PRELIMINARY ENVIRONMENTAL RISK ASSESSMENT
REXTON WASTEWATER TREATMENT PLANT

Prepared for:

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DRAFT REPORT

Our File No.: 1072-1
March 23, 2011

PRELIMINARY ENVIRONMENTAL RISK ASSESSMENT

Village of Rexton

Submitted to:

Province of New Brunswick
Department of Environment
P.O. Box 6000 Fredericton, N.B.
E3B 5H1

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ABBREVIATIONS

$CBOD_5$: Carbonaceous Biochemical Oxygen Demand

CCME: Canadian Council of Ministers of the Environment

CEQG: Canadian Environmental Quality Guidelines

EDO: Effluent Discharge Objective

EQO: Environmental Quality Objective

ERA: Environmental Risk Assessment

MDL: Method Detection Limit

MWWE: Municipal Wastewater Effluent

N/A: Not Applicable

TBD: To Be Determined

TKN: Total Kjeldahl Nitrogen

TP: Total Phosphorus

TSS: Total Suspended Solids

TU: Toxic Unit

WET: Whole Effluent Toxicity

SECTION 1.0: Introduction

The Canadian Council of Ministers of the Environment (CCME) has developed a Canada-wide Strategy for the Management of Municipal Wastewater Effluent (MWWE). The Strategy was established in order to ensure that wastewater facility owners will have clarity in managing municipal wastewater effluent that will be protective of human health and of the surrounding environment.

This Environmental Risk Assessment (ERA) study is being conducted on the Village of Rexton facility, which is located off of Main Street, Highway 134, and is situated in the southeast area of New Brunswick and is approximately 80 km from the City of Moncton. It is a facultative lagoon that was built in 1994.

The ERA will determine the effluent discharge objectives (EDOs) of this facility based on either the strategy for the MWWE (described as environmental quality objectives, EQOs) or the Canadian Environmental Quality Guidelines (CEQGs), and will depend on the site and facility characteristics. Effluent discharge objectives (EDOs) are the effluent quality characteristics as they leave the wastewater treatment facility before the effluent enters the receiving water that result in the effluent meeting the environmental quality objectives (EQOs) at the edge of the designated mixing plume in the receiving water. This study will also determine if the effluent is impacting the receiving environment at the edge of the specified mixing zone.

This draft report includes a one-year period where the effluent quality from the facility is characterized (initial characterization). The complete analysis of all potential substances of concern will be included in the final report following the one-year initial characterization period.

SECTION 2.0: Facility Characterization

In order to properly conduct the ERA the correct characterization of the facility, list of substances of potential concern as well as additional possible effluent substances due to industrial discharges must be established according to the facility size and location to appropriately set the EDOs for all relevant substances present in the MWWE.

2.1 Facility Categorization

The Village of Rexton's facultative lagoon has an annual average daily flow rate of 880m^3/day for the year 2010. The facility is classified as a small WWTP since the annual average daily flow rate is predicted to be greater than 500m^3/day and less than 2,500m^3/day.

There are no industrial inputs, such as resource exploration and development, manufacturing/fabrications, processing, marine or air transport, landfill leachate, hospitals and laboratories, which exceed 5% of the total dry weather flow in the sewer on an annual average basis. Therefore, the lagoon is correctly classified as a small facility.

As indicated on attached drawing 1072-1D-C01, the effluent from the Village of Rexton's lagoon is discharged into an un-named brook that eventually discharges to Beatties Creek.

2.2 Preliminary List of Substances of Potential Concern

The substances in the effluent of potential concern evaluated in this draft report for the small Village of Rexton facility are as follow and are consistent with the CCME requirements:

Table 1: Small Sized Facility – Potential Substances of Concern

Test Group	Substances
General Chemistry / Nutrients	Total Suspended Solids (TSS) Carbonaceous Biochemical Oxygen Demand ($CBOD_5$) Total Ammonia Nitrogen Total Kjeldahl Nitrogen (TKN) Total Phosphorus (TP) pH Temperature
Pathogens	E. *coli* Faecal coliform

These substances will be sampled and monitored at the lagoon discharge location as well as at a location upstream (sampled seasonally) of the facility for a one-year initial characterization period. The levels of the substances being discharged will then be determined as being protective of the environment or requiring compliance monitoring.

It is to be noted that regardless of the one-year initial characterization results TSS and $CBOD_5$ will be selected for compliance monitoring as outlined in *Technical Supplement 3* of the CCME strategy as this monitors the efficiency of the facility's treatment.

2.3 Industrial Discharges

The industries located in the Village of Rexton are primarily service industries and include a health center, construction/lumber, pharmacy and restaurant that do also contribute to the municipal waste. However, they do not have industrial process wastewater so no additional substances of concern are to be added to the list in Table 1. The industrial input does not exceed 5% of the total dry weather flow of the MWWE as mentioned in section 2.1.

SECTION 3.0: Prepare Characterization of MWWE

Preparing the initial characterization program includes the selection of substances to be monitored, toxicity testing methods, and sampling frequencies prior to initiating the program.

3.1 Substances to be Monitored

For the initial characterization of the assessment, the substances of potential concern are listed in Table 1 of Section 2.2 and will be monitored according to the facility size as demonstrated in Table 2 of Section 3.3.

3.2 Select Toxicity Testing Methods

For a small facility size acute and chronic toxicity testing are also required in accordance with the strategy. Tests are done using the following methods:

1. The acute toxicity tests are to be done on Rainbow Trout as well as *Daphnia magna* in single concentration for a period of 96 hours. The acute test will allow for screening of concentrations high enough to cause effects over a short exposure time and will be expressed as a pass or fail. The sample for these tests is taken at the outlet chamber, prior to coming into contact with the receiving water.

2. The chronic toxicity tests are to be done on the *Ceriodaphnia dubia*. Chronic tests determine sub lethal effects such as inhibited growth or reproduction over a period of seven or more days. These tests require a sample at the outlet chamber and will be tested at different dilutions.

The acute and chronic toxicity tests are to be done quarterly, in accordance with the strategy for the initial characterization of the facility over a period of one year as shown in Table 2. This will be done this year (2011) and will be included in the final report.

During the on-site toxicity sampling, photographs of the site conditions will be taken on the different sampling dates (winter: January 13, 2011, spring: TBD, summer: TBD and fall: TBD) as shown in the Figures below:

Figure 1a: Rexton Lagoon
(Winter Conditions)

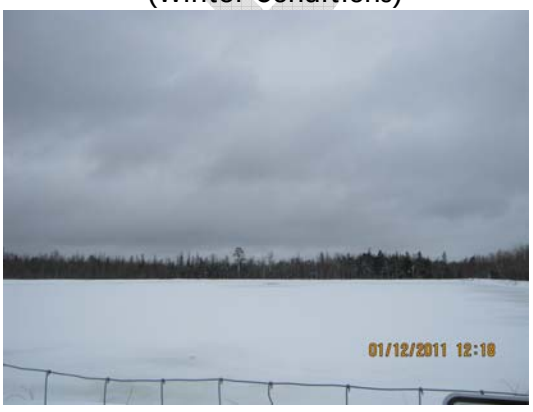
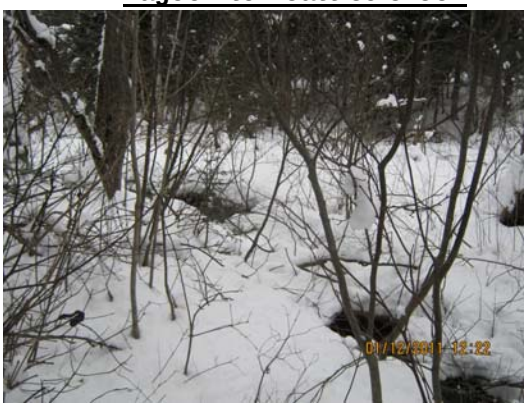


Figure 1b: Small Stream From Lagoon to Beatties Creek



The lagoon effluent collected on January 13, 2011 was done by Jessica de Vries, MIT and Scott Rogers, P. Tech from Crandall Engineering Ltd. The samples were sent immediately to Buchanan Environmental Ltd. in Fredericton, N.B. for analysis.

3.3 Sampling Frequency

Based on the size of the facility and the substances of potential concern listed in Table 1 the following table determines the sampling frequency for the initial characterization program.

Table 2: Monitoring for Substances and Test Groups for Initial Characterization
(monitored over one year continuous discharge)

Facility Size	$CBOD_5$, TSS, Pathogens and Nutrients[1]	Acute Toxicity	Chronic Toxicity
Small	Monthly	Quarterly	Quarterly

[1] Nutrients include total ammonia nitrogen, TKN (ammonia + organic N) and total phosphorus. Temperature and pH must also be measured to determine the level of toxicity of ammonia. Pathogens include E.*coli*. and Faecal coliform.

3.4 Other Considerations

The average daily flow rate will be recorded along with the samples. The operators at the Village of Rexton facility already record the flow rate when sampling the outlet parameters. They also record lagoon conditions while sampling.

It is recommended that samples be taken not less than two (2) days after rainfall or a rise in temperature that could potentially cause melting of snow and ice in order to avoid possible variances in sampling results. The operators of the facility will take note of these occurrences while sampling, but will not change the date of sampling during these occurrences due to their busy schedule and limited availabilities.

Sampling upstream of the brook, prior to the Village of Rexton's lagoon outlet, will also be conducted quarterly (to represent the different seasons) in order to compare to the CEQG and to establish a better representation of the receiving environment.

SECTION 4.0: Implementing the Initial Characterization Program

Implementing the initial municipal wastewater effluent characterization program requires careful sampling, preservation, storage and analyses of the MWWE over a one-year period in order to get precise and accurate results of the treatment facility.

4.1 Sample Collection and Analysis

Samples are to be taken in the outlet chamber in order to get the best representation of the lagoon effluent before it reaches the receiving water. The sample will be collected by method of multiple grab sampling with large enough containers to provide a sufficient volume for analysis of all required tests to be conducted on all of the potential substances of concern listed above.

The sampling container for the outlet chamber will be designated for use only at that specific location in order to prevent any cross contamination of sampling at different locations. Prior to collecting the sample, the container will be rinsed with the MWWE. The sampling techniques are to remain the same throughout the initial characterization period, but if any changes are required they will be documented.

For each sample collected, the following will be labeled on the container:

- the facility name (Rexton WWTP);
- date and time of sample;
- name of the person who collected the sample;
- weather conditions at the time of sampling;
- description of sample (influent, effluent, downstream or upstream); and,
- sample preservatives used, if applicable.

The designated accredited laboratory analyzing the samples will be contacted prior to sampling in order to pre-determine the volumes required for analyses to achieve the analytical Method Detection Limit (MDL) and to correctly prepare the laboratory containers with any preservatives, if applicable.

SECTION 5.0: Establishing Effluent Discharge Objectives (EDOs)

The single discharge ERA begins with the CEQGs, or their provincial equivalent, to first establish the EQOs for the receiving environment. EQOs for water are defined as numerical concentrations or narrative statements to protect the most sensitive designated use at a site, in this case the Rexton WWTP discharge area. The following steps will set the EQOs for this specific site location, which will be used to set the EDOs.

5.1 Water Uses on Beatties Creek

The MWWE could affect the health of the ecosystem if not carefully regulated. The CEQGs will be used based on the protection of aquatic life values. However, as mentioned in section 3.4 – Other Considerations, upstream sampling will also be conducted quarterly (representing the different seasons) for comparison to the CEQGs.

Figure 2: Beatties Creek near the Village of Rexton Facility
(November 14, 2010)

5.2 Finding Generic EQOs

There are three approaches that could be used to determine the EQOs which are the physical/chemical/pathogenic, whole effluent toxicity (WET) or biological criteria/bio-assessment approaches.

The provincial guidelines that will be used in order to determine the EQOs will be based on the physical/chemical/pathogenic (monthly sampling of lagoon effluent) combined with the WET approach (quarterly toxicity testing) in this case. The CEQGs based on the protection of aquatic life (as mentioned previously) or the upstream sampling of the brook (seasonally) will be used depending on the most conservative values. The generic values for each substance of potential concern are shown in Table 3 below and the upstream sampling values are shown in Table 4 in the next section.

Table 3: Generic Water Quality Values

Test Group	Substances	Generic EQOs (mg/L)
General Chemistry / Nutrients	TSS	25.0
	$CBOD_5$	25.0
	Total Ammonia Nitrogen	1.1-7.3
	TKN	N/A
	TP	0.055
	pH	7.0-8.7 units
	Temperature	±1°C
Pathogens	E.*coli*	200MPN/100mL
	Faecal coliform	200MPN/100mL

5.3 Characterizing the Receiving Water (Natech's Study)

In order to properly characterize the MWWE receiving environment field studies have been conducted around the Village of Rexton facility to obtain relevant information.

The upstream water quality background levels of the small brook leading to Beatties Creek are shown in the following table. (For the purpose of this Draft Report, the November 14, 2010 and February 9, 2011, values have been added; the seasonal values being obtained as part of this ERA will be added to the Table as they are determined.)

Table 4: Upstream Water Quality Background Levels

Test Group	Substances	11/14/11 (mg/L)	Winter 02/09/11 (mg/L)	Spring 2011 (mg/L)	Summer 2011 (mg/L)	Fall 2011 (mg/L)
General Chemistry / Nutrients	TSS	30.00	<5.00			
	$CBOD_5$	<6.00	<6.00			
	Total Ammonia Nitrogen	<0.05	0.08			
	TKN	0.60	<0.25			
	TP	0.06	0.013			
	pH	7.1 units	7.4 units			
	Temperature	5.6°C	---			
Pathogens	E. *coli* (MPN/100mL)	200	14			
	Faecal coliform(MPN/100mL)	700	24			
Brook Property	Flow (m^3/day)	4,320.0	---			

The brook flow was calculated, by Natech Environmental to be 50L/s (4,320m^3/day). The field investigation report is attached in Appendix B of this report.

Natech also identified the brook characteristics, upstream from the effluent discharge, as follows:

- Width: 2.3m
- Depth: 0.1m
- Velocity: 0.3m/s

The tidal behavior of the small brook leading to Beatties Creek is first observed approximately 45m downstream from the effluent pipe. During the rising tide, the effluent is pooling in the intertidal zone. During the low tide, the pooled water will be drained into the Beatties Creek estuary.

The field investigation results by Natech Environmental conclude that the near field mixing zone extends to a distance of approximately one meter. By the time the effluent reaches the end of the road culvert (approximately 13m away), the effluent is completely mixed. At this point, a dilution of 1:3 (wastewater : brook flow) has been achieved in the small brook based on the flows observed during the field investigation.

CORMIX software predicts plume dispersion of a discharge into a receiving environment. CORMIX modeling will describe the mixing plume between the effluent and receiving environment at the WWTP discharge. The aforementioned data and information will be used in order to perform a CORMIX model analysis of the effluent discharge into the small un-named brook leading to Beatties Creek.

CORMIX Simulation and Assumptions

The CORMIX model is used to predict, within the plume as defined by the model, the dispersion of the effluent being discharged from the lagoon into the brook. The assumptions made in order to run the model are shown in the following table.

Table 5: CORMIX Simulation Assumptions
(based on data obtained from initial field investigation)

Parameter	Brook
Average Depth (m)	0.1
Depth at Discharge (m)	0.1
Average Width (m)	2.3
Manning's n (units)	0.02
Mixing Zone	50% of width
Port Height Above Bottom (m)	0.1

The results obtained from the model and the above assumptions are presented in Table 6 below.

Table 6: CORMIX Simulation Results – Near Field

Parameter	Plume
Dilution (1 in)	6.0
Length (m)	1.06
Width (m)	1.6
Depth (m)	0.1

Based on the simulation, the near-field mixing zone extends to approximately 1.06 m downstream from the discharge location. The effluent is shown by CORMIX modeling to mix effectively with the brook. This was also observed during the field investigation.

5.4 Finding Background Substance Concentration

The CEQGs may not be appropriate to apply to the actual receiving environment at the Village of Rexton facility. In this case, background substance concentrations are needed in order to compare the natural environment in the upstream location to the CEQGs. The higher of the two values will be the value used in evaluating the MWWE.

Table 7: Background Substance Concentration Compared to Generic EQOs

Test Group	Substances	Generic EQOs (mg/L)	Average Background Substance Concentration (mg/L) (From Table 4 – To Date)
General Chemistry / Nutrients	TSS	25.00	17.50
	$CBOD_5$	25.00	<6.00
	Total Ammonia Nitrogen	1.10-7.30	<0.065
	TKN	N/A	0.6
	TP	0.055	0.425
	pH	7.0-8.7 units	7.25 units
	Temperature	±1°C	5.6°C
Pathogens	E.*coli* (MPN/100mL)	200	107
	Faecal coliform (MPN/100mL)	200	362

The EQO is applied at the edge of the mixing zone. Therefore, to protect aquatic life, the respective substances in the table are not to exceed the higher value between both columns (generic EQOs and Average Background Substance Concentration).

5.5 Finding Toxicological EQOs

The toxicological EQOs may be based on either the acute or chronic toxicity tests. The methods of these tests were explained in Section 3.2.

Toxicological EQOs are expressed as Toxic Units (TUs). These values are obtained by dividing 100% by the minimum percentage of effluent that produces an effect on the aquatic life being tested. The higher the value of TUs the more toxic is the effluent. If there is no effect at 100% effluent, the TU is 1.0.

Toxicological EQOs are always 1 TU_a (without dilution) or 1 TU_c (with dilution) at end-of-pipe for acute and chronic toxicity respectively.

For the Village of Rexton's facultative facility, the acute and chronic toxicity tests were sampled at the effluent discharge. The sample was tested by Buchanan Environmental Ltd. in Fredericton, N.B. (Refer to Appendix C for complete analysis.)

The results showed that the acute toxicity test was non-lethal for both the Rainbow Trout and *Daphnia magna* Bioassays. There were 10 Rainbow Trout in 25 L of aerated lagoon effluent. No fatalities were found in the effluent water, therefore, the acute toxicity test was equal to 1 TU_a for Rainbow Trout. There were 10 Daphnids in 150 mL of aerated lagoon effluent. No fatalities were found in the effluent water, therefore, the acute toxicity test was equal to 1 TU_a for *Daphnia magna.*

The sub-lethal chronic toxicity test was conducted for *Ceriodaphnia dubia* to test growth and reproducibility of the species. The effluent was diluted at seven different concentrations ranging from 1.56% to 100%. The survival and reproduction of the species were tested and shown to be non sub-lethal (>100%), therefore, the chronic toxicity test was equal to 1 TU_c for *Ceriodaphnia dubia.*

5.6 Definition of Mixing Zones

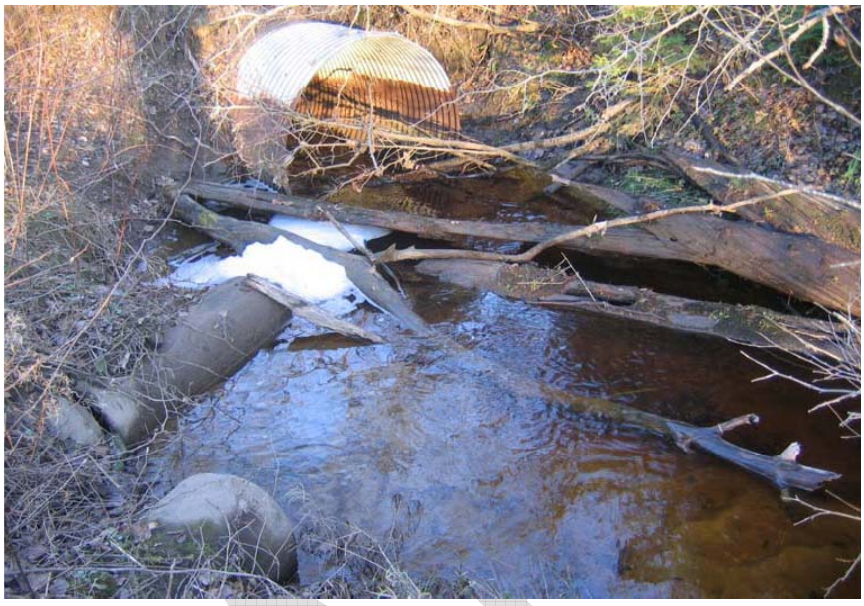
The mixing zone is the defined **portion** of the receiving water that **dilutes** the MWWE. The water quality beyond the mixing zone boundary should meet the EQOs.

The physical size of the mixing zone is not fixed but varies with time according to the effluent flow rate, design of the outfall, ambient properties (depth, velocity, density, etc.) and **concentrations of the substances** in both the receiving environment and the effluent.

The largest mixing zone created from a particular substance will be the basis for all other similar substances.

The water body is considered protected even if the environmental values are exceeded within the mixing zone, as long as the effluent does not cause significant mortality inside the zone and respects the environmental values (EQOs) at the edge of the zone.

Figure 3: MWWE Enters Small Brook Leading to Beatties Creek
(November 14, 2010)



The mixing zone will be modeled in the final report using the CORMIX software, Version 6.0, as described in Section 5.3 and calibration of the theoretical model will be done on-site with dye testing procedures conducted by Natech Environment.

5.7 Criteria for Allocating the Mixing Zone

The following criteria apply for allocating the mixing zone for the MWWE for the Village of Rexton's facility.

- The mixing zone shall be as small as possible;
- The mixing zone shall not impinge on the aquatic life;
- The area outside the mixing zone should be sufficient to support all of the uses designated by the receiving environment;
- A zone of passage for aquatic organisms shall be maintained including passage into tributaries;
- No mixing zones should be allocated for persistent, toxic and bioaccumulative substances.

5.8 Mixing Zone Limits and Acceptable Dilution for Mixing

The dimensions of the mixing zone describe where the dilution factor should be estimated in order to back calculate from the EQO of the receiving environment at the edge of the mixing zone to the EDO from the MWWE at the end of the discharge pipe.

As mentioned in Section 5.3 – Characterizing the Receiving Water, Natech's field investigation showed dilution results of 1:3 after the road culvert (approximately 13m from the discharge pipe). As the small brook grew larger in width a 1:4 dilution and finally a 1:400 dilution was achieved (approximately 100m and 150m from the discharge location respectively) prior to reaching Beatties Creek estuary, which is an additional distance of approximately 150m from the last dilution recorded.

5.9 Determine the need for EDOs

The use of reasonable and realistic worst case scenarios will be used when determining the need for EDOs, which would be dependent on the receiving environment.

From Table 8 below, by comparing the effluent discharge concentration from the Village of Rexton facility for the year 2011, it may be observed that certain substances do not require an EDO as they are lower than the EQOs listed. (This will be verified for the Final Report when the results of the 2011 sampling program have been obtained.) See attached Village of Rexton WWTP sampling results in Appendix E for further details of the 2011 results to date.

The sampling results attached in Appendix D are for the years 2008 up to 2010. It is to be noted that the samples were collected from the month of May to October, 2010 as the Village of Rexton WWTP is a facultative lagoon. During the winter months the lagoon is covered with ice as may be observed in Figure 1a of Section 3.2 – Select Toxicity Testing Methods and has historically not been required by the Province to monitor effluent quality during those months.

The initial characterization for the full year of 2011 that the ERA will be based upon will be provided in the Final Report.

Table 8: Determining the Need for an EDO

Test Group	Substances	EQOs (mg/L)	Initial Characterization - Year 2011 (mg/L)
General Chemistry / Nutrients	TSS $CBOD_5$ (BOD) Total Ammonia Nitrogen TKN TP pH Temperature		
Pathogens	E.*coli* Faecal coliform		

The initial characterization sampling for the year 2011 will be done from January until December. Table 8 will be completed in the final report.

5.10 Development of the EDOs

Upon establishing the need for an EDO from Section 5.9, the EDO will be developed where the EQO will otherwise be exceeded at the edge of the mixing zone.

Based on the effluent discharge flow (880m^3/day), mixing zone (dilution ratio of 1:3), in the small Brook, leading to Beatties Creek (flow 4,320 m^3/day) and upstream concentrations of the various substances of potential concern (Table 4) outlined in this report the EDOs may be established for the Village of Rexton facility as depicted in Table 9.

Table 9: EDOs for Substances of Potential Concern

Test Group	Substances	EQOs (mg/L)	EDOs (mg/L)
General Chemistry / Nutrients	TSS $CBOD_5$ Total Ammonia Nitrogen TKN TP pH Temperature		
Pathogens	E.*coli* Faecal coliform		

Hence, the EQOs for the various substances of potential concern for the Village of Rexton facility requires that the MWWE meet EDOs as described in the table above (when completed in the Final Report) in order to meet the mixing zone requirements.

SECTION 6.0: Selection of Substances for Compliance Monitoring

6.1 Selection of Substances

Regardless of the initial characterization program the following substances shall be selected for compliance monitoring TSS and $CBOD_5$ as these parameters describe the functionality and treatment efficiency of the facility.

Based on the initial characterization results the substances of potential concern that do not meet the EDOs shall fall under the subsequent compliance monitoring phase of the study.

The details and scope of the compliance monitoring phase will be determined after completing the initial characterization program for the year of 2011 and will be included in the final report.

6.2 Selection of Monitoring Frequencies

Compliance monitoring will study more closely the operation of the facilities following the initial characterization program. The table below represents the monitoring frequencies of $CBOD_5$ and TSS in order to document the treatment operation at the facility.

Table 10: Compliance Monitoring and Toxicity Testing Requirements
(continuous discharge facilities)

Facility Size	$CBOD_5$ and TSS[1]	Acute Toxicity	Chronic Toxicity
Small	Monthly	n/a	n/a

[1] Note that any substances of potential concern that did not meet the respective EDO shall fall under this category.

Other parameters may be added to the table, depending on the results from the initial characterization program of the facility for the year 2011.

SECTION 7.0: Conclusion & Recommendations

The primary purpose of the Draft Report is to describe and implement the initial characterization program for the year 2011 and to establish all necessary parameters required during the initial characterization period in order to be able to determine the EDOs for the Rexton WWTP facility upon completion of the one (1) year characterization period.

The following actions have been initiated to date:

1. Establishment of monthly effluent sampling of the lagoon from January 2011 to December 31st, 2011;

2. Quarterly toxicity testing of the effluent at the lagoon (including completion for the month of January);

3. Quarterly upstream sampling of the background concentrations in the receiving brook (including the completion for the winter season);

4. Field investigations and Cormix modeling of the mixing zone;

5. Preliminary EQO values for different substances of potential concern have been determined (to date) and must be compared to the natural environment (to be included in final report).

Upon completion of the ERA study (initial characterization) on the Rexton WWTP the following will be included in the Final Report:

1. Final EQO values for the different substances of potential concern, based on natural background concentrations to be sampled over the one (1) year period;

2. Effluent values of the substances of potential concern as well as toxicity test results over the one year period;

3. Finally, determination of EDOs for the different substances of potential concern.

APPENDIX A: Crandall Engineering Ltd. Drawing 1072-1D-C100

APPENDIX B: Natech Environmental Services Inc. Field Investigation Report
Dated December 12, 2010

APPENDIX C: Buchanan Environmental Ltd. Toxicity Test Results

APPENDIX D: Village of Rexton WWTP Sampling Results
Year 2008 to Year 2010

Effluent & Upstream Sampling Results - Rexton WWTP

Small Facility - Year (2008)

EFFLUENT VALUES										AVERAGE EFFLUENT VALUES: YEAR 2008
Test Group	Substances	Units	2008							
			April	May	June	July	August	September	October	
General Chemistry / Nutrients	Total Suspended Solids (TSS)	mg/L	12.00	<10.00	36.00	29.00	21.00	<10.00	33.00	13.80
	Biological Oxygen Demand (BOD_5)	mg/L	10.00	<10.00	15.00	<10.00	13.00	<10.00	16.00	13.50
	Total Ammonia Nitrogen	mg/L				2.80			6.50	4.65
	Total Kjeldahl (TKN)	mg/L		4.40		7.80			12.80	8.33
	Total Phosphorus (TP)	mg/L		<1.00		1.50			2.00	1.25
	pH	units		7.63	7.85	8.08	8.00	7.33	7.80	7.78
	Temperature	°C		12.80	19.81	23.73	20.82	17.55	11.90	17.77
Parameter	Effluent Flow	m^3/day		1069.76	754.96	357.04	743.76	481.05	300.58	617.86

Notes: Color of the lagoon was dominantly green throughout the year

Ducks were always present

Between the months of July and August some duckweek was present

Weather Conditions:

Sampler: Brent Goodwin - Town of Rexton

Effluent & Upstream Sampling Results - Rexton WWTP

Small Facility - Year (2009)

EFFLUENT VALUES										AVERAGE EFFLUENT VALUES: YEAR 2009
Test Group	Substances	Units	2009							
			May	June	July	August	September	October	November	
General Chemistry / Nutrients	Total Suspended Solids (TSS)	mg/L	44.00	12.00	32.00	<10.00	<10.00	<10.00	13.00	13.80
	Biological Oxygen Demand (BOD_5)	mg/L	15.00	12.00	10.00	<10.00	<10.00	<10.00	11.00	12.00
	Total Ammonia Nitrogen	mg/L		3.90		4.80		6.00		4.90
	Total Kjeldahl (TKN)	mg/L		6.70		6.40		9.00		7.37
	Total Phosphorus (TP)	mg/L		<1.00		<1.00		<1.00		1.25
	pH	units	8.11	8.09	7.86	8.19	8.26	7.76		8.05
	Temperature	^oC	15.66	19.09	21.58	23.38	17.52	10.49		17.95
Parameter	Effluent Flow	m^3/day	2009.53	1572.36	1095.13	1564.00	1090.67	2654.00		1664.28

Notes: Color of the lagoon ranged from light green, green to dark green thoughout the year

A lot of ducks were present until the end of September

Duckweed was bad in the month of August and some started to grow in July, but none was present afterwards or before these months

Weather Conditions:

Sampler: Brent Goodwin - Village of Rexton

Effluent & Upstream Sampling Results - Rexton WWTP

Small Facility - Year (2010)

EFFLUENT VALUES									AVERAGE EFFLUENT VALUES: YEAR 2010
Test Group	Substances	Units	2010						
			May	June	July	August	September	October	
General Chemistry / Nutrients	Total Suspended Solids (TSS)	mg/L	<10.00	14.00	19.00	16.00	<10.00		13.80
	Biological Oxygen Demand (BOD_5)	mg/L	10.00	13.00	19.00	11.00	<10.00		13.25
	Total Kjeldahl (TKN)	mg/L	7.70		7.80				7.75
	Total Phosphorus (TP)	mg/L	<1.00		1.50				1.25
	pH	units	7.47	7.67	7.53	8.09	8.21	8.10	7.85
	Temperature	^oC	14.86	19.68	24.92	22.73	17.38	10.63	18.37
Parameter	Effluent Flow	m^3/day	1022.30	965.82	655.78	750.33	1089.50	785.25	878.16

Notes: Lagoon was the color light green or green throughout the year

Ducks were present most of the year until end of September

Duckweeds caused an issue this year, the hotter it got (July, August) the more there were, some in October when it was hot, September most died off (cooler)

Weather Conditions:

Sampler: Brent Goodwin - Village of Rexton Operator

APPENDIX E: Village of Rexton WWTP Initial Characterization Program
Year 2011 (to Date)

Effluent & Upstream Sampling Results - Rexton WWTP

Small Facility - Year (2011)

EFFLUENT VALUES

Test Group	Substances	Units	2011											
			January	February	March	April	May	June	July	August	September	October	November	December
General Chemistry / Nutrients	Total Suspended Solids (TSS)	mg/L	<10.00	<10.00										
	Carbonaceous Biochemical Oxygen Demand ($CBOD_5$)	mg/L	<10.00	20.00										
	Biological Oxygen Demand (BOD_5)	mg/L	<10.00	23.00										
	Total Ammonia Nitrogen	mg/L	7.80	12.20										
	Total Kjeldahl (TKN)	mg/L	8.70	12.60										
	Total Phosphorus (TP)	mg/L	<1.00	1.80										
	pH	units	8.00	8.00										
	Temperature	°C	1.20	1.60										
Pathogens	E. *coli*	MPN/100 mL	160,000	365,000										
	Faecal coliforms	CFU/100 mL	81,000	118,000										
Toxicity Tests	Acute: Rainbow Trout	TUa	<1.00											
	Daphnia magna	TUa	<1.00											
	Chronic: *Ceriodaphnia dubia*	TU c	<1.00											
Parameter	Effluent Flow	m^3/day	1,322.00	1,322.00										

UPSTREAM VALUES

Test Group	Substances	Units	2011			
			February	April - June	July - September	October - December
General Chemistry / Nutrients	Total Suspended Solids (TSS)	mg/L	<5.00			
	Carbonaceous Biochemical Oxygen Demand ($CBOD_5$)	mg/L	<6.00			
	Total Ammonia Nitrogen	mg/L	0.08			
	Total Kjeldahl (TKN)	mg/L	<0.25			
	Total Phosphorus (TP)	mg/L	0.01			
	pH	units	7.40			
	Temperature	°C				
Pathogens	E. *coli*	MPN/100 mL	14.00			
	Faecal coliforms	CFU/100 mL	24.00			
Parameter	Upstream Flow	m^3/day				

Notes:

Weather Conditions:

Winter: ice cover over lagoon and large amount of snowfall

Sampler: Brent Goodwin, Village of Rexton Operator