VOLUME 3 OF 3

PRELIMINARY ENGINEER'S REPORT

SHOKAN WASTEWATER MANAGEMENT PROGRAM
FOR THE

HAMLET OF SHOKAN

TOWN OF OLIVE
ULSTER COUNTY, NEW YORK

New York City Watershed Memorandum of Agreement (MOA)

Initial Draft Issued September 25, 2019 – Volume 1
Amendment #1 Issued February 21, 2020 – Volume 2
Amendment #2 Issued April 30, 2020 – Volume 3
FINAL ISSUED SEPTEMBER 25, 2020

A Program of the Catskill Watershed Corporation

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File No.: R:\2018017\Report\Shokan Preliminary Engineer's Report.doc

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EXHIBITS

EXECUTIVE SUMMARY

The Draft Preliminary Engineer's Report (Draft PER) of September 25, 2019 concluded that a Septic Maintenance District was not adequate for the Hamlet of Shokan.

The Draft PER also concluded that a community-wide septic system with subsurface disposal was not adequate for the Hamlet due to the lack of potential subsurface disposal sites.

The Draft PER therefore concluded that a large diameter gravity sewer system and an MBR WWTP on Site D was the recommended option at a capital cost of $40.9M and an annual operation & maintenance (O&M) cost of $693,000.

The Draft PER was submitted to the Catskill Watershed Corporation (CWC) and the New York City Department of Environmental Protection (NYCDEP) for review and discussion.

Upon their review, NYCDEP requested that further and more detailed analysis be done of the option of conveying Shokan wastewater to a retrofitted and expanded Boiceville WWTP in consideration of the potential reduction in Operations and Maintenance costs of one WWTP instead of two WWTPs.

Subsequent to the NYCDEP request, Lamont Engineers (Lamont) prepared an evaluation of the feasibility and cost estimates for conveying the Hamlet of Shokan's wastewater to Boiceville and retrofitting the Boiceville WWTP. This evaluation was submitted under Amendment #1.

In analysis and preliminary design of the Boiceville WWTP retrofit, additional information was obtained that warranted revisions to the Shokan WWTP Option. Information obtained included items such as preliminary SPDES permit limits from NYSDEC, additional (and corrective) vendor input, additional Boiceville operator input, and NYCDEP input. The revisions to the Shokan WWTP allowed for a better comparison to the Boiceville WWTP Retrofit at the same level of operation and maintenance.

Amendment #1 determined that the timeframe to achieve full payback of the O&M cost savings for the Boiceville Retrofit would be approximately 35 Years.

Both the stand-alone Shokan MBR WWTP and a combined MBR Retrofitted Boiceville WWTP were determined to be viable options. Each option had both pros and cons.

Amendment #1 concluded that another possibility should be evaluated. Because a combined WWTP will have less costly O&M (as detailed in Amendment #1) and because construction of a new WWTP may be more economical versus the retrofitting of the

existing WWTP, Lamont Engineers recommended an evaluation of a combined WWTP in Shokan on Site D or elsewhere.

Amendment #2 includes revisions to the cost estimates for the initial two options to reflect recent bidding results.

A summary of all three wastewater management options evaluated under Amendment #2 with total project costs and operation and maintenance costs follows:

	Capital Cost	O&M Cost
LDGS to MBR WWTP in SHOKAN	$42.6 M	$740,000 per year*
LDGS to MBR COMBINED FLOW RETROFIT of BOICEVILLE WWTP	$49.0 M	$1,136,000 per year
LDSG to COMBINED FLOW WWTP in SHOKAN	$48.7M	$1,140,000 per year

*Excludes Boiceville WWTP O&M

The Combined Flow in Shokan project costs are similar to the Boiceville Retrofit Combined Flow project costs. The Combined Flow in Shokan Project protects both Shokan and Boiceville from potential flooding and associated costs. Also, the Combined Flow in Shokan project is entirely new and will not encounter the inevitable issues associated with retrofitting an existing WWTP, such as unforeseen physical construction conflicts, high retrofit construction labor, and other uncertainties.

Furthermore, the capital costs associated with the Combined Flow in Shokan option could possibly be reduced by exploring use of packaged MBR's rather than custom cast in place concrete tanks. This could be reviewed as a further amendment to this Preliminary Engineer's Report or accomplished during the preconstruction (design) phase.

In consideration of all the above, Lamont Engineers recommends the Combined Flow in Shokan option to NYCDEP, CWC, the Town of Olive and the Hamlets of Shokan and Boiceville.

INTRODUCTION

The Draft Preliminary Engineer's Report (PER) of September 25, 2019 recommended a large diameter gravity sewer system and an MBR WWTP on Site D in Shokan at an estimated capital cost of $41M and an annual operation and maintenance (O&M) cost of $693,000 (at design flow, 168,000 gpd).

On October 28, 2019, NYCDEP requested that further and more detailed analysis be done of the option of conveying Shokan wastewater to an MBR retrofitted and expanded Boiceville WWTP in consideration of the potential reduction in O&M costs of one WWTP instead of two WWTPs.

PER Amendment No. 1 was issued to NYCDEP and the Catskill Watershed Corporation on February 21, 2020.

In analysis and preliminary design of the Boiceville WWTP retrofit, additional information was obtained that warranted revisions to the Shokan WWTP Option. Information obtained included items such as preliminary SPDES permit limits from NYSDEC, additional (and corrective) vendor input, additional Boiceville operator input, and NYCDEP input. The revisions to the Shokan WWTP allowed for a better comparison to the Boiceville WWTP Retrofit at the same level of operation and maintenance. (As a result of these revisions, the Shokan capital and O&M costs were revised upward by 3% and 7% respectively).

A summary of both wastewater management options with total project costs and operation and maintenance costs follows:

	Capital Cost	O&M Cost (at design flow)
LDGS to MBR WWTP in SHOKAN	$42.2 M	$740,000 per year
LDGS to MBR RETROFIT of BOICEVILLE WWTP	$48.4 M	$1,136,000 per year

Thus, the retrofitted Boiceville WWTP combined flow option will cost $6.2M more than the Shokan option but would save $174,000 per year in operations and maintenance costs (at design flow).

PER Amendment #1 concluded that evaluation of another combined flow option was warranted – a combined WWTP on Site D in Shokan or on a site between Boiceville and Shokan; these options would capture the O&M savings of the Boiceville Option but might be cheaper to build. This PER Amendment #2 reports the finding of that evaluation.

SECTION 1
Review of Issues

1.1. Amendment #1 Recap of Issues

There were a number of items discussed in Amendment #1 that outlined and addressed various issues. These issues are as follows:

- Boiceville WWTP Issues
  - Ammonia Removal
  - Higher than Normal Ammonia
- Flow Estimate for Shokan
- Revised NYSDEC SPDES Limits
  - Shokan WWTP in Shokan
  - Combined Retrofit WWTP in Boiceville
- Number of MBR Treatment Units
- Ammonia Load
- Design Concentrations and Loadings

The issues and resulting discussion in Amendment #1 remain unchanged. Please see Amendment #1 for detailed discussion on these items.

1.2. NYSDEC SPDES Limits

1.2.a. Combined WWTP in Shokan

SPDES Limits for a combined WWTP in Shokan would likely be a combination of the SPDES Limits for the Shokan WWTP in Shokan (based on the receiving stream) and the Combined Retrofit WWTP in Boiceville (based on a combined total flow) as outlined in Amendment #1. Based on this assumption, the SPDES Limits for a combined WWTP in Shokan would likely be as follows (Note: This assumption still needs to be verified with NYSDEC):

Parameter	Effluent Limitation
Flow, Monthly Average	243,000 GPD
BOD, Daily max	5 mg/l
Suspended Solids, Daily max	10 mg/l
Settleable Solids, Daily max	0.1 mg/l
Chlorine Residual, Daily max	0.03 mg/l
pH, range	6.5 to 8.5 SU
Temperature	Monitor
Dissolved Oxygen, Daily min	7.0 mg/l
Ammonia (NH_3 as N), Daily max	0.9 mg/l as N (June 1 – Oct. 31)

Ammonia (NH_3 as N), Daily max	1.8 mg/l as N (Nov. 1 – May 31)
Total Phosphorus, Monthly Avg	0.7 lbs/day
Total Phosphorus, Daily Max	0.5 mg/L
Fecal Coliform, 30-day Geo Mean	200 No./100ml
Fecal Coliform, 7-day Geo Mean	400 No./100ml
Giardia Lamblia Cysts	99.9% removal and / or inactivation
Enteric Viruses	99.9% removal / inactivation
Turbidity	≤0.5 NTU in 95% of measurements

1.3. Basis of Design

1.3.a. Number of MBR Treatment Units

The number of MBR Treatment Units was discussed in detail in Amendment #1. The same logic will be applied to this evaluation for a combined WWTP in Shokan. Therefore, three MBR treatment trains each capable of treating ½ the design flow needs to be constructed in order to adequately provide the capacity to properly operate and maintain the facility at average daily flows.

1.3.b. Ammonia Load

As detailed in Amendment #1, the influent ammonia loading used for the MBR WWTP retrofit design was based on 40 mg/l. This same ammonia concentration will be used in the design for the combined WWTP in Shokan. See Amendment #1 for details on the reasoning for the ammonia concentration.

1.3.c. Design Concentrations and Loadings

Please see below a summary of the design concentrations used for the MBR WWTP retrofit.

Parameter	Influent Loading
Flow, Monthly Average	243,000 GPD
Flow, Maximum Daily	486,000 GPD
Peak Hour	627 GPM
BOD_5	250 mg/l
TSS	275 mg/l
Ammonia (NH_3 as N)	40 mg/l
Total Phosphorus	10 mg/l

SECTION 2
Description of Options with Narrative Review

2.1. Separate WWTP's for Shokan and Boiceville

Per the initial Draft Preliminary Engineers Report, it was recommended that the Hamlet of Shokan, Town of Olive pursue the development of a large diameter gravity sewer with conveyance to a new MBR WWTP at a site located in the Hamlet of Shokan (Site D). See detailed description of what was proposed for the Shokan WWTP in Section 9.2 of the September 25, 2019 Draft Preliminary Engineers Report.

With Shokan having its own collection system and WWTP, the Boiceville WWTP would continue to operate serving only the Hamlet of Boiceville.

2.2. Combined Flow MBR Retrofit for Boiceville WWTP

Per Amendment #1, under this scenario the Shokan wastewater flows would be conveyed to the Boiceville WWTP via a pump station and force main and treated by an MBR retrofitted Boiceville WWTP. Please see Amendment #1 for specific details of this option.

2.3. Combined Flow WWTP for Shokan and Boiceville in Shokan on Site D

Boiceville Pump Station and Force Main

Conveyance of the wastewater flows from the Hamlet of Boiceville to Shokan will require a retrofit of the existing Boiceville WWTP influent pump station. The Boiceville SBR tanks will be converted to emergency storage tanks.

The Boiceville WWTP influent pump station retrofit would consist of the installation of new pumps with the capability of pumping a peak hourly flow of 202 gpm. In addition, a new sewage force main and magnetic flow meter would be installed to meter the flows from the Hamlet of Boiceville. All existing utilities (electric, telephone, backup generator, etc.) for the WWTP would remain the same. The electrical circuitry for the influent pump station would be upgraded.

For emergency situations, a new valve vault would be provided to redirect flow from the pump station to the existing headworks and then to the existing Boiceville WWTP SBR Tanks.

The headworks (bar screens, comminutor, Parashall flume, flow meter, and grit chamber) would remain the same.

As noted, the SBR tanks will be converted to emergency storage tanks. The existing SBR blowers and aeration system would remain for aeration of the stored wastewater. New submersible pumps would be installed in the SBR tanks to convey wastewater back to the retrofitted Boiceville WWTP influent pump station.

All Boiceville WWTP processes downstream from the SBR's will be decommissioned. Once the project is completed, the portions of the Boiceville WWTP that are not utilized to convey wastewater to Shokan will remain in place unused. Some of the equipment may be removed by salvage companies. We assume a zero-cost difference to have equipment removed by salvage companies.

See Exhibit 2.3.A for the preliminary layout of the Conversion of the Boiceville WWTP to a Pump Station for the Hamlet of Boiceville.

From Boiceville, the sewage force main will run within the NYS Route 28 right-of-way along the edge of the roadway and will discharge to a receiving structure (terminus vault) upstream of the combined flow WWTP on Site D.

Combined Flow WWTP

As described in Amendment #1 dated February 21, 2020 for a Shokan (Alone) WWTP, a new Combined Flow WWTP in Shokan (or elsewhere) will include 3 MBR treatment trains at ½ Average Daily Flow (ADF) capacity each, but sized for the combined ADF of 243,000 gpd (See above WWTP Flow Schematic in Amendment #1, Exhibit 1.4.a.B)

See Exhibit 2.3.B for the Flow Schematic of Combined Flow Piping and Conveyance System.

See Exhibit 2.3.C for New Combined Flow WWTP Building Preliminary Floor Plan.

SECTION 3
Preliminary Design Evaluation of Options

3.1. Revisions to Shokan WWTP Option

Since the submission of the original Shokan WMP Draft Preliminary Engineers Report and the subsequent Amendment #1, additional information has been obtained that warrants revisions to the Shokan WWTP Option.

3.1.a. Temperature

Amendment #1 discussed the possibility that the Shokan WWTP may in the future have an effluent temperature limit of 70 degrees Fahrenheit. However, the amendment did not discuss how to address a future temperature limit.

Based on existing effluent temperatures with highs of 76 degrees Fahrenheit at the Boiceville WWTP, in a worst-case scenario (likely summer time) we would need to drop the temperature of the effluent approximately 6 degrees. If the outfall piping is constructed of 10-inch ductile iron pipe and buried at a depth of 5 feet below grade, the soil temperatures could be used to decrease the temperature of the effluent through heat transfer. The length of 10-inch ductile iron pipe required to accomplish a 6 degree reduction in effluent temperature is 204 linear feet.

The length of the proposed outfall is approximately 450 linear feet which provides a safety factor of approximately 120%. Therefore, there is enough outfall length to accomplish the necessary heat transfer to cool the WWTP effluent to 70 degrees Fahrenheit.

3.1.b. Cost Estimate

Recent bidding results of projects in and out of the NYC Watershed have revealed that construction costs, especially electrical costs, have increased significantly. Therefore, the cost estimates were reevaluated and adjusted accordingly. Please see Section 4 for the Cost Evaluation of all Options.

3.2. Revisions to Combined Flow MBR Retrofit of Boiceville WWTP

3.2.a. Temperature

Amendment #1 discussed the possibility that the MBR Retrofit of the Boiceville WWTP may in the future have an effluent temperature limit of 70 degrees Fahrenheit. However, as with the Shokan WWTP Option, Amendment #1 did not discuss how to address a future temperature limit.

As discussed above under the Shokan WWTP Option, reduction of the WWTP effluent temperature can be accomplished through heat transfer. The length of 10-inch ductile iron pipe required to accomplish a 6 degree reduction in effluent temperature is 310 linear feet (the length is different because there is more rock along the outfall path and thus less heat transfer).

The length of the proposed outfall is approximately 360 linear feet which provides a safety factor of approximately 15%. Therefore, there is enough outfall length to accomplish the necessary heat transfer to cool the WWTP effluent to 70 degrees Fahrenheit.

3.2.b. Cost Estimate

As stated above under the Shokan WWTP Option, recent bidding results of projects in and out of the NYC Watershed have revealed that construction costs, especially electrical costs, have increased significantly. Therefore, the cost estimates were reevaluated and adjusted accordingly. Please see Section 4 for the Cost Evaluation of all Options.

3.3. Combined Flow WWTP in Shokan on Site D

The Combined Flow WWTP in Shokan on Site D is less complicated than the Boiceville WWTP Retrofit as proposed. This option will still require some interruption of the existing Boiceville WWTP but to a much lesser extent than the Combined Flow MBR Retrofit of the Boiceville WWTP

Unlike the Boiceville WWTP Retrofit, the Combined Flow WWTP in Shokan on Site D is outside of the 100 Year Floodplain and the site is such that there is adequate room for the entire facility with minimal construction difficulty, unlike the Boiceville WWTP Retrofit.

The operation and maintenance of the Combined Flow WWTP in Shokan should prove more effective and efficient than the Boiceville Retrofit. The Combined Flow WWTP in Shokan will be new and will be set up more logically for ease of operation and maintenance. Please see Section 4 for the Cost Evaluation of all Options.

SECTION 4
Cost Evaluation of Options

4.1. Shokan (Alone) LDGS to MBR WWTP

See Exhibit 4.1.A Opinion of Probable Cost of Shokan LDGS to MBR WWTP.

Shokan (Alone) LDGS to MBR WWTP		
Capital Cost – Construction		
LDGS Collection System	$	23,499,000
MBR WWTP	$	11,586,000
TOTAL CONSTRUCTION=	$	35,085,000
TOTAL NON-CONSTRUCTION=	$	7,517,000
TOTAL COST	**$**	**42,602,000**
O&M Cost (Yearly)	$	740,000

4.2. Shokan LDGS to MBR Retrofit of Boiceville WWTP

See Exhibit 4.2.A Opinion of Probable Cost of Shokan LDGS to MBR Retrofit of Boiceville WWTP.

Shokan LDGS to MBR Retrofit of Boiceville WWTP		
Capital Cost – Construction		
LDGS Collection System	$	23,348,000
Boiceville WWTP MBR Retrofit	$	17,047,000
TOTAL CONSTRUCTION=	$	40,395,000
TOTAL NON-CONSTRUCTION=	$	8,579,000
TOTAL COST	**$**	**48,974,000**
O&M Cost (Yearly)	$	1,136,000

4.3. Shokan LDGS to New Combined Flow MBR WWTP

See Exhibit 4.3.A Opinion of Probable Cost of Shokan LDGS to Combined Flow MBR WWTP.

Shokan LDGS to New Combined Flow MBR WWTP	
Capital Cost – Construction	
LDGS Collection System	$ 23,499,000
Combined Flow MBR WWTP	$ 16,680,000
TOTAL CONSTRUCTION=	$ 40,179,000
TOTAL NON-CONSTRUCTION=	$ 8,536,000
TOTAL COST	**$ 48,715,000**
O&M Cost (Yearly)	$ 1,140,000

SECTION 5
Conclusion and Recommendations

5.1. Pros and Cons

Shokan Alone WWTP

Pros: out of floodplain, lower capital costs as compared to the other two options.

Cons: nearer Ashokan Reservoir, higher total O & M costs (Boiceville Sewer District & Shokan Sewer District) as compared to the other two options.

Combined Flow MBR Retrofit of Boiceville WWTP

Pros: further from Ashokan Reservoir, lower total O & M costs than Shokan Alone, helps with (future) ammonia removal issues at Boiceville.

Cons: in floodplain, requires Town of Olive approval on behalf of Boiceville Sewer District, higher capital costs than Shokan Alone, more complicated due to staged retrofit demolition and construction, public perception of further floodplain development when flood buy-outs are occurring in the vicinity.

Combined Flow WWTP at Shokan on Site D

Pros: out of floodplain, lower O&M costs than Shokan Alone, eliminates ammonia removal issues at Boiceville because the WWTP will be decommissioned.

Cons: nearer reservoir, higher capital costs than Shokan Alone.

(Note: Amendment #1, Section 5.1.a – Travel Time Issue remains the same as detailed in Amendment #1 and applies to Amendment #2 accordingly.)

5.2. Cost Comparisons

Combined Flow Options

The Combined Flow MBR Retrofit of the Boiceville WWTP compared to the Combined Flow WWTP at Shokan on Site D are very similar in both capital cost and operation and maintenance cost. The level of accuracy of the cost estimates are such that at the magnitude of the project capital cost, a difference of $200,000 is less than half of a percent. These cost estimates are such that the accuracy is likely to the nearest $100,000. Therefore, the capital cost price difference is close enough to say that they are the same cost.

The same can be said for the operation and maintenance cost. The O&M cost estimates are likely to be accurate to the nearest $10,000. Therefore, the O&M cost price difference is close enough to say that they are the same.

Shokan Alone Compared to Combined Flow Options

A detailed cost comparison between the Shokan LDGS to MBR WWTP Option and the Shokan LDGS to MBR Retrofit of Boiceville WWTP Option was performed in Amendment #1. Amendment #1 determined that the timeframe to achieve full payback of the O&M cost savings for the Boiceville Retrofit would be approximately 35 years.

Using the same method of evaluation used in Amendment #1, an updated evaluation of both Shokan Alone versus the Boiceville Retrofit and Shokan Alone versus Shokan Combined follows:

Shokan Alone and Boiceville Retrofit

O&M Cost Comparison (at design flow)

Please see below for an O&M comparison at full flow for the options:

Shokan alone-O&M =	$ 740,000
Existing Boiceville-alone O&M =	$ 570,000
Total Combined O&M =	$ 1,310,000
Boiceville Retrofit O&M =	$ 1,136,000
Difference =	$ 174,000

Based on the above, the total difference between Shokan alone O&M plus existing Boiceville-alone O&M minus the Boiceville Retrofit O&M is $174,000.

Capital Cost Comparison

As detailed in Section 4, the total capital costs are as follows:

Shokan LDGS to MBR WWTP = $42,602,000
Shokan LDGS to MBR Retrofit of Boiceville WWTP = $48,974,000

The total capital cost difference between the two options above is $6,372,000. If the O&M difference (calculated above) of $174,000 is divided into the total capital cost difference, the timeframe to achieve full payback from the O&M cost savings for the Boiceville Retrofit would be approximately 37 Years.

Shokan Alone and Shokan Combined

O&M Cost Comparison (at design flow)

Please see below for an O&M comparison at full flow for the options:

Shokan alone-O&M =	$ 740,000
Existing Boiceville-alone O&M =	$ 570,000
Total Combined O&M =	$ 1,310,000
Shokan Combined O&M =	$ 1,140,000
Difference =	$ 170,000

Based on the above, the total difference between Shokan alone O&M plus existing Boiceville-alone O&M minus the Boiceville Retrofit O&M is $170,000.

Capital Cost Comparison

As detailed in Section 4, the total capital costs are as follows:

Shokan Alone LDGS to MBR WWTP =	$42,602,000
Shokan Combined LDGS to MBR Retrofit of Boiceville WWTP =	$48,715,000

The total capital cost difference between the two options above is $6,113,000. If the O&M difference (calculated above) of $170,000 is divided into the total capital cost difference, the timeframe to achieve full payback of the O&M cost savings for the Boiceville Retrofit would be approximately 36 Years.

Cost Comparison Conclusion

In either case of comparing the Shokan Alone to a Boiceville Retrofit or Shokan Alone to Shokan Combined, the timeframe to achieve full payback of the O&M cost savings for either combined option would be approximately 36 Years.

(Note: Amendment #1, Section 5.2.a – Number of Operators Needed and Section 5.2.b – Deductive Alternates remain the same as detailed in Amendment #1 and apply to Amendment #2 accordingly.)

5.3. Recommendations

There are several items to consider in making a final recommendation. Typically, cost is the deciding factor in selection of an option. However, with the three scenarios presented there really is no clear cost winner. The two combined options are essentially equal when all costs (capital costs and operation and maintenance

costs) and payback periods are considered. The Shokan Alone Option is lower in capital costs but higher in perpetual O&M costs.

One question that remains relating to project cost is…"are there any savings to be had with any of the options that would set one option above the rest?" The answer is that there is a potential savings that would directly affect both the Shokan Alone and the Shokan Combined options. In discussions with Ovivo (the MBR manufacturer on which our cost estimates are based), they could offer a cost savings for the proposed facility by providing a packaged MBR WWTP. The equipment and tankage would be constructed at their facility and transported to the site where it would be assembled. The tankage would be stainless steel instead of cast-in-place concrete. The only components that would still need to be constructed would include a building (to protect the packaged MBR WWTP), aerobic digesters, and any related site work. The exact cost savings is yet to be determined. A further amendment could address this issue or it could be explored further in the preconstruction phase.

Besides project costs, other factors to consider for each option include potential flooding of the facility, construction within the 100 Year Floodplain and impacts on adjacent property, and proximity of the WWTP and discharge to the Ashokan Reservoir.

A WWTP on Site D is much less likely to have 100-Year Floodplain construction and permit issues and flooding issues than a Boiceville Retrofit. In fact, the Boiceville WWTP has experienced flooding which caused a great deal of damage and some pollution.

Relative to the proximity of the WWTP and discharge to the Ashokan Reservoir, NYCDEP prefers the Boiceville WWTP Site over Site D. If this is an overarching consideration, a study could be performed to determine which discharge location is actually in closer proximity to the Ashokan Reservoir Intake. As stated in Amendment 1, Section 5.1.a, both locations are located outside of the 60-day travel time and are approvable based on the New York City Watershed Rules and Regulations. Lamont Engineers believes that flooding is the more significant water quality risk.

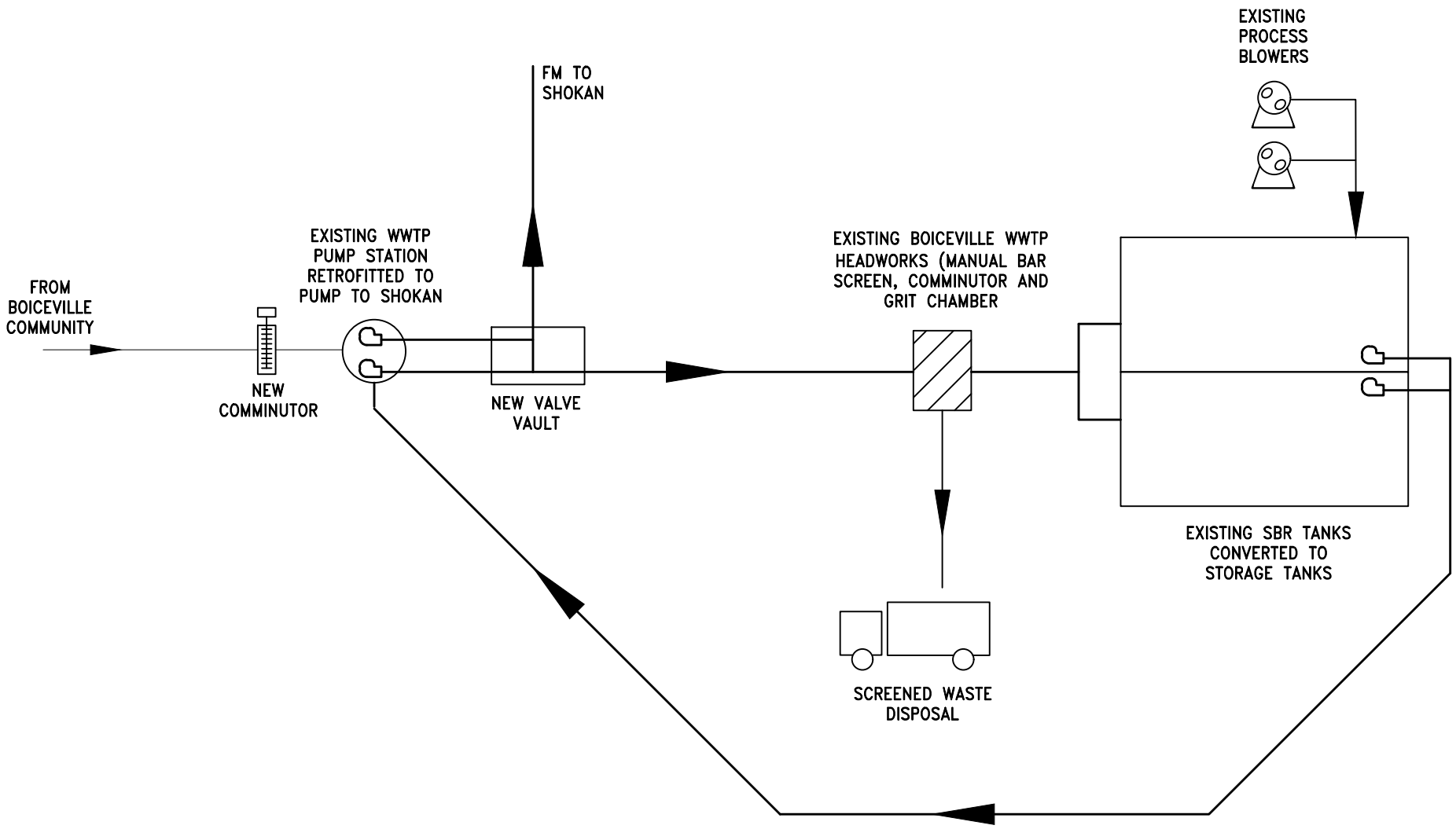
With Shokan Alone, the Boiceville WWTP will still need to be operated and maintained. The perpetual O&M costs differential and the ability to eliminate a flooding concern at Boiceville, are compelling factors.

Also, a retrofit unavoidably involves more uncertainties than new construction, and new design and new construction will undoubtedly lead to more effective and efficient operational results.

All considered, Lamont Engineers recommends that the Shokan Combined option be pursued with a capital cost of $48,715,000 and a yearly operation and maintenance cost of $1,140,000.

Exhibit 2.3.A

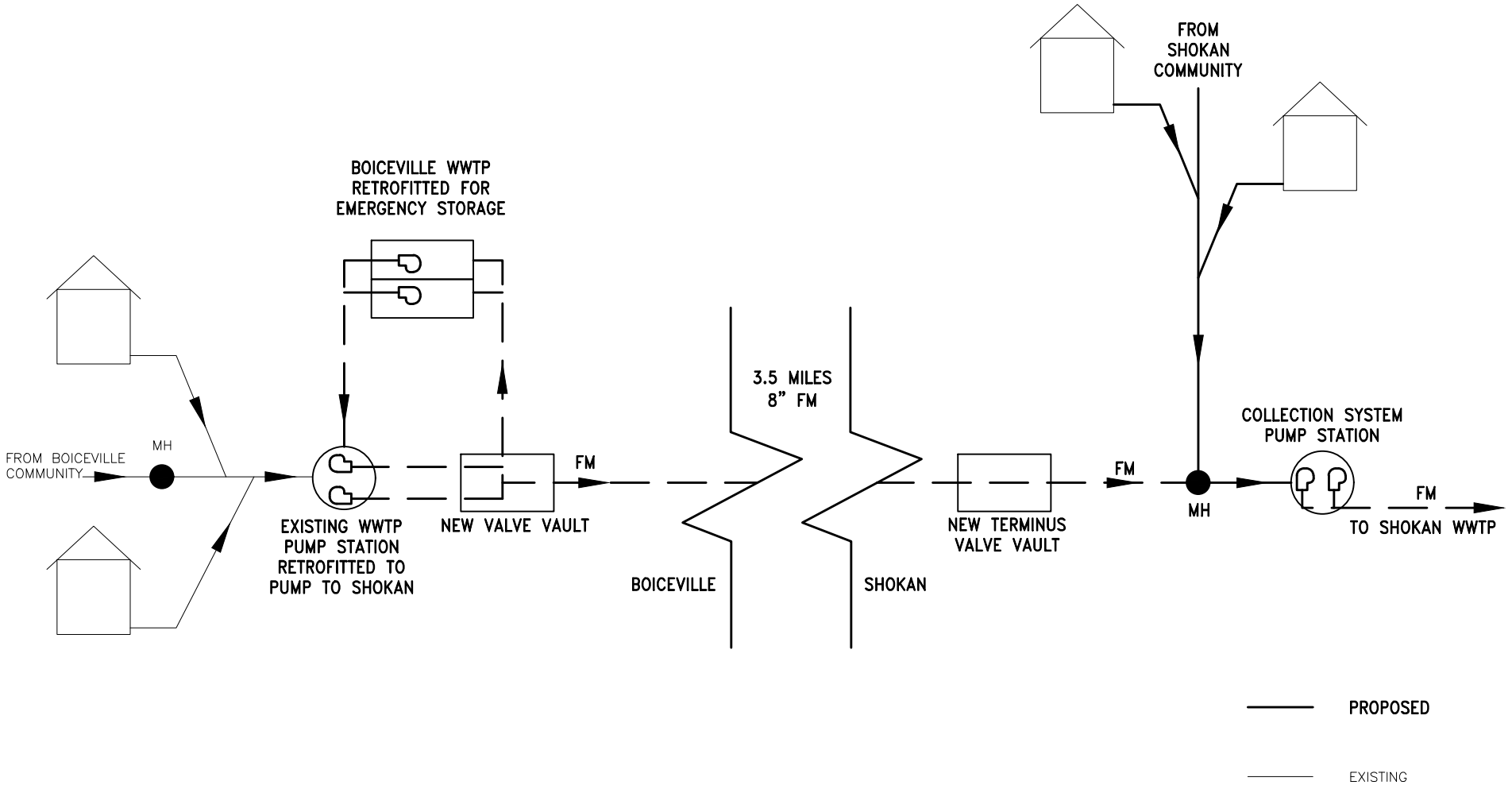
Preliminary Layout of Conversion of Boiceville WWTP To Pump Station



DATE 4/15/2020	PROJECT NO. 2018017	EXHIBIT 2.3.A PRELIMINARY LAYOUT OF CONVERSION OF BOICEVILLE WWTP TO PUMP STATION ULSTER COUNTY NEW YORK STATE	Lamont Engineers ENGINEERS • PLANNERS • FACILITY OPERATIONS
SCALE NOT TO SCALE	DRAWN NW		

2.3.B

Flow Schematic of Combined Flow Pumping and Conveyance System



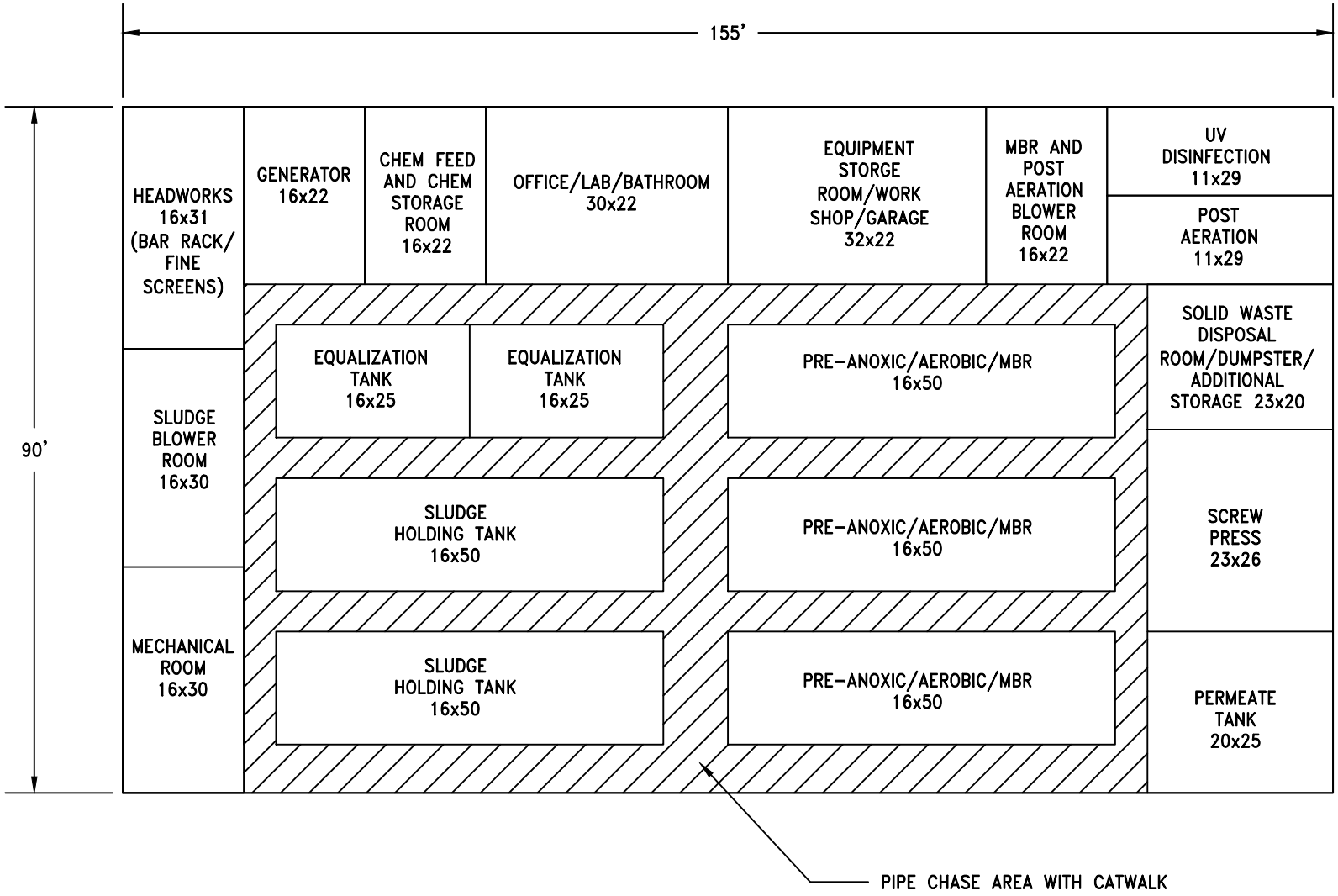
DATE 1/7/20	PROJECT NO. 2018017
SCALE NOT TO SCALE	DRAWN SK

EXHIBIT 2.3.B
FLOW SCHEMATIC OF COMBINED FLOW PUMPING AND CONVEYANCE SYSTEM

Lamont Engineers
ENGINEERS • PLANNERS • FACILITY OPERATIONS

Exhibit 2.3.C

New Combined Flow WWTP Building Preliminary Floor Plan



DATE 3/31/20	PROJECT NO. 2018017	EXHIBIT 2.3.C NEW COMBINED FLOW WWTP BUILDING PRELIMINARY FLOOR PLAN ULSTER COUNTY NEW YORK STATE	Lamont Engineers ENGINEERS • PLANNERS • FACILITY OPERATIONS
SCALE NTS	DRAWN NW		

Exhibit 4.1.A

Opinion of Probable Cost
Shokan LDGS to MBR WWTP

Exhibit 4.1.A
Draft PER Exhibit 10.1.A Revised
Shokan WMP
Opinion of Probable Cost
MBR Wastewater Treatment Plant
with Large Diameter Gravity Sewers
Shokan Alone

	Item	Description		Amount
1	**LDGS Collection System**		$	23,499,000
2	**MBR WWTP - Shokan Alone**		$	11,586,000
		Total Construction Cost	**$**	**35,085,000**
1	**Non-Construction**	Includes administrative, legal, SEQRA Compliance, permitting, aerial mapping, engineering (design & construction), easement acquisition, etc.	$	7,017,000
2	**Property Acquisition**		$	500,000
		Total Non-Construction Cost	**$**	**7,517,000**
		Total Project Cost	**$**	**42,602,000**
1	**Annual Collection System Operation and Maintenance Cost (at design flow)**		$	263,000
2	**Annual WWTP Operation and Maintenance Cost (at design flow)**		$	477,000
		Total Annual Operation and Maintenance Cost	**$**	**740,000**

Exhibit 4.1.A
Draft PER Exhibit 10.1.A Revised
Shokan WMP
Collection System
Opinion of Probable Cost
MBR Wastewater Treatment Plant
with Large Diameter Gravity Sewers

Item	Quantity	Units	Unit Price*	Amount
Gravity Sewer Main (8"- 10")	70,000	LF	$ 185	$ 12,950,000
HDPE FM (3"- 6")	14,850	LF	$ 75	$ 1,113,750
Stream Crossing HDPE FM	1,300	LF	$ 300	$ 390,000
Lateral Stubs**	525	EA	$ 1,250	$ 656,250
Manholes	206	EA	$ 3,500	$ 721,000
Collection System Pump Station	12	EA	$ 125,000	$ 1,500,000
Grinder Pumps	12	EA	$ 30,000	$ 360,000
Rock Removal (Sewer Main***)	15,600	Cubic yards	$ 100	$ 1,560,000
Rock Removal (FM****)	1,700	Cubic yards	$ 100	$ 170,000
			Subtotal	$ 19,421,000
			Inflation 10%	$ 1,942,100
			Subtotal	$ 21,363,100
			Contingency (10%)	$ 2,136,310
			Construction Total	**$ 23,499,410**
			USE	**$ 23,499,000**

* Unit Prices based on previous CWMP project cost estimates and bidding results.

** Assumes 1 lateral stub per property installed from sewer main to edge of right-of-way or edge of easement .

*** Assumes rock removal of 3'w by 2'd by length of gravity collection piping.

**** Assumes rock removal of 3'w by 1'd by length of open cut force main piping.

Exhibit 4.1.A
Draft PER Exhibit 10.1.A Revised
Shokan WMP
WWTP
Opinion of Probable Cost
MBR Wastewater Treatment Plant
with Large Diameter Gravity Sewers

	Item	Units	Quantity	Unit price	Amount	
Site Preparation						
	Environmental Protection	LS	1	$ 25,000	$ 25,000	
	Site Preparation (Includes Stormwater Treatment)	LS	1	$ 140,000	$ 140,000	
	Mobilization/Demobilization	LS	1	$ 25,000	$ 25,000	
	Survey and Stakeout	LS	1	$ 20,000	$ 20,000	
	Access Drive and Parking Area	LS	1	$ 50,000	$ 50,000	
	Restoration	LS	1	$ 25,000	$ 25,000	
	Outfall Sewer	LF	450	$ 100	$ 45,000	
	Field Office	LS	1	$ 50,000	$ 50,000	
	Rock Removal	CY	800	$ 100	$ 80,000	
	Subtotal Site Preparation					$ 460,000
Secondary/Tertiary Treatment						
	MBR Package Plant Equipment (Fine Screens, Pumps,MBR Filters, Mixers, Blowers)	EA	1	$ 3,312,000	$ 3,312,000	
	Cast-In-Place Concrete Tanks	LS	1	$ 1,300,000	$ 1,300,000	
	Chemical Storage	EA	1	$ 15,000	$ 15,000	
	Subtotal Secondary/Tertiary Treatment					$ 4,627,000
Other Treatment Plant Equipment						
	Ultaviolet Disinfection System	EA	1	$ 108,000	$ 108,000	
	Flow Meter	EA	1	$ 20,000	$ 20,000	
	Solids Handling System	EA	1	$ 200,000	$ 200,000	
	EQ Blowers and Diffusers	EA	1	$ 50,000	$ 50,000	
	Process Piping	EA	1	$ 75,000	$ 75,000	
	Non-Potable Water System	EA	1	$ 10,000	$ 10,000	
	O&M Manuals	EA	1	$ 5,000	$ 5,000	
	Spare Parts	LS	1	$ 10,000	$ 10,000	
	Subtotal Other Treatment Plant Equipment					$ 478,000
Building						
	Steel Pre-Engineered Building (150'x85')	SF	12,750	$ 200	$ 2,550,000	
	Curbs and Sidewalk	EA	1	$ 15,000	$ 15,000	
	Water Supply Well	EA	1	$ 20,000	$ 20,000	
	Office Furniture/ Lab Equipment	EA	1	$ 20,000	$ 20,000	
	Hand Rails Misc. Bldg.	LS	1	$ 25,000	$ 25,000	
	Misc. Metals, Platforms and Grates	LS	1	$ 50,000	$ 50,000	
	Subtotal Building					$ 2,680,000
Electrical		LS	1	$ 950,000	$ 950,000	$ 950,000
Plumbing		LS	1	$ 100,000	$ 100,000	$ 100,000
HVAC		LS	1	$ 180,000	$ 180,000	$ 180,000
Utilities		LS	1	$ 100,000	$ 100,000	$ 100,000
					Subtotal	$ 9,575,000
					Inflation (10%)	$ 957,500
					Subtotal	$ 10,532,500
					Contingency (10%)	$ 1,053,250
					Construction Total	**$ 11,585,750**
					USE	**$ 11,586,000**

Exhibit 4.1.A
Draft PER Exhibit 10.1.A Revised
Shokan WMP
Collection System Operation and Maintenance
Opinion of Probable Cost
MBR Wastewater Treatment Plant
with Large Diameter Gravity Sewers

Line Item Description	Budget	COMMENTS
Utilities		
Generator Fuel Collection System PS's (12) (Diesel)	$ 6,000	Based on current Prattsville Sewer Budget ($500 for each pump station)
Electricty Collection System PS's (12)	$ 36,000	Based on $250 per month per community station serving an average of 25 EDUs
Electricity Individual Grinder PS's (12)	$ 5,040	Based on Boiceville - $35/month per individual station.
Telephone Service	$ 14,400	Based on current Roxbury Sewer Budget (Assumes 12 Telephone Services)
Utilities Subtotal	**$ 61,440**	
Chemicals		
Degreaser (Wet Wells)	$ 9,000	Based on current Roxbury Sewer Budget (12 Main Pump Stations at $750 per pump station)
Chemicals Subtotal	**$ 9,000**	
Personnel		
O&M Operator	$ 135,200	Based on one full time operator at 40 hours per week at an average cost of $65.00 per hour
O&M Engineering	$ 200	Based on current Roxbury Sewer Budget
Personnel Subtotal	**$ 135,400**	
Administration		
Insurance	$ 2,000	Based on current Roxbury Sewer Budget and proportioned to Boiceville & Shokan Combined
Administration Subtotal	**$ 2,000**	
O&M		
Generator Annual Service and Repair (12 PS's)	$ 12,000	Based on current Roxbury Sewer Budget ($1,000 for each generator)
Individual Grinder Pump Station Preventive Maintenance/Service Contracts (12 PS's)	$ 1,200	Assumes $100 for each PS
Collection System Pump Station Grounds Maintenance (12 PS's)	$ 6,000	Assumes grounds keeping to be sub-contracted by Town of Olive and to include lawn mowing, and summer grounds care, as well as snow plowing and removal in winter for 11 pump stations.
Equipment/Spare Parts/Repairs	$ 5,000	Based on current Roxbury Sewer Budget and proportioned to Boiceville & Shokan Combined
Maintenance Supplies	$ 1,000	Cleaning Supplies, shovels, portable pumps etc,.
Instrumentation Spare Parts	$ 1,000	Based on current Roxbury Sewer Budget and proportioned to Boiceville & Shokan Combined
Leak Detection/Repair	$ 2,500	Based on current Roxbury Sewer Budget and proportioned to Boiceville & Shokan Combined
Periodic Sewer Cleaning and Inspection	$ 2,500	Assumes cleaning and TV inspection of 10,000 linear feet of sewer main per year at $1/ft.
O&M Subtotal	**$ 31,200**	
Total O&M Budget Subtotal	$ 239,040	
Contingency	$ 23,904	10% of the budget before contingency.
TOTAL	**$ 262,944**	
TOTAL PROPOSED O&M BUDGET	**$ 263,000**	

Exhibit 4.1.A
Draft PER Exhibit 10.1.A Revised
Shokan WMP
WWTP Full Flow Operation and Maintenance
Opinion of Probable Cost
MBR Wastewater Treatment Plant
with Large Diameter Gravity Sewers

Line Item Description	Budget	COMMENTS
Utilities		
Fuel	$ 1,000	Based on current Boiceville Budget
Propane	$ 4,200	Based on current Boiceville Budget
WWTP Electricity Cost	$ 98,550	Based on 2,250 kWh per day at $0.12 per kWh
Utilities Subtotal	**$ 103,750**	
Chemicals		
Alum, Citric Acid, Chlorine, De-greasers	$ 6,000	Based on current Boiceville Budget
Chemicals Subtotal	**$ 6,000**	
Sludge Disposal		
Sludge dewatering and Solid Waste Disposal	$ 68,040	Based on a total processing and hauling cost of $270 per ton.
Personnel Subtotal	**$ 68,040**	
Personnel		
O&M Operator	$ 202,800	Based on one chief operator at 20 hrs per week (split time with existing Boiceville WWTP) and one full time operator at 40 hours per week all at an average cost of $65.00 per hour
O&M Engineering	$ 1,000	Based on current Boiceville Budget
Personnel Subtotal	**$ 203,800**	
Wastewater Samples & Analysis		
SPDES Monthly Samples	$ 2,500	Based on current Boiceville Budget
Process Control Samples	$ 500	Based on current Boiceville 2020 Budget
Chemicals Subtotal	**$ 3,000**	
Administration		
O&M Legal	$ 1,500	Based on current Boiceville Budget
Force Account/Clerical	$ 2,000	Record keeping and reporting including assistance in preparing reconciliation, monthly reports,
Office Supplies	$ 3,200	Record keeping and reporting.
Insurance	$ 8,000	Based on current Boiceville Budget
Administration Subtotal	**$ 14,700**	
O&M		
Preventive Maintenance/Service Contracts	$ 10,000	Based on current Boiceville Budget
Telephone/Fax/Internet	$ 3,000	Based on current Boiceville Budget
Building Maintenance -- includes grounds maintenance	$ 4,500	Assumes grounds keeping to be sub-contracted by Town of Olive and to include lawn mowing, and summer grounds care, as well as snow plowing and removal in winter.
Equipment/Spare Parts/Repairs	$ 10,000	Based on current Boiceville Budget
Maintenance Supplies	$ 3,000	Cleaning Supplies, shovels, portable pumps etc,.
Instrumentation Spare Parts	$ 4,000	Based on current Boiceville Budget
O&M Subtotal	**$ 34,500**	
Total O&M Budget Subtotal	$ 433,790	
Contingency	$ 43,379	10% of the budget before contingency.
TOTAL	**$ 477,169**	
TOTAL PROPOSED O&M BUDGET	**$ 477,000**	

Exhibit 4.2.A

Opinion of Probable Cost
Shokan LDGS to MBR Retrofit of Boiceville WWTP

Exhibit 4.2.A
Opinion of Probable Cost
Retrofit Boiceville WWTP to an
MBR Wastewater Treatment Plant
with Large Diameter Gravity Sewers

	Item	Description		Amount
1	**LDGS Collection System**		$	23,348,000
2	**MBR WWTP - Boiceville Retrofit**		$	17,047,000
		Total Construction Cost	**$**	**40,395,000**
1	**Non-Construction**	Includes administrative, legal, SEQRA Compliance, permitting, aerial mapping, engineering (design & construction), easement acquisition, etc.	$	8,079,000
2	**Property Acquisition**		$	500,000
		Total Non-Construction Cost	**$**	**8,579,000**
		Total Project Cost	**$**	**48,974,000**
1	**Annual Collection System Operation and Maintenance Cost (at design flow)**		$	337,000
2	**Annual WWTP Operation and Maintenance Cost (at design flow)**		$	799,000
		Total Annual Operation and Maintenance Cost	**$**	**1,136,000**

Exhibit 4.2.A
Collection System
Opinion of Probable Cost
Retrofit Boiceville WWTP to an
MBR Wastewater Treatment Plant
with Large Diameter Gravity Sewers

Item	Quantity	Units	Unit Price*	Amount
Gravity Sewer Main (8"- 10")	70,000	LF	$ 185	$ 12,950,000
HDPE FM (3"- 6")	14,850	LF	$ 75	$ 1,113,750
Stream Crossing HDPE FM	1,300	LF	$ 300	$ 390,000
Lateral Stubs**	525	EA	$ 1,250	$ 656,250
Manholes	206	EA	$ 3,500	$ 721,000
Collection System Pump Station	11	EA	$ 125,000	$ 1,375,000
Grinder Pumps	12	EA	$ 30,000	$ 360,000
Rock Removal (Sewer Main***)	15,600	Cubic yards	$ 100	$ 1,560,000
Rock Removal (FM****)	1,700	Cubic yards	$ 100	$ 170,000
			Subtotal	$ 19,296,000
			Inflation 10%	$ 1,929,600
			Subtotal	$ 21,225,600
			Contingency (10%)	$ 2,122,560
			Construction Total	**$ 23,348,160**
			USE	**$ 23,348,000**

* Unit Prices based on previous CWMP project cost estimates and bidding results.

** Assumes 1 lateral stub per property installed from sewer main to edge of right-of-way or edge of easement .

*** Assumes rock removal of 3'w by 2'd by length of gravity collection piping.

**** Assumes rock removal of 3'w by 1'd by length of open cut force main piping.

Exhibit 4.2.A
WWTP
Opinion of Probable Cost
Retrofit Boiceville WWTP to an
MBR Wastewater Treatment Plant
with Large Diameter Gravity Sewers

	Item	Units	Quantity	Unit Price	Amount	
Shokan Pump Station Site Preparation						
	Environmental Protection	LS	1	$ 25,000	$ 25,000	
	Site Preparation (Includes Stormwater Treatment)	LS	1	$ 140,000	$ 140,000	
	Mobilization/Demobilization	LS	1	$ 15,000	$ 15,000	
	Survey and Stakeout	LS	1	$ 25,000	$ 25,000	
	Restoration	LS	1	$ 50,000	$ 50,000	
	Site Work	LS	1	$ 50,000	$ 50,000	
	Field Office	LS	1	$ 50,000	$ 50,000	
	Subtotal Pump Station Site Preparation					$ 355,000
Boiceville WWTP Site Preparation						
	Environmental Protection	LS	1	$ 10,000	$ 10,000	
	Site Preparation (Includes Stormwater Treatment and Sheeting)	LS	1	$ 200,000	$ 200,000	
	Mobilization/Demobilization	LS	1	$ 15,000	$ 15,000	
	Survey and Stakeout	LS	1	$ 5,000	$ 5,000	
	Restoration	LS	1	$ 10,000	$ 10,000	
	Site Work	LS	1	$ 10,000	$ 10,000	
	Subtotal Boiceville WWTP Site Preparation					$ 250,000
Shokan Pump Station and Force Main to Boiceville						
	Pump Station	EA	1	$ 125,000	$ 125,000	
	Pumps, VFD's and Controls	EA	2	$ 75,000	$ 150,000	
	Wet Weather Storage Tank and Associated piping	EA	1	$ 500,000	$ 500,000	
	Flow Meter and Vault	EA	2	$ 25,000	$ 50,000	
	Valve Vaults and Valves	LS	1	$ 25,000	$ 25,000	
	Comminutor/Grinder	EA	1	$ 55,000	$ 55,000	
	8" Solids Handling Forcemain by Open Cut	LF	18,500	$ 85	$ 1,572,500	
	Rock Removal	CY	3,500	$ 100	$ 350,000	
	Extra Common Fill Backfill	CY	3,500	$ 10	$ 35,000	
	Force main cleanouts/air release	EA	37	$ 5,000	$ 185,000	
	Subtotal Pump Station and Force Main to Boiceville					$ 3,047,500
Boiceville WWTP Upgrades						
	Headworks (includes fine screens)	EA	2	$ 75,000	$ 150,000	
	Flow Meter	EA	1	$ 20,000	$ 20,000	
	MBR Package Equipment	EA	1	$ 5,940,000	$ 5,940,000	
	Ultraviolet Disinfection Upgrades	EA	1	$ 144,000	$ 144,000	
	Cast-In-Place Concrete Tanks	LS	1	$ 600,000	$ 600,000	
	Sludge Digester Blower Upgrades	EA	2	$ 15,000	$ 30,000	
	Decommissioning and Disposal of Existing Equipment	EA	1	$ 350,000	$ 350,000	
	Misc. Building Modifications	EA	1	$ 150,000	$ 150,000	
	Building Addition for New Headworks and Sludge Digestors	SF	2,250	$ 250	$ 562,500	
	Building Addition for Third MBR Treatment Train	SF	1,000	$ 250	$ 250,000	
	Misc. Metals, Platforms and Grates	LS	1	$ 50,000	$ 50,000	
	Hand Rails Misc. Bldg	LS	1	$ 50,000	$ 50,000	
	Influent Pump Station Force Main Relocation	LS	1	$ 10,000	$ 10,000	
	Water Service Relocation	LS	1	$ 10,000	$ 10,000	
	Gas Line Relocation	LS	1	$ 10,000	$ 10,000	
	WWTP Sewer Lateral Relocation	LS	1	$ 10,000	$ 10,000	
	WWTP Outfall Relocation	LF	360	$ 185	$ 66,600	
	Subtotal Boiceville WWTP Upgrades					$ 8,403,100
Other Facility Equipment						
	Process Piping	EA	1	$ 75,000	$ 75,000	
	EQ Blowers and Diffusers	EA	1	$ 50,000	$ 50,000	
	Non-Potable Water System Upgrade	EA	1	$ 5,000	$ 5,000	
	O&M Manuals	EA	1	$ 5,000	$ 5,000	
	Spare Parts	LS	1	$ 10,000	$ 10,000	
	Subtotal Other Treatment Facility Equipment					$ 145,000
Storage/Equipment Building						
	Wood Frame Building (incl. Foundation)	SF	500	$ 200	$ 100,000	
	Misc. Metals, Platforms and Grates	LS	1	$ 20,000	$ 20,000	
	Office Furniture/ Lab Equipment	LS	1	$ 2,500	$ 2,500	
	Water Service/Well	LS	1	$ 20,000	$ 20,000	
	Driveway/Parking Areas	LS	1	$ 30,000	$ 30,000	
	Subtotal Storage/Equipment Building					$ 172,500
Electrical						
	Shokan Pump Station Electrical (includes generator)	LS	1	$ 75,000	$ 75,000	
	Boiceville WWTP Electrical Upgrades/Retrofit (includes generator)	LS	1	$ 1,400,000	$ 1,400,000	
	Subtotal Electrical					$ 1,475,000
Plumbing						
	Shokan Pump Station Plumbing	LS	1	$ 10,000	$ 10,000	
	Boiceville WWTP Plumbing Upgrades/Retrofit	LS	1	$ 20,000	$ 20,000	

Exhibit 4.2.A
WWTP
Opinion of Probable Cost
Retrofit Boiceville WWTP to an
MBR Wastewater Treatment Plant
with Large Diameter Gravity Sewers

	Subtotal Plumbing					$ 30,000
HVAC						
	Shokan Pump Station HVAC	LS	1	$ 15,000	$ 15,000	
	Boiceville WWTP HVAC Upgrades/Retrofit	LS	1	$ 100,000	$ 100,000	
	Subtotal HVAC					$ 115,000
Utilities						
	Shokan Pump Station Utilities	LS	1	$ 20,000	$ 20,000	
	Boiceville WWTP Utilities Upgrades/Retrofit	LS	1	$ 75,000	$ 75,000	
	Subtotal Utilities					$ 95,000
					SUBTOTAL	$ 14,088,100
					Inflation (10%)	$ 1,408,810
					Subtotal	$ 15,496,910
					Contingency (10%)	$ 1,549,691
					Construction Total	**$ 17,046,601**
					USE	**$ 17,047,000**

Exhibit 4.2.A
Combined Collection System
Operation Maintenance
Opinion of Probable Cost
Retrofit Boiceville WWTP to an
MBR Wastewater Treatment Plant
with Large Diameter Gravity Sewers

Line Item Description	Budget	COMMENTS
Utilities		
Generator Fuel Main PS and Building (Propane)	$ 1,500	Based on current Roxbury Sewer Budget for Maine Care Pump Station
Generator Fuel Collection System PS's (11) (Diesel)	$ 5,500	Based on current Prattsville Sewer Budget ($500 for each pump station)
Electricity Cost Main PS and Building	$ 15,000	Based on current Roxbury Sewer Budget and proportioned to Shokan
Electricty Collection System PS's (11)	$ 33,000	Based on $250 per month per community station serving an average of 25 EDUs
Electricity Individual Grinder PS's (17)	$ 7,140	Based on Boiceville - $35/month per individual station.
Telephone Service	$ 14,000	Based on current Roxbury Sewer Budget (Assumes 12 Telephone Services)
Utilities Subtotal	**$ 76,140**	
Chemicals		
Degreaser (Wet Wells)	$ 9,000	Based on current Roxbury Sewer Budget (12 Main Pump Stations at $750 per pump station)
Bioxide (Odor control at Main Pump Station)	$ 6,000	Based on current Roxbury Sewer Budget and proportioned to Shokan
Chemicals Subtotal	**$ 15,000**	
Personnel		
O&M Operator	$ 135,200	Based on one full time operator at 40 hours per week at an average cost of $65.00 per hour
O&M Engineering	$ 1,000	Based on current Roxbury Sewer Budget
Personnel Subtotal	**$ 136,200**	
Administration		
O&M Legal	$ 1,500	Based on current Roxbury Sewer Budget
Force Account/Clerical	$ 2,000	Record keeping and reporting including assistance in preparing reconciliation, monthly reports, annual reports, and other obligations under the O&M Agreement.
Office Supplies	$ 1,000	Record keeping and reporting.
Insurance	$ 10,000	Based on current Roxbury Sewer Budget and proportioned to Boiceville & Shokan Combined
Administration Subtotal	**$ 14,500**	
O&M		
Generator Annual Service and Repair (12 PS's)	$ 12,000	Based on current Roxbury Sewer Budget ($1,000 for each generator)
Main Pump Station Preventive Maintenance/Service Contracts (12 PS's)	$ 12,000	Based on current Roxbury Sewer Budget ($1,000 for each PS)
Individual Grinder Pump Station Preventive Maintenance/Service Contracts (17 PS's)	$ 1,700	Assumes $100 for each PS
Main Pump Station and Building and Grounds Maintenance	$ 2,000	Assumes grounds keeping to be sub-contracted by Town of Olive and to include lawn mowing, and summer grounds care, as well as snow plowing and removal in winter.
Collection System Pump Station Grounds Maintenance (11 PS's)	$ 5,500	Assumes grounds keeping to be sub-contracted by Town of Olive and to include lawn mowing, and summer grounds care, as well as snow plowing and removal in winter for 11 pump stations.
Equipment/Spare Parts/Repairs	$ 10,000	Based on current Roxbury Sewer Budget and proportioned to Boiceville & Shokan Combined
Maintenance Supplies	$ 1,000	Cleaning Supplies, shovels, portable pumps etc,.
Instrumentation Spare Parts	$ 5,000	Based on current Roxbury Sewer Budget and proportioned to Boiceville & Shokan Combined
Leak Detection/Repair	$ 5,000	Based on current Roxbury Sewer Budget and proportioned to Boiceville & Shokan Combined
Periodic Sewer Cleaning and Inspection	$ 10,000	Assumes cleaning and TV inspection of 10,000 linear feet of sewer main per year at $1/ft.
O&M Subtotal	**$ 64,200**	
Total O&M Budget Subtotal	$ 306,040	
Contingency	$ 30,604	10% of the budget before contingency.
TOTAL	**$ 336,644**	
TOTAL PROPOSED O&M BUDGET	**$ 337,000**	

Exhibit 4.2.A
WWTP Full Flow Operation and Maintenance
Opinion of Probable Cost
Retrofit Boiceville WWTP to an
MBR Wastewater Treatment Plant
with Large Diameter Gravity Sewers

Line Item Description	Budget	COMMENTS
Utilities		
Fuel	$ 1,000	Based on current Boiceville 2020 Budget
Propane	$ 4,000	Based on current Boiceville 2020 Budget
WWTP Electricity Cost	$ 131,400	Based on 3000 kWh per day at $0.12 per kWh
Utilities Subtotal	**$ 136,400**	
		Based on current Boiceville 2020 Budget
Chemicals		
Alum, Citric Acid, Chlorine, De-greasers	$ 18,000	
Chemicals Subtotal	**$ 18,000**	
Sludge Processing/Disposal		
Sludge dewatering and Solid Waste Disposal	$ 83,950	Based on a total processing and hauling cost of $230 per ton.
Sludge Disposal Subtotal	**$ 83,950**	
Personnel		
O&M Operator	$ 405,600	Based on three full time operators at 40 hours per week all at an average cost of $65.00 per hour
O&M Engineering	$ 2,500	Based on current Boiceville Budget
Personnel Subtotal	**$ 408,100**	
Wastewater Samples & Analysis		
SPDES Monthly Samples	$ 2,500	Based on current Boiceville 2020 Budget
Process Control Samples	$ 500	Based on current Boiceville 2020 Budget
Chemicals Subtotal	**$ 3,000**	
Administration		
O&M Legal	$ 3,000	Based on current Boiceville 2020 Budget
Force Account/Clerical	$ 3,800	Record keeping and reporting including assistance in preparing reconciliation, monthly reports, annual reports, and other obligations under the O&M Agreement.
Office Supplies	$ 3,500	Record keeping and reporting.
Permit Renewals	$ 1,500	Based on current Boiceville 2020 Budget
Insurance	$ 10,000	Based on current Boiceville 2020 Budget
Administration Subtotal	**$ 21,800**	
O&M		
Preventive Maintenance/Service Contracts	$ 18,500	Based on current Boiceville 2020 Budget
Telephone/Fax/Internet	$ 3,500	Based on current Boiceville 2020 Budget
Building Maintenance -- includes grounds maintenance	$ 9,000	Assumes grounds keeping to be sub-contracted by Town of Olive and to include lawn mowing, and summer grounds care, as well as snow plowing and removal in winter.
Equipment/Spare Parts/Repairs	$ 15,000	Based on current Boiceville 2020 Budget
Maintenance Supplies	$ 4,000	Cleaning Supplies, shovels, portable pumps etc,.
Instrumentation Spare Parts	$ 5,000	Based on current Boiceville 2020 Budget
O&M Subtotal	**$ 55,000**	
Total O&M Budget Subtotal	$ 726,250	
Contingency	$ 72,625	10% of the budget before contingency.
TOTAL	**$ 798,875**	
TOTAL PROPOSED O&M BUDGET	**$ 799,000**	

Exhibit 4.3.A

Opinion of Probable Cost
Shokan LDGS to Combined Flow MBR WWTP

Exhibit 4.3.A
Opinion of Probable Cost
Shokan WWTP with Boiceville flows
MBR Wastewater Treatment Plant
with Large Diameter Gravity Sewers

	Item	Description		Amount
1	**LDGS Collection System**		$	23,499,000
2	**MBR WWTP - Shokan Combined**		$	16,680,000
		Total Construction Cost	**$**	**40,179,000**
1	**Non-Construction**	Includes administrative, legal, SEQRA Compliance, permitting, aerial mapping, engineering (design & construction), easement acquisition, etc.	$	8,036,000
2	**Property Acquisition**		$	500,000
		Total Non-Construction Cost	**$**	**8,536,000**
		Total Project Cost	**$**	**48,715,000**
1	**Annual Collection System Operation and Maintenance Cost (at design flow)**		$	341,000
2	**Annual WWTP Operation and Maintenance Cost (at design flow)**		$	799,000
		Total Annual Operation and Maintenance Cost	**$**	**1,140,000**

Exhibit 4.3.A
Collection System
Opinion of Probable Cost
Shokan WWTP with Boiceville flows
MBR Wastewater Treatment Plant
with Large Diameter Gravity Sewers

Item	Quantity	Units	Unit Price*	Amount
Gravity Sewer Main (8"- 10")	70,000	LF	$ 185	$ 12,950,000
HDPE FM (3"- 6")	14,850	LF	$ 75	$ 1,113,750
Stream Crossing HDPE FM	1,300	LF	$ 300	$ 390,000
Lateral Stubs**	525	EA	$ 1,250	$ 656,250
Manholes	206	EA	$ 3,500	$ 721,000
Collection System Pump Station	12	EA	$ 125,000	$ 1,500,000
Grinder Pumps	12	EA	$ 30,000	$ 360,000
Rock Removal (Sewer Main***)	15,600	Cubic yards	$ 100	$ 1,560,000
Rock Removal (FM****)	1,700	Cubic yards	$ 100	$ 170,000
			Subtotal	$ 19,421,000
			Inflation 10%	$ 1,942,100
			Subtotal	$ 21,363,100
			Contingency (10%)	$ 2,136,310
			Construction Total	**$ 23,499,410**
			USE	**$ 23,499,000**

* Unit Prices based on previous CWMP project cost estimates and bidding results.

** Assumes 1 lateral stub per property installed from sewer main to edge of right-of-way or edge of easement .

*** Assumes rock removal of 3'w by 2'd by length of gravity collection piping.

**** Assumes rock removal of 3'w by 1'd by length of open cut force main piping.

Exhibit 4.3.A
WWTP
Opinion of Probable Cost
Shokan WWTP with Boiceville flows
MBR Wastewater Treatment Plant
with Large Diameter Gravity Sewers

	Item	Units	Quantity	Unit Price	Amount	
Shokan WWTP Site Preparation						
	Environmental Protection	LS	1	$ 25,000	$ 25,000	
	Site Preparation (Includes Stormwater Treatment)	LS	1	$ 140,000	$ 140,000	
	Mobilization/Demobilization	LS	1	$ 15,000	$ 15,000	
	Survey and Stakeout	LS	1	$ 20,000	$ 20,000	
	Site work, Access Drive and Parking Area	LS	1	$ 50,000	$ 50,000	
	Restoration	LS	1	$ 25,000	$ 25,000	
	Outfall Sewer	LF	450	$ 100	$ 45,000	
	Field Office	LS	1	$ 50,000	$ 50,000	
	Rock Removal	CY	880	$ 100	$ 88,000	
	Subtotal Pump Station Site Preparation					$ 458,000
Boiceville WWTP Retrofit to Pump Station Site Preparation						
	Environmental Protection	LS	1	$ 10,000	$ 10,000	
	Site Preparation (Includes Stormwater Treatment)	LS	1	$ 5,000	$ 5,000	
	Mobilization/Demobilization	LS	1	$ 15,000	$ 15,000	
	Survey and Stakeout	LS	1	$ 5,000	$ 5,000	
	Restoration	LS	1	$ 10,000	$ 10,000	
	Site Work	LS	1	$ 10,000	$ 10,000	
	Subtotal Boiceville WWTP Site Preparation					$ 55,000
Boiceville WWTP Retrofit to Pump Station and FM to Shokan						
	Pumps, VFD's and Controls	EA	2	$ 75,000	$ 150,000	
	Retrofit of Boiceville WWTP Existing Tankage for Wet Weather Storage	EA	1	$ 50,000	$ 50,000	
	Flow Meter and Vault	EA	2	$ 25,000	$ 50,000	
	Valve Vaults and Valves	LS	1	$ 25,000	$ 25,000	
	Comminutor/Grinder	EA	1	$ 55,000	$ 55,000	
	8" Solids Handling Forcemain by Open Cut	LF	17,625	$ 85	$ 1,498,125	
	Rock Removal	CY	3,300	$ 100	$ 330,000	
	Extra Common Fill Backfill	CY	3,300	$ 10	$ 33,000	
	Force main cleanouts/air release	EA	35	$ 5,000	$ 175,000	
Subtotal Boiceville WWTP Retrofit to Pump Station and FM to Shokan						$ 2,366,125
Shokan WWTP Secondary/Tertiary Treatment						
	Headworks (includes fine screens)	EA	2	$ 75,000	$ 150,000	
	MBR Package Equipment	EA	1	$ 4,312,000	$ 4,312,000	
	Cast-In-Place Concrete Tanks	LS	1	$ 1,400,000	$ 1,400,000	
	Chemical Storage	EA	1	$ 75,000	$ 75,000	
	Subtotal Shokan WWTP Secondary/Tertiary Treatment					$ 5,937,000
Other Facility Equipment						
	Flow Meter	EA	1	$ 20,000	$ 20,000	
	Ultraviolet Disinfection System	EA	1	$ 144,000	$ 144,000	
	Solids Handling System	EA	1	$ 200,000	$ 200,000	
	EQ Blowers and Diffusers	EA	1	$ 50,000	$ 50,000	
	Process Piping	EA	1	$ 75,000	$ 75,000	
	Non-Potable Water System	EA	1	$ 10,000	$ 10,000	
	O&M Manuals	EA	1	$ 5,000	$ 5,000	
	Spare Parts	LS	1	$ 10,000	$ 10,000	
	Subtotal Other Treatment Facility Equipment					$ 514,000
Building						
	Steel Pre-Engineered Building (155'x90')	SF	13,950	$ 200	$ 2,790,000	
	Curbs and Sidewalk	EA	1	$ 15,000	$ 15,000	
	Water Supply Well	EA	1	$ 20,000	$ 20,000	
	Office Furniture/Lab Equipment	EA	1	$ 20,000	$ 20,000	
	Hand Rails Misc. Bldg.	LS	1	$ 25,000	$ 25,000	
	Misc. Metals, Platforms and Grates	LS	1	$ 50,000	$ 50,000	
	Subtotal Building					$ 2,920,000

Exhibit 4.3.A
WWTP
Opinion of Probable Cost
Shokan WWTP with Boiceville flows
MBR Wastewater Treatment Plant
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Electrical						
	Shokan WWTP Electrical (includes generator)	LS	1	$ 1,100,000	$ 1,100,000	
	Boiceville WWTP Electrical Upgrades/Retrofit	LS	1	$ 25,000	$ 25,000	
	Subtotal Electrical					$ 1,125,000
Plumbing						
	Shokan WWTP Plumbing	LS	1	$ 105,000	$ 105,000	
	Boiceville WWTP Plumbing Upgrades/Retrofit	LS	1	$ 5,000	$ 5,000	
	Subtotal Plumbing					$ 110,000
HVAC						
	Shokan WWTP HVAC	LS	1	$ 190,000	$ 190,000	
	Boiceville WWTP HVAC Upgrades/Retrofit	LS	1	$ 5,000	$ 5,000	
	Subtotal HVAC					$ 195,000
Utilities						
	Shokan WWTP Utilities	LS	1	$ 100,000	$ 100,000	
	Boiceville WWTP Utilities Upgrades/Retrofit	LS	1	$ 5,000	$ 5,000	
	Subtotal Utilities					$ 105,000
					SUBTOTAL	$ 13,785,125
					Inflation (10%)	$ 1,378,513
					Subtotal	$ 15,163,638
					Contingency (10%)	$ 1,516,364
					Construction Total	**$ 16,680,001**
					USE	**$ 16,680,000**

Exhibit 4.3.A
WWTP Full Flow Operation and Maintenance
Opinion of Probable Cost
Shokan WWTP with Boiceville Flows
MBR Wastewater Treatment Plant
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Line Item Description	Budget	COMMENTS
Utilities		
Generator Fuel Main PS and Building (Propane)	$ 1,500	Based on current Roxbury Sewer Budget for Maine Care Pump Station
Generator Fuel Collection System PS's (12) (Diesel)	$ 6,000	Based on current Prattsville Sewer Budget ($500 for each pump station)
Electricity Cost Main PS and Building	$ 15,000	Based on current Boiceville Budget
Electricty Collection System PS's (12)	$ 36,000	Based on $250 per month per community station serving an average of 25 EDUs
Electricity Individual Grinder PS's (17)	$ 7,140	Based on Boiceville - $35/month per individual station.
Telephone Service	$ 15,000	Based on current Roxbury Sewer Budget (Assumes 13 Telephone Services)
Utilities Subtotal	**$ 80,640**	
Chemicals		
Degreaser (Wet Wells)	$ 9,750	Based on current Roxbury Sewer Budget (13 Main Pump Stations at $750 per pump station)
Bioxide (Odor control at Main Pump Station)	$ 2,700	Based on current Roxbury Sewer Budget and proportioned to Boiceville
Chemicals Subtotal	**$ 12,450**	
Personnel		
O&M Operator	$ 135,200	Based on one full time operator at 40 hours per week at an average cost of $65.00 per hour
O&M Engineering	$ 1,000	Based on current Roxbury Sewer Budget
Personnel Subtotal	**$ 136,200**	
Administration		
O&M Legal	$ 1,500	Based on current Roxbury Sewer Budget
Force Account/Clerical	$ 2,000	Record keeping and reporting including assistance in preparing reconciliation, monthly reports, annual reports, and other obligations under the O&M Agreement.
Office Supplies	$ 1,000	Record keeping and reporting.
Insurance	$ 10,000	Based on current Roxbury Sewer Budget and proportioned to Boiceville & Shokan Combined
Administration Subtotal	**$ 14,500**	
O&M		
Generator Annual Service and Repair (13 PS's)	$ 13,000	Based on current Roxbury Sewer Budget ($1,000 for each generator)
Main Pump Station Preventive Maintenance/Service Contracts (13 PS's)	$ 13,000	Based on current Roxbury Sewer Budget ($1,000 for each PS)
Individual Grinder Pump Station Preventive Maintenance/Service Contracts (17 PS's)	$ 1,700	Assumes $100 for each PS
Main Pump Station and Building and Grounds Maintenance	$ 2,000	Assumes grounds keeping to be sub-contracted by Town of Olive and to include lawn mowing, and summer grounds care, as well as snow plowing and removal in winter.
Collection System Pump Station Grounds Maintenance (12 PS's)	$ 5,500	Assumes grounds keeping to be sub-contracted by Town of Olive and to include lawn mowing, and summer grounds care, as well as snow plowing and removal in winter for 12 pump stations.
Equipment/Spare Parts/Repairs	$ 10,000	Based on current Roxbury Sewer Budget and proportioned to Boiceville & Shokan Combined
Maintenance Supplies	$ 1,000	Cleaning Supplies, shovels, portable pumps etc,.
Instrumentation Spare Parts	$ 5,000	Based on current Roxbury Sewer Budget and proportioned to Boiceville & Shokan Combined
Leak Detection/Repair	$ 5,000	Based on current Roxbury Sewer Budget and proportioned to Boiceville & Shokan Combined
Periodic Sewer Cleaning and Inspection	$ 10,000	Assumes cleaning and TV inspection of 10,000 linear feet of sewer main per year at $1/ft.
O&M Subtotal	**$ 66,200**	
Total O&M Budget Subtotal	$ 309,990	
Contingency	$ 30,999	10% of the budget before contingency.
TOTAL	**$ 340,989**	
TOTAL PROPOSED O&M BUDGET	**$ 341,000**	

Exhibit 4.3.A
WWTP Full Flow Operation and Maintenance
Opinion of Probable Cost
Shokan WWTP with Boiceville Flows
MBR Wastewater Treatment Plant
with Large Diameter Gravity Sewers

Line Item Description	Budget	COMMENTS
Utilities		
Fuel	$ 1,000	Based on current Boiceville 2020 Budget
Propane	$ 4,000	Based on current Boiceville 2020 Budget
WWTP Electricity Cost	$ 131,400	Based on 3000 kWh per day at $0.12 per kWh
Utilities Subtotal	**$ 136,400**	
Chemicals		
Alum, Citric Acid, Chlorine, De-greasers	$ 18,000	
Chemicals Subtotal	**$ 18,000**	
Sludge Processing/Disposal		
Sludge dewatering and Solid Waste Disposal	$ 83,950	Based on a total processing and hauling cost of $230 per ton.
Sludge Disposal Subtotal	**$ 83,950**	
Personnel		
O&M Operator	$ 405,600	Based on three full time operators at 40 hours per week all at an average cost of $65.00 per hour
O&M Engineering	$ 2,500	Based on current Boiceville Budget
Personnel Subtotal	**$ 408,100**	
Wastewater Samples & Analysis		
SPDES Monthly Samples	$ 2,500	Based on current Boiceville 2020 Budget
Process Control Samples	$ 500	Based on current Boiceville 2020 Budget
Chemicals Subtotal	**$ 3,000**	
Administration		
O&M Legal	$ 3,000	Based on current Boiceville 2020 Budget
Force Account/Clerical	$ 3,800	Record keeping and reporting including assistance in preparing reconciliation, monthly reports, annual reports, and other obligations under the O&M Agreement.
Office Supplies	$ 3,500	Record keeping and reporting.
Permit Renewals	$ 1,500	Based on current Boiceville 2020 Budget
Insurance	$ 10,000	Based on current Boiceville 2020 Budget
Administration Subtotal	**$ 21,800**	
O&M		
Preventive Maintenance/Service Contracts	$ 18,500	Based on current Boiceville 2020 Budget
Telephone/Fax/Internet	$ 3,500	Based on current Boiceville 2020 Budget
Building Maintenance -- includes grounds maintenance	$ 9,000	Assumes grounds keeping to be sub-contracted by Town of Olive and to include lawn mowing, and summer grounds care, as well as snow plowing and removal in winter.
Equipment/Spare Parts/Repairs	$ 15,000	Based on current Boiceville 2020 Budget
Maintenance Supplies	$ 4,000	Cleaning Supplies, shovels, portable pumps etc,.
Instrumentation Spare Parts	$ 5,000	Based on current Boiceville 2020 Budget
O&M Subtotal	**$ 55,000**	
Total O&M Budget Subtotal	$ 726,250	
Contingency	$ 72,625	10% of the budget before contingency.
TOTAL	**$ 798,875**	
TOTAL PROPOSED O&M BUDGET	**$ 799,000**	