Prepared By:

Town of Minto

Clifford WWTP Filter Assessment Report

GMBP File: 323072

March 2024

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APPENDICES

CLIFFORD WASTEWATER TREATMENT PLANT

FILTER ASSESSMENT REPORT

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1. INTRODUCTION

GM BluePlan Engineering Limited (GMBP) was retained by the Municipality of the Town of Minto (Minto) to provide professional engineering services for assessment of the existing sand filters at Clifford Wastewater Treatment Plant (WWTP). The scope of work is described in our letter proposal to Minto dated September 22, 2023. This assignment is initiated by the Town due to operating experience which is demonstrating that the sand filters are not draining properly and plant performance is declining. There are currently no Orders or Directives from the Ministry of Environment, Conservation and Parks (MECP) regarding the sewage works.

GMBP technical staff conducted a detailed site investigation with operations staff on November 7, 2023. As part of the field work, samples were collected from lagoon effluent and filter effluent. Filter media samples were also collected from several locations in one filter cell and analyzed for geotechnical properties relevant to filter performance.

2. BACKGROUND

The Village of Clifford is located in northern Wellington County and has a population of approximately 760 people. The Village is serviced with municipal water and sanitary sewage services. The Clifford sewage works generally consists of a sanitary sewage collection system, raw sewage pumping station, control building for aeration blowers, chemical feed equipment and standby power, aerated lagoon cell, 3 non-aerated facultative lagoons, lagoon effluent pumping station, 4 cell intermittent sand filter, 2 filtered effluent storage lagoons, and final effluent outfall pipe to a local Municipal Drain. The plant operates on a seasonal discharge basis, with filtered effluent produced from Spring to Fall that is stored in the filtered effluent storage lagoons for discharge to the receiver from Fall to Spring, on an annual basis. The allowable final effluent discharge period is April 1 to November 30 each year.

The Clifford WWTP is captured by the Ministry of Environment, Conservation and Parks (MECP) with Environmental Compliance Approval (ECA) No. 8901-A8YJ9C dated June 7, 2016. The rated annual average flow capacity of the plant is 500 cubic metres per day (m^3/d) with a peak flow capacity of 2,151 m^3/d. A copy of the ECA is contained in Appendix A.

Minto provided GMBP with plant operating data for wastewater analysis for the period from January 1, 2020 to December 31, 2023. This information was analyzed as part of this assignment.

A map showing the general location of the Village of Clifford and the associated WWTP are shown below in Figure 1.

Figure 1. Site Location Map of Clifford WWTP (Google Maps, 2023)

3. DESCRIPTION OF EXISTING SYSTEM

Main components of the sewage works as described in the ECA are outlined below.

1. Sanitary Sewer Collection System
   a. List of the streets in Clifford with sanitary sewers

2. Influent Pumping Station
   a. One (1) 3.0m diameter wet well;
   b. Duplex submersible sewage pumps, each rated at 29 L/s at 15 m TDH;
   c. Basket screen with hoisting equipment.

3. Control Building, contains
   a. 2 blowers rated at 99 L/s at 41 kPa for the aerated lagoon cell;
   b. Chemical feed system with duplex metering pumps and 27,000 L chemical storage tank;
   c. 60kW standby diesel generator with 908 litre fuel tank.

4. Aerated Facultative Lagoon
   a. One (1) cell with surface area of approx. 1,400 m2 and total storage volume of 2,000 m3;
   b. Equipped with coarse air bubble diffusion, inlet and outlet chambers;
   c. Discharging to Facultative Lagoon 1.

5. Facultative Lagoons (3)
   a. Lagoon Cell 1 with a surface area of approx. 22,300 m2 and storage volume of 35,000 m3;
   b. Lagoon Cell 2 with a surface area of approx. 24,500 m2 and storage volume of 40,000 m3;
   c. Lagoon Cell 3 with a surface area of approx. 33,900 m2 and storage volume of 75,000 m3;
   d. Total facultative lagoon storage volume of 150,000 m3

6. Lagoon Effluent Pump Station
   a. Underground concrete pumping chamber installed at edge of Facultative Lagoon 3;

b. Equipped with four (4) submersible pumps, each rated at 30 L/s at 5.2 m TDH discharging to a 200mm forcemains feeding each sand filter.

7. Intermittent Sand Filter (ISF)
   a. Consisting of four (4) ISF cells, each with a surface area of 460 m^2;
   b. Each filter contains a layer of sand filter media 760mm thick, filter influent piping and valves, filter distribution piping, filter underdrain piping, effluent sewer and manholes;
   c. Discharges filtered effluent via a Filtered Effluent Distribution Chamber to Filtered Effluent Storage Lagoon 1.

8. Filtered Effluent Storage Lagoons
   a. Two (2) filtered effluent storage lagoons, each with surface area of approx. 42,900 m2, liquid depth of 2.4m for a total storage capacity of 187,600 m3.

9. Effluent Outfall
   a. One (1) 200mm diameter outfall sewer discharging to an open ditch on the property, ultimately flowing to Raccoon Creek via Minto Municipal Drain 93.

GM BluePlan Engineering (formerly Gamsby and Mannerow Ltd.) was the original design engineer for the Clifford WWTP. The plant was constructed in 1995. Selected design drawings are included in Appendix E that show the overall treatment process and details of the sand filters.

The following table summarizes monitoring requirements and effluent quality criteria stipulated in the ECA.

Table 1. Summary of ECA Parameters and Monitoring Requirements

Parameter	Monitoring Raw Sewage	Monitoring Effluent (1.)	Objectives (mg/L)	Limits (mg/L)
5-day Biochemical Oxygen Demand (BOD5)	weekly	n/a	n/a	n/a
5-day Carbonaceous Biochemical Oxygen Demand (cBOD5)	n/a	weekly	7.5	12.0
Total Suspended Solids (TSS)	weekly	weekly	7.5	12.0
Total Phosphorous (TP)	weekly	weekly	0.7	0.7
Total Kjeldahl Nitrogen (TKN)	weekly	n/a	n/a	n/a
Total Ammonia Nitrogen (TAN)	n/a	weekly	2.0 (Fall, Spring) 4.0 (Winter)	3.0 (Fall, Spring) 6.0 (Winter)
Un-ionized Ammonia Nitrogen NH3 (calculated)	n/a	weekly	0.02	n/a
E. Coli	n/a	weekly	100 CFU/100mL	n/a
Dissolved Oxygen (DO)	n/a	weekly	=> 5.0	n/a
pH	n/a	weekly	6.0 to 9.5	n/a
Temperature	n/a	weekly	n/a	n/a

Notes

1. Effluent quality monitoring is required only during discharge period.
2. n/a : not applicable.

The system operates on a seasonal discharge basis. Final effluent can only be discharged from November 1 to April 30 annually and only during a non-freezing period. Effluent monitoring is conducted weekly during the approved discharge period only.

An aerial view of the Clifford WWTP with the main components of the system are shown below in Figure 2.

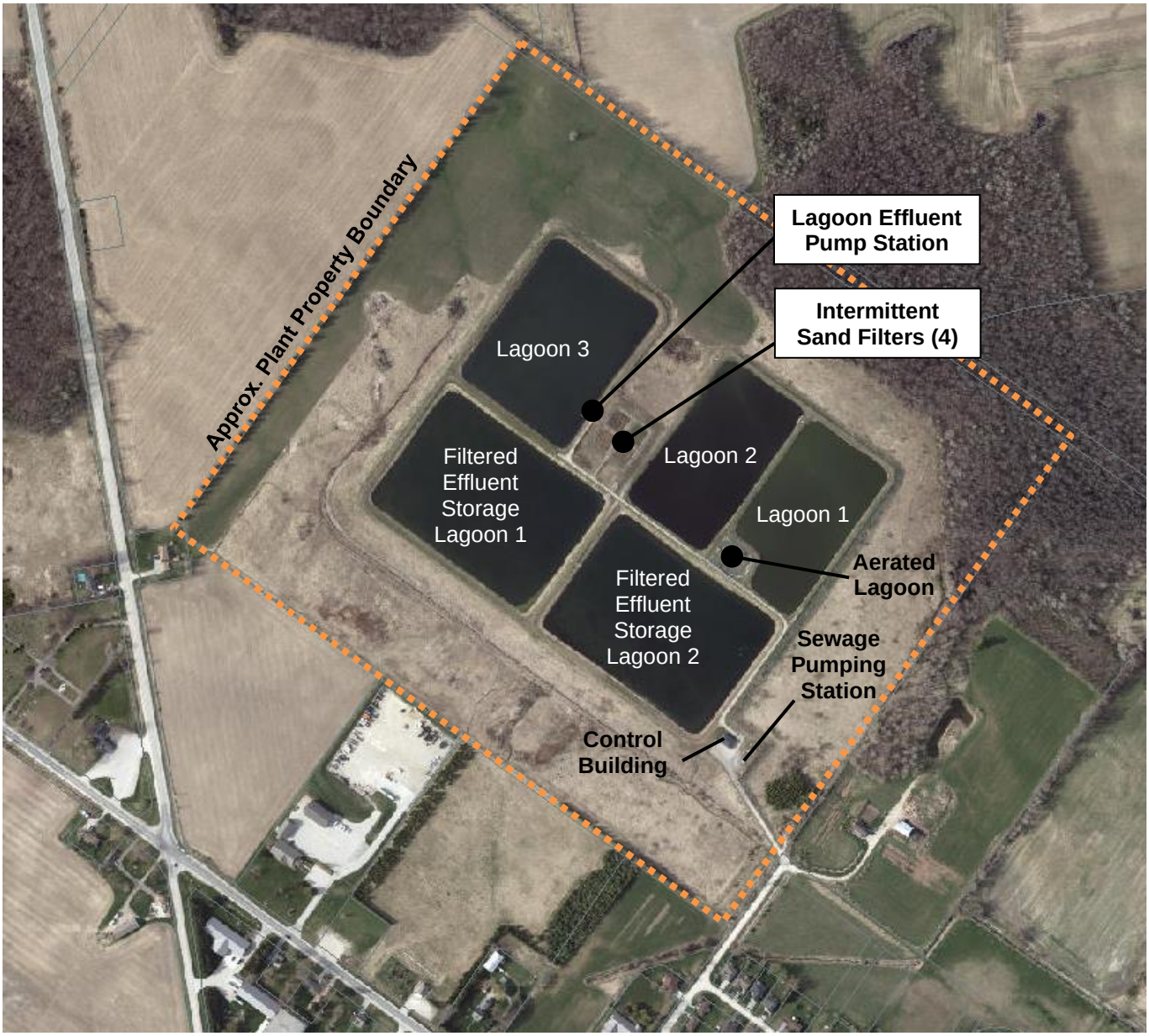


Figure 2. Aerial View of Clifford Wastewater Treatment Plant (MNRF, 2023)

4. ANALYSIS OF PLANT OPERATING DATA

4.1 Sewage Flows

The final effluent discharge period is defined as November 1 to April 30 annually, due to the available assimilative capacity of the receiving stream. Flow rates in the receiving stream are typically at their seasonal minimal level during summer months. However, the sand filters can only be operated during non-freezing periods. Consequently, original design of the treatment train included 2 filtered effluent storage lagoons with a large storage volume to hold filtered effluent annually from May 1 to October 31.

The following table summarizes allowable discharge volumes of final effluent to the receiver for the Clifford WWTP along with measured discharge volumes for the period from January 1, 2020 to September 30, 2023.

Table 2. Summary of Reported Sewage Flows

Month	Allowable Discharge (m3/day)	Allowable Discharge (m3/month)	Monthly Averages (m3/month)	Monthly Maximums (m3/month)
November	470	14,100	6,086	8,300
December	734	22,754	13,743	17,182
January	1,028	31,868	22,933	26,889
February	1,075	30,100	21,348	25,080
March	1,970	61,070	22,003	27,453
April	1,345	40,350	10,562	22,446
May to October	0	0	0	0
ANNUAL TOTALS	**---**	**200,242 m^3**	**96,675 m^3**	**---**

The 95th percentile and absolute maximum recorded daily discharge volumes from the data set were 899 m3/day and 998 m3/day, respectively. These values are well below the maximum allowable daily value of 2,151 m3/day indicated in the ECA. Monthly flow volume indicated in Table 2 above are all below allowable limits. Review of effluent discharge data indicates that the plant has been consistently operating well below maximum allowable discharge rates.

Figure 3 below illustrates sewage flow data for the period from January 1, 2020 to September 30, 2023.

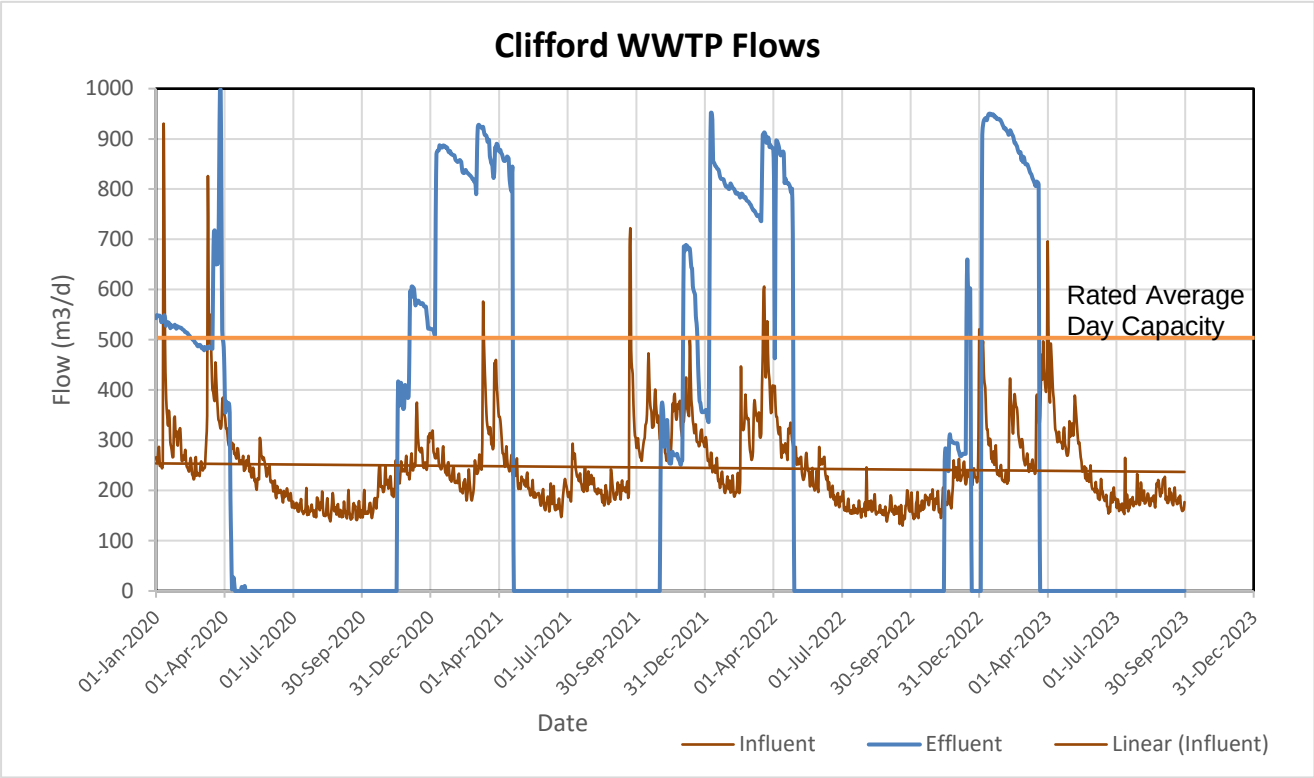


Figure 3. Sewage Flow Profile

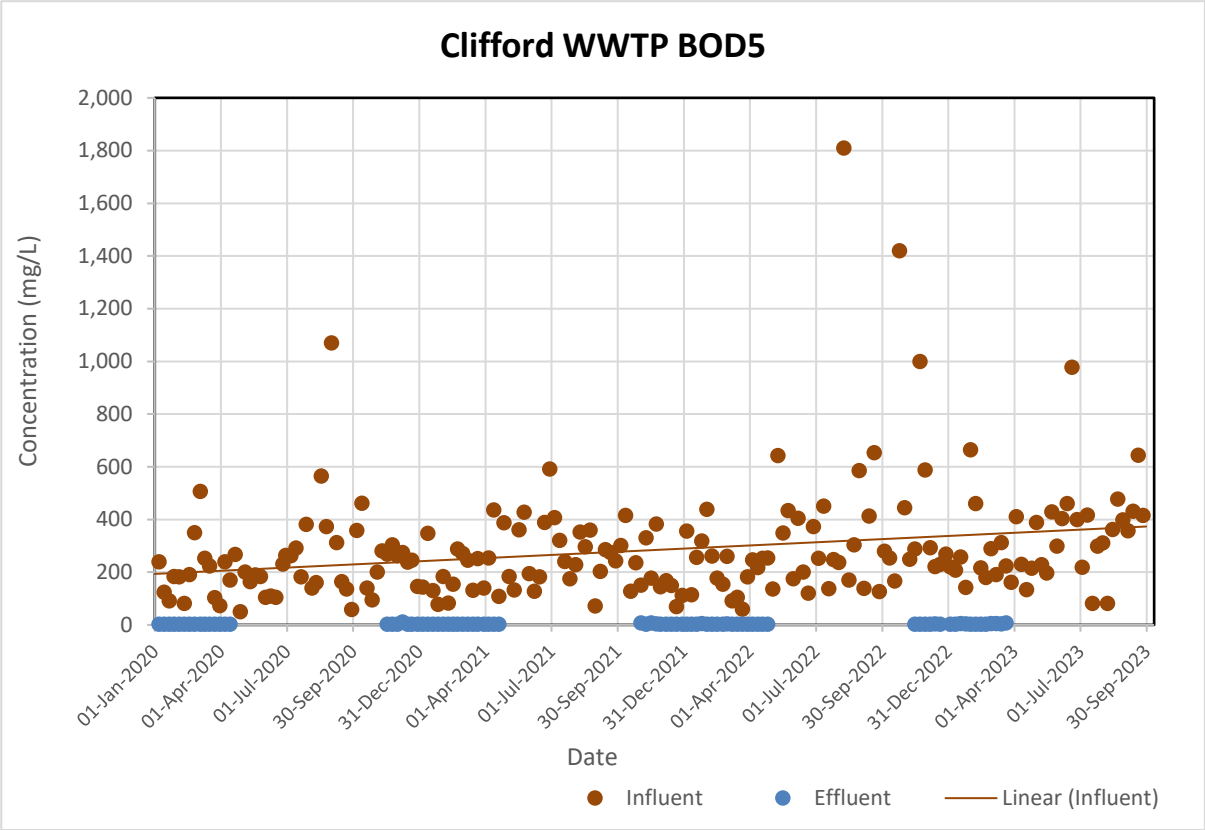
The linear trend line indicated in Figure 3 above is nearly flat, indicating no apparent increasing or decreasing trend in raw sewage flows arriving at the plant since January 2020.

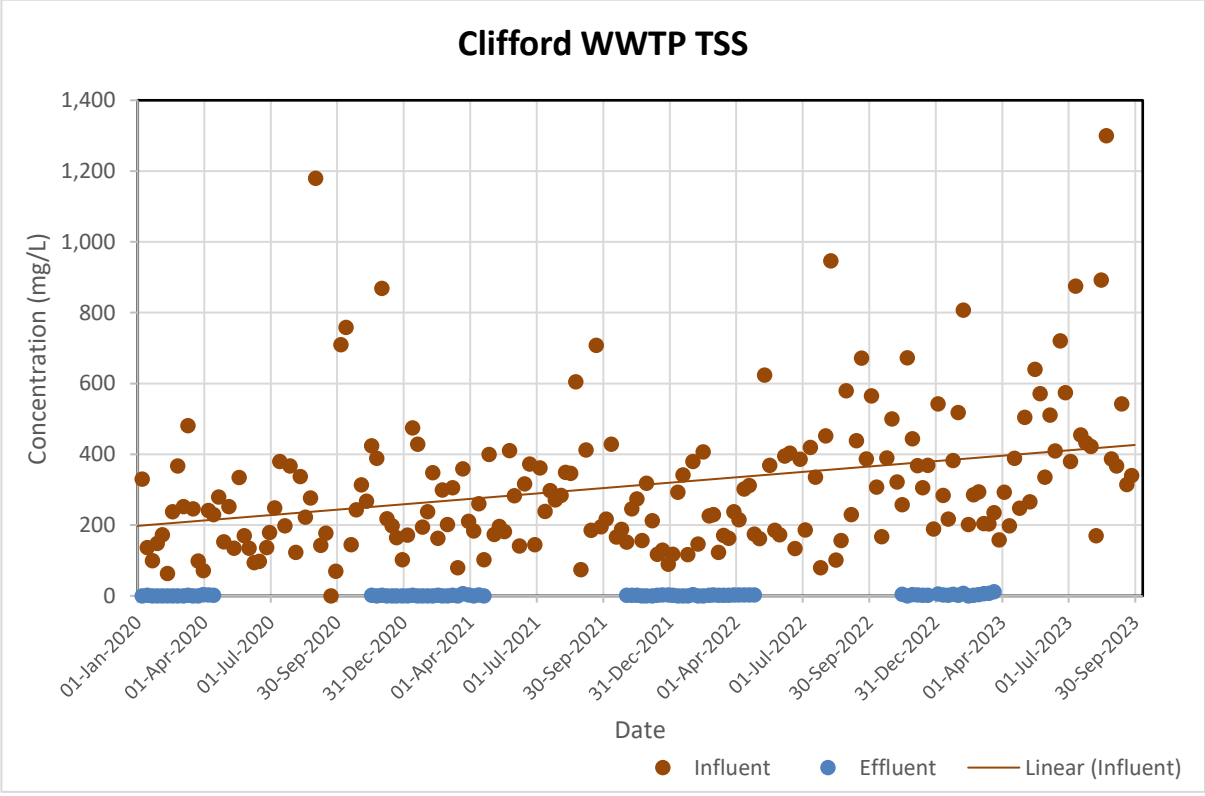
4.2 Raw Sewage Quality Analysis

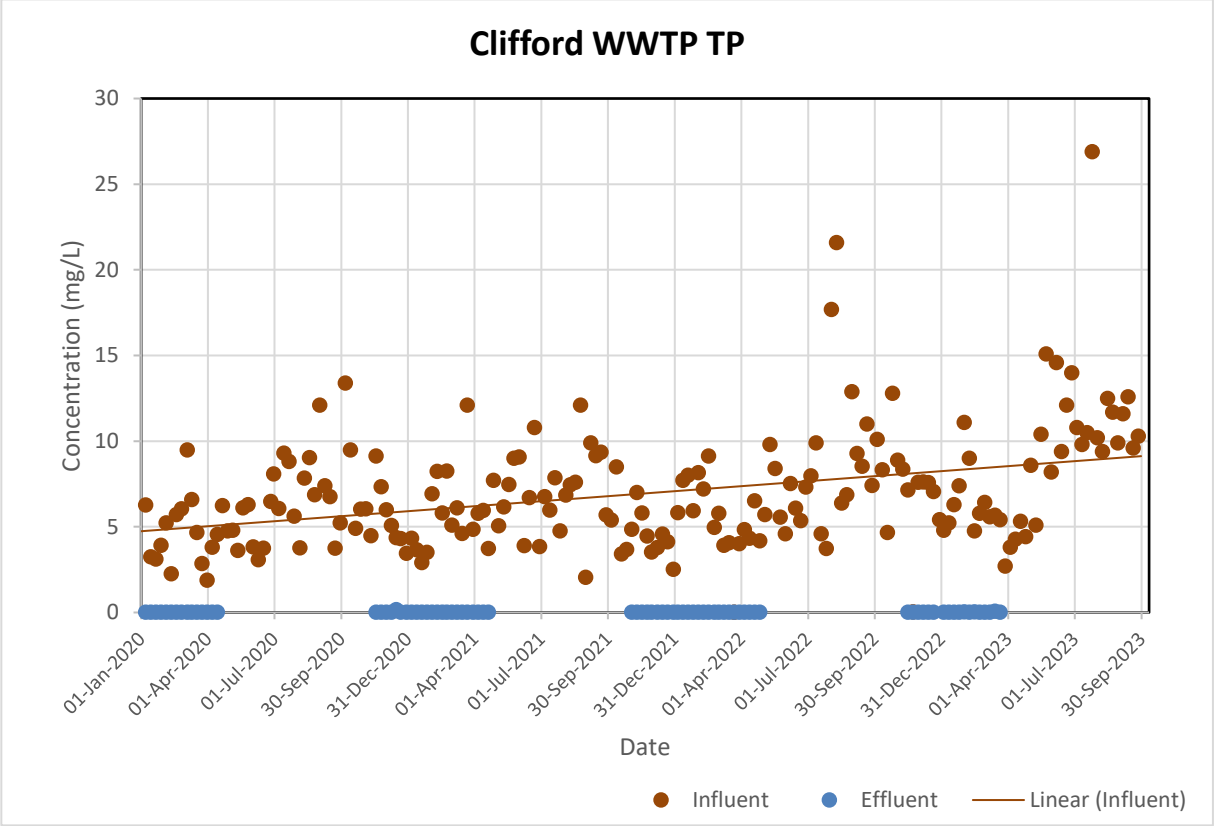
The intent of reviewing raw sewage strength is to determine if there is a trend or change that may be contributing to the observed decline in final effluent quality. Analysis of plant operating data indicates that the raw sewage concentration for BOD_5 is increasing gradually, while raw sewage concentrations for TSS, TP, and TAN are increasing moderately. See graphs below in Figure 4. It is noted that final effluent concentrations for CBOD5, TSS, TAN, and TP have been increasing in 2022 and 2023.

Reasons for an observed trend in increasing raw sewage strength may include implementation of water conservation measures such as low-flow plumbing fixtures, and a reduction in extraneous flows (inflow and infiltration) into the sanitary sewer collection system. There may be a new industrial or commercial customer in Clifford that is discharging high-strength waste to the system, although that may manifest as a step increase rather than a gradual long-term trend.

The following 4 graphs illustrate raw sewage quality monitoring results for the period from January 1, 2020 to September 30, 2023. The solid line is a linear regression line to indicate the trend in raw sewage strength for each parameter.


Clifford WWTP BOD5
Concentration (mg/L)
2,000
1,800
1,600
1,400
1,200
1,000
800
600
400
200
0
01-Jan-2020
01-Apr-2020
01-Jul-2020
30-Sep-2020
31-Dec-2020
01-Apr-2021
01-Jul-2021
30-Sep-2021
31-Dec-2021
01-Apr-2022
01-Jul-2022
30-Sep-2022
31-Dec-2022
01-Apr-2023
01-Jul-2023
30-Sep-2023
Date
Influent
Effluent
Linear (Influent)


Clifford WWTP TSS
Concentration (mg/L)
1,400
1,200
1,000
800
600
400
200
0
01-Jan-2020
01-Apr-2020
01-Jul-2020
30-Sep-2020
31-Dec-2020
01-Apr-2021
01-Jul-2021
30-Sep-2021
31-Dec-2021
01-Apr-2022
01-Jul-2022
30-Sep-2022
31-Dec-2022
01-Apr-2023
01-Jul-2023
30-Sep-2023
Date
Influent
Effluent
Linear (Influent)



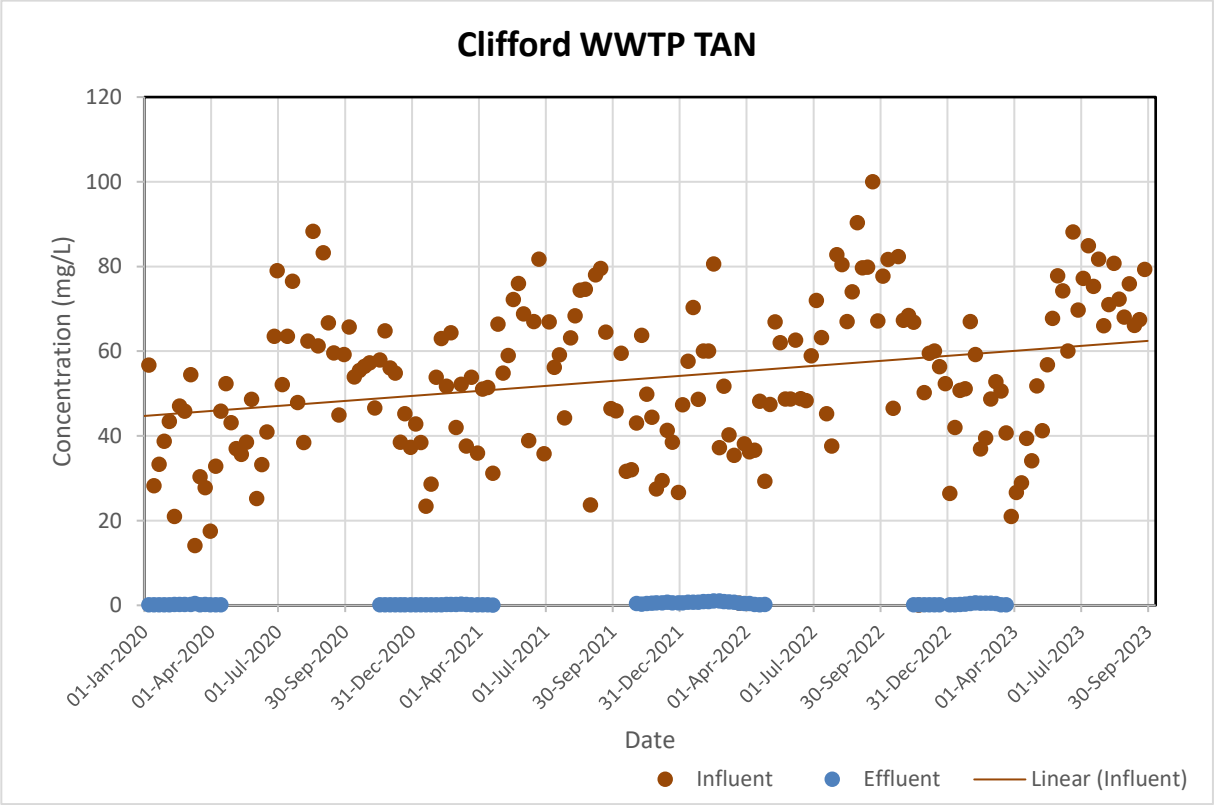


Figure 4: Raw Sewage Quality Graphs

The following table summarizes lab results for key wastewater parameters in raw sewage along with design guideline values published by MECP Design Guidelines (2008) and by Metcalf and Eddy Wastewater Engineering (5th Ed.) for untreated domestic wastewater.

Table 3. Comparison of Raw Sewage Characteristics to Design Values (mg/L)

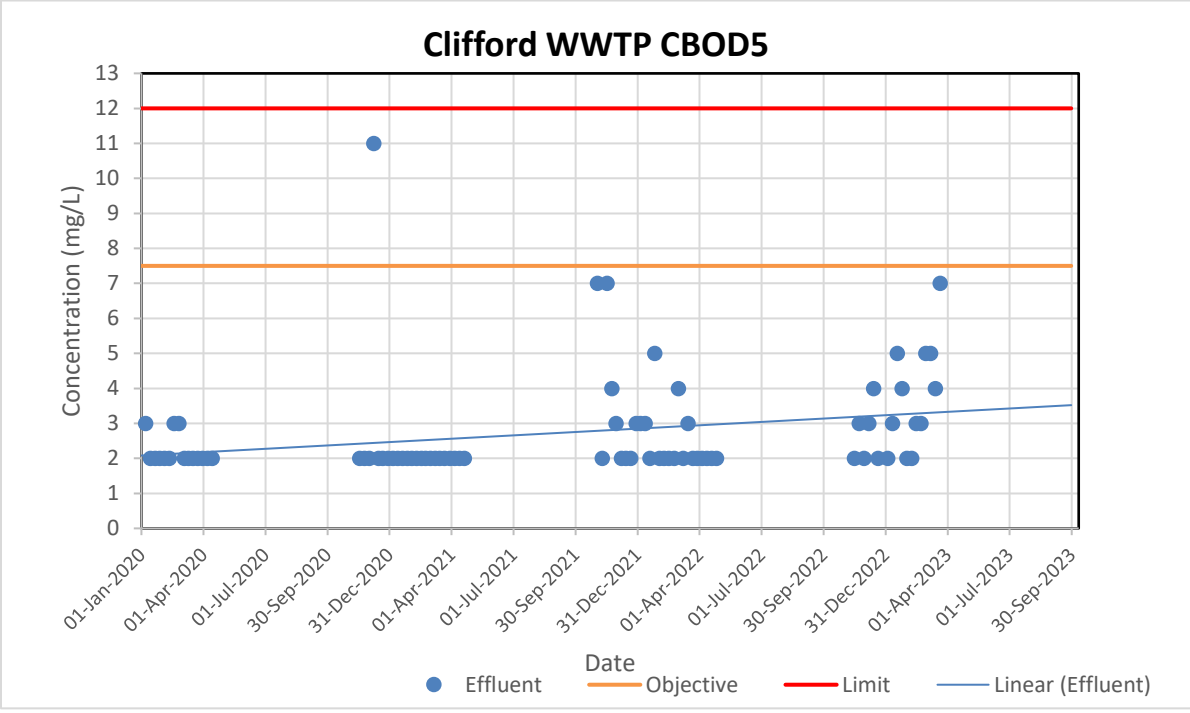
Parameter	Clifford (Jan. 1, 2020 to Sept. 30, 2023)	MECP Design Guidelines	M&E Wastewater Engineering (1.)	M&E Wastewater Engineering (2.)
BOD5	284	155 to 286	190	350
TSS	314	155 to 330	210	400
TKN	66	26 to 75	40	70
TAN	54	4 to 13	25	45
Organic N	12	22 to 62	15	25
TP	7	6 to 12	7	12

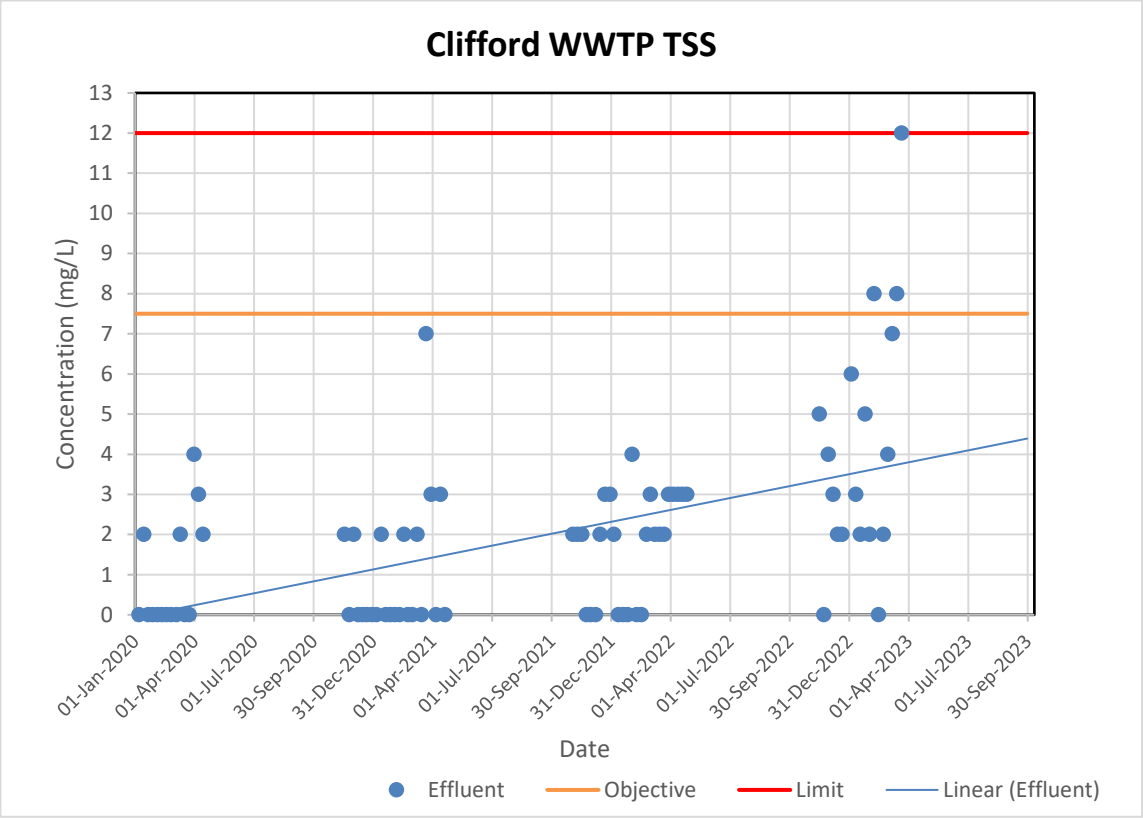
Notes
1. Medium Strength Wastewater
2. High Strength Wastewater

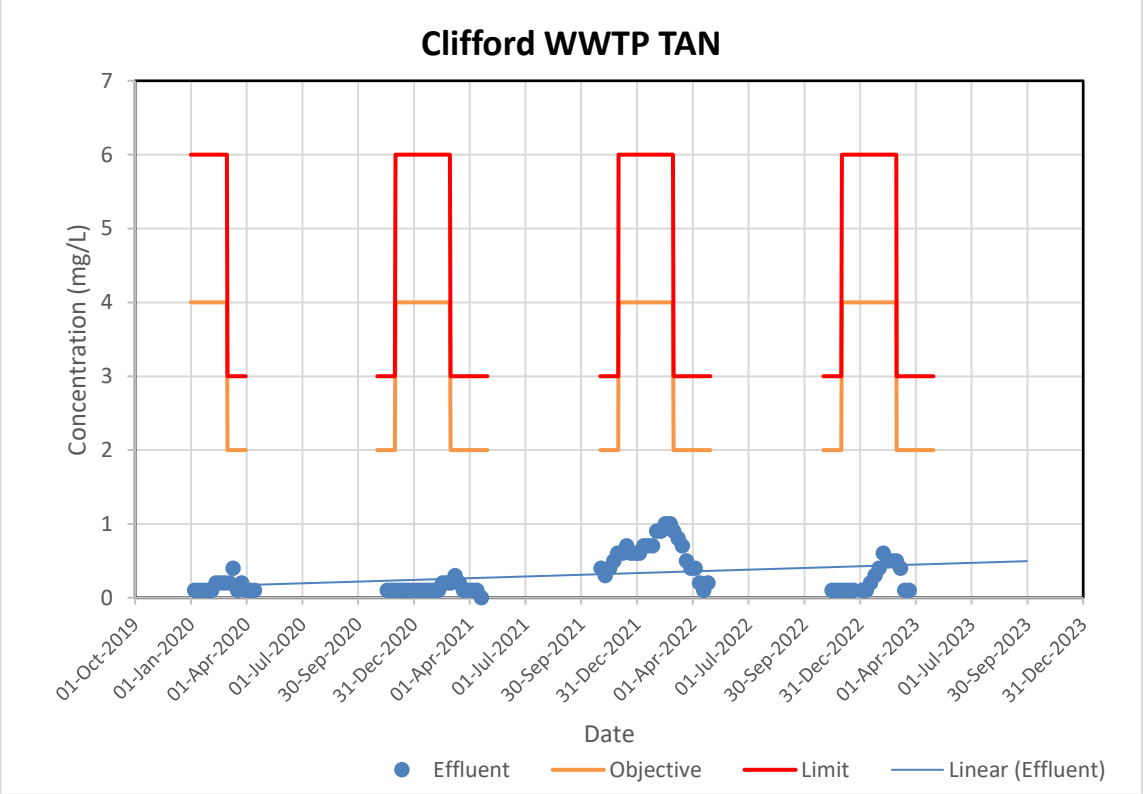
Based on a comparison of average values for Clifford to published design guideline values, raw sewage at Clifford could be considered as medium to high strength wastewater in terms of BOD5, TSS, and Total Ammonia Nitrogen, and medium strength sewage in terms of organic nitrogen and Total Phosphorous.

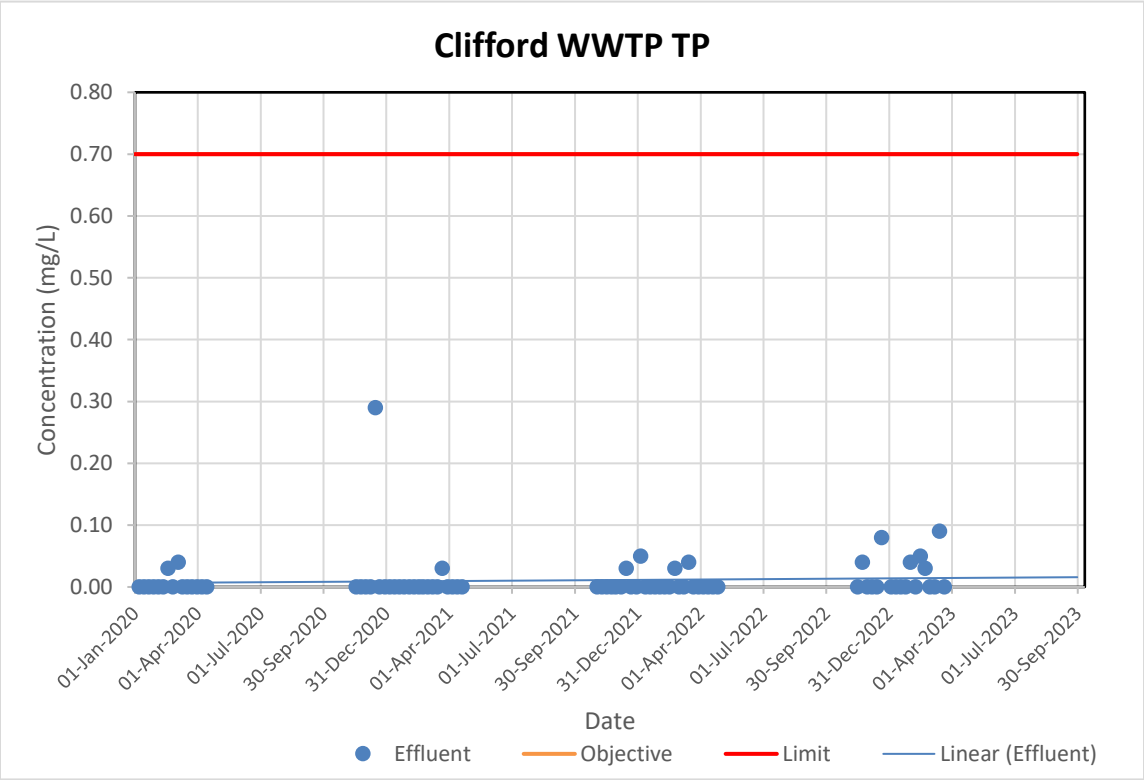
4.3 Effluent Quality Analysis

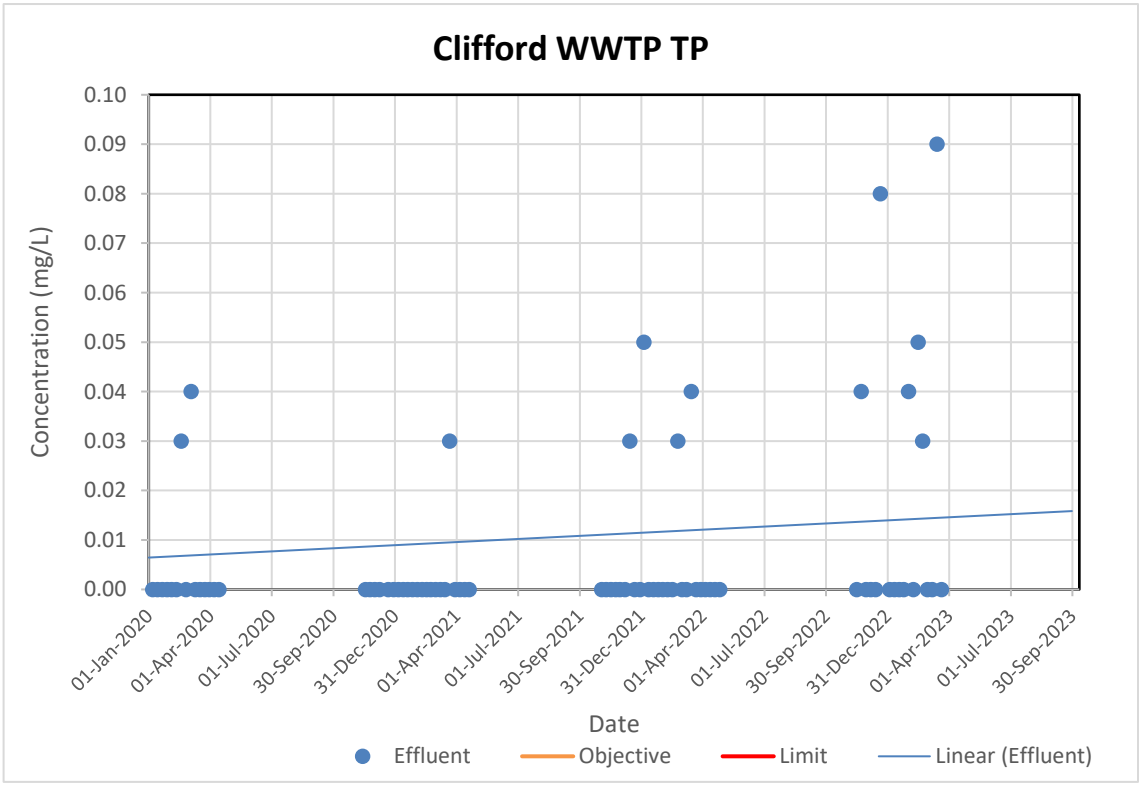
The following 7 graphs illustrate final effluent quality monitoring results for the period from January 1, 2020 to September 30, 2023 for key wastewater parameters. The solid line is a linear regression line to indicate the trend in effluent quality for each parameter.



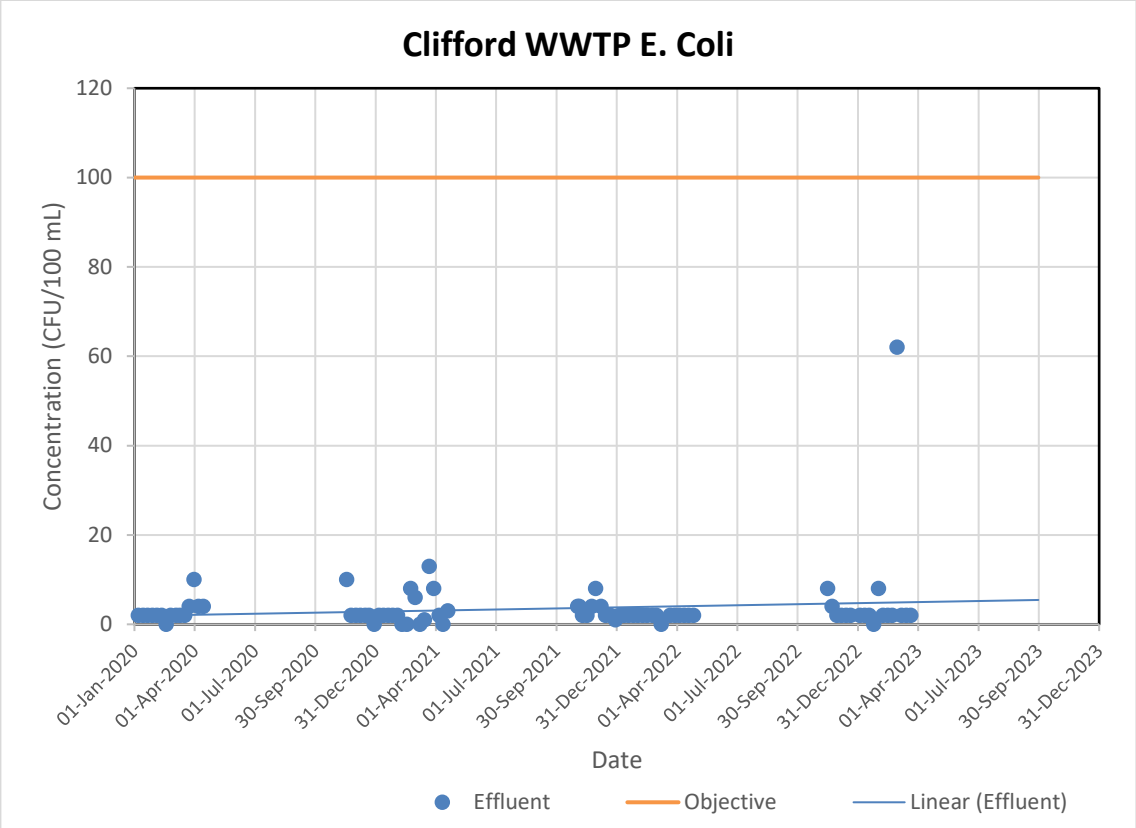

Clifford WWTP TSS
Concentration (mg/L)
Date
Effluent
Objective
Limit
Linear (Effluent)


Clifford WWTP TAN
Concentration (mg/L)
Date
Effluent
Objective
Limit
Linear (Effluent)





Second TP graph with a small vertical scale to show detail.



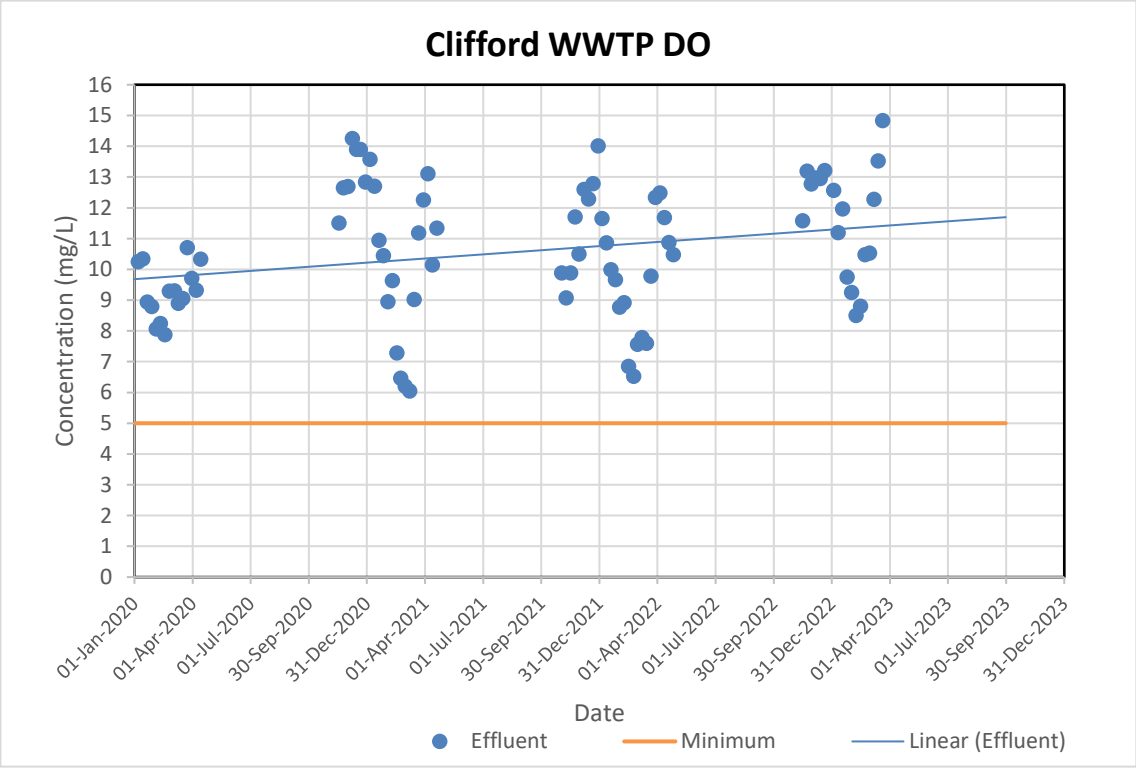


Figure 5: Final Effluent Quality Graphs

Key observations from review of effluent quality data for the period noted above indicate that effluent quality has been gradually deteriorating for the following parameters: BOD_5, TSS, TAN, and TP. Effluent quality has remained relatively consistent for E. coli. In addition, concentrations of TSS occasionally exceed effluent quality objectives and one occurrence where the limit was exceeded. The concentration of effluent BOD_5 exceeded the effluent objective in late 2020, but that appears to be an outlier and not part of the recent trends. Although effluent quality for the other parameters has been declining, test results are still low with no exceedances of limits or objectives during the above noted time period, with the exception of TSS in March 2021 which exceeded the effluent objective of 7.5 mg/L. TP concentrations in final effluent have been increasing in 2022 and 2023, however actual concentrations remain well below the effluent quality criteria for both the objective and limit.

Figures 4 and 5 above present a series of graphs illustrating lab results for wastewater sampling for raw sewage and final effluent, respectively. Each graph also includes a linear trend line to determine if there is a decreasing, steady, or increasing trend in wastewater quality characteristics. Results of that analysis are summarized in the following table.

Table 4. Observed Trends in Wastewater Quality

Parameter	Raw Sewage	Final Effluent
$cBOD_5$	Increasing	Increasing
TSS	Increasing	Increasing
TAN	Increasing	Increasing
TP	Increasing	Increasing
E. Coli	n/a	No change

Notes

1. Data used in the above table is from lab results provided for the period from January 1, 2020 to September 30, 2023.

Declining effluent quality for BOD_5, TSS, TAN, and TP could be attributed in part to a corresponding increase in raw sewage strength for those parameters.

5. RESULTS OF SYSTEM ASSESSMENT

During our site visit on November 7, 2023, samples of wastewater and filter media were collected for analysis at environmental labs. See Appendix B for lab results from analysis of wastewater samples and Appendix C for lab results from analysis of sand filter media. A summary of the findings is described in the following sections.

5.1 Facultative Lagoons

This section presents a cursory analysis of lagoon performance based on available data. The intent is to determine if lagoon performance is contributing to declining final effluent quality.

The system consists of an aerated lagoon cell followed by 3 much larger facultative lagoons, all operating in series. Solids settle to the bottom of each lagoon, while partially treated effluent is discharged to the next lagoon in series. Lagoon Cell 3 discharges by gravity to the Lagoon Effluent Pump Station that doses the filters.

The following table summarizes basis of design values from MECP Design Guidelines along with the actual lab results and corresponding calculated values for organic loading rates. Average raw BOD_5 for the data period indicated in the table below was 284 mg/L.

Table 5. Basis of Design for Facultative Lagoons

Source of Information	Organic Loading Rates (kg/ha-d)		Lagoon Effluent		
			BOD_5	TSS	TP
	Lagoon 1 (1.)	Lagoon 1 (2.)	(mg/L)	(mg/L)	(mg/L)
Clifford (Jan. 1, 2020 to Sept. 30, 2023)	31	64	n/a	n/a	n/a
Clifford (Nov. 7, 2023)	n/a	n/a	6	10	0.20
MECP Design Guidelines	22	22	25	30	1.00

Notes :

1. Based on average influent flow rate of 245 m3/d.
2. Based on plant rated capacity of 500 m3/d.

Calculated organic loading rates to Lagoon Cell 1 in the above table are based on an average raw sewage BOD_5 concentration of 284 mg/L. The above calculations appear to indicate that Lagoon Cell 1 is undersized. However, the calculations do not take into account the aerated lagoon ahead of Lagoon Cell 1. The aerated lagoon cell is aerated continuously year-round, and is expected to reduced BOD_5 by 50 to 70%. Based on this, it appears that the lagoons are sized appropriately for organic loading. Based on a single grab sample collected on November 7, 2023, effluent quality from Lagoon 3 is very good, with concentrations of key wastewater parameters well below MECP Guidelines.

Operations staff reported that the depth of the sludge blanket in Lagoon Cells 1 and 2 were measured in 2018 and the depth of sludge was low, with some mounding at the lagoon inlets, as expected.

5.2 Intermittent Sand Filters (IFS)

The filters at the plant are classified as intermittent slow sand filters (ISSF) and are a common treatment step used to provide tertiary treatment to lagoon effluent for direct surface discharge. Operating experience with sewage systems consisting of lagoons followed by intermittent sand filters in Southern Ontario indicates that filter performance is generally good and can remain consistent with routine maintenance, but can gradually decline over time and require some form of rehabilitation or replacement. Intermittent sand filters by design cannot be routinely backwashed like manufactured rapid sand filtration systems. Consequently, ISSF's eventually require media replenishment or replacement at some point in their design life.

The sewage works includes 4 filter cells with a total surface are of 1,840m^2. The approx. dimensions of each filter cell are 20m east-west by 23m north-south and each filter cell has 5 parallel runs of above-ground perforated distribution pipe. Secondary effluent from Lagoon 3 is gravity fed into a lagoon effluent pumping station. The pump station has 4 submersible effluent pumps, each dedicated to intermittently dosing one filter cell on a timed basis. Filtered effluent is collected by a network of filter underdrain piping and is directed to a 200mm diameter gravity outfall pipe, which discharges to an open swale leading to a municipal drain.

The sand filters were installed in 1995 and there have been no media replenishment or replacement since that time. System operators regularly remove vegetation that grows of the surface of the media. Based on our test pits, it appears that the total depth of sand media is approx. 475mm to 550mm, compared to the original installed depth of 760mm. Vegetation was removed and the surface of the sand media raked in 2012 and 2015. In 2023, the top 300mm of filter sand were removed, but not replenished with new sand. This results in a sand filter bed depth that is less than the original design thickness of 760 mm.

The sewage works operates based on seasonal discharge. The filters are typically operated annually from May 1 to October 31, depending on the weather. Filtered effluent is not immediately discharged to the receiver. It is stored on-site in 2 filtered effluent storage lagoons for Fall to Spring final effluent discharge. The filters are dosed by the lagoon effluent pumping station on an intermittent timed basis. Typical operation involves each filter going through 8 one-hour cycles per day, with one cycle consisting of a 15-minute dosage period followed by a 45-minute rest period, resulting in a cumulative daily dosage time of 2 hours for each filter.

A comparison of Lagoon 3 wastewater quality versus final effluent quality is summarized in the following table. This table provides a general indication of performance of the filters to improve and polish lagoon effluent.

Table 6. Comparison of Lagoon Effluent and Filter Effluent Quality

Parameter	Effluent Concentration (mg/L)		% Reduction Through Filters	ECA Objective (mg/L)
	Lagoon 3	Filter		
BOD_5	6	5	17	n/a
$cBOD_5$	5	2	60	7.5
TSS	<10	<10	---	7.5
TKN	7.4	4.1	45	n/a
TAN	6.1	3.1	49	2.0 (Fall, Spring) 4.0 (Winter)
NO_2	0.123	0.355	(189%)	n/a
NO_3	0.31	1.09	(252%)	n/a
TP	0.20	0.27	(35%)	0.7
dP	0.11	0.18	(64%)	n/a
Alkalinity	180	190	(6%)	n/a
pH	7.96	7.84	n/a	6.0 to 9.5
E. coli	20	<10	50%	100

Notes

1. Data used in the above table is from lab results from a single grab sample collected on Nov. 7, 2023.
2. dP is Dissolved Phosphorous

Conclusions from the above are limited since data is based on a single grab sample.

Comparing the Lagoon 3 effluent quality to filter effluent quality indicates that the filters are generally providing a reduction in BOD5, TAN, and E. coli. Lagoon effluent TSS was already low. TP increased but was low from the lagoon. Nitrite and nitrate increased through the filters, indicating some passive nitrification (oxidization of ammonia) occurring through the filters.

There was very little vegetation observed covering the filter surface area during our site visit. The filter feed piping appeared in good condition with a few sections of piping and pipe supports that had settled. Seasonal operation of the filters had just ended prior to our site visit on November 7, 2023. Consequently, the effluent spray pattern and distribution could not be observed. Ideally, effluent should be evenly distributed across the filter media surface while the filter pump station pumps were operating. It was noted that 3 of the 4 filter cells (Cells 1, 2, and 4) had standing water on the surface even though the last dosing period was the previous day, indicated poor drainage through the filter media.

Photos from the inspection are shown below.

Figure 6a: Filter Cell 3 (facing north)

Figure 6b: Filter Cell 1 (facing north)

Figure 6c: Filter Cell 2 (facing north)

Figure 6d: Filter sand test pit

5.3 Filter Media Analysis

Five (5) filter media samples were collected from Filter Cell 3 (northwest cell). Two sand samples were collected from a depth of approx. 300mm below the surface ("shallow"), and two from approx. 600mm below the surface ("deep") in the north and south areas of Cell 1. A fifth sample was collected of the surface layer. Each sample was analyzed for grain size distribution, soil classification, percolation rate, coefficient of uniformity (Cu), effective grain size (D-10), and grain size distribution curve. Results from the soil testing are summarized in the following Table with the analytical report from the testing laboratory is included in Appendix C.

Table 7. Summary of Filter Media Sand Analysis

Sample ID/ Parameter	Cell 3 Surface	Cell 3 North - Shallow	Cell 3 North - Deep	Cell 3 South - Shallow	Cell 3 South - Deep
Grain Size Distribution and Soil Classification	SAND, trace silt, trace clay, trace gravel (SP)	SAND, trace silt, trace clay, trace gravel (SP)	SAND, trace silt, trace gravel (SW)	SAND, trace silt, trace gravel (SP)	SAND, trace silt, trace gravel, trace clay (SW)
Percolation Rate (min/cm)	2-8	2-8	2-12	2-8	2-12
Percolation Rate (L/m2/d)	1,800 – 7,200	1,800 – 7,200	1,200 – 7,200	1,800 – 7,200	1,200 – 7,200
Coefficient of Uniformity (Cu)	7.75	6.04	5.28	6.96	5.08
Effective Grain Size (D-10)	0.08 mm	0.14 mm	0.15 mm	0.11 mm	0.16 mm

Definition of the terms in the above table are as follows.

Soil classification : A general description of the physical properties of a soil sample in terms of its grain size and grain size distribution.

Percolation rate : Expressed in minutes per centimetre (min/cm). A higher percolation rate applies to more porous soils with coarser grain size.

Coefficient of Uniformity (Cu) : A dimensionless parameter. A higher Coefficient of Uniformity corresponds to a lower degree of uniformity of the media particles sizes.

Effective Grain Size (D-10) : Expressed in units of millimetres (mm). Grain size factor D-10 indicates that 10% of the particles are less than the specified particle size in the sample.

GMBP compared filter media sample results with MECP Design Guidelines. A summary table of the guidelines, comparison to field results, and GMBP recommendations are provided below:

Table 8. Summary of Literature Review and Comparison to Field Analysis

Parameter	MECP Guideline (12.3.6)	Clifford WWTP	Findings / Recommendations
Dosage	• Filter surface should be flooded with lagoon effluent 1-2 times per day. • Filters should be capable of filtering total daily hydraulic load in <6 hours to ensure maximum head and bed reaeration after drainage. • Typical ISF filter run length is <30 days, with lagoon effluent TSS >50 mg/L. • Hydraulic loading rate of 500 L/(m^2·d).	• Operations confirmed that filters are dosed through 8 cycles/day. Each cycle consists of 15 min dose, 45 min. rest period. • Hydraulic loading rate based on current operation is 470 L/(m^2·d), within MECP Guidelines.	• Dosage is within MECP guidelines. • Site observations indicate filters beds are draining very slowly, impairs filtration hydraulic capacity • Hydraulic overloading is not occurring, not an issue.
Bed Depth and Condition	• Sand depth should be 900mm and underlain by graded gravel layer. • Allow removal of top 2-5cm layer during each cleaning cycle and replacement of that sand about once per year.	• Original design filter media depth was 760mm • Current bed depth is approx. 475 mm to 550mm, with an underlain gravel layer. • 300mm of sand media was removed in 2023 but not replenished	• Sand media depth has become too shallow. Directly impacts filtration performance. • Original sand media is still in place since 1995. Remove original sand media and replace with new sand.
Effective Particle Size (D10)	• 0.15 to 0.30mm	• 0.11 – 0.16 mm	• Trending low, i.e. media grain size is too fine. Replace removed sand with effective particle sizes closer to 0.20 to 0.30mm.
Uniformity Coefficient (Cu)	• <5	• 5 to 7	• Grain size distribution too broad, well graded.

Clifford WWTP results were also compared to additional key design guidelines and research papers related to design and operation of ISF's for filtration of secondary wastewater effluent. A summary of results in shown on the next page in Table 9.

Table 9. Summary of Literature Review on ISFs

Reference	Hydraulic Loading Rates ($m^3/m^2/day$)		Filter Media Properties	
	Min	**Max**	**Description**	**D10 (mm)**
Clifford WWTP Design Basis	0.47	0.47	Effective D10 particle size = 0.2 mm, Cu < 3	0.20
US EPA Fact Sheet (1999)	0.08	0.20	Washed durable granular material, Cu < 4.0	0.25 to 0.75
US EPA Fact Sheet (2002)	0.04	0.08	Washed durable sand with rounded grains, Cu<4.0	0.25 to 1.00
British Columbia – Ministry of Environment	no data	no data	No data	no data
National Small Flows Clearinghouse – Fact Sheet	no data	no data	No data	no data
Orenco Intermittent Sand Filters	no data	no data	No data	no data
Utah State University – 1974	0.03	0.12	Well graded sand, insoluble, no clay or loam, Cu<5.0	0.2 to 0.5
Utah State University – 1977	1.40	2.80	Well graded sand, insoluble, no clay or loam, Cu<5.1	0.2 to 0.6
Washington State – Dept. of Health (2012)	0.03	0.04	Coarse D10 >0.30, Fine ASTM C-33 D10 ~0.15	0.15
Water Environment Federation Article (1961)	0.08	0.16	Washed sand, free from organics, Cu < 4	0.3 to 0.5
Ministry of Works and Development (New Zealand)	0.50	1.50	Washed sand, free from organics, Cu < 4	0.3 to 0.6
Univ. of Nevada "Upgrading Pond Effluents – An Overview" (1995)	0.37	0.56	Selected sand, Cu < 7	0.2 to 0.3
MOEE Paper "Upgrading Effluent Quality for Lagoon-Based Systems " (1995)	0.40	0.50		
Averages from Reference Literature	**0.34**	**0.64**		**0.2 to 0.6**
Clifford WWTP	**1.2**	**7.2**	**Sand, trace silt, clay, and gravel (SP, SW), avg. Cu = 5.8**	**0.11 to 0.16**

Analysis of the filter sand media reveals that the percolation rate was within accepted design values. However, the Effective Particle Size ranges from 0.11 to 0.16mm, is at the low end of MECP Guidelines of 0.15 to 0.30mm and is lower than most of the examples in the literary review. Also, the uniformity coefficient (Cu) was above design guidelines, meaning the grain size distribution is too varied, not sufficiently uniform. This result could be explained by long-term accumulation of fine particles from lagoon effluent in the upper layer of the media bed.

The following table summarizes calculations on the loading rate being applied to the sand filters based on filter dimensions and the capacity of the lagoon effluent pumps that dose the filters.

Table 10. Filter Media Loading Analysis

Filter Bed Dimensions				Flow	Applicable	Calc'd Loading
Length (m)	**Width (m)**	**No. of Cells**	**Area (sq.m.)**	**Rate (L/s)**	**Timing**	**Rate (m3/m2/d)**
Based on the pumping rate from the Lagoon Effluent Pumping Station						
23	20	4	1,840	30	2 hrs/day	470
Based on the rated hydraulic capacity of the plant at 500 m3/day						
23	20	4	1,840	5.8	6 months/yr	543

MECP Design /Guidelines indicate the hydraulic loading rate to intermittent slow sand filters should not exceed 500 m3/m3/day.

6. CONCLUSIONS AND RECOMMENDATIONS

6.1 System Capacity

Analysis of system flows indicates that the system consistently operates well below rated hydraulic capacity on average at approx. 50% of plant rated capacity. Consequently, declining final effluent quality is not due to increasing flows to the plant.

6.2 Raw Sewage Monitoring

Analysis of plant operating data indicates that the raw sewage concentration for key wastewater parameters, including BOD_5, TSS, TP, and TAN are increasing for the period from January 1, 2020 to September 30, 2023. This may partly explain the corresponding recent decline in final effluent quality for those parameters.

Increasing raw sewage strength may be due to implementation of water conservation measures such as low-flow plumbing fixtures, or a reduction in extraneous flows (inflow and infiltration) into the sanitary sewer collection system.

6.3 Facultative Lagoons

The MECP Design Guidelines for Sewage Works defines lagoons as equivalent to secondary treatment capable of achieving effluent $CBOD_5$ concentrations less than 25 mg/L, TSS concentrations less than 30 mg/L, and TP concentrations less than 1.0 mg/L. Based on a single gab sample collected on November 7, 2023, the lagoons appear to be functioning well with lagoon effluent quality exceeding MECP Design Guidelines.

The calculated organic loading rate to the lagoons appears to be within MECP Design Guidelines, although limited operational data was available to confirm this. Also, the measured depth of sludge blanket in Lagoon Cells 1 and 2 were determined to be low in 2018. Consequently, there was no evidence to suggest that declining final effluent quality is attributable to performance or available capacity of the lagoons.

6.4 Intermittent Sand Filters

Filter Maintenance

It is recommended that vegetation be completely removed from the filter bed, including any roots or cuttings, each operating season. The above-ground irrigation piping should be temporarily removed to allow the surface of the sand media to be ploughed or raked with a small farm tractor to restore some of the lost filtration capacity. The irrigation piping would be re-installed after this work. This process should be repeated as needed to maintain the filter cells free of vegetation. Based on discussions with plant operations staff, the filters are being properly maintained.

Filter Operation

The filter loading rates and dosage timing are considered to be acceptable and in line with common practice for intermittent slow sand filters. No changes to the operation of the filters are recommended at this time.

Partial Filter Sand Replacement (Top 300mm Layer)

The thickness of the sand media in the filter beds is less than adequate based on the original design of the filters, MECP Design Guidelines, and literature review. Each filter bed could be upgraded by adding a 300mm layer of new sand media of the appropriate particle size, grain size distribution, and other key media characteristics as outlined above. That layer would be added on top of the existing filter sand.

For each consecutive year, 5cm of sand can be removed, cleaned, and reused, until the effective particle size diminishes, and new sand should be placed. There is no readily available system or company that has a means to wash and regrade filter sand media in situ for ISSF's.

Through the results of previous informal surveys of other municipalities in Southern Ontario with lagoons and ISSF's, there is limited success with partial sand replacement (Blenheim WWTP & Alymer WWTP). This feedback is supported by literature review stating that the fouling of filter beds typical occurs in the upper layers between 100 mm to 300mm.

Sand media samples were taken on-site on November 7, 2023, and results showed that the effective grain size has been reduced since the original installation in both the shallow bed and deep bed sample locations, indicating that fines may have mitigated into the lower portion of the filter media. Therefore, partial sand media replacement may not fully restore the filter basins to their original performance if fines have migrated through the entire sand media profile.

Total Filter Sand Replacement

The sand filters have been in operation for 28 years to year 2023. These types of filters have no means for regular media backwashing and regeneration like engineered backwashing media filters. Full sand filter depth replacement was considered as a conservative approach to rehabilitation of the existing filters. Grain size analysis from samples taken from shallow and deep layers of the sand media indicated a finer material than recommended by MECP Guidelines and compared to reference literature. This could be explained by long-term migration of fines from the upper portions of the filter media to the lower portions of the bed. In addition, filter bed thickness is less than adequate since removal of the top 300mm layer in 2023.

Construction of Additional Filter Cell

There is physical space available on plant property to construct additional filter cell(s) adjacent to the existing filter cells on the north side. Results of our assessment indicate that constructing an additional (i.e. fifth) filter cell adjacent to the existing filter cells is not considered necessary or the most viable option for system upgrades at this time.

7. PRELIMINARY COST ESTIMATES FOR RECOMMENDATIONS

The following table provides preliminary cost estimates for each recommendation in order of ascending cost. It may be advantageous to complete upgrades in a phased approach until filtered effluent quality has improved. A detailed breakdown for each cost estimate is contained in Appendix D.

Table 11. Summary of Cost Estimates for Upgrade Recommendations

Option No.	Description of Upgrades	Cost Estimate ($ 2024, excl. HST)
1.	Partial sand media replacement • Remove and stockpile irrigation piping, supports, and fittings • 300 mm sand layer across 1,840 m^2 surface area = 550m^3 total sand media volume. • Re-install irrigation piping, supports, and fittings • Repair or replace any deficient pipe supports and sections of irrigation piping	$84,000
2.	Full sand media replacement • Remove and stockpile irrigation piping, supports, and fittings • 760mm sand layer across 1,840 m^2 surface area = 1,400 m^3 total sand media volume. • Re-install irrigation piping, supports, and fittings • Repair or replace any deficient pipe supports and sections of irrigation piping	$204,000

Notes

1. Rough budget estimate for $30 to $35/tonne. Delivery charge may be ~ $6/t/hour
2. Density of uncompacted filter sand is 2.0 tonne/cu.m.
3. Budget estimates in the above table do not include HST.

The 2 key recommendations above are to either replace the top 300mm of filter sand, or replace the entire layer of filter sand. Based on assessment of the performance of the existing sand filters and geotechnical analysis of the sand filter media, it is recommended to proceed with full replacement of the sand filter media for each filter cell. Based on sand media grain size analysis, it is likely that the entire depth of the sand filter media may be compromised due to long-term infiltration of fines, and consequently, it is recommended to replace the entire depth of filter sand to restore filtration performance. Although the cost for replacement of the full depth of filter sand is approx. 2.5 times the cost to replace only the top 300mm of filter media, the full life-cycle cost benefit supports full sand replacement.

Figure 7 below presents a cross-section of the existing filter bed layers, indicating replacement of the sand filter media to its entire depth, but leaving the gravel support layers intact.

Description of Media	Symbol	Thickness	Status
Filter Sand Effective Grain Size : 0.8 to 1.2mm D-10 size = 0.2mm Uniformity Coefficient less than 5.0		760mm	***To Be Replaced***
5mm Clear Stone		75mm	To Remain
9.5mm Clear Stone		75mm	To Remain
13mm Clear Stone		75mm	To Remain
19mm Clear Stone		75mm	To Remain
19mm Clear Stone 100mm Perforated Underdrain Pipes		275mm	To Remain

Figure 7: Filter Bed Cross-Section

Yours truly,

GM BLUEPLAN ENGINEERING LIMITED

Per:

Grant Parkinson, P. Eng.
Project Manager
Encl.

APPENDIX A:
MECP ENVIRONMENTAL COMPLIANCE APPROVAL

Ontario

Ministry of the Environment and Climate Change
Ministère de l'Environnement et de l'Action en matière de changement climatique

AMENDED ENVIRONMENTAL COMPLIANCE APPROVAL
NUMBER 8901-A8YJ9C
Issue Date: June 7, 2016

The Corporation of the Town of Minto
5941 Highway 89 R.R. 1, P.O. Box 160, Harriston
Minto, Ontario
N0G 1Z0

Site Location: Clifford Wastewater Treatment Plant
Lot 57 and 58, Concession C
Town of Minto, County of Wellington

You have applied under section 20.2 of Part II.1 of the Environmental Protection Act, R.S.O. 1990, c. E. 19 (Environmental Protection Act) for approval of:

Existing sewage works at the Clifford Wastewater Treatment Plant with a rated average daily flow capacity of 500 m 3 /d (peak flow capacity of 2,151 m 3 /d), located on Part of Lots 57 and 58, Concession C, in the Town of Minto, discharging to the Coon Creek via the Minto Municipal Drain No. 93, consisting of the following:

Sanitary Sewer

- Sanitary sewer on James Street from Clark Street to Taylor Street, on Queen Street from Ann Street to Brown Street, on Geddes Street from approximately 200 m west of Cecelia Street to William Street, on Allan Street from Ann Street to Brown Street and from approximately 190 m west of Cecelia Street to approximately 120 m east of Minto Street, on John Street from Ann Street to Elora Street and from Brown Street to Taylor Street, on Nelson Street from Ann Street to Brown Street, on Main Street from Ann Street to Elora Street and from William Street to Brown Street, on Taylor Street from John Street to James Street, on Brown Street from Nelson Street to James Street, on William Street from Main Street to James Street, on Elora Street from Main Street to James Street, on Clark Street from Main Street to James Street, on Ann Street from Nelson Street to Queen Street, on Minto Street from Allan Street to Geddes Street, and Easement from intersection of James Street and Taylor Street to approximately 50 m west of James Street;

Influent Pumping Station

- a 3 m diameter raw sewage pumping station, equipped with two (2) submersible pumps, each rated at 29 L/s at 15 m TDH and a screening basket and above ground hoisting equipment, together with two (2) 200 mm diameter forcemains from the pumping station to the control building, thence via a 200 mm diameter forcemain to the aerated facultative lagoon.

Control Building

A 10.8 m x 15.8 m single story control building, housing the following:

- two (2) rotary positive displacement air blowers (one standby), each capable of providing 99 L/s of air at 41 kPa;

- one (1) chemical feed system consisting of two (2) chemical metering pumps (one standby), each capable of feeding up to a maximum of 38 L/hr of alum solution and chemical storage of approximately 27,000 L in PVC closed liner within spill containment area, with eyewash and deluge;

- a 60 kw diesel engine generator set and a 908 L capacity fuel storage tank within spill containment area;

Aerated Facultative Lagoon

- a 3.6 m deep (with 0.6 m freeboard) lined aerated lagoon with a surface area of approximately 1,420 m^2 , and liquid depth of 3 m, providing a total storage volume of 2,000 m^3 , equipped with coarse air bubble diffusion system and inlet and outlet chambers, discharging to Facultative Lagoon No.1 as described below;

- one (1) bypass channel between the downstream of influent pumping station and the inlet of Facultative Lagoon No.1 for bypassing the Aerated Facultative Lagoon;

Facultative Lagoons

- three (3) facultative lagoon cells operating in series, Lagoons No. 1 and No. 2 with a depth of 1.8 m and Lagoon No. 3 having a depth of 2.4 m, providing a total storage capacity of 150,000 m^3 , with 4:1 interior side slope and 3:1 exterior side slope and inlet and outlet chamber, discharging effluent from facultative lagoon No.3 to the Intermittent Sand Filter via the Treated Effluent Pumping Station as described below;

Treated Effluent Pumping Station

- a 3.2 m x 8.2 m underground concrete pumping chamber located within the embankment of facultative lagoon No. 3, equipped with four (4) submersible sewage pumps, each rated at 30 L/s at 5.25 m TDH with 200 mm diameter forcemain to discharge effluent from Facultative Lagoon No.3 to the Intermittent Sand Filter;

Intermittent Sand Filter

- an intermittent sand filter made up of four (4) cells, each with a filtration surface area of approximately 460 m^2 , with filter media consisting of a 300 mm layer of graded crushed stone overlain by a 760 mm layer of sand, a perforated aluminum distribution piping system and underdain system with 0.6 m freeboard;

- one (1) bypass channel between the downstream of Facultative Lagoon No. 3 and the inlet of the Filtered Effluent Storage Lagoon No. 1 for bypassing the Intermittent Sand Filter;

Filtered Effluent Storage lagoons

- two (2) filtered effluent storage lagoons (No.1 and No.2), each with a surface area of approximately 42,900 m^2 and liquid depth of 2.4 m, providing a total storage capacity of 187,600 m^3 with inlet and outlet chambers with discharge to the open outfall ditch via the control building;

Effluent Outfall

- one (1) 200 mm diameter outfall sewer connected to an open ditch, discharging to Coon Creek via the Minto Municipal Drain No. 93;

all other controls, piping, valves, drains, and appurtenances essential for the proper operation of the aforementioned sewage works;

all in accordance with the submitted supporting documents listed in Schedule A.

For the purpose of this environmental compliance approval, the following definitions apply:

"Act" means the Ontario Water Resources Act , R.S.O. 1990, Chapter 0.40, as amended;

"Approval" means this entire document and any schedules attached to it, and the application;

"Average Daily Flow" means the cumulative total sewage flow to the sewage works during a calendar year divided by the number of days during which sewage was flowing to the sewage works that year;

"BOD5" (also known as TBOD 5) means five day biochemical oxygen demand measured in an unfiltered sample and includes carbonaceous and nitrogenous oxygen demand;

"By-pass" means diversion of sewage around one or more unit processes within the Sewage Treatment Plant with the diverted sewage flows being returned to the Sewage Treatment Plant treatment train upstream of the Final Effluent sampling location, and discharging to the environment through the Sewage Treatment Plant outfall;

"CBOD5" means five day carbonaceous (nitrification inhibited) biochemical oxygen demand measured in an unfiltered sample;

"Daily Concentration" means the concentration of a contaminant in the effluent discharged over any single day, as measured by a composite or grab sample, whichever is required;

"Director" means a person appointed by the Minister pursuant to section 5 of the EPA for the purposes of Part II.1 of the EPA;

" *E. Coli"* refers to the thermally tolerant forms of Escherichia that can survive at 44.5 degrees Celsius;

"Emergency Situation" means a structural, mechanical or electrical failure that causes a temporary reduction in the capacity of the Sewage Treatment Plant or an unforeseen flow condition that may result in:
a) danger to the health or safety of any person; or,
b) injury or damage to any property, or serious risk of injury or damage to any property; or
c) treatment process biomass washout. "EPA" means the *Environmental Protection Act* , R.S.O. 1990, c.E.19, as amended;

"Equivalent Equipment" means a substituted equipment or like-for-like equipment that meets the required quality and performance standards of a named equipment;

"Event" means an action or occurrence, at a given location within the Sewage Treatment Plant that causes a Plant Bypass or Plant Overflow. An Event ends when there is no recurrence of a Bypass or Overflow in the 12-hour period following the last Bypass or Overflow. Two Events are separated by at least 12 hours during which there has been no recurrence of a Bypass or Overflow;

"Final Effluent" means sewage discharge via the Sewage Treatment Plant outfall after undergoing the full train of unit processes as listed in the Approval;

"Geometric Mean Density" is the nth root of the product of multiplication of the results of n number of

samples over the period specified;

"Limited Operational Flexibility" (LOF) means any modifications that the Owner is permitted to make to the Works under this Approval;

"Ministry" means the ministry of the government of Ontario responsible for the EPA and OWRA and includes all officials, employees or other persons acting on its behalf;

"Monthly Average Concentration" means the arithmetic mean of all Daily Concentrations of a contaminant in the effluent sampled or measured, or both, during a calendar month;

"Monthly Average Daily Flow" means the cumulative total sewage flow to the sewage works during a calendar month divided by the number of days during which sewage was flowing to the sewage works that month;

"Notice of Modifications" means the form entitled "Notice of Modifications to Sewage Works";

"Owner" means The Corporation of the Town of Minto and its successors and assignees;

"OWRA" means the *Ontario Water Resources Act* , R.S.O. 1990, c. O.40, as amended;

"Peak Flow Rate" means the maximum rate of sewage flow for which the plant or process unit was designed;

"Plant Overflow" means a discharge to the environment from the Sewage Treatment Plant at a location other than the plant outfall or into the plant outfall downstream of the Final Effluent sampling location;

"Rated Capacity" means the Average Daily Flow for which the Works are approved to handle;

"Regional Water Compliance Manager" means the Regional Water Compliance Manager of the West Central Region of the Ministry;

"Sewage Treatment Plant" means the entire sewage treatment and effluent discharge facility;

"Water Supervisor" means the Water Supervisor for the Guelph office of the Ministry; and

"Works" means the sewage works described in the Owner's application, and this Approval, and includes Proposed Works, Previous Works, and modifications made under Limited Operational Flexibility.

You are hereby notified that this environmental compliance approval is issued to you subject to the terms and conditions outlined below:

TERMS AND CONDITIONS

1. GENERAL PROVISIONS

(1) The Owner shall ensure that any person authorized to carry out work on or operate any aspect of the Works is notified of this Approval and the conditions herein and shall take all reasonable measures to ensure any such person complies with the same.

(2) Except as otherwise provided by these conditions, the Owner shall design, build, install, operate and maintain the Works in accordance with the description given in this Approval, and the application

for approval of the Works.

(3) Where there is a conflict between a provision of any document in the schedule referred to in this Approval and the conditions of this Approval, the Conditions in this Approval shall take precedence, and where there is a conflict between the documents in the schedule, the document bearing the most recent date shall prevail.

(4) Where there is a conflict between the documents listed in the Schedule submitted documents, and the application, the application shall take precedence unless it is clear that the purpose of the document was to amend the application.

(5) The Conditions of this Approval are severable. If any Condition of this Approval, or the application of any requirement of this Approval to any circumstance, is held invalid or unenforceable, the application of such condition to other circumstances and the remainder of this Approval shall not be affected thereby.

(6) The approval granted by this Approval is based upon a review of the Works in the context of its effect on the environment, its process performance and general principles of wastewater engineering. The review did not include a consideration of the architectural, mechanical, electrical or structural components and minor details of the Works except to the extent necessary to review the Works.

2. EXPIRY OF APPROVAL

The approval issued by this Approval will cease to apply to those parts of the Works which have not been constructed within five (5) years of the date of this Approval.

3. CHANGE OF OWNER

(1) The Owner shall notify the Water Supervisor and the Director, in writing, of any of the following changes within thirty (30) days of the change occurring:

(a) change of Owner;

(b) change of address of the Owner;

(c) change of partners where the Owner is or at any time becomes a partnership, and a copy of the most recent declaration filed under the *Business Names Act* , R.S.O. 1990, c.B17 shall be included in the notification to the Water Supervisor;

(d) change of name of the corporation where the Owner is or at any time becomes a corporation, and a copy of the most current information filed under the *Corporations Information Act* , R.S.O. 1990, c. C39 shall be included in the notification to the Water Supervisor;

(2) In the event of any change in ownership of the Works, other than a change to a successor municipality, the Owner shall notify in writing the succeeding owner of the existence of this Approval, and a copy of such notice shall be forwarded to the Water Supervisor and the Director.

4. BY-PASSES

(1) Any By-pass or Plant Overflow is prohibited, except:

(a) in an Emergency Situation;

(b) where the By-pass / Plant Overflow is a direct and unavoidable result of a planned maintenance procedure, the Owner notified the Water Supervisor 15 days prior to the By-pass and the Water Supervisor has given written consent of the Bypass; and

(c) where the By-pass / Plant Overflow is planned for research or training purposes, the discharger notified the Water Supervisor 15 days prior to the By-pass / Plant Overflow and the Water Supervisor has given written consent of the By-pass / Plant Overflow.

(2) The Owner shall forthwith notify the Spills Action Centre (SAC) and the Medical Officer of Health of all By-pass and Plant Overflow Events. This notice shall include, at a minimum, the following information:

(a) the date, time, and duration of the Event;

(b) the location of the Event;

(c) the measured or estimated volume of the Event (unless the Event is ongoing);

(d) the reason for the Event; and

(e) the level of treatment the By-pass(es) and/or Plant Overflow(s) received and disinfection status of same .

(3) The Owner shall submit By-pass and Plant Overflow Event Reports to the Ministry's local office on a quarterly basis, no later than each of the following dates for each calendar year: February 14, May 15, August 14, and November 15. Event Reports shall be in an electronic format specified by the Ministry. In each Event Report the Owner shall include, at a minimum, the following information on any Events that occurred during the preceding quarter:

(a) the date of the Event(s);

(b) the measured or estimated volume of the Event(s);

(c) the duration of the Event(s);

(d) the location of the Event(s);

(e) the reason for the Event(s); and

(f) the level of treatment the By-pass(es) and/or Plant Overflow(s) received and disinfection status of same .

(4) The Owner shall use best efforts to collect a representative sample consisting of a minimum of two (2) grab samples of the By-pass / Plant Overflow and have it analyzed for parameters outlined in

Condition 6, one at the beginning of the Event and the second approximately near the end of the Event, to best reflect the effluent quality of such By-pass or Plant Overflow.

(5) The Owner shall maintain a logbook of all Plant By-passes and Plant Overflows, which shall contain, at a minimum, the types of information set out in subsection 2 (a) to 2(e) in respect of each By-pass and Plant Overflow.

5. EFFLUENT OBJECTIVES

(1) The Owner shall use best efforts to operate and maintain the Works with the objective that the concentrations of the materials named below as effluent parameters are not exceeded in the effluent from the Works.

Table 1 - Effluent Objectives	
Effluent Parameter	**Concentration Objective** (milligrams per litre unless otherwise indicated)
CBOD5	7.5
Total Suspended Solids	7.5
Total Phosphorus	0.7
Total Ammonia Nitrogen - March, April, November - December, January, February	2.0 4.0
Dissolved Oxygen	no less than 5.0
E. coli	100 organisms per 100 millilitres Monthly Geometric Mean Density

(2) The Owner shall use best efforts to:

(a) maintain the pH of the effluent from the Works within the range of 6.0 - 9.5, inclusive, at all times;

(b) operate the works within the Rated Capacity of the Works;

(c) ensure that the effluent from the Works is essentially free of floating and settleable solids and does not contain oil or any other substance in amounts sufficient to create a visible film or sheen or foam or discolouration on the receiving waters.

(3) The Owner shall include in all reports submitted in accordance with Condition 10 a summary of the efforts made and results achieved under this Condition.

6. EFFLUENT LIMITS

(1) The Owner shall operate and maintain the Works such that the concentrations and waste loadings of the materials named below as effluent parameters are not exceeded in the effluent from the Works.

Table 2 - Effluent Limits	
Effluent Parameter	**Monthly Average Concentration** (milligrams per litre unless otherwise indicated)

Column 1	Column 2
CBOD5	12.0
Total Suspended Solids	12.0
Total Phosphorus	0.7
Total Ammonia Nitrogen - March, April, November - December, January, February	3.0 6.0

(2) For the purposes of determining compliance with and enforcing subsection (1):

(a) The Monthly Average Concentration of a parameter named in Column 1 of subsection (1) shall not exceed the corresponding maximum concentration set out in Column 2 of subsection (1).

(3) The Owner shall design and construct and operate and maintain the Works such that the pH of the effluent is maintained within the range of 6.0 - 9.5, inclusive, at all times.

(4) Paragraphs (a) of subsection (2) shall apply upon the issuance of this Approval.

(5) The effluent limit set out in subsection (3) shall apply upon the issuance of this Approval.

7. SPECIAL CONDITIONS

(1) The treated effluent discharge from the filtered effluent storage lagoons to the Minto Municipal Drain No. 93 shall not exceed the allowance discharge as follows:

Table 3 - Effluent Discharge Flows	
Month	Allowable Discharge (m 3 /d)
November	470
December	734
January	1,028
February	1,075
March	1,970
April	1,345
May to October (inclusive)	0

8. OPERATION AND MAINTENANCE

(1) The Owner shall exercise due diligence in ensuring that, at all times, the Works and the related equipment and appurtenances used to achieve compliance with this Approval are properly operated and maintained. Proper operation and maintenance shall include effective performance, adequate funding, adequate operator staffing and training, including training in all procedures and other requirements of this Approval and the Act and regulations, adequate laboratory facilities, process controls and alarms and the use of process chemicals and other substances used in the Works.

(2) The Owner shall prepare an operations manual upon the issuance of this Approval, that includes, but not necessarily limited to, the following information:

(a) operating procedures for routine operation of the Works;

(b) inspection programs, including frequency of inspection, for the Works and the methods or tests employed to detect when maintenance is necessary;

(c) repair and maintenance programs, including the frequency of repair and maintenance for the Works;

(d) procedures for the inspection and calibration of monitoring equipment;

(e) a spill prevention control and countermeasures plan, consisting of contingency plans and procedures for dealing with equipment breakdowns, potential spills and any other abnormal situations, including notification of the Water Supervisor; and

(f) procedures for receiving, responding and recording public complaints, including recording any followup actions taken.

(3) The Owner shall keep a complete set of the up-to-date record drawings at the site of the sewage works throughout the operational life of the sewage works, and upon request, shall make the drawings available for inspection by Ministry staff.

(4) The Owner shall maintain the operations manual current and retain a copy at the location of the Works for the operational life of the Works. Upon request, the Owner shall make the manual available to Ministry staff.

(5) The Owner shall provide for the overall operation of the Works with an operator who holds a licence that is applicable to that type of facility and that is of the same class as or higher than the class of the facility in accordance with Ontario Regulation 129/04.

9. MONITORING AND RECORDING

The Owner shall, upon commencement of operation of the Works, carry out the following monitoring program:

(1) All samples and measurements taken for the purposes of this Approval are to be taken at a time and in a location characteristic of the quality and quantity of the effluent stream over the time period being monitored.

(2) For the purposes of this condition, the following definitions apply:

(a) Weekly means once every week;

(3) Samples shall be collected at the following sampling points, at the minimum frequency specified, by means of the specified sample type and analyzed for each parameter listed and all results recorded:

Table 4a - Raw Sewage Monitoring
(Sampling point at the downstream of influent pumping station)

Parameters	Sample Type	Frequency
BOD5	Grab	weekly
Total Suspended Solids	Grab	weekly
Total Phosphorus	Grab	weekly
Total Kjeldahl Nitrogen	Grab	weekly

Table 4b - Effluent Monitoring

(Sampling point at the downstream of the Filtered Effluent Storage Lagoon No.2)		
Parameters	**Sample Type**	**Frequency**
CBOD5	at least 8-hour Composite	weekly
Total Suspended Solids	at least 8-hour Composite	weekly
Total Phosphorus	at least 8-hour Composite	weekly
Total Ammonia (Ammonia + Ammonium) Nitrogen	at least 8-hour Composite	weekly
E. Coli	Grab	weekly
Dissolved Oxygen	Grab	weekly
pH	Grab/Probe	weekly
Temperature	Grab/Probe	weekly

(4) The methods and protocols for sampling, analysis and recording shall conform, in order of precedence, to the methods and protocols specified in the following:

(a) the Ministry's Procedure F-10-1, “Procedures for Sampling and Analysis Requirements for Municipal and Private Sewage Treatment Works (Liquid Waste Streams Only), as amended from time to time by more recently published editions;

(b) the Ministry's publication "Protocol for the Sampling and Analysis of Industrial/Municipal Wastewater" (January 1999), ISBN 0-7778-1880-9, as amended from time to time by more recently published editions;

(c) the publication "Standard Methods for the Examination of Water and Wastewater" (21st edition), as amended from time to time by more recently published editions;

(5) The temperature and pH of the effluent from the Works shall be determined in the field at the time of sampling for Total Ammonia Nitrogen, using the methodology stipulated in "Ontario's Provincial Water Quality Objectives" dated July 1994, as amended.

(6) The Owner shall install and maintain (a) continuous flow measuring device(s), to measure the flowrate of the influent to or effluent from the Works with an accuracy to within plus or minus 15 per cent (+/- 15%) of the actual flowrate for the entire design range of the flow measuring device, and record the flowrate at a daily frequency.

(7) The Owner shall retain for a minimum of five (5) years from the date of their creation, all records and information related to or resulting from the monitoring activities required by this Approval.

(8) Within 8 months of the issuance date of this Approval, the Owner shall submit a plan to the Water Supervisor for his approval outlining the periodic biological assessments to be undertaken (by the Owner) of the Coon Creek and for visual inspection of the Minto Municipal Drain No. 93 during the effluent discharge period. The plan shall include appropriate mitigative and contingency measures that will be undertaken in the event conditions in the Coon Creek and Minto Municipal Drain No. 93 deteriorate to unacceptable levels. Upon approval of this plan from the Water Supervisor, the plan

shall be implemented.

10. REPORTING

(1) Fifteen (15) days prior to the date of a planned By-pass being conducted pursuant to Condition 4 and as soon as possible for an unplanned By-pass, the Owner shall notify the Water Supervisor (in writing) of the pending start date, in addition to an assessment of the potential adverse effects on the environment and the duration of the By-pass.

(2) The Owner shall report to the Water Supervisor or designate, any exceedence of any parameter specified in Condition 6 orally, as soon as reasonably possible, and in writing within seven (7) days of the exceedence.

(3) In addition to the obligations under Part X of the *Environmental Protection Act* , the Owner shall, within ten (10) working days of the occurrence of any reportable spill as defined in Ontario Regulation 675/98, bypass or loss of any product, by-product, intermediate product, oil, solvent, waste material or any other polluting substance into the environment, submit a full written report of the occurrence to the Water Supervisor describing the cause and discovery of the spill or loss, clean-up and recovery measures taken, preventative measures to be taken and schedule of implementation.

(4) The Owner shall, upon request, make all manuals, plans, records, data, procedures and supporting documentation available to Ministry staff.

(5) The Owner shall prepare and submit a performance report to the Water Supervisor on an annual basis, within ninety (90) days following the end of the period being reported upon. The first such report shall cover the first annual period following the commencement of operation of the Works and subsequent reports shall be submitted to cover successive annual periods following thereafter. The reports shall contain, but shall not be limited to, the following information:

(a) a summary and interpretation of all monitoring data and a comparison to the effluent limits outlined in Condition 6, including an overview of the success and adequacy of the Works;

(b) a description of any operating problems encountered and corrective actions taken;

(c) a summary of all maintenance carried out on any major structure, equipment, apparatus, mechanism or thing forming part of the Works;

(d) a summary of any effluent quality assurance or control measures undertaken in the reporting period;

(e) a summary of the calibration and maintenance carried out on all effluent monitoring equipment; and

(f) a description of efforts made and results achieved in meeting the Effluent Objectives of Condition 5.

(g) a tabulation of the volume of sludge generated in the reporting period, an outline of anticipated volumes to be generated in the next reporting period and a summary of the locations to where the sludge was disposed;

(h) a summary of any complaints received during the reporting period and any steps taken to address the complaints;

(i) a summary of all By-pass, spill or abnormal discharge events;

(j) a copy of all Notice of Modifications submitted to the Water Supervisor as a result of Schedule B, Section 1, with a status report on the implementation of each modification;

(k) a report summarizing all modifications completed as a result of Schedule B, Section 3; and

(l) any other information the Water Supervisor requires from time to time.

(6) The Owner shall, within thirty (30) calendar days of issuance of this Approval, submit a Municipal and Local Services Board Sewage Works Profile Information Form, and shall resubmit the updated document every time a notification is provided to the Water Supervisor in compliance with requirements of change of ownership under this Approval.

11. LIMITED OPERATIONAL FLEXIBILITY

(1) The Owner may make modifications to the Works in accordance with the Terms and Conditions of this Approval and subject to the Ministry's "Limited Operational Flexibility Criteria for Modifications to Sewage Works ", included under Schedule B of this Approval, as amended.

(2) Sewage works proposed under Limited Operational Flexibility shall adhere to the design guidelines contained within the Ministry's publication "Design Guidelines for Sewage Works 2008", as amended.

(3) The Owner shall ensure at all times, that the Works, related equipment and appurtenances which are installed or used to achieve compliance are operated in accordance with all Terms and Conditions of this Approval.

(4) For greater certainty, the following are not permitted as part of Limited Operational Flexibility:

(a) Modifications to the Works that result in an increase of the Rated Capacity of the Works;

(b) Modifications to the Works that may adversely affect the approved effluent quality criteria or the location of the discharge/outfall;

(c) Modifications to the treatment process technology of the Works, or modifications that involve construction of new reactors (tanks) or alter the treatment train process design;

(d) Modifications to the Works approved under s.9 of the EPA, and

(e) Modifications to the Works pursuant to an order issued by the Ministry.

(5) Implementation of Limited Operational Flexibility is not intended to be used for piecemeal measures that result in major alterations or expansions.

(6) If the implementation of Limited Operational Flexibility requires changes to be made to the Emergency Response, Spill Reporting and Contingency Plan, the Owner shall, as deemed necessary in consultation with the Water Supervisor, provide a revised copy of this plan for approval to the local fire services authority prior to implementing Limited Operational Flexibility.

(7) For greater certainty, any modification made under the Limited Operational Flexibility may only be carried out after other legal obligations have been complied with, including those arising from the *Environmental Protection Act, Niagara Escarpment Planning and Development Act, Oak Ridges Moraine Conservation Act, Lake Simcoe Protection Act* and *Greenbelt Act.*

(8) Prior to implementing Limited Operational Flexibility, the Owner shall complete a Notice of Modifications describing any proposed modifications to the Works and submit it to the Water Supervisor.

Schedule "A"

1. Amended Certificate of Approval for Municipal and Private Sewage Works No. 3-1547-92-947, issued on May 3, 1994.

2. All additional supporting documents provided by Mark Robertson from The Corporation of the Town of Minto.

Schedule "B"
Limited Operational Flexibility Criteria for Modifications to Sewage Works

1. The modifications to sewage works approved under an Environmental Compliance Approval (Approval) that are permitted under the Limited Operational Flexibility (LOF), are outlined below and are subject to the LOF conditions in the Approval, and require the submission of the Notice of Modifications. If there is a conflict between the sewage works listed below and the Terms and Conditions in the Approval, the Terms and Conditions in the Approval shall take precedence.

1.1 Sewage Pumping Stations

a. Alter pumping capacity by adding or replacing equipment where new equipment is located within an existing sewage treatment plant site or an existing sewage pumping station site, provided that the modifications do not result in an increase of the sewage treatment plant Rated Capacity and the existing flow process and/or treatment train are maintained, as applicable.

b. Forcemain relining and replacement with similar pipe size where the nominal diameter is not greater than 1,200 mm.

1.2 Sewage Treatment Process

a. Installing additional chemical dosage equipment including replacing with alternative chemicals for pH adjustment or coagulants (non-toxic polymers) provided that there are no modifications of treatment processes or other modifications that may alter the intent of operations and may have negative impacts on the effluent quantity and quality.

b. Expanding the buffer zone between a sanitary sewage lagoon facility or land treatment area and adjacent uses provided that the buffer zone is entirely on the proponent’s land.

c. Optimizing existing sanitary sewage lagoons with the purpose to increase efficiency of treatment operations provided that existing sewage treatment plant rated capacity is not exceeded and where no land acquisition is required.

d. Optimizing existing sewage treatment plant equipment with the purpose to increase the

efficiency of the existing treatment operations, provided that there are no modifications to the works that result in an increase of the Rated Capacity, and may have adverse effects to the effluent quality or location of the discharge.

e. Replacement, refurbishment of previously approved equipment in whole or in part with Equivalent Equipment, like-for-like of different make and model, provided that the firm capacity, reliability, performance standard, level of quality and redundancy of the group of equipment is kept the same. For clarity purposes, the following equipment can be considered under this provision: pumps, screens, grit separators, blowers, aeration equipment, sludge thickeners, dewatering equipment, UV systems, chlorine contact equipment, bio-disks, and sludge digester systems.

1.3 Sewage Treatment Plant Outfall

a. Replacement of discharge pipe with similar pipe size and diffusers provided that the outfall location is not changed.

1.4 Sanitary Sewers

a. Pipe relining and replacement with similar pipe size within the Sewage Treatment Plant site, where the nominal diameter is not greater than 1,200 mm.

1.5 Pilot Systems

a. Installation of pilot systems for new or existing technologies provided that:

i. any effluent from the pilot system is discharged to the inlet of the sewage treatment plant or hauled off-site for proper disposal,
ii. any effluent from the pilot system discharged to the inlet of the sewage treatment plant or sewage conveyance system does not significantly alter the composition/concentration of the influent sewage to be treated in the downstream process; and that it does not add any inhibiting substances to the downstream process, and
iii. the pilot system's duration does not exceed a maximum of two years; and a report with results is submitted to the Director and Water Supervisor three months after completion of the pilot project.

2. Sewage works that are exempt from section 53 of the OWRA by O. Reg. 525/98 continue to be exempt and are not required to follow the notification process under this Limited Operational Flexibility.

3. Normal or emergency operational modifications, such as repairs, reconstructions, or other improvements that are part of maintenance activities, including cleaning, renovations to existing approved sewage works equipment, provided that the modification is made with Equivalent Equipment, are considered pre-approved.

4. The modifications noted in section (3) above are not required to follow the notification protocols under Limited Operational Flexibility, provided that the number of pieces and description of the

equipment as described in the Approval does not change.

The reasons for the imposition of these terms and conditions are as follows:

1. Condition 1 is imposed to ensure that the Works are built and operated in the manner in which they were described for review and upon which approval was granted. This condition is also included to emphasize the precedence of Conditions in the Approval and the practice that the Approval is based on the most current document, if several conflicting documents are submitted for review. The condition also advises the Owners their responsibility to notify any person they authorized to carry out work pursuant to this Approval the existence of this Approval.

2. Condition 2 is included to ensure that the Works are constructed in a timely manner so that standards applicable at the time of Approval of the Works are still applicable at the time of construction, to ensure the ongoing protection of the environment.

3. Condition 3 is included to ensure that the Ministry records are kept accurate and current with respect to the approved works and to ensure that subsequent owners of the Works are made aware of the Approval and continue to operate the Works in compliance with it.

4. Condition 4 is included to indicate that By-pass / Plant Overflows of untreated or partially treated sewage to the receiving watercourse is prohibited, save in certain limited circumstances where the failure to By-pass / Plant Overflow could result in greater injury to the public interest than the Bypass itself where a By-pass / Plant Overflow will not violate the approved effluent requirements, or where the By-pass / Plant Overflow can be limited or otherwise mitigated by handling it in accordance with an approved contingency plan. The notification and documentation requirements allow the Ministry to take action in an informed manner and will ensure the Owner is aware of the extent and frequency of By-pass / Plant Overflow events.

5. Condition 5 is imposed to establish non-enforceable effluent quality objectives which the Owner is obligated to use best efforts to strive towards on an ongoing basis. These objectives are to be used as a mechanism to trigger corrective action proactively and voluntarily before environmental impairment occurs and before the compliance limits of Condition 6 are exceeded.

6. Conditions 6 and 7 are imposed to ensure that the effluent discharged from the Works meets the Ministry's effluent quality requirements thus minimizing environmental impact on the receiver and to protect water quality, fish and other aquatic life in the receiving water body.

7. Condition 8 is included to require that the Works be properly operated, maintained, funded, staffed and equipped such that the environment is protected and deterioration, loss, injury or damage to any person or property is prevented. As well, the inclusion of a comprehensive operations manual governing all significant areas of operation, maintenance and repair is prepared, implemented and kept up-to-date by the Owner and made available to the Ministry. Such a manual is an integral part of the operation of the Works. Its compilation and use should assist the Owner in staff training, in proper plant operation and in identifying and planning for contingencies during possible abnormal conditions. The manual will also act as a benchmark for Ministry staff when reviewing the Owner's operation of the Works.

8. Condition 9 is included to enable the Owner to evaluate and demonstrate the performance of the Works, on a continual basis, so that the Works are properly operated and maintained at a level which is consistent with the design objectives and effluent limits specified in the Approval and that the Works does not cause any impairment to the receiving watercourse.

9. Condition 10 is included to provide a performance record for future references, to ensure that the

Ministry is made aware of problems as they arise, and to provide a compliance record for all the terms and conditions outlined in this Approval, so that the Ministry can work with the Owner in resolving any problems in a timely manner.

10. Condition 11 is included to ensure that the Works are operated in accordance with the application and supporting documentation submitted by the Owner, and not in a manner which the Director has not been asked to consider. These Conditions are also included to ensure that a Professional Engineer has reviewed the proposed modifications and attests that the modifications are in line with that of Limited Operational Flexibility, and provide assurance that the proposed modifications comply with the Ministry's requirements stipulated in the Terms and Conditions of this Approval, MOE policies, guidelines, and industry engineering standards and best management practices.

Upon issuance of the environmental compliance approval, I hereby revoke Approval No(s). 3-1547-92-947 issued on May 3, 1994

In accordance with Section 139 of the Environmental Protection Act, you may by written Notice served upon me and the Environmental Review Tribunal within 15 days after receipt of this Notice, require a hearing by the Tribunal. Section 142 of the Environmental Protection Act provides that the Notice requiring the hearing shall state:

1. The portions of the environmental compliance approval or each term or condition in the environmental compliance approval in respect of which the hearing is required, and;
2. The grounds on which you intend to rely at the hearing in relation to each portion appealed.

Pursuant to subsection 139(3) of the Environmental Protection Act, a hearing may not be required with respect to any terms and conditions in this environmental compliance approval, if the terms and conditions are substantially the same as those contained in an approval that is amended or revoked by this environmental compliance approval.

The Notice should also include:

3. The name of the appellant;
4. The address of the appellant;
5. The environmental compliance approval number;
6. The date of the environmental compliance approval;
7. The name of the Director, and;
8. The municipality or municipalities within which the project is to be engaged in.

And the Notice should be signed and dated by the appellant.

This Notice must be served upon:

The Secretary*
Environmental Review Tribunal
655 Bay Street, Suite 1500
Toronto, Ontario
M5G 1E5

AND

The Director appointed for the purposes of Part II.1 of the Environmental Protection Act
Ministry of the Environment and Climate Change
135 St. Clair Avenue West, 1st Floor
Toronto, Ontario
M4V 1P5

*** Further information on the Environmental Review Tribunal's requirements for an appeal can be obtained directly from the Tribunal at: Tel: (416) 212-6349, Fax: (416) 326-5370 or**

www.ert.gov.on.ca

The above noted activity is approved under s.20.3 of Part II.1 of the Environmental Protection Act.

DATED AT TORONTO this 7th day of June, 2016

Fariha Pannu, P.Eng.
Director
appointed for the purposes of Part II.1 of
the *Environmental Protection Act*

YZ/
c: DWMD Supervisor, MOECC Guelph Office
Mark Robertson, The Corporation of the Town of Minto

APPENDIX B:
LAB RESULTS – WASTEWATER SAMPLING

Your P.O. #: 303072
Your Project #: 303072
Site Location: CLIFFORD WWTP
Your C.O.C. #: 932020-03-01

Attention: Kim Wilkinson

GM BluePlan Engineering Limited
650 Woodlawn Rd W
Block C, Unit 2
Guelph, ON
CANADA N1K 1B8

Report Date: 2023/11/15
Report #: R7913191
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BUREAU VERITAS JOB #: C3Y9188
Received: 2023/11/07, 15:53

Sample Matrix: Water
Samples Received: 2

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Alkalinity	2	N/A	2023/11/09	CAM SOP-00448	SM 24 2320 B m
Biochemical Oxygen Demand (BOD)	2	2023/11/09	2023/11/14	CAM SOP-00427	SM 23 5210B m
Carbonaceous BOD	2	2023/11/09	2023/11/14	CAM SOP-00427	SM 23 5210B m
E.coli, (CFU/100mL)	2	N/A	2023/11/07	CAM SOP-00552	MECP E3371
Total Ammonia-N	2	N/A	2023/11/10	CAM SOP-00441	USGS I-2522-90 m
Nitrate & Nitrite as Nitrogen in Water (1)	2	N/A	2023/11/15	CAM SOP-00440	SM 23 4500-NO3I/NO2B
pH	2	2023/11/08	2023/11/09	CAM SOP-00413	SM 24th - 4500H+ B
Total Kjeldahl Nitrogen in Water	2	2023/11/09	2023/11/10	CAM SOP-00938	OMOE E3516 m
Total Phosphorus (Colourimetric)	1	2023/11/08	2023/11/09	CAM SOP-00407	SM 23 4500-P I
Total Phosphorus (Colourimetric)	1	2023/11/09	2023/11/10	CAM SOP-00407	SM 23 4500-P I
Dissolved Phosphorus	2	2023/11/14	2023/11/15	CAM SOP-00407	SM 23 4500-P I
Total Suspended Solids	1	2023/11/10	2023/11/11	CAM SOP-00428	SM 23 2540D m
Total Suspended Solids	1	2023/11/11	2023/11/13	CAM SOP-00428	SM 23 2540D m

Remarks:

Bureau Veritas is accredited to ISO/IEC 17025 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Bureau Veritas are based upon recognized Provincial, Federal or US method compendia such as CCME, MELCCFP, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Bureau Veritas' profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Bureau Veritas in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

Bureau Veritas liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Bureau Veritas has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Bureau Veritas, unless otherwise agreed in writing. Bureau Veritas is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.

Your P.O. #: 303072
Your Project #: 303072
Site Location: CLIFFORD WWTP
Your C.O.C. #: 932020-03-01

Attention: Kim Wilkinson

GM BluePlan Engineering Limited
650 Woodlawn Rd W
Block C, Unit 2
Guelph, ON
CANADA N1K 1B8

Report Date: 2023/11/15
Report #: R7913191
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BUREAU VERITAS JOB #: C3Y9188

Received: 2023/11/07, 15:53

Results relate to samples tested. When sampling is not conducted by Bureau Veritas, results relate to the supplied samples tested.

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

(1) Values for calculated parameters may not appear to add up due to rounding of raw data and significant figures.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to:
Ashton Gibson, Project Manager
Email: Ashton.Gibson@bureauveritas.com
Phone# (905)817-5765

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This report has been generated and distributed using a secure automated process.

Bureau Veritas has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation, please refer to the Validation Signatures page if included, otherwise available by request. For Department specific Analyst/Supervisor validation names, please refer to the Test Summary section if included, otherwise available by request. This report is authorized by Rodney Major, General Manager responsible for Ontario Environmental laboratory operations.

Bureau Veritas Job #: C3Y9188
Report Date: 2023/11/15

GM BluePlan Engineering Limited
Client Project #: 303072
Site Location: CLIFFORD WWTP
Your P.O. #: 303072
Sampler Initials: GP

RESULTS OF ANALYSES OF WATER

Bureau Veritas ID		XNN323		XNN324			XNN324		
Sampling Date		2023/11/07 12:00		2023/11/07 11:30			2023/11/07 11:30		
COC Number		932020-03-01		932020-03-01			932020-03-01		
	UNITS	LAGOON EFFLUENT	QC Batch	FILTER EFFLUENT	RDL	QC Batch	FILTER EFFLUENT Lab-Dup	RDL	QC Batch
Inorganics									
Total Ammonia-N	mg/L	6.1	9040409	3.1	0.050	9040409			
Total BOD	mg/L	6	9038584	5	2	9038584			
Total Carbonaceous BOD	mg/L	5	9038589	<2	2	9038589			
Total Kjeldahl Nitrogen (TKN)	mg/L	7.4	9041098	4.1	0.50	9039685	3.9	0.50	9039685
pH	pH	7.96	9037835	7.84		9037835			
Dissolved Phosphorus	mg/L	0.11	9046788	0.18	0.020	9046788			
Total Phosphorus	mg/L	0.20	9041080	0.27	0.020	9036869			
Total Suspended Solids	mg/L	<10	9041919	<10	10	9044252			
Alkalinity (Total as CaCO3)	mg/L	180	9037831	190	1.0	9037831			
Nitrite (N)	mg/L	0.123	9036940	0.355	0.010	9036940	0.341	0.010	9036940
Nitrate (N)	mg/L	0.31	9036940	1.09	0.10	9036940	1.08	0.10	9036940
Nitrate + Nitrite (N)	mg/L	0.44	9036940	1.45	0.10	9036940	1.42	0.10	9036940

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate

Bureau Veritas 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.bvna.com

Bureau Veritas Job #: C3Y9188
Report Date: 2023/11/15

GM BluePlan Engineering Limited
Client Project #: 303072
Site Location: CLIFFORD WWTP
Your P.O. #: 303072
Sampler Initials: GP

MICROBIOLOGY (WATER)

Bureau Veritas ID		XNN323	XNN324		
Sampling Date		2023/11/07 12:00	2023/11/07 11:30		
COC Number		932020-03-01	932020-03-01		
	UNITS	LAGOON EFFLUENT	FILTER EFFLUENT	RDL	QC Batch
Microbiological					
Escherichia coli	CFU/100mL	20	<10	10	9035464

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Bureau Veritas 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.bvna.com

Bureau Veritas Job #: C3Y9188
Report Date: 2023/11/15

GM BluePlan Engineering Limited
Client Project #: 303072
Site Location: CLIFFORD WWTP
Your P.O. #: 303072
Sampler Initials: GP

TEST SUMMARY

Bureau Veritas ID: XNN323
Sample ID: LAGOON EFFLUENT
Matrix: Water

Collected: 2023/11/07
Shipped:
Received: 2023/11/07

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	9037831	N/A	2023/11/09	Nachiketa Gohil
Biochemical Oxygen Demand (BOD)	DO	9038584	2023/11/09	2023/11/14	Gurjot Kaur
Carbonaceous BOD	DO	9038589	2023/11/09	2023/11/14	Gurjot Kaur
E.coli, (CFU/100mL)	PL	9035464	N/A	2023/11/07	Sonja Elavinamannil
Total Ammonia-N	LACH/NH4	9040409	N/A	2023/11/10	Prabhjot Kaur
Nitrate & Nitrite as Nitrogen in Water	LACH	9036940	N/A	2023/11/15	Viorica Rotaru
pH	AT	9037835	2023/11/08	2023/11/09	Nachiketa Gohil
Total Kjeldahl Nitrogen in Water	SKAL	9041098	2023/11/09	2023/11/10	Rajni Tyagi
Total Phosphorus (Colourimetric)	SKAL/P	9041080	2023/11/09	2023/11/10	Muskan
Dissolved Phosphorus	SKAL/P	9046788	2023/11/14	2023/11/15	Muskan
Total Suspended Solids	BAL	9041919	2023/11/10	2023/11/11	Razieh Tabesh

Bureau Veritas ID: XNN324
Sample ID: FILTER EFFLUENT
Matrix: Water

Collected: 2023/11/07
Shipped:
Received: 2023/11/07

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	9037831	N/A	2023/11/09	Nachiketa Gohil
Biochemical Oxygen Demand (BOD)	DO	9038584	2023/11/09	2023/11/14	Gurjot Kaur
Carbonaceous BOD	DO	9038589	2023/11/09	2023/11/14	Gurjot Kaur
E.coli, (CFU/100mL)	PL	9035464	N/A	2023/11/07	Sonja Elavinamannil
Total Ammonia-N	LACH/NH4	9040409	N/A	2023/11/10	Prabhjot Kaur
Nitrate & Nitrite as Nitrogen in Water	LACH	9036940	N/A	2023/11/15	Viorica Rotaru
pH	AT	9037835	2023/11/08	2023/11/09	Nachiketa Gohil
Total Kjeldahl Nitrogen in Water	SKAL	9039685	2023/11/09	2023/11/10	Rajni Tyagi
Total Phosphorus (Colourimetric)	SKAL/P	9036869	2023/11/08	2023/11/09	Muskan
Dissolved Phosphorus	SKAL/P	9046788	2023/11/14	2023/11/15	Muskan
Total Suspended Solids	BAL	9044252	2023/11/11	2023/11/13	Razieh Tabesh

Bureau Veritas ID: XNN324 Dup
Sample ID: FILTER EFFLUENT
Matrix: Water

Collected: 2023/11/07
Shipped:
Received: 2023/11/07

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Nitrate & Nitrite as Nitrogen in Water	LACH	9036940	N/A	2023/11/15	Viorica Rotaru
Total Kjeldahl Nitrogen in Water	SKAL	9039685	2023/11/09	2023/11/10	Rajni Tyagi

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Bureau Veritas Job #: C3Y9188
Report Date: 2023/11/15

GM BluePlan Engineering Limited
Client Project #: 303072
Site Location: CLIFFORD WWTP
Your P.O. #: 303072
Sampler Initials: GP

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	7.3°C

Results relate only to the items tested.

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Bureau Veritas Job #: C3Y9188
Report Date: 2023/11/15

QUALITY ASSURANCE REPORT

GM BluePlan Engineering Limited
Client Project #: 303072
Site Location: CLIFFORD WWTP
Your P.O. #: 303072
Sampler Initials: GP

			Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
9036869	Total Phosphorus	2023/11/09	101	80 - 120	104	80 - 120	<0.020	mg/L	1.5	20	104	80 - 120
9036940	Nitrate (N)	2023/11/15	93	80 - 120	99	80 - 120	<0.10	mg/L	1.5	20		
9036940	Nitrite (N)	2023/11/15	98	80 - 120	108	80 - 120	<0.010	mg/L	4.1	20		
9037831	Alkalinity (Total as CaCO3)	2023/11/09			96	85 - 115	<1.0	mg/L	1.7	20		
9037835	pH	2023/11/09			102	98 - 103			0.80	N/A		
9038584	Total BOD	2023/11/14					<2	mg/L	NC	30	93	80 - 120
9038589	Total Carbonaceous BOD	2023/11/14					<2	mg/L	4.5	30	93	85 - 115
9039685	Total Kjeldahl Nitrogen (TKN)	2023/11/10	NC	80 - 120	99	80 - 120	<0.10	mg/L	5.2	20	111	80 - 120
9040409	Total Ammonia-N	2023/11/10	104	75 - 125	104	80 - 120	<0.050	mg/L	NC	20		
9041080	Total Phosphorus	2023/11/10	109	80 - 120	104	80 - 120	<0.020	mg/L	3.4	20	107	80 - 120
9041098	Total Kjeldahl Nitrogen (TKN)	2023/11/13	NC	80 - 120	101	80 - 120	<0.10	mg/L	0.17	20	96	80 - 120
9041919	Total Suspended Solids	2023/11/11			96	85 - 115	<10	mg/L	NC	20		
9044252	Total Suspended Solids	2023/11/13			97	85 - 115	<10	mg/L	NC	20		
9046788	Dissolved Phosphorus	2023/11/15	94	80 - 120	99	80 - 120	<0.020	mg/L	5.4	20	99	80 - 120

N/A = Not Applicable

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

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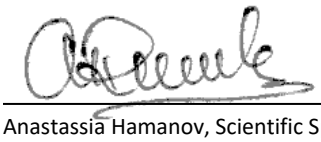
Bureau Veritas Job #: C3Y9188
Report Date: 2023/11/15

GM BluePlan Engineering Limited
Client Project #: 303072
Site Location: CLIFFORD WWTP
Your P.O. #: 303072
Sampler Initials: GP

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by:



Anastassia Hamanov, Scientific Specialist

Sonja Elavinamannil, Master of Biochemistry, Team Lead

Bureau Veritas has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation, please refer to the Validation Signatures page if included, otherwise available by request. For Department specific Analyst/Supervisor validation names, please refer to the Test Summary section if included, otherwise available by request. This report is authorized by Rodney Major, General Manager responsible for Ontario Environmental laboratory operations.

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CHAIN OF CUSTODY RECORD

INVOICE TO:		REPORT TO:		PROJECT INFORMATION:		Laboratory Use Only:	
Company Name:	#1067 GM BluePlan Engineering Limited	Company Name:		Quotation #:	~~C0033~~ 303072	Bureau Veritas Job #:	Bottle Order #:
Attention:	Kim Wilkinson	Attention:	~~Joanna Slesink~~ Same	P.O. #:	303072		932020
Address:	650 Woodlawn Rd W Block C, Unit 2 Guelph ON N1K 1B8	Address:	grant.parkinson@gmblueplan.ca	Project:		COC #:	Project Manager:
Tel:	(519) 824-8150 Fax: (519) 824-8089	Tel:	(519) 824-8150 Ext: ~~259~~ Fax:	Project Name:	Clifford WWTP	C#932020-03-01	Ashton Gibson
Email:	info@gmblueplan.ca	Email:	joanna.slesink@gmblueplan.ca; tony.young@gmblueplan	Site #:			
				Sampled By:	Grant Parkinson		

MOE REGULATED DRINKING WATER OR WATER INTENDED FOR HUMAN CONSUMPTION MUST BE SUBMITTED ON THE BUREAU VERITAS DRINKING WATER CHAIN OF CUSTODY

Regulation 153 (2011): ☐ Table 1 ☐ Res/Park ☐ Medium/Fine ☐ Table 2 ☐ Ind/Comm ☐ Coarse ☐ Table 3 ☐ Agri/Other ☐ For RSC ☐ Table ___

Other Regulations: ☐ CCME ☐ Sanitary Sewer Bylaw ☐ Reg 558 ☐ Storm Sewer Bylaw ☐ MISA Municipality ☐ PWQO ☐ Reg 406 Table ☐ Other

Special Instructions

Include Criteria on Certificate of Analysis (Y/N)? ___

Turnaround Time (TAT) Required:
Please provide advance notice for rush projects

Regular (Standard) TAT: ☒
(will be applied if Rush TAT is not specified):
Standard TAT = 5-7 Working days for most tests.
Please note: Standard TAT for certain tests such as BOD and Dioxins/Furans are > 5 days - contact your Project Manager for details.

Job Specific Rush TAT (if applies to entire submission)
Date Required: ___ Time Required: ___ ☐
Rush Confirmation Number: ___ *(call lab for #)*

	Sample Barcode Label	Sample (Location) Identification	Date Sampled	Time Sampled	Matrix	Field Filtered (please circle): Metals / Hg / Cr VI	ANALYSIS REQUESTED (PLEASE BE SPECIFIC): BOD5, CBOD5	TSS	TKN	Total Ammonia N	NO2, NO3	Total & soluble phosphorus	pH	Alkalinity	E. Coli	# of Bottles	Comments
1		Lagoon Effluent	2023/11/07	12:00	W/W	No	✓	✓	✓	✓	✓	✓	✓	✓	✓	6	
2		Filter Effluent	"	11:30	W/W	No	✓	✓	✓	✓	✓	✓	✓	✓	✓	6	MICRO
3																	BOD
4																	
5																	
6																	
7																	
8																	
9																	
10																	

07-Nov-23 15:53
Ashton Gibson
C3Y9188
ATH ENV-895

Received In WATERLOO

once

* RELINQUISHED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	RECEIVED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	# jars used and not submitted	Laboratory Use Only: Time Sensitive	Temperature (°C) on Recei	Custody Seal	Yes	No
Grant Parkinson	23/11/07	16:00	TAMSIN DENISON	~~2023~~/23/07	2023/11/07	15.53		5 8 9 °C	Present		
			RAMAN	2023/11/07	17:50				Intact	✓	

* UNLESS OTHERWISE AGREED TO IN WRITING, WORK SUBMITTED ON THIS CHAIN OF CUSTODY IS SUBJECT TO BUREAU VERITAS'S STANDARD TERMS AND CONDITIONS. SIGNING OF THIS CHAIN OF CUSTODY DOCUMENT IS ACKNOWLEDGMENT AND ACCEPTANCE OF OUR TERMS WHICH ARE AVAILABLE FOR VIEWING AT WWW.BVNA.COM/ENVIRONMENTAL-LABORATORIES/RESOURCES/COC-TERMS-AND-CONDITIONS.

* IT IS THE RESPONSIBILITY OF THE RELINQUISHER TO ENSURE THE ACCURACY OF THE CHAIN OF CUSTODY RECORD. AN INCOMPLETE CHAIN OF CUSTODY MAY RESULT IN ANALYTICAL TAT DELAYS.

** SAMPLE CONTAINER, PRESERVATION, HOLD TIME AND PACKAGE INFORMATION CAN BE VIEWED AT WWW.BVNA.COM/ENVIRONMENTAL-LABORATORIES/RESOURCES/CHAIN-CUSTODY-FORMS-COCS.

SAMPLES MUST BE KEPT COOL (< 10° C) FROM TIME OF SAMPLING UNTIL DELIVERY TO BUREAU VERITAS

White: Bureau Veritas Yellow: Client

6/10/5

Bureau Veritas Canada (2019) Inc.

627882

APPENDIX C:
LAB RESULTS – FILTER MEDIA SAMPLING

JLP

Geotechnical & Environmental Consultants

January 15, 2024

Reference No. G4795-23-11

GM Blueplan Engineering Ltd.
650 Woodlawn Road West
Block C, Unit 2
Guelph, Ontario
N1K 1B8

Attention: Mr. Grant Parkinson

RE: Materials Testing & Inspection
Clifford WWTP Sand Filters
GMBP Project No. 323072

Dear Sir,

Please find enclosed the reports for the recent materials testing and inspection services carried out for the above project.

If you have any questions or concerns regarding this report, please do not hesitate to contact this office.

Yours very truly,
JLP SERVICES INC.

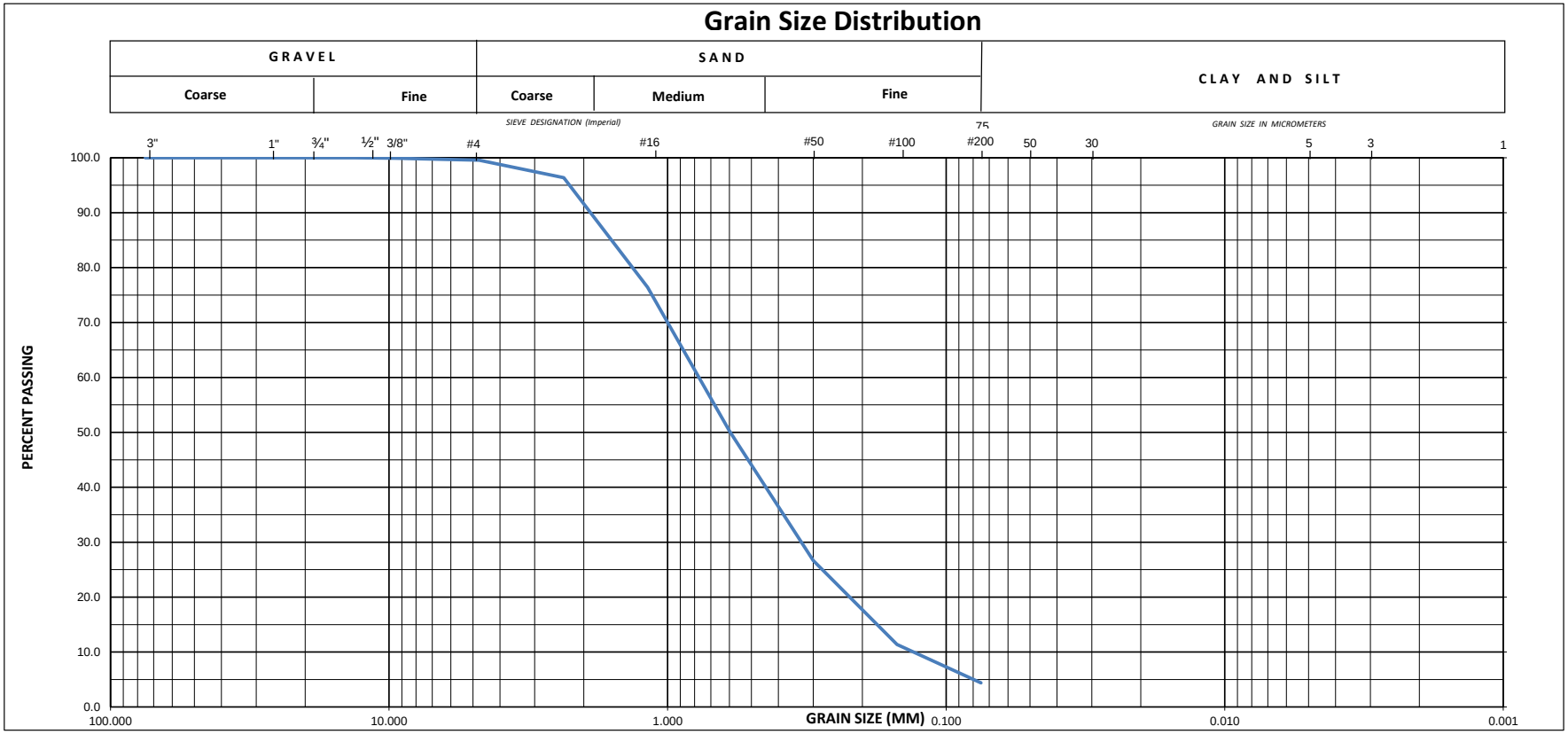
Alexander Lee, M.Sc. (Eng.), P. Eng.
Senior Geotechnical Engineer

AL:ak

Encls.

JLP
Geotechnical & Environmental Consultants

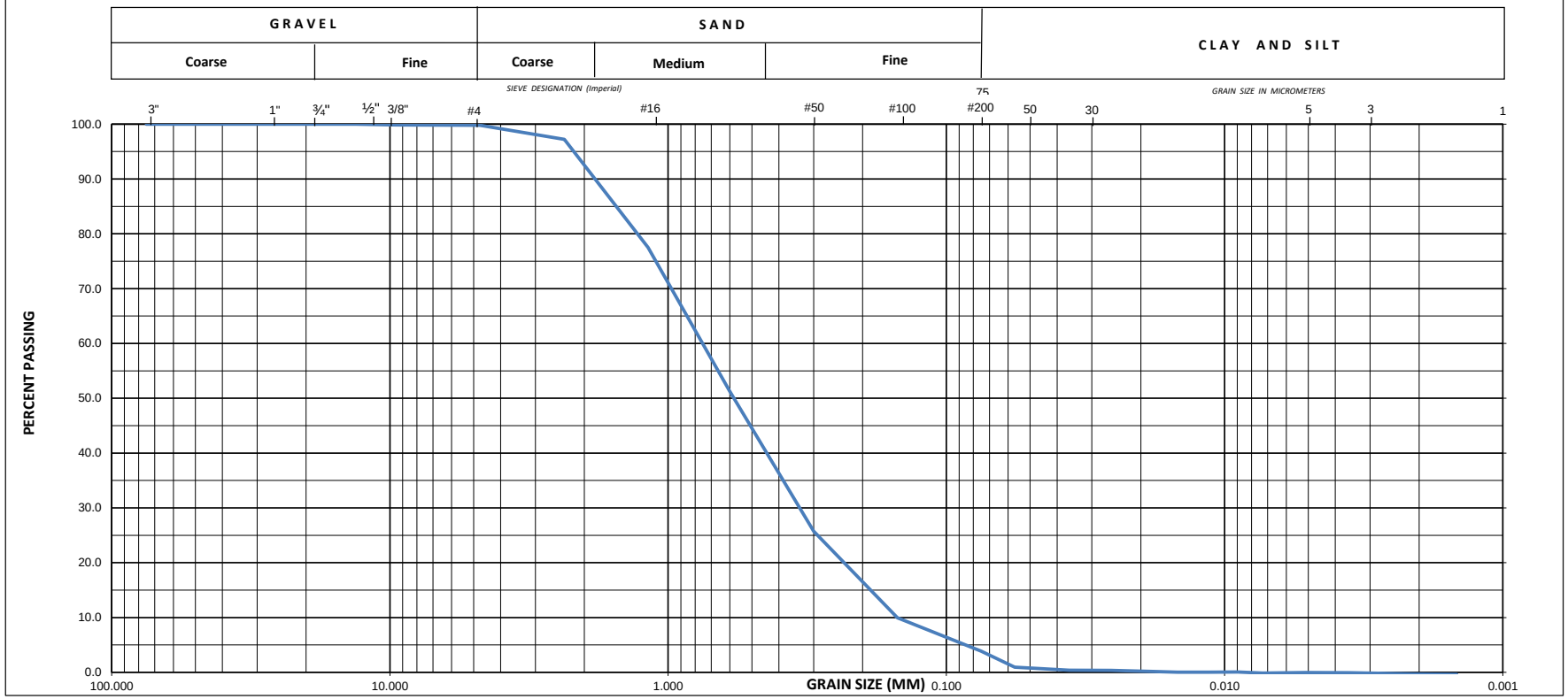
Grain Size Distribution



Classification of Sample and Group Symbol: SAND, trace silt, trace clay, trace gravel (SP)

Project No:	G4795-23-11	**D10 =**	0.14	**PLASTIC PROPERTIES**	
Location:	-	**D30 =**	0.34	**Liquid Limit**	% = NP
Borehole No:	0	**D60 =**	0.82	**Plastic Limit**	% = NP
Sample No:	1	**Coefficient of Uniformity:**	6.04	**Plasticity Index**	% = NP
Depth (m):	0	**Coefficient of Curvature:**	3.11	**Moisture Content**	% = 19
Elevation (m):	0.0	**Percolation Time (mins/cm):**	2 - 8	**Enclosure Number:**	1

Grain Size Distribution

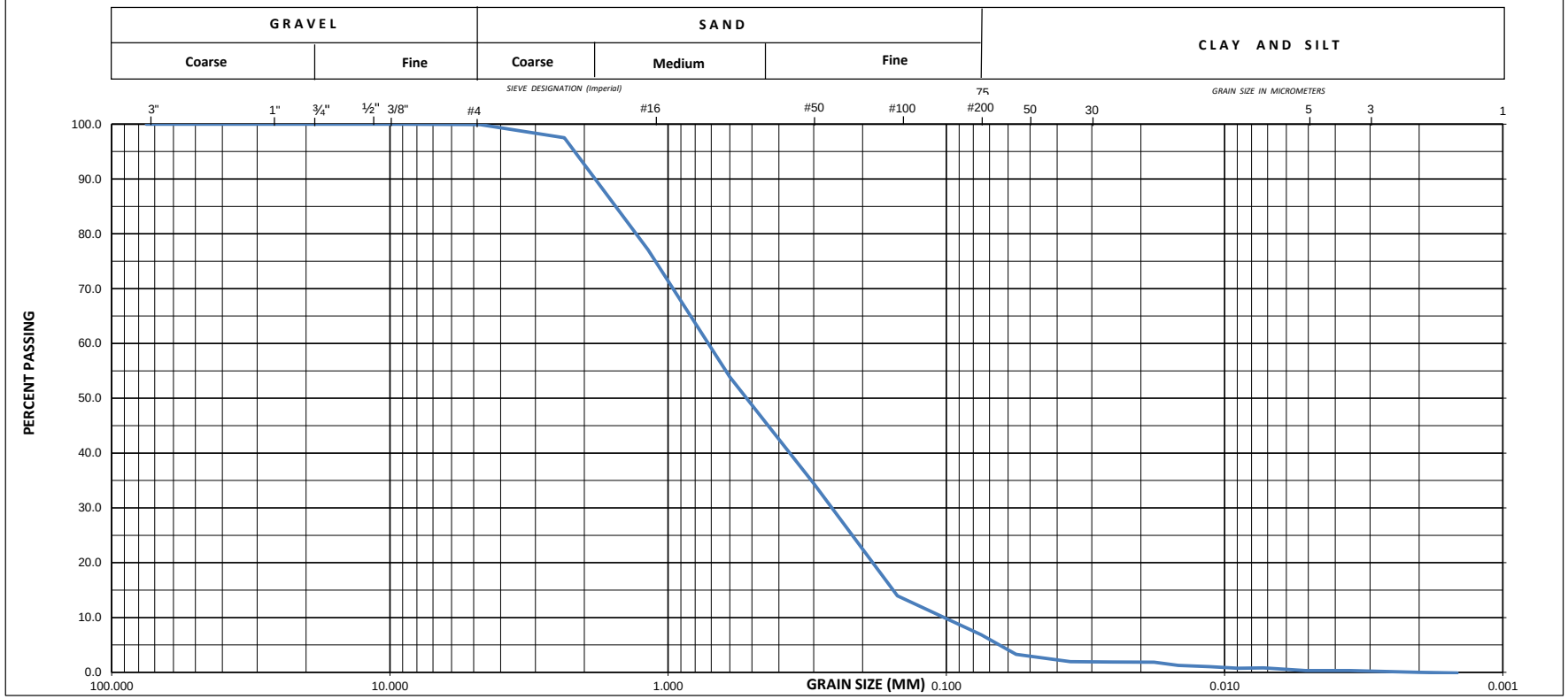


Classification of Sample and Group Symbol: SAND, trace silt, trace gravel (SW)

Project No:	G4795-23-11	**D10 =**	0.15	**PLASTIC PROPERTIES**	
Location:	-	**D30 =**	0.35	**Liquid Limit**	% = NP
Borehole No:	0	**D60 =**	0.79	**Plastic Limit**	% = NP
Sample No:	2	**Coefficient of Uniformity:**	5.28	**Plasticity Index**	% = NP
Depth (m):	0	**Coefficient of Curvature:**	2.93	**Moisture Content**	% = 9
Elevation (m):	0.0	**Percolation Time (mins/cm):**	2 - 12	**Enclosure Number:**	1

JLP
Geotechnical & Environmental Consultants

Grain Size Distribution

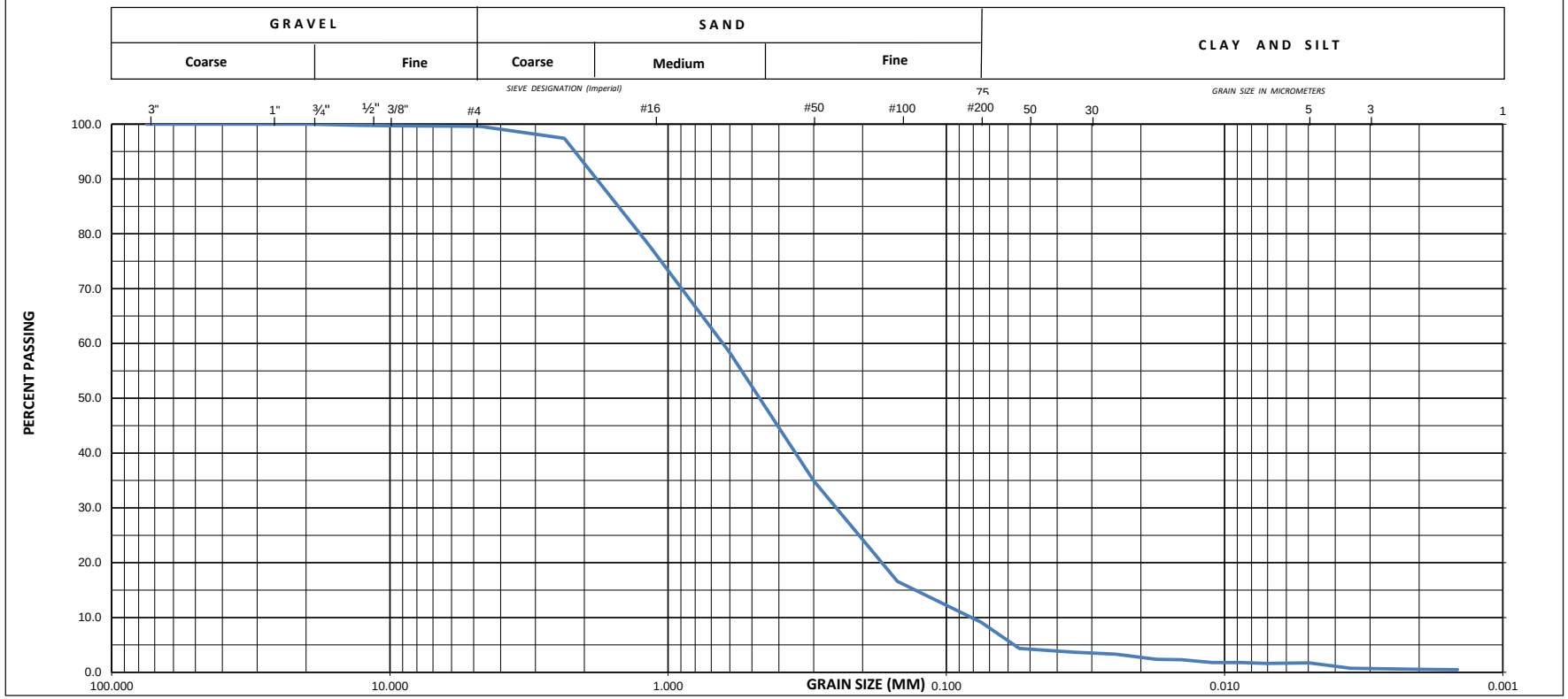


Classification of Sample and Group Symbol: SAND, trace silt, trace gravel (SP)

Project No:	G4795-23-11	**D10 =**	0.11	**PLASTIC PROPERTIES**	
Location:	-	**D30 =**	0.27	**Liquid Limit**	% = NP
Borehole No:	0	**D60 =**	0.75	**Plastic Limit**	% = NP
Sample No:	3	**Coefficient of Uniformity:**	6.96	**Plasticity Index**	% = NP
Depth (m):	0	**Coefficient of Curvature:**	3.28	**Moisture Content**	% = 13
Elevation (m):	0.0	**Percolation Time (mins/cm):**	2 - 8	**Enclosure Number:**	1

JLP
Geotechnical & Environmental Consultants

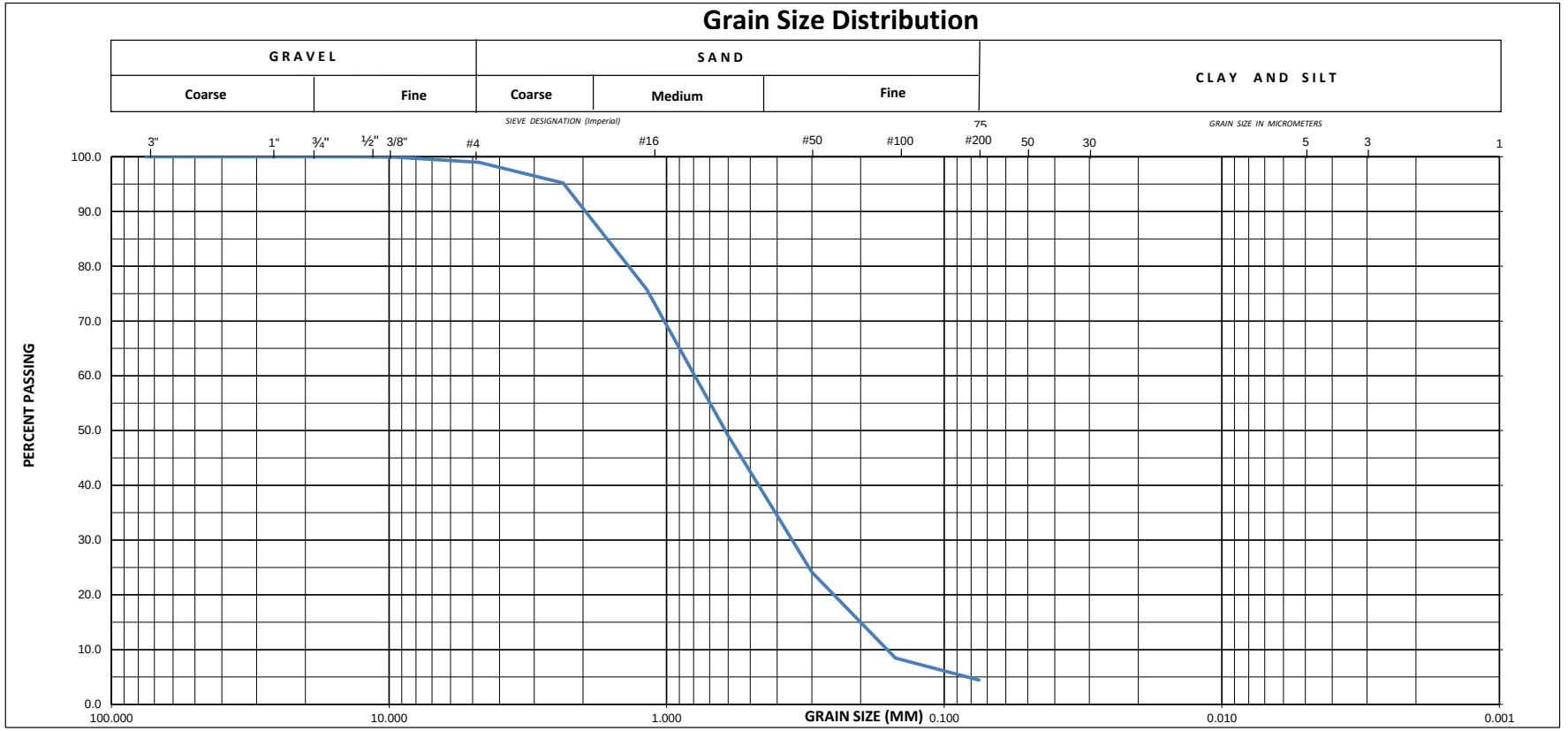
Grain Size Distribution



Classification of Sample and Group Symbol: SAND, trace silt, trace clay, trace gravel (SP)

Project No:	G4795-23-11	**D10 =**	0.08	**PLASTIC PROPERTIES**	
Location:	-	**D30 =**	0.26	**Liquid Limit**	% = NP
Borehole No:	0	**D60 =**	0.65	**Plastic Limit**	% = NP
Sample No:	4	**Coefficient of Uniformity:**	7.75	**Plasticity Index**	% = NP
Depth (m):	0	**Coefficient of Curvature:**	4.77	**Moisture Content**	% = 24
Elevation (m):	0.0	**Percolation Time (mins/cm):**	2 - 8	**Enclosure Number:**	1

Grain Size Distribution



Classification of Sample and Group Symbol: SAND, trace silt, trace gravel, trace clay (SW)

Project No:	G4795-23-11	**D10 =**	0.16	**PLASTIC PROPERTIES**	
Location:	-	**D30 =**	0.37	**Liquid Limit**	% = NP
Borehole No:	0	**D60 =**	0.84	**Plastic Limit**	% = NP
Sample No:	5	**Coefficient of Uniformity:**	5.08	**Plasticity Index**	% = NP
Depth (m):	0	**Coefficient of Curvature:**	2.69	**Moisture Content**	% = 17
Elevation (m):	0.0	**Percolation Time (mins/cm):**	2 - 12	**Enclosure Number:**	1

APPENDIX D:
COST ESTIMATES – DETAILED BREAKDOWN

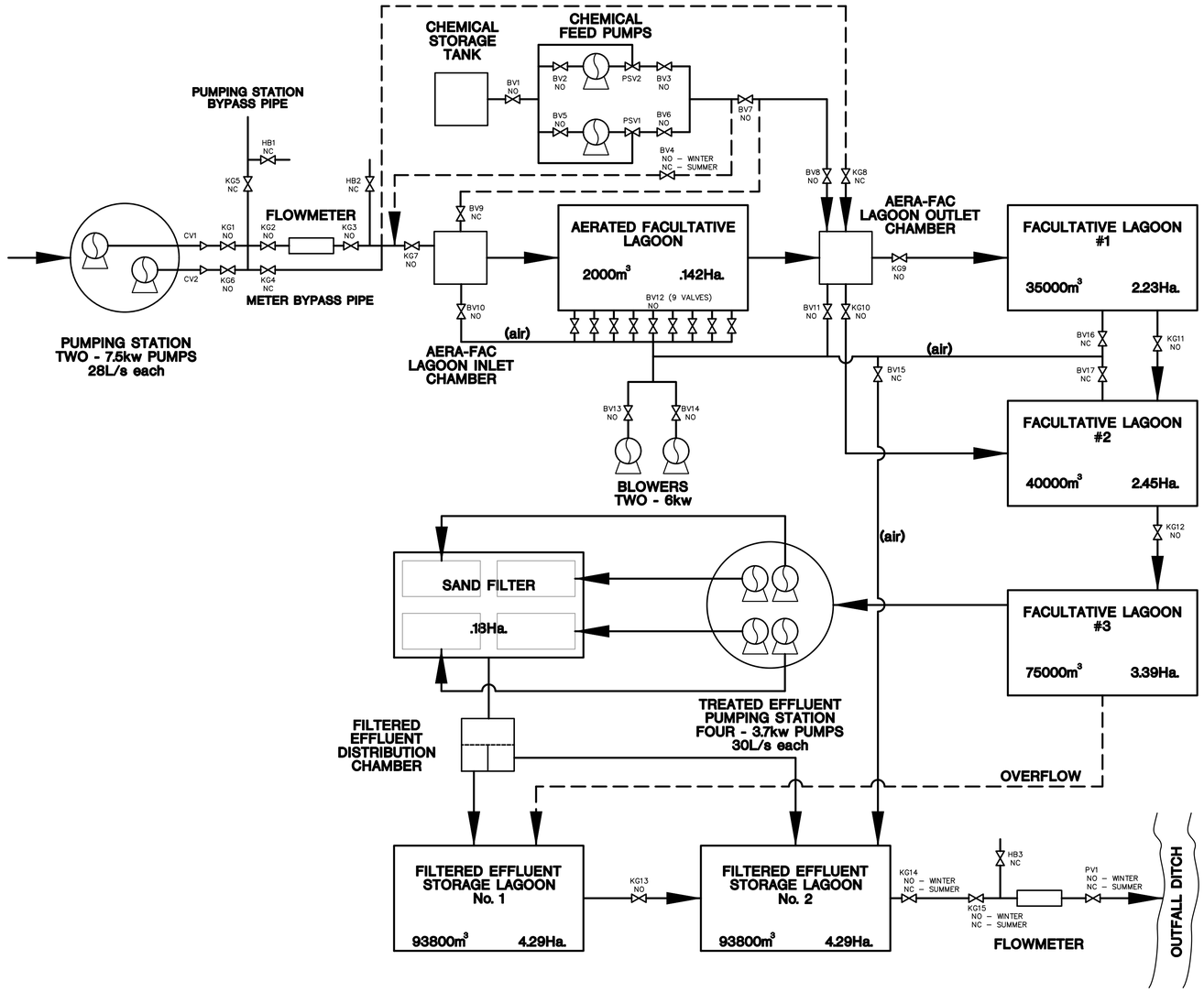
TOWN OF MINTO
CLIFFORD WWTP UPGRADES
Option #1 - Partial Filter Sand Replacement

Item No.	Description of Item	Quantity	Unit	Unit Cost	Total Cost
Division 1 - General Requirements					
1	General Requirements	100%	L.S.	$ 2,000.00	$ 2,000
2	Mobilization and Demobilization	100%	L.S.	3% of Total Cost	$ 1,760
3	Bonding and Insurance	100%	L.S.	2% of Total Cost	$ 1,173
4	Allowance to Maintain Operation of Existing Plant during Construction	100%	L.S.	$ -	$ -
5	Legal Survey of Site to Verify Property Boundaries	0	L.S.	$ -	$ -
				Division 1 - General Requirements Sub-Total	**$ 4,933**
Division 2 - Site Construction					
6	Removals - Irrigiation Piping, Fittings, Supports. Stockpile on site.	100%	L.S.	$ 5,000.00	$ 5,000
7	Excavate, Remove, and Dispose Off Site Top Layer of Filter Sand	0	cu.m.	$ 14.00	$ -
8	Supply and Place New Top Layer of Filter Sand	1,104	tonne	$ 35.00	$ 38,640
9	Spread New Top Layer of Filter Sand	1,840	sq.m.	$ 1.50	$ 2,760
10	Re-Install Irrigation Piping and Fittings	1,840	l.m.	$ 5.00	$ 9,200
11	Re-Install Irrigation Piping Supports and Fasteners	613	each	$ 5.00	$ 3,067
				Division 2 - Site Construction Sub-Total	**$ 58,667**
Division 3 - Concrete					
	not applicable	0	L.S.	$ -	$ -
				Division 3 - Concrete Sub-Total	**$ -**
Division 4 - Masonry					
	not applicable	0	L.S.	$ -	$ -
				Division 4 - Masonry Sub-Total	**$ -**
Division 5 - Metals					
	not applicable	0	L.S.	$ -	$ -
				Division 5 - Metals Sub-Total	**$ -**
Division 6 - Wood and Plastics					
	not applicable	0	L.S.	$ -	$ -
				Division 6 - Wood and Plastics Sub-Total	**$ -**
Division 7 - Thermal and Moisture Protection					
	not applicable	0	L.S.	$ -	$ -
				Division 7 - Thermal and Moisture Protection Sub-Total	**$ -**
Division 8 - Doors and Windows					
	not applicable	0	L.S.	$ -	$ -
				Division 8 - Doors and Windows Sub-Total	**$ -**
Division 9 - Finishes					
	not applicable	0	L.S.	$ -	$ -
				Division 9 - Finishes Sub-Total	**$ -**
Division 10 - Specialties					
	not applicable	0	L.S.	$ -	$ -
				Division 10 - Specialties Sub-Total	**$ -**
Division 11 - Equipment					
				Division 11 - Equipment Sub-Total	**$ -**
Division 12 - Furnishings					
	not applicable	0	L.S.	$ -	$ -
				Division 12 - Furnishings Sub-Total	**$ -**
Division 13 - Special Construction					
	not applicable	0	L.S.	$ -	$ -
				Division 13 - Special Construction Sub-Total	**$ -**
Division 14 - Conveying Systems					
	not applicable	0	L.S.	$ -	$ -
				Division 14 - Conveying Systems Sub-Total	**$ -**
Division 15 - Mechanical					
	not applicable	0	L.S.	$ -	$ -
				Division 15 - Mechanical Sub-Total	**$ -**
Division 16 - Electrical					
	not applicable	0	L.S.	$ -	$ -
				Division 16 - Electrical Sub-Total	**$ -**
				Construction Sub-Total	**$ 63,600**
Engineering Services					
15	Detailed design, approvals, tendering, contract administration, site inspection, materials testing, testing and commissioning (10% of construction sub-total)	100%	L.S.	10%	$ 6,360
				Engineering Services Sub-Total	**$ 6,360**
				Sub-Total	**$ 69,960**
				Contingency Allowance 20%	**$ 13,992**
				Total Estimated Cost excl. HST ($2024)	**$ 83,952**

TOWN OF MINTO
CLIFFORD WWTP UPGRADES
Option #2 - Full Filter Sand Replacement

Item No.	Description of Item	Quantity	Unit	Unit Cost	Total Cost
Division 1 - General Requirements					
1	General Requirements	100%	L.S.	$ 5,000.00	$ 5,000
2	Mobilization and Demobilization	100%	L.S.	5% of Total Cost	$ 6,537.28
3	Bonding and Insurance	100%	L.S.	2% of Total Cost	$ 2,614.91
4	Allowance to Maintain Operation of Existing Plant during Construction	100%	L.S.	$ 10,000.00	$ 10,000
				Division 1 - General Requirements Sub-Total	**$ 24,152**
Division 2 - Site Construction					
6	Removals - Irrigiation Piping, Fittings, Supports. Stockpile on site.	100%	L.S.	$ 5,000.00	$ 5,000
7	Excavate, Remove, and Dispose Entire Layer of Filter Sand	1,398	cu.m.	$ 14.00	$ 19,578
8	Supply and Place New Full Layer of Filter Sand	2,797	tonne	$ 35.00	$ 97,888
9	Spread New Layer of Filter Sand	1,840	sq.m.	$ 4.50	$ 8,280
10	Re-Install Irrigation Piping and Fittings	1,840	l.m.	$ 5.00	$ 9,200
11	Re-Install Irrigation Piping Supports and Fasteners	613	each	$ 5.00	$ 3,067
				Division 2 - Site Construction Sub-Total	**$ 130,746**
Division 3 - Concrete					
	not applicable	0	L.S.	$ -	$ -
				Division 3 - Concrete Sub-Total	**$ -**
Division 4 - Masonry					
	not applicable	0	L.S.	$ -	$ -
				Division 4 - Masonry Sub-Total	**$ -**
Division 5 - Metals					
	not applicable	0	L.S.	$ -	$ -
				Division 5 - Metals Sub-Total	**$ -**
Division 6 - Wood and Plastics					
	not applicable	0	L.S.	0	$ -
				Division 6 - Wood and Plastics Sub-Total	**$ -**
Division 7 - Thermal and Moisture Protection					
	not applicable	0	L.S.	$ -	$ -
				Division 7 - Thermal and Moisture Protection Sub-Total	**$ -**
Division 8 - Doors and Windows					
	not applicable	0	L.S.	$ -	$ -
				Division 8 - Doors and Windows Sub-Total	**$ -**
Division 9 - Finishes					
	not applicable	0	L.S.	$ -	$ -
				Division 9 - Finishes Sub-Total	**$ -**
Division 10 - Specialties					
	not applicable	0	L.S.	$ -	$ -
				Division 10 - Specialties Sub-Total	**$ -**
Division 11 - Equipment					
				Division 11 - Equipment Sub-Total	**$ -**
Division 12 - Furnishings					
	not applicable	0	L.S.	$ -	$ -
				Division 12 - Furnishings Sub-Total	**$ -**
Division 13 - Special Construction					
	not applicable	0	L.S.	$ -	$ -
				Division 13 - Special Construction Sub-Total	**$ -**
Division 14 - Conveying Systems					
	not applicable	0	L.S.	$ -	$ -
				Division 14 - Conveying Systems Sub-Total	**$ -**
Division 15 - Mechanical					
	not applicable	0	L.S.	$ -	$ -
				Division 15 - Mechanical Sub-Total	**$ -**
Division 16 - Electrical					
	not applicable	0	L.S.	$ -	$ -
				Division 16 - Electrical Sub-Total	**$ -**
				Construction Sub-Total	**$ 154,898**
Engineering Services					
15	Detailed design, approvals, tendering, contract administration, site inspection, materials testing, testing and commissioning (10% of construction sub-total)	100%	L.S.	10%	$ 15,490
				Engineering Services Sub-Total	**$ 15,490**
				Sub-Total	**$ 170,388**
				Contingency Allowance 20%	**$ 34,078**
				Total Estimated Cost excl. HST ($2024)	**$ 204,465**

APPENDIX E:
SELECTED DESIGN DRAWINGS



FLOW SCHEMATIC

EFFLUENT OBJECTIVES AND TREATMENT EFFICIENCY

Parameter	Raw Sewage	Final Effluent	% Removed
Biochemical Oxygen Demand	170 mg/l	7.5	95.6
Suspended Solids	170 mg/l	7.5	95.6
Ammonia	20 mg/l	2	90.0
Phosphorus	8 mg/l	.7	91.2

DISCHARGE RATE TO RECEIVING STREAM

	Allowable Discharge m3/d	Proposed Maximum Daily Discharge rate in m3/d	Total Volume Discharged in m3
NOVEMBER	470	470	14,100
DECEMBER	734	734	22,754
JANUARY	1,028	1,028	31,868
FEBRUARY	1,075	1,075	30,100
MARCH	1,970	1,970	61,070
APRIL	1,345	1,345	22,608
TOTAL			182,500

* See Note 1

DESIGN POPULATION	
DESIGN	1100
1993	720

ORGANIC LOADING		
DESIGN	(kg/day)	85
1993	(kg/day)	56

SEWAGE PUMPING STATION	
No. OF PUMPS	2
KILOWATTS	7.5
CAPACITY (l/s) each	28

AERATED FACULTATIVE LAGOON	
– SURFACE AREA	0.142 ha.
– LIQUID DEPTH	3.0 m
– CAPACITY	2500 m3
– HYDRAULIC RETENTION TIME (HRT)	5 days

BLOWERS	
No. OF BLOWERS	2
KILOWATTS	6
AIRFLOW (l/s) each	99.0

FACULTATIVE LAGOONS	No. 1	No. 2	No. 3	TOTAL
– SURFACE AREA, ha	2.23	2.45	3.39	8.07
– LIQUID DEPTH, m	1.80	1.80	2.40	---
– CAPACITY, m3	35000	40000	75000	150000
– HYDRAULIC RETENTION TIME (HRT), days	70	80	150	300

FILTER MEDIA	
– 760 mm SAND	0.20 mm EFFECTIVE SIZE 3.0 UNIFORMITY COEFFICIENT
– 75 mm	5 mm CRUSHED STONE
– 75 mm	10 mm CRUSHED STONE
– 75 mm	15 mm CRUSHED STONE
– 75 mm	20 mm CRUSHED STONE

SAND FILTER		
– NUMBER OF CELLS		4
– AREA PER CELL	(ha)	0.046
– TOTAL AREA	(ha)	0.18
– HYDRAULIC LOADING RATE	(m3/ha/day)	5600
– APPLICATION RATE (MAX)	(m3/day)	1000

FILTERED EFFLUENT STORAGE LAGOONS	No. 1	No. 2	TOTAL
– SURFACE AREA, ha	4.29	4.29	8.58
– LIQUID DEPTH, m	2.40	2.40	---
– CAPACITY, m3	93800	93800	187600
– HYDRAULIC RETENTION TIME (HRT), days	187.6	187.6	375.2

TREATED EFFLUENT PUMPING STATION	
No. OF PUMPS	4
KILOWATTS	3.7
CAPACITY (l/s) each	30

AS CONSTRUCTED

MUNICIPALITY
KEY PLAN
NOT TO SCALE

NOTES :

1. MAX MONTHLY DISCHARGE FOR APRIL IS 40,350 m3

BENCH MARKS :

THE POSITION OF POLE LINES, CONDUITS, WATERMAINS, SEWERS AND OTHER UNDERGROUND AND OVERGROUND UTILITIES AND STRUCTURES IS NOT NECESSARILY SHOWN ON THE CONTRACT DRAWINGS, AND, WHERE SHOWN, THE ACCURACY OF THE POSITION OF SUCH UTILITIES AND STRUCTURES IS NOT GUARANTEED.

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NO.	DATE	REVISION DESCRIPTION	CHKD

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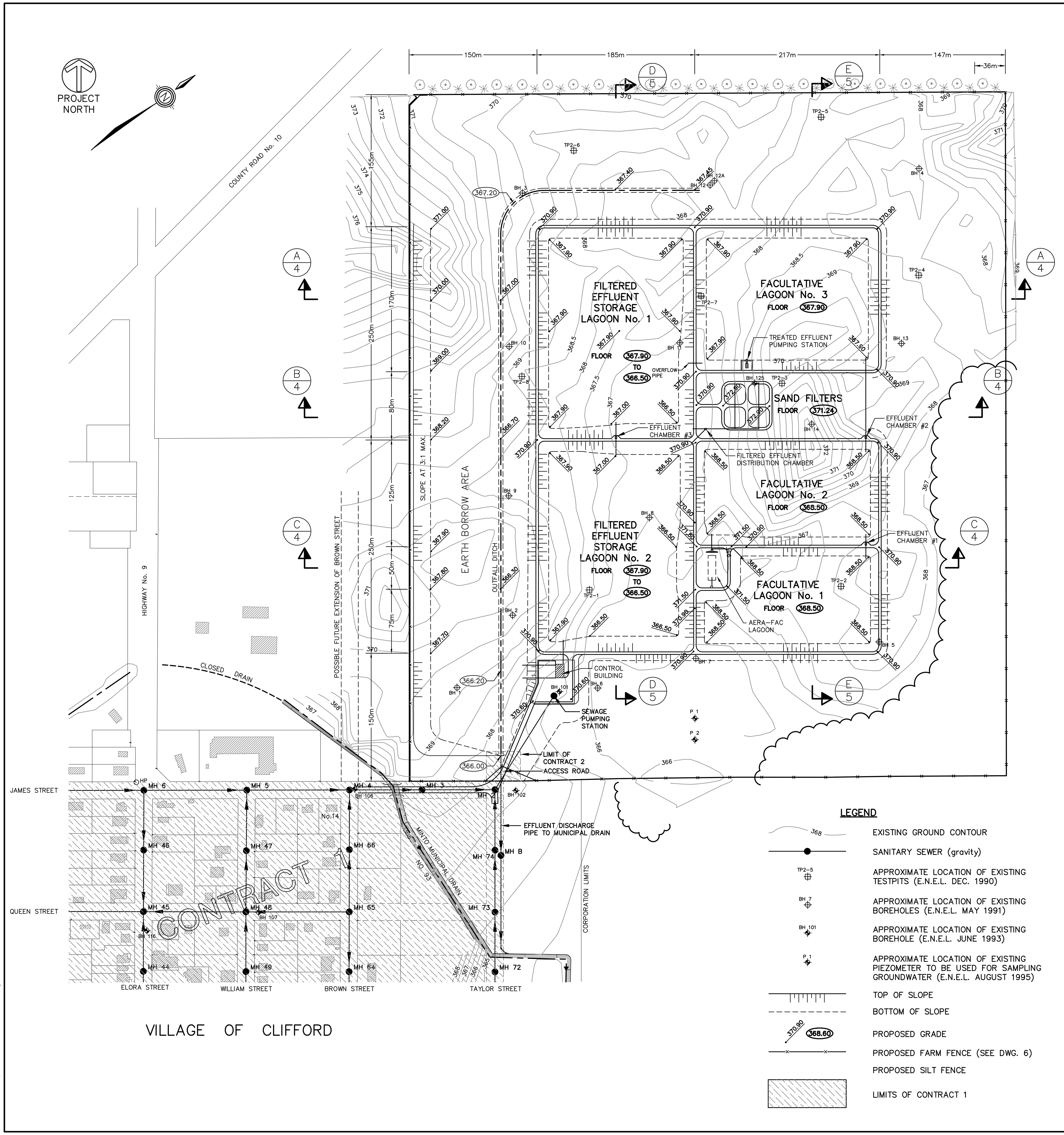
WASTEWATER TREATMENT PLANT

TOWN OF MINTO

CLIFFORD

FLOW SCHEMATIC & DESIGN DATA

DRAWN BY :	APPROVED BY :	PROJECT NO. :	DRAWING NO. :
- -	- -	323072	1
DESIGNED BY :	DATE :	SCALE :	
- -	FEBRUARY 2024	N.T.S.	



GENERAL CONTRACT NOTES

LAYOUT

CONSTRUCTION SHALL NOT COMMENCE UNTIL CONTROL POINTS HAVE BEEN ERECTED AND APPROVED BY THE ENGINEER.

ALL DIMENSIONS GIVEN IN MILLIMETRES UNLESS OTHERWISE NOTED.

ALL ELEVATIONS GIVEN IN METRES.

BENCHMARK

TOP OF NORTH EAST CORNER OF DOOR SILL AT No. 14 JAMES STREET EAST.
ELEVATION 371.125

SPECIFICATIONS

OPSS, M.T.O., M.O.E., FORMS AND SPECIAL PROVISIONS.

CONCRETE AND GROUT

CONCRETE MIX TO BE A M.T.O. APPROVED DESIGN MIX WITH MINIMUM STRENGTH AT 28 DAYS OF :

MASS AND FILL CONCRETE	15MPa
IN CONCRETE BLOCK WALLS	20MPa
ALL OTHER CONCRETE	30MPa

ADMIXTURES

AIR ENTRAINMENT EXCEPT, SKIM SLABS, MASS AND FILL CONCRETE.

SUPERPLASTICIZER FOR ALL WALLS AND COLUMNS.

THE AIR ENTRAINING AGENT SHALL BE ADDED AT THE CONCRETE PLANT AND THE SUPERPLASTICIZER SHALL BE ADDED AT THE JOBSITE.

AIR ENTRAINMENT – 6% ± 1% EXCEPT FOR CONCRETE WITH SUPERPLASTICIZER TO BE 8% ± 1%.

SOURCE OF SUPPLY OF READYMIX CONCRETE MUST BE APPROVED BY THE ENGINEER.

SLUMP SHALL BE AS FOLLOWS: BASE SLABS AND FOUNDATION 50± 25mm
SKIM, MASS AND FILL CONCRETE 50± 25mm
WALLS AND COLUMNS 50± 25mm
BEFORE ADDING SUPERPLASTICIZER AND AFTER ADDING SUPERPLASTICIZER 150± 40mm

REINFORCING STEEL

ALL STEEL SHALL BE GRADE 400.

MINIMUM LENGTH OF LAPS AND HOOKS AS PER CSA CAN3–A23 M84.

CLEAR CONCRETE COVER OVER REINFORCING STEEL TO BE AS FOLLOWS:
UNFORMED SURFACES IN CONTACT WITH EARTH OR ROCK; 70 ± 20mm.

ALL OTHERS; 80 ± 20mm.

GENERAL CONTRACTOR

FOUNDATION EXCAVATION MUST BE INSPECTED AND APPROVED BY THE ENGINEER PRIOR TO PLACING BASE SLAB CONCRETE.

ALL CONSTRUCTION JOINTS SHALL BE MADE ONLY AT THE LOCATIONS SHOWN ON THE DRAWINGS USING WATERSTOPS, OR AS APPROVED BY THE ENGINEER.

SUCCESSIVE POURS SHALL BE SUITABLY KEYED TOGETHER.

POURING SEQUENCE OF CONCRETE TO BE APPROVED BY THE ENGINEER.

INSTALLED REINFORCING STEEL TO BE INSPECTED AND APPROVED BY THE ENGINEER PRIOR TO POUR.

CONCRETE NOT TO BE POURED UNDER WATER OR IN TEMPERATURES BELOW 0°C WITHOUT THE PERMISSION OF THE ENGINEER.

ALL EXPOSED EDGES TO BE CHAMFERED 20mm UNLESS OTHERWISE NOTED.

THE CONTRACTOR SHALL NOTE THAT SOME CONCRETE WORK IS SHOWN ON THE MECHANICAL DRAWINGS, & SOME MECHANICAL WORK IS SHOWN ON THE STRUCTURAL DRAWINGS.

GROUT RINGS TO BE USED WHEREVER PIPES PASS THROUGH CONCRETE WALLS.

AS CONSTRUCTED

MUNICIPALITY
KEY PLAN
NOT TO SCALE

NOTES :

1. EXISTING FARM FENCE ALONG NORTH AND SOUTH PROPERTY LINES WAS REMOVED AND REPLACED WITH NEW FARM FENCE.

BENCH MARKS :

TOP OF NORTH EAST CORNER OF DOOR SILL AT No. 14 JAMES STREET EAST. ELEVATION 371.125m

THE POSITION OF POLE LINES, CONDUITS, WATERMAINS, SEWERS AND OTHER UNDERGROUND AND OVERGROUND UTILITIES AND STRUCTURES IS NOT NECESSARILY SHOWN ON THE CONTRACT DRAWINGS, AND, WHERE SHOWN, THE ACCURACY OF THE POSITION OF SUCH UTILITIES AND STRUCTURES IS NOT GUARANTEED.

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NO.	DATE	REVISION DESCRIPTION	CH'KD

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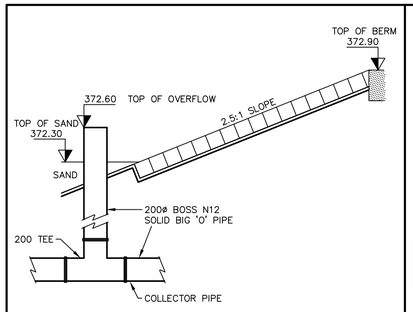
WASTEWATER TREATMENT PLANT

TOWN OF MINTO

CLIFFORD

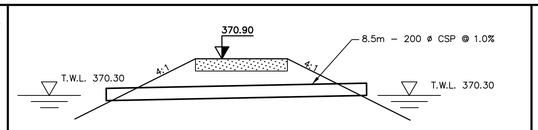
GENERAL SITE PLAN - GENERAL NOTES

DRAWN BY :	APPROVED BY :	PROJECT NO. :	DRAWING NO. :
- -	- -	323072	2
DESIGNED BY :	DATE :	SCALE :	
- -	FEBRUARY 2024	1 : 2500	



DETAIL OF OVERFLOW PIPE

N.T.S.



DETAIL OF OVERFLOW PIPE 'B'

N.T.S.

PIPE LEGEND

- TREATED EFFLUENT DISTRIBUTION PIPE (PERFORATED ALUMINUM)
- FORCEMAIN
- AIR–LINE
- CHEMICAL FEED LINE
- WATERMAIN
- SANITARY SEWER
- FILTERED EFFLUENT COLLECTOR PIPE
- PARTIALLY TREATED, TREATED EFFLUENT, OR FOUNDATION DRAIN PIPE

AS CONSTRUCTED

MUNICIPALITY

KEY PLAN

NOT TO SCALE

NOTES :

BENCH MARKS :

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WASTEWATER TREATMENT PLANT

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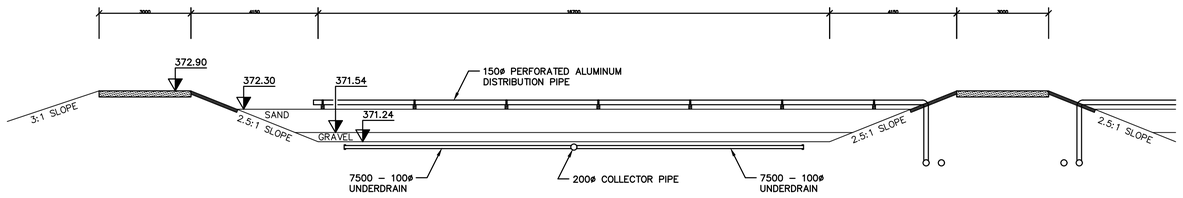
SITE PLAN

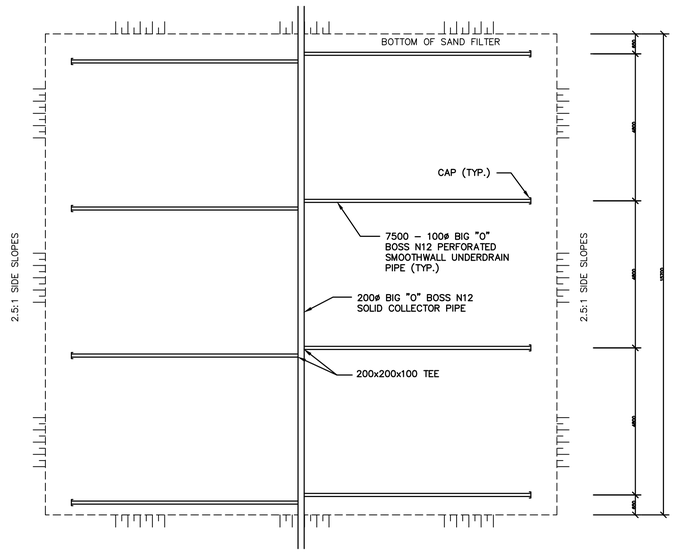
DRAWN BY :	APPROVED BY :	PROJECT NO. :	DRAWING NO.
- -	- -	323072	3
DESIGNED BY :	DATE :	SCALE :	
- -	FEBRUARY 2024	1 : 300	

FILE:W:\Listowel\2023\323072 Clifford Sewage Lagoons\5 Work In Progress\Drafting\M2318113X.DWG LAYOUT:DWG 13
LAST SAVED BY:Blambar, 2/9/2024 10:46:43 PM PLOTTED BY:Bradley Lambar - GM BluePlan 2/9/2024 10:48:36 PM



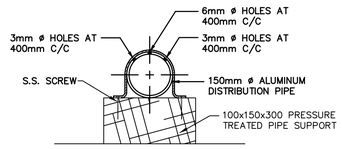
SECTION THROUGH SAND FILTER (TYP.)

SCALE 1:100



LAYOUT OF COLLECTOR AND UNDERDRAIN PIPE FOR SAND FILTER (TYP.)

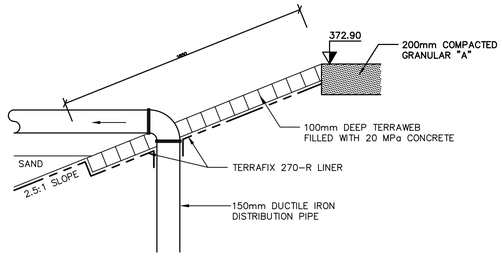
SCALE 1:100



NOTE:
ALL P.T. PIPE SUPPORTS SECURED TO PIPE WITH 150 ø HEAVY DUTY PIPE CLIP IN STAINLESS STEEL

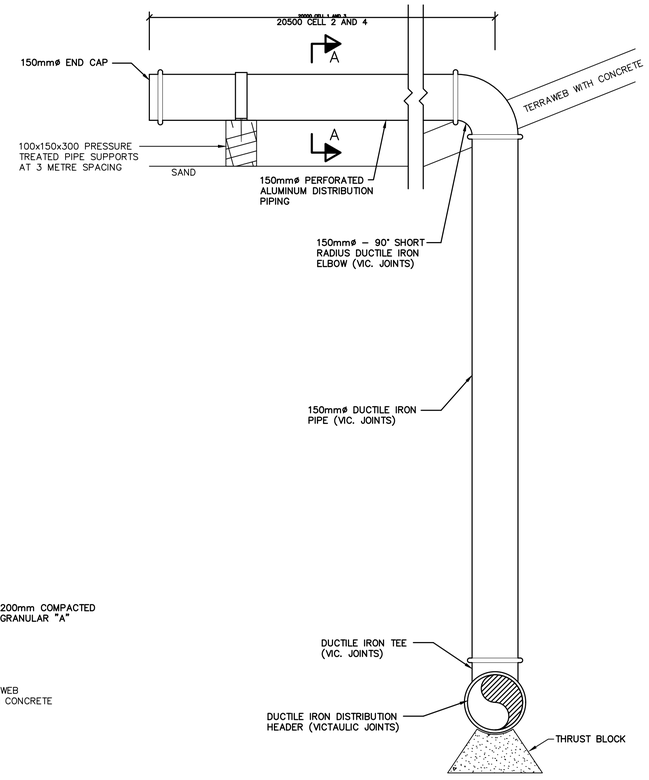
SECTION A–A

SCALE 1:10



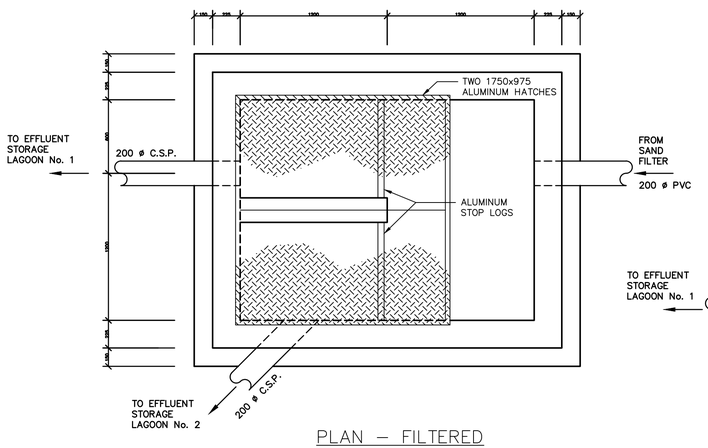
DETAIL OF SAND FILTER SLOPE PROTECTION

SCALE 1:20



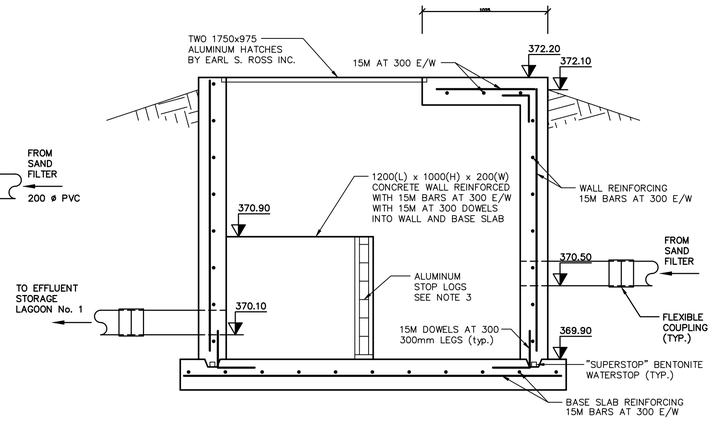
TYPICAL SECTION OF DISTRIBUTION PIPING

SCALE 1:10



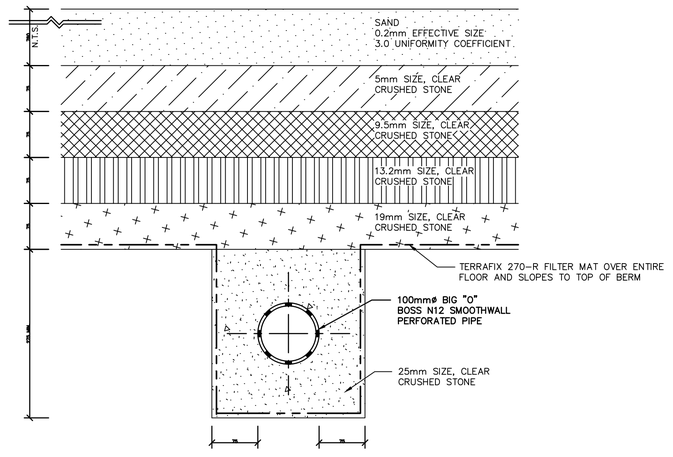
PLAN – FILTERED EFFLUENT DISTRIBUTION CHAMBER

SCALE 1:25



SECTION – FILTERED EFFLUENT DISTRIBUTION CHAMBER

SCALE 1:25



TYPICAL CROSS SECTION OF FILTER AND UNDERDRAIN

SCALE 1:5

AS CONSTRUCTED

MUNICIPALITY

KEY PLAN

NOT TO SCALE

NOTES :

1. MAX MONTHLY DISCHARGE FOR APRIL IS 40,350 m³

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CLIFFORD

LAYOUT, SECTIONS AND DETAILS

DRAWN BY :	APPROVED BY :	PROJECT NO. :	DRAWING NO. :
--	--	323072	4
DESIGNED BY :	DATE :	SCALE :	
--	FEBRUARY 2024	AS NOTED	