frame sludge press. Since the plant handles so much sludge, it is proposed that a new aerobic sludge digestion process be added to the plant. This would greatly increase the amount of sludge the plant would be capable of handling, and would reduce the amount of sludge the plant would need to dispose of after handling.

It is proposed that a new ATAD (Autothermal Thermophilic Aerobic Digestion) system be installed, which would not only reduce the biomass by up to 75%, but would also produce Class A biosolids which can then be managed or disposed of more easily than the plant's current waste sludge material. Since Kiamesha Lake is the primary sludge handling plant for the entire Town, this improvement would benefit Town residents in all sewer districts, and would have a long-term financial benefit to the Town in general. The aerobic sludge digestion improvements proposed for this plant upgrade are listed below:

- ATAD
    - Provide new ATAD system
    - Provide new ATAD process tanks

  - Provide new ATAD process building
  - Provide new ATAD process piping
  - Provide new sludge pumps (three Moyno 100 gpm pumps; two duty and one spare on shelf)
- Provide new HVAC system for the new ATAD building
- Provide new non-potable water piping in the new ATAD building
- Provide new potable water piping in the new ATAD building

5.3.1.15 Sludge Press Improvements

The existing sludge press is relatively new, but has difficulty keeping up with the high volume of sludge the plant receives and treats. It is therefore proposed that a higher capacity sludge press unit be installed to more easily meet the demand. The proposed sludge press improvements are listed below:

- Provide new sludge dewatering press (2-meter belt filter press)
- Provide disconnection and reconnection of the new back wash pumps and control panel
- Provide disconnection and reconnection of the new non-potable water pumps and control panel

5.3.1.16 Sludge Drying Bed Improvements

The sludge drying beds are sufficiently large. The structure that covers the sludge drying beds is structurally adequate, but the existing fiberglass roof is aging and in need of replacement. Additionally, the area under the structure has a tendency to become very humid, which adversely affects sludge drying rates. It is proposed that a new roofing system with a ridge vent be installed to reduce humidity under the structure. The sludge drying bed improvements are listed below:

- Demolish, remove, and dispose of existing fiberglass roof
- Provide new fiberglass roof with ridge vent
- Provide new metal roof over the sludge press area

5.3.1.17 Site Pump Station Process Improvements

The pump station currently drains the polishing lagoon and returns water from the Control Building drain system to the head of the plant. Proposed improvements are listed below:

- Site pump station structural repair work
- Provide new pumps and control panel

5.3.1.18 Control Building Improvements

The existing Control Building was originally constructed during the first major plant improvement project in 1983. The building has been well maintained and has seen minor improvements periodically. There are some building components that should be considered for replacement due to age, including the roof system, metal doors, windows, and flooring. The proposed improvements are listed below:

- Provide a new metal roof
- Select building improvements (e.g., select doors, windows, flooring, etc.)

5.3.1.19 Grit Removal Building Improvements

The Grit Removal Building is small and sees limited use. It has been well maintained. However, it was constructed during the 1983 plant upgrade project, and the lighting, HVAC, and electrical components are aging and should be considered for replacement. The proposed Grit Removal Building improvements are listed below:

- Provide a new metal roof
- Demolish, remove, and dispose of existing lighting
- Provide new interior lighting
- Demolish, remove, and dispose of existing conduit, conductor, and receptacles
- Provide new conduit, conductor, and receptacles
- Provide new HVAC system
- Provide disconnection and connection for the new HVAC equipment

5.3.1.20 Filter Building Improvements

The Filter Building is large and contains many critical pieces of plant equipment. Several building components (roof, doors, etc.) should be considered for replacement. The building's HVAC and electrical systems should also be considered for improvements. The proposed improvements are listed below:

- Provide a new metal roof
- Select building improvements (e.g., select doors, windows, flooring, etc.)
- Demolish, remove, and dispose of existing fuel oil tank and building
- Provide new convault fuel oil tank
- Install concrete curb on the front of the building and repair rusting panels.
- Paint the building interior areas including the filter room and mechanical room
- Paint the building exterior
- Provide disconnection/connection of the new HVAC equipment
- Demolish, remove, and dispose of existing conduit, conductor, and switches
- Provide new lighting in the filter room
- Provide new conduit, conductor, and receptacles
- Provide new disconnects (NEMA 3R)
- Provide new HVAC system for the existing Filter Building

5.3.1.21 Storage Building (Old Blower Building) Improvements

The Storage Building is aging and some building components should be considered for repair or replacement. The proposed improvements are listed below:

- Provide a new metal roof

5.3.1.22 Blower Building Improvements

The Blower Building is aging and some building components should be considered for repair or replacement. The proposed improvements are listed below:

- Provide a new metal roof

5.3.1.23 New WWTP Work Shop and Maintenance Building Improvements

The existing maintenance and work shop buildings are aging and in poor shape. The buildings are in need of replacement. It is proposed that the two buildings should be demolished and replaced with a single, larger building. The proposed new building would include space for both storage and maintenance of vehicles and equipment, and space to be used as a workshop for general work and maintenance of wastewater treatment plant equipment. The proposed work shop and maintenance building improvements are listed below:

- Demolish, remove, and dispose of two existing buildings
- Disconnect electrical components for the two existing buildings which are to be demolished
- Perform site clearing and grubbing
- Provide new WWTP work shop and maintenance building (with 8 vehicle bays and an approximate area of 9,900 square feet)
- Provide new electrical service for the new WWTP work shop and maintenance building
- Provide new lighting and receptacles for the new WWTP work shop and maintenance building
- Provide new HVAC system for the WWTP work shop and maintenance building
- Perform electrical connection of new HVAC components
- Provide plumbing in the new WWTP work shop and maintenance building

5.3.1.24 Generator Building Improvements

The Generator Building is in good condition and has been well maintained. However, the emergency power generator within the building is aging and has consistently needed repairs. The model is obsolete and replacement parts are increasingly difficult to acquire. As such, it is proposed that the emergency power generator be replaced with a new unit. The proposed improvements are listed below:

- Demolish, remove, and dispose the existing emergency generator and transfer switch
- Provide a temporary emergency power generator during construction (750 kW)
- Provide a new WWTP emergency power generator (750 kW), transfer switch, and appurtenances

5.3.1.25 Yard Piping Improvements

The proposed improvements for this project include several new buildings and processes. Therefore, changes to the yard piping system will be needed to supply these new facilities with water, waste flow, and sludge as needed for proper operation. The proposed yard piping improvements are listed below:

- Provide new 6" ductile iron non-potable water line from the Filter Building and new UV building to the new ATAD building
- Provide new 6" ductile iron non-potable water line from the Filter Building and new UV building to the existing sludge dewatering building
- Provide a new 2" copper potable water line from the water main to new ATAD building
- Replace existing and provide new 6" ductile iron sludge piping from the existing sludge holding tanks to the new ATAD building
- Replace existing and provide new 4" ductile iron sludge piping from the existing sludge holding tanks to the sludge dewatering building

5.3.1.26 Site Work Improvements

The proposed site improvements are listed below:

- Relocate the existing WWTP fence (approximately 400 linear feet)
- Perform site work for the new ATAD building
- Perform site work for the new WWTP shop and maintenance building
- Provide bollards around the new WWTP shop and maintenance building
- Perform paving around WWTP work shop and maintenance building
- Perform site restoration

5.3.1.27 SCADA Improvements

The SCADA system of the existing plant should be considered for improvements to better control existing facilities and to control the new facilities. The proposed SCADA improvements are listed below:

- Provide new PLC control
- Provide new tertiary filter control panel
- Provide new RAS pump VFD control panel
- Provide new fiber optic for plant-wide SCADA

5.3.1.28 Instrumentation Improvements

With many major improvements to the plant proposed, modifications and improvements to the plant’s existing instrumentation system will be necessary. The proposed improvements to the plant’s instrumentation system are listed below:

- Provide new dissolved oxygen meter for Oxidation Ditch 1 & 2 (Two total - one in each ditch)

- Provide new dissolved oxygen meter for Oxidation Ditch 3
- Provide new RAS flow meter (Doppler), located in the Blower Building
- Provide new WAS flow meter (Doppler), located in the Filter Building
- Provide new compressed air system low pressure switch alarm
- Provide new ULT and redundant floats to the mud well, for RAS pump control
- Provide new dissolved oxygen meter for the post-aeration tank
- Provide new conduit and conductor for the new dissolved oxygen meter for Oxidation Ditch 1 & 2 (Two total - one in each ditch)
- Provide new conduit and conductor for the new dissolved oxygen meter for Oxidation Ditch 3
- Provide new conduit and conductor for the new compressed air system low pressure switch alarm
- Provide new conduit and conductor for the new dissolved oxygen meter for the post aeration tank

5.3.1.29 Other Improvements

There are currently no other improvements planned, but there is a possibility that during design or construction previously unknown issues might be identified.

5.3.2 Design Criteria

Facility improvements will be made to industry standards.

Electrical improvements will be made to NEC standards.

Building improvements will comply with NYS Building Codes and applicable Town codes.

Process improvements will comply with Ten State Standards.

5.3.3 Map/Location

See **Figure 3 – Upgrade Site Plan** for the location of the existing and proposed plant process units, buildings, and facilities. See **Figure 4 – Existing Process Schematic** and **Figure 5 – Proposed Process Schematic** for the relation of existing and proposed plant process units.

5.3.4 Environmental Impacts & Mitigation Measures

There are no anticipated environmental impacts that will occur as a result of this project or planned mitigation measures to be implemented during this project.

5.3.5 Land Requirements

No additional land will be required for the proposed improvements of this project. All new facilities will be constructed at the existing Kiamesha Lake WWTP site, on property currently owned by the Town.

5.3.6 Discharge Permit Requirements

It is not anticipated that any of the project improvements will require any changes to the discharge permit limits. However, the schedule for the new disinfection system will need to be renegotiated with permit regulators to allow this work to be completed as a part of the overall upgrade.

5.3. 7 Sustainability Considerations

<u>Water and Energy Efficiency:</u>
There are no apparent opportunities to improve water efficiency for the plant.

In order to improve energy efficiency, it is proposed that the existing aeration system be modified. There are currently four large, centrally located blowers that serve the majority of the plant processes that require aeration. As part of this project, those blowers will be replaced with smaller, more energy efficient blowers dedicated to each process (eight in total). These new blowers will have VFD’s to more efficiently control the energy usage based on demand. The new blowers will also be located closer to the processes they serve, reducing the energy loss required to supply forced air long distances to reach all portions of the plant. Although there is a higher capital cost involved in purchasing and installing eight blowers, rather than replacing four in kind, it is anticipated that this will increase the energy efficiency of the plant.

Additionally, all aging pumps and motors scheduled for replacement will be replaced with new, energy efficient models.

<u>Green Infrastructure:</u>
It is proposed that a new ATAD system be installed at the Kiamsha Lake plant. This system will produce Class A biosolids suitable for beneficial reuse. This system should also help increase the energy efficiency of the plant and will dramatically reduce the impact associated with disposal in a landfill. The ATAD system is discussed in detail in section 5.1.4.3 above.

<u>Other:</u>
Providing new parts and equipment to replace aging and failing equipment will help to sustain plant operation for the foreseeable future. These improvements will improve the reliability of the plant and will reduce the risk of some or all of the plant becoming inoperable. For example,

replacing the emergency power generator with a new model with readily available parts will ensure long-term reliability and mitigate the risk of plant downtime due to power outages.

5.3.8 Storm Flood Resiliency

The plant facilities are outside the flood plain area (see **Appendix A – Project Background Information** for FEMA Flood Maps). No storm damage of note has occurred to the plant. With the exception of replacing some damaged trench drain, no storm or flood resiliency improvements are planned for this project.

5.3.9 Schedule and Constructability

All planned improvements can be completed with minimal impact to plant operations and can be constructed within the anticipated construction schedule.

5.3.10 Estimated Costs

Capital Improvement Costs:
The estimated total project cost for the recommended improvements is $27 million. The construction costs for the Town of Thompson, Kiamesha Lake WWTP Upgrade Project are estimated to be $20,443,545 ($16,639,799 General + $2,225,770 Electrical + $328,107 HVAC + $92,687 Plumbing). A detailed cost estimate is contained in **Appendix J – Comprehensive Project Cost Estimate**, and a summary is shown below in section 5.6.

O & M Costs:
O & M costs are subject to change as new users connect and development occurs in the district over time. A reasonable appraisal includes estimating costs for the first year (Year 1) of operation following the upgrade, as this provides a fair comparison with current costs.

O & M costs are anticipated to increase somewhat due to increased energy use by the seasonal UV disinfection and the ATAD sludge processing. The Year 1 O & M costs are estimated to equal $1,389,500. A breakout is shown in section 5.7 below.

5.5 Project Schedule

The anticipated project schedule is as follows:

Table 5.1 Anticipated Project Schedule*

Date (target)	Milestone
September 2019	IUP Project Listing, Engineering Report, Smart Growth form submittal to NYSEFC
December 2019	NYSEFC Hardship Eligibility and Grant Determination
February 2020 – April 2020	SEQR Coordinated Review
February 2020 – April 2020	Town Law 202(b) Proceeding
May 2020	Bond Resolution Prepared & Adopted
May 2020	Publication of Notice of Bond Resolution Subject to Permissive Referendum
June 2020	30-day Permissive Referendum Period Complete; no petitions
July 2020	Publication of Bond Resolution/Notice of Estoppel
July 2020	Submit CWSRF Funding Application
July 2020	Submit Water Infrastructure Improvement Act (WIIA) Grant Application
December 2020	Funding Determination/Notification NYSEFC/WIIA Grant
January 2021	Contract for Professional Services
May 2021	Short-Term Financing for Pre-Construction Services
January 2021 – June 2021	Design
June 2021	Submit Plans and Specifications to NYSDEC and NYSEFC for Review
August 2021	Secure NYSDEC and NYSEFC Design Approval
November 2021	Bid/Award Construction Related Contracts
December 2021	Issue Notice to Proceed
January 2022- April 2023	Construction
May 2023	Construction Completion (Final) and Project Closeout
June 2023	Long-Term Loan Closing

* Note that the schedule for compliance with new disinfection limits in the current SPDES permit will need to be renegotiated with regulators in order for new disinfection to be included with this overall plant upgrade project.

This schedule assumes that the Town will pursue financing through NYSEFC and follow applicable Town Law requirements and NYSEFC submittal schedules.

5.6 Total Project Cost Estimate

A summary of the estimated costs for all considered project improvements is shown below. A detailed cost estimate is attached as **Appendix J – Comprehensive Project Cost Estimate**.

A. Construction:

• Influent Channel/Flow Splitter Box Process Improvements	$ 34,000
• Mechanical Bar Screen Process Improvements	$ 0
• Grit Removal Process Improvements	$ 0
• Oxidation Ditch D1 & D2 Process Improvements	$ 949,140
• Oxidation Ditch D3 Process Improvements	$ 330,925
• Blower Building Process Improvements	$ 558,146
• Secondary Clarifier Process Improvements	$ 1,200
• Filter Building Process Improvements	$ 564,450
• UV Disinfection Process Improvements	$ 1,043,250
• Polishing Lagoon Process Improvements	$ 0
• Sludge Holding Tank Process Improvements	$ 267,250
• RAS/WAS Pump Process Improvements	$ 355,200
• Aerobic Sludge Digester Process Improvements	$ 5,171,780
• Sludge Dewatering Process Improvements	$ 1,033,400
• Sludge Drying Bed Improvements	$ 401,360
• Pump Station Process Improvements	$ 46,400
• Control Building Improvements	$ 191,305
• Grit Removal Building Improvements	$ 28,150
• Filter Building Improvements	$ 477,025
• Storage Building Improvements	$ 40,400
• Blower Building Improvements	$ 63,900
• WWTP Work Shop/Maintenance Building	$ 2,944,100
• Yard Piping Improvements	$ 387,145
• Site Work	$ 185,106
• SCADA Improvements	$ 438,000
• Instrumentation Improvements	$ 70,950
• Emergency Generator Improvements	$ 576,000
• Other Expenses	$ 85,200
• Other Contract Costs	
o NYSEFC Contract Compliance	$ 38,500
o Contractors Overhead and Profit (15%)	$ 2,442,342
o Mobilization/Bonds/Insurance (3%)	$ 561,739
Construction Subtotal	**$19,286,363**

	• Construction Cost Inflation Adjustment (3% per year for 2 years)	$ 1,157,182
	Adjusted Construction Subtotal	**$20,443,545**
B.	Other Costs:	
	• Professional Services	$ 3,531,886
	• Town Costs	$ 147,952
	Other Costs Subtotal	**$ 3,679,838**
C.	Contingency (10%)	$ 2,412,338
D.	Total Estimated Project Cost (2021 dollars)	$26,535,721
E.	Other Funding	$ 0
F.	Total to Finance	$26,535,721
G.	NYSEFC CWSRF Issuance Costs*	
	• Direct Expense (1.0%)	$ 265,357
	• State Bond Issuance (0.84%)	$ 222,900
	NYSEFC CWSRF Issuance Costs Subtotal	**$ 488,257**
H.	**Total Project Costs and Issuance Costs**	**$ 27,023,978**

* These costs would go to zero if hardship financing is secured.

5.7 Annual Operation & Maintenance Costs

The planned upgrade primarily entails the replacement of existing equipment for continued operation with two additional systems will be introduced into the process train; UV disinfection and Autothermal Thermophilic Aerobic Digestion (ATAD). Additional costs associated with the anticipated increased energy use and periodic UV bulb replacement will be added to the annual O & M budget to reflect anticipated Year 1 costs.

O & M Budget Summary:

	2019 Budget	Projected Year 1
• Labor & Benefits	$ 856,940	$ 856,940
• Equipment	$ 176,000	$ 50,000
• Contractual Items	$ 66,820	$ 66,820
• Laboratory Testing	$ 10,000	$ 10,000
• Utilities	$ 191,567	$ 345,740
• Chemicals	$ 40,000	$ 60,000
Total	$ 1,341,330	$ 1,389,500

5.8 Projected Financial Impact

5.8.1 Current Rates

In 2018, the Town of Thompson collected a total of $637,790 in sewer rents from 378 sewer accounts in the Kiamesha Lake sewer district. Each account is assigned a rent points value and in 2018 district users were charged $80.59 per point. A single-family home in the Kiamesha sewer district is considered to have 7.5 rent points resulting in an annual water rent charge of $605 for a typical single-family home.

Additionally, in 2018, the Town collected $103,000 in debt payments from 486 properties to satisfy existing annual sewer district debt service. Each real property located in the sewer district is assigned a debt points value, and in 2018 property owners were charged $5.23 per point. A single-family home located in the Kiamesha sewer district is considered to have 7.5 debt points resulting in an annual debt service charge of $40. Therefore, in 2018, the total water rent/debt service paid by a typical single-family home was $645.

The Kiamesha Sewer District receives additional fees from the Adelaar and Anawana sewer districts, outside users located within the Town. The Town is in the process of restructuring rates for all of the sewer districts. Outside user financial contributions to support this project will be determined following completion of a rate analysis and restructuring. The user impacts described below assume no additional financial contributions from outside users, or from other Town sewer districts for sludge disposal.

5.8.2 Projected Impact on Users

The estimated project cost to be financed approximately equals $27 million. The table below summarizes the cost to users under three interest rate scenarios and with and without the maximum $5 million grant award. Please note that these figures do not include potential additional financial contributions for outside district users, primarily the Adelaar and Anawana sewer districts, but does assume that the outside users will continue to contribute at current rates.

Given the Town's demographic data, the Town has a strong chance of securing both hardship (0%) financing and the maximum grant award. A more detailed funding analysis, which contains the demographic data used to analyze hardship and grant eligibility, is included in **Appendix K – Rate Impact Summary**. Please note the analysis assumes a 3.5% increase in operations and maintenance costs associated with the upgrade project.

Table 5.2 Rate Impact Summary

$27,000,000			
No Grant Award			
	Hardship Financing (0%)	Subsidized Financing[5,6] (1.65%)	Market Rate Financing[5,6] (3.3%)
Project Cost:	$27,000,000	$27,000,000	$27,000,000
Annual Debt Service:	$900,000	$1,148,309	$1,431,472
Average Annual Cost Increase/EDU[4,7]:	$343	$437	$545
Percent Increase:	52%	66%	82%
Annual Sewer Service Cost to Typical Single-Family Home [1,2,7,8]:	$1,008	$1,102	$1,210
Maximum Grant Award (SRF/WIIA[3]): $5,000,000			
	Hardship Financing (0%)	Subsidized Financing[5,6] (1.65%)	Market Rate Financing[5,6] (3.3%)
Amount to be Financed:	$22,000,000	$22,000,000	$22,000,000
Annual Debt Service w/ Grant:	$733,333	$935,659	$1,166,385
Average Annual Cost Increase/EDU[4,7]:	$279	$356	$444
Percent Increase:	42%	54%	67%
Annual Sewer Service Cost to Typical Single-Family Home[1,2,3,7,8]:	$944	$1,021	$1,109

1- Final costs do not include additional debt service or O&M contributions from outside users, which will lower final costs to in-district users. However, they do assume that outside users, including Adelaar, continue to pay at current rates. Also, cost sharing with other Town sewer districts for certain future shared services (e.g. bio-solids processing) are not included in this rate analysis.
2- Final costs do include an anticipated 3.5% increase to operations and maintenance costs.
3- Final estimated user costs are the same regardless of whether the grant is SRF, WIIA or combination of both.
4- The total number of EDUs (2,626) for the district was determined by dividing the total capital points for the district in 2018 (19,695) by the capital points assigned for a single-family home (7.5)
5- Market rate as of June 2019. Subsidized rate is set by EFC at 50% market rate
6- All financing assumes 30-year term
7- For 2018, the annual cost to a typical single-family home (1 EDU) was $644.
8- Rate projections utilize 2018 rate structure and budgets

Final costs to the typical single-family home will ultimately depend upon the terms of the financing package received by the Town. The proposed $27 million project will increase annual sewer rates by $545 (82%) if market rate financing is secured (currently 3.3%), and $343 (52%) if hardship funding (0%) is secured.

If the Town is able to secure the maximum $5 million grant award, then cost increases would be $444 (67%) if market rate financing is secured, and $279 (42%) if hardship financing is secured.

In 2018, the average annual sewer fee for the typical single-family home was approximately $644/year. The 2017 median household income (MHI) for Town residents was $42,175. As a percentage of MHI, district users currently pay approximately 1.5% of household income for sewer service.

5.9 The Next Steps

This engineering report, along with other required listing materials, allows the Town's project to be included on the NYSEFC Annual Intended Use Plan (IUP) for future SRF funding requests including CWSRF and Water Grant (WIIA) funding and will be uploaded to the applicable website on/before 5 pm on September 3, 2019.

The Town is ready to proceed with the project accordance with the project schedule presented above.

5.10 Engineering Report Certification

The signed certification form is contained in **Appendix M – Engineering Report Certification**.

5.11 Smart Growth Assessment

The signed form is contained in **Appendix N – Smart Growth Assessment Form**.

6.0 CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusions

The Town was involved with and has reviewed the scope and costs associated with WWTP upgrade.

The Town decided that it is feasible to move forward with upgrading its existing facilities to handle flow and loads up to the permit limits.

The recommended project includes that following upgrades:

- Influent Channel and Flow Splitter Box Improvements
- Oxidation Ditch 1 & 2 Improvements
- Oxidation Ditch 3 Improvements
- Process Air Supply Blower Improvements
- Sand Filter Improvements
- Post-Aeration Improvements
- UV Disinfection Process Improvements
- Sludge Holding Tank Improvements
- RAS/WAS Pump Improvements
- Aerobic Sludge Digester Process Improvements
- Sludge Press Improvements
- Sludge Drying Bed Improvements
- Pump Station Process Improvements
- Control Building Improvements
- Grit Removal Building Improvements
- Filter Building Improvements
- Storage Building Improvements
- Blower Building Improvements
- WWTP Work Shop and Maintenance Building
- Generator Building Improvements
- Yard Piping Improvements
- Site Work Improvements
- SCADA Improvements
- Instrumentation Improvements

The estimated total project cost, including inflation adjustment and issuance costs, is $27 million.

The Town will seek funding through the CWSRF program for short term and long-term financing, and will seek grant funding via the WIIA program. The Town will also consider funding or co-funding from other sources.

If hardship financing assistance and the maximum grant ($5 million) is received, it is estimated that sewer rates (debt service and O & M) could increase by approximately 40% for an average in-district single family home. However, this should be lower, as these estimates don't include contributions from outside users or from other sewer districts for shared services (e.g., sludge disposal).

Based on the current plan forward, if a favorable funding determination is reached in December 2019, and the Town decides to move forward as planned, construction for this project could begin in early 2022 and be completed near the middle of 2023.

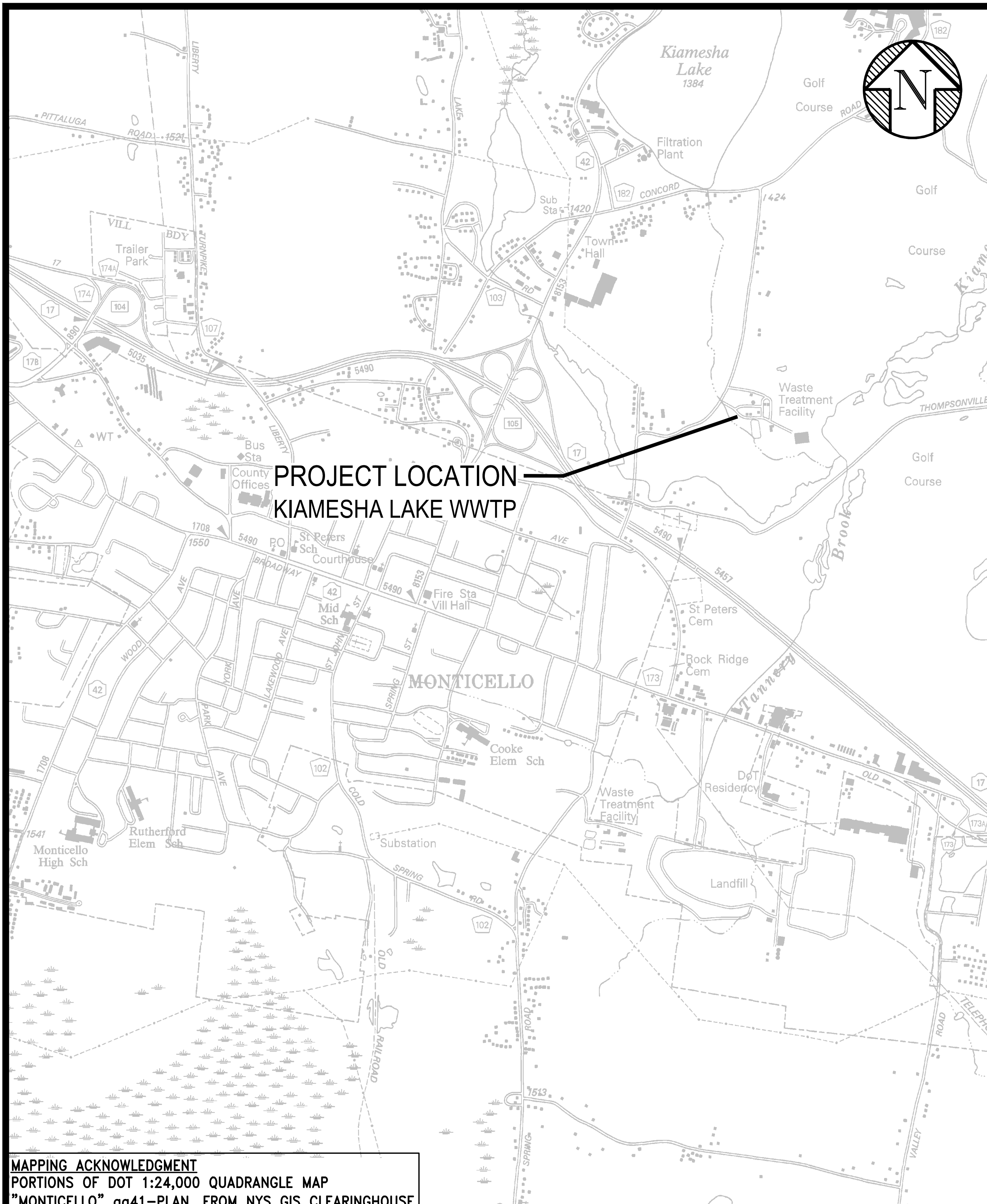
6.2 Recommendations

The Town should move forward with implementation of the project in accordance with the schedule and pursue grant funding to mitigate project cost impact.

FIGURES

FIGURE 1

Location Map



MAPPING ACKNOWLEDGMENT
PORTIONS OF DOT 1:24,000 QUADRANGLE MAP
"MONTICELLO" aa41-PLAN, FROM NYS GIS CLEARINGHOUSE

SHEET NO:

FIG-1

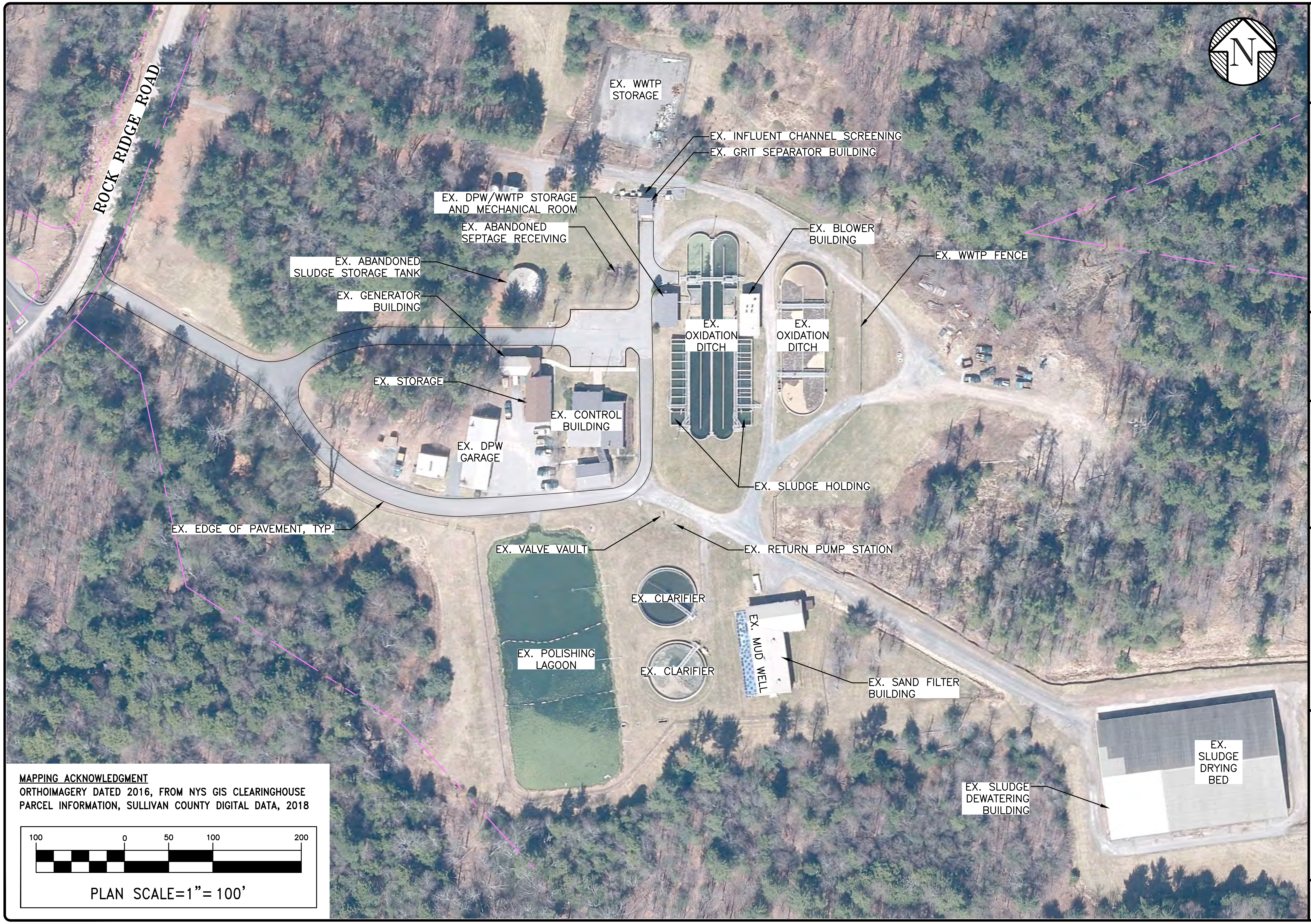
KIAMESHA LAKE WWTP
SITE LOCATION MAP
TOWN OF THOMPSON
SULLIVAN COUNTY, NY

DATE:	8/30/19
DRAWN BY:	MO
SCALE:	1"=2,000'
REVIEWED BY:	DRO
PROJECT NO.:	19-1753
FILE:	KIEMESHA LAKE WWTP

DELAWARE ENGINEERING, D.P.C.
ONEONTA
55 SOUTH MAIN STREET, ONEONTA, NY 13820 - 607.432.8073
ALBANY
28 MADISON AVENUE EXTENSION, ALBANY, NY 12203 - 518.452.1290
WALTON
6 TOWNSEND STREET, WALTON, NY 13856 - 607.865.92354
LIBERTY
31 N. MAIN STREET, LIBERTY, NY 12754 - 845.747.9952
RED HOOK
16 EAST MARKET STREET, RED HOOK, NY 12571 - 518.452.1290

FIGURE 2

Existing Site Plan



MAPPING ACKNOWLEDGMENT

ORTHOIMAGERY DATED 2016, FROM NYS GIS CLEARINGHOUSE

PARCEL INFORMATION, SULLIVAN COUNTY DIGITAL DATA, 2018

100 0 50 100 200

PLAN SCALE=1"= 100'

DATE: 8/30/19
DRAWN BY: MO
SCALE: 1"=100'
REVIEWED BY: DRO
PROJECT NO.:
FILE:

DELAWARE ENGINEERING, D.P.C.
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31 N. MAIN STREET, LIBERTY, NY 12754 - 845.747.9952
16 EAST MARKET STREET, RED HOOK, NY 12571 - 518.452.1290

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NO.	DATE	DESCRIPTION
.	.	

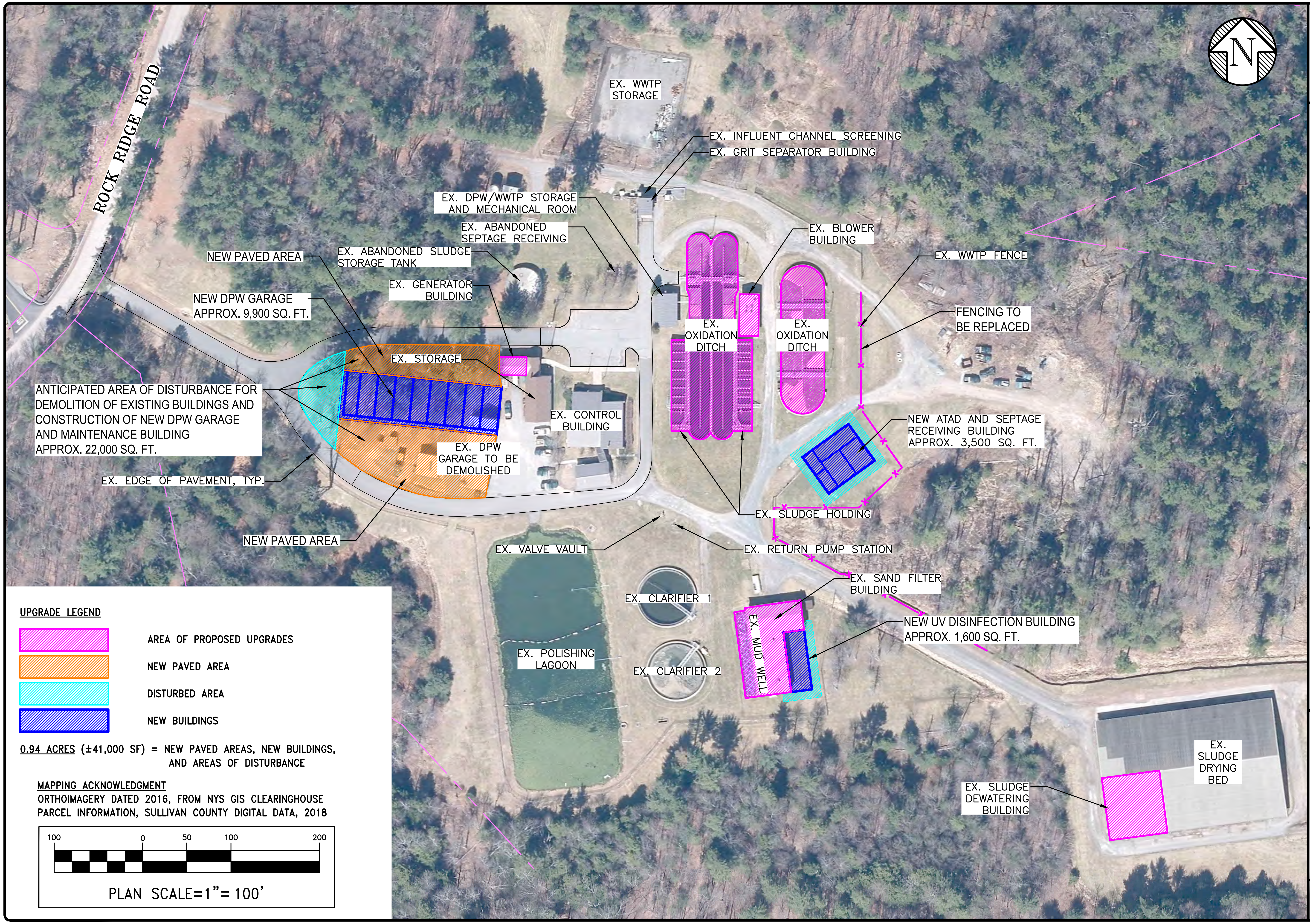
KIAMESHKA LAKE
TOWN OF THOMPSON
SULLIVAN COUNTY, NY

EXISTING SITE PLAN

SHEET:
FIG-2

FIGURE 3

Upgrade Site Plan



UPGRADE LEGEND

- AREA OF PROPOSED UPGRADES
- NEW PAVED AREA
- DISTURBED AREA
- NEW BUILDINGS

0.94 ACRES (±41,000 SF) = NEW PAVED AREAS, NEW BUILDINGS, AND AREAS OF DISTURBANCE

MAPPING ACKNOWLEDGMENT
ORTHOIMAGERY DATED 2016, FROM NYS GIS CLEARINGHOUSE
PARCEL INFORMATION, SULLIVAN COUNTY DIGITAL DATA, 2018

100 0 50 100 200

PLAN SCALE=1"= 100'

DATE: 8/30/19
DRAWN BY: MO
SCALE: 1"=100'
REVIEWED BY: DRO
PROJECT NO.:
FILE:

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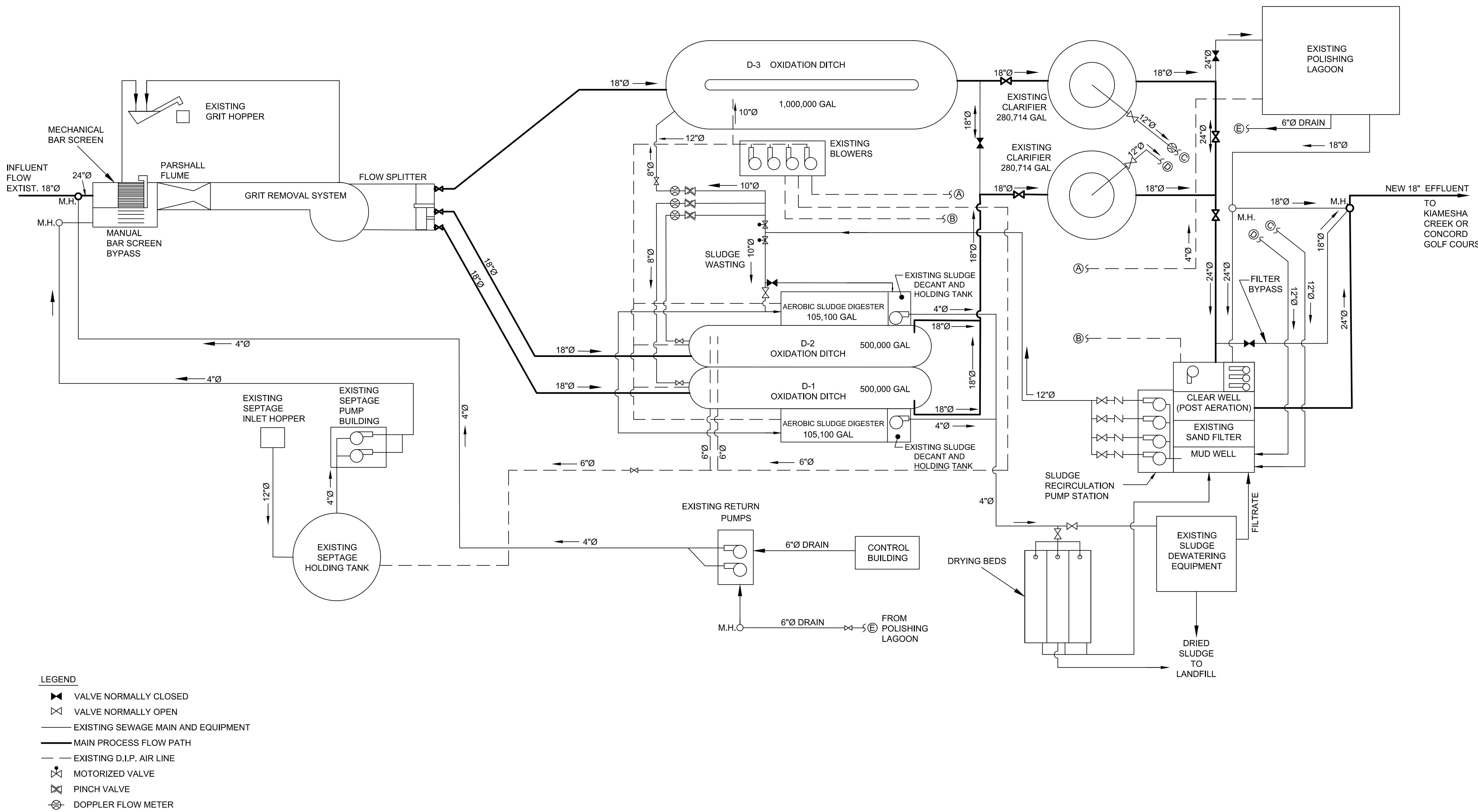
KIAMESHKA LAKE
TOWN OF THOMPSON
SULLIVAN COUNTY, NY

UPGRADE SITE PLAN

SHEET: FIG-3

FIGURE 4

Existing Process Schematic



DATE:	8/30/19
DRAWN BY:	JP
SCALE:	NTS
REVIEWED BY:	DRO
PROJECT NO.:	
FILE:	KIAMESHA LAKE WWTP

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REVISIONS

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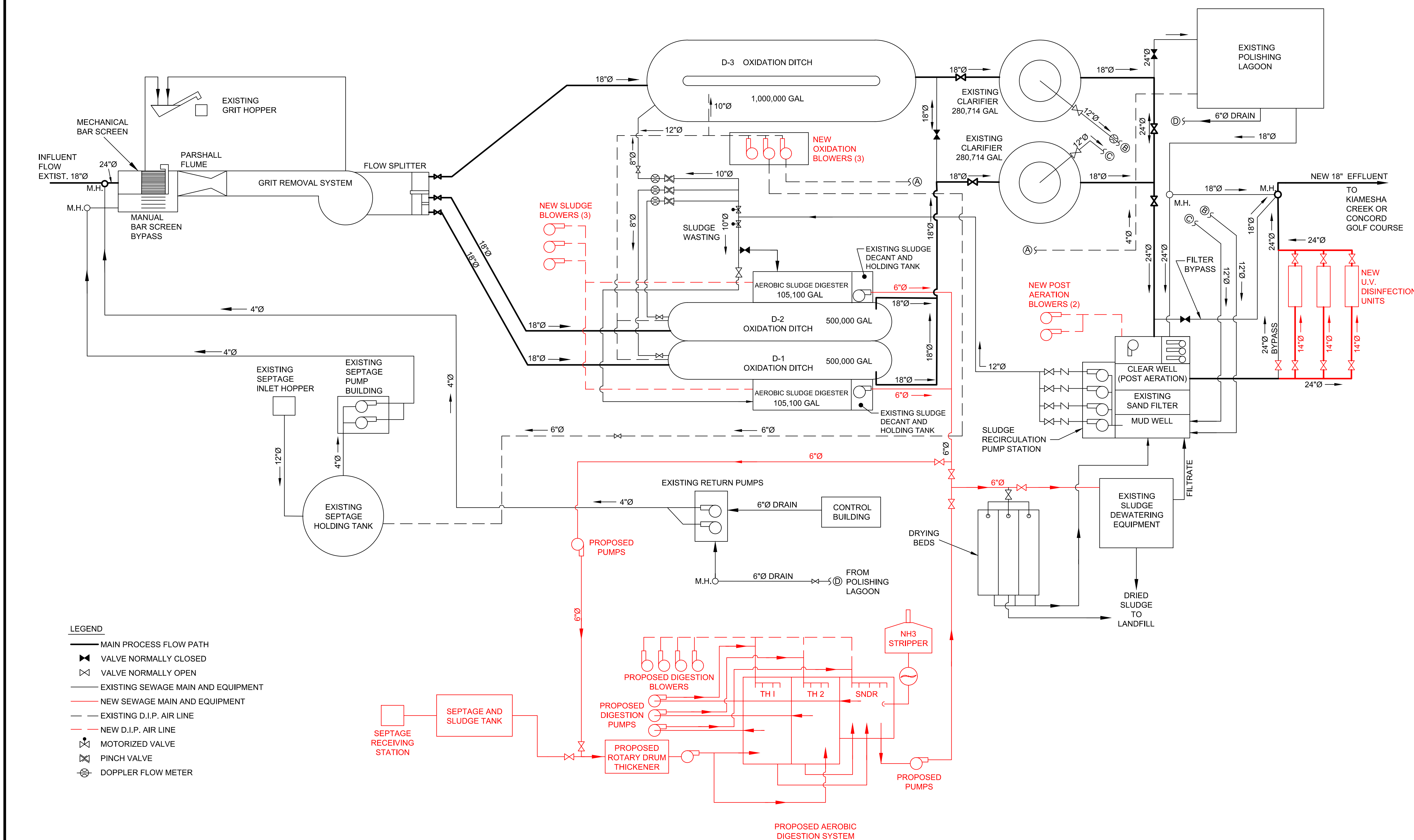
WWTP UPGRADES
TOWN OF THOMPSON
KIAMESHA LAKE
SULLIVAN COUNTY, N.Y.

EXISTING PROCESS SCHEMATIC

SHEET: FIG-4

FIGURE 5

Upgrade Process Schematic



DATE: 8/30/19
DRAWN BY: JP
SCALE: NTS
REVIEWED BY: DRO
PROJECT NO.:
FILE: KIAMESHA LAKE WWTP

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REVISIONS

NO.	DATE	DESCRIPTION
.	.	.

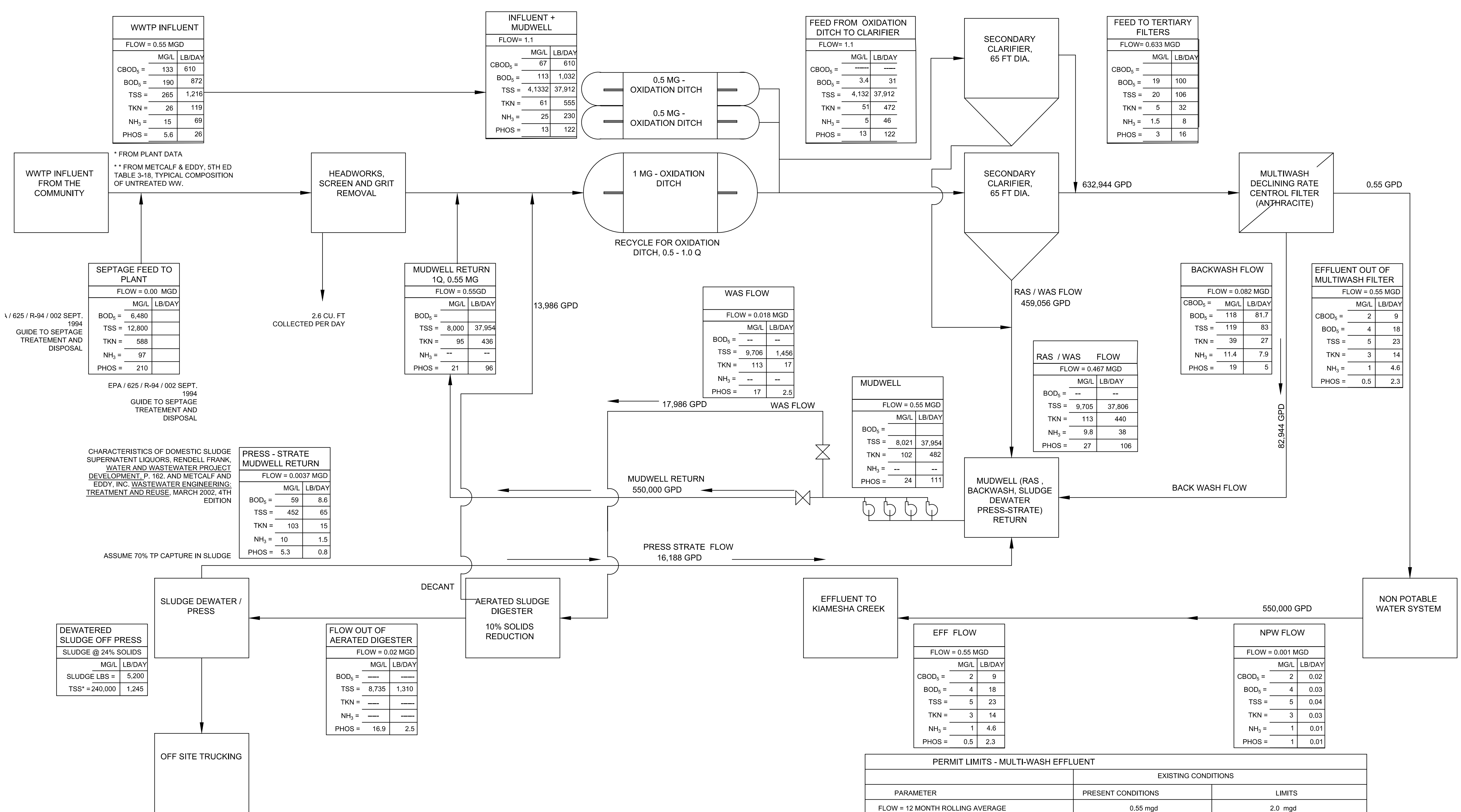
WWTP UPGRADES
TOWN OF THOMPSON
KIAMESHA LAKE
SULLIVAN COUNTY, N.Y.

UPGRADE PROCESS SCHEMATIC

SHEET: FIG-5

FIGURE 6

Existing Mass Balance/Flow Diagram
0.55 MGD (ADF)



PERMIT LIMITS - MULTI-WASH EFFLUENT

	EXISTING CONDITIONS	
PARAMETER	PRESENT CONDITIONS	LIMITS
FLOW = 12 MONTH ROLLING AVERAGE	0.55 mgd	2.0 mgd
UOD (JUNE 1 - OCTOBER 31)[1]	16.5 MG/L DAILY AVG. (76 LBS / DAY)	15.3 MG/L DAILY MAX. (260 LBS /DAY)
UOD (NOVEMBER 1 - M AY 31)[1]		32 MG/L DAILY MAX. (530 LBS /DAY)
TOTAL SUSPENDED SOLIDS	5 MG/L, 23 LBS /DAY	10 MG/L DAILY MAX. (170 LBS /DAY)
SETTLEABLE SOLIDS		0.1 ML / L
pH	6.2	6.0 - 9.0 SU
NITROGEN AMM. (AS N) (JUNE 1 - OCTOBER 31)	1 MG/L - 4.6 LB /DAY	1.4 MG/L , MONTHLY AVERAGE
NITROGEN AMM. (AS N) (NOV. 1 - MAY 31)		2.1 MG/L, MONTHLY AVERAGE
TKN	3 MG/L - 14 LB / DAY	MONITOR, DAILY MAXIMUM
DISSOLVED OXYGEN		7.0 MG/L DAILY
COLIFORM, FECAL (MAY 1 TO OCT. 31)		200 NO. / 100ML, 30-DAY GEOMETRIC MEAN
COLIFORM, FECAL (MAY 1 TO OCT. 31)		400 NO. / 100 ML , 7 DAY GEOMETRIC MEAN
CHLORINE, TOTAL RESIDUAL		10 MG/L DAILY MAX. (170 LBS /DAY)

[1]ULTIMATE OXYGEN DEMAND SHALL BE COMPUTED AS FOLLOWS: UOD = 1.5 cBOD5 + 4.5 TKN

DATE: 8/22/19
DRAWN BY: MBP
SCALE: NTS
REVIEWED BY: DRO
PROJECT NO.: TWN THOMPSON
FILE: PRMM FIG 4 PRO SCH.

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31 N. MAIN STREET, LIBERTY, NY 12754 - 845.747.9952

REVISIONS

NO.	DATE	DESCRIPTION
.	.	

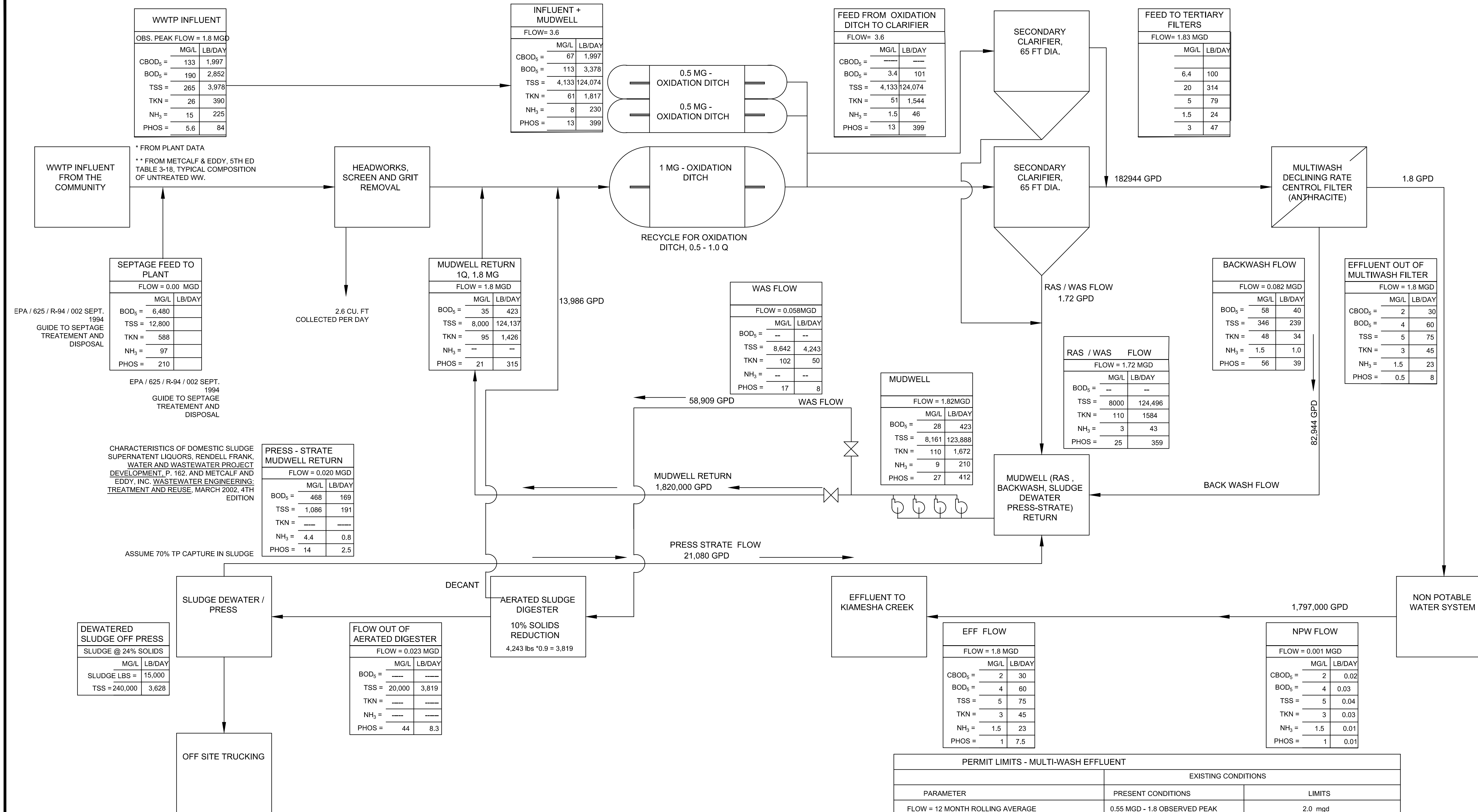
WWTP UPGRADES
TOWN OF THOMPSON
KIAMESHA LAKE
SULLIVAN COUNTY, N.Y.

EXISTING MASS BALANCE / FLOW DIAGRAM, 0.55 MGD ADF

SHEET:
FIG-6

FIGURE 7

Existing Mass Balance/Flow Diagram
1.8 MGD (MDF)



WWTP INFLUENT

OBS. PEAK FLOW = 1.8 MGD

	MG/L	LB/DAY
$CBOD_5$ =	133	1,997
BOD_5 =	190	2,852
TSS =	265	3,978
TKN =	26	390
NH_3 =	15	225
PHOS =	5.6	84

* FROM PLANT DATA

* * FROM METCALF & EDDY, 5TH ED TABLE 3-18, TYPICAL COMPOSITION OF UNTREATED WW.

INFLUENT + MUDWELL

FLOW= 3.6

	MG/L	LB/DAY
$CBOD_5$ =	67	1,997
BOD_5 =	113	3,378
TSS =	4,133	124,074
TKN =	61	1,817
NH_3 =	8	230
PHOS =	13	399

FEED FROM OXIDATION DITCH TO CLARIFIER

FLOW= 3.6

	MG/L	LB/DAY
$CBOD_5$ =	----	----
BOD_5 =	3.4	101
TSS =	4,133	124,074
TKN =	51	1,544
NH_3 =	1.5	46
PHOS =	13	399

FEED TO TERTIARY FILTERS

FLOW= 1.83 MGD

MG/L	LB/DAY
6.4	100
20	314
5	79
1.5	24
3	47

SEPTAGE FEED TO PLANT

FLOW = 0.00 MGD

	MG/L	LB/DAY
BOD_5 =	6,480	
TSS =	12,800	
TKN =	588	
NH_3 =	97	
PHOS =	210	

EPA / 625 / R-94 / 002 SEPT. 1994 GUIDE TO SEPTAGE TREATEMENT AND DISPOSAL

EPA / 625 / R-94 / 002 SEPT. 1994 GUIDE TO SEPTAGE TREATEMENT AND DISPOSAL

MUDWELL RETURN 1Q, 1.8 MG

FLOW = 1.8 MGD

	MG/L	LB/DAY
BOD_5 =	35	423
TSS =	8,000	124,137
TKN =	95	1,426
NH_3 =	--	--
PHOS =	21	315

WAS FLOW

FLOW = 0.058MGD

	MG/L	LB/DAY
BOD_5 =	--	--
TSS =	8,642	4,243
TKN =	102	50
NH_3 =	--	--
PHOS =	17	8

MUDWELL

FLOW = 1.82MGD

	MG/L	LB/DAY
BOD_5 =	28	423
TSS =	8,161	123,888
TKN =	110	1,672
NH_3 =	9	210
PHOS =	27	412

RAS / WAS FLOW

FLOW = 1.72 MGD

	MG/L	LB/DAY
BOD_5 =	--	--
TSS =	8000	124,496
TKN =	110	1584
NH_3 =	3	43
PHOS =	25	359

BACKWASH FLOW

FLOW = 0.082 MGD

	MG/L	LB/DAY
BOD_5 =	58	40
TSS =	346	239
TKN =	48	34
NH_3 =	1.5	1.0
PHOS =	56	39

EFFLUENT OUT OF MULTIWASH FILTER

FLOW = 1.8 MGD

	MG/L	LB/DAY
$CBOD_5$ =	2	30
BOD_5 =	4	60
TSS =	5	75
TKN =	3	45
NH_3 =	1.5	23
PHOS =	0.5	8

CHARACTERISTICS OF DOMESTIC SLUDGE SUPERNATENT LIQUORS, RENDELL FRANK, WATER AND WASTEWATER PROJECT DEVELOPMENT, P. 162. AND METCALF AND EDDY, INC. WASTEWATER ENGINEERING: TREATMENT AND REUSE, MARCH 2002, 4TH EDITION

PRESS - STRATE MUDWELL RETURN

FLOW = 0.020 MGD

	MG/L	LB/DAY
BOD_5 =	468	169
TSS =	1,086	191
TKN =	----	----
NH_3 =	4.4	0.8
PHOS =	14	2.5

DEWATERED SLUDGE OFF PRESS

SLUDGE @ 24% SOLIDS

	MG/L	LB/DAY
SLUDGE LBS =		15,000
TSS = 240,000		3,628

FLOW OUT OF AERATED DIGESTER

FLOW = 0.023 MGD

	MG/L	LB/DAY
BOD_5 =	----	----
TSS =	20,000	3,819
TKN =	----	----
NH_3 =	----	----
PHOS =	44	8.3

EFF FLOW

FLOW = 1.8 MGD

	MG/L	LB/DAY
$CBOD_5$ =	2	30
BOD_5 =	4	60
TSS =	5	75
TKN =	3	45
NH_3 =	1.5	23
PHOS =	1	7.5

NPW FLOW

FLOW = 0.001 MGD

	MG/L	LB/DAY
$CBOD_5$ =	2	0.02
BOD_5 =	4	0.03
TSS =	5	0.04
TKN =	3	0.03
NH_3 =	1.5	0.01
PHOS =	1	0.01

PERMIT LIMITS - MULTI-WASH EFFLUENT

	EXISTING CONDITIONS	
PARAMETER	PRESENT CONDITIONS	LIMITS
FLOW = 12 MONTH ROLLING AVERAGE	0.55 MGD - 1.8 OBSERVED PEAK	2.0 mgd
UOD (JUNE 1 - OCTOBER 31)[1]	25.5 MG/L DAILY AVG. (383 LBS / DAY)	15.3 MG/L DAILY MAX. (260 LBS /DAY)
UOD (NOVEMBER 1 - M AY 31)[1]		32 MG/L DAILY MAX. (530 LBS /DAY)
TOTAL SUSPENDED SOLIDS	5 MG/L, 75 LBS /DAY	10 MG/L DAILY MAX. (170 LBS /DAY)
SETTLEABLE SOLIDS		0.1 ML / L
pH	6.2	6.0 - 9.0 SU
NITROGEN AMM. (AS N) (JUNE 1 - OCTOBER 31)	3 MG/L - 45LB /DAY	1.4 MG/L , MONTHLY AVERAGE
NITROGEN AMM. (AS N) (NOV. 1 - MAY 31)		2.1 MG/L, MONTHLY AVERAGE
TKN	5 MG/L - 75 LB / DAY	MONITOR, DAILY MAXIMUM
DISSOLVED OXYGEN		7.0 MG/L DAILY
COLIFORM, FECAL (MAY 1 TO OCT. 31)		200 NO. / 100ML, 30-DAY GEOMETRIC MEAN
COLIFORM, FECAL (MAY 1 TO OCT. 31)		400 NO. / 100 ML , 7 DAY GEOMETRIC MEAN
CHLORINE, TOTAL RESIDUAL		10 MG/L DAILY MAX. (170 LBS /DAY)

[1]ULTIMATE OXYGEN DEMAND SHALL BE COMPUTED AS FOLLOWS: UOD = 1.5 cBOD5 + 4.5 TKN

DATE: 8/13/19
DRAWN BY: MBP
SCALE: NTS
REVIEWED BY: DRO
PROJECT NO.: TWN THOMPSON
FILE: PRIMM FIG 4 PRO SCH.

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31 N. MAIN STREET, LIBERTY, NY 12754 - 845.747.9952

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NO.	DATE	DESCRIPTION
.	.	.

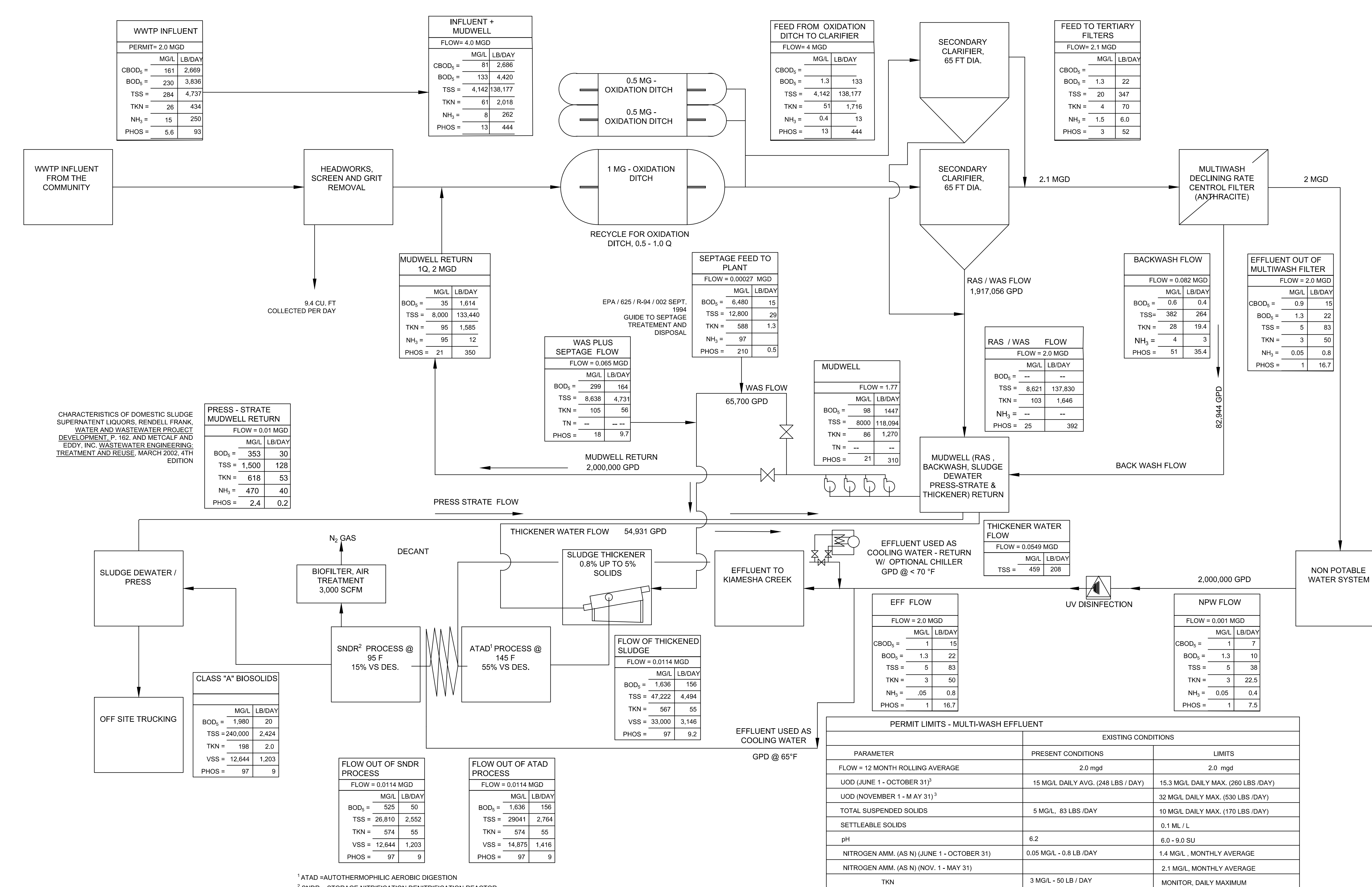
WWTP UPGRADES
TOWN OF THOMPSON
KIAMESHA LAKE
SULLIVAN COUNTY, N.Y.

EXISTING MASS BALANCE / FLOW DIAGRAM, 1.8 MGD (MDF)

SHEET:
FIG-7

FIGURE 8

Upgrade Mass Balance/Flow Diagram 2.0 MGD (DADF)



[1] ATAD =AUTOTHERMOPHILIC AEROBIC DIGESTION
[2] SNDR = STORAGE NITRIFICATION DENITRIFICATION REACTOR

PERMIT LIMITS - MULTI-WASH EFFLUENT

PARAMETER	EXISTING CONDITIONS: PRESENT CONDITIONS	LIMITS
FLOW = 12 MONTH ROLLING AVERAGE	2.0 mgd	2.0 mgd
UOD (JUNE 1 - OCTOBER 31)[3]	15 MG/L DAILY AVG. (248 LBS / DAY)	15.3 MG/L DAILY MAX. (260 LBS /DAY)
UOD (NOVEMBER 1 - M AY 31)[3]		32 MG/L DAILY MAX. (530 LBS /DAY)
TOTAL SUSPENDED SOLIDS	5 MG/L, 83 LBS /DAY	10 MG/L DAILY MAX. (170 LBS /DAY)
SETTLEABLE SOLIDS		0.1 ML / L
pH	6.2	6.0 - 9.0 SU
NITROGEN AMM. (AS N) (JUNE 1 - OCTOBER 31)	0.05 MG/L - 0.8 LB /DAY	1.4 MG/L , MONTHLY AVERAGE
NITROGEN AMM. (AS N) (NOV. 1 - MAY 31)		2.1 MG/L, MONTHLY AVERAGE
TKN	3 MG/L - 50 LB / DAY	MONITOR, DAILY MAXIMUM
DISSOLVED OXYGEN		7.0 MG/L DAILY
COLIFORM, FECAL (MAY 1 TO OCT. 31)		200 NO. / 100ML, 30-DAY GEOMETRIC MEAN
COLIFORM, FECAL (MAY 1 TO OCT. 31)		400 NO. / 100 ML , 7 DAY GEOMETRIC MEAN
CHLORINE, TOTAL RESIDUAL		10 MG/L DAILY MAX. (170 LBS /DAY)

[3]ULTIMATE OXYGEN DEMAND SHALL BE COMPUTED AS FOLLOWS: UOD = 1.5 cBOD5 + 4.5 TKN

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FILE: PRMM FIG 4 PRO SCH.

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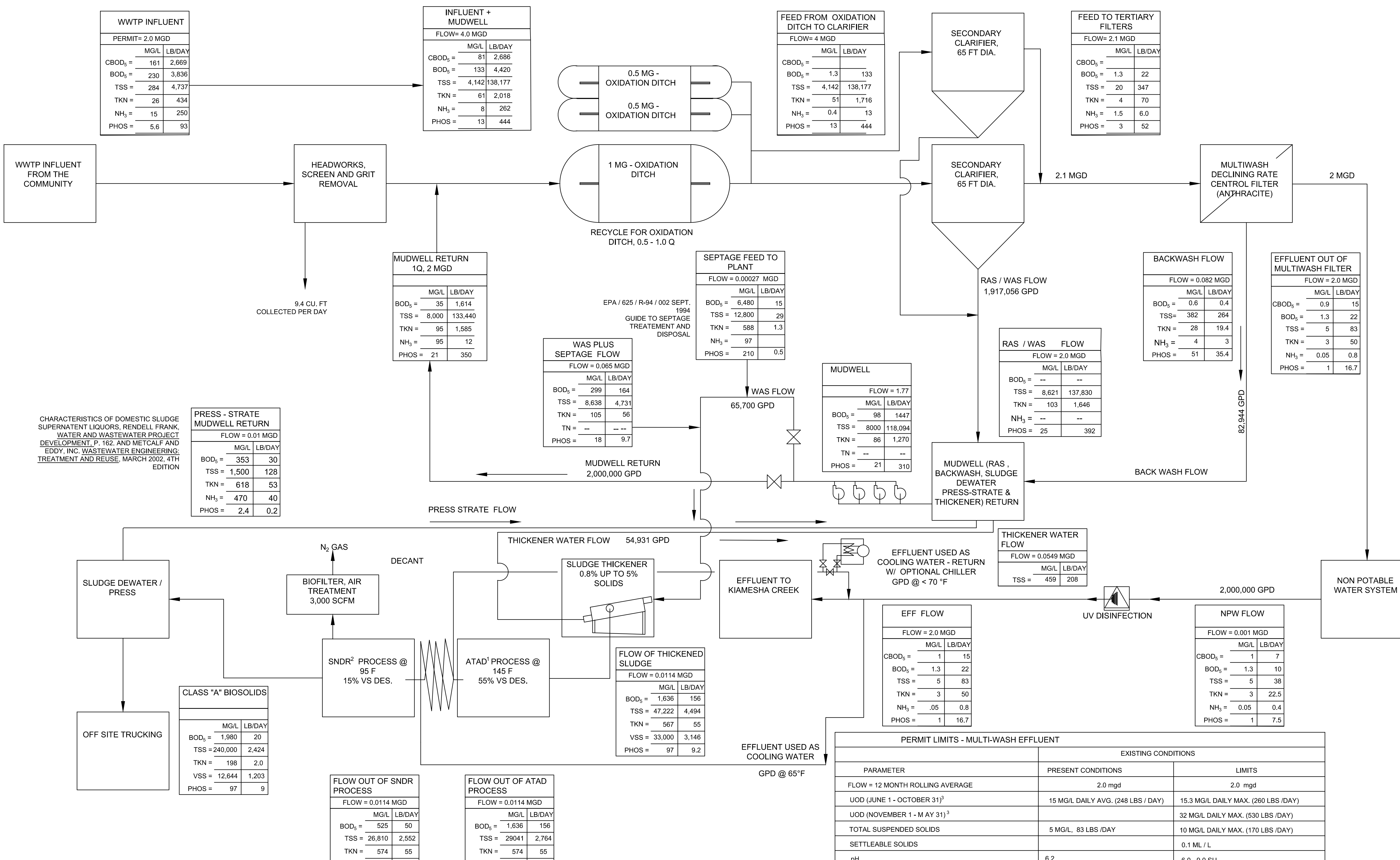
WWTP UPGRADES
TOWN OF THOMPSON
KIAMESHA LAKE
SULLIVAN COUNTY, N.Y.

UPGRADE MASS BALANCE / FLOW DIAGRAM, 2 MGD (DAF)

SHEET:
FIG-8

FIGURE 9

Upgrade Mass Balance/Flow Diagram 4.0 MGD (DMDF)



CHARACTERISTICS OF DOMESTIC SLUDGE SUPERNATENT LIQUORS, RENDELL FRANK, WATER AND WASTEWATER PROJECT DEVELOPMENT, P. 162, AND METCALF AND EDDY, INC. WASTEWATER ENGINEERING: TREATMENT AND REUSE, MARCH 2002, 4TH EDITION

WWTP INFLUENT — PERMIT= 2.0 MGD

	MG/L	LB/DAY
$CBOD_5$ =	161	2,669
BOD_5 =	230	3,836
TSS =	284	4,737
TKN =	26	434
NH_3 =	15	250
PHOS =	5.6	93

INFLUENT + MUDWELL — FLOW= 4.0 MGD

	MG/L	LB/DAY
$CBOD_5$ =	81	2,686
BOD_5 =	133	4,420
TSS =	4,142	138,177
TKN =	61	2,018
NH_3 =	8	262
PHOS =	13	444

FEED FROM OXIDATION DITCH TO CLARIFIER — FLOW= 4 MGD

	MG/L	LB/DAY
$CBOD_5$ =		
BOD_5 =	1.3	133
TSS =	4,142	138,177
TKN =	51	1,716
NH_3 =	0.4	13
PHOS =	13	444

FEED TO TERTIARY FILTERS — FLOW= 2.1 MGD

	MG/L	LB/DAY
$CBOD_5$ =		
BOD_5 =	1.3	22
TSS =	20	347
TKN =	4	70
NH_3 =	1.5	6.0
PHOS =	3	52

MUDWELL RETURN 1Q, 2 MGD

	MG/L	LB/DAY
BOD_5 =	35	1,614
TSS =	8,000	133,440
TKN =	95	1,585
NH_3 =	95	12
PHOS =	21	350

SEPTAGE FEED TO PLANT — FLOW = 0.00027 MGD

	MG/L	LB/DAY
BOD_5 =	6,480	15
TSS =	12,800	29
TKN =	588	1.3
NH_3 =	97	
PHOS =	210	0.5

WAS PLUS SEPTAGE FLOW — FLOW = 0.065 MGD

	MG/L	LB/DAY
BOD_5 =	299	164
TSS =	8,638	4,731
TKN =	105	56
TN =	--	-- --
PHOS =	18	9.7

MUDWELL — FLOW = 1.77

	MG/L	LB/DAY
BOD_5 =	98	1447
TSS =	8000	118,094
TKN =	86	1,270
TN =	--	--
PHOS =	21	310

RAS / WAS FLOW — FLOW = 2.0 MGD

	MG/L	LB/DAY
BOD_5 =	--	--
TSS =	8,621	137,830
TKN =	103	1,646
NH_3 =	--	--
PHOS =	25	392

BACKWASH FLOW — FLOW = 0.082 MGD

	MG/L	LB/DAY
BOD_5 =	0.6	0.4
TSS=	382	264
TKN =	28	19.4
NH_3 =	4	3
PHOS =	51	35.4

EFFLUENT OUT OF MULTIWASH FILTER — FLOW = 2.0 MGD

	MG/L	LB/DAY
$CBOD_5$ =	0.9	15
BOD_5 =	1.3	22
TSS =	5	83
TKN =	3	50
NH_3 =	0.05	0.8
PHOS =	1	16.7

PRESS - STRATE MUDWELL RETURN — FLOW = 0.01 MGD

	MG/L	LB/DAY
BOD_5 =	353	30
TSS =	1,500	128
TKN =	618	53
NH_3 =	470	40
PHOS =	2.4	0.2

THICKENER WATER FLOW — FLOW = 0.0549 MGD

	MG/L	LB/DAY
TSS =	459	208

EFF FLOW — FLOW = 2.0 MGD

	MG/L	LB/DAY
$CBOD_5$ =	1	15
BOD_5 =	1.3	22
TSS =	5	83
TKN =	3	50
NH_3 =	.05	0.8
PHOS =	1	16.7

NPW FLOW — FLOW = 0.001 MGD

	MG/L	LB/DAY
$CBOD_5$ =	1	7
BOD_5 =	1.3	10
TSS =	5	38
TKN =	3	22.5
NH_3 =	0.05	0.4
PHOS =	1	7.5

FLOW OF THICKENED SLUDGE — FLOW = 0.0114 MGD

	MG/L	LB/DAY
BOD_5 =	1,636	156
TSS =	47,222	4,494
TKN =	567	55
VSS =	33,000	3,146
PHOS =	97	9.2

CLASS "A" BIOSOLIDS

	MG/L	LB/DAY
BOD_5 =	1,980	20
TSS =	240,000	2,424
TKN =	198	2.0
VSS =	12,644	1,203
PHOS =	97	9

FLOW OUT OF SNDR PROCESS — FLOW = 0.0114 MGD

	MG/L	LB/DAY
BOD_5 =	525	50
TSS =	26,810	2,552
TKN =	574	55
VSS =	12,644	1,203
PHOS =	97	9

FLOW OUT OF ATAD PROCESS — FLOW = 0.0114 MGD

	MG/L	LB/DAY
BOD_5 =	1,636	156
TSS =	29041	2,764
TKN =	574	55
VSS =	14,875	1,416
PHOS =	97	9

[1] ATAD =AUTOTHERMOPHILIC AEROBIC DIGESTION
[2] SNDR = STORAGE NITRIFICATION DENITRIFICATION REACTOR

PERMIT LIMITS - MULTI-WASH EFFLUENT

	EXISTING CONDITIONS	
PARAMETER	PRESENT CONDITIONS	LIMITS
FLOW = 12 MONTH ROLLING AVERAGE	2.0 mgd	2.0 mgd
UOD (JUNE 1 - OCTOBER 31)[3]	15 MG/L DAILY AVG. (248 LBS / DAY)	15.3 MG/L DAILY MAX. (260 LBS /DAY)
UOD (NOVEMBER 1 - M AY 31)[3]		32 MG/L DAILY MAX. (530 LBS /DAY)
TOTAL SUSPENDED SOLIDS	5 MG/L, 83 LBS /DAY	10 MG/L DAILY MAX. (170 LBS /DAY)
SETTLEABLE SOLIDS		0.1 ML / L
pH	6.2	6.0 - 9.0 SU
NITROGEN AMM. (AS N) (JUNE 1 - OCTOBER 31)	0.05 MG/L - 0.8 LB /DAY	1.4 MG/L , MONTHLY AVERAGE
NITROGEN AMM. (AS N) (NOV. 1 - MAY 31)		2.1 MG/L, MONTHLY AVERAGE
TKN	3 MG/L - 50 LB / DAY	MONITOR, DAILY MAXIMUM
DISSOLVED OXYGEN		7.0 MG/L DAILY
COLIFORM, FECAL (MAY 1 TO OCT. 31)		200 NO. / 100ML, 30-DAY GEOMETRIC MEAN
COLIFORM, FECAL (MAY 1 TO OCT. 31)		400 NO. / 100 ML , 7 DAY GEOMETRIC MEAN
CHLORINE, TOTAL RESIDUAL		10 MG/L DAILY MAX. (170 LBS /DAY)

[3] ULTIMATE OXYGEN DEMAND SHALL BE COMPUTED AS FOLLOWS: UOD = 1.5 cBOD5 + 4.5 TKN

DATE: 8/22/19
DRAWN BY: MBP
SCALE: NTS
REVIEWED BY:
PROJECT NO.: TWN THOMPSON
FILE: PRIMM FIG 4 PRO SCH.

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WWTP UPGRADES
TOWN OF THOMPSON
KIAMESHA LAKE
SULLIVAN COUNTY, N.Y.

UPGRADE MASS BALNCE / FLOW DIAGRAM, 4.0 MGD (DMDF)

SHEET: FIG-9

APPENDICES

Appendix A	**Project Background Information**
Appendix B	**WWTP SPDES Permit with Renewal Application Acceptance Letter**
Appendix C	**DRBC Docket**
Appendix D	**Historical WWTP Data Summary (January 2017 - June 2019)**
Appendix E	**Influent Flow and Loads Spreadsheet**
Appendix F	**Indebtedness Analysis**
Appendix G	**Conceptual Cost Estimates for the SBR & MBR Alternatives**
Appendix H	**Estimated Project Cost Summary**
Appendix I	**SRF Application Project Budget and Construction Costs**
Appendix J	**Comprehensive Project Cost Estimates**
Appendix K	**Rate Impact Summary**
Appendix L	**IUP Listing Form**
Appendix M	**Engineering Report Certification**
Appendix N	**Smart Growth Assessment Form**
Appendix O	**Basis of Design**
Appendix P	**Process Calculations**
Appendix Q	**ATAD Brochure**
Appendix R	**UV Brochure and General Assembly Layout Drawing**

APPENDIX A

Project Background Information

Soil Map—Sullivan County, New York
(Kiamesha Lake WWTP)

Map Scale: 1:4,580 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0, 50, 100, 200, 300

Feet: 0, 200, 400, 800, 1200

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 1:15,800.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

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: Sullivan County, New York
Survey Area Data: Version 17, Sep 3, 2018

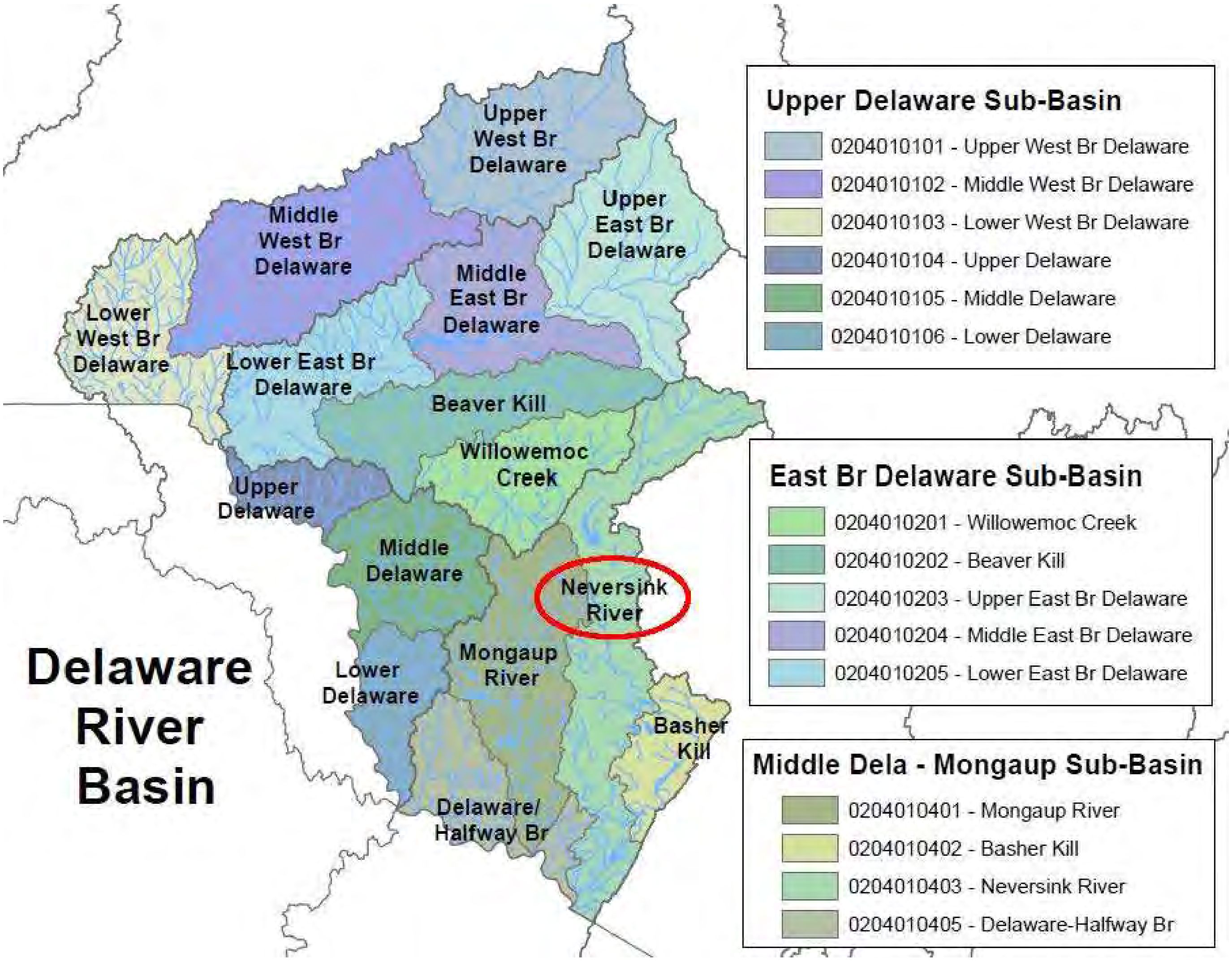
Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Feb 5, 2014—Sep 15, 2016

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
Fu	Fluvaquents-Udifluvents complex, frequently flooded	27.5	32.9%
Ne	Neversink loam	23.1	27.6%
Ra	Raynham silt loam	1.6	1.9%
Re	Red Hook sandy loam	1.5	1.8%
W	Water	0.0	0.0%
Wd	Wayland soils complex, non-calcareous substratum, 0 to 3 percent slopes, frequently flooded	1.5	1.8%
WeB	Wellsboro gravelly loam, 3 to 8 percent slopes	3.5	4.1%
WeC	Wellsboro gravelly loam, 8 to 15 percent slopes	2.4	2.9%
WlC	Wellsboro and Wurtsboro soils, strongly sloping, extremely stony	18.5	22.1%
WuB	Wurtsboro loam, 3 to 8 pecent slopes, stony	4.1	4.9%
Totals for Area of Interest		**83.7**	**100.0%**



Neversink River Watershed (0204010403)

Water Index Number	Waterbody Segment	Category
D- 1 (portion 1)	Neversink River, Lower, Main Stem (1402-0020)	MinorImpacts
D- 1 (portion 2)	Neversink River, Middle, Main Stem (1402-0006)	NoKnownImpct
D- 1 (portion 3)	Neversink River, Middle, Main Stem (1402-0021)	MinorImpacts
D- 1 (portion 4)/P58b	Neversink Reservoir (1402-0009)	Impaired Seg
D- 1 (portion 5)	Upper Neversink River and minor tribs (1402-0022)	MinorImpacts
D- 1- 1 thru 11 (selected)	Minor Tribs to Lower Neversink River (1402-0023)	MinorImpacts
D- 1- 2	Trib to Neversink/Port Jervis W.Supply (1402-0025)	UnAssessed
D- 1- 2-1-P2	Martin Lake (1402-0026)	UnAssessed
D- 1- 2-P3,P4,P5	Port Jervis Reservoirs (1402-0027)	UnAssessed
D- 1- 5-P5a	Hawthorne Lake (1402-0028)	UnAssessed
D- 1- 6-P8,P9	Lake Marling, Sand Pond (1402-0029)	UnAssessed
D- 1- 9-P13	Walls Pond (1402-0030)	UnAssessed
D- 1-10-P14	Guymard/Guymaer Lake (1402-0031)	UnAssessed
D- 1-13 thru 36 (selected)	Minor Tribs to Middle Neversink (1402-0041)	UnAssessed
D- 1-13	Unnamed trib to Neversink (1 402-0040)	UnAssessed

D- 1-22	Bush Kill and tribs (1402-0042)	NoKnownImpct
D- 1-22- 1-P31	Beaverdam Pond (1402-0043)	UnAssessed
D- 1-22-P33,P35,P36	Crane, Gilman Ponds, Melody Lake (1402-0044)	UnAssessed
D- 1-33-P37	Wolf Reservoir (1402-0045)	Need Verific
D- 1-34,35,36	Mercer, McKee, Barnum Brooks and tribs (1402-0046)	UnAssessed
D- 1-35-P38c	Davies Lake (1402-0047)	UnAssessed
D- 1-35-P39	Treasure Lake (1402-0048)	UnAssessed
D- 1-35-P40	McKee Reservoir/Lake Louise Marie (1402-0049)	UnAssessed
D- 1-37 thru 63 (selected)	Minor Tribs to Middle Neversink (1402-0050)	NoKnownImpct
D- 1-38	Sheldrake Stream and minor tribs (1402-0051)	NoKnownImpct
D- 1-38-3	Kiamesha Creek and minor tribs (1402-0005)	NoKnownImpct
D- 1-38-3-2	Anawana Brook and tribs (1402-0052)	UnAssessed
D- 1-38-3-2-P40b	Lotus/Bailey Lake (1402-0053)	UnAssessed
D- 1-38-3-2-P41	Anawana Lake (1402-0054)	UnAssessed
D- 1-38-3-P44	Kiamesha Lake (1402-0003)	NeedVerific
D- 1-38-P45	Pleasure Lake (1402-0055)	UnAssessed
D- 1-38-P47	Alta Lake (1402-0056)	UnAssessed
D- 1-38-P50	Hill Pond/Morningside Lake (1402-0001)	Need Verific
D- 1-38-P50a	Evens Lake (1402-0004)	Need Verific
D- 1-38-P51	Loch Sheldrake/Sheldrake Pond (1402-0057)	UnAssessed
D- 1-39-5-P52	Bowers Pond (1402-0058)	UnAssessed
D- 1-39-P53	Wanaksink Lake/Lords Reservoir (1402-0059)	UnAssessed
D- 1-48-P55	East Pond (1402-0060)	UnAssessed
D- 1-49-P55b	Wohl Lake (1402-0061)	UnAssessed
D- 1-51-P57	South Wind Lake (1402-0062)	UnAssessed
D- 1-59-P58a	Lake Paradise (1402-0063)	UnAssessed
D- 1-83-1-P65	Round Pond (1402-0064)	UnAssessed
D- 1-P58b-64 thru 75	Neversink Reservoir Tributaries (1402-0011)	NoKnownImpct
D- 1-P58b-82	East Branch Neversink River and tribs (1402-0007)	MinorImpacts
D- 1-P58b-83	West Branch Neversink River and tribs(1402-0008)	NoKnownImpct

Kiamesha Creek and minor tribs (1402-0005) NoKnownImpct

Waterbody Location Information

Revised: 07/05/02

Water Index No:	D- 1-38-3	**Drain Basin:**	Delaware River
Hydro Unit Code:	02040104/080 **Str Class:** B		Mid Delaware-Mongaup
Waterbody Type:	River	**Reg/County:**	3/Sullivan Co. (53)
Waterbody Size:	10.1 Miles (Low Flow)	**Quad Map:**	MONTICELLO (O-22-1)
Seg Description:	entire stream and selected/smaller tribs		

Water Quality Problem/Issue Information

(CAPS indicate MAJOR Use Impacts/Pollutants/Sources)

Use(s) Impacted	Severity	Problem Documentation
NO USE IMPAIRMENT		

Type of Pollutant(s)
- Known: - - -
- Suspected: - - -
- Possible: - - -

Source(s) of Pollutant(s)
- Known: - - -
- Suspected: - - -
- Possible: - - -

Resolution/Management Information

Issue Resolvability: 8 (No Known Use Impairment)
Verification Status: (Not Applicable for Selected RESOLVABILITY)
Lead Agency/Office: n/a **Resolution Potential:**
TMDL/303d Status: n/a ()

Further Details

A biological (macroinvertebrate) assessment of Kiamesha Creek at the mouth near Thompsonville was conducted in 1999. Field sampling results indicated non-impacted water quality conditions at the site. The sample satisfied field screening criteria and was returned to the stream. Another sample was collected at Kiamesha Lake, but impoundment and other habitat impacts invalidate this sample. (DEC/DOW, BWAR/SBU, June 2002)

Construction activity at the Sullivan County Landfill had been previously cited as causing intermittent turbidity problems is a trib (Tannery Brook (-1). However the landfill has been capped and improved erosion and sediment control practices have taken effect. (DEC/DOW, Region 3, June 2002)

This segment includes the entire stream and selected/smaller tribs. The waters of the creek are Class B from the mouth to P39f and Class C for the remainder of the reach. Tribs to this reach, including Tannery/Cold Spring Brook (-1) and Roxbury Brook (-1-2), are primarily Class B with a portion of Cold Spring Brook designated Class C. (December 2000)

Kiamesha Lake (1402-0003) — Need Verific

Waterbody Location Information

Revised: 07/05/02

Water Index No:	D- 1-38-3-P44			**Drain Basin:**	Delaware River
Hydro Unit Code:	02040104/080	**Str Class:**	A		Mid Delaware-Mongaup
Waterbody Type:	Lake			**Reg/County:**	3/Sullivan Co. (53)
Waterbody Size:	140.8 Acres ( )			**Quad Map:**	MONTICELLO (O-22-1)
Seg Description:	entire lake				

Water Quality Problem/Issue Information

(CAPS indicate MAJOR Use Impacts/Pollutants/Sources)

Use(s) Impacted	Severity	Problem Documentation
Water Supply	Stressed	Possible
Recreation	Stressed	Possible

Type of Pollutant(s)

Known: - - -
Suspected: ALGAL/WEED GROWTH
Possible: Nutrients (phosphorus), Silt/Sediment

Source(s) of Pollutant(s)

Known: - - -
Suspected: OTHER SOURCE
Possible: Construction, Urban Runoff

Resolution/Management Information

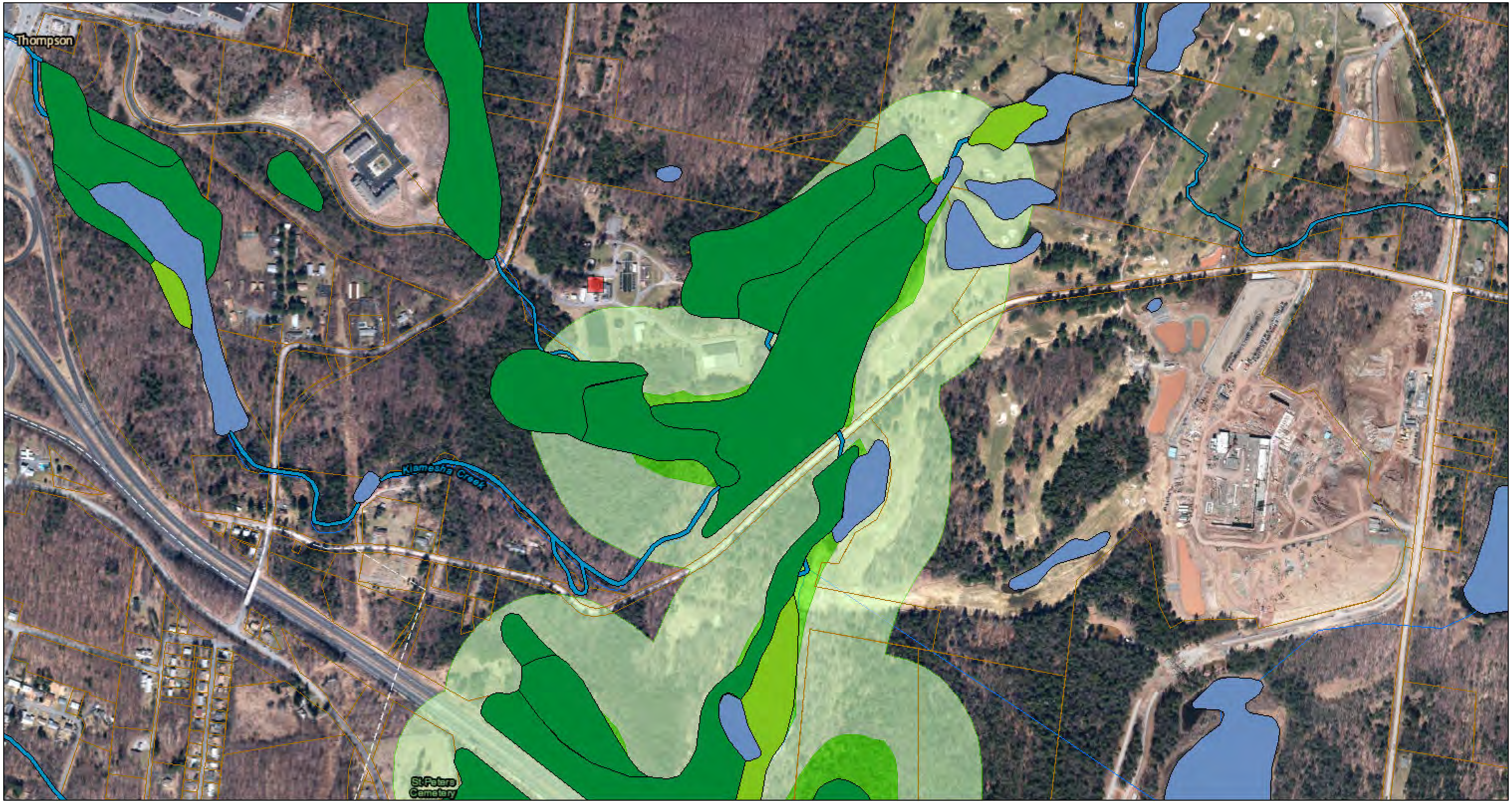
Issue Resolvability: 1 (Needs Verification/Study (see STATUS))
Verification Status: 1 (Waterbody Nominated, Problem Not Verified)
Lead Agency/Office: ext/WQCC
Resolution Potential:
TMDL/303d Status: n/a ()

Further Details

Drinking water supply and recreational uses may be affected by excessive weed and algal growth in the lake. Nutrient loadings from a nearby golf course may contribute to water quality impacts.

Construction activity was previously cited as a source, however there are no longer any active projects underway; although the potential for development is high. The lake is a source of drinking water for the Town of Thompson and the Village of Monticello. (DEC/DOW, Region 3, April 2002)

Kiamesha Lake WWTP ERM w/ Wetland Layers



August 7, 2019

1:9,028

0 0.1 0.2 0.4 mi

0 0.175 0.35 0.7 km

Esri, HERE, Garmin, (c) OpenStreetMap contributors, and the GIS user community
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Author: RC 08-07-2019
Not a legal document

Kiamesha Lake WWTP ERM All Layers

August 7, 2019

1:9,028

0 0.1 0.2 0.4 mi

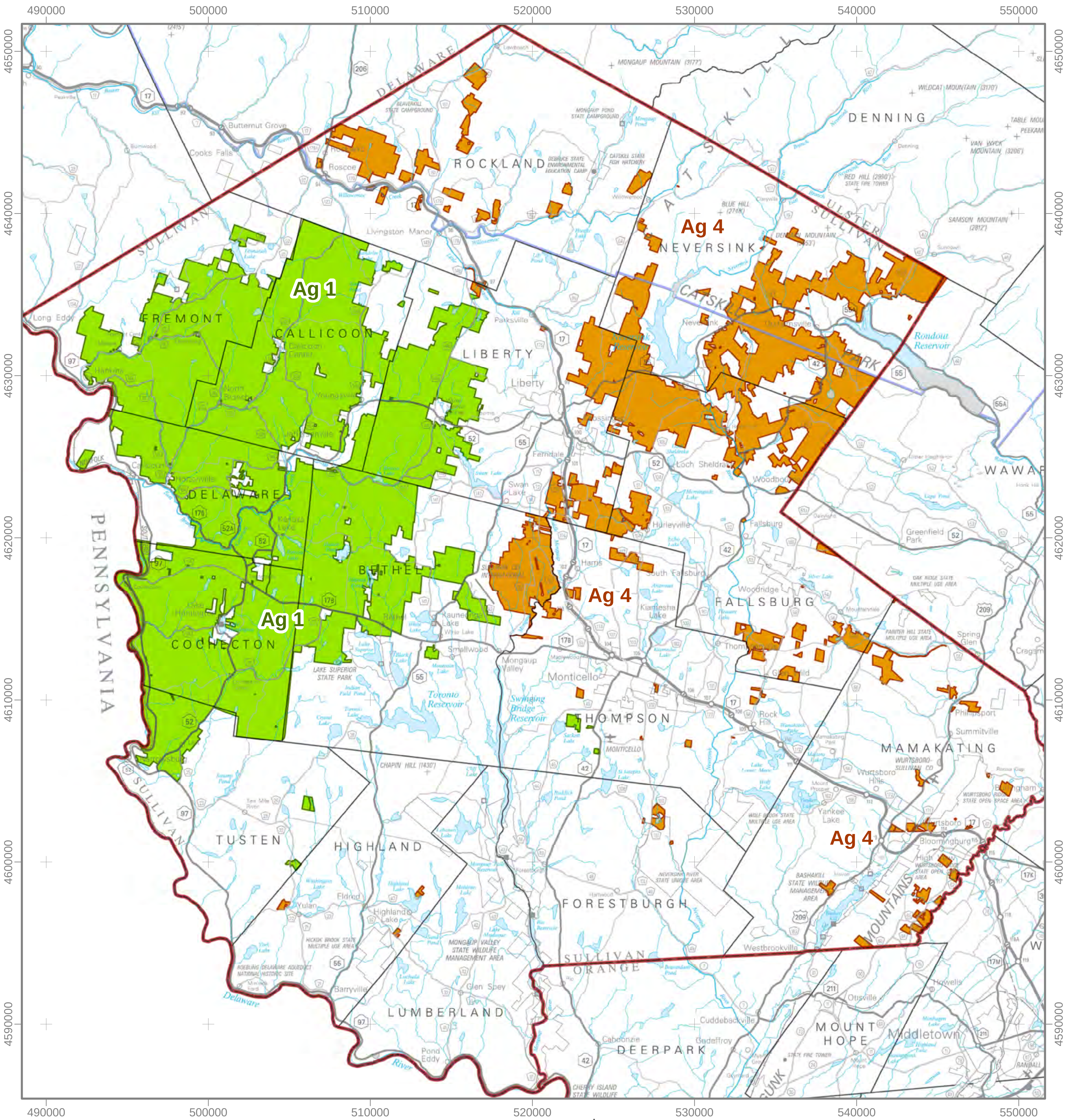
0 0.175 0.35 0.7 km

Author: RC 08-07-2019
Not a legal document

New York State Dept of Agriculture and Markets

SULLIVAN COUNTY

Agricultural Districts 2016



MAP PROJECTION

UTM Zone 18, NAD83 meters

5 4 3 2 1 0 5 miles

10,000 5,000 0 10,000 meters

KEY

Ag. District 1

Ag. District 4

DISTRICT CERTIFICATIONS and TOWNS

DISTRICT 1
CERTIFIED 11/13/2013

Bethel	Delaware	Thompson
Callicoon	Fremont	Tusten
Cochecton	Liberty	

DISTRICT 4
CERTIFIED 10/15/2015

Bethel	Highland	Neversink
Fallsburg	Liberty	Rockland
Forestburgh	Mamakating	Thompson

MAP SOURCE INFORMATION

Map created at Cornell IRIS (Institute for Resource Information Sciences) <http://iris.css.cornell.edu> for the NYS Department of Agriculture and Markets

Agricultural Districts boundary data is available at CUGIR (Cornell University Geospatial Information Repository) website: <http://cugir.mannlib.cornell.edu>

Base Map: state250_bw.tif 1998
Scale: 1:250,000; County boundaries imported from the file nyshore.e00 from the NYSGIS Clearinghouse website: <http://gis.ny.gov>

DISCLAIMER
This is a general reference to Agricultural District boundaries; not a legal substitute for actual tax parcel information.

Boundaries as certified prior to January 2016

Open Enrollment Annual Additions are not included in this data. Check with county agencies to confirm the status of individual parcels.

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD 88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations tables in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations tables should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Universal Transverse Mercator (UTM) zone 18. The **horizontal datum** was NAD 83, GRS80 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at **(301) 713-3242**, or visit its website at http://www.ngs.noaa.gov.

Base map information shown on this FIRM was derived from digital orthophotography provided by the New York Office of Cyber Security & Critical Infrastructure Coordination. This information was provided as 30-centimeter and 60-centimeter resolution natural color orthoimagery from photography dated April 2004.

Based on updated topographic information, this map reflects more detailed and up-to-date **stream channel configurations and floodplain delineations** than those shown on the previous FIRM for this jurisdiction. As a result, the Flood Profiles and Floodway Data tables in the Flood Insurance Study Report (which contains authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on this map. Also, the road to floodplain relationships for unrevised streams may differ from what is shown on previous maps.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

For information on **available products** associated with this FIRM, visit the Map Service Center (MSC) website at http://msc.fema.gov. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. Many of these products can be ordered or obtained directly from the MSC website.

If you have **questions about this map,** how to order products, or the National Flood Insurance Program in general, please call the FEMA Map Information eXchange (FMIX) at 1-877-FEMA-MAP (1-877-336-2627) or visit the FEMA website at http://www.fema.gov/business/nfip.

LEGEND

SPECIAL FLOOD HAZARD AREAS SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99	Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X	Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X	Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D	Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

1% annual chance floodplain boundary

0.2% annual chance floodplain boundary

Floodway boundary

Zone D boundary

CBRS and OPA boundary

Boundary dividing Special Flood Hazard Area Zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.

Limit of Moderate Wave Action

~~ 513 ~~~	Base Flood Elevation line and value; elevation in feet*
(EL 987)	Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the North American Vertical Datum of 1988

(A)———(A)	Cross section line
(23)- - - - - -(23)	Transect line
87°07'45", 32°22'30"	Geographic coordinates referenced to the North American Datum of 1983 (NAD 83), Western Hemisphere
$^{24}76^{000m}$N	1000-meter Universal Transverse Mercator grid values, zone 18N
600000 FT	5000-foot grid values: New York State Plane coordinate system, East zone (FIPSZONE 3101), Transverse Mercator projection
DX5510 ×	Bench mark (see explanation in Notes to Users section of this FIRM panel)
• M1.5	River Mile

MAP REPOSITORY
Refer to listing of Map Repositories on Map Index

EFFECTIVE DATE OF COUNTYWIDE
FLOOD INSURANCE RATE MAP
February 18, 2011

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your Insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 1000'

500 0 1000 2000 FEET

300 0 300 600 METERS

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0470F

FIRM
FLOOD INSURANCE RATE MAP

for SULLIVAN COUNTY, NEW YORK
(ALL JURISDICTIONS)

CONTAINS:

COMMUNITY	NUMBER
MONTICELLO, VILLAGE OF	361613
THOMPSON, TOWN OF	360830

PANEL 470 OF 780
MAP SUFFIX: F
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
36105C0470F

MAP EFFECTIVE
FEBRUARY 18, 2011

Federal Emergency Management Agency

APPENDIX B

WWTP SPDES Permit with Renewal Application Acceptance Letter

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

Division of Environmental Permits
625 Broadway, 4th Floor, Albany, New York 12233-1750
P: (518) 402-9167 | F: (518) 402-9168 | deppermitting@dec.ny.gov
www.dec.ny.gov

August 16, 2019

Mr. William J. Rieber
Supervisor
Town of Thompson
4052 ST RTE 42
Monticello, NY 12701

Re: Kiamesha Lake SD STP SPDES Renewal Permit Application
DEC ID# 3-4846-00039/00003, SPDES# NY0030724

Dear Mr. Rieber,

On June 17, 2019, the Department received an application to renew the above-referenced State Pollutant Discharge Elimination System (SPDES) permit. The application was timely and sufficient. Therefore, the current permit will remain in effect in accordance with the State Administrative Procedures Act.

The Department will, at some point in the future, undertake a full technical review of the SPDES discharge to determine the need to incorporate new permit requirements under the Federal Clean Water Act. The timing of the Department's full technical review will be determined by the ranking of the discharge under the Environmental Benefit Permit Strategy (EBPS). The EBPS utilizes criteria to score and rank a wastewater discharge, giving priority for technical review to those discharges with the greatest potential to cause environmental harm. To initiate a full technical review, the Department will send you a "Request for Information" seeking data to be used in the evaluation of the discharge and in the establishment of provisions proposed for inclusion in the permit.

No further action is required on your part at this time. In accordance with the Uniform Procedures Act, the Department has suspended its review of your application and will resume review upon receipt of your response to the "Request for Information".

If you have any technical questions, please contact Carol Lamb-Lafay at carol.lamb-lafay@dec.ny.gov. For assistance with permitting questions, please contact me at michael.schaefer@dec.ny.gov or at (518) 402-9167.

Sincerely,

Michael Schaefer
Environmental Analyst

ec: NYSDEC: Carol Lamb - Lafay, Cheri Jamison, Lorraine Holdridge, John Petronella

State Pollutant Discharge Elimination System (SPDES) DISCHARGE PERMIT

New York State of Opportunity | Department of Environmental Conservation

Industrial Code:	**4952**	SPDES Number:	**NY 003 0724**
Discharge Class (CL):	**05**	DEC Number:	**3-4846-00039/00003**
Toxic Class (TX):	**T**	Effective Date (EDP):	**04/01/2015**
Major Drainage Basin:	**14**	Expiration Date (ExDP):	**03/31/2020**
Sub Drainage Basin:	**02**	Modification Dates: (EDPM)	**12/01/2017**
Water Index Number:	**D-1-38-3**		
Compact Area:	**DRBC**		

This SPDES permit is issued in compliance with Title 8 of Article 17 of the Environmental Conservation Law of New York State and in compliance with the Clean Water Act, as amended, (33 U.S.C. §1251 et.seq.)(hereinafter referred to as "the Act").

PERMITTEE NAME AND ADDRESS					
Name:	**Town of Thompson**	Attention:	**William Culligan – Superintendent**		
Street:	**4052 Route 42**				
City:	**Monticello**	State:	**NY**	Zip Code:	**12701**

is authorized to discharge from the facility described below:

FACILITY NAME AND ADDRESS													
Name:	**Thompson (T) Kiamesha Lake Sewer District**												
Location (C,T,V):	**Thompson (T)**							County:	**Sullivan**				
Facility Address:	**4052 Route 42**												
City:	**Monticello**			State:				**NY**	Zip Code:	**12701**			
From Outfall No.:	001	at Latitude:		°		′		′′	& Longitude:		°	′	′′
into receiving waters known as:	**Kiamesha Creek**								Class:	C			

and (list other Outfalls, Receiving Waters & Water Classifications)

in accordance with: effluent limitations; monitoring and reporting requirements; other provisions and conditions set forth in this permit; and 6 NYCRR Part 750-1and 750-2.

DISCHARGE MONITORING REPORT (DMR) MAILING ADDRESS					
Mailing Name:	**Kiamesha Lake STP**				
Street:	**4052 Route 42**				
City:	**Monticello**	State:	**NY**	Zip Code:	**12701**
Responsible Official or Agent:	**William Culligan**	Phone:	**(845) 794-5280**		

This permit and the authorization to discharge shall expire on midnight of the expiration date shown above and the permittee shall not discharge after the expiration date unless this permit has been renewed, or extended pursuant to law. To be authorized to discharge beyond the expiration date, the permittee shall apply for permit renewal not less than 180 days prior to the expiration date shown above.

DISTRIBUTION:

CO BWP - Permit Coordinator
RWE
RPA
EPA Region II
NYSEFC
NYSDOH District Office

Chief Permit Administrator: John J. Ferguson	
Address: Division of Environmental Permits 625 Broadway, 4th Floor Albany, NY 12233-1750	
Signature: [signature]	Date: 11 / 27 /2017

PERMIT LIMITS, LEVELS AND MONITORING DEFINITIONS

OUTFALL	WASTEWATER TYPE	RECEIVING WATER	EFFECTIVE	EXPIRING
	This cell describes the type of wastewater authorized for discharge. Examples include process or sanitary wastewater, storm water, non-contact cooling water.	This cell lists classified waters of the state to which the listed outfall discharges.	The date this page starts in effect. (e.g. EDP or EDPM)	The date this page is no longer in effect. (e.g. ExDP)

PARAMETER	MINIMUM	MAXIMUM	UNITS	SAMPLE FREQ.	SAMPLE TYPE
e.g. pH, TRC, Temperature, D.O.	The minimum level that must be maintained at all instants in time.	The maximum level that may not be exceeded at any instant in time.	SU, °F, mg/l, etc.	See below	See below

PARAMETER	EFFLUENT LIMIT or CALCULATED LEVEL	COMPLIANCE LEVEL / MINIMUM LEVEL (ML)	ACTION LEVEL	UNITS	SAMPLE FREQUENCY	SAMPLE TYPE
	Limit types are defined below in Note 1. The effluent limit is developed based on the more stringent of technology-based limits, required under the Clean Water Act, or New York State water quality standards. The limit has been derived based on existing assumptions and rules. These assumptions include receiving water hardness, pH and temperature; rates of this and other discharges to the receiving stream; etc. If assumptions or rules change the limit may, after due process and modification of this permit, change.	For the purposes of compliance assessment, the permittee shall use the approved EPA analytical method with the lowest possible detection limit as promulgated under 40CFR Part 136 for the determination of the concentrations of parameters present in the sample unless otherwise specified. If a sample result is below the detection limit of the most sensitive method, compliance with the permit limit for that parameter was achieved. Monitoring results that are lower than this level must be reported, but shall not be used to determine compliance with the calculated limit. This Minimum Level (ML) can be neither lowered nor raised without a modification of this permit.	Action Levels are monitoring requirements, as defined below in Note 2, which trigger additional monitoring and permit review when exceeded.	This can include units of flow, pH, mass, temperature, or concentration. Examples include µg/l, lbs/d, etc.	Examples include Daily, 3/week, weekly, 2/month, monthly, quarterly, 2/yr and yearly. All monitoring periods (quarterly, semiannual, annual, etc.) are based upon the calendar year unless otherwise specified in this Permit.	Examples include grab, 24 hour composite and 3 grab samples collected over a 6 hour period.

Notes:

1. EFFLUENT LIMIT TYPES:
   a. DAILY DISCHARGE: The discharge of a pollutant measured during a calendar day or any 24-hour period that reasonably represents the calendar day for the purposes of sampling. For pollutants expressed in units of mass, the 'daily discharge' is calculated as the total mass of the pollutant discharged over the day. For pollutants with limitations expressed in other units of measurement, the 'daily discharge' is calculated as the average measurement of the pollutant over the day.
   b. DAILY MAX: The highest allowable daily discharge.
   c. DAILY MIN: The lowest allowable daily discharge.
   d. MONTHLY AVG: The highest allowable average of daily discharges over a calendar month, calculated as the sum of each of the daily discharges measured during a calendar month divided by the number of daily discharges measured during that month.
   e. 7 DAY ARITHMETIC MEAN (7 day average): The highest allowable average of daily discharges over a calendar week.
   f. 30 DAY GEOMETRIC MEAN: The highest allowable geometric mean of daily discharges over a calendar month, calculated as the antilog of: the sum of the log of each of the daily discharges measured during a calendar month divided by the number of daily discharges measured during that month.
   g. 7 DAY GEOMETRIC MEAN: The highest allowable geometric mean of daily discharges over a calendar week.
   h. 12 MONTH ROLLING AVERAGE: The current monthly value of a parameter, plus the sum of the monthly values over the previous 11 months for that parameter, divided by 12.
   i. RANGE: The minimum and maximum instantaneous measurements for the reporting period must remain between the two values shown.

2. ACTION LEVELS: Routine Action Level monitoring results, if not provided for on the Discharge Monitoring Report (DMR) form, shall be appended to the DMR for the period during which the sampling was conducted. If the additional monitoring requirement is triggered as noted below, the permittee shall undertake a short-term, high-intensity monitoring program for the parameter(s). Samples identical to those required for routine monitoring purposes shall be taken on each of at least three consecutive operating and discharging days and analyzed. Results shall be expressed in terms of both concentration and mass, and shall be submitted no later than the end of the third month following the month when the additional monitoring requirement was triggered. Results may be appended to the DMR or transmitted under separate cover to the same address. If levels higher than the Action Levels are confirmed, the permit may be reopened by the Department for consideration of revised Action Levels or effluent limits. The permittee is not authorized to discharge any of the listed parameters at levels which may cause or contribute to a violation of water quality standards.

PERMIT LIMITS, LEVELS AND MONITORING

OUTFALL	LIMITATIONS APPLY:	RECEIVING WATER	EFFECTIVE	EXPIRING
001	All year otherwise stated	Kiamesha Creek	12/01/2017	3/31/2020

PARAMETER	EFFLUENT LIMIT					MONITORING REQUIREMENTS				FN
								Location		
	Type	Limit	Units	Limit	Units	Sample Frequency	Sample Type	Inf.	Eff.	
Flow	Monthly Average	Monitor	MGD		MGD	Continuous	Recorder		X	
Flow	12 Month Rolling Average	2.0	MGD		MGD	Continuous	Recorder		X	
$CBOD_5$	Daily Max	Monitor	mg/l	Monitor	lbs/d	1/Week	24-hr. Comp.		X	
UOD (June 1 – October 31)	Daily Max	15.3	mg/l	260	lbs/d		24-hr. Comp.		X	(1)
UOD (June 1 – October 31)	Daily Max	32	mg/l	530	lbs/d		24-hr. Comp.		X	(1)
Solids, Suspended	Daily Max	10	mg/l	170	lbs/d	1/Week	24-hr. Comp.		X	
Solids, Settleable	Daily Maximum	0.1	ml/l			2/Day	Grab		X	
pH	Range	6.0 – 9.0	SU			2/Day	Grab		X	
Nitrogen, Ammonia (as N) (Nov. 1 – May 31)	Monthly Average	1.4	mg/l			1/Week	24-hr. Comp.		X	
Nitrogen, Ammonia (as N) (Nov. 1 – May 31)	Monthly Average	2.1	mg/l			1/Week	24-hr. Comp.		X	
Nitrogen, TKN (as N)	Daily Max	Monitor	mg/l			1/Week	24-hr. Comp.		X	(2)
Dissolved Oxygen	Daily	7.0	mg/l			1/Week	Grab		X	
Mercury, Total	Daily Max	50	ng/l			Quarterly	Grab		X	
Temperature	Daily Maximum	Monitor	Deg F			2/Day	Grab		X	
Effluent Disinfection required		[X] Seasonal from **May 1** to **Oct 31**						(3, 5)		
Coliform, Fecal	30-Day Geometric Mean	200	No./ 100 ml			1/Week	Grab		X	(3)
Coliform, Fecal	7 Day Geometric Mean	400	No./ 100 ml			1/Week	Grab		X	(3)
Chlorine, Total Residual	Daily Maximum	20	ug/l	0.33	lbs/d	2/Day	Grab		X	(3,4)

FOOTNOTES:

(1) Ultimate Oxygen Demand shall be computed as follows: UOD = 1.5CBD5 + 4.5TKN
(2) The sample for TKN (Total Kjelkahl Nitrogen) shall be obtained concurrently with the sample for CBOD.
(3) Limits and monitoring requirements are not in effect until May 1, 2022. See the schedule of compliance on page 4.
(4) If Chlorine and chlorine containing compound is not used in the treatment process, then total residual chlorine monitoring is not required.
(5) Disinfection shall be practiced at all times if the effluent is land applied.

SCHEDULE OF COMPLIANCE

a. The permittee shall comply with the following schedule:

Outfall(s)	Parameter(s) Affected	Interim Effluent Limit(s)	Compliance Action	Due Date
001	Fecal Coliform Total Residual Chlorine	N/A	The permittee shall submit an approvable engineering report, prepared by a Professional Engineer licensed to practice engineering in New York State, detailing the disinfection designs that will be used to comply with the final effluent limitations for Fecal Coliform and Total Residual Chlorine.	May 1, 2019
			The permittee shall submit approvable Engineering Plans, Specifications, and Construction Schedule for the Implementation of effluent disinfection.	May 1, 2020
			The permittee shall begin construction of the treatment facilities in accordance with the Department approved schedule.	May 1, 2021
			The permittee shall complete construction and commence operation of the system, and comply with the final effluent limitations for Fecal Coliform and Total Residual Chlorine.	May 1, 2022
The above compliance actions are one time requirements. The permittee shall comply with the above compliance actions to the Department's satisfaction once. When this permit is administratively renewed by NYSDEC letter entitled "SPDES NOTICE/RENEWAL APPLICATION/PERMIT," the permittee is not required to repeat the submission(s) noted above. The above due dates are independent from the effective date of the permit stated in the "SPDES NOTICE/RENEWAL APPLICATION/PERMIT" letter.				

b. For any action where the compliance date is greater than 9 months past the previous compliance due date, the permittee shall submit interim progress reports to the Department every nine (9) months until the due date for these compliance items are met.

c. The permittee shall submit a written notice of compliance or non-compliance with each of the above schedule dates no later than 14 days following each elapsed date, unless conditions require more immediate notice as prescribed in 6 NYCRR Part 750-1.2(a) and 750-2. All such compliance or non-compliance notification shall be sent to the locations listed under the section of this permit entitled RECORDING, REPORTING AND ADDITIONAL MONITORING REQUIREMENTS. Each notice of non-compliance shall include the following information:

MERCURY MINIMIZATION PROGRAM – High Priority POTWs

1. **General** - The permittee shall develop, implement, and maintain a Mercury Minimization Program (MMP). The MMP is required because the permit limit exceeds the statewide water quality based effluent limit (WQBEL) of 0.70 nanograms/liter (ng/L) for Total Mercury. The goal of the MMP will be to reduce mercury effluent levels in pursuit of the WQBEL. Note – The mercury-related requirements in this permit conform to the mercury Multiple Discharge Variance specified in NYSDEC policy *DOW 1.3.10*.

2. **MMP Elements** - The MMP shall be documented in narrative form and shall include any necessary drawings or maps. Other related documents already prepared for the facility may be used as part of the MMP and may be incorporated by reference. As a minimum, the MMP shall include an on-going program consisting of: periodic monitoring designed to quantify and, over time, track the reduction of mercury; an acceptable control strategy for reducing mercury discharges via cost-effective measures, which may include more stringent control of tributary waste streams; and submission of periodic status reports.

A. Monitoring - The permittee shall conduct periodic monitoring designed to quantify and, over time, track the reduction of mercury. All permit-related wastewater and stormwater mercury compliance point (outfall) monitoring shall be performed using EPA Method 1631. Use of EPA Method 1669 during sample collection is recommended. Unless otherwise specified, all samples shall be grabs. Monitoring at influent and other locations tributary to compliance points may be performed using either EPA Methods 1631 or 245.7. Monitoring of raw materials, equipment, treatment residuals, and other non-wastewater/non-stormwater substances may be performed using other methods as appropriate. Monitoring shall be coordinated so that the results can be effectively compared between internal locations and final outfalls. Minimum required monitoring is as follows:

i. Sewage Treatment Plant Influent & Effluent, and Type II SSO Outfalls - Samples at each of these locations shall be collected in accordance with the minimum frequency specified on the mercury permit limits page.

ii. Key Locations in the Collection System and Potential Significant Mercury Sources - The minimum monitoring frequency at these locations shall be semi-annual. Monitoring of properly treated dental facility discharges is not required.

iii. Hauled Wastes - Hauled wastes which may contain significant mercury levels shall be periodically tested prior to acceptance to ensure compliance with pretreatment/local limits requirements and/or determine mercury load.

iv. Additional monitoring shall be completed as may be required elsewhere in this permit or upon Department request.

B. Control Strategy - An acceptable control strategy is required for reducing mercury discharges via cost-effective measures, including but not limited to more stringent control of industrial users and hauled wastes. The control strategy will become enforceable under this permit and shall contain the following minimum elements:

i. Pretreatment/Local Limits - The permittee shall evaluate and revise current requirements in pursuit of the goal.

ii. Periodic Inspection - The permittee shall inspect users as necessary to support the MMP. Each dental facility shall be inspected at least once every five years to verify compliance with the wastewater treatment operation, maintenance, and notification elements of 6NYCRR Part 374.4. Other mercury sources shall also be inspected once every five years. Alternatively, the permittee may develop an outreach program which informs these users of their responsibilities once every five years and is supported by a subset of site inspections. Monitoring shall be performed as above.

iii. Systems with CSO & Type II SSO Outfalls - Priority shall be given to controlling mercury sources upstream of CSOs and Type II SSOs through mercury reduction activities and/or controlled-release discharge. Effective control is necessary to avoid the need for the Department to establish mercury permit limits at these outfalls.

iv. Equipment and Materials – Equipment and materials which may contain mercury shall be evaluated by the permittee and replaced with mercury-free alternatives where environmentally preferable.

v. Bulk Chemical Evaluation - For chemicals used at a rate which exceeds 1,000 gallons/year or 10,000 pounds/year, the permittee shall obtain a manufacturer's certificate of analysis and/or a notarized affidavit which describes the substances' mercury concentration and the detection limit achieved. The permittee shall only use bulk chemicals which contain <10 ppb mercury, if available.

C. Annual Status Report - An annual status report shall be submitted to the Regional Water Engineer and to the Bureau of Water Permits, 625 Broadway, Albany, N.Y. 12233-3505, summarizing: (a) all MMP monitoring results for the previous year; (b) a list of known and potential mercury sources; (c) all action undertaken pursuant to the strategy during the previous year; (d) actions planned for the upcoming year; and, (e) progress toward the goal. The first annual status report is due one year after the permit is modified to include the MMP requirement and follow-up status reports are due annually thereafter. A file shall be maintained containing all MMP documentation, including the dental forms required by 6NYCRR Part 374.4, which shall be available for review by NYSDEC representatives. Copies shall be provided upon request.

3. **MMP Modification** - The MMP shall be modified whenever: (a)changes at the facility or within the collection system increase the potential for mercury discharges; (b) actual discharges exceed 50 ng/L; (c) a letter from the Department identifies inadequacies in the MMP; or, (d) pursuant to a permit modification.

DISCHARGE NOTIFICATION REQUIREMENTS

(a) Except as provided in (c) and (g) of these Discharge Notification Act requirements, the permittee shall install and maintain identification signs at all outfalls to surface waters listed in this permit. Such signs shall be installed before initiation of any discharge.

(b) Subsequent modifications to or renewal of this permit does not reset or revise the deadline set forth in (a) above, unless a new deadline is set explicitly by such permit modification or renewal.

(c) The Discharge Notification Requirements described herein do not apply to outfalls from which the discharge is composed exclusively of storm water, or discharges to ground water.

(d) The sign(s) shall be conspicuous, legible and in as close proximity to the point of discharge as is reasonably possible while ensuring the maximum visibility from the surface water and shore. The signs shall be installed in such a manner to pose minimal hazard to navigation, bathing or other water related activities. If the public has access to the water from the land in the vicinity of the outfall, an identical sign shall be posted to be visible from the direction approaching the surface water.

The signs shall have **minimum** dimensions of eighteen inches by twenty four inches (18" x 24") and shall have white letters on a green background and contain the following information:

N.Y.S. PERMITTED DISCHARGE POINT

SPDES PERMIT No.: NY__________

OUTFALL No. :____

For information about this permitted discharge contact:

Permittee Name: ____

Permittee Contact: ____

Permittee Phone: ( ) - ### - ####

OR:

NYSDEC Division of Water Regional Office Address:

NYSDEC Division of Water Regional Phone: ( ) - ### -####

(e) For each discharge required to have a sign in accordance with a), the permittee shall, concurrent with the installation of the sign, provide a repository of copies of the Discharge Monitoring Reports (DMRs), as required by the **RECORDING, REPORTING AND ADDITIONAL MONITORING REQUIREMENTS** page of this permit. This repository shall be open to the public, at a minimum, during normal daytime business hours. The repository may be at the business office repository of the permittee or at an off-premises location of its choice (such location shall be the village, town, city or county clerk's office, the local library or other location as approved by the Department). In accordance with the **RECORDING, REPORTING AND ADDITIONAL MONITORING REQUIREMENTS** page of your permit, each DMR shall be maintained on record for a period of five years

(f) The permittee shall periodically inspect the outfall identification sign(s) in order to ensure they are maintained, are still visible, and contain information that is current and factually correct. Signs that are damaged or incorrect shall be replaced within 3 months of inspection.

DISCHARGE NOTIFICATION REQUIREMENTS (continued)

(g) All requirements of the Discharge Notification Act, including public repository requirements, are waived for any outfall meeting any of the following circumstances, provided Department notification is made in accordance with (h) below:

(i) such sign would be inconsistent with any other state or federal statute;

(ii) the Discharge Notification Requirements contained herein would require that such sign could only be located in an area that is damaged by ice or flooding due to a one-year storm or storms of less severity;

(iii) instances in which the outfall to the receiving water is located on private or government property which is restricted to the public through fencing, patrolling, or other control mechanisms. Property which is posted only, without additional control mechanisms, does not qualify for this provision;

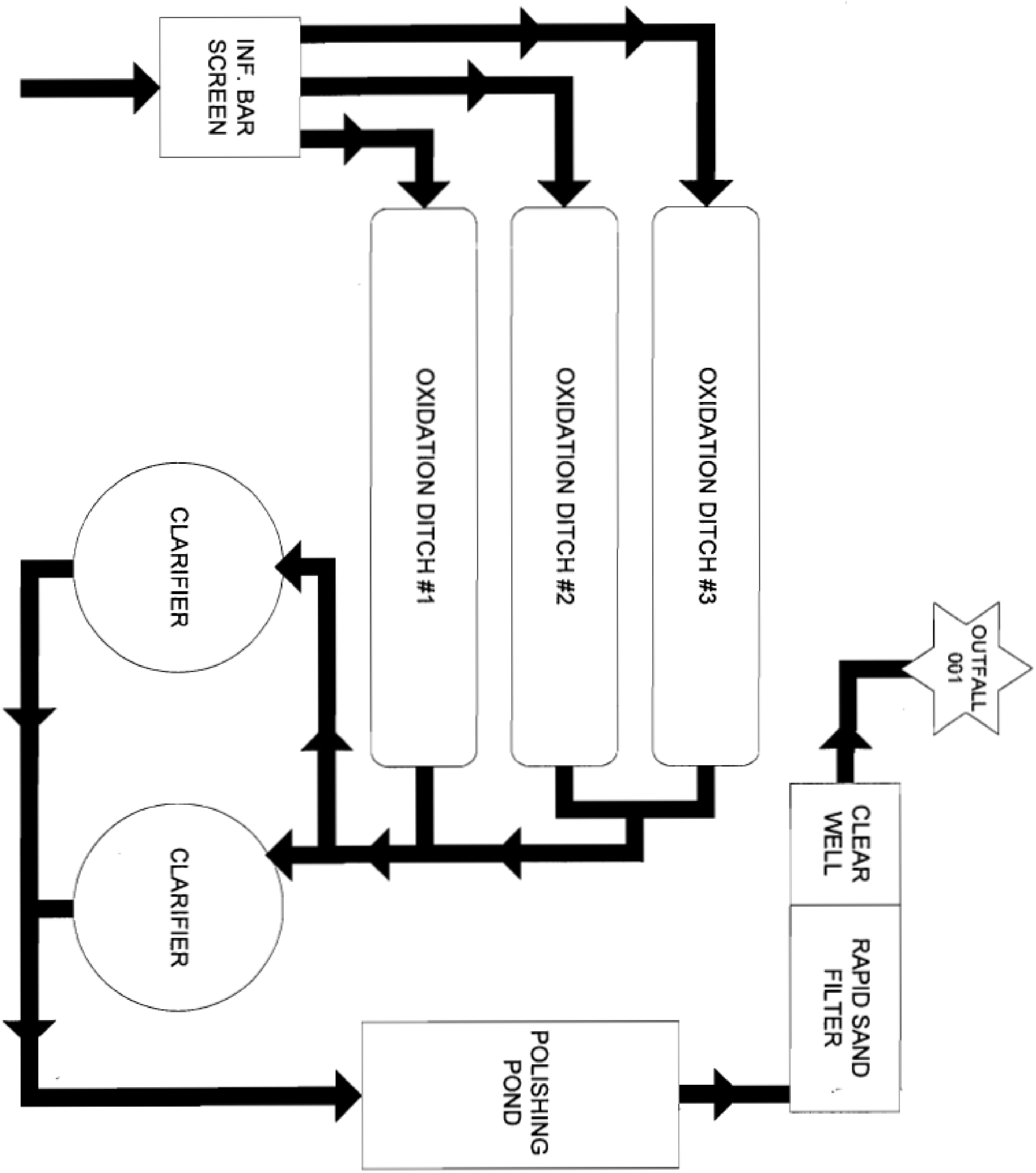
(iv) instances where the outfall pipe or channel discharges to another outfall pipe or channel, before discharge to a receiving water; or

(v) instances in which the discharge from the outfall is located in the receiving water, two-hundred or more feet from the shoreline of the receiving water.

(h) If the permittee believes that any outfall which discharges wastewater from the permitted facility meets any of the waiver criteria listed in (g) above, notification (form enclosed) must be made to the Department's Bureau of Water Permits, 625 Broadway, Albany, N.Y. 12233-3505, of such fact, and, provided there is no objection by the Department, a sign and DMR repository for the involved outfall(s) are not required. This notification must include the facility's name, address, telephone number, contact, permit number, outfall number(s), and reason why such outfall(s) is waived from the requirements of discharge notification. The Department may evaluate the applicability of a waiver at any time, and take appropriate measures to assure that the ECL and associated regulations are complied with.

MONITORING LOCATIONS

The permittee shall take samples and measurements, to comply with the monitoring requirements specified in this permit, at the locations(s) specified below:



GENERAL REQUIREMENTS

A. The regulations in 6 NYCRR Part 750 are hereby incorporated by reference and the conditions are enforceable requirements under this permit. The permittee shall comply with all requirements set forth in this permit and with all the applicable requirements of 6 NYCRR Part 750 incorporated into this permit by reference, including but not limited to the regulations in paragraphs B through I as follows:

B. <u>General Conditions</u>

1.	Duty to comply	6 NYCRR 750-2.1(e) & 2.4
2.	Duty to reapply	6 NYCRR 750-1.16(a)
3.	Need to halt or reduce activity not a defense	6 NYCRR 750-2.1(g)
4.	Duty to mitigate	6 NYCRR 750-2.7(f)
5.	Permit actions	6 NYCRR 750-1.1(c), 1.18, 1.20 & 2.1(h)
6.	Property rights	6 NYCRR 750-2.2(b)
7.	Duty to provide information	6 NYCRR 750-2.1(i)
8.	Inspection and entry	6 NYCRR 750-2.1(a) & 2.3

C. Operation and Maintenance

1.	Proper Operation & Maintenance	6 NYCRR 750-2.8
2.	Bypass	6 NYCRR 750-1.2(a)(17), 2.8(b) & 2.7
3.	Upset	6 NYCRR 750-1.2(a)(94) & 2.8(c)

D. Monitoring and Records

1.	Monitoring and records	6 NYCRR 750-2.5(a)(2), 2.5(a)(6), 2.5(c)(1), 2.5(c)(2), & 2.5(d)
2.	Signatory requirements	6 NYCRR 750-1.8 & 2.5(b)

E. Reporting Requirements

1.	Reporting requirements for POTWs	6 NYCRR 750-2.5, 2.7 & 1.17
2.	Anticipated noncompliance	6 NYCRR 750-2.7(a)
3.	Transfers	6 NYCRR 750-1.17
4.	Monitoring reports	6 NYCRR 750-2.5(e)
5.	Compliance schedules	6 NYCRR 750-1.14(d)
6.	24-hour reporting	6 NYCRR 750-2.7(c) & (d)
7.	Other noncompliance	6 NYCRR 750-2.7(e)
8.	Other information	6 NYCRR 750-2.1(f)
9.	Additional conditions applicable to a POTW	6 NYCRR 750-2.9

F. Planned Changes

1. The permittee shall give notice to the Department as soon as possible of any planned physical alterations or additions to the permitted facility. Notice is required only when:

    a. The alteration or addition to the permitted facility may meet of the criteria for determining whether facility is a new source in 40 CFR §122.29(b); or
    b. The alteration or addition could significantly change the nature or increase the quantity of pollutants discharged. This notification applies to pollutants which are subject neither to effluent limitations in the permit, or to notification requirements under 40 CFR §122.42(a)(1); or
    c. The alteration or addition results in a significant change in the permittee's sludge use or disposal practices, and such alteration, addition, or change may justify the application of permit conditions that are different from or absent in the existing permit, including notification of additional use or disposal sites not reported during the permit application process or not reported pursuant to an approved land application plan.

In addition to the Department, the permittee shall submit a copy of this notice to the United States Environmental Protection Agency at the following address: U.S. EPA Region 2, Clean Water Regulatory Branch, 290 Broadway, 24th Floor, New York, NY 10007-1866.

GENERAL REQUIREMENTS continued

G. Notification Requirement for POTWs

1. All POTWs shall provide adequate notice to the Department and the USEPA of the following:
   a. Any new introduction of pollutants into the POTW from an indirect discharger which would be subject to section 301 or 306 of CWA if it were directly discharging those pollutants; or
   b. Any substantial change in the volume or character of pollutants being introduced into that POTW by a source introducing pollutants into the POTW at the time of issuance of the permit.
   c. For the purposes of this paragraph, adequate notice shall include information on:
      i. the quality and quantity of effluent introduced into the POTW, and
      ii. any anticipated impact of the change on the quantity or quality of effluent to be discharged from the POTW.

POTWs shall submit a copy of this notice to the United States Environmental Protection Agency, at the following address:
U.S. EPA Region 2, Clean Water Regulatory Branch, 290 Broadway, 24th Floor, New York, NY 10007-1866

H. Sludge Management

The permittee shall comply with all applicable requirements of 6 NYCRR Part 360.

I. SPDES Permit Program Fee

The permittee shall pay to the Department an annual SPDES permit program fee within 30 days of the date of the first invoice, unless otherwise directed by the Department, and shall comply with all applicable requirements of ECL 72-0602 and 6 NYCRR Parts 480, 481 and 485. Note that if there is inconsistency between the fees specified in ECL 72-0602 and 6 NYCRR Part 485, the ECL 72-0602 fees govern.

J. Water Treatment Chemicals (WTCs)

New or increased use and discharge of a WTC requires prior Department review and authorization. At a minimum, the permittee must notify the Department in writing of its intent to change WTC use by submitting a completed *WTC Notification Form* for each proposed WTC. The Department will review that submittal and determine if a SPDES permit modification is necessary or whether WTC review and authorization may proceed outside of the formal permit administrative process. The majority of WTC authorizations do not require SPDES permit modification. In any event, use and discharge of a WTC shall not proceed without prior authorization from the Department. Examples of WTCs include biocides, coagulants, conditioners, corrosion inhibitors, defoamers, deposit control agents, flocculants, scale inhibitors, sequestrants, and settling aids.

1. WTC use shall not exceed the rate explicitly authorized by this permit or otherwise authorized in writing by the Department.
2. The permittee shall maintain a logbook of all WTC use, noting for each WTC the date, time, exact location, and amount of each dosage, and, the name of the individual applying or measuring the chemical. The logbook must also document that adequate process controls are in place to ensure that excessive levels of WTCs are not used.
3. The permittee shall submit a completed WTC Annual Report Form each year that they use and discharge WTCs. This form shall be attached to either the December DMR or the annual monitoring report required below.

The *WTC Notification Form and WTC Annual Report Form* are available from the Department's website at:
http://www.dec.ny.gov/permits/93245.html

RECORDING, REPORTING AND ADDITIONAL MONITORING REQUIREMENTS

A. The monitoring information required by this permit shall be summarized, signed and retained for a period of at least five years from the date of the sampling for subsequent inspection by the Department or its designated agent. **Also, monitoring information required by this permit shall be summarized and reported by submitting;**

[X] (if box is checked) completed and signed Discharge Monitoring Report (DMR) forms for each __1__ month reporting period to the locations specified below. Blank forms are available at the Department's Albany office listed below. The first reporting period begins on the effective date of this permit and the reports will be due no later than the 28th day of the month following the end of each reporting period.

[ ] (if box is checked) an annual report to the Regional Water Engineer at the address specified below. The annual report is due by February 1 each year and must summarize information for January to December of the previous year in a format acceptable to the Department.

[X] (if box is checked) a monthly "Wastewater Facility Operation Report..." (form 92-15-7) to the:
[X] Regional Water Engineer and/or [ ] County Health Department or Environmental Control Agency specified below

Send the **original** (top sheet) of each DMR page to:
Department of Environmental Conservation
Division of Water, Bureau of Water Compliance
625 Broadway
Albany, New York 12233-3506

Phone: (518) 402-8177

Send the **first copy** (second sheet) of each DMR page to:
Department of Environmental Conservation
Regional Water Engineer, Region 3
100 Hillside Avenue, Suite 1W
White Plains, New York 10603-2860

Phone: (914) 428-2505

Send an **additional copy** of each DMR page to:

B. Monitoring and analysis shall be conducted according to test procedures approved under 40 CFR Part 136, unless other test procedures have been specified in this permit.

C. More frequent monitoring of the discharge(s), monitoring point(s), or waters of the State than required by the permit, where analysis is performed by a certified laboratory or where such analysis is not required to be performed by a certified laboratory, shall be included in the calculations and recording of the data on the corresponding DMRs.

D. Calculations which require averaging of measurements shall utilize an arithmetic mean unless otherwise specified in this permit.

E. Unless otherwise specified, all information recorded on the DMRs shall be based upon measurements and sampling carried out during the most recently completed reporting period.

F. Any laboratory test or sample analysis required by this permit for which the State Commissioner of Health issues certificates of approval pursuant to section 502 of the Public Health Law shall be conducted by a laboratory which has been issued a certificate of approval. Inquiries regarding laboratory certification should be directed to the New York State Department of Health, Environmental Laboratory Accreditation Program.

APPENDIX C

DRBC Docket

DOCKET NO. D-89-11 CP

DELAWARE RIVER BASIN COMMISSION

Town of Thompson
Kiamesha Lake Sewage Treatment Plant Upgrade/Expansion Project
Town of Thompson, Sullivan County, New York

PROCEEDINGS

This is an application submitted by the Town of Thompson and referred to the Commission, pursuant to an Administrative Agreement under Sections 2-3.4 (a) and 2-3.7 of the Administrative Manual - Part II, Rules of Practice and Procedure, by the New York Department of Environmental Conservation (NYDEC), for review of a sewage treatment plant upgrade and expansion project. The project facilities were approved by the NYDEC on April 1, 1990.

The application was reviewed for inclusion of the project in the Comprehensive Plan and approval under Section 3.8 of the Delaware River Basin Compact. The Sullivan County Planning Board has been notified of pending action on this docket. A public hearing on this project was held by the Delaware River Basin Commission (DRBC) on May 25, 1994.

DESCRIPTION

Purpose.-- The purpose of this project is to provide additional treatment capacity and improve the treatment quality at the applicant's Kiamesha Lake sewage treatment plant (STP).

Location.-- The project STP is located near the east side of an unnamed tributary to Kiamesha Creek in the Town of Thompson, Sullivan County, New York. The STP will continue to discharge to the unnamed tributary of Kiamesha Creek approximately 1,500 feet upstream from its confluence with Kiamesha Creek at River Mile 253.64 - 27.3 - 1.7 - 3.2 - 0.3.

Kiamesha Creek flows to Sheldrake Stream which is a tributary of the Neversink River. The Neversink River flows to the reach of the Delaware River classified as Special Protection-Significant Resource Waters. The boundary control point for this project is at the confluence of the Neversink and Delaware Rivers at River Mile 253.64. The project discharge is approximately 32.5 river miles upstream of the boundary control point.

Service area.-- The area served by the STP is shown on a map in the engineer's report titled "Town of Thompson WWTP Expansion Project" dated January, 1989. The map shows the location of Kiamesha Lake Sewer District and the Ananwana Lake Sewer District, both in the Town of Thompson.

Physical features.

a. Design criteria.-- The expanded STP will provide additional sewage treatment capacity (increased from 1.0 mgd to 2.0 mgd) and improve the treatment quality for the wastewater generated in the existing service area which encompasses the Hamlet of Kiamesha Lake and surrounding residential and commercial developments.

The STP is designed to handle fluctuating flows that typically occur in a summer resort area. The average volume of sewage in the summer months is 70 percent greater than the rest of the year. The new STP expands a 1.0 mgd oxidation ditch activated sludge treatment system with an additional 1.0 mgd capacity oxidation ditch with fine bubble aeration. All effluent will pass through new secondary clarifiers and a new tertiary filter facility prior to discharge to an unnamed tributary of Kiamesha Creek. The applicant is required to provide a high level of BOD and nitrogen removal during the warmer months and a high rate of suspended solids removal year round. All the removal rates during these times are expected to average greater than 90 percent with BOD removal expected to average approximately 98 percent.

The project upgrade was undertaken as part of a Consent Order of Agreement between the NYDEC and the applicant. Due in part to regulatory agency oversight, the project was constructed prior to DRBC review and approval.

b. Facilities.-- The previous facilities consisted of a headwork with screen device; two primary clarifiers; twin 0.5 mgd capacity oxidation ditches, each with an integral secondary clarifier; and a gas chlorinator and chlorine contact tank.

The new STP consists of the addition of a new mechanical bar screen and grit removal system, a new 1.0 mgd capacity oxidation ditch with fine bubble aerators, modification of the previously existing oxidation ditches by addition of fine bubble aeration, conversion of the integral secondary clarifiers to sludge settling tanks, two new circular secondary clarifiers, and a new four cell tertiary sand filter.

c. Other.-- The potable water supply in the project service area is provided by individually owned wells and the Kiamesha Artesian Water Company.

The project facilities are above the 100-year flood elevation.

To operate critical facilities, emergency power is provided with a backup diesel generator that is automatically activated if there is a power outage. An alarm system with automatic telephone dialing to notify key personnel is installed in the event there is a plant power outage or a critical treatment unit failure.

Wasted sludge will be hauled off-site by a licensed hauler for deposit at a State-approved facility.

The New York State National Pollutant Discharge Elimination System (NYSPDES) Permit No. NY0030724 issued by NYDEC on April 1, 1990, includes final effluent limitations for the project discharge. The following average monthly effluent limits are among those listed in the NYSPDES permit.

Parameter	Limit
Waste Flow	2.0 mgd
pH (Standard Units)	6 to 9 at all times
Total Suspended Solids	10 mg/l
*UOD (6-1 to 10-31) (11-1 to 5-31)	15.3 mg/l 32.0 mg/l
*Total Kjeldahl Nitrogen	Monitor
*$CBOD_5$	Monitor
Ammonia Nitrogen (6-1 to 10-31) (11-1 to 5-31)	1.7 mg/l 4.2 mg/l

* UOD is the Ultimate Oxygen Demand and is computed as the total of 4.5 times the Total Kjeldahl Nitrogen (TKN) concentration plus 1.5 times the $CBOD_5$ (UOD = 4.5 TKN + 1.5 $CBOD_5$). The sample of TKN must be obtained concurrently with the sample for $CBOD_5$. Summer BOD_5 is expected to average approximately 5 mg/l; winter approximately 10 mg/l.

The total dissolved solids concentration in the effluent is expected to be less than 500 mg/l.

<u>Cost</u>.-- The overall cost of this project is estimated to be $1,000,000.

<u>Relationship to the Comprehensive Plan</u>.-- The Town of Thompson Kiamesha Lake STP was first included in the DRBC Comprehensive Plan via Addendum No. 2 adopted July 25, 1962. An expansion of the STP was included in the Comprehensive Plan by Docket No. D-69-107 CP approved September 2, 1969.

FINDINGS

The nearest surface water intake of record for public water supply downstream of the project discharge is that of the City of Easton on the Delaware River located more than 102 river miles downstream.

At the project site, the unnamed tributary to Kiamesha Creek is intermittent. The Kiamesha Creek, located approximately 1,500 feet downstream of the discharge, has an estimated seven day low flow with a recurrence interval of ten years ($Q_{7\text{-}10}$ flow) of 0.84 mgd. Sheldrake Stream, located approximately 3.5 river miles downstream of the project discharge, has an estimated $Q_{7\text{-}10}$ flow of 3.1 mgd.

The project discharge is to a stream in the tributary area of the DRBC Special Protection Waters designated as Significant Resource Waters of the Delaware River between River Mile 258.4 (the downstream boundary of the Upper Delaware Scenic and Recreational River) and River Mile 250.1 (the upstream boundary of the Delaware Water Gap National Recreation Area). The boundary control point for the project discharge is at the confluence of the Neversink River with the Delaware River (River Mile 253.64). The NYDEC has determined that the project discharge should not alter the existing water quality at the boundary control point since the project STP is required to produce a high quality effluent, and the point of discharge is located more than 32 river miles upstream of the Special Protection-Significant Resource Waters. The NYDEC has not required disinfection of the wastewater effluent since it has determined that the discharge does not adversely affect intrastate waters.

The limits of the NYSPDES Permit are in compliance with Commission effluent quality requirements, where applicable.

The proposed project is designed to produce a discharge meeting the effluent requirements as set forth in the Water Quality Standards of the DRBC.

The project does not conflict with nor adversely affect the Comprehensive Plan, is physically feasible, and does not adversely influence the present or future use and development of the water resources of the Basin.

DECISION

I. The project, as described above, with modifications specified hereinafter, is hereby added to the Comprehensive Plan.

II. The project is approved pursuant to Section 3.8 of the Compact, subject to the following conditions:

a. Approval is subject to all conditions imposed by the NYDEC.

b. The facility shall be available at all times for inspection by the DRBC.

c. The facility shall be operated at all times to comply with the requirements of the Water Quality Standards of the DRBC.

d. If at any time the receiving treatment plant proves unable to produce an acceptable effluent because of overloading or other reason, no further connections shall be permitted until the deficiency is remedied.

e. Nothing herein shall be construed to exempt the applicant from obtaining all necessary permits and/or approvals from other State, Federal or local government agencies having jurisdiction over this project.

f. The applicant shall submit a statement to the DRBC, signed by the applicant's engineer or other responsible agent, advising the Commission that the construction has been completed in compliance with the approved plans, giving the final construction cost of the approved project, and the date the project is placed into operation.

g. The area served by this project is limited to the service area as described above. Any expansion beyond this area is subject to review in accordance with Section 3.8 of the Compact.

h. Any requirements imposed by the National Pollutant Discharge Elimination System permitting agency shall supersede the requirements of this approval insofar as they impose more stringent treatment criteria.

i. The applicant shall make waste water discharge in such a manner as to avoid injury or damage to fish or wildlife and shall avoid any injury to public or private property. The applicant shall assume all responsibility for any claims arising from the proposed discharges and shall indemnify and hold harmless the Commission against and from any and all claims made by or on behalf of any person arising from any discharges made by the applicant.

j. No sewer service connections shall be made to newly constructed premises with plumbing fixtures and fittings that do not comply with water conservation performance standards contained in Resolution No. 88-2 (Revision 2).

k. Nothing in this docket shall be construed as limiting the authority of DRBC to adopt and apply charges or other fees to this discharge or project to compensate for flow augmentation or other actions necessary to compensate for impacts on the Delaware estuary salinity.

BY THE COMMISSION

DATED: May 25, 1994

APPENDIX D

Historical WWTP Data Summary (January 2017 – June 2019)

DELAWARE ENGINEERING, D.P.C.
CIVIL & ENVIRONMENTAL ENGINEERING
ALBANY – ONEONTA, NEW YORK

Last Revised 08/30/2019

TOWN OF THOMPSON
KIAMESHA LAKE WWTP UPGRADE
HISTORICAL WWTP DATA SUMMARY
(JANUARY 2017 - JUNE 2019)

	PRECIPITATION (WWTP)			FLOW EFFFLUENT				TEMP INF	TEMP INF	TEMP EFF	TEMP EFF	pH INF	pH INF	pH EFF	pH EFF	TSS INFLUENT			TSS EFFLUENT		
	Monthly Total	Monthly Min.	Monthly Max.	Month Avg.	Monthly Min.	Monthly Max.	Avg. Ratio Max. Day	Monthly Avg.	Monthly Max.	Monthly Avg.	Monthly Max.	Monthly Min.	Monthly Max.	Monthly Min.	Monthly Max.	Monthly Avg.	Monthly Min.	Monthly/ 7 day Max.	Monthly Avg.	Monthly Min.	Monthly/ 7day Max.
PERMIT	-	-	-	2	-	-	Month Avg.	-	Mon.	-	Mon.	Mon.	Mon.	6	9	Mon.	-	Mon.	-	-	10
	in./day	in./day	in./day	(MGD)	(MGD)	(MGD)	(MGD)	Deg.F	Deg.F	Deg.F	Deg.F	pH	pH	pH	pH	mg/l	mg/l	mg/l	mg/L	mg/L	mg/L
Jan-17	2.88	0.00	0.62	-*	0.122	0.773	-*	48	58	44	51	6.8	8.2	6.7	8.5	470	905	160	4	4	4
Feb-17	2.41	0.00	0.74	0.410	0.122	1.083	2.64	49	61	46	62	6.4	8.3	6.2	8.3	247	345	146	5	4	7
Mar-17	3.64	0.00	1.53	0.604	0.420	1.307	2.16	48	65	45	54	6.2	9.1	6.4	8.9	162	87	282	4	4	4
Apr-17	1.41	0.00	0.39	0.634	0.434	1.131	1.78	49	55	51	58	6.2	8.5	6.2	7.9	137	84	213	0	< 4	< 4
May-17	3.51	0.00	0.74	0.528	0.394	0.742	1.40	56	66	59	66	6.3	8.3	6.2	8.0	183	78	188	0	< 3	< 3
Jun-17	5.53	0.00	1.25	0.514	0.354	1.010	1.97	62	70	66	70	6.6	8.0	6.4	8.1	178	82	280	0	< 4	< 4
Jul-17	3.50	0.00	1.16	0.555	0.433	0.910	1.64	66	69	70	73	6.4	9.4	6.1	8.0	204	152	278	0	< 4	< 4
Aug-17	2.11	0.00	0.54	0.525	0.403	0.717	1.37	66	69	69	71	6.6	8.0	6.5	7.9	294	166	533	0	< 4	< 4
Sep-17	3.02	0.00	1.02	0.361	0.219	0.944	2.61	64	67	66	70	6.3	7.6	6.3	8.1	242	73	444	5	< 4	18
Oct-17	5.68	0.00	2.36	0.453	0.289	1.710	3.78	62	70	61	70	6.5	7.8	6.6	7.8	510	215	1010	0	< 4	< 4
Nov-17	0.50	0.00	0.12	0.414	0.319	0.477	1.15	54	59	50	66	6.7	7.8	6.9	8.3	175	137	217	0	< 4	< 4
Dec-17	1.46	0.00	0.69	0.422	0.308	0.819	1.94	53	71	50	71	6.4	8.1	6.3	8.3	120	72	187	0	< 4	< 4
Jan-18	2.74	0.00	1.21	0.346	0.324	1.211	3.50	46	60	42	57	5.4	8.4	6.0	8.5	142	88	312	0	< 4	< 4
Feb-18	3.97	0.00	0.64	0.515	0.376	1.222	2.37	43	37	43	37	6.2	8.0	6.0	8.1	102	25	236	17	< 4	34
Mar-18	2.95	0.00	1.51	0.620	0.457	0.853	1.38	46	51	46	52	6.2	7.4	6.0	7.4	140	34	368	0	< 4	< 4
Apr-18	3.49	0.00	0.48	0.617	0.490	1.224	1.98	49	59	50	61	6.1	7.6	6.0	7.7	151	117	174	0	< 4	< 4
May-18	3.10	0.00	0.92	0.533	0.195	1.023	1.92	56	60	57	65	6.7	7.6	6.4	7.6	219	115	340	3	< 4	5
Jun-18	2.14	0.00	0.47	0.483	0.405	0.660	1.37	63	68	65	68	6.1	7.3	6.4	7.4	398	137	826	2	< 5	7
Jul-18	8.08	0.00	3.35	0.689	0.511	1.640	2.38	66	72	69	72	5.9	7.6	6.3	7.5	332	142	837	3	< 5	12
Aug-18	4.92	0.00	1.16	0.698	0.411	0.979	1.40	69	72	71	73	5.9	7.4	6.1	7.3	78	41	119	0	< 5	< 5
Sep-18	5.86	0.00	1.69	0.538	0.343	1.860	3.46	65	72	67	73	5.7	7.5	6.0	7.6	297	230	338	2	< 5	6
Oct-18	4.14	0.00	1.82	0.570	0.438	1.820	3.19	60	64	61	67	6.2	7.3	6.3	7.4	279	95	590	0	< 5	< 5
Nov-18	7.41	0.00	1.27	0.736	0.548	1.195	1.62	52	61	52	61	6.1	7.5	6.2	7.7	110	53	149	0	< 5	< 5
Dec-18	4.93	0.00	1.24	0.658	0.472	1.034	1.57	49	56	46	52	5.2	7.6	6.0	7.3	587	144	1520	0	< 5	< 5
Jan-19	3.50	0.00	1.01	0.575	0.418	0.798	1.39	46	59	45	51	5.8	9.1	6.0	8.4	1190	95	5310	4	< 5	21
Feb-19	2.30	0.00	0.49	0.573	0.256	0.996	1.74	46	56	44	50	6.5	7.7	6.7	7.6	256	121	438	3	< 5	6
Mar-19	1.80	0.00	0.61	0.597	0.432	0.959	1.61	48	59	45	52	6.2	7.5	6.1	7.4	237	57	462	< 5	< 5	5
Apr-19	4.78	0.00	0.71	0.635	0.003	1.145	1.80	52	59	53	59	6.0	7.6	6.1	7.3	191	40	377	< 5	< 5	< 5
May-19	5.82	0.00	1.00	0.694	0.422	1.253	1.81	59	65	58	64	5.9	7.7	6.1	7.6	173	71	219	< 5	< 5	5
Jun-19	3.24	0.00	1.10	0.386	0.244	0.669	1.73	63	70	64	68	6.4	7.4	6.4	7.4	149	67	232	< 5	< 5	< 5
Annual Tot. 17	35.65	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Annual Avg. 17	2.97	0.00	0.93	0.493	0.318	0.969	2.04	56	65	56	65	6.5	8.3	6.4	8.2	243	200	328	1	4	5
Min. 17	0.50	0.00	0.12	0.361	0.122	0.477	1.15	48	55	44	51	6.2	7.6	6.1	7.8	120	72	146	0	3	3
Max. 17	5.68	0.00	2.36	0.634	0.434	1.710	3.78	66	71	70	73	6.8	9.4	6.9	8.9	510	905	1010	5	4	18
Annual Tot.. 18	53.73	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Annual Avg. 18	4.48	0.00	1.31	0.584	0.414	1.227	2.18	55	61	56	62	6.0	7.6	6.1	7.6	236	102	484	2	5	8
Min. 18	2.14	0.00	0.47	0.346	0.195	0.660	1.37	43	37	42	37	5.2	7.3	6.0	7.3	78	25	119	0	4	4
Max. 18	8.08	0.00	3.35	0.736	0.548	1.860	3.50	69	72	71	73	6.7	8.4	6.4	8.5	587	230	1520	17	5	34
Annual Tot.. 19	21.44	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Annual Avg. 19	3.57	0.00	0.82	0.577	0.296	0.970	1.68	52	61	52	57	6.1	7.8	6.2	7.6	366	75	1173	4	5	8
Min. 19	1.80	0.00	0.49	0.386	0.003	0.669	1.39	46	56	44	50	5.8	7.4	6.0	7.3	149	40	219	3	5	5
Max. 19	5.82	0.00	1.10	0.694	0.432	1.253	1.81	63	70	64	68	6.5	9.1	6.7	8.4	1190	121	5310	5	5	21
Total Ave.	3.69	0.00	1.06	0.548	0.352	1.072	2.00	55	63	55	62	6.2	7.9	6.3	7.8	265	136	560	2	4	7
Total Min.	0.50	0.00	0.12	0.346	0.003	0.477	1.15	43	37	42	37	5.2	7.3	6.0	7.3	78	25	119	0	3	3
Total Max.	8.08	0.00	3.35	0.736	0.548	1.860	3.78	69	72	71	73	6.8	9.4	6.9	8.9	1190	905	5310	17	5	34

	CBOD5 INFLUENT			CBOD5 EFFLUENT			Settleable Solids INF	Settleable Solids EFF	Ammonia Nitrogen (as N) EFFLUENT				TKN Nitrogen (as N) EFFLUENT		UOD (1.5 CBOD5 + 4.5 TKN) EFFLUENT		
	Monthly Avg.	Monthly Min.	Monthly/ 7 day Max.	Monthly Avg.	Monthly Min.	Monthly/ 7day Max.	Monthly Max.	Monthly Max.	Monthly Avg. June - Oct.	Monthly Avg. Nov. - May	Monthly Min.	Monthly Max.	Monthly Avg.	Monthly Max.	Monthly Avg.	Monthly Max. June - Oct	Monthly Max. Nov. - May
PERMIT	Mon.	-	Mon.	Mon.	-	Mon.	Mon.	0.1	1.4	2.1	-	-	-	Mon.	-	15.3	32
	mg/l	mg/l	mg/l	mg/L	mg/L	mg/L	mL/L	mL/L	mg/l mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Jan-17	194	102	276	3.0	3	3	66	0.0	-	0.6	0.5	0.8	1.0	1.0	9.0	-	9
Feb-17	128	83	200	3.6	3	4	22	0.0	-	0.5	0.5	0.5	1.0	1.0	9.8	-	11
Mar-17	91	60	114	3.0	3	3	63	0.0	-	0.5	0.5	0.5	1.0	1.0	9.0	-	9
Apr-17	85	62	115	1.6	< 3	6	125	0.0	-	0.0	< 0.5	< 0.5	1.3	5.3	15.0	-	33
May-17	122	169	197	0.0	< 4	< 4	33	0.0	-	0.0	< 0.5	< 0.5	0.2	1.0	0.0	-	< 9
Jun-17	92	69	119	0.0	< 3	< 3	72	0.0	0.0	-	< 0.5	< 0.5	0.0	< 1.0	0.0	< 9	-
Jul-17	131	101	162	0.0	< 3	< 3	34	0.0	0.0	-	< 0.5	< 0.5	0.0	< 1.0	0.0	< 9	-
Aug-17	159	81	276	0.0	< 3	< 3	45	0.0	0.0	-	< 0.5	< 0.5	0.0	< 1.0	0.0	< 9	-
Sep-17	143	69	179	0.8	< 1	3	33	0.0	0.0	-	< 0.5	< 0.5	0.0	< 1.0	0.0	< 9	-
Oct-17	139	68	212	0.9	< 3	3	55	0.0	0.0	-	< 0.5	< 0.5	1.0	1.0	2.5	10	-
Nov-17	125	66	185	0.0	< 3	< 3	26	0.0	-	0.2	< 0.5	< 0.8	0.4	1.1	0.0	< -	9
Dec-17	96	69	119	0.0	< 3	< 3	64	0.0	-	0.2	< 0.5	0.7	0.3	1.2	0.0	-	< 10
Jan-18	90	41	171	0.0	< 3	< 3	24	0.0	-	0.1	< 0.5	0.6	0.4	2.0	0.0	-	< 14
Feb-18	98	30	234	10.1	< 3	19	200	0.0	-	5.4	< 0.5	8.3	9.0	15.0	55.7	-	96
Mar-18	133	30	414	0.8	< 3	4	100	0.0	-	0.6	< 0.5	1.8	1.3	3.7	4.6	-	23
Apr-18	117	83	171	0.0	< 3	< 3	40	0.0	-	0.1	< 0.5	0.5	0.7	1.7	0.0	-	< 12
May-18	149	71	204	0.6	< 3	3	35	0.0	-	0.1	< 0.5	0.6	0.4	1.2	0.0	-	< 10
Jun-18	149	83	219	0.8	< 3	3	100	0.0	0.0	-	< 0.5	< 0.5	0.6	1.2	0.0	< 10	-
Jul-18	113	92	147	3.0	< 3	12	35	0.0	18.9	-	16.0	24.0	19.3	24.0	25.8	< 113	-
Aug-18	92	38	126	2.5	< 3	7	65	0.0	9.0	-	5.9	11.3	10.0	14.0	20.4	< 68	-
Sep-18	175	91	254	6.4	5	7	58	0.0	0.0	-	< 0.5	< 0.5	0.0	< 1.0	0.0	< 11	-
Oct-18	246	101	520	2.3	< 3	6	1000	0.0	0.0	-	< 0.5	< 0.5	0.0	< 1.0	0.0	< 14	-
Nov-18	90	75	147	0.0	< 3	< 3	100	0.0	-	0.4	< 0.5	1.6	0.4	1.5	0.0	< -	11
Dec-18	81	53	129	0.0	< 3	< 3	200	0.0	-	1.2	< 0.5	5.0	1.7	6.8	7.8	-	31
Jan-19	167	65	414	0.7	< 3	3	125	0.0	-	0.2	< 0.5	0.8	0.5	1.2	0.0	-	< 10
Feb-19	205	76	378	0.0	< 3	< 3	100	0.0	-	0.1	< 0.5	0.5	1.0	1.4	0.0	-	< 11
Mar-19	250	54	720	< 3.1	< 3	3	80	0.0	-	< 0.5	< 0.5	< 0.5	< 1.1	1.2	9.6	-	10.05
Apr-19	108	50	194	< 4	< 3	5	90	0.0	-	< 4.0	< 0.5	7.1	4.9	7.7	27.3	-	41.55
May-19	88	62	114	< 3	< 3	4	200	0.0	-	< 3.9	< 0.5	11.3	< 4.8	13.0	26.4	-	63.9
Jun-19	126	60	177	< 7	< 3	9	200	0.0	< 2.3	-	< 0.5	6.2	< 3.0	7.7	24.2	20.75	-
Annual Tot. 17	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Annual Avg. 17	125	83	180	1	3	3	53	0.0	0.0	0.3	0.5	0.6	0.5	1.4	3.8	9.2	12.9
Min. 17	85	60	114	0	1	3	22	0.0	0.0	0.0	0.5	0.5	0.0	1.0	0.0	9.0	9.0
Max. 17	194	169	276	4	4	6	125	0.0	0.0	0.6	0.5	0.8	1.3	5.3	15.0	10.0	33.0
Annual Tot.. 18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Annual Avg. 18	128	66	228	2	3	6	163	0.0	5.6	1.1	2.2	4.6	3.7	6.1	9.5	43.2	28.1
Min. 18	81	30	126	0	3	3	24	0.0	0.0	0.1	0.5	0.5	0.0	1.0	0.0	10.0	10.0
Max. 18	246	101	520	10	5	19	1000	0.0	18.9	5.4	16.0	24.0	19.3	24.0	55.7	113.0	96.0
Annual Tot.. 19	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Annual Avg. 19	157	61	333	3	3	4	133	0.0	-	1.7	0.5	4.4	2.6	5.4	14.6	-	27.3
Min. 19	88	50	114	0	3	3	80	0.0	-	0.1	0.5	0.5	0.5	1.2	0.0	-	10.0
Max. 19	250	76	720	7	3	9	200	0.0	-	4.0	0.5	11.3	4.9	13.0	27.3	-	63.9
Total Ave.	133	72	230	2	3	5	113	0.0	2.7	1.0	1.2	2.9	2.2	4.1	8.2	25.7	22.3
Total Min.	81	30	114	0	1	3	22	0.0	0.0	0.0	0.5	0.5	0.0	1.0	0.0	9.0	9.0
Total Max.	250	169	720	10	5	19	1000	0.0	18.9	5.4	16.0	24.0	19.3	24.0	55.7	113.0	96.0

* No flow measurement after 01/05/19
Red Text Represents Extrapolated Data

APPENDIX E

Influent Flow and Loads Spreadsheet

DELAWARE ENGINEERING, D.P.C.
CIVIL & ENVIRONMENTAL ENGINEERING
ALBANY – ONEONTA, NEW YORK

Last Revised 08/30/19

Town of Thompson, NY
Kiamesha Lake WWTP Upgrade
Influent Flow and Loads Spreadsheet

Use	Flow (MGD)	CBOD (mg/L)	CBOD (lb/day)	BOD[2] (mg/L)	BOD[2] (lb/day)	TSS (mg/L)	TSS (lb/day)	NH_3[3] (mg/L)	NH_3[3] (lb/day)	TKN[3] (mg/L)	TKN[3] (lb/day)
Existing WWTP Flow[1,4]	Σ Below	133	608	190	868	265	1211	15	69	26	119
Baseflow	0.403	-	-	-	-	-	-	-	-	-	-
Casino "A"	0.100	-	-	-	-	-	-	-	-	-	-
Entertainment Village	0.020	-	-	-	-	-	-	-	-	-	-
Water Park	0.025	-	-	-	-	-	-	-	-	-	-
Total Existing WWTP Flow	0.548	-	-	-	-	-	-	-	-	-	-
Future Possible Flows[5]											
Casino "A"	0.021	385	67	550	96	350	61	25	4	45	8
Golf Course	0.020	210	35	300	50	325	54	15	3	26	4
Casino "B"	0.020	385	64	550	92	350	58	25	4	45	8
Entertainment Village	0.076	210	133	300	190	325	206	15	10	26	16
Recreation	0.065	210	114	300	163	325	176	15	8	26	14
Water Park	0.103	210	180	300	258	325	279	15	13	26	22
Reserved Undeveloped Parcel	0.325	210	569	300	813	325	881	15	41	26	70
Future KSD Flows[6]	0.822	133	912	190	1303	265	1817	15	103	26	178
Totals	2.000	-	2683	-	3833	-	4744	-	254	-	440
Average[7]	-	161	-	230	-	284	-	15	-	26	-

[1] CBOD and TSS based on the historical monthly average influent concentration for 2017-June of 2019. See Appendix D - Historical WWTP Data Summary (2017- June 2019)

[2] Estimated from limited influent CBOD data assuming CBOD = 0.7BOD

[3] No influent data; concentrations taken from Table: Kiamesha Lake WWTP Improvements: Sanitary Sewer Load Calcs contained in the January 13, 2016 MH&E Facility Plant for the Kiamesha Lake Water Treatment Plant, Revised April 12, 2016, Page 3.

[4] Based on 2017 thru June 2019 data

[5] Future Possible Flows estimated by subtracting current 2017-2018 flows from those contained in the Table: Kiamesha Lake WWTP Improvements: Sanitary Sewer Load Calcs contained in the January 13, 2016 MH&E Facility Plant for the Kiamesha Lake Water Treatment Plant, Revised April 12, 2016, Page 3.

[6] Future KSD Flows adjusted by 0.700 MGD from the Table: Kiamesha Lake WWTP Improvements: Sanitary Sewer Load Calcs contained in the January 13, 2016 MH&E Facility Plant for the Kiamesha Lake Water Treatment Plant, Revised April 12, 2016, Page 3.

[7] Average concentration computed by total loading (lb/d) divided by the total flow (2.0 MGD).

APPENDIX F

Indebtedness Analysis

Town of Thompson Indebtedness
Estimate* August 2019

Valuation of Taxable Real Estate in the Town of Thompson			
Year	**Amount ($)**	**Equalization Rate (%)**	**Valuation / Equalization Rate**
2019	$1,097,467,881	86.00%	$1,276,125,443
2018	$1,100,268,442	86.00%	$1,279,381,909
2017	$1,112,284,541	88.00%	$1,263,959,706
2016	$1,113,008,050	88.00%	$1,264,781,875
2015	$1,116,837,703	88.00%	$1,269,133,753
		Average =	**$1,265,958,445**

Debt Limit =	**$88,617,091**

Debt Power --- Water not Included			
	a	Average 5 Year AV	$1,265,958,445
	b	7% of Ave 5 Year AV	$88,617,091
	c	Long Term Debt	$4,981,436.61
	d	Bond Anticipation Notes	$3,390,000.00
	e	Total Debt (c+d)	$8,371,436.61
	f	Exclusions	
		Total of Water Debt	$19,838.00
	g	Net Indebtness (e-f)	$8,351,598.61
Unused Debt Capacity	h	Net Debt Contract Margin (b-g)	$80,265,492.52
	i	Debt Contracting Power Exhausted ((g/b)*100)	9.4
	j	Debt Contracting Power Remaining (100-i)	90.6

Debt Power --- Subtracting Sewer too			
	a	Average 5 Year AV	$1,265,958,445
	b	7% of Ave 5 Year AV	$88,617,091
	c	Long Term Debt	$8,371,436.61
	d	Bond Anticipation Notes	$0.00
	e	Total Debt (c+d)	$8,371,436.61
	f	Exclusions	
		Water	$19,838.00
		Sewer	$7,961,908.00
	g	Net Indebtness (e-f)	$389,690.61
Unused Debt Capacity	h	Net Debt Contract Margin (b-g)	$88,227,401
	i	Debt Contracting Power Exhausted ((g/b)*100)	0.4
	j	Debt Contracting Power Remaining (100-i)	99.6

Statement of Indebtedness August 2019

BAN SUMMARY		ORIGINATION DATE	
Ban 1	$90,000.00	12/10/2012	Rock Hill Sewer
Ban 2	$1,500,000.00	7/26/2019	Kiamesha Sewer
Ban 3	$600,000.00	4/4/2019	Emerald Green Sewer
Ban 4	$1,200,000.00	4/4/2019	Emerald Green Sewer
TOTAL	$3,390,000.00		

LONG TERM DEBT			
2015 5 YR Statutory Installment Bond	$103,024.61	12/15/2015	Highway Equipment
2017 5 YR Statutory Installment Bond	$160,000.00	11/21/2017	Highway Equipment
2014 Statutory Installment Bond	$25,000.00	9/4/2014	Emerald Green Sewer
2005/2015 Serial Bond	$126,666.00	4/14/2015	Highway - Bridge Reconstruction
2005/2015 Serial Bond	$1,560,128.00	4/14/2015	Emerald Green Sewer
2005/2015 Serial Bond	$19,838.00	4/14/2015	Cold Spring Water
EFC 0% Refi	$1,848,780.00	12/31/2001	Kiamesha Sewer
EFC Serial Bond	$378,000.00	12/12/2015	Melody Lake Sewer
20 Year Serial Bond	$760,000.00	3/1/2012	Harris Woods Sewer
Total	$4,981,436.61		

LEASES	
	$0.00

TOTAL DEBT	$8,371,436.61

APPENDIX G

Conceptual Cost Estimates for the SBR & MBR Alternatives

Table 3
Town of Thompson, NY
Kiamesha Lake WWTP Upgrade
Conceptual Estimated Project Cost
SBR Alternative

			Major Cost Items Included In Est.
1.)	Construction - All Trades (General, Electrical, HVAC, & Plumbing)		
	a.)	Influent Channel/Flow Splitter Box Process Improvements	$ 34,000
	b.)	Mechanical Screen Process Improvements	$ -
	c.)	Grit Removal Process Improvements	$ -
	d.)	Oxidation Ditch D1 & D2 Process Improvements	$ -
	e.)	Oxidation Ditch D3 Process Improvements	$ -
	f.)	Blower Building Process Improvements	$ -
	g.)	Secondary Clarifier Process Improvements	$ 1,200
	h.)	Filter Building Process Improvements	$ 564,450
	i.)	UV Disinfection Process	$ 1,043,250
	j.)	Polishing Lagoon Process Improvements	$ -
	k.)	Sludge Holding Tank Process Improvements	$ 267,250
	l.)	RAS/WAS Pump Process Improvements	$ 355,200
	m.)	Aerobic Sludge Digester Process	$ 5,171,780
	n.)	Sludge Dewatering Process Improvements	$ 1,033,400
	o.)	Sludge Drying Bed Improvements	$ 401,360
	p.)	Pump Station Process Improvements	$ 46,400
	q.)	Control Building Improvements	$ 191,305
	r.)	Grit Removal Building Improvements	$ 28,150
	s.)	Filter Building Improvements	$ 477,025
	t.)	Storage Building Improvements (old Blower Building)	$ 40,400
	u.)	Blower Building Improvements	$ 63,900
	v.)	WWTP Work Shop/8-Bay Maintenance Building (9,900 SF) - New Item	$ 2,944,100
	w.)	Yard Piping	$ 387,145
	x.)	Site Work (Revised to inlcude Paving limited to WWTP Work Shop area, disturbance <1 AC, no SWPPP req	$ 185,106
	y.)	SCADA	$ 438,000
	z.)	Instrumentation	$ 70,950
	aa.)	WWTP Emergency Generator	$ 576,000
	ab.)	Other Expenses	$ 85,200
	ac.)	SBR Process Equipment & Tank	$ 4,500,000
	ad.)	Post SBR Equilization Tank	$ 1,000,000
	ae.)	NYSEFC Contract Compliance	$ 38,500
	af.)	Contractors Overhead and Profit (15% Max)	$ 2,991,611
	ag.)	Mobilization/Demobilization/Bonds/Insurance (3% Max)	$ 688,070
		Subtotal - All Construction	**$ 23,623,752**
5.)	Construction Cost Inflation Adjustment (@3% per year, August 2019 - Sept. 2021 Bidding = 2 Years)		$ 1,417,425
		Subtotal - Construction Cost Inflation Adjustment	**$ 1,417,425**
		Subtotal - All Construction	**$ 25,041,177**
6.)	Other Costs (18%)		$ 4,507,412
	a.)	Engineering/Professional Services	$ 4,359,460
		Subtotal - Engineering/Professional Services	**$ 4,359,460**
	b.)	Other Town Costs (includes short term financing for preconstruction phase $1.5M @ 5% for 1 year)	$ 147,952
		Subtotal - Other Town Costs	**$ 147,952**
		Subtotal - Other Costs	**$ 4,507,412**
7.)	Project Contingency (10% of Construction and Other Costs)		$ 2,954,859
		Subtotal - Project Contingency (10% of All Project Costs)	**$ 2,954,859**
8.)	SRF Issuance Costs (1.84%) (If hardship this goes to 0%)		$ 598,063
		Subtotal - SRF Issuance Cost (1.84% of All Project Costs)	**$ 598,063**
		Total Estimated Project Cost	**$ 33,101,511**

Table 4
Town of Thompson, NY
Kiamesha Lake WWTP Upgrade
Conceputal Estimated Project Cost
MBR Alternative

			Major Cost Items Included In Est.	
1.)	Construction - All Trades (General, Electrical, HVAC, & Plumbing)			
	a.)	Influent Channel/Flow Splitter Box Process Improvements	$	34,000
	b.)	Mechanical Screen Process Improvements	$	1,245,000
	c.)	Grit Removal Process Improvements	$	-
	d.)	Oxidation Ditch D1 & D2 Process Improvements	$	-
	e.)	Oxidation Ditch D3 Process Improvements	$	-
	f.)	Blower Building Process Improvements	$	-
	g.)	Secondary Clarifier Process Improvements	$	-
	h.)	Filter Building Process Improvements	$	-
	i.)	UV Disinfection Process	$	1,043,250
	j.)	Polishing Lagoon Process Improvements	$	-
	k.)	Sludge Holding Tank Process Improvements	$	267,250
	l.)	RAS/WAS Pump Process Improvements	$	-
	m.)	Aerobic Sludge Digester Process	$	5,171,780
	n.)	Sludge Dewatering Process Improvements	$	1,033,400
	o.)	Sludge Drying Bed Improvements	$	401,360
	p.)	Pump Station Process Improvements	$	46,400
	q.)	Control Building Improvements	$	191,305
	r.)	Grit Removal Building Improvements	$	28,150
	s.)	Filter Building Improvements	$	477,025
	t.)	Storage Building Improvements (old Blower Building)	$	40,400
	u.)	Blower Building Improvements	$	63,900
	v.)	WWTP Work Shop/8-Bay Maintenance Building (9,900 SF) - New Item	$	2,944,100
	w.)	Yard Piping	$	387,145
	x.)	Site Work (Revised to inlcude Paving limited to WWTP Work Shop area, disturbance <1 AC, no SWPPP rec	$	185,106
	y.)	SCADA	$	438,000
	z.)	Instrumentation	$	70,950
	aa.)	WWTP Emergency Generator	$	576,000
	ab.)	Other Expenses	$	85,200
	ac.)	MBR Process Equipment	$	14,000,000
	ad.)	NYSEFC Contract Compliance	$	38,500
	ae.)	Contractors Overhead and Profit (15% Max)	$	4,315,233
	af.)	Mobilization/Demobilization/Bonds/Insurance (3% Max)	$	992,504
		Subtotal - All Construction	**$**	**34,075,958**
5.)	Construction Cost Inflation Adjustment (@3% per year, August 2019 - Sept. 2021 Bidding = 2 Years)		$	2,044,557
		Subtotal - Construction Cost Inflation Adjustment	**$**	**2,044,557**
		Subtotal - All Construction	**$**	**36,120,515**
6.)	Other Costs (18%)		$	6,501,693
	a.)	Engineering/Professional Services	$	6,353,741
		Subtotal - Engineering/Professional Services	**$**	**6,353,741**
	c.)	Other Town Costs	$	147,952
		Subtotal - Other Town Costs	**$**	**147,952**
		Subtotal - Other Costs	**$**	**6,501,693**
7.)	Project Contingency (10% of Construction and Other Costs)		$	4,262,221
		Subtotal - Project Contingency (10% of All Project Costs)	**$**	**4,262,221**
8.)	SRF Issuance Costs (1.84%) (If hardship this goes to 0%)		$	862,673
		Subtotal - SRF Issuance Cost (1.84% of All Project Costs)	**$**	**862,673**
		Total Estimated Project Cost	**$**	**47,747,102**

APPENDIX H

Estimated Project Cost Summary

Table 2
Town of Thompson, NY
Kiamesha Lake WWTP Upgrade
Estimated Project Cost Summary

			Major Cost Items Included In Est.
1.)	Construction - All Trades (General, Electrical, HVAC, & Plumbing)		
	a.)	Influent Channel/Flow Splitter Box Process Improvements	$ 34,000
	b.)	Mechanical Screen Process Improvements	$ -
	c.)	Grit Removal Process Improvements	$ -
	d.)	Oxidation Ditch D1 & D2 Process Improvements	$ 949,140
	e.)	Oxidation Ditch D3 Process Improvements	$ 330,925
	f.)	Blower Building Process Improvements	$ 558,146
	g.)	Secondary Clarifier Process Improvements	$ 1,200
	h.)	Filter Building Process Improvements	$ 564,450
	i.)	UV Disinfection Process	$ 1,043,250
	j.)	Polishing Lagoon Process Improvements	$ -
	k.)	Sludge Holding Tank Process Improvements	$ 267,250
	l.)	RAS/WAS Pump Process Improvements	$ 355,200
	m.)	Aerobic Sludge Digester Process (Added chiller $60,000)	$ 5,171,780
	n.)	Sludge Dewatering Process Improvements and Sludge Tanker Truck	$ 1,033,400
	o.)	Sludge Drying Bed Improvements	$ 401,360
	p.)	Pump Station Process Improvements	$ 46,400
	q.)	Control Building Improvements	$ 191,305
	r.)	Grit Removal Building Improvements	$ 28,150
	s.)	Filter Building Improvements	$ 477,025
	t.)	Storage Building Improvements (old Blower Building)	$ 40,400
	u.)	Blower Building Improvements	$ 63,900
	v.)	WWTP Work Shop/8-Bay Maintenance Building (9,900 SF) - New Item	$ 2,944,100
	w.)	Yard Piping	$ 387,145
	x.)	Site Work (Revised to inlcude Paving limited to WWTP Work Shop area, disturbance <1 AC, no SWPPP re	$ 185,106
	y.)	SCADA	$ 438,000
	z.)	Instrumentation	$ 70,950
	aa.)	WWTP Emergency Generator	$ 576,000
	ab.)	Other Expenses	$ 85,200
	ac.)	NYSEFC Contract Compliance	$ 38,500
	ad.)	Contractors Overhead and Profit (15% Max)	$ 2,442,342
	ae.)	Mobilization/Demobilization/Bonds/Insurance (3% Max)	$ 561,739
		Subtotal - All Construction	**$ 19,286,363**
5.)	Construction Cost Inflation Adjustment (@3% per year, August 2019 - Sept. 2021 Bidding = 2 Years)		$ 1,157,182
		Subtotal - Construction Cost Inflation Adjustment	**$ 20,443,545**
		Subtotal - All Construction	**$ 20,443,545**
6.)	Other Costs (18%)		$ 3,679,838
	a.)	Engineering/Professional Services	$ 3,531,886
		Subtotal - Engineering/Professional Services	**$ 3,531,886**
	b.)	Other Town Costs (includes short term financing for preconstruction phase $1.5M @ 5% for 1 year)	$ 147,952
		Subtotal - Other Town Costs	**$ 147,952**
		Subtotal - Other Costs	**$ 3,679,838**
7.)	Project Contingency (10% of Construction and Other Costs)		$ 2,412,338
		Subtotal - Project Contingency (10% of All Project Costs)	**$ 2,412,338**
8.)	SRF Issuance Costs (1.84%) (If hardship this goes to 0%)		$ 488,257
		Subtotal - SRF Issuance Cost (1.84% of All Project Costs)	**$ 488,257**
		Total Estimated Project Cost	**$ 27,023,978**

APPENDIX I

SRF Application Project Budget and Construction Costs

6. PROJECT BUDGET AND CONSTRUCTION COSTS

A. Total Project Budget for SRF Projects

Category	Anticipated Costs
1. Construction Costs	
Contract 1	$ 16,639,799.00
Contract 2	$ 2,225,770.00
Contract 3	$ 328,107.00
Contract 4	$ 92,687.00
2. Engineering Costs	
a. Planning	$ 37,500.00
b. Design	$ 1,397,754.40
c. Construction	$ 2,096,631.60
d. Other	
3. Other Expenses	
a. Local Counsel	$ 15,000.00
b. Bond Counsel	$ 25,000.00
c. Work Force	
- Technical	
- Administrative	
d. Financial Services	
e. Net Interest	$ 75,000.00
f. Miscellaneous (please describe)	
DRBC Project Review Fee	$ 32,952.00
Construction Cost Inflation Adjustment (3%/Year, 2 Y	$ 1,157,182.00
4. Equipment	
5. Land Acquisition	
6. Contingencies	$ 2,412,338.00
7. Total Project Costs (sum lines 1-6)	$ 26,535,721.00
8. Less: Other Sources of Funding (Provide details in Section 7 of application)	
9. Project Costs to be Financed with SRF (line 7 minus line 8)	$ 26,535,721.00
10. SRF Issuance Costs[1]. Percentages should be applied to line 9.	
a. Direct Expenses (1.0%)	$ 265,357.00
b. State Bond Issuance Charge (.84%)	$ 222,900.00
c. Administrative Fee (1.1%) [2]	
11. **TOTAL COSTS REQUESTED FOR SRF FINANCING (sum of lines 9,10a,10b, and 10c)**	$ 27,023,978.00

[1] Applicable to long-term non-hardship financings

[2] DWSRF only

APPENDIX J

Comprehensive Project Cost Estimate

DELAWARE ENGINEERING, D.P.C.
CIVIL & ENVIRONMENTAL ENGINEERING
ALBANY — ONEONTA, NEW YORK

Table 1
Town of Thompson, NY
Kiamesha Lake WWTP Upgrade
Comprehensive Project Cost Estimate

	Column Formulas =======>	A		B	C = A • B	D	E = D • C	F = C • E		
		Quantity	Units	Unit Cost	Item/Equip. Cost	Installation Factor	Installation Cost	Total/Combined Est. Cost	Major Cost Items Included In Est.	Cumulative Est. Total Cost
1.)	**Construction - General**									
a.)	**Influent Channel/Flow Splitter Box Process Improvements**								$ 28,600	
i.)	Demo, remove, and dispose of the existing flow splitter box weirs	1	Lump Sum	$ 2,000	$ 2,000	0.10	$ 200	$ 2,200		$ 2,200
ii.)	Provide new flow splitter box weir ~~and frame~~ (2-Type 1, 5'W X 2'-6"H), use existing slides	2	Each	$ 2,000	$ 4,000	0.10	$ 400	$ 4,400		$ 6,600
iii.)	Provide new flow splitter box weir ~~and frame~~ (2-Type 2, 2'-2"W X 5'-5"H), use existing slides	2	Each	$ 1,500	$ 3,000	0.10	$ 300	$ 3,300		$ 9,900
vi.)	Provide new flow splitter box gate ~~and frame~~ (2-Type 4, 3'W X 3'H), use existing slides	2	Each	$ 1,500	$ 3,000	0.10	$ 300	$ 3,300		$ 24,200
v.)	Provide new flow splitter box gate ~~and frame~~ (5-Type 5, 2'-6"W X 3'H), use existing slides	5	Each	$ 2,000	$ 10,000	0.10	$ 1,000	$ 11,000		$ 20,900
vi.)	Provide new solid surface grating at mechanical screen (freeze protection)	2	Each	$ 2,000	$ 4,000	0.10	$ 400	$ 4,400		$ 28,600
b.)	**Mechanical Screen Process Improvements**								$ -	
i.)	None	0	Lump Sum	$ -	$ -		$ -	$ -		$ 28,600
c.)	**Grit Removal Process Improvements**								$ -	
i.)	None	0	Lump Sum	$ -	$ -		$ -	$ -		$ 28,600
d.)	**Oxidation Ditch D1 & D2 Process Improvements**								$ 730,140	
i.)	Provide repairs to the existing tank floor and vertical walls as required (allowance)	2	Each	$ 10,000	$ 20,000		$ -	$ 20,000		$ 48,600
ii.)	Provide Structure reconstruction work (major) in each tank	2	Each	$ 25,000	$ 50,000		$ -	$ 50,000		$ 98,600
iii.)	Provide new Oxidation Ditch mixers (replace-in-kind), $245K each	0	Each	$ 245,000	$ -	0.15	$ -	$ -		$ 98,600
(1)	Mixing Alternative A - Reconfigure tank to retro fit to updated mixing system	OR								
(a)	Provide updated mixing system	2	Each	$ 125,000	$ 250,000	0.15	$ 37,500	$ 287,500		$ 386,100
(b)	Other misc. tank work/modifications required	2	Each	$ 25,000	$ 50,000	0.15	$ 7,500	$ 57,500		$ 443,600
(c)	Provide new Davit Crane	6	Each	$ 4,000	$ 24,000	0.15	$ 3,600	$ 27,600		$ 471,200
(d)	Provide misc. metals for new jet pump	1	LF	$ 10,000	$ 10,000	0.20	$ 2,000	$ 12,000		$ 483,200
vi.)	Provide new Oxidation Ditch aeration system diffusers	2	Each	$ 43,300	$ 86,600	0.15	$ 12,990	$ 99,590		$ 582,790
v.)	Provide new diffuser cleaning system	2	Each	$ 5,000	$ 10,000	0.15	$ 1,500	$ 11,500		$ 594,290
vi.)	Air Distribution Piping									
(1)	Demo, remove, and dispose of existing air distribution piping (DIP) to WL, ext. only	1	Lump Sum	$ 10,000	$ 10,000		$ -	$ 10,000		$ 604,290
(1)	Provide new air distribution piping (sch 10 SS)	1	Lump Sum	$ 55,000	$ 55,000	0.20	$ 11,000	$ 66,000		$ 670,290
(1)	Provide new Oxidation Ditch aeration system isolation valves (butterfly wafer style)	1	Lump Sum	$ 25,000	$ 25,000	0.15	$ 3,750	$ 28,750		$ 699,040
(1)	Provide new Oxidation Ditch aeration system modulating (electronically actuated) valves (butterfly wafer :	2	Each	$ 9,000	$ 18,000	0.15	$ 2,700	$ 20,700		$ 719,740
vii.)	Demo, remove, and dispose of the existing chlorine feed system to diffusers	2	Each	$ 5,000	$ 10,000		$ -	$ 10,000		$ 729,740
viii.)	Demo, remove, and dispose of the existing gates	1	Lump Sum	$ 5,000	$ 5,000		$ -	$ 5,000		$ 734,740
ix.)	Provide new gates	2	Each	$ 10,000	$ 20,000	0.20	$ 4,000	$ 24,000		$ 758,740
e.)	**Oxidation Ditch D3 Process Improvements**								$ 312,325	
i.)	Provide repairs to the existing tank floor and vertical walls as required (allowance)	1	Lump Sum	$ 5,000	$ 5,000		$ -	$ 5,000		$ 763,740
ii.)	Provide Structure reconstruction work (major)	0	Lump Sum	$ 25,000	$ -		$ -	$ -		$ 763,740
iii.)	Provide new Oxidation Ditch aeration system diffusers	1	Lump Sum	$ 73,500	$ 73,500	0.20	$ 14,700	$ 88,200		$ 851,940
iv.)	Provide new diffuser cleaning system	1	Each	$ 10,000	$ 10,000	0.15	$ 1,500	$ 11,500		$ 863,440
v.)	Air Distribution Piping									
(1)	Demo, remove, and dispose of existing air distribution piping (DIP) to WL, ext. only	1	Lump Sum	$ 10,000	$ 10,000		$ -	$ 10,000		$ 873,440
(2)	Provide new air distribution piping (sch 10 SS)	1	Lump Sum	$ 55,000	$ 55,000	0.20	$ 11,000	$ 66,000		$ 939,440
(3)	Provide new Oxidation Ditch aeration system isolation valves (butterfly wafer style)	1	Lump Sum	$ 25,000	$ 25,000	0.30	$ 7,500	$ 32,500		$ 971,940
vi.)	Demo, remove, and dispose of the existing chlorine feed system to diffusers	2	Each	$ 5,000	$ 10,000		$ -	$ 10,000		$ 981,940
vii.)	Demo, remove, and dispose of the existing gates	1	Lump Sum	$ 5,000	$ 5,000		$ -	$ 5,000		$ 986,940
viii.)	Air Lift Equipment									
(1)	Demo, remove, and dispose of existing air lift equipment	1	Lump Sum	$ 5,000	$ 5,000		$ -	$ 5,000		$ 991,940
(2)	Provide new air lift equipment	1	Lump Sum	$ 27,500	$ 27,500	0.15	$ 4,125	$ 31,625		$ 1,023,565
iv.)	Other Misc. Work									
(1)	Clean, prep, prime, and paint the existing steel baffle walls (24'L x 13'-6"H)	1	Lump Sum	$ 10,000	$ 10,000	0.15	$ 1,500	$ 11,500		$ 1,035,065
(2)	Provide new walkways and stairs to new mixers	1	Lump Sum	$ 30,000	$ 30,000	0.20	$ 6,000	$ 36,000		$ 1,071,065
f.)	**Blower Building Process Improvements**								$ 536,846	
i.)	Demo, remove, and dispose of the existing oxidation ditch blowers	1	Lump Sum	$ 7,500	$ 7,500		$ -	$ 7,500		$ 1,078,565
ii.)	Piping modification/new piping (12" carbon steel)	1	Lump Sum	$ 15,000	$ 15,000	0.20	$ 3,000	$ 18,000		$ 1,096,565
iii.)	Provide new Blowers (rotary screw FBS660L-SFC – 100hp – 5875rpm Rotary Screw Blower Package: (~turn-	3	Each	$ 115,000	$ 345,000	0.15	$ 51,750	$ 396,750		$ 1,493,315
iv.)	Provide new blower isolation valves (butterfly wafer style)	6	Each	$ 2,000	$ 12,000	0.15	$ 1,800	$ 13,800		$ 1,507,115
v.)	Valve Pit/Area									
(1)	Demo, remove, and dispose of existing sludge control valves	1	Lump Sum	$ 5,000	$ 5,000		$ -	$ 5,000		$ 1,512,115
(2)	Provide new pinch valves (10") (flow control)	3	Each	$ 15,000	$ 45,000	0.15	$ 6,750	$ 51,750		$ 1,563,865
(3)	Provide new plug valves (10") with electronic actuator	3	Each	$ 10,564	$ 31,692	0.15	$ 4,754	$ 36,446		$ 1,600,311
vi.)	Demo, remove, and dispose of the existing chlorine feed equipment	1	Lump Sum	$ 3,000	$ 3,000		$ -	$ 3,000		$ 1,603,311

DELAWARE ENGINEERING, D.P.C.
CIVIL & ENVIRONMENTAL ENGINEERING
ALBANY – ONEONTA, NEW YORK

Table 1
Town of Thompson, NY
Kiamesha Lake WWTP Upgrade
Comprehensive Project Cost Estimate

	Column Formulas =======>	A		B	C = A • B	D	E = D • C	F = C • E		
		Quantity	Units	Unit Cost	Item/Equip. Cost	Installation Factor	Installation Cost	Total/Combined Est. Cost	Major Cost Items Included In Est.	Cumulative Est. Total Cost
vii.)	Provide new sump pump	1	Lump Sum	$ 4,000	$ 4,000	0.15	$ 600	$ 4,600		$ 1,607,911
g.)	**Secondary Clarifier Process Improvements**								$ -	
i.)	None	0	Lump Sum	$ -	$ -		$ -	$ -		$ 1,607,911
h.)	**Filter Building Process Improvements**								$ 528,050	
i.)	Demo, remove, and dispose of existing BW Pump and Control Panel	1	Lump Sum	$ 5,000	$ 5,000		$ -	$ 5,000		$ 1,612,911
ii.)	Provide new BW Pump (submersible) and Control Panel w/ VFD	2	Each	$ 167,000	$ 334,000	0.20	$ 66,800	$ 400,800		$ 2,013,711
iii.)	Demo, remove, and dispose of existing NPW Pump and Control Panel	1	Lump Sum	$ 2,500	$ 2,500		$ -	$ 2,500		$ 2,016,211
iv.)	Provide new NPW Pumps and Control Panel w/ VFD's	2	Each	$ 9,500	$ 19,000	0.20	$ 3,800	$ 22,800		$ 2,039,011
v.)	Provide new 4" DIP piping and connections for NPW Pumps	1	Lump Sum	$ 6,000	$ 6,000	0.20	$ 1,200	$ 7,200		$ 2,046,211
vi.)	Post Aeration Tank									
	(1) Demo, remove, and dispose of existing diffusers and piping	1	Lump Sum	$ 500	$ 500		$ -	$ 500		$ 2,046,711
	(2) Provide new fine bubble diffusers, and piping	1	Lump Sum	$ 15,000	$ 15,000	0.15	$ 2,250	$ 17,250		$ 2,063,961
	(3) Provide new post aeration blowers	2	Lump Sum	$ 30,000	$ 60,000	0.20	$ 12,000	$ 72,000		$ 2,135,961
i.)	**UV Disinfection Process**								$ 971,050	
i.)	Provide new structure foundation - 30'W X 60'L X 10" Slab	1800	SF	$ 240	$ 432,000		$ -	$ 432,000		$ 2,567,961
ii.)	Provide new UV Building Structure - 30'W X 60'L, 1,800 SF	1	Lump Sum	$ 135,000	$ 135,000	0.20	$ 27,000	$ 162,000		$ 2,729,961
iii.)	Provide new UV Disinfection System	3	Each	$ 93,000	$ 279,000	0.15	$ 41,850	$ 320,850		$ 3,050,811
iv.)	Provide support for existing 24" DIP Pipe, temporary	1	Lump Sum	$ 8,000	$ 8,000	0.20	$ 1,600	$ 9,600		$ 3,060,411
v.)	Provide new process piping	1	Lump Sum	$ 18,000	$ 18,000	0.20	$ 3,600	$ 21,600		$ 3,082,011
vi.)	Misc. Metals	1	Lump Sum	$ 25,000	$ 25,000		$ -	$ 25,000		$ 3,107,011
j.)	**Polishing Lagoon Process Improvements**								$ -	
i.)	None	0	Lump Sum	$ -	$ -		$ -	$ -		$ 3,107,011
k.)	**Sludge Holding Tank Process Improvements**								$ 261,250	
i.)	Tank work misc., for both tanks	1	Lump Sum	$ 10,000	$ 10,000		$ -	$ 10,000		$ 3,117,011
ii.)	Provide new Sludge Holding Tank Blower, located at tank	3	Lump Sum	$ 55,000	$ 165,000	0.20	$ 33,000	$ 198,000		$ 3,315,011
iii.)	Provide air piping (SS) and valves	1	Lump Sum	$ 30,000	$ 30,000	0.20	$ 6,000	$ 36,000		$ 3,351,011
vi.)	Provide new course bubble diffuser system, for both tanks	2	Lump Sum	$ 7,500	$ 15,000	0.15	$ 2,250	$ 17,250		$ 3,368,261
l.)	**RAS/WAS Pump Process Improvements**								$ 331,200	
i.)	Demo, remove, and dispose of existing Smith & Loveless Pumps	1	Lump Sum	$ 15,000	$ 15,000		$ -	$ 15,000		$ 3,383,261
ii.)	Provide new Smith & Loveless Pumps and Control Panel w/ VFD's	4	Lump Sum	$ 40,000	$ 160,000	0.20	$ 32,000	$ 192,000		$ 3,575,261
iii.)	Provide New RAS/WAS Isolation Plug Valves (10"), located in the Filter Building	8	Lump Sum	$ 8,500	$ 68,000	0.15	$ 10,200	$ 78,200		$ 3,653,461
iv.)	Provide New RAS/WAS Check Valves (10")	4	Lump Sum	$ 10,000	$ 40,000	0.15	$ 6,000	$ 46,000		$ 3,699,461
m.)	**Aerobic Sludge Digester Process**								$ 4,920,730	
i.)	ATAD									
	(1) Provide new ATAD System, including Drum Thickener and Control Panel	1	Lump Sum	$ 2,000,000	$ 2,000,000	0.20	$ 400,000	$ 2,400,000		$ 6,099,461
	(2) Provide new ATAD Process Tanks, Slab: 92'L X 30' X 24" = 205 CY, Wall: 256LF, 20', 2'-6" thick = 475 C	780	CY	$ 1,800	$ 1,404,000		$ -	$ 1,404,000		$ 7,503,461
	(3) Provide new ATAD Process Building 70'L X 40'W = 2.800 SF	2800	CY	$ 180	$ 504,000		$ -	$ 504,000		$ 8,007,461
	(4) Provide new ATAD Process Piping	1	Lump Sum	$ 60,000	$ 60,000		$ -	$ 60,000		$ 8,067,461
	(5) Provide new sludge pumps (moyno) (100 gpm) (2-duty, spare on shelf)	3	Lump Sum	$ 15,000	$ 45,000	0.15	$ 6,750	$ 51,750		$ 8,119,211
ii.)	Septage Receiving Station									
	(1) Provide new Septage Receiving Station (400 gpm)	1	Lump Sum	$ 175,000	$ 175,000	0.15	$ 26,250	$ 201,250		$ 8,320,461
	(2) Hauler access station	1	Lump Sum	$ 32,500	$ 32,500	0.10	$ 3,250	$ 35,750		$ 8,356,211
	(3) Provide new Septage Receiving Tank (8,000 gal., 8'W X 24'L X 7'-6"D) Slab: 30'L X 10' X18" = 18 CY, W	53	CY	$ 1,800	$ 95,400	0.20	$ 19,080	$ 114,480		$ 8,470,691
	(4) Provide new Septage Receiving Building (24'L X 24' open sided = 575 SF @ $125/SF	575	SF	$ 125	$ 71,875	0.20	$ 14,375	$ 86,250		$ 8,556,941
	(5) Provide new Septage Receiving Tank mixer	1	Lump Sum	$ 45,000	$ 45,000	0.15	$ 6,750	$ 51,750		$ 8,608,691
	(6) Provide new Septage Receiving Tank piping	1	Lump Sum	$ 10,000	$ 10,000	0.15	$ 1,500	$ 11,500		$ 8,620,191
n.)	**Sludge Dewatering Process Improvements**								$ 990,000	
i.)	Demo, remove, and dispose of existing press equipment	1	Lump Sum	$ 10,000	$ 10,000		$ -	$ 10,000		$ 8,630,191
ii.)	Provide new Sludge Dewatering Press (2M BFP), Control Panel and Ancillary Equipment	1	Lump Sum	$ 750,000	$ 750,000	0.20	$ 150,000	$ 900,000		$ 9,530,191
iii.)	Provide new Tanker Truck	1	Lump Sum	$ 80,000	$ 80,000		$ -	$ 80,000		$ 9,610,191
o.)	**Sludge Drying Bed Improvements**								$ 401,360	
i.)	Demo, remove, and dispose of existing fiberglass roof	1	Lump Sum	$ 15,000	$ 15,000		$ -	$ 15,000		$ 9,625,191
ii.)	Provide new fiberglass roof w/ ridge vent	31100	Lump Sum	$ 2	$ 62,200	0.80	$ 49,760	$ 111,960		$ 9,737,151
iii.)	Provide new metal roof (sludge dewatering area) (70' X70' = 4,900 SF)	4900	Lump Sum	$ 40	$ 196,000	0.40	$ 78,400	$ 274,400		$ 10,011,551

DELAWARE ENGINEERING, D.P.C.
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ALBANY – ONEONTA, NEW YORK

Table 1
Town of Thompson, NY
Kiamesha Lake WWTP Upgrade
Comprehensive Project Cost Estimate

	Column Formulas =======>	A		B	C = A • B	D	E = D • C	F = C • E		
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p.)	**Pump Station Process Improvements**								$ 44,400	
i.)	Site Pump Station Work ($10,000), Pumps and Control Panel ($27,000)	1	Lump Sum	$ 37,000	$ 37,000	0.20	$ 7,400	$ 44,400		$ 10,055,951
q.)	**Control Building Improvements**								$ 191,305	
i.)	Provide new metal roof	3680	Lump Sum	$ 40	$ 147,200		$ -	$ 147,200		$ 10,203,151
ii.)	Lunch Room/Existing UV Bldg. - Provide new metal roof	722	Lump Sum	$ 40	$ 28,880		$ -	$ 28,880		$ 10,232,031
iii.)	Walkway Lunch Room/Existing UV Bldg. - Provide new rubber roof	190	Lump Sum	$ 65	$ 12,350		$ -	$ 12,350		$ 10,244,381
iv.)	Doors	1	Lump Sum	$ 2,500	$ 2,500	0.15	$ 375	$ 2,875		$ 10,247,256
v.)	Windows?	0	Lump Sum	$ -	$ -		$ -	$ -		$ 10,247,256
vi.)	Floors?	0	Lump Sum	$ -	$ -		$ -	$ -		$ 10,247,256
r.)	**Grit Removal Building Improvements**								$ 9,000	
i.)	Provide new metal roof	225	Lump Sum	$ 40	$ 9,000		$ -	$ 9,000		$ 10,256,256
ii.)	Demo, remove, and dispose of the existing roll-up door(s)	0	Lump Sum	$ -	$ -		$ -	$ -		$ 10,256,256
iii.)	Demo, remove, and dispose of the existing mandoor(s) - None	0	Lump Sum	$ -	$ -		$ -	$ -		$ 10,256,256
iv.)	Demo, remove, and dispose of the existing window(s) - None	0	Lump Sum	$ -	$ -		$ -	$ -		$ 10,256,256
v.)	Provide new roll-up door (s)	0	Lump Sum	$ -	$ -		$ -	$ -		$ 10,256,256
vi.)	Demo, remove, and dispose of the existing mandoor(s) - None	0	Lump Sum	$ -	$ -		$ -	$ -		$ 10,256,256
vii.)	Demo, remove, and dispose of the existing window(s) - None	0	Lump Sum	$ -	$ -		$ -	$ -		$ 10,256,256
s.)	**Filter Building Improvements**								$ 408,325	
i.)	Provide new metal roof	8810	SF	$ 40	$ 352,400		$ -	$ 352,400		$ 10,608,656
ii.)	Demo, remove, and dispose of existing mandoor	1	Lump Sum	$ 1,500	$ 1,500	0.20	$ 300	$ 1,800		$ 10,610,456
iii.)	Provide new mandoor	1	Lump Sum	$ 2,500	$ 2,500	0.15	$ 375	$ 2,875		$ 10,613,331
iv.)	Demo, remove, and dispose of existing fuel oil tank and Bldg.	1	Lump Sum	$ 2,500	$ 2,500		$ -	$ 2,500		$ 10,615,831
v.)	Provide new convault fuel oil tank	1	Lump Sum	$ 7,500	$ 7,500	0.20	$ 1,500	$ 9,000		$ 10,624,831
vi.)	Install concrete curb on front of Bldg. and repair rusting panels.	1	Lump Sum	$ 10,500	$ 10,500	0.50	$ 5,250	$ 15,750		$ 10,640,581
vii.)	Paint Bldg. interior areas filter area and equipment area	1	Lump Sum	$ 10,000	$ 10,000	0.20	$ 2,000	$ 12,000		$ 10,652,581
viii.)	Paint Bldg. exterior	1	Lump Sum	$ 10,000	$ 10,000	0.20	$ 2,000	$ 12,000		$ 10,664,581
t.)	**Storage Building Improvements (old Blower Building)**								$ 40,400	
i.)	Provide new metal roof	1010	Lump Sum	$ 40	$ 40,400		$ -	$ 40,400		$ 10,704,981
ii.)	Doors?	0	Lump Sum	$ 2,500	$ -	0.15	$ -	$ -		$ 10,704,981
iii.)	Windows?	0	Lump Sum	$ -	$ -	0.30	$ -	$ -		$ 10,704,981
u.)	**Blower Building Improvements**								$ 40,400	
i.)	Provide new metal roof	1010	SF	$ 40	$ 40,400		$ -	$ 40,400		$ 10,745,381
ii.)	Doors?	0	Lump Sum	$ 2,500	$ -	0.15	$ -	$ -		$ 10,745,381
iii.)	Windows?	0	Lump Sum	$ 30	$ -	0.30	$ -	$ -		$ 10,745,381
v.)	**WWTP Work Shop/8-Bay Maintenance Building (9,900 SF)**								$ 2,787,500	
i.)	Demo, remove, and dispose of two existing buildings	1	LS	$ 25,000	$ 25,000		$ -	$ 25,000		$ 10,770,381
ii.)	Site clearing and grubbing	1	Lump Sum	$ 40,000	$ 40,000		$ -	$ 40,000		$ 10,810,381
iii.)	Provide new WWTP Work Shop/Maintenance Building	9900	SF	$ 275	$ 2,722,500		$ -	$ 2,722,500		$ 13,532,881
w.)	**Yard Piping**								$ 249,765	
Grit	Provide new 6" DIP NPW water line from FB/UV Bldg. to new ATAD Bldg.	320	LF	$ 135	$ 43,200	0.15	$ 6,480	$ 49,680		$ 13,582,561
i.)	Provide new 6" DIP NPW water line from FB/UV Bldg. to existing Sludge Dewatering Bldg.	400	LF	$ 135	$ 54,000	0.15	$ 8,100	$ 62,100		$ 13,644,661
ii.)	Provide new 6" DIP NPW water line from ATAD Bldg. to FB/UV Bldg. (cooling loop)	320	LF	$ 135	$ 43,200	0.15	$ 6,480	$ 49,680		$ 13,694,341
iii.)	Provide new 2" CU PW water line from water main to new ATAD Bldg.	100	LF	$ 90	$ 9,000	0.15	$ 1,350	$ 10,350		$ 13,704,691
iv.)	Replace existing and provide new 6" DIP sludge piping from the existing Sludge Holding Tanks to the new AT	100	LF	$ 135	$ 13,500	0.15	$ 2,025	$ 15,525		$ 13,720,216
v.)	Replace existing and provide new 6" DIP sludge piping from the existing Sludge Holding Tanks to the Sludge	580	LF	$ 90	$ 52,200	0.15	$ 7,830	$ 60,030		$ 13,780,246
vi.)	Provide new 1'1/2" Copper water line to the to the WWTP Work Shop/Maintenance Building	1	LS	$ 2,000	$ 2,000	0.20	$ 400	$ 2,400		$ 13,782,646
x.)	**Site Work**								$ 170,106	
i.)	Relocate existing WWTP Fence (400 LF)	1	Lump Sum	$ 4,000	$ 4,000	0.20	$ 800	$ 4,800		$ 13,787,446
ii.)	Existing Paved Area									
	(1) WWTP Site - Demo, remove & dispose of existing pavement and 8" subbase (17,000 SF)	0	SF	$ 0.20	$ -		$ -	$ -		$ 13,787,446
	(2) WWTP Site - Provide new woven geotextile for new pavement system (17,000 SF)	0	SF	$ 0.15	$ -		$ -	$ -		$ 13,787,446
	(3) WWTP Site - Provide new subbase - 8" compacted item 4 gravel over geotextile	0	CY	$ 30	$ -		$ -	$ -		$ 13,787,446

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Last Revised 08-30-2019

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Kiamesha Lake WWTP Upgrade
Comprehensive Project Cost Estimate

Item	Column Formulas =======>	A		B	C = A • B	D	E = D • C	F = C • E		
		Quantity	Units	Unit Cost	Item/Equip. Cost	Installation Factor	Installation Cost	Total/Combined Est. Cost	Major Cost Items Included In Est.	Cumulative Est. Total Cost
	8" compacted item 4 gravel = 17,000 SF x 1.1 compaction x 8/12 =12,500 cf/27 = 462 CY)									$ 13,787,446
(4)	WWTP Site - Provide new hot mix asphalt - 3" Type 1 Base compacted	0	Ton	$ 52	$ -	0.80	$ -	$ -		$ 13,787,446
	qty = 17,000 SF x 1.1 compaction x 3/12 x 140 lb/cf /2000 lb/ton = 330 Ton									
(5)	WWTP Site - Provide new hot mix asphalt - 2" Type 3 Binder compacted	0	Ton	$ 53	$ -	0.80	$ -	$ -		$ 13,787,446
	qty = 17,000 SF x 1.1 compaction x 2/12 x 140 lb/cf /2000 lb/ton = 220 Ton									
(6)	WWTP Site - Provide new hot mix asphalt - 1.5" Type 6 Top compacted	0	Ton	$ 57	$ -	0.80	$ -	$ -		$ 13,787,446
	qty = 17,000 SF x 1.1 compaction x 1.5/12 x 140 lb/cf /2000 lb/ton = 165 Ton									
iii.)	New Paved Area to Sludge Drying Bed									
(1)	WWTP Site - Demo, remove & dispose of existing pavement and 8" subbase (12,000 SF)	0	SF	$ 0.20	$ -		$ -	$ -		$ 13,787,446
(2)	WWTP Site - Provide new woven geotextile for new pavement system (12,000 SF)	0	SF	$ 0.15	$ -		$ -	$ -		$ 13,787,446
(3)	WWTP Site - Provide new subbase - 8" compacted item 4 gravel over geotextile	0	CY	$ 30	$ -		$ -	$ -		$ 13,787,446
	8" compacted item 4 gravel = 12,000 SF x 1.1 compaction x 8/12 =8,800 cf/27 = 326 CY)									$ 13,787,446
(4)	WWTP Site - Provide new hot mix asphalt - 3" Type 1 Base compacted	0	Ton	$ 52	$ -	0.80	$ -	$ -		$ 13,787,446
	qty = 12,000 SF x 1.1 compaction x 3/12 x 140 lb/cf /2000 lb/ton = 233 Ton									
(5)	WWTP Site - Provide new hot mix asphalt - 2" Type 3 Binder compacted	0	Ton	$ 53	$ -	0.80	$ -	$ -		$ 13,787,446
	qty = 12,000 SF x 1.1 compaction x 2/12 x 140 lb/cf /2000 lb/ton = 155 Ton									
(6)	WWTP Site - Provide new hot mix asphalt - 1.5" Type 6 Top compacted	0	Ton	$ 57	$ -	0.80	$ -	$ -		$ 13,787,446
	qty = 12,000 SF x 1.1 compaction x 1.5/12 x 140 lb/cf /2000 lb/ton = 120 Ton									
iv.)	New Paved Area to in front of Filter Building and ATAD Building									
(1)	WWTP Site - Demo, remove & dispose of existing pavement and 8" subbase (10,900 SF)	10900	SF	$ 0.20	$ 2,180		$ -	$ 2,180		$ 13,789,626
(2)	WWTP Site - Provide new woven geotextile for new pavement system (10,900 SF)	10900	SF	$ 0.15	$ 1,635		$ -	$ 1,635		$ 13,791,261
(3)	WWTP Site - Provide new subbase - 8" compacted item 4 gravel over geotextile	296	CY	$ 30	$ 8,880		$ -	$ 8,880		$ 13,800,141
	8" compacted item 4 gravel = 10,900 SF x 1.1 compaction x 8/12 =7,993 cf/27 = 296 CY)									$ 13,800,141
(4)	WWTP Site - Provide new hot mix asphalt - 3" Type 1 Base compacted	209	Ton	$ 52	$ 10,868	0.80	$ 8,694	$ 19,562		$ 13,819,703
	qty = 10,900 SF x 1.1 compaction x 3/12 x 140 lb/cf /2000 lb/ton = 209 Ton									
(5)	WWTP Site - Provide new hot mix asphalt - 2" Type 3 Binder compacted	139	Ton	$ 53	$ 7,367	0.80	$ 5,894	$ 13,261		$ 13,832,964
	qty = 10,900 SF x 1.1 compaction x 2/12 x 140 lb/cf /2000 lb/ton = 139 Ton									
(6)	WWTP Site - Provide new hot mix asphalt - 1.5" Type 6 Top compacted	105	Ton	$ 57	$ 5,985	0.80	$ 4,788	$ 10,773		$ 13,843,737
	qty = 10,900 SF x 1.1 compaction x 1.5/12 x 140 lb/cf /2000 lb/ton = 105 Ton									
v.)	Site work for new ATAD Building	1	Lump Sum	$ 15,000	$ 15,000	0.20	$ 3,000	$ 18,000		$ 13,861,737
vi.)	Site work for new WWTP Shop/Maintenance Building (i.e., bollards)	1	Lump Sum	$ 2,000	$ 2,000	0.20	$ 400	$ 2,400		$ 13,864,137
vii.)	New Paved Area around WWTP Work Shop/Maintenace Building									
(1)	WWTP Site - Demo, remove & dispose of existing pavement and 8" subbase (17,000 SF)	17000	SF	$ 0.20	$ 3,400		$ -	$ 3,400		$ 13,867,537
(2)	WWTP Site - Provide new woven geotextile for new pavement system (17,000 SF)	17000	SF	$ 0.15	$ 2,550		$ -	$ 2,550		$ 13,870,087
(3)	WWTP Site - Provide new subbase - 8" compacted item 4 gravel over geotextile	462	CY	$ 30	$ 13,860		$ -	$ 13,860		$ 13,883,947
	8" compacted item 4 gravel = 17,000 SF x 1.1 compaction x 8/12 =12,500 cf/27 = 462 CY)									$ 13,883,947
(4)	WWTP Site - Provide new hot mix asphalt - 3" Type 1 Base compacted	330	Ton	$ 52	$ 17,160	0.80	$ 13,728	$ 30,888		$ 13,914,835
	qty = 17,000 SF x 1.1 compaction x 3/12 x 140 lb/cf /2000 lb/ton = 330 Ton									
(5)	WWTP Site - Provide new hot mix asphalt - 2" Type 3 Binder compacted	220	Ton	$ 53	$ 11,660	0.80	$ 9,328	$ 20,988		$ 13,935,823
	qty = 17,000 SF x 1.1 compaction x 2/12 x 140 lb/cf /2000 lb/ton = 220 Ton									
(6)	WWTP Site - Provide new hot mix asphalt - 1.5" Type 6 Top compacted	165	Ton	$ 57	$ 9,405	0.80	$ 7,524	$ 16,929		$ 13,952,752
	qty = 17,000 SF x 1.1 compaction x 1.5/12 x 140 lb/cf /2000 lb/ton = 165 Ton									
y.)	**SCADA (In Electrical Contract - See below)**								$ -	
i.)	None	0	Lump Sum	$ -	$ -		$ -	$ -		$ 13,952,752
z.)	**Instrumentation (In Electrical Contract - See below)**								$ -	
i.)	None	0	Lump Sum	$ -	$ -		$ -	$ -		$ 13,952,752
aa.)	**WWTP Emergency Generator (In Electrical Contract - See below)**								$ -	
i.)	None	0	Lump Sum	$ -	$ -		$ -	$ -		$ 13,952,752
ab.)	**Other Expenses**								$ 85,200	
i.)	Provide new canopy over new/or existing? septage receiving station (20' X 20') = 400 SF	400	SF	$ 65	$ 26,000	0.20	$ 5,200	$ 31,200		$ 13,983,952
ii.)	Misc. metal maintenance and painting	1	LS	$ 45,000	$ 45,000	0.20	$ 9,000	$ 54,000		$ 14,037,952
ac.)	**NYSEFC Contract Compliance**								$ 10,000	
i.)	Subcontractor Solicitation, Contracting and Coordination	1	Lump Sum	$ 5,000	$ 5,000		$ -	$ 5,000		$ 14,042,952
ii.)	NYSEFC Project Paperwork (e.g., utilization plan, monthly reports, project inspection, etc.)	1	Lump Sum	$ 5,000	$ 5,000		$ -	$ 5,000		$ 14,047,952

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ad.) Contractors Overhead and Profit (15% Max)	1	Lump Sum	$ 2,107,193	$ 2,107,193		$ -	$ 2,107,193	$ 2,107,193	$ 16,155,145
ae.) Mobilization/Demobilization/Bonds/Insurance (3% Max)	1	Lump Sum	$ 484,654	$ 484,654		$ -	$ 484,654	$ 484,654	$ 16,639,799
						Subtotal - General Construction	**$ 16,639,799**	**$ 16,639,799**	NA

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2.)	**Construction - Electrical**									
a.)	**Influent Channel/Flow Splitter Box Process Improvements**								$ 5,400	
i.)	Provide new conduit and conductor (control) to the new ULT	1	Lump Sum	$ 4,500	$ 4,500	0.20	$ 900	$ 5,400		$ 16,645,199
b.)	**Mechanical Screen Process Improvements**								$ -	
i.)	None	0	Lump Sum	$ -	$ -		$ -	$ -		$ 16,645,199
c.)	**Grit Removal Process Improvements**								$ -	
i.)	None	0	Lump Sum	$ -	$ -		$ -	$ -		$ 16,645,199
d.)	**Oxidation Ditch D1 & D2 Process Improvements**								$ 219,000	
i.)	Provide new maintenance receptacle	2	Lump Sum	$ 4,000	$ 8,000	0.20	$ 1,600	$ 9,600		$ 16,654,799
ii.)	Demo, remove, and dispose of existing conduit, conductor, & receptacles (existing)	1	Lump Sum	$ 1,000	$ 1,000		$ -	$ 1,000		$ 16,655,799
iii.)	Provide new conduit, conductor, and receptacles (existing)	1	Lump Sum	$ 1,000	$ 1,000	0.20	$ 200	$ 1,200		$ 16,656,999
iv.)	Demo, remove, and dispose of existing lighting	1	Lump Sum	$ 1,000	$ 1,000		$ -	$ 1,000		$ 16,657,999
v.)	Provide new lighting	1	Lump Sum	$ 8,000	$ 8,000	0.20	$ 1,600	$ 9,600		$ 16,667,599
vi.)	Demo, remove, and dispose of existing conduit and conductor to existing mixer	2	Lump Sum	$ 1,500	$ 3,000		$ -	$ 3,000		$ 16,670,599
vii.)	Provide new conduit and conductor (power) to the mixer	2	Lump Sum	$ 1,500	$ 3,000	0.20	$ 600	$ 3,600		$ 16,674,199
viii.)	Provide new conduit and conductor (control) to the mixer	0	Lump Sum	$ 1,000	$ -		$ -	$ -		$ 16,674,199
iv.)	Mixing Alternative A - Reconfigure tank to retro fit to updated mixing system	OR								
(1)	Provide new disconnects for the new mixers	10	Each	$ 4,000	$ 40,000	0.15	$ 6,000	$ 46,000		$ 16,720,199
(1)	Provide new conduit and conductor (power) to the new mixers	10	Each	$ 3,500	$ 35,000	0.20	$ 7,000	$ 42,000		$ 16,762,199
(1)	Provide new conduit and conductor (control) to the new mixers	10	Each	$ 8,000	$ 80,000	0.20	$ 16,000	$ 96,000		$ 16,858,199
x.)	Provide new conduit and conductor (power) to the new DO Meter	2	Lump Sum	$ 1,500	$ 3,000	0.20	$ 600	$ 3,600		$ 16,861,799
xi.)	Provide new conduit and conductor (control) to the new DO Meter	2	Lump Sum	$ 1,000	$ 2,000	0.20	$ 400	$ 2,400		$ 16,864,199
e.)	**Oxidation Ditch D3 Process Improvements**								$ 18,600	
i.)	Provide new maintenance receptacle	1	Lump Sum	$ 5,000	$ 5,000		$ -	$ 5,000		$ 16,869,199
ii.)	Demo, remove, and dispose of existing conduit, conductor, & receptacles (existing)	0	Lump Sum	$ -	$ -		$ -	$ -		$ 16,869,199
iii.)	Provide new conduit, conductor, and receptacles (existing)	0	Lump Sum	$ -	$ -		$ -	$ -		$ 16,869,199
iv.)	Demo, remove, and dispose of existing lighting	1	Lump Sum	$ 1,000	$ 1,000		$ -	$ 1,000		$ 16,870,199
v.)	Provide new lighting	1	Lump Sum	$ 8,000	$ 8,000	0.20	$ 1,600	$ 9,600		$ 16,879,799
vi.)	Provide new conduit and conductor (power) to the new DO Meter	1	Lump Sum	$ 1,500	$ 1,500	0.20	$ 300	$ 1,800		$ 16,881,599
vii.)	Provide new conduit and conductor (control) to the new DO Meter	1	Lump Sum	$ 1,000	$ 1,000	0.20	$ 200	$ 1,200		$ 16,882,799
f.)	**Blower Building Process Improvements**								$ 21,300	
i.)	Provide new disconnects for the new blowers	3	Lump Sum	$ 2,000	$ 6,000	0.15	$ 900	$ 6,900		$ 16,889,699
ii.)	Provide new conduit and conductor (power) to the new blowers	3	Lump Sum	$ 2,500	$ 7,500	0.20	$ 1,500	$ 9,000		$ 16,898,699
iii.)	Provide new conduit and conductor (control) to the new blowers	3	Lump Sum	$ 1,500	$ 4,500	0.20	$ 900	$ 5,400		$ 16,904,099
g.)	**Secondary Clarifier Process Improvements**								$ 1,200	
i.)	Provide new conduit and conductor (control) to secondary clarifiers	1	Lump Sum	$ 1,000	$ 1,000	0.20	$ 200	$ 1,200		$ 16,905,299
h.)	**Filter Building Process Improvements**								$ 36,400	
i.)	Provide new conduit and conductor (power) to new actuated valves	1	Lump Sum	$ 2,500	$ 2,500	0.20	$ 500	$ 3,000		$ 16,908,299
ii.)	Provide new conduit and conductor (control) to new actuated valves	1	Lump Sum	$ 2,500	$ 2,500	0.20	$ 500	$ 3,000		$ 16,911,299
iii.)	Provide new disconnects for new backwash pumps	2	Lump Sum	$ 4,000	$ 8,000	0.15	$ 1,200	$ 9,200		$ 16,920,499
iv.)	Provide new conduit and conductor (power) to new backwash pumps	1	Lump Sum	$ 2,500	$ 2,500	0.20	$ 500	$ 3,000		$ 16,923,499
v.)	Provide new conduit and conductor (control) to new backwash pumps	1	Lump Sum	$ 2,500	$ 2,500	0.20	$ 500	$ 3,000		$ 16,926,499
vi.)	Provide new disconnects for new post aeration tank blowers	2	Lump Sum	$ 4,000	$ 8,000	0.15	$ 1,200	$ 9,200		$ 16,935,699
vii.)	Provide new conduit and conductor (power) to new post aeration tank blowers	1	Lump Sum	$ 2,500	$ 2,500	0.20	$ 500	$ 3,000		$ 16,938,699
viii.)	Provide new conduit and conductor (control) to new post aeration tank blowers	1	Lump Sum	$ 2,500	$ 2,500	0.20	$ 500	$ 3,000		$ 16,941,699

DELAWARE ENGINEERING, D.P.C.
CIVIL & ENVIRONMENTAL ENGINEERING
ALBANY — ONEONTA, NEW YORK

Table 1
Town of Thompson, NY
Kiamesha Lake WWTP Upgrade
Comprehensive Project Cost Estimate

	Column Formulas =======>	A		B	C = A • B	D	E = D • C	F = C • E		
		Quantity	Units	Unit Cost	Item/Equip. Cost	Installation Factor	Installation Cost	Total/Combined Est. Cost	Major Cost Items Included In Est.	Cumulative Est. Total Cost
i.)	**UV Disinfection Process**								$ 66,450	
i.)	Provide new electrical panel & service (400A)	1	Lump Sum	$ 15,000	$ 15,000	0.20	$ 3,000	$ 18,000		$ 16,959,699
ii.)	Provide new disconnects for the new UV Units	3	Lump Sum	$ 5,000	$ 15,000	0.15	$ 2,250	$ 17,250		$ 16,976,949
iii.)	Provide new conduit and conductor (power) to the new UV Units	3	Lump Sum	$ 2,500	$ 7,500	0.20	$ 1,500	$ 9,000		$ 16,985,949
iv.)	Provide new conduit and conductor (control) to the new UV Units	3	Lump Sum	$ 2,500	$ 7,500	0.20	$ 1,500	$ 9,000		$ 16,994,949
v.)	Provide new conduit and conductor (power) to the new BW pumps and Control Panel?	1	Lump Sum	$ 8,500	$ 8,500	0.20	$ 1,700	$ 10,200		$ 17,005,149
vi.)	Provide new conduit and conductor (control) to the new BW pumps and Control Panel?	1	Lump Sum	$ 2,500	$ 2,500	0.20	$ 500	$ 3,000		$ 17,008,149
j.)	**Polishing Lagoon Process Improvements**								$ -	
i.)	None	1	Lump Sum	$ -	$ -		$ -	$ -		$ 17,008,149
k.)	**Sludge Holding Tank Process Improvements**								$ 6,000	
i.)	Provide new conduit and conductor (power) to new sludge blowers	1	Lump Sum	$ 2,500	$ 2,500	0.20	$ 500	$ 3,000		$ 17,011,149
ii.)	Provide new conduit and conductor (control) to new sludge blowers	1	Lump Sum	$ 2,500	$ 2,500	0.20	$ 500	$ 3,000		$ 17,014,149
l.)	**RAS/WAS Pump Process Improvements**								$ 24,000	
i.)	Demo, remove, and dispose of existing conduit, conductor, and disconnects	4	Lump Sum	$ 1,000	$ 4,000	0.20	$ 800	$ 4,800		$ 17,018,949
ii.)	Provide new conduit and conductor (power)	4	Lump Sum	$ 1,000	$ 4,000	0.20	$ 800	$ 4,800		$ 17,023,749
iii.)	Provide new conduit and conductor (control)	4	Lump Sum	$ 1,000	$ 4,000	0.20	$ 800	$ 4,800		$ 17,028,549
iv.)	Provide new disconnects (NEMA 3R)	4	Lump Sum	$ 2,000	$ 8,000	0.20	$ 1,600	$ 9,600		$ 17,038,149
m.)	**Aerobic Sludge Digester Process**								$ 109,800	
i.)	Provide new electrical panel & service (400A)	1	Lump Sum	$ 15,000	$ 15,000	0.20	$ 3,000	$ 18,000		$ 17,056,149
ii.)	Provide disconnects for the new Blowers (3)	3	Lump Sum	$ 2,500	$ 7,500	0.20	$ 1,500	$ 9,000		$ 17,065,149
iii.)	Provide conduit and conductor (power) to the new Blowers (3)	3	Lump Sum	$ 2,500	$ 7,500	0.20	$ 1,500	$ 9,000		$ 17,074,149
iv.)	Provide conduit and conductor (control) to the new Blowers (3)	1	Lump Sum	$ 2,500	$ 2,500	0.20	$ 500	$ 3,000		$ 17,077,149
v.)	Provide disconnects for the new Pumps (3)	3	Lump Sum	$ 1,500	$ 4,500	0.20	$ 900	$ 5,400		$ 17,082,549
vi.)	Provide conduit and conductor (power) to the new Pumps (3)	3	Lump Sum	$ 2,500	$ 7,500	0.20	$ 1,500	$ 9,000		$ 17,091,549
vii.)	Provide conduit and conductor (control) to the new Pumps (3)	3	Lump Sum	$ 2,500	$ 7,500	0.20	$ 1,500	$ 9,000		$ 17,100,549
viii.)	Provide misc. control devices	1	Lump Sum	$ 15,000	$ 15,000	0.20	$ 3,000	$ 18,000		$ 17,118,549
ix.)	Provide disconnects for the new Drum Thickener and Control Panel	1	Lump Sum	$ 4,500	$ 4,500	0.20	$ 900	$ 5,400		$ 17,123,949
x.)	Provide conduit and conductor (power) to the new Drum Thickener and Control Panel	1	Lump Sum	$ 2,500	$ 2,500	0.20	$ 500	$ 3,000		$ 17,126,949
xi.)	Provide conduit and conductor (control) to the new Drum Thickener and Control Panel	1	Lump Sum	$ 2,500	$ 2,500	0.20	$ 500	$ 3,000		$ 17,129,949
xii.)	Provide disconnects for the new Sludge Pumps	2	Lump Sum	$ 1,000	$ 2,000	0.20	$ 400	$ 2,400		$ 17,132,349
xiii.)	Provide conduit and conductor (power) to the new Sludge Pumps	2	Lump Sum	$ 2,500	$ 5,000	0.20	$ 1,000	$ 6,000		$ 17,138,349
xiv.)	Provide conduit and conductor (control) to the new Sludge Pumps	2	Lump Sum	$ 2,500	$ 5,000	0.20	$ 1,000	$ 6,000		$ 17,144,349
xv.)	Provide disconnection/connection for new HVAC equipment	1	Lump Sum	$ 500	$ 500	0.20	$ 100	$ 600		$ 17,144,949
xvi.)	Provide new conduit, conductor, and receptacles	1	Lump Sum	$ 2,500	$ 2,500	0.20	$ 500	$ 3,000		$ 17,147,949
n.)	**Sludge Dewatering Process Improvements**								$ 43,400	
i.)	Demo, remove, and dispose of existing press equipment	1	Lump Sum	$ 2,000	$ 2,000		$ -	$ 2,000		$ 17,149,949
ii.)	Provide connection of the new BFP	1	Lump Sum	$ 6,500	$ 6,500	0.20	$ 1,300	$ 7,800		$ 17,157,749
iii.)	Provide conduit and conductor (power) to the new BFP and ancillary equipment	1	Lump Sum	$ 2,500	$ 5,000	0.20	$ 1,000	$ 6,000		$ 17,163,749
iv.)	Provide conduit and conductor (control) to the new BFP and ancillary equipment	1	Lump Sum	$ 2,500	$ 2,500	0.20	$ 500	$ 3,000		$ 17,166,749
v.)	Provide conduit and conductor (power) to the new conveyor and ancillary equipment	1	Lump Sum	$ 2,500	$ 5,000	0.20	$ 1,000	$ 6,000		$ 17,172,749
vi.)	Provide conduit and conductor (control) to the new conveyor and ancillary equipment	1	Lump Sum	$ 2,500	$ 2,500	0.20	$ 500	$ 3,000		$ 17,175,749
vii.)	Provide disconnection/connection of the new Booster Pumps and Control Panel	1	Lump Sum	$ 6,500	$ 6,500	0.20	$ 1,300	$ 7,800		$ 17,183,549
viii.)	Provide connection of the new NPW Pumps and Control Panel	1	Lump Sum	$ 6,500	$ 6,500	0.20	$ 1,300	$ 7,800		$ 17,191,349
o.)	**Sludge Drying Bed Improvements**								$ -	
i.)	None	1	Lump Sum	$ -	$ -		$ -	$ -		$ 17,191,349
p.)	**Pump Station Process Improvements**								$ 2,000	
i.)	Disconnect and reconnect pumps	1	Lump Sum	$ 2,000	$ 2,000		$ -	$ 2,000		$ 17,193,349
q.)	**Control Building Improvements**								$ -	
i.)	None	1	Lump Sum	$ -	$ -		$ -	$ -		$ 17,193,349

Delaware Engineering, D.P.C.
Civil & Environmental Engineering
Albany — Oneonta, New York

Table 1
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Kiamesha Lake WWTP Upgrade
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		Quantity	Units	Unit Cost	Item/Equip. Cost	Installation Factor	Installation Cost	Total/Combined Est. Cost	Major Cost Items Included In Est.	Cumulative Est. Total Cost
r.)	**Grit Removal Building Improvements**								$ 13,400	
i.)	Provide disconnection/connection for new HVAC equipment	1	Lump Sum	$ 500	$ 500	0.20	$ 100	$ 600		$ 17,193,949
ii.)	Demo, remove, and dispose of existing lighting	1	Lump Sum	$ 1,000	$ 1,000		$ -	$ 1,000		$ 17,194,949
iii.)	Provide new lighting Grit Removal Building	1	Lump Sum	$ 6,500	$ 6,500	0.20	$ 1,300	$ 7,800		$ 17,202,749
iv.)	Demo, remove, and dispose of existing conduit, conductor, and receptacles	1	Lump Sum	$ 1,000	$ 1,000		$ -	$ 1,000		$ 17,203,749
v.)	Provide new conduit, conductor, and receptacles	1	Lump Sum	$ 2,500	$ 2,500	0.20	$ 500	$ 3,000		$ 17,206,749
s.)	**Filter Building Improvements**								$ 12,700	
i.)	Provide disconnection/connection of the new HVAC Equipment	1	Lump Sum	$ 500	$ 500		$ -	$ 500		$ 17,207,249
ii.)	Demo, remove, and dispose of existing conduit, conductor, and switches	1	Lump Sum	$ 2,000	$ 2,000		$ -	$ 2,000		$ 17,209,249
iii.)	Provide new conduit, conductor, and receptacles	1	Lump Sum	$ 6,000	$ 6,000	0.20	$ 1,200	$ 7,200		$ 17,216,449
iv.)	Provide new disconnects (NEMA 3R)	0	Lump Sum	$ 2,500	$ -	0.15	$ -	$ -		$ 17,216,449
v.)	Provide new lighting in filter area	0	Lump Sum	$ 6,000	$ -	0.20	$ -	$ -		$ 17,216,449
vi.)	Provide new conduit, conductor, and receptacles in new UV Building	1	Lump Sum	$ 2,500	$ 2,500	0.20	$ 500	$ 3,000		$ 17,219,449
t.)	**Storage Building Improvements (old Blower Building)**								$ -	
i.)	None	1	Lump Sum	$ -	$ -		$ -	$ -		$ 17,219,449
u.)	**Blower Building Improvements**								$ 12,000	
i.)	Provide Blower Building ventilation system	1	Lump Sum	$ 10,000	$ 10,000	0.20	$ 2,000	$ 12,000		$ 17,231,449
v.)	**WWTP Work Shop/8-Bay Maintenance Building (9,900 SF)**								$ 36,600	
i.)	Disconnect electrical components for the two existing buildings	1	Lump Sum	$ 2,000	$ 2,000	0.20	$ 400	$ 2,400		$ 17,233,849
ii.)	Provide new service for the new WWTP Work Shop/Maintenance Building	1	Lump Sum	$ 6,000	$ 6,000	0.20	$ 1,200	$ 7,200		$ 17,241,049
iii.)	Provide new lighting and receptacles	1	Lump Sum	$ 20,000	$ 20,000	0.20	$ 4,000	$ 24,000		$ 17,265,049
iv.)	Connection of new HVAC components	1	Lump Sum	$ 2,500	$ 2,500	0.20	$ 500	$ 3,000		$ 17,268,049
w.)	**Yard Piping**								$ 137,380	
i.)	Provide conduit and conductor (power) to the new ATAD Bldg. (400A)	400	LF	$ 100	$ 40,000	0.20	$ 8,000	$ 48,000		$ 17,316,049
ii.)	Provide conduit and conductor (control) to the new ATAD Bldg.	350	LF	$ 50	$ 17,500	0.10	$ 1,750	$ 19,250		$ 17,335,299
iii.)	Provide conduit and conductor (power) to the new UV Bldg. (400A)	400	LF	$ 100	$ 40,000	0.20	$ 8,000	$ 48,000		$ 17,383,299
iv.)	Provide conduit and conductor (control) to the new UV Bldg.	350	LF	$ 50	$ 17,500	0.10	$ 1,750	$ 19,250		$ 17,402,549
v.)	Provide conduit and conductor (power) to the new WWTP Work Shop/Maintenance Building (100A)	60	LF	$ 40	$ 2,400	0.20	$ 480	$ 2,880		$ 17,405,429
x.)	**Site Work**								$ 15,000	
i.)	Site Restoration	1	Lump Sum	$ 15,000	$ 15,000		$ -	$ 15,000		$ 17,420,429
y.)	**SCADA**								$ 438,000	
i.)	Provide new PLC control (reuse existing enclosure, or new enclosure?)	1	Lump Sum	$ 200,000	$ 200,000	0.50	$ 100,000	$ 300,000		$ 17,720,429
ii.)	Provide new RAS Pump VFD Control Panel	1	Lump Sum	$ 35,000	$ 35,000	0.20	$ 7,000	$ 42,000		$ 17,762,429
iii.)	Provide new fiber optic for plant wide SCADA	1	Lump Sum	$ 60,000	$ 60,000	0.20	$ 12,000	$ 72,000		$ 17,834,429
iv.)	Provide new tertiary filter control panel	1	Lump Sum	$ 20,000	$ 20,000	0.20	$ 4,000	$ 24,000		$ 17,858,429
z.)	**Instrumentation**								$ 70,950	
i.)	Provide new ULT for the existing parshall flume in the influent channel	1	Lump Sum	$ 3,500	$ 3,500	0.10	$ 350	$ 3,850		$ 17,862,279
ii.)	Provide new Dissolved Oxygen Meter for D1 & D2 (2-one in each ditch)	2	Lump Sum	$ 7,500	$ 15,000	0.10	$ 1,500	$ 16,500		$ 17,878,779
iii.)	Provide new Dissolved Oxygen Meter for D3	1	Lump Sum	$ 7,500	$ 7,500	0.10	$ 750	$ 8,250		$ 17,887,029
iv.)	Provide new RAS flow meter (Doppler), located in the Blower Bldg.	3	Lump Sum	$ 5,000	$ 15,000	0.10	$ 1,500	$ 16,500		$ 17,903,529
v.)	Provide new WAS flow meter (Doppler), located in the Blower Building	1	Lump Sum	$ 5,000	$ 5,000	0.10	$ 500	$ 5,500		$ 17,909,029
vi.)	Provide new WAS/RAS/recycle flow meter (Doppler), located in the Filter Building	1	Lump Sum	$ 5,000	$ 5,000	0.10	$ 500	$ 5,500		$ 17,914,529
vii.)	Provide new Compressed Air System Low Pressure switch alarm	1	Lump Sum	$ 1,500	$ 1,500	0.10	$ 150	$ 1,650		$ 17,916,179
viii.)	Provide new ULT and redundant floats to the Mud Well, for RAS pump control	1	Lump Sum	$ 1,500	$ 1,500	0.10	$ 150	$ 1,650		$ 17,917,829
ix.)	Provide new Dissolved Oxygen Meter for the Post Aeration Tank	0	Lump Sum	$ -	$ -		$ -	$ -		$ 17,917,829
x.)	Provide new conduit and conductor for the new Dissolved Oxygen Meter for D1 & D2 (2-one in each ditch)	1	Lump Sum	$ 4,500	$ 4,500	0.10	$ 450	$ 4,950		$ 17,922,779
xi.)	Provide new conduit and conductor for the new Dissolved Oxygen Meter for D3	1	Lump Sum	$ 4,500	$ 4,500	0.10	$ 450	$ 4,950		$ 17,927,729
xii.)	Provide new conduit and conductor for the new Compressed Air System Low Pressure switch alarm	1	Lump Sum	$ 1,500	$ 1,500	0.10	$ 150	$ 1,650		$ 17,929,379
xiii.)	Provide new conduit and conductor for the new Dissolved Oxygen Meter for the Post Aeration Tank	0	Lump Sum	$ -	$ -		$ -	$ -		$ 17,929,379
aa.)	**WWTP Emergency Generator**								$ 576,000	
i.)	Demo, remove, and dispose the existing emergency generator	1	Lump Sum	$ 10,000	$ 10,000	0.20	$ 2,000	$ 12,000		$ 17,941,379

Table 1
Town of Thompson, NY
Kiamesha Lake WWTP Upgrade
Comprehensive Project Cost Estimate

		A		B	C = A • B	D	E = D • C	F = C • E		
	Column Formulas =======>	**Quantity**	**Units**	**Unit Cost**	**Item/Equip. Cost**	**Installation Factor**	**Installation Cost**	**Total/Combined Est. Cost**	**Major Cost Items Included In Est.**	**Cumulative Est. Total Cost**
ii.)	Provide temporary emergency generator (750 kW)	1	Lump Sum	$ 20,000	$ 20,000	0.20	$ 4,000	$ 24,000		$ 17,965,379
iii.)	Provide new WWTP emergency generator (750 kW)	1	Lump Sum	$ 450,000	$ 450,000	0.20	$ 90,000	$ 540,000		$ 18,505,379
ab.)	**Other Expenses**								$ -	
i.)	None	0	Lump Sum	$ -	$ -		$ -	$ -		$ 18,505,379
ac.)	**NYSEFC Contract Compliance**								$ 13,500	
i.)	Subcontractor Solicitation, Contracting and Coordination	1	Lump Sum	$ 3,500	$ 3,500		$ -	$ 3,500		$ 18,508,879
ii.)	NYSEFC Project Paperwork (e.g., utilization plan, monthly reports, project inspection, etc.)	1	Lump Sum	$ 10,000	$ 10,000		$ -	$ 10,000		$ 18,518,879
ad.)	**Contractors Overhead and Profit (15% Max)**	1	Lump Sum	$ 281,862	$ 281,862		$ -	$ 281,862	$ 281,862	$ 18,800,741
ae.)	**Mobilization/Demobilization/Bonds/Insurance (3% Max)**	1	Lump Sum	$ 64,828	$ 64,828		$ -	$ 64,828	$ 64,828	$ 18,865,569
					Subtotal - Electrical Construction			**$ 2,225,770**	**$ 2,225,770**	NA

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Kiamesha Lake WWTP Upgrade
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			Quantity	Units	Unit Cost	Item/Equip. Cost	Installation Factor	Installation Cost	Total/Combined Est. Cost	Major Cost Items Included In Est.	Cumulative Est. Total Cost
3.)		Construction - HVAC									
	a.)	Influent Channel/Flow Splitter Box Process Improvements								$ -	
	i.)	None	0	Lump Sum	$ -	$ -		$ -	$ -		$ 18,865,569
	b.)	Mechanical Screen Process Improvements								$ -	
	i.)	None	0	Lump Sum	$ -	$ -		$ -	$ -		$ 18,865,569
	c.)	Grit Removal Process Improvements								$ -	
	i.)	None	0	Lump Sum	$ -	$ -		$ -	$ -		$ 18,865,569
	d.)	Oxidation Ditch D1 & D2 Process Improvements								$ -	
	i.)	None	0	Lump Sum	$ -	$ -		$ -	$ -		$ 18,865,569
	e.)	Oxidation Ditch D3 Process Improvements								$ -	
	i.)	None	0	Lump Sum	$ -	$ -		$ -	$ -		$ 18,865,569
	f.)	Blower Building Process Improvements								$ -	
	i.)	None	0	Lump Sum	$ -	$ -		$ -	$ -		$ 18,865,569
	g.)	Secondary Clarifier Process Improvements								$ -	
	i.)	None	0	Lump Sum	$ -	$ -		$ -	$ -		$ 18,865,569
	h.)	Filter Building Process Improvements								$ -	
	i.)	None	0	Lump Sum	$ -	$ -		$ -	$ -		$ 18,865,569
	i.)	UV Disinfection Process								$ -	
	i.)	None	0	Lump Sum	$ -	$ -		$ -	$ -		$ 18,865,569
	j.)	Polishing Lagoon Process Improvements								$ -	
	i.)	None	0	Lump Sum	$ -	$ -		$ -	$ -		$ 18,865,569
	k.)	Sludge Holding Tank Process Improvements								$ -	
	i.)	None	0	Lump Sum	$ -	$ -		$ -	$ -		$ 18,865,569
	l.)	RAS/WAS Improvements								$ -	
	i.)	None	0	Lump Sum	$ -	$ -		$ -	$ -		$ 18,865,569
	m.)	Aerobic Sludge Digester Process								$ 95,250	
	i.)	Provide new HVAC System for new ATAD Bldg.	1	Lump Sum	$ 15,000	$ 15,000	0.15	$ 2,250	$ 17,250		$ 18,882,819
	i.)	Provide chiller for ATAD cooling water and electrical room cooling	1	Lump Sum	$ 60,000	$ 60,000	0.30	$ 18,000	$ 78,000		$ 18,960,819
	n.)	Sludge Dewatering Improvements								$ -	
	i.)	None	0	Lump Sum	$ -	$ -		$ -	$ -		$ 18,960,819
	o.)	Sludge Drying Bed Process Improvements								$ -	
	i.)	None	0	Lump Sum	$ -	$ -		$ -	$ -		$ 18,960,819
	p.)	Pump Station Process Improvements								$ -	
	i.)	None	0	Lump Sum	$ -	$ -		$ -	$ -		$ 18,960,819
	q.)	Control Building Improvements								$ -	
	i.)	None	0	Lump Sum	$ -	$ -		$ -	$ -		$ 18,960,819
	r.)	Grit Removal Building Improvements								$ 5,750	
	i.)	Provide new HVAC System for the Grit Removal Building	1	Lump Sum	$ 5,000	$ 5,000	0.15	$ 750	$ 5,750		$ 18,966,569

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s.)	**Filter Building Improvements**								$ 56,000	
i.)	Provide new HVAC System for the Filter Building	1	Lump Sum	$ 40,000	$ 40,000	0.15	$ 6,000	$ 46,000		$ 19,012,569
ii.)	New UV Building									
(1)	Provide new HVAC System for the new UV Building	1	Lump Sum	$ 10,000	$ 10,000		$ -	$ 10,000		$ 19,022,569
t.)	**Storage Building Improvements (old Blower Building)**								$ -	
i.)	None	0	Lump Sum	$ -	$ -		$ -	$ -		$ 19,022,569
u.)	**Blower Building Improvements**								$ 11,500	
i.)	Provide new HVAC System for the Blower Building	1	Lump Sum	$ 10,000	$ 10,000	0.15	$ 1,500	$ 11,500		$ 19,034,069
v.)	**WWTP Work Shop/8-Bay Maintenance Building (9,900 SF)**								$ 100,000	
i.)	Provide new HVAC System for the WWTP Work Shop/Maintenance Building	1	Lump Sum	$ 100,000	$ 100,000		$ -	$ 100,000		$ 19,134,069
w.)	**Yard Piping**								$ -	
i.)	None	0	Lump Sum	$ -	$ -		$ -	$ -		$ 19,134,069
x.)	**Site Work**								$ -	
i.)	None	0	Lump Sum	$ -	$ -		$ -	$ -		$ 19,134,069
y.)	**SCADA (or electrical contract?)**								$ -	
i.)	None	0	Lump Sum	$ -	$ -		$ -	$ -		$ 19,134,069
z.)	**Instrumentation**								$ -	
i.)	None	0	Lump Sum	$ -	$ -		$ -	$ -		$ 19,134,069
aa.)	**WWTP Emergency Generator**								$ -	
i.)	None	1	Lump Sum	$ -	$ -		$ -	$ -		$ 19,134,069
ab.)	**Other Expenses**								$ -	
i.)	None	0	Lump Sum	$ -	$ -		$ -	$ -		$ 19,134,069
ac.)	**NYSEFC Contract Compliance**								$ 8,500	
i.)	Subcontractor Solicitation, Contracting and Coordination	1	Lump Sum	$ 3,500	$ 3,500		$ -	$ 3,500		$ 19,137,569
ii.)	NYSEFC Project Paperwork (e.g., utilization plan, monthly reports, project inspection, etc.)	1	Lump Sum	$ 5,000	$ 5,000		$ -	$ 5,000		$ 19,142,569
ad.)	**Contractors Overhead and Profit (15% Max)**	1	Lump Sum	$ 41,550	$ 41,550		$ -	$ 41,550	$ 41,550	$ 19,184,119
ae.)	**Mobilization/Demobilization/Bonds/Insurance (3% Max)**	1	Lump Sum	$ 9,557	$ 9,557		$ -	$ 9,557	$ 9,557	$ 19,193,676
							Subtotal - HVAC Construction	**$ 328,107**	**$ 328,107**	NA

Table 1
Town of Thompson, NY
Kiamesha Lake WWTP Upgrade
Comprehensive Project Cost Estimate

DELAWARE ENGINEERING, D.P.C.
CIVIL & ENVIRONMENTAL ENGINEERING
ALBANY – ONEONTA, NEW YORK

Item	Column Formulas =======>	A Quantity	Units	B Unit Cost	C = A • B Item/Equip. Cost	D Installation Factor	E = D • C Installation Cost	F = C • E Total/Combined Est. Cost	Major Cost Items Included In Est.	Cumulative Est. Total Cost
4.)	**Construction - Plumbing**									
a.)	**Influent Channel/Flow Splitter Box Process Improvements**								$ -	
i.)	None	0	Lump Sum	$ -	$ -		$ -	$ -		$ 19,193,676
b.)	**Mechanical Screen Process Improvements**								$ -	
i.)	None	0	Lump Sum	$ -	$ -		$ -	$ -		$ -
c.)	**Grit Removal Process Improvements**								$ -	
i.)	None	0	Lump Sum	$ -	$ -		$ -	$ -		$ 19,193,676
d.)	**Oxidation Ditch D1 & D2 Process Improvements**								$ -	
i.)	None	0	Lump Sum	$ -	$ -		$ -	$ -		$ 19,193,676
e.)	**Oxidation Ditch D3 Process Improvements**								$ -	
i.)	None	0	Lump Sum	$ -	$ -		$ -	$ -		$ 19,193,676
f.)	**Blower Building Process Improvements**								$ -	
	None	0	Lump Sum	$ -	$ -		$ -	$ -		$ 19,193,676
g.)	**Secondary Clarifier Improvements**								$ -	
i.)	None	0	Lump Sum	$ -	$ -		$ -	$ -		$ 19,193,676
h.)	**Filter Building Process Improvements**								$ -	
i.)	None	0	Lump Sum	$ -	$ -		$ -	$ -		$ 19,193,676
i.)	**UV Disinfection**								$ 5,750	
i.)	Provide hose bib	1	Lump Sum	$ 5,000	$ 5,000	0.15	$ 750	$ 5,750		$ 19,199,426
j.)	**Polishing Lagoon Process Improvements**								$ -	
i.)	None	0	Lump Sum	$ -	$ -		$ -	$ -		$ 19,199,426
k.)	**Sludge Holding Tank Process Improvements**								$ -	
i.)	None	0	Lump Sum	$ -	$ -		$ -	$ -		$ 19,199,426
l.)	**RAS/WAS Pump Process Improvements**								$ -	
i.)	None	0	Lump Sum	$ -	$ -		$ -	$ -		$ 19,199,426
m.)	**Aerobic Sludge Digester Process**								$ 46,000	
i.)	Provide new NPW piping in the new ATAD Bldg.	1	Lump Sum	$ 30,000	$ 30,000	0.15	$ 4,500	$ 34,500		$ 19,233,926
ii.)	Provide new PW piping in the new ATAD Bldg.	1	Lump Sum	$ 10,000	$ 10,000	0.15	$ 1,500	$ 11,500		$ 19,245,426
n.)	**Sludge Dewatering Process Improvements**								$ -	
i.)	None	0	Lump Sum	$ -	$ -		$ -	$ -		$ 19,245,426
o.)	**Sludge Drying Bed Improvements**								$ -	
i.)	None	0	Lump Sum	$ -	$ -		$ -	$ -		$ 19,245,426
p.)	**Pump Station Process Improvements**								$ -	
i.)	None	0	Lump Sum	$ -	$ -		$ -	$ -		$ 19,245,426
q.)	**Control Building Improvements**								$ -	
	None	1	Lump Sum	$ -	$ -		$ -	$ -		$ 19,245,426

DELAWARE ENGINEERING, D.P.C.
CIVIL & ENVIRONMENTAL ENGINEERING
ALBANY — ONEONTA, NEW YORK

Table 1
Town of Thompson, NY
Kiamesha Lake WWTP Upgrade
Comprehensive Project Cost Estimate

	Column Formulas =======>	A Quantity	Units	B Unit Cost	C = A • B Item/Equip. Cost	D Installation Factor	E = D • C Installation Cost	F = C • E Total/Combined Est. Cost	Major Cost Items Included In Est.	Cumulative Est. Total Cost
r.)	**Grit Removal Building Improvements**								$ -	
i.)	None	1	Lump Sum	$ -	$ -		$ -	$ -		$ 19,245,426
s.)	**Filter Building Improvements**								$ -	
i.)	None	0	Lump Sum	$ -	$ -		$ -	$ -		$ 19,245,426
t.)	**Storage Building Improvements (old Blower Building)**								$ -	
i.)	None	0	Lump Sum	$ -	$ -		$ -	$ -		$ 19,245,426
u.)	**Blower Building Improvements**								$ -	
	None	1	Lump Sum	$ -	$ -		$ -	$ -		$ 19,245,426
v.)	**WWTP Work Shop/8-Bay Maintenance Building (9,900 SF)**								$ 20,000	
i.)	Provide plumbing in the new WWTP Work Shop/Maintenance Building	1	Lump Sum	$ 20,000	$ 20,000		$ -	$ 20,000		$ 19,265,426
w.)	**Yard Piping**								$ -	
i.)	None	1	Lump Sum	$ -	$ -		$ -	$ -		$ 19,265,426
x.)	**Site Work**								$ -	
i.)	None	1	Lump Sum	$ -	$ -		$ -	$ -		$ 19,265,426
y.)	**SCADA**								$ -	
i.)	None	1	Lump Sum	$ -	$ -		$ -	$ -		$ 19,265,426
z.)	**Instrumentation**								$ -	
i.)	None	1	Lump Sum	$ -	$ -		$ -	$ -		$ 19,265,426
aa.)	**WWTP Emergency Generator**								$ -	
i.)	None	1	Lump Sum	$ -	$ -		$ -	$ -		$ 19,265,426
ab.)	**Other Expenses**								$ -	
i.)	None	1	Lump Sum	$ -	$ -		$ -	$ -		$ 19,265,426
ac.)	**NYSEFC Contract Compliance**								$ 6,500	
i.)	Subcontractor Solicitation, Contracting and Coordination	1	Lump Sum	$ 1,500	$ 1,500		$ -	$ 1,500		$ 19,266,926
ii.)	NYSEFC Project Paperwork (e.g., utilization plan, monthly reports, project inspection, etc.)	1	Lump Sum	$ 5,000	$ 5,000		$ -	$ 5,000		$ 19,271,926
ad.)	**Contractors Overhead and Profit (15% Max)**	1	Lump Sum	$ 11,738	$ 11,738		$ -	$ 11,738	$ 11,738	$ 19,283,663
ae.)	**Mobilization/Demobilization/Bonds/Insurance (3% Max)**	1	Lump Sum	$ 2,700	$ 2,700		$ -	$ 2,700	$ 2,700	$ 19,286,363
							Subtotal - Plumbing Construction	**$ 92,687**	**$ 92,687**	NA
							Subtotal - All Construction	**$ 19,286,363**	**$ 19,286,363**	NA
5.)	**Construction Cost Inflation Adjustment (@3% per year, August 2019 - Sept. 2021 Bidding = 2 Years)**	2	Years	3%	$ 1,157,181.77		$ -	$ 1,157,182	$ 1,157,182	$ 20,443,545
							Subtotal - Construction Cost Inflation Adjustment	**$ 1,157,182**	**$ 1,157,182**	NA
							Subtotal - All Construction	**$ 20,443,545**	**$ 20,443,545**	NA

Delaware Engineering, D.P.C.
Civil & Environmental Engineering
Albany — Oneonta, New York

Last Revised 08-30-2019

Table 1
Town of Thompson, NY
Kiamesha Lake WWTP Upgrade
Comprehensive Project Cost Estimate

Column Formulas =======>	A		B	C = A • B	D	E = D • C	F = C • E		
	Quantity	**Units**	**Unit Cost**	**Item/Equip. Cost**	**Installation Factor**	**Installation Cost**	**Total/Combined Est. Cost**	**Major Cost Items Included In Est.**	**Cumulative Est. Total Cost**
6.) Other Costs (18%)							$ 3,679,838	$ 3,679,838	
a.) Engineering/Professional Services							$ 3,531,886	$ 3,531,886	$ 23,975,431
ii.) Planning (Engineering Report, SEQR ,etc)	0	Lump Sum	$ -	$ -			$ -		
ii.) Design	0	Lump Sum	$ -	$ -			$ -		
iv.) SWPPP (not required)	0	Lump Sum	$ -	$ -			$ -		
iv.) Bid/Award	0	Lump Sum	$ -	$ -			$ -		
v.) Engineering During Construction/Construction Administration (based on 20 months)	0	Lump Sum	$ -	$ -			$ -		
vi.) As-Builts	0	Lump Sum	$ -	$ -			$ -		
vii.) Onsite Observation Services (based on 14 months full-time and 4 months part-time = 16 months total)	0	Lump Sum	$ -	$ -			$ -		
h.) Other - NYSEFC Paperwork/Sub Solicitation& Coordination	0	Months	$ -	$ -			$ -		
i.) Other - Potential Engineering/Professional Services MWBE Subcontracts (goal of 23%)	0	Months	$ -	$ -			$ -		
(1) Fiscal Services & NYSEFC Project Paperwork Assistance for Town (WBE - Kehoe Consulting or other)	0	Lump Sum	$ -	$ -			$ -		
(2) Geotechnical Services	0	Lump Sum	$ -	$ -			$ -		
(3) Underground Utility Location Services	0	Lump Sum	$ -	$ -			$ -		
(4) Surveying Services	0	Lump Sum	$ -	$ -			$ -		
(5) Special Construction inspections and testing services	0	Lump Sum	$ -	$ -			$ -		
(6) Other (not defined at this time)	0	Lump Sum	$ -	$ -			$ -		
Subtotal - Engineering/Professional Services							**$ 3,531,886**	**$ 3,531,886**	NA
b.) Other Town Costs									$ 23,975,431
i.) Town Costs								$ 147,952	
(1) Misc. (Repro/Mailing/Other Services/Expenses/Publishing of Bond Resolution and Bid Notices	0	Lump Sum	$ -	$ -			$ -		$ 23,975,431
(2) Bid Notice Legal Notice Publication	0	Lump Sum	$ -	$ -			$ -		$ 23,975,431
(3) Town Attorney/Legal & Misc.	1	Lump Sum	$ 15,000	$ 15,000			$ 15,000		$ 23,990,431
(4) Bond Counsel	1	Lump Sum	$ 25,000	$ 25,000			$ 25,000		$ 24,015,431
(5) Work Force - Technical	0	Lump Sum	$ -	$ -			$ -		$ 24,015,431
(6) Work Force - Admin	0	Lump Sum	$ -	$ -			$ -		$ 24,015,431
(7) Short Term Financing for preconstruction phase (1.5M BAN for 1 Year @ 5%) - Net Interest	1	Lump Sum	$ 75,000	$ 75,000			$ 75,000		$ 24,090,431
(8) DRBC Project Review Fee ($523 + >$10M X 0.0012)	1	Lump Sum	$ 32,952	$ 32,952			$ 32,952		$ 24,123,383
Subtotal - Other Town Costs							**$ 147,952**	**$ 147,952**	NA
Subtotal - Other Costs							**$ 3,679,838**	**$ 3,679,838**	NA
7.) Project Contingency (10% of Construction, Engineering and Other Costs)	10	Percent	$ 24,123,383	$ 2,412,338			$ 2,412,338	$ 2,412,338	$ 26,535,721
Subtotal - Project Contingency (10% of All Project Costs)							**$ 2,412,338**	**$ 2,412,338**	NA
8.) SRF Issuance Costs (1.84%) (If hardship goes to 0%)	1	Lump Sum	$ 488,257	$ 488,257			$ 488,257	$ 488,257	$ 27,023,978
Subtotal - SRF Issuance Cost (1.84% of All Project Costs)							**$ 488,257**	**$ 488,257**	NA
Total Estimated Project Cost							**$ 27,023,978**	**$ 27,023,978**	**$ 27,023,978**

APPENDIX K

Rate Impact Summary

Password: Deleng1		
Unless otherwise noted, for a complete matrix all yellow highlighted questions must be answered. Items in Red should be updated annually.		
Links to data resources are provided on the right.		
Municipality:	Thompson (T) - Kiamesha	
USDA RD 2010 ACS Data[1]		
USDA 2010 ACS Population*:	15,308	[1] https://factfinder.census.gov/faces/nav/jsf/pages/community_facts.xhtml
USDA 2010 ACS MHI 5-year estimate (Table B19013)*:	$37,417	ref: Advanced Search Table B19013 for 5-year MHI estimate.
2010 SNMHI*:	$54,862	
EFC SRF 2017 ACS Data[2]		https://www.efc.ny.gov/sites/default/files/uploads/Financing%20Documents/EPG_MHI_POP_POV_ACS_5-year%20Estimate
EFC 2017 ACS Population*:	15,034	ref: Table for MHI, Population and Poverty Rate data.
2017 ACS MHI*:	$42,175	
2017 NYS MHI*:	$62,765	
2000 ACS Population:	14,189	https://www.census.gov/census2000/states/ny.html
2010 ACS Population:	15,308	https://www.census.gov/census2000/states/ny.html
(For CWSRF Projects) 2017 NYS Family Poverty Rate (%)*:	11.30%	
(For CWSRF Projects) Municipal Poverty Rate (%)*:	14.90%	
(For CWSRF Projects) 2017 % County Unemployment:	6.00%	
(For CWSRF Projects) 2017 NYS Unemployment Rate:	4.7%	
Municipal % of Low to Moderate Income*[3]:	49.44%	[3] http://www.nyshcr.org/Programs/NYS-CDBG/EligibleCommunities.htm
Does the project alleviate a documented		
health or sanitary problem (Y/N)*?	Y	
Is there an intermunicipal agreement for		
shared services for water and/or sewer (Y/N)*?	N	
Is the project located in Dutchess, Orange,		
Putnam, Rockland, Sullivan, Ulster, or Westchester County (Y/N)*[4]?	Y	
For Engineering Planning Grants Only		
Is this a Clean Water project or a Drinking Water project (C/D)?	C	
Is this an I&I project that is the resut of an		
Order on Consent or SPDES Permit Compliance Schedule (Y/N)?	N	
2018 USDA Interest Rates[5]		[5] https://www.rd.usda.gov/programs-services/water-waste-disposal-loan-grant-program
Poverty Rate:	2.125%	
Intermediate Rate:	2.750%	
Market Rate:	3.500%	
Term (years):	38	
2019 CWSRF Interest Rates[6]		
Hardship:	0%	
Subsidized:	1.65%	
Market Rate:	3.30%	
Term (years):	30	
Sewer Department Data		
No. of Service Connections:	378	
Average Annual Cost/EDU*[7]:	$665	
Real Property Data		
Number of 1-Family Homes:	287.00	
Percentage of Residential Users:	75.93%	
Number of EDUs:	2,626.00	
Estimated Project Cost:	$27,000,000	
Project Cost Increment Range:	$1,000,000	

[1] -USDA RD uses the 2010 ACS information. For the 2010 5-year MHI estimates, refer to Table B19013 in the Advanced Search tab on the ACS website.

[2] -For EFC projects, use the linked 2015 spreadsheet for Population, MHI and Poverty Rate.

[3]- For low to moderate income data, choose the appropriate table (City, Town, Village) in the eligible communities tab.

[4] -SRF Projects located in these counties use a Regional Cost Factor for an adjusted MHI. For 2019, the factor is 1.33. (Ref cell B5 in SRF spreadsheets)

[5] -USDA Interest rates can be found at the link adjacent to the question.

[6] -SRF Interest rates are set in the annual IUP. Currently, to determine the subsidized rate, reduce the market rate by 50% for CWSRF projects.

[7] -Unless provided by the Municipality, the calculated average annual water rate is determined based upon the $/gal + fees with an average usage for a single family home of 169 gpd or 61,685 gallons per year. If the Municipality has provided an average annual water rate, insert in cell B62.

CWSRF GRANT /LOAN CALCULATOR

Municipality:	Thompson (T) - Kiamesha
Population:	15,034
Regionally Adjusted MHI Factor:	1.33
2015 ACS MHI:	$42,175
SMHI:	$83,477
80% of SMHI	$66,782
MHI as a % of SNMHI:	51%
Does the project Alleviate a Documented Health or Sanitary Problem (Y/N):?	Y
Interest Rate Eligibility	
Hardship:	0%
Subsidized:	1.650%
Market Rate:	3.30%
Term (years):	30
No. of Service Connections:	378
Average Annual Sewer Rate/EDU:	$665
Hardship Eligibility:	YES

The municipality meets the minimum criteria for hardship eligibility. Ultimately, the final determination will be based on how the project scores relative to the IUP hardship and subsidized financing lines.

Number of EDUs:	2626.00
Number of Single Family Connections:	287
Percentage of Residential Users:	75.93%
Affordibility Score 1:	7
Population Change (2000-2010):	1,119
Affordibility Score 2:	0
2016 % County Unemployment:	6.00%
Affordibility Score 3:	2
2015 % Families Below Poverty:	14.90%
Affordibility Score 4:	5
Affordibility Score Total Points:	14
Maximum Grant Amount:	$5,000,000

$22,000,000			
	Hardship Financing	Subsidized Financing	Market Rate Financing
Project Cost:	$22,000,000	$22,000,000	$22,000,000
Annual Debt Service:	$733,333	$935,659	$1,166,385
Average Annual Cost Increase/EDU:	$279	$356	$444
Maximum Grant Award:	$5,000,000	$5,000,000	$5,000,000
Amount to be Financed:	$17,000,000	$17,000,000	$17,000,000
Annual Debt Service if Awarded Grant:	$566,667	$723,009	$901,297
Average Annual Cost Increase/EDU:	$216	$275	$343
Percent Increase:	32%	41%	52%

$23,000,000			
	Hardship Financing	Subsidized Financing	Market Rate Financing
Project Cost:	$23,000,000	$23,000,000	$23,000,000
Annual Debt Service:	$766,667	$978,189	$1,219,402
Average Annual Cost Increase/EDU:	$292	$373	$464
Maximum Grant Award:	$5,000,000	$5,000,000	$5,000,000
Amount to be Financed:	$18,000,000	$18,000,000	$18,000,000
Annual Debt Service if Awarded Grant:	$600,000	$765,539	$954,315
Average Annual Cost Increase/EDU:	$228	$292	$363
Percent Increase:	34%	44%	55%

$24,000,000			
	Hardship Financing	Subsidized Financing	Market Rate Financing
Project Cost:	$24,000,000	$24,000,000	$24,000,000
Annual Debt Service:	$800,000	$1,020,719	$1,272,420
Average Annual Cost Increase/EDU:	$305	$389	$485
Maximum Grant Award:	$5,000,000	$5,000,000	$5,000,000
Amount to be Financed:	$19,000,000	$19,000,000	$19,000,000
Annual Debt Service if Awarded Grant:	$633,333	$808,069	$1,007,332
Average Annual Cost Increase/EDU:	$241	$308	$384
Percent Increase:	36%	46%	58%

$25,000,000			
	Hardship Financing	Subsidized Financing	Market Rate Financing
Project Cost:	$25,000,000	$25,000,000	$25,000,000
Annual Debt Service:	$833,333	$1,063,249	$1,325,437
Average Annual Cost Increase/EDU:	$317	$405	$505
Maximum Grant Award:	$5,000,000	$5,000,000	$5,000,000
Amount to be Financed:	$20,000,000	$20,000,000	$20,000,000
Annual Debt Service if Awarded Grant:	$666,667	$850,599	$1,060,350
Average Annual Cost Increase/EDU:	$254	$324	$404
Percent Increase:	38%	49%	61%

$26,000,000			
	Hardship Financing	Subsidized Financing	Market Rate Financing
Project Cost:	$26,000,000	$26,000,000	$26,000,000
Annual Debt Service:	$866,667	$1,105,779	$1,378,455
Average Annual Cost /Connection:	$330	$330	$525
Maximum Grant Award:	$5,000,000	$5,000,000	$5,000,000
Amount to be Financed:	$21,000,000	$21,000,000	$21,000,000
Annual Debt Service if Awarded Grant:	$700,000	$893,129	$1,113,367
Average Annual Cost Increase/EDU:	$267	$340	$424
Percent Increase:	40%	51%	64%
$27,000,000			
No Grant Award			
	Hardship Financing (0%)	Subsidized Financing (1.65%)	Market Rate Financing (3.3%)
Project Cost:	$27,000,000	$27,000,000	$27,000,000
Annual Debt Service:	$900,000	$1,148,309	$1,431,472
Average Annual Cost Increase/EDU:	$343	$437	$545
Percent Increase:	52%	66%	82%
Annual Sewer Service Cost to Typical Single Family Home:	$1,008	$1,102	$1,210
25% Maximum Grant Award:	$5,000,000	$5,000,000	$5,000,000
Amount to be Financed:	$22,000,000	$22,000,000	$22,000,000
Annual Debt Service w/ Grant:	$733,333	$935,659	$1,166,385
Average Annual Cost Increase/EDU:	$279	$356	$444
Percent Increase:	42%	54%	67%
Annual Sewer Service Cost to Typical Single Family Home:	$944	$1,021	$1,109
$28,000,000			
	Hardship Financing	Subsidized Financing	Market Rate Financing
Project Cost:	$28,000,000	$28,000,000	$28,000,000
Annual Debt Service:	$933,333	$1,190,839	$1,484,490
Average Annual Cost Increase/EDU:	$355	$453	$565
Maximum Grant Award:	$5,000,000	$5,000,000	$5,000,000
Amount to be Financed:	$23,000,000	$23,000,000	$23,000,000
Annual Debt Service if Awarded Grant:	$766,667	$978,189	$1,219,402
Average Annual Cost Increase/EDU:	$292	$373	$464
Percent Increase:	44%	56%	70%
$29,000,000			
	Hardship Financing	Subsidized Financing	Market Rate Financing
Project Cost:	$29,000,000	$29,000,000	$29,000,000
Annual Debt Service:	$966,667	$1,233,369	$1,537,507
Average Annual Cost Increase/EDU:	$368	$470	$585
Maximum Grant Award:	$5,000,000	$5,000,000	$5,000,000
Amount to be Financed:	$24,000,000	$24,000,000	$24,000,000
Annual Debt Service if Awarded Grant:	$800,000	$1,020,719	$1,272,420
Average Annual Cost Increase/EDU:	$305	$389	$485
Percent Increase:	46%	58%	73%
$30,000,000			
	Hardship Financing	Subsidized Financing	Market Rate Financing
Project Cost:	$30,000,000	$30,000,000	$30,000,000
Annual Debt Service:	$1,000,000	$1,275,899	$1,590,524
Average Annual Cost Increase/EDU:	$381	$486	$606
Maximum Grant Award:	$5,000,000	$5,000,000	$5,000,000
Amount to be Financed:	$25,000,000	$25,000,000	$25,000,000
Annual Debt Service if Awarded Grant:	$833,333	$1,063,249	$1,325,437
Average Annual Cost Increase/EDU:	$317	$405	$505
Percent Increase:	48%	61%	76%
$31,000,000			
	Hardship Financing	Subsidized Financing	Market Rate Financing
Project Cost:	$31,000,000	$31,000,000	$31,000,000
Annual Debt Service:	$1,033,333	$1,318,429	$1,643,542
Average Annual Cost Increase/EDU:	$394	$502	$626
Maximum Grant Award:	$5,000,000	$5,000,000	$5,000,000
Amount to be Financed:	$26,000,000	$26,000,000	$26,000,000
Annual Debt Service if Awarded Grant:	$866,667	$1,105,779	$1,378,455
Average Annual Cost Increase/EDU:	$330	$421	$525
Percent Increase:	50%	63%	79%
$32,000,000			
	Hardship Financing	Subsidized Financing	Market Rate Financing
Project Cost:	$32,000,000	$32,000,000	$32,000,000
Annual Debt Service:	$1,066,667	$1,360,959	$1,696,559
Average Annual Cost Increase/EDU:	$406	$518	$646
Maximum Grant Award:	$5,000,000	$5,000,000	$5,000,000
Amount to be Financed:	$27,000,000	$27,000,000	$27,000,000
Annual Debt Service if Awarded Grant:	$900,000	$1,148,309	$1,431,472
Average Annual Cost Increase/EDU:	$343	$437	$545
Percent Increase:	52%	66%	82%

Clean Water Project
Funding Matrix

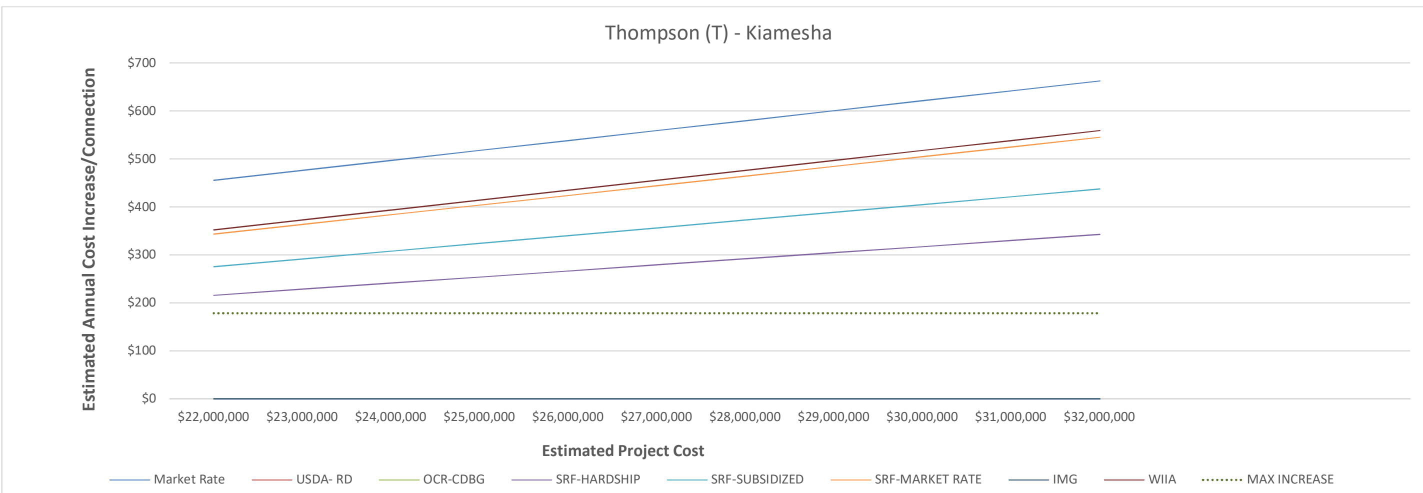
Municipality: Thompson (T) - Kiamesha
2017 Population: 15,034
2017 MHI: $42,175
No. of Service Connections: 378
Number of EDUs: 2,626
Average Annual Cost/EDU: $665
2% of MHI: $844
Rate as a percentage of MHI: 1.58%

CWSRF Category: D
CWSRF Priority Ranking Score:
DRAFT 2019 Hardship Line: --
DRAFT 2019 Subsidy Line: N/A

Max Increase (2% MHI): $179

Average Annual Cost Increase per EDU									
Project Cost	Market Rate	100% USDA Grant	OCR -Max Grant $750K	CWSRF (25% Grant)			IMG (40% Grant)	WIIA-CW (25% grant)	Max Increase
	4.00%	2.125% @ 38 years*	3.50%	0%	1.65%	3.30%	3.30%	3.50%	
		Not Eligible	Not Eligible				Not Eligible		
$22,000,000	$456	$0	$0	$216	$275	$343	$0	$352	$179
$23,000,000	$476	$0	$0	$228	$292	$363	$0	$373	$179
$24,000,000	$497	$0	$0	$241	$308	$384	$0	$393	$179
$25,000,000	$518	$0	$0	$254	$324	$404	$0	$414	$179
$26,000,000	$538	$0	$0	$267	$340	$424	$0	$435	$179
$27,000,000	$559	$0	$0	$279	$356	$444	$0	$456	$179
$28,000,000	$580	$0	$0	$292	$373	$464	$0	$476	$179
$29,000,000	$600	$0	$0	$305	$389	$485	$0	$497	$179
$30,000,000	$621	$0	$0	$317	$405	$505	$0	$518	$179
$31,000,000	$642	$0	$0	$330	$421	$525	$0	$538	$179
$32,000,000	$663	$0	$0	$343	$437	$545	$0	$559	$179

* Unless otherwise indicated, the term of all loans is 30 years



APPENDIX L

IUP Listing Form

Project Scope:

Project Name:

Kiamesha Lake Wastewater Treatment Plant Upgrade

Project No:

County:

Sullivan

Location:

128 Rock Ridge Drive

Latitude:

41.662258

Longitude:

-74.662844

If Project is in a district (proposed or actual) of a Town or County, please indicate population of district.

0

Is the municipality under an enforcement order, SPDES permit or permit requiring the construction of the project?

☑

SPDES Permit No:

NY 003 0724

What is the Receiving Water:

Kiamesha Creek

Which category or categories is this project in? Check all that apply.

Treatment Plant Upgrade:

Treatment Plant New:

Collection System Upgrade:

Collection System New:

Combined Sewer Overflow:

Sanitary Sewer Overflow:

Storm Water Management:

Landfill:

Other Project Category:

Please describe this project:

If the project is identified in or consistent with an approved management plan, please list plan(s) here:

If the project is located in or serves a designated Empire Zone (EZ), please identify that EZ here:

If the project has received funding through the DEC/EFC Wastewater Infrastructure Engineering Planning Grant (EPG) Program, please identify the EPG number here:

83702

Municipal Contact Information:

Salutation:
First:
MI:
Last:
Title:

Municipal Contact:

Mr.

William

J.

Rieber

Town Supervisor

Mailing Address:

4052 Route 42

City:

Monticello

State:

NY

Zip Code:

12701

Phone Number:

(845) 794-2500

Fax:

(845) 794-8600

Municipal Email:

supervisor@townofthompson.com

Consulting Engineer Information:

Engineering Firm:

Delaware Engineering, D.P.C.

Salutation:
First:
MI:
Last:
Title:

Name of Contact:

Mr.

Robert

G

Chiappisi

Technician

Mailing Address:

55 South Main Street

City:

Oneonta

State:

NY

Zip Code:

13820

Phone Number:

(607) 432-8073

Fax:

(607) 432-0432

Email:

rchiappisi@delawaredngineering.com

Project Budget and Funding Sources

Construction Costs:

20,443,545.00

Equipment Costs:

0.00

Work Force Costs:

0.00

Engineering Fees:

Planning:

37,500.00

Design:

1,397,755.00

Construction:

2,096,633.00

Other Expense:

Local Counsel:

15,000.00

Bond Counsel:

25,000.00

Fiscal Services:

0.00

Miscellaneous:

107,950.00

Contingencies:

2,412,338.00

Total Project Costs (A):

26,535,721.00

Other Funding Sources

Type	Status	Amount

Total Other Funding Sources (B):

0.00

Subtotal (A - B) = (C):

26,535,721.00

Issuance Costs (D): (approx. 1.84% of (C))

488,257.27

Total CWSRF IUP Amount (C + D):

27,023,978.27

Prior CWSRF IUP Amount:

0.00

Project Schedule		Target/Actual	Date
1. Please indicate whether or not the implementation of your project requires the formation of a Special Improvement District. If yes, indicate the target or actual date of district formation.	☐		
2. Enter the date by which you anticipate submitting an engineering/technical report for review and approval by the appropriate reviewing agency. If you have already done so, indicate the actual date submitted. Please allow a minimum of two (2) months for completion of regulatory review of document(s). PLEASE NOTE: A municipality must have an approvable engineering/technical report to be listed for short-term or long-term financing in the Annual List of an IUP. A project must be listed on the Annual List of an IUP in order to receive funding during that IUP period.		Targe…	09/03/2019
3. A municipality must complete environmental review requirements for its project before it can receive either short-term or long-term financing. This process can take several months to complete.			
	3.a. Enter the date you anticipate completing the State Environmental Quality Review (SEQR) process or the date it was completed.	Targe…	04/01/2020
	3.b. Enter the date you anticipate receipt of the State Historic Preservation Office (SHPO) approval or the date approval was received.	Targe…	04/01/2020
Items 4, 5, 6 and 7 from previous Update Forms are now broken down by contract to enable multiple answers:			

Contract Type	Description	Amount	Plans and Specs Submitted to EFC	P&S Sub T/A	Anticipated Advertising Date for Bids	Advert Bid Date T/A	Constr. Start Date	Start Date T/A	Constr. End Date	End Date T/A
Construction	General	$17,638,185.00	6/1/2021	Targeted	9/1/2021	Targeted	1/3/2022	Targeted	12/29/2023	Targeted
Construction	Electrical	$2,359,315.00	6/1/2021	Targeted	9/1/2021	Targeted	1/3/2022	Targeted	12/29/2023	Targeted
Construction	Plumbing	$98,250.00	6/1/2021	Targeted	9/1/2021	Targeted	1/3/2022	Targeted	12/29/2023	Targeted
Construction	HVAC	$347,795.00	6/1/2021	Targeted	9/1/2021	Targeted	1/3/2022	Targeted	12/29/2023	Targeted

Application Schedule	Target/Actual	Date
8.) Enter the date by which you anticipate submitting a CWSRF financing application.	Targe…	04/01/2020
9.) Enter the date by which you anticipate needing CWSRF financing.	Targe…	05/01/2020

Municipal Authorization:

Our community requests the listing of the project described herein on the CWSRF Project Priority List (PPL) of the Intended Use Plan (IUP). We are interested in the following type(s) of CWSRF financing for the project:

☐ Short-Term Financing Only;

☐ Long-Term Financing Only;

☑ Both Short & Long-Term Financing.

Completed By:

Robert Chiappisi

Date:

08/06/2019

Title:

Technician

Current Documents:

Document Type	File Name	Description	Uploaded Date	Uploaded By

REQUIREMENTS FOR BUSINESS PARTICIPATION OPPORTUNITIES FOR MINORITY- AND WOMEN-OWNED BUSINESS ENTERPRISES AND EQUAL EMPLOYMENT OPPORTUNITIES FOR MINORITY GROUP MEMBERS AND WOMEN

To receive financial assistance through the Clean Water State Revolving Fund ("CWSRF"), the applicant for financial assistance ("You") will need to meet various New York State and federal requirements. Specifically, You must comply with the minority- and women-owned business enterprise ("MWBE") participation and equal employment opportunity ("EEO") requirements of Article 15-A of the New York State Executive Law, 5 NYCRR Parts 140-145, and 40 CFR Part 33, and other requirements as prescribed by the Environmental Facilities Corporation ("EFC"), as applicable, by:

1. Including required contractual language found in the applicable EFC Bid Packet, at www.efc.ny.gov (http://www.efc.ny.gov), in all bid documents and contracts to be funded through EFC;
2. Providing subcontracting opportunities and documenting good faith efforts to obtain MWBE participation;
3. Abiding by the requirements of Your EEO policy, which must include a policy to not discriminate against any employee or applicant for employment on the basis of race, creed, color, national origin, sex, age, disability, or marital status, and other requirements as further outlined in the applicable EFC Bid Packet; and
4. Maintaining records and taking actions necessary to demonstrate compliance throughout the life of the project.
5. Requiring your contractors and subcontractors to comply with 1-4 above.

Designated Minority Business Officer (MBO):

The MBO is responsible for administering Your MWBE-EEO program.

Name:

William J. Rieber

Email:

supervisor@townofthompson.com

Phone Number:

(845) 794-2500

Mailing Address:

4052 Route 42

City:

Monticello

State:

NY

Zip Code:

12701

MBE/WBE Combined Goals: 20% (MWBE goals may differ if You are also receiving other types of financial assistance from EFC. Please consult EFC's Bid Packets for additional information.)

Please note that all project costs You intend to finance through the CWSRF must meet the requirements referenced herein, regardless of whether some project work may have been completed prior to applying for CWSRF financing. Failure to meet these requirements may result in the loss of CWSRF financing for a particular contract.

I hereby certify that I have read and will abide by the above program requirements and that the information submitted herein is accurate and complete to the best of my knowledge and belief.

Authorized Representative for Applicant:

William J. Rieber

Date:

08/30/2019

By completing the above fields, I certify that the information submitted herein is true, accurate and complete to the best of my knowledge and belief.

State Smart Growth Public Infrastructure Policy Act Acknowledgement

CWSRF financings are subject to the State Smart Growth Public Infrastructure Policy Act. As set forth in the Act, EFC is required to determine that each project that includes the construction of new or expanded public infrastructure is consistent with the relevant smart growth criteria to the extent practicable. EFC has developed guidance for use by applicants that explains what is required by EFC to make this determination.

In addition to information required elsewhere, Applicants will need to demonstrate that projects meet the following criteria in the Smart Growth Assessment:

1. Uses or Improves Existing Infrastructure -supports projects that improve existing infrastructure.
2. Serves a Municipal Center - advances development and re-development of existing centers of activity and land use.
3. Community-Based Planning - encourages projects that result from inclusive, bottom-up, stakeholder-driven planning processes where proper outreach has been conducted, particularly to underserved/under-represented environmental justice communities.
4. Sustainable Development - promotes projects that use existing resources in ways that do not compromise the needs of future generations, including consideration and adoption, where appropriate, of green infrastructure techniques, decentralized infrastructure techniques and energy efficiency measures.

More information regarding EFC's smart growth review process (including the Act, Guidance for Applicants and Smart Growth Assessment) is available at:

http://www.efc.ny.gov/CleanWaterStateRevolvingFund/SmartGrowth.aspx

Completed By:

ROBERT G CHIAPPISI

Date:

08/12/2019

Requirements for projects to be listed on the Annual List of the IUP – Acknowledgement

The Annual Project Priority List identifies projects that EFC may provide financial assistance to during the IUP Period. For a project to be included on the Annual List, the applicant must also submit an approvable engineering report and a Smart Growth Assessment Form to EFC. A project may receive financial assistance in the IUP Period only if it is on the Annual List.

Please check this box to acknowledge that you are aware of this requirement and that you are authorized to make this acknowledgement on behalf of the applicant.

☑

The Requirements of Davis-Bacon and Related Acts – Acknowledgement

In order to receive financial assistance through either the Clean Water or the Drinking Water State Revolving Funds (SRFs), you will need to meet various New York State and federal requirements. In support of your SRF-financed project, you are required to engage in procurement and construction oversight practices to ensure that construction contractors and subcontractors are complying with provisions of the Davis-Bacon Act and other related requirements including payment of the higher of the state or federal wages and supplemental benefits. The Davis-Bacon requirements apply to any construction contract in excess of $2,000 that is still under construction after October 30, 2009. For construction contracts executed prior to October 30, 2009, it may be necessary to issue a change order to the contractor to incorporate the provisions of the Act.

Recipients of SRF financial assistance will be required to perform certain actions to verify the proper wages were paid, maintain and retain certain records, and ensure certain provisions are contained in all contracts and subcontracts. Specific Davis-Bacon guidance is available on the EFC website (http://www.efc.ny.gov).

Please check this box to acknowledge that you are aware of this requirement and that you are authorized to make this acknowledgement on behalf of the applicant.

☑

American Iron & Steel Requirement – Acknowledgement

In order to receive financial assistance through either the Clean Water or Drinking Water State Revolving Funds (SRFs), you will need to meet various New York State and federal requirements. In support of your SRF-financed project, you are required to engage in procurement and construction oversight practices to ensure that construction contractors and subcontractors are complying with the American Iron & Steel provisions of the CWSRF.

Recipients of SRF financial assistance will be required to perform certain actions to verify the compliance, and ensure certain provisions are contained in all contracts and subcontracts. Specific American Iron & Steel guidance is available on the EFC website (http://www.efc.ny.gov (http://www.efc.ny.gov)).

Please check this box to acknowledge that you are aware of this requirement and that you are authorized to make this acknowledgement on behalf of the applicant.

☑

APPENDIX M

Engineering Report Certification

Appendix C: Engineering Report Certification

(required for EFC financial assistance)

Engineering Report Certification

To Be Provided by the Professional Engineer Preparing the Report

During the preparation of this Engineering Report, I have studied and evaluated the cost and effectiveness of the processes, materials, techniques, and technologies for carrying out the proposed project or activity for which assistance is being sought from the New York State Clean Water State Revolving Fund. In my professional opinion, I have recommended for selection, to the maximum extent practicable, a project or activity that maximizes the potential for efficient water use, reuse, recapture, and conservation, and energy conservation, taking into account the cost of constructing the project or activity, the cost of operating and maintaining the project or activity over the life of the project or activity, and the cost of replacing the project and activity.

Title of Engineering Report: Town of Thompson, NY, Sullivan County, Kiamesha Lake WWTP Upgrade, Engineering Report

Date of Report: August 30, 0219

Professional Engineer's Name: Dave Ohman, P.E.

Signature:

Date: August 30, 2019

APPENDIX N

Smart Growth Assessment Form

NEW YORK STATE OF OPPORTUNITY. | Department of Health | Environmental Facilities Corporation

Smart Growth Assessment Form

This form should be completed by the applicant's project engineer or other design professional.[1]

Applicant Information

Applicant: Town of Thompson Project No.:

Project Name: Kiamesha Lake WWTP Upgrade

Is project construction complete? ☐ Yes, date: ☑ No

Project Summary: (provide a short project summary in plain language including the location of the area the project serves)

Upgrade WWTP to replace aged equipment and meet SPDES requirements for fecal coliform and chlorine residual by May 1, 2022

Section 1 – Screening Questions

1. Prior Approvals

1A. Has the project been previously approved for EFC financial assistance? ☐ Yes ☑ No

1B. If so, what was the project number(s) for the prior approval(s)? Project No.:

Is the scope of the project substantially the same as that which was approved? ☐ Yes ☐ No

IF THE PROJECT WAS PREVIOUSLY APPROVED BY EFC'S BOARD AND THE SCOPE OF THE PROJECT HAS NOT MATERIALLY CHANGED, THE PROJECT IS **NOT** SUBJECT TO SMART GROWTH REVIEW. SKIP TO SIGNATURE BLOCK.

2. New or Expanded Infrastructure

2A. Does the project add new wastewater collection/new water mains or a new wastewater treatment system/water treatment plant? ☐ Yes ☑ No

Note: A new infrastructure project adds wastewater collection/water mains or a wastewater treatment/water treatment plant where none existed previously

2B. Will the project result in either: ☐ Yes ☑ No

An increase of the State Pollutant Discharge Elimination System (SPDES) permitted flow capacity for an existing treatment system;

OR

An increase such that a NYSDEC water withdrawal permit will need to be obtained or modified, or result in the NYSDOH approving an increase in the capacity of the water treatment plant?

Note: An expanded infrastructure project results in an increase of the SPDES permitted flow capacity for the wastewater treatment system, or an increase of the permitted water withdrawal or the permitted flow capacity for the water treatment system.

[1] If project construction is complete and the project was not previously financed through EFC, an authorized municipal representative may complete and sign this assessment.

IF THE ANSWER IS “NO” TO BOTH “2A” and “2B” ON THE PREVIOUS PAGE, THE PROJECT IS NOT SUBJECT TO FURTHER SMART GROWTH REVIEW. SKIP TO SIGNATURE BLOCK.

3. Court or Administrative Consent Orders

3A. Is the project expressly required by a court or administrative consent order? ☐ Yes ☐ No

3B. If so, have you previously submitted the order to NYS EFC or DOH? If not, please attach. ☐ Yes ☐ No

Section 2 – Additional Information Needed for Relevant Smart Growth Criteria

EFC has determined that the following smart growth criteria are relevant for EFC-funded projects and that projects must meet each of these criteria to the extent practicable:

1. Uses or Improves Existing Infrastructure

1A. Does the project use or improve existing infrastructure? ☐ Yes ☐ No

Please describe:

2. Serves a Municipal Center

Projects must serve an area in either 2A, 2B or 2C to the extent practicable.

2A. Does the project serve an area **limited** to one or more of the following municipal centers?

i. A City or incorporated Village ☐Yes ☐No

ii. A central business district ☐Yes ☐No

iii. A main street ☐Yes ☐No

iv. A downtown area ☐Yes ☐No

v. A Brownfield Opportunity Area ☐Yes ☐No
(for more information, go to www.dos.ny.gov & search “Brownfield”)

vi. A downtown area of a Local Waterfront Revitalization Program Area ☐Yes ☐No
(for more information, go to www.dos.ny.gov and search “Waterfront Revitalization”)

vii. An area of transit-oriented development ☐Yes ☐No

viii. An Environmental Justice Area ☐Yes ☐No
(for more information, go to www.dec.ny.gov/public/899.html)

ix. A Hardship/Poverty Area ☐Yes ☐No
Note: Projects that primarily serve census tracts and block numbering areas with a poverty rate of at least twenty percent according to the latest census data

Please describe all selections:

2B. If the project serves an area located outside of a municipal center, does it serve an area located adjacent to a municipal center which has clearly defined borders, designated for concentrated development in a municipal or regional comprehensive plan and exhibit strong land use, transportation, infrastructure and economic connections to an existing municipal center? ☐Yes ☐No

Please describe:

2C. If the project is not located in a municipal center as defined above, is the area designated by a comprehensive plan and identified in zoning ordinance as a future municipal center? ☐Yes ☐No

Please describe and reference applicable plans:

3. Resiliency Criteria

3A. Was there consideration of future physical climate risk due to sea-level rise, storm surge, and/or flooding during the planning of this project? ☐Yes ☐No

Please describe:

Signature Block: By entering your name in the box below, you agree that you are authorized to act on behalf of the applicant and that the information contained in this Smart Growth Assessment is true, correct and complete to the best of your knowledge and belief.

Applicant: Town of Thompson	Phone Number: (607) 432-8073
Dave Ohman, P.E., President, Delaware Engineering, D.P.C.	
(Name & Title of Project Engineer or Design Professional or Authorized Municipal Representative)	
[signature]	08/30/19
(Signature)	(Date)

APPENDIX O

Basis of Design

Town of Thompson
Kiamesha Lake WWTP Upgrade
Basis of Design
Equipment Summary

Unit Process	Existing Conditions Value	Existing Conditions Units	Anticipated Conditions Value	Anticipated Conditions Units	Design Standard: Recommended Standards for Wastewater Standards 2014 Edition	Design Standard: Other	Comments/Remarks
A.) Influent Pipe							
Size (in, dia.)	24	in					**Current ADF = 0.55 MGD**
Material	ADS - N-12 corrugated pipe						**Permit ADF= 2.0 MGD**
Invert Elevation	1364.90	ft					**Permit PHF = 6.0 MGD**
							Permit PDF = 4.0 MGD
B.) Mechanical Screen							Schloss Model Mark IX-A
Bar Thickness	2 x 1/4	in					2'-9" channel width
Bar Spacing	3/4	in					
Slope	75	deg			Mechanically cleaned screens should be placed on a slope of 45 to 90 degrees from the horizontal.		Existing Installation
Channel Width	3	ft					
Channel Depth	4.83	ft					
Invert	1364.9	ft			The screen channel invert should be 3 to 6 inches below the invert of the incoming sewer.		
Dual Channel	Yes	-			Required		Existing Bar Rack, bypass channel
Freeze Protection	Yes				Freeze Protection Req'd.	OK 10SS	2" polystyrene, 1 KW strip heater, add new solid surface grating on channel before and afer screen during project
Average Flow	2	MGD					
% Plugged/Blinded		%					
Estimated Head loss	0.25	in					
Average Approach Velocity	2	fps			At design average flow conditions, approach velocity 1.5 to 3.0 fps at average		
Disposal Bin	Yes				Disposal bin req'd.	OK 10SS	
Voltage							1/2 HP, 480 V.,60 Hz.
Control Panel	Yes						
C.) Coarse Bar Rack (1)					Where a single mechanically cleaned screen is used, an auxiliary manually cleaned screen shall be provided		Mechanical screen bypass, removable galvanized
Bar Thickness	3/8	in					2'-9" channel width
Bar Spacing	2.5	in			Clear openings between bars should be no less than 1 inch (25 mm) for manually cleaned screens.		
Slope	60	deg			Manually cleaned screens should be placed on a slope of 30 to 45 degrees from the horizontal.		Existing Installation
Channel Width	2.5	ft					
Channel Depth	5	ft					
Invert	1383.75	ft			The screen channel invert should be 3 to 6 inches below the invert of the incoming sewer.	Not compliant	Existing installaton
Dual Channel	Yes	-			Required		Existing bar rack and mechanical screen in dual channel
Freeze Protection	No				Freeze Protection Req'd.	Not compliant	Existing Installation, solid cover will inhibit maintenace
Average Flow	2	MGD					
% Plugged/Blinded	30	%					
Estimated Head loss	0.92	in					
Average Approach Velocity	2	fps			At design average flow conditions, approach velocity 1.5 to 3.0 fps at average		
Ventilation						OK 10SS	Exterior installation
D.) Parshall Flume							Warminster Fiberglass Co., Model Type 10F
Size	12	in					
Min	0.078	MGD					
Max	10.4	MGD					
Ultrasonic Transducer	No		Add New ULT		Flow Measurement, totalizing and recording	NO	Proposed installation of new ultrasonic transducer in upgrade connected to SCADA
E.) Grit Chamber					Grit removal facilities should be located ahead of pumps and comminuting devices.	OK 10SS	Smith & Loveless, Inc, Model 7.0 Pista Grit chamber.
Channel Dia.	10	ft					full hydraulic flow range between 0.7 and 7.0 mgd
Head Loss	1/2	in					
Channel Depth	6.83	ft					
SWD	2.83	ft					
Free Board	4	ft					
Velocity	1.6-3.5	fps			Channel-type chambers shall be designed to control velocities during normal variations in flow as close as possible to 1 foot per second		
Voltage							1 HP, 480 V.,60 Hz.
Isolation Gates	Yes				Isolation gates req'd.	OK 10SS	
Bypass Channel	Yes						30"
Grit Pump							Smith & Loveless, Inc, Turbo grit removal pump with vacuum priming
Design Flow	175	gpm			3-5 minutes @ PHF	OK 10SS	
Design Discharge Head	32	ft					
Size	4	in					All internal clearances shall provide for the passage of a 4-inch spherical solid
Voltage							1 HP, 480 V.,60 Hz.

Town of Thompson
Kiamesha Lake WWTP Upgrade
Basis of Design
Equipment Summary

Unit Process	Existing Conditions		Anticipated Conditions		Design Standard		Comments/Remarks
	Value	Units	Value	Units	Recommended Standards for Wastewater Standards 2014 Edition	Other	
Freeze Protection	Yes				Grit removal facilities located outside shall be protected from freezing	OK 10SS	Fiberglass cover with heater
Ventilation	Yes				N/A	N/A	Exterior installation, elclosure cooling only
Grit Cyclone							Krebs
Max Flow	200	gpm					
Grit Classifier			Replace in kind				
Spiral conveyor	12	in					2 HP, 480 V.,60 Hz.
Disposal Bin	Yes				Disposal bin req'd.	OK 10SS	
Control Panel	Yes						NEMA type 4, HOA and timer controls
F.) Flow Splitter Box							
Oxidation Ditch West & East (D-1&D-2)							Weir crest 1364.85
Channel Width	60	in					
Plate height	30	in					
Rectanglar Weir Hole (HxL)	12 x 52	in					Replace weir
Oxidation Ditch West (D-1)							Weir crest 1363.95
Channel Width (rectangular weir)	26	ft					
Plate height	29	in					
Rectanglar Weir Hole (HxL)	13 x 18	in					Replace weir
Distribution pipe size	18	in					Isolation valve buired outside of box
Oxidation Ditch East (D-2)							Weir crest 1363.95
Channel Width (rectangular weir)	26	ft					
Plate height	29	in					
Rectanglar Weir Hole (HxL)	13 x 18	in					Replace weir
Distribution pipe size	18	in					Isolation valve buired outside of box
Oxidation Ditch (D-3)							Weir crest 1364.85
Channel Width (rectangular weir)	5	ft					
Plate height	30	in					
Rectanglar Weir Hole (HxL)	12 x 52	in					Replace weir
Distribution pipe size	18	in					Isolation valve buired outside of box
G.) Oxidation Ditch D -1 & D -2							
Channel length	231.5	ft					
Channel Width	23	ft					
Channel Depth	15	ft					
SWD	12	ft					
Free Board	3	ft			18 inches or greater	OK 10 SS	
Volume each	500,000	gallons					
Total Volume	1,000,000	gallons					
Detention Time /Basin	480	min @PHF					
MLSS	4000	mg/L			3,000-5,000 mg/L		
MCRT	18	days			15 to 25 days (typical)		
F/M Ratio	0.082				F/M Ratio lb BOD5/d/lb MLVSS 0.05-0.1	OK 10 SS	
Organic Loading	14.35				Aeration Tank Organic Loading 15 lb BOD^5/d/1000 ft^3	OK 10 SS	
Draft Tube Aerator	1/tank						Lightnin DHT 150A (81975), 1200/900 RPM, New motor 2019
U- Tubes	72	in					72" Diameter Concrete Pipe, channel velocitiy +/- 1 ft/sec.
~~Sparge Ring (air diffuser)~~	N/A						Not in use, to be removed
Voltage							75 HP, 480 V.,60 Hz.
DO Control (Optical)	0-20	mg/L					
Diffused Air System							
diffusers/tank	382		472				
grids /tank	4		4				
Size	9	in					
Type	Fine Bubble						
Material	Ceramic						
Flow Max/ diffuser	3.0	scfm					
Flow Min/ diffuser	0.03	scfm					
Anhydrous hydrogen chloride gas diffuser cleaning syst	Yes						System is not in service, broken feed lines. Add new injection point on air feed line
Minimum aeration tank dissolved oxygen concentration	2	mg/l					
SOR			7,182	lb/day	1.5 lb O2/lb design peak hourly BOD5 (see appendix P for SOR calculation sheet)	Not OK 10 SS	Based on 3 MGD (PHF), all aeration tanks on line
Critical wastewater temperature	20	C.				See SOR Sheet	
Altitude of plant	1380.00	ft					
Return Sludge Flow Rates (based on 1 MGD)			Add VFD's to four recycle pumps				Based on all aeration tanks on line
Minimum	43	%			Minimum 50% design average		Existing Equipment
Maximum	75	%			Maximum 150% design average		Existing Equipment
Air disribution piping (above water line and to drop leg	Varies	in					DI w/ SS air Drops, change DI to Sch. 10 SS

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		Existing Conditions		Anticipated Conditions		Design Standard		
	Unit Process	Value	Units	Value	Units	Recommended Standards for Wastewater Standards 2014 Edition	Other	Comments/Remarks
H.)	Oxidation Ditch D -3							
	Channel length	168	ft					
	Channel Width	47 (2 @ 23.5')	ft					
	Channel Depth	19.5	ft					
	SWD	18	ft					
	Free Board	1.5	ft			18 inches or greater	OK 10 SS	
	Total Volume	1,000,000	gallons					
	Detention Time /Basin	480	min @PHF					
	MLSS	4000	mg/L			< 6000 mg/L		
	MCRT	18	days			15 to 25 days (typical)		
	F/M Ratio	0.082				0.05-0.1 F/M Ratio	OK 10 SS	
	Organic Loading	14.35				Aeration Tank Organic Loading 15 lb BOD^5/d/1000 ft^3	OK 10 SS	
	DO Control (Optical)	N/A		0-20	mg/L			
	Diffused Air System							
	diffusers/tank	648		950				
	grids /tank	4		4				
	Size	9	in					
	Type	Fine Bubble						
	Material	Ceramic						
	Flow Max/ diffuser	0.030	scfm					
	Flow Min/ diffuser	3.0	scfm					
	Anhydrous hydrogen chloride gas diffuser cleaning syst	Yes		Yes				System is not in service, broken feed lines, Upgrade system in upgrade
	Minimum aeration tank dissolved oxygen concentration	2.0	mg/l					
	SOR			7182	lb/day	1.5 lb O2/lb design peak hourly BOD5 (see appendix P for SOR calculation sheet)	Not OK 10 SS	Based on 3 MGD (PHF), all aeration tanks on line
	Critical wastewater temperature	20	C.				See SOR Sheet	
	Altitude of plant	1380.00	ft					
	Return Sludge Flow Rates (based on 2 MGD)							
	Minimum	43	%			Minimum 50% design average		Existing Equipment
	Maximum	75	%			Maximum 150% design average		Existing Equipment
	Air disribution piping (above water line and to drop leg	Varies	in					DI w/ SS air Drops, change DI to Sch. 10 SS
I.)	Oxidation Ditch D -1 & D -2 Blowers							Model # 856-4-0-0-2-0-AD, Shares duty to Sludge Tanks
	Type	Multi-stage centrifugal		Rotary Screw		Share redundant blower with D3		
	Stages	7		N/A				
	Max Air Flow	2080	scfm	2827	scfm			
	Discharge Pressure	6.7	psig	6.7	psig			Water Level 12'-0"
	Inlet Presure	13.98	psia	14	psig			
	VFD	No		Yes				
	Horse Power	100	hp	125	hp			3600 RPM, 460 V.,60 Hz,. ODP Motor
	Air Piping	10	in.	12	in			Sch 40 painted steel in building
J.)	Oxidation Ditch D -3 Blowers							Model # 818-3-0-0-5-0-AD
	Type	Multi-stage centrifugal		Rotary Screw		Share redundant blower with D1&D2		
	Stages	9		N/A				
	Max Air Flow	1385	scfm	2827	scfm			
	Discharge Pressure	9.3	psig	9.3	psig			Water Level 18'-0"
	Inlet Presure	13.98	psia	14	psig			
	VFD	No		Yes				
	Voltage	100	hp	125	hp			3600 RPM, 460 V.,60 Hz,. ODP Motor
	Air Piping	10	in.	12	in			Sch 40 painted steel in building
K.)	Sludge Recirculation Pumps (4)			Replace with new pumps				Smith & Loveless 6C3B Vacuum Prime Suction Lift
	Type	Vortex						
	Suction	6	in					
	Discharge	6	in					Solids Size - 3" sphere
	Min Flow	1080	gpm					
	Design Discharge Head	31.5	ft					
	Max Flow	2950	gpm					
	Design Discharge Head	34.5	ft					
	VFD	No		Install new VFD's (4)				
	Voltage	15	hp					1170 RPM, 460 V.,60 Hz,. ODP Motor
	RAS/WAS Flow Meters (3)	-	in	Install new units				Greyline Doppler flow meter, trend in new SCADA
	Return Sludge Flow Rates (based on 2 MGD)							
	Minimum	43	%			Minimum 50% design average	OK 10SS	Peripheral feed inlet, Smith & Loveless circular clarifier mechanism
	Maximum	179	%			Maximum 150% design average		Surface Area 2826 ft^2
							OK 10SS	96 sq./in. total, equally distributd around clarifier periphery

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Unit Process	Existing Conditions Value	Existing Conditions Units	Anticipated Conditions Value	Anticipated Conditions Units	Design Standard: Recommended Standards for Wastewater Standards 2014 Edition	Design Standard: Other	Comments/Remarks
L.) Secondary Clarifier No. 1 & No. 2					Multiple settling units capable of independent operation	OK 10SS	
Diameter	65	ft					
SWD	12	ft			Secondary tank following activated sludge process Min SWD = 12'		Hydra-Neumatic Sales
Free board	18	in			Walls of settling tanks shall provide not less than 12 inches of freeboard	OK 10SS	Feed individual from Ox. Ditches with valved selector pipe between
Floor Slope	1/8 on 12	in					
Fiberglass Inlet Nozzles (12)	8	in				OK 10SS	
Flow Distribution	18	in			Effective flow splitting devices and control appurtenances shall be provided	OK 10SS	
Volume	280,714	gal					
Weir Trough					Weir troughs shall be designed to prevent submergence at design peak hourly flow		
Weir Trough Velocity					Maintain a velocity of at least 1 foot per second (0.3 m/s) at one-half design average flow.	OK 10SS	Assume both units on line
Weir Material	Aluminum					OK 10SS	Assume both units on line
Length of weir	204	ft				OK 10SS	Assume both units on line
Weir over flow rate	30,000	gpd/lin ft			Loading rate at design peak hourly flow (30,000 gpd/lin ft)	OK 10SS	Sludge collector
Surface over flow rate	452	gpd/ft^2			Design peak hourly flow, Extended Aeration single stage nitrification (1000 gpd/ft^2)	OK 10SS	6" telescoping valve control
Peak solids loading rate	34.1	lb/day/ft^2			Peak solids loading rate @ max day flow + max return sludge flow @ design MLSS (35 lb/day/ft2)	NA	Suction lift clarifier
Full surface scum collection	Yes				Req'd	OK 10SS	
Scum hopper removal piping	6	in			6" min	OK 10SS	
Sludge Hopper					The minimum slope of the side walls shall be 1.7 vertical to 1 horizontal.		
Sludge drawoff pipe	8	in			Each sludge hopper shall have an individually valved sludgewithdrawal line at least 6 inches dia.	OK 10SS	
Sludge /scum recirculation pipe	12	in			6" min	OK 10SS	
Center column	16	in					460 V., 3 ph, 60 Hz.
Sludge Collection					Mechanical sludge collection & withdrawal shall be designed to assure rapid removal of the sludge.		
Drive mechanism designed rated torque	5500	ft.-lbs.					Max/ADF each
Voltage	1	hp					Max/ADF each
Design Criteria							Max/ADF each
MLSS Flow	4/1.5	mgd					Max/ADF each
Effluent Flow	3/1.5	mgd					
Return Sludge Flow	1/0.5	mgd					RAS/WAS and Tertiary Filter Backwash Tank
Overflow Rate	904/302	gpd/ft^2					
M.) MudWell							
Tank length	94.67	ft					
Tank Width	14.5	ft					
Tank Depth (average)	14.33	ft					
SWD (average)	9.33	ft					
Free Board	5	ft					
Volume @ HWL	94,250	gal					
N.) Tertiary Filtration							
Filter Cells (4)							1152 ft^2 total filter area
Width	16	ft				OK TSS	Design Capacity 4200 GPM (4500 GPM Max.)
Length	18	ft					
Filter Area	288	ft^2					
Filter Rate	3.65	gpm/ft^2			< or = to 5 gpm/ft^2		
Air wash Rate	4	cfm/ft^2					Double action Pneumatic acuactors
Washwater Rate	12	gpm/ft^2					12 gpm/ft^2 of bed area, Double action Pneumatic acuactors
Control Valves							Double action Pneumatic acuactors
Influent (4)	10	in					4 cfm/ft^2 of bed areaDouble action Pneumatic acuactors
Backwash (4)	16	in					Anthracite
Cell Isolation (4)	20	in					
Backwash Air Supply (4) butterfly	8	in					
Filter Media							
Depth	30	in					Adjustable
Effective Size	1.4-1.6						ABS Model AFW-300-6-10"40 HP, 1150 RPM
Uniformity Coefficient	<1.75						
Effluent Weir	22	ft					Replace valves and check valves, 12" ball checks?
Backwash Pumps							
Type	Submersable						
Flow	3700-4600	gpm					
TDH	14-19	ft					460 V./3 Ph./60 Cycle
Float Control	4						
Discharge	12	in.					Roots Model 615RAI-U
Control Panel	By Filter Vendor						
Level Control	Float LWL						

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Unit Process	Existing Conditions Value	Existing Conditions Units	Anticipated Conditions Value	Anticipated Conditions Units	Design Standard: Recommended Standards for Wastewater Standards 2014 Edition	Design Standard: Other	Comments/Remarks
Backwash Air Supply Blowers 1&2							
Type	Positive Displacement						
Max Air Flow	1152	scfm					
Discharge Pressure	5	psig					460 V.,60 Hz., 3 ph., ODP
Inlet Presure	13.98	psia					Quincy Model FF-108, duplex compressor, 3/4 HP, 460 V., 3 ph, 60 Hz. valve air supply
VFD	No						230/460 V.,60 Hz., 3 ph., ODP
Voltage	40	hp					Hankinson Model 8010
Air Compressor system	4.7	CFM					
Voltage	0.75	hp					
Refrigerated Air Dryer							Grundfos, Source fitler clear well
Receiver	60	gal					Replace valves and check valves
							3” suction, 2.5” discharge, 8” impeller and 0.375” sphere capability
Non-Potable Water System			Install New				
Flow	5	gpm	220	gpm			
TDH	72	ft	72	ft			
Float Control							460 V./3 Ph./60 Cycle,
Discharge	3	in.					
Pressure tank			80	gal			460 V.,60 Hz., 3 ph., VFD pump control
Control Panel	By pump Vendor		By pump Vendor				
Pressure Control			Pressure transducer				
Voltage	7.5	hp	10	HP			
O.) Post Aeration (filter clearwell)							
Tank length	33	ft					
Tank Width	18	ft					
Tank Depth @HWL	15.08	ft					
SWD (average)	13.33	ft					
Free Board	1.75	ft					
Volume each	57,600	gal					
Diffused Air System							
diffusers/tank	100		Replace in Kind				
headers /tank	5						
Size	9	in					
Type	Fine Bubble						
Material	Ceramic						
Flow Max/ diffuser	3.0	scfm					
Flow Min/ diffuser	0.030	scfm					
DO Control	No						
Post Aeration Blowers 1&2							
Type	Multi-stage centrifugal		Install new PD blowers				
Stages	side stream from Aeration		9				
Max Air Flow	tank blowers		300	scfm			
Discharge Pressure			9.3	psig			460 V./3 Ph./60 Cycle
Inlet Presure			13.98	psia			
VFD			Yes				Model Enpo Cornell 151-5, 0.75 HP, 115/1/60
Horse Power			15	hp			Replace valve and check valve
P.) Blower Building Sump Pump							
Flow	55	gpm					460 V./3 Ph./60 Cycle
TDH	20	ft					
Float Control	1					OK 10SS	
Control Panel	Simplex Control					OK 10SS	
							Assume sludge holding and sludge decant tank as one
Q.) Sludge Holding Tank No. 1 & No. 2					Volume Required, Extended aeration activated sludge 3.0 ft3/P.E. (see appendix P for calculation)		
Tank length	91.83	ft			Multiple digestion units capable of independent operation shall be provided	OK 10SS	per tank
Tank Width	18	ft					
Tank Depth (average)	12.5	ft					
SWD (average)	8.5	ft					
Free Board	4	ft					Existing Tanks
Volume each	105,094	gal			Total ft3 = 14,050 per tank		
Total volume	210,188	gal			Total ft3 = 28,100		Sanitaire Coarse Bubble Diffuser
Covered	No						
Air Flow per Diffuser	11.4	SCFM					
Tank Mixing	28	per tank			Nonclog type designed to permit continuity of service	OK 10SS	Wall openings to Oxidation Ditch D -1 & D -2 @ elevation 1362.50
Existing Tank Air Supply	456	SCFM			420 cfm req'd for 10SS air supply, 456 SCFM provided by oxidation Ditch D -1 & D -2 Blowers	OK 10SS	4- supernanat decant airlifts/train
Proposed Blowers 1 ,2&3			500	scfm	New PD blowers (3) both tanks share standby blower	OK 10SS	150 cfm req'd for 10SS air supply, 500 SCFM provided by New Blowers Submergence (Feet) 9'0" Oxygen Transfer (Lbs. 02/Day) 720
Unvalved overflow					An unvalved high level overflow and any necessary piping shall be provided to return digester overflow back to the head of the plant or to the aeration process in case of accidental overfilling		
Supernatant Seperation					Facilities shall be provided for effective separation or decanting of supernatant	OK 10SS	

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	Unit Process	Existing Conditions		Anticipated Conditions		Design Standard		Comments/Remarks
		Value	Units	Value	Units	Recommended Standards for Wastewater Standards 2014 Edition	Other	
	Sludge Tank Aeration Blowers 1&2					Provide air to keep the solids in suspension & maintain dissolved oxygen between 1 mg/L and 2 mg/L. Minimum mixing and oxygen requirements, air supply of 30 cfm/1000 ft3 of tank volume with the largest blower out of service		
	Type			Install new PD blowers				
	Max Air Flow			500	scfm	420 SCFM required for each tank	OK 10SS	
	Discharge Pressure			4	psig			460 V./3 Ph./60 Cycle
	Inlet Presure			13.98	psia			
	VFD			Yes				
	Voltage			15	hp		mgd	
							mgd	
R.)	UV Disinfection No. 1, No. 2 & No. 3					>65% UV radiation transmittance at 254 nanometers wave length, BOD5 and suspended solids ≤ 30 mg/L design peak hourly flow, UV dosage not less than 30 (mW·s)/cm2 alarm system shall be provided to separately indicate lamp failure, low UV intensity and any other cause of UV disinfection unit failure	mgd	
	Peak Hour Flow	6					mg/l	Based on 30 day average
	Average flow	2					%	Minimum at 253.7 nm
	Minimum flow	0.4						
	Total suspended solids	≤ 30						
	Transmittance	65						
	Bulbs per bank	12					OK 10SS	
	Type	Medium Pressure					OK 10SS	
	In-line pipe mount	Closed					OK 10SS	
	UV Dosage	37	(mW·s)/cm2			≥ 30 (mW·s)/cm2	OK 10SS	One reactor at ADF , two reactors at PHF
	Automatic Cleaning System	Yes						
	Alarm System	Yes						Bentonite Clay Liner, retention time 2.6 days
	Redundancy	Yes						three aerated cells, 24" inlet, 18" outlet, 6" metered drain to PS
S.)	Polishing Lagoon							
	Length	292	ft					
	Width	126	ft					
	Depth	10.5	ft					
	Volume	2,889,000 ~	gal					
T.)	Site Pump Station							
	Concrete Wet Well							
	Diameter	6	ft					
	Depth	19	ft					
	Access Hatch	Aluminum Bilco				Install New Hatch		
	Detached Valve Vault							
	Diameter	5	ft					3500 RPM, 5 HP, 460/3/60 Hydromatic S3HRC 500
	Depth	7	ft					Replace valves and check valves, 4"?
	Access Hatch	Aluminum Bilco				Install New Hatch		
	Pumps					Replace in kind		
	Flow	140	gpm					460 V./3 Ph./60 Cycle
	TDH	55	ft					
	Float Control	4						JWI Model 1200G32102-75/100YSL
	Control Panel	Duplex Control				New with Pumps		
U.)	Filter Press (Plate & Frame)							Installed in belt press feed pipe
	Size	1200	mm					
	Feed Volume / batch	8000	gal					
	Flow Meter	N/A						Washdown only
	Feed Volume	Varies						
	Discharge solids	26-30	%					
	Wash Water Req.	Varies	gpm					
	Polymer Feed System							Chemtaineer FRP tank 12' dia. X 11' h.
	Polymer feed pump to batch tank							Chemtainer Mixer Model 3CTD-3
	Polymer feed pump to sludge pump suction							460 V./3 Ph./60 Cycle
	Batch Tank	9000	gal					
	Tank Mixer	100	rpm					Batch Tank LWL & HWL floats
	Voltage	3	hp					ARO 3" Diaphragm Pump Model PD30
	Batch tank feed pump							CompAir Rotary Screw
	Existing	10-125	GPM					
	Press Feed Pump							
	Air Compenssor							460 V./3 Ph./60 Cycle
	Flow		scfm					Blum 42" Slat Conveyor
	Discharge Pressure	125	psi					460 V./3 Ph./60 Cycle
	Voltage	20	hp					
	Sludge Conveyor	1	unit					3DP Model Belt Press
	Voltage	5	hp					PLC based electrical control panel for all Press and polymer control functions

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Unit Process	Existing Conditions		Anticipated Conditions		Design Standard		Comments/Remarks
	Value	Units	Value	Units	Recommended Standards for Wastewater Standards 2014 Edition	Other	
Belt Filter Press							
Size			2	meter			
Feed Volume			83-200	gpm			
Flow Meter			4	in			
Feed Volume			850	lb/hr			
Discharge solids			18-22	%			
Wash Water Req.			100	gpm			Spare on shelf
Polymer Feed System							
Polymer feed pump to static mixer			6	gpm			
Belt press feed pump			80-200	gpm			
Moyno Pump							
Hydraulic power unit			1	unit			
Washwater Booster Pump							
Flow			100	gpm			
Discharge Pressure			80	tdh			Backup use and cake storage for disposal
Sludge screw conveyor			12	in			
Belt Press Control Panel			1	304 SS			
V.) Sludge Drying Beds	4						Binder, NYSDOT 403.13, slope to pea stone sump at edge
Length	130	ft					
Width	32	ft					
Area	4000	ft^2					
Asphalt Surface	4	in					
W.) Aerobic Digester Process Class A Biosolids							
ThermAer Reactor (2) 55% VS destruction					Multiple digestion units capable of independent operation shall be provided	OK 10SS	
Length			32	ft			
Width			12	ft			
Height			24	ft			
SWD			18	ft			
Volume			51,700	gal			
Sludge Feed Rate/ tank (avg 7 days/wk			640-2500	lb/d			
Sludge Feed Concentration			40,000-60,000	mg/l			
52-14 ThermAer jet motive pump, 60 HP							
Positive displacement blower, 25 HP							
Foam control SplashCone (2)							
Nozzle Jet Aeration System (6)							
Radar foam level sensor (1)							
ORP probe (1)							
SNDR Reactor 15% VS destruction							
Length			32	ft			
Width			24	ft			
Height			24	ft			
SWD			18	ft			
Volume			103,400	gal			
52-14 ThermAer jet motive pump, 60 HP							
Positive displacement blower, 25 HP							
Foam control SplashCone (2)							
Nozzle Jet Aeration System (4)							
Radar foam level sensor (1)							
ORP probe (1)							
Heat Exchanger							
BiofiltAer Odor Control Unit							
Length			24	ft			
Width			12	ft			
Height			12	ft			
Inorganic Biofilter media							
Organic Biofilter media							
3,000 SCFM @ 9" WC Fan (1) 10 HP							
Rotary Drum Sludge Thickener							
Loading Rate			80-100	gpm			
Feed Sludge Concentration			0.3 - 1.0	%			
Model 3656 wash water booster pumps (1)							
Flow			10	gpm			
Discharge Pressure			50-80	psi			
Emulsion polymer make down system (1)			1200	gph			
Progressive cavity neat polymer pump			2.5	gph			
Sludge feed pump, 10 HP, VFD							
Flow			165	gpm			
Discharge Pressure			40	psi			

Unit Process	Existing Conditions Value	Units	Anticipated Conditions Value	Units	Design Standard: Recommended Standards for Wastewater Standards 2014 Edition	Other	Comments/Remarks
TWAS pump,10 HP, VFD							
Flow			80	gpm			
Discharge Pressure			40	psi			
Belt Press Feed Pump, 15 HP, VFD							
Flow			165	gpm			
Discharge Pressure			40	psi			
X.) Septage Receiving							
Model RoFAS size 0.5							
Max Flow			400	gpm			
Drum Perforation Sizing			10	mm			
Installation Angle of Drum			10	deg.			
Wash Water Consumption			22	gpm			
Rock Trap							
Washer Compactor							
Screenings Capacity			140	ft^3/hr			
Wash Water Consumption			16	gpm			
Septage Receiving Tank			10,000	gal			
Y.) Septage Holding Tank (Abandoned in Place)							Roots Model 215T, 1750 RPM
Diameter		ft					
Depth		ft					
Volume		gal					
Blowers 1&2							
Type	Positive Displacement						
Max Air Flow	140	scfm					208 V.,60 Hz., 3 ph., ODP
Discharge Pressure	10	psig					Pollution Control, Model DP-75
Inlet Presure	13.98	psia					
VFD	No						
Voltage	10	hp					
Diffused Air System							
diffusers/tank	51						
headers /tank	?						
Size	?	in					
Type	?						
Material	?						
Flow Max/ diffuser	12.000	scfm					Robins & Myers, Model 1E0ESI
Flow Min/ diffuser		scfm					
DO Control	No						
Septage Pump Vault							
Type	Monyo						230/460 V./3 Ph./60 Cycle
Flow	10	gpm					Hydromatic Model SP 50 AH
TDH	25	ft					
Float Control	4						
Voltage	1.5	HP					
Sump Pump							
Type	Submersable						115 V./ 1 Ph,/60 Cycle
Flow	50	gpm					
TDH	37	ft					
Float Control	1						
Voltage	0.5	HP					

APPENDIX P

Process Calculations

- **Activated Sludge Process Tanks**
  - **– Food to Mass Ratio**
  - **– Organic Loading Rate**
  - **– SOR Calculations (Ditch 1 & 2)**
  - **– SOR Calculations (Ditch 3)**
  - **– MCRT Calculations**
- **Secondary Clarifier Tanks**
  - **– Surface Overflow Rate**
  - **– Peak Solids Loading Rate**
  - **– Weir Overflow Rates**
  - **– Weir Troughs**
- **Tertiary Filtration**
- **Post Aeration Tank**
- **Aerobic Sludge Digestion**
- **Belt Filter Press**

Activated Sludge Process Tanks 2- 500,000 gallon oxidation ditches (D1 & D-2)
1- 1,000,000 gallon oxidation ditch (D-3)

Food to Mass Ratio

Ten States Design Standard
Extended Aeration Single Stage Nitrification F/M Ratio 0.05-0.1 lb BOD5/d/lb MLVSS

F/M Formula

BOD_5, lbs/day
MLVSS,lbs
Assume 70% Volitile

MLSS,mg/l 6500

MLSS,mg/l 4000

Existing ADF

BOD_5		Flow (MGD)				lbs BOD_5				
190	x	0.55	x	8.34	=	872	=	0.022967033		Assume D-3 aeration tank on line
4550	x	1.0	x	8.34	=	37947				
MLVSS		Volume (MGD)				lbs, MLVSS				

Permit Flow

BOD_5		Flow (MGD)				lbs BOD_5				
230	x	2	x	8.34	=	3836	=	0.082142857		Assume D-1, D-2 & D-3 aeration tank on line
2800	x	2.0	x	8.34	=	46704				
MLVSS		Volume (MGD)				lbs, MLVSS				

Maximum Loading

BOD_5		Flow (MGD)				lbs BOD_5				
280	x	2	x	8.34	=	4670	=	0.1		Assume D-1, D-2 & D-3 aeration tank on line
2800	x	2.0	x	8.34	=	46704				
MLVSS		Volume (MGD)				lbs, MLVSS				

Organic Loading Rate

Ten States Design Standard
Extended Aeration Single Stage Nitrification 15 lb BOD_5/d/1000 ft^3

Formula

$$\frac{\text{*Organic Load, lbs } BOD_5 \text{ /day}}{\text{Volume, cu ft,1000 ft3}}$$

BOD_5		Flow (MGD)				lbs BOD_5			
230	x	2	x	8.34	=	3836	=	14.35	Average Daily Flow
2000000			x	7.48	=	267			Assume D-1, D-2 & D-3 aeration tank on line
Volume (MGD)									

BOD_5		Flow (MGD)				lbs BOD_6			
241	x	2	x	8.34	=	4020	=	15.03	Maximum Capacity
2000000			÷	7.48	=	267			Assume D-1, D-2 & D-3 aeration tank on line
Volume (MGD)						cu/ft			

* Volumetric loadings are based on the influent organic load to the aeration tank at plant design average BOD5.
** Refer to 11.251(a) for definition of BOD5.
*** Maximum MLSS values are dependent upon the surface area provided for final sedimentation, the rate of sludge return, and the aeration process.
**** Total aeration capacity includes both contact and reaeration capacities. Normally the contact zone equals 30 to 35% of the total aeration capacity.

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Town of Thompson, NY
Kiameshia Lake WWTP Upgrade
Standard Oxygen Requirement (SOR) Calulations

I. Biological Oxygen Demand Loading

Values in Red need to be entered

BOD Loading = (Q_{Permit}) X (BOD_5) X (8.34)

Average Daily Flow (Q_{Ave})=	0.55	mgd		
Permit Flow (Design) =	1	mgd		Calculation based on D1&D2 air supply,
Peak Flow =	3	mgd		D3 req'd are the same but dedicated blower
Inf. BOD_5 =	230	mg/l	Note, based on plant design	Flow equally split between both ditches
Eff. BOD_5 =	5	mg/l		
BOD Loading In =	1918	lb BOD/day	daily monitoring reports	***Permit x [BOD] x 8.34***
BOD Loading Out =	42	lb BOD/day		
BOD to be Treated =	1877	lb BOD/day	To be treated at MGD 1	***BOD in - BOD out***

II. Nitrogenous Oxygen Demand Loading

NOD Loading = (Q_{permit}) x (NOD) x (8.34)

NOD =	35	mg/l		
NOD Loading =	292	lb NOD/day		***NOD amount x Permit x 8.34***
NOD Req. Aeration Rate =	4.6	lb O_2/lb NOD		***Note: USED 4.57 INSTEAD OF 4.7***
NOD =	1334	lbO_2/day	To be treated at 2 MGD	***NOD amount x req. aeration rate***

II. Oxygenation Requirements

A.) BOD

1.) Metcalf Method

Lb. of O_2/day=a(lb BOD_5/day) + b(lb. MLSS)

where, **a** = slope, and from a data plot of lb O2 /day/lb MLSS versus lb BOD removed / lb MLSS/day
b = Intercept from a data plot of (Lb. O_2/day/Lb. MLSS),
relative to the O_2/day/Lb. MLSS
Assume for the Village of Liberty WWTP influent characteristics

a = 0.45
b = 0.15

BOD Loading to be Treated =	1877	lb BOD/day	
Aeration Basin Volume =	1.000	MG	
MLSS Concentration =	4,000	mg/l	
lb of MLSS under air =	33,360	lbs	***pound of MLSS x concentration x 8.34***
Lb. of O_2/day =	5,848	lb O_2/day	Note, target aeration rate for total volume of basin

{Source: page 27 of Notes on Activated Sludge, Smith & Loveless}

Lb. of O_2/day=a(lb BOD_5/day) + b(lb. MLSS)

THIS TAKES INTO ACCOUNT YOUR MASS UNDER AIR.

Calculate F/M

Food to mass ratio (F:M) is important as nitrification generally requires a low food to mass ratio F/M
Generally speaking, a F/M <0.3 will allow for nitrification

Use F/M to figure on aeration tank size

Mass under air=	33,360	(MLSS lbs)
Incoming food as BOD=	1,877	lb BOD/day
F/M	0.06	dimensionless

Typical F/M values

The Food/Mass or the Food/Microorganism ratio commonly referred to as F/M is based upon the ratio of food fed to the microorganisms each day to the mass of microorganisms held under aeration. It is a simple calculation, using the results from the influent BOD test to the aerator and the mixed liquor suspended solids test.

Common ranges for F/M for a conventional activated sludge plant are from **0.15 to 0.3**

Total Oxygen Requirement = O_2 Required for BOD + O_2 Required for NOD

= 5848 lb O2(BOD) + 1334 lb O2(NOD) = 7182 lb O_2/day

III. Compressor Requirements

$Pw=(wRT_1/550ne)[(p_2/p_1)^{0.283}-1]$

w, Weight of Flow of Air

Daily Oxygen Requirement, lbs = 7182 lb O_2/day/aeration zone

(extended aeration)

Town of Thompson, NY
Kiameshia Lake WWTP Upgrade
Standard Oxygen Requirement (SOR) Calulations

	21	%	Percent of atmosphere that is oxygen
Atmospheric Air Flow Requirement =	34202	lb Air/day	
Lb. Air/ft^3 =	0.0724	. Air/ft^3 =	{be careful here of this value at very high altitudes}
Atmospheric Air Flow Requirement =	472403	ft^3/day	
Oxygen Transfer Efficiency =	12	%	
Air Flow Requirement accounting OTE =	3936688	ft^3/day	
Air Flow Requirement accounting OTE =	2734	scfm	convert ft^3/day to scfm

Correction of Volumetric flow from Standard Temp = $[(460+°F_{of\ Operation})/(460+°F_{Standard})] \times$ scfm

The above equation converts °F to °Rankine (is a thermodynamic (absolute) temperature scale)

$°F_{of\ Operation}$ =	86	°F	Enter hottest day. / Then enter coldest day for comparison
$°S_{tandard}$ =	68	°F	Average temperature for area
Correction of Volumetric flow from Standard Temp. =	2827	ft^3/min	
Weight of Air =	0.072	lb Air/ft^3	Note: can vary by altitude
w, Weight of Flow of Air =	203.54	lb Air/min	
w =	3.392	lb air/sec	

Constants

R, Engineering Gas Constant for air =	53.3	ft-lb/(lb air)·°R
n =	0.283	Note, n=(k-1)/k = 0.283 for air, k=1.395 for air

Assumptions

T_1, absolute inlet temperature =	546	K (°R), (460 + $°F_{of\ Operation}$ (86°F))	What temperature is chosen
P_1, absolute inlet pressure =	14.7	atm (lb_f/in^2)	
P_2, absolute inlet pressure =	23	atm (lb_f/in^2)	
e, efficiecny =	0.760		Refers to blower efficiency

Power Required

Pw = 113 hp

IV. Motor Requirements

bhp=Pw/e_{motor}

Assumptions

e_{motor} =	0.85	, 85%	Refers to motor efficiency
bhp=	132.6	hp	Note, total required motor horsepower

V. Diffusers Neede

Size of diffusers =	9 in			
cfm Range =	0.3	to 3 cfm		
75% of diffuser range =	2 cfm			
Required Flow Rate =	2827 cfm			
Number of Diffusers Needed =	1396	Diffusers	Note, per basin, D3	If odd number round up to even
Number of Diffusers Needed =	698	Diffusers	Note, per aeration zone D1&D2	So this number will be even.

MCRT at 2.0 MGD Flow and 2.0 MG under aeration

$$\text{MCRT} = \frac{\text{Solids in Activated Sludge Process, lbs.}}{\text{Solids Removed from Process, lbs/day}}$$

Calculation:

SS in Aerator lbs.

MLSS mg/l	X	Aerator Vol.MG	X	8.34	=	SS solids in aerator
4000	x	2.00	x	8.34	=	66720

SS lost in effluent lbs/day

Inf flow MGD	X	Effl. SS, mg/l	X	8.34	=	SS lost/day
2	x	5	x	8.34	=	83.4

SS wasted in lbs/day

Waste flow MGD	X	WAS mg/L	X	8.34	=	SS lost/day
0.0657	x	6300	x	8.34	=	3452.009

WAS GPM	X	Minutes			=	WAS MGD
137	x	480			=	0.06576

Solids in Activated Sludge Process, lbs.	=	66720	**MCRT**	**18.87193**	**days**
Solids Removed from Process, lbs/day	=	3535.409			

Final Settling Tanks - Activated Sludge Two 65' diameter clarifiers

Ten States Design Standard
Surface Overflow Rates at Design Peak Hourly Flow* 1000 gpd/ft2 (10 SS)
Extended Aeration Single Stage Nitrification

Surface Overflow Rate*

Surface Overflow Rate Formula

$$\frac{\text{Influent Flow}}{(0.785)(\text{diameter2})}$$

	0.785	x	65^2	=	3317	=	165.8	gpd/ft^2	Assume one clarifier tank on line
Existing Clarifiers 65' diameter (2 units)		0.55		=	550000				
Existing ADF		MGD							
	0.785	x	65^2	=	3317	=	301.5	gpd/ft^2	Average Daily Flow
Existing Clarifiers 65' diameter (2 units)		2		=	2000000				Assume 2 clarifier tank on line
Permit ADF		MGD							
	0.785	x	65^2	=	3317	=	1000.0	gpd/ft^2	Maximum Capacity
Existing Clarifiers 65' diameter (2 units)		6.634		=	6634000				Assume 2 clarifier tank on line
Max. Capacity		MGD							

Peak Solids Loading Rate ***

Ten States Design Standard 35 lb/day/ft2
Peak Solids Loading Rate Formula

$$\frac{\text{Solids Applied /Day, lbs}}{\text{Surface Area, ft2}}$$

Max Day TSS	4.3	MGD	x	284	TSS mg/L	x	8.34	=	10185		
Design MLSS under Air	2	MGD	x	4000	MLSS	x	8.34	=	66720		Peak Day Flow
Return on Max Day	2	MGD	x	8977	MLSS	x	8.34	=	149736.36		Assume 2 clarifier tank on line
									226641	lbs, solids	
Peak Solids Loading at 2.0 MGD	=		34.2 lb/day/ft2								
Max Day TSS	6.75	MGD	x	284	TSS mg/L	x	8.34	=	15988		
Design MLSS under Air	2	MGD	x	4000	MLSS	x	8.34	=	66720		Maximum Capacity
Return on Max Day	2	MGD	x	8977	MLSS	x	8.34	=	149736.36		Assume 2 clarifier tank on line
									232444	lbs, solids	
Peak Solids Loading at 2.0 MGD	=		35.0 lb/day/ft2								

* Based on influent flow only.
** Plants needing to meet 20 mg/L suspended solids should reduce the surface overflow rate to 1000 gallons per day per square foot
*** The clarifier peak solids loading rate shall be calculated based on the design maximum day flow rate plus the design maximum return sludge rate requirement and the design MLSS under aeration.
**** When phosphorus removal to a concentration of than 1.0 mg/L is required.

Weir Overflow Rates

Ten States Design Standard
Average Plant Capacity greater than 1 mgd — Loading Rate at Design Peak Hourly Flow 30,000 gpd/lin ft

Weir Overflow Rate Formula

$$\frac{\text{Flow, gpd@phf}}{\text{Weir Length, ft}} \quad (\pi)(\text{Diameter})$$

(2) 65' diameter clarifiers

$$\frac{6{,}000{,}000}{200} = 30000 \text{ gpd}$$

Average Daily Flow (Max. Day Flow)
Assume 2 clarifier tank on line

Weir Troughs

Ten States Design Standard
Weir troughs shall be designed to prevent submergence at design peak hourly flow, and to maintain a velocity of at least 1 foot per second at one-half design average flow

PHF		min/day		cu,ft,gal		total		
6,000,000	÷	1,440	÷	7.48	=	557.041	cu,ft, gpm	0.9284017 ft,depth @ PHF
200	x	2	x	1.5	=	600	Area, ft^2	
lin. ft. wer		No. on line		depth to weir				

1/2 ADF		min/day		cu,ft,gal		sec/min		total		
1,000,000	÷	1,440	÷	7.48	÷	60	=	1.5473361	cu,ft, sec	1.5473361 Velocity ft/sec
200	x	1	x	0.005			=	1	Area, ft^2	
lin. ft. wer		No. on line		depth						

Teritairy Filtration 4- 288 ft^2 filter beds

Ten States Design Standard
Allowable Filtration Rates-Filtration rates shall not exceed 5 gpm/sq ft based on the design peak hourly flow rate applied to the filter units.
The expected design maximum suspended solids loading to the filter should also be considered in determining the necessary filter area.

PHF = 6.0 MGD or	4167	gpm	=	4.8	gpm/ft^2	Design Peak Hourly Flow
Filter Area (3 beds)	864	ft2				
6.228 MGD or	4325	gpm	=	5.0	gpm/ft^2	Maximum Peak Hourly Flow Capacity
Filter Area (3)	864	ft2				

Anticipated clarifier effluent TSS =

Number of Units-Total filter area shall be provided in two or more units, and the filtration rate shall be calculated on the total available filter area with one unit out of service.

Backwash Rate-The backwash rate shall be adequate to fluidize and expand each media layer by a minimum of 20 percent based on the media selected.

Post Aeration Tank

SWD	13.25	ft
Length	33	ft
Width	14.67	ft
	47,980	Gallons

Detention time @ 2.0 MGD	47,980	÷	1,388	=	34.6
	Gallons		GPM		Minutes
Blower Sizing	100	x	3	=	300.0
	diffusers		cfm/diffuser		SCFM

Aerobic Sludge Holding

Ten States Requirments

Mutiple Units	Multiple digestion units capable of independent operation are desirable and shall be provided in all plants where the design average flow exceeds 100,000 gallons per day.
Volume Requirments	Digestion tank capacities are based on a solids concentration of 2 percent with supernatant separation performed in a separate tank.
	If supernatant separation is performed in the digestion tank, a minimum of 25 percent additional volume shall be provided.

Existing Volume /tank	91.83	x	18	x	8.5	=	14050	or	105094	assume holding and decant as one tank on each side of D1&D2
	Length		Width		Depth		ft^3		gallons	

Extended aeration activated sludge 3.0 ft3/P.E

3	x	13333	x	=	39999	Both tanks equal 28,100 $ft^{3,}$ Aerobic digestion following
ft^3		PE (EDU)			ft^3	

Kamisha Lake - Thompson, NY
DESIGN CALCULATIONS
Dewatering Options
ATAD Sludge

	Future Design	Future Design	Current 0.309 MGD	Current 0.309 MGD	
Design Performance	**BDP 1.5m 3DP**	**BDP 2.0m 3DP**	**BDP 1.5m 3DP**	**BDP 2.0m 3DP**	**UNITS**
Wet Pounds Per Month	**411,111**	**411,111**	**46,296**	**46,296**	**at 18%**
Wet Tons per Month	**206**	**206**	**23**	**23**	**at 18%**
Dry Tons per Month	**37**	**37**	**4**	**4**	**based on 18%**
Dry Tons Per Year	**444**	**444**	**50**	**50**	
Weekly Sludge Flow	205,200	205,200	23,400	23,160	Gallons Per Week
Average Feed Solids	1	1.00	1	1.00	%wt
Dry Solids - Yearly	445	445	51	50	Dry Tons per Year
Operational Days	4	3	1	1	Days per Week
Operational Hours	5.7	5.7	2.6	1.93	Hours per Day
Number of Units in service	**1**	**1**	**1**	**1**	Units
#/hr per/ unit	751	1001	751	1001	#/hr per meter
Hydraulic Loading per unit	150	200	150	200	GPM on each Unit
Expected Avg Polymer Dosage	20	20	20	20	Pounds per Dry Ton - Active
Expected Discharge Solids	18	18	18	18	%wt
Operating Costs					**UNITS**
Hours per Day of operation	5.7	5.7	2.6	1.93	hours
Days per Week operating	4	3	1	1	Days
Total Hours per year	1185.6	889.2	135.2	100.36	Hours (total for both units)
Polymer Costs					
Total Polymer Usage	8899	8899	1015	1004	Pounds of Active Polymer per year
Gallons of Ferric Sulfate	32011	32011	3650	3613	Gallons per Year
Cost of Ferric Sulfate	$64,554	$64,554	$7,361	$7,286	Cost per Year
Total Polymer Cost	$90,273	$90,273	$10,294	$10,189	$ per year (based on $1.30 per pound neat)
Energy Consumption					
Feedbox/Floc Tank/transfer pump	0.33	0.33	0.33	0.33	HP
GBT Drive/RDT	2	3	2	3	HP
Press Section	3	6	3	6	HP
Hydraulic Unit	2	2	2	2	HP
Booster Pump	10	15	10	15	HP
Total kW	10.1456	15.5168	10.1456	15.5168	kW/hr
Yearly Energy Cost	$1,443.4	$1,655.7	$164.6	$186.9	$ per Year (at $0.12 / kW-hr)
Water Usage					
Total Wash Water Usage	75	92	75	92	GPM per Unit
Hourly Usage	4500	5520	4500	5520	Gallons Per Hour
Yearly Usage	5.3352	4.908384	0.6084	0.5539872	MG per Year
Total Costs	$92,200	$92,291	$10,514	$10,417	$ per year

APPENDIX Q

ATAD Brochure

THERMAL
PROCESS
SYSTEMS

TPS THERMAER™ PROCESS

Your Class A Solution for Biosolids Management

TPS
THERMAER™
PROCESS

BiofiltAer™ at the Morehead, KY facility. Organic material along with a constant 90ºF temperature and moisture help reduce any residual ammonia from the biomass.

Advanced thermophilic biosolids treatment

A revolutionary process that delivers the results you want — without the side effects

Thermal Process Systems' proprietary ThermAer biosolids reduction system is the second generation in Autothermal Thermophilic Aerobic Digestion (ATAD) technology. It gives you the best of all worlds — a high quality pathogen-free product — plus controlled foam, the elimination of foul odors through more complete oxidation with Oxidation/Reduction Potential (ORP) control and superior reduction of volatile solids. On the following pages you will see how ThermAer can make all the difference in your process.

Retrofit of anaerobic digesters - Morehead, KY

Your best solution for biosolids management

Now, for the first time you have a reliable, realistic solution to the increasingly difficult problem of biosolids processing, reuse and disposal. With the ThermAer Process you achieve:

Superior volatile solids reduction

Today, biosolids disposal is more complex than ever. Many states have imposed restrictive legislation on land application, composting and land fills. Volume reduction and odor control are key elements in successful biosolids management. Now, thanks to ThermAer, you have a solution.

- ThermAer destroys 60-70% of volatile solids and increases dewatering cakesolids as much as 25-30%. This process generates a high quality product reducing solids volume by up to 70%, while saving on your transportation and disposal costs.

- The nutrient and moisture content in ThermAer biosolids are ideal for direct land application as well as composting applications — often completely eliminating disposal costs.

Assured "Class A" quality at a "Class B" price

A quality product is needed to compete for access to today's limited land application and reuse markets. With ThermAer, you're assured of Class A solids classification under USEPA Part 503 regulations, giving you unrestricted use of your biosolids.

Environmentally Green

Without the production of methane, a gas with 22 times the potential atmospheric destruction of carbon dioxide, the ThermAer is kinder to Mother Earth. In addition, the excess autothermal heat produced in the reactor can be used to heat buildings or as supplement heat used in other processes. The reuse of this energy lowers the overall carbon footprint; a consideration for our environment.

Reduces capital and operating costs

Your savings in operating and capital expense can often more than justify your decision to specify ThermAer. It's the ideal solution to upgrade your current system or as the heart of your new installation.

Process Flexibility

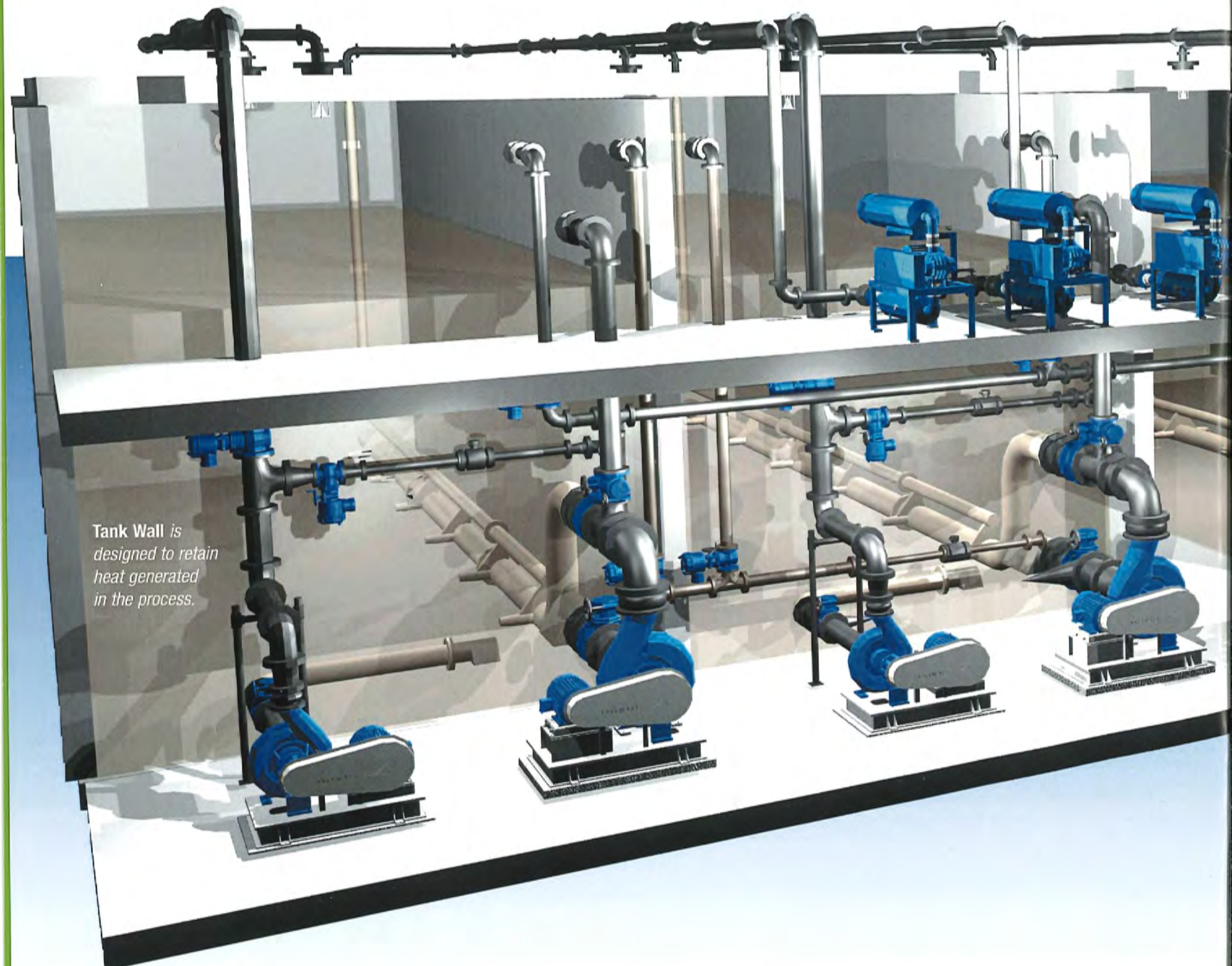
Now you can meet required volatile solids destruction and pathogen kill rates with greater process flexibility. You can achieve the desired results in either a single reactor or multiple reactors operated in parallel systems.

Downstream efficiency and synergy

The ThermAer process reduces volatile solids and improves dewaterability, resulting in reduced mass and volume. This significantly decreases the size, operational costs and capital investment of unit processes required for "further treatment" downstream (such as dewatering, drying, etc.), while increasing their efficiency.

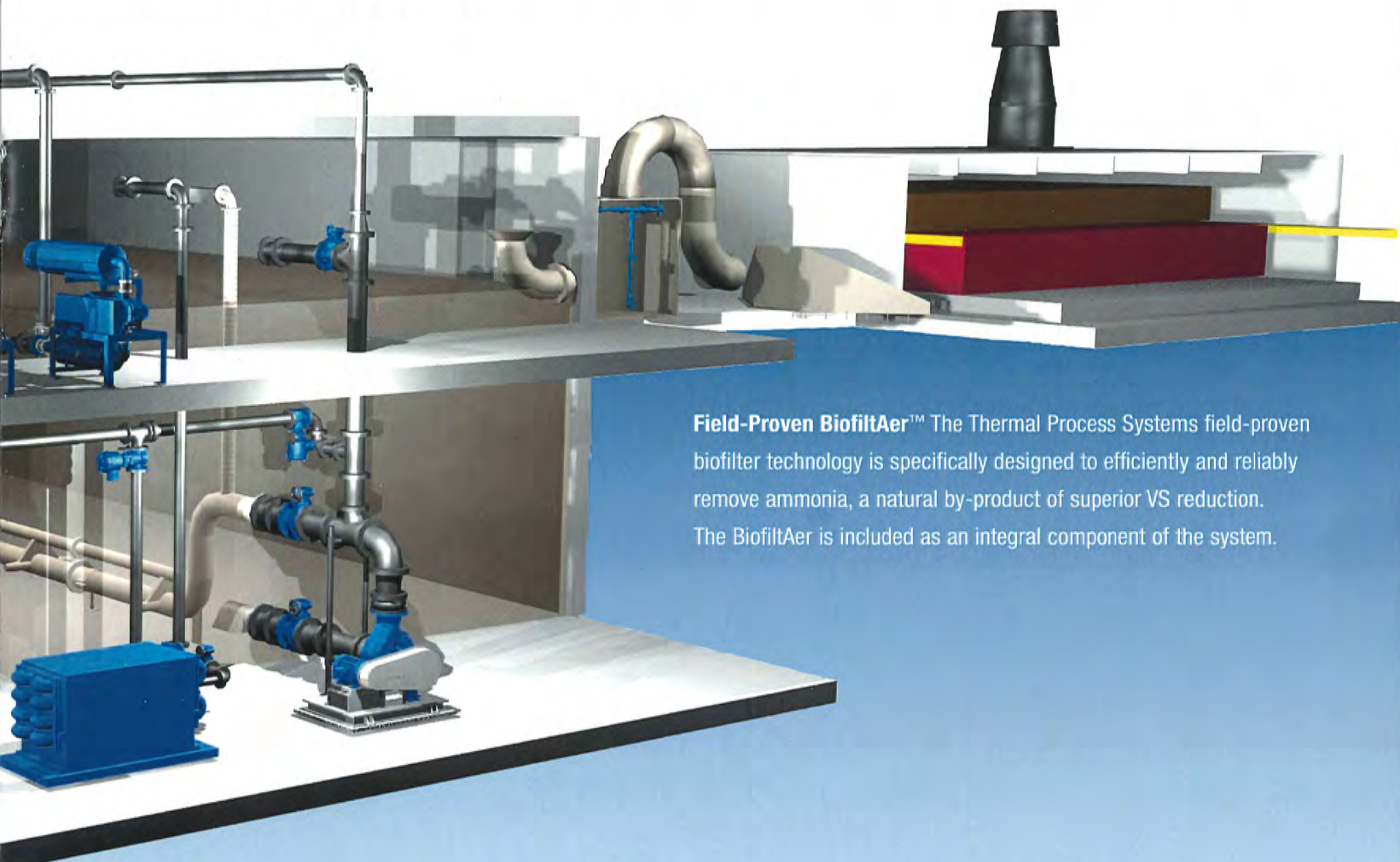
TPS THERMAER™ PROCESS

Your system will be custom-engineered to fit your requirements exactly, whether you would like to retrofit your existing basins — or integrate ThermAer into your new system. In typical installations, such as the one illustrated here, you will have the flexibility to batch or continuously feed the process daily, after thickening the feed material.



Assured product quality – with no compromises

With the patented ThermAer Process, you can achieve the results you want without compromising your quality or cost objectives. The system delivers superior volatile solids and pathogen reduction combined with extremely low odor in any reactor configuration – with assured EPA Class A and/or exceptional quality certification.



Field-Proven BiofiltAer™ The Thermal Process Systems field-proven biofilter technology is specifically designed to efficiently and reliably remove ammonia, a natural by-product of superior VS reduction. The BiofiltAer is included as an integral component of the system.

Pump Gallery — Yorkville, IL
Conventional Out-of-Basin Pumps are already familiar to operating and maintenance staff.

Control Panel — Delphos, OH
An Integrated Control Package provides the flexibility to operate the processes by a simple touch on the screen.

Positive Displacement Blowers — Delphos, OH
Positive displacement blowers allow for the flexibility of varying the liquid depth in the reactors as well as air flow delivery.

TPS ThermAer Process
Overall Flow Schematic*

Thickener
6.8%

- Primary and/or secondary thickened before feeding to ThermAer Reactor(s)

10,000 Lbs

- Jet Aeration
- High oxygen transfer efficiency
- Independent mixing and oxygen delivery control
- Hydraulic foam control
- Fully automated
- Varying liquid depths

ThermAer
~65-70°C

3.4% TS
pH 8-8.5

- High temperature and intense mixing ruptures the cell walls of incoming waste stream
- Foam production, an indication of degradation of proteins, controlled by hydraulic foam control cones
- Very low yield, and high volatile solids reduction

5,000 Lbs

- Single reactor system for nitrification and denitrification
- Integrated control strategy for pH, temperature and ORP
- Headspace utilized as a natural scrubber

SNDR
~35-40°C

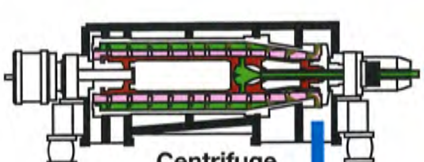
2.6% TS
pH 6.5-6.8

- Greatly reduces the overall dewatering costs
- Mesophilic conditioning and optimum pH provide suitable conditions for nitrification and denitrification
- No external alkalinity required
- Conditioning in SNDR decreases ammonia and soluble COD while reducing overall chemical and polymer consumption

3,800 Lbs

Coagulant

Polymer



Centrifuge

27-30% Solids

~9 Cubic Yards

** Destruction data based upon the representative observed values at Yorkville Bristol Sanitary District*

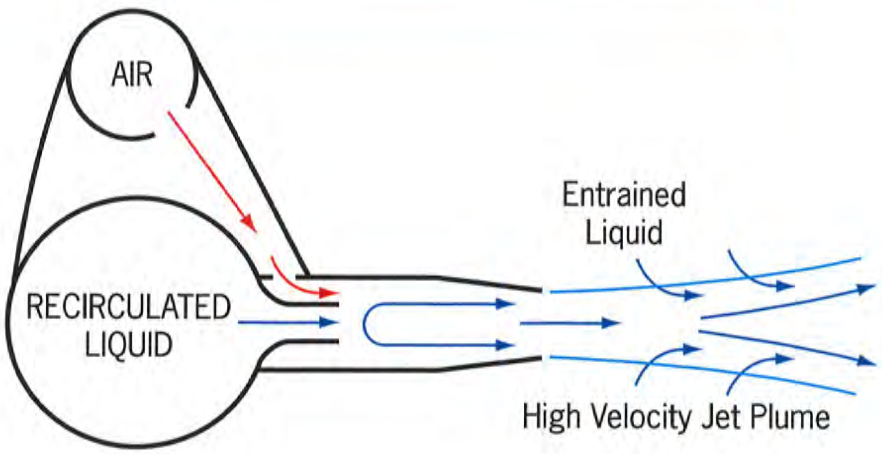
Granulated dewatered biosolids at Yorkville Bristol Sanitary District, IL. Volume reduction greatly increases the storage capacity while reducing, and in some cases completely eliminating transportation and disposal costs.


TPS
THERMAER™
PROCESS

ThermAer Jet Aeration System
Matching oxygen supply to process demands

ThermAer uses naturally occurring thermophilic microorganisms, through an aerobic process, to consume organic material. The exact amount of oxygen they need for optimum performance is not constant. Oxygen demand varies widely depending upon the stage of the process.

ThermAer Jet Aeration System
Exclusive system monitors and controls air flow and liquid pumping.



At the heart of the ThermAer process: our exclusive jet aeration system efficiently provides the right amount of oxygen needed to keep the biomass fed and healthy, without excessive foam or reduced sulfur compounds.

Today the rules have changed...

For the first time you can precisely match oxygen delivery to oxygen demand, thanks to the revolutionary ThermAer process featuring a patented flexible-flow Jet Aeration System. Benefits included, yet not limited to:

- High shear aeration provides excellent mixing and viscosity reduction with thickened biosolids.
- Extremely high oxygen transfer efficiencies at low air/liquid ratio.
- High heat production with minimal evaporation heat loss.
- Independent control of oxygen supply and mixing.
- Variable liquid and air delivery provides ORP control while conserving heat for proper temperature control.
- "Retrofitability" to virtually any basin/tank geometry.

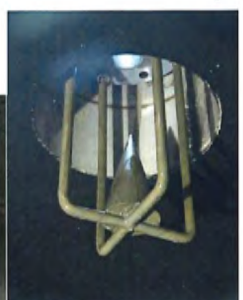
Horsepower When You Need It.
Energy Savings When You Don't.

The ThermAer system monitors and controls your process throughout the cycle. Using proprietary technology, available only with ThermAer, aerobic conditions are maintained in the reactor. The benefits of this revolutionary concept have been proven through several years of full-scale operating experience:

- Optimized energy input.
- More efficient mixing from the bottom up — providing the most effective mixing intensity for 3-4% solids mixed liquor.
- Managed and controlled foam production.
- Minimizing the production of reduced sulfur compounds which may cause offensive odors.

TPS THERMAER™ PROCESS

The scrubber unit (right foreground) can remove up to 60% of the ammonia emitted by the ThermAer system before the remaining gases are treated by the BiofiltAer at this Marshall, MN installation.



The Splash Cone™ (left) hydraulically controls foam to a preset elevation. This allows for maximum aeration during critical phases of the digestion process.

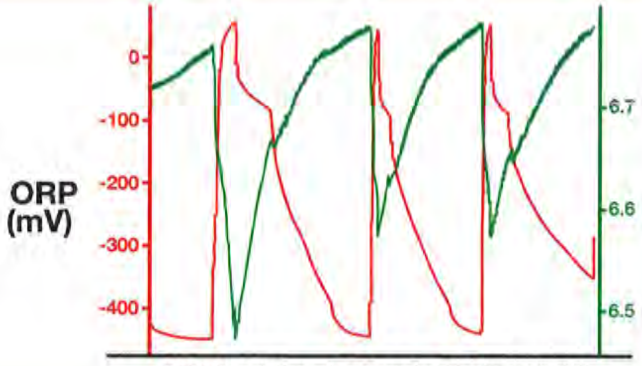
Pump galleries may be configured in a variety of layouts, including straight line, semi-circular or in a "clover-leaf" configuration as shown here.

Storage Nitrification Denitrification Reactor* (SNDR™)

The importance of producing a high-quality cake and reducing recycle constituents cannot be overstated. With the advent of Storage Nitrification Denitrification Reactor (SNDR), thermophilic sludges can be dewatered more economically, producing a very high-quality end product. Mesophilic conditioning - as provided in the SNDR, prior to dewatering reduces the soluble COD fraction in the digested biosolids. The SNDR provides optimum temperature, pH, alkalinity and aeration conditions for nitrification and denitrification of digested biosolids. The SNDR improves dewaterability, cake quality and reduces recycle concentrations.

Nitrification and denitrification are controlled in the SNDR by monitoring the pH, temperature, and ORP. Since nitrification is inhibited at temperatures above ~100° F, this reactor is operated just under this temperature, in order to fully optimize the growth rate of these specialized microorganisms. pH set points can be used to control the nitrification and denitrification process by creating an aerobic or anoxic condition as warranted. Because a reduction of total alkalinity accompanies nitrification, the pH of the system provides an ideal method of control.

**Patent Pending*



Typical variation of ORP and pH in the SNDR™

SNDR Advantages

- **Lower Conditioning Costs**
  Reduction in soluble COD and ammonium in the SNDR significantly reduces dewatering costs.
- **Lower Nutrient Recycle**
  Nitrification and denitrification in the SNDR greatly reduce the ammonium concentration in the recycle streams.
- **Single Reactor System**
  Nitrification and denitrification is carried out in a single tank.
- **No External Alkalinity Required**
  CO_2 released during ThermAer digestion generates carbonate and bi-carbonate alkalinity. When transferred to the SNDR, this alkalinity is utilized for nitrification; therefore, eliminating the requirement for an external alkalinity source.
- **Simple Control Strategy**
  A control strategy based on pH, temperature and ORP controls the overall process in SNDR.
- **Lower Disposal Costs**
  SNDR provides an additional 10-15% VS reduction in addition to already high VS destruction in ThermAer. The SNDR further reduces the volume of biosolids to be hauled from the facility.
- **Full Automation**
  Automation includes automatic waste, feed, aeration, nitrification and denitrification. The system can be operated with minimal assistance.

The SNDR:

- Reduces ammonium and soluble COD fraction in recycle stream.
- Provides optimum conditions for nitrification and denitrification in a single reactor system.
- Provides additional aeration to reduce the oxidative demand and lower odor potential.
- Provides additional 10-15% VSR, thus reducing the biosolids to be hauled from the facility.
- Utilizes a heat exchanger and/or air cooling to lower the temperature of the liquid contents.
- Lower temperature and pH provide the optimum conditions for the scrubbing action in the headspace of the tank.
- Provides nitrifiers and denitrifiers in the centrate to continuously re-seed the activated sludge basin system.

Quality Biosolids

Cake Nutrient Data*

Total Nitrogen	~30	pounds/ton
Organic Nitrogen	~25	pounds/ton
Phosphorus (P)	~20	pounds/ton
Potassium (K)	~30	pounds/ton

Centrate Data*

TSS	~150	mg/L
NH_3 as N	~300	mg/L
COD	~2000	mg/L
Phosphorus	~30	mg/L
BOD	~200	mg/L

* Based on the representative sample analyzed from Yorkville Bristol Sanitary District

BiofiltAer odor control unit in Bowling Green, OH. BiofiltAer ensures that no odors are present on site.

TPS BIOFILTAER™

BiofiltAer components:

- Odor control fan
- Primary humidification chamber
- Secondary humidification chamber
- Air redistributors
- Biofiltration chamber

BiofiltAer has:

- The ability to remove high ammonia concentrations during upset conditions.
- No additional requirements for nutrients.
- Low operating cost.
- Minimal head losses.
- Minimal electrical requirements.
- Low re-acclimation time.
- Inorganic layer for longer media life.
- Root wood media for biological culture to attach and thrive.

BiofiltAer in Marshall, MN. The BiofiltAer is available in prefabricated modular units for quick and easy startup, field-constructed units for larger projects and can often be retrofitted to existing equipment. The constant temperature and moisture levels ensure ammonia is removed through constant action by natural microorganisms in the organic filter media bed.

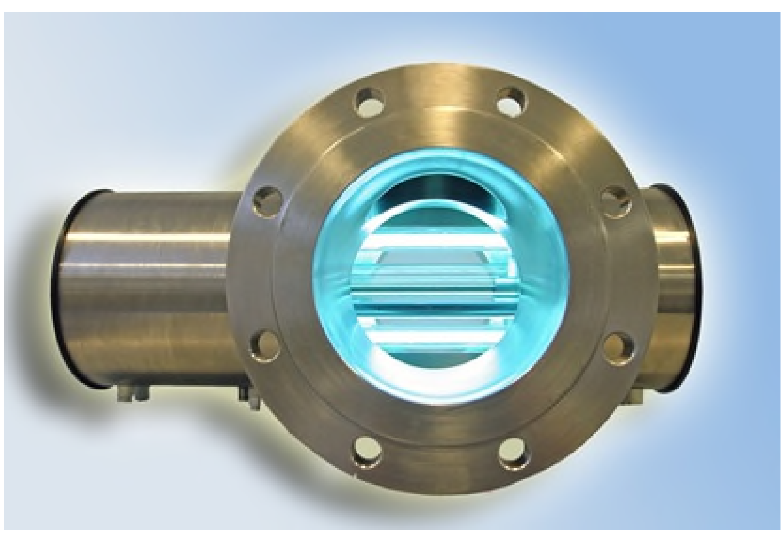
APPENDIX R

UV Brochure and General Assembly Layout Drawing

Datasheet

InLine+ W Series

InLine W 7500+



Type : Version 1
Revision number : 7-2017 BT rev.5
Document version: IL+W EB

AQUIONICS UV Delivered

UV reactor

Specifications	
Material:	Stainless Steel, 316 L
Internal Finish:	Ra_{max} 0.81 µm
Degree of Protection:	NEMA 12 (IP 54)
Flange Connections:	14” ANSI 150 lbs
Dimensions:	See drawing next page
Weight dry/wet:	375 lbs (170 kg)/ 595 lbs (270 kg)
Lamp Type:	B4035E+
Number of Lamps:	12
Temperature Sensor:	(1) PT 100
UV Sensors:	(1) absolute dry sensor
Sleeve Material:	Quartz – Type 200 nm
Sleeve Cleaning System:	Automatic cleaning mechanism
Air Release Valves:	2
Drain:	NPT Fittings
Pressure Rating:	145 psi (10 bar) / 220 psi (15 bar)
Maximum Hydraulic Flow Rate:	7.9 MGD (1250 m^3/h)

Electrical Cabinet

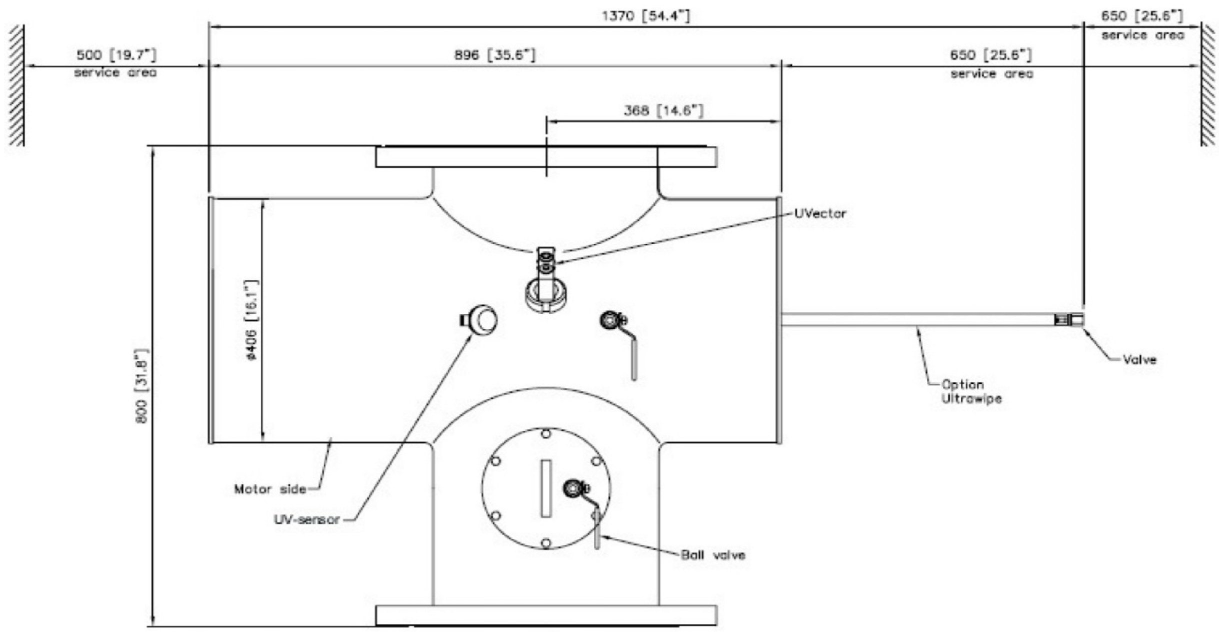
Specifications	
Cabinet Configuration:	(1) Combined power/control cabinet; floor standing
Dimensions:	82.7 x 47.2 x 23.6 in (HxWxD); (2100 x 1200 x 600 mm)
Weight:	705 lbs (320 kg)
Material & Color:	Painted Steel; RAL7035
Degree of Protection:	NEMA 12 (IP 54) - Indoor
Standard Cable Length (Cabinet to Reactor):	30 ft (10 m)
Ambient Operationg Temperature (min/max):	40/95° F (5/35° C)
Maximum Ambient Humidity:	95% (non-condensing)
Controller:	ECtronicΩ PLC Based (incl. UV dose output 4-20 mA, Modbus)
Lamp Driver Type:	Electronic (Stepless variable output 35 to 100%)
Required Voltage Supply:	480V, 3L, 60 Hz
Maximum Power Consumption:	54 kW (+/- 5%)
Size of Customer Breaker:	> 125 A
Wiring Included:	30 ft (10 m) – Lamp*, temp. Sensor, UV sensor, limit switches) * TBD prior to installation. Please contact AQX
UL Labeling:	UL 508A

Optional Features

Specifications	
- NEMA 4X Upgrade (w. cabinet air conditioners)	- Stainless Steel Cabinet Upgrade – NEMA 12
- Allen Bradley PLC 800 Series	- Ultrawipe™ (chemical assisted) cleaning system
- 100 ft cable (maximum length)	

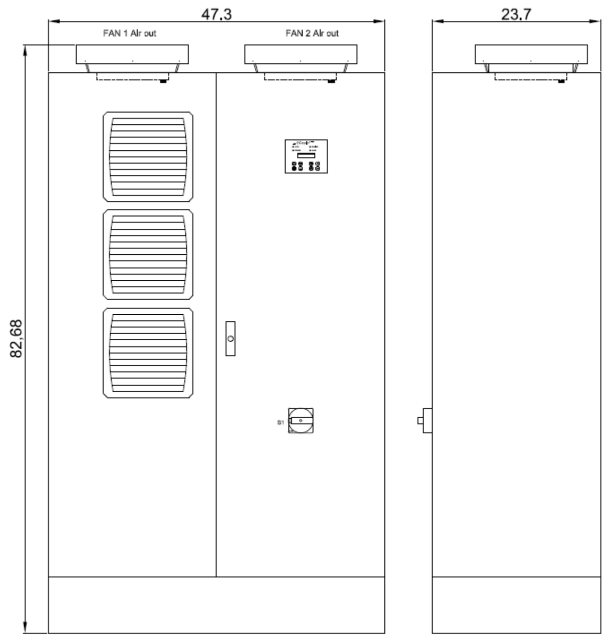
Note: Deviation from standard may result in change of reactor and cabinet size. Subject to change without notice.

UV Reactor



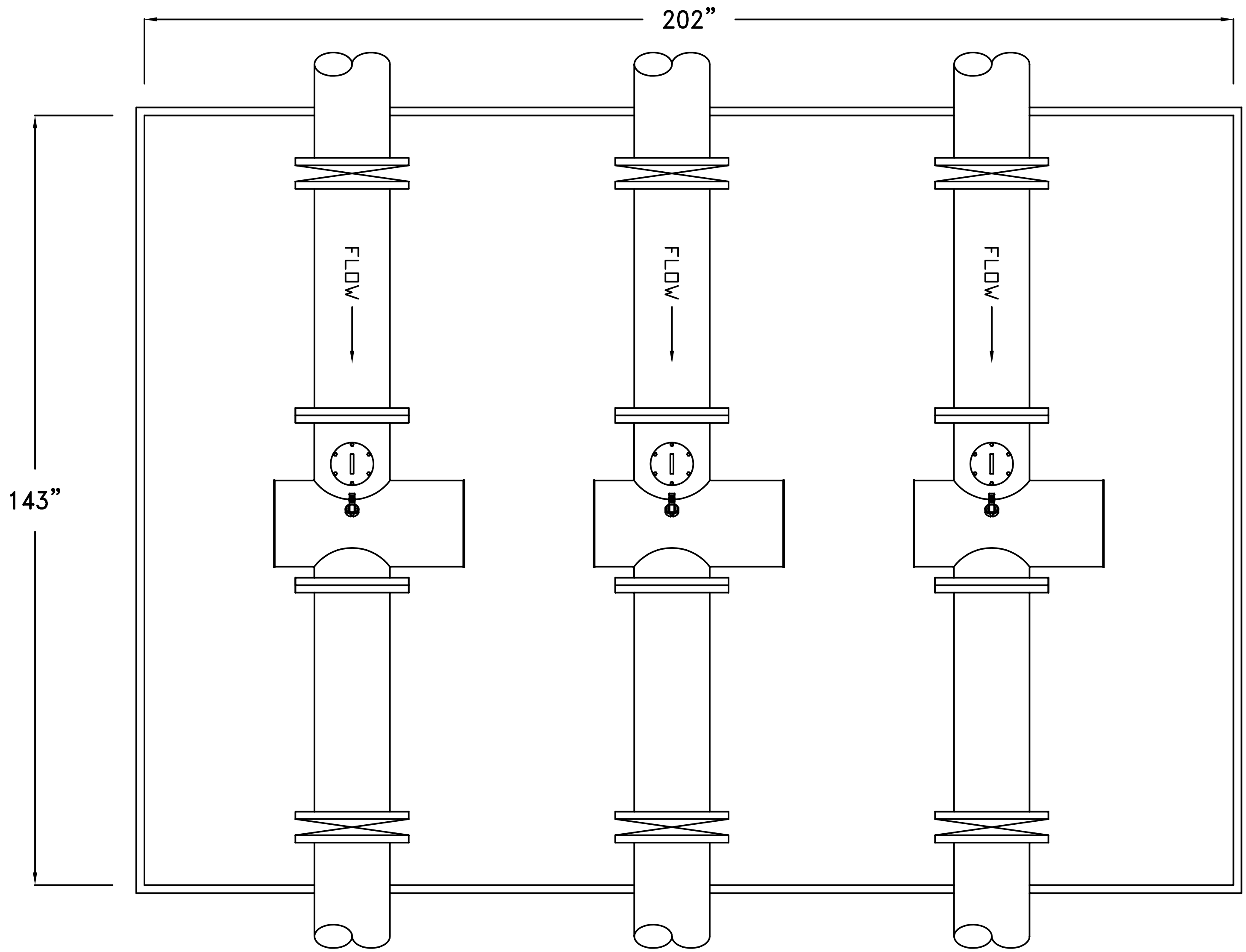
Dimensions in mm [inches]

Power/Control Cabinet



Dimensions in inches

Aquionics Inc.
4215 Stuart Andrew Blvd, Suite E, Charlotte, NC 28217 USA
Phone: 980-256-5700 Fax: 980-598-8012
Mail: sales@aquionics.com Web: www.aquionics.com



NOTES:
1. DIMENSIONS AS SHOWN.
2. DO NOT SCALE DRAWING.
3. CLEARANCE REQUIRED FOR SERVICE AND MAINTENANCE OF SYSTEM.
4. DIMENSIONS SUBJECT TO CHANGE WITHOUT NOTICE.
5. ACCESS HATCH SHOULD BE PLACED UPSTREAM.

Title: THREE PARALLEL INLINE W 7500+		Scale: NTS
		Page 1 of 1
14" ANSI FLANGES	Drawn: BT	Date: 11/19/10
AQUIONICS A HALMA GROUP COMPANY	Appd:	Date:
	Mat. 316L SS	Rev. B
	Part No.: 3P14In+	