Amended 19 Oct 09

The Corporation of
THE TOWNSHIP OF LANARK HIGHLANDS

PROPOSED

ADDENDUM

TO

ENVIRONMENTAL STUDY REPORT APRIL 11, 2008

FOR

WATER AND WASTEWATER PROJECT LANARK VILLAGE

PREPARED BY:

Lanark Highlands Township
and
Huber Environmental Consulting

October, 2009

The Corporation of
THE TOWNSHIP OF LANARK HIGHLANDS

TOWNSHIP OF LANARK HIGHLANDS
CLASS ENVIRONMENTAL ASSESSMENT
PROPOSED ENVIRONMENTAL STUDY REPORT ADDENDUM

The Environmental Study Report for the Water and Sewer Project for the Village of Lanark (hereafter referred to as “the ESR”) was completed in April, 2008 by Stantec Consulting Ltd to address public health concerns relating to unsafe drinking water.

In October, 2008 the Township contracted with CH2MHILL to complete the design for the project. In reviewing the ESR the consultant advised that the cost for the proposed Membrane BioReactor (MBR) wastewater treatment plant would in fact be twice the ESR estimate. In addition, advice was received that the MBR would have difficulty dealing with the hardness of the water which the village would be using.

The Township commenced a re-evaluation of the options in the ESR which were considered most viable. The result was the selection of a proposal made to the Township by Northern Watertek Corporation for an Envapocrystallization (EVC) plant which combines the Snowfluent technology in use in Westport, Ontario for the past 12 years with a warm weather digester cell/recirculating intermittent filters/high pressure spray process.

This Addendum to the ESR reviews the selection process, describes the operation of the proposed system and outlines the impacts on the natural environment. The Township retained the services of Huber Environmental Consulting to provide professional advice in producing the ESR Addendum.

The Addendum should be read in conjunction with the original report.

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APPENDICES

1.0 INTRODUCTION

The ESR for the Village of Lanark was completed in April, 2008 by Stantec Consulting Ltd. to address public health concerns relating to unsafe drinking water.

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This Addendum to the original ESR reviews the selection process, describes the operation of the proposed system and outlines the impacts on the natural environment. The Township retained the services of Huber Environmental Consulting to provide professional advice and producing the ESR Addendum. The Addendum should be read in conjunction with the original report.

2.1 EVALUATION MATRIX - WASTEWATER TREATMENT AND DISPOSAL

The Township selected the three most viable options from the original ESR for re-evaluation. These were:

- **Option # 1** A mechanical plant discharging to a shallow-bury trench as per the preferred option in the ESR but using a Sequencing Batch Reactor (SBR) or Rotating Biological Contactor (RBC) mechanical plant in lieu of the MBR. Costs were based on the ESR estimates which tied into estimates provided in earlier proposals by a design/build/operate company and by an RBC manufacturer.

- **Option #2** A mechanical plant discharging to the Clyde River via a dry ditch and natural wetlands. This is Option #19 in the ESR options assessment. Costs were altered to reflect a proposal received from a design/build/operate company and an RBC manufacturer. Additional costs are anticipated here because the high background total phosphorus in the river and low summer flows would probably require a retention pond or arrangements with the nearby golf course to handle the effluent during the summer months.

- **Option #3** An Envapocrystallization (EVC) plant recently proposed by Northern Watertek Corporation using the Snowfluent technology used at Westport plus a warm weather treatment plus spray process for the warm months.

All Options would be located on the 95 acre site owned by the Township within the old village boundary on the west side of the village. This was the site used for the preferred option in the ESR.

The evaluation matrix used in the ESR (para 5.6 and on) was used to re-evaluate these options. The criteria and weighting factors used in the ESR were used again in this evaluation.

2.1.1 Probable Costs

Table 2.1

	Option#1	**Option#2**	**Option#3**
Capital Forcemain Cost ($m)	0.5	0.5	0.5
Capital Treatment Cost ($m)	4.5	4.5	3.56
Capital Outfall Cost ($m)	2.8	0.1	0
Total Capital Cost ($m)	7.8	5.1	4.06
Capital Cost Rank	**3**	**2**	**1**
Annual Forcemain O&M Cost ($)	2,000	2,000	2,000
Annual Treatment O&M Cost ($)	281,000	200,000	100,000
Total Annual O&M Cost ($)	283,000	202,000	102,000
O&M Cost Rank	**3**	**2**	**1**

The estimated capital and operating and maintenance (O&M) costs of the mechanical plants, whether they discharged to the shallow bury trench or to the Clyde River were considered the same for the purposes of this evaluation based on information received from two design/build/operate firms. The estimated costs for the EVC system were based on a firm proposal from Northern Watertek Corporation and a NWC proposal for Munster Hamlet in 2002 which had been amended by XCG Consultants Ltd and Conestoga Rovers and Associates Ltd. Otherwise the estimated costs reflect those used in the ESR.

The results of the cost comparison are shown in Table 2.1

2.1.2 Evaluation

The evaluation marks assigned in the ESR in Table 5.9 were retained where this was appropriate. New marks are annotated with an *. The Option identified in

Table 9 as Land Application (Winter) located on the Cavanagh site was used as the basis for marking Option 3. The evaluation is shown below in Table 2.2

Table 2.2

Economical Criteria (25%)	**WEIGHT**	**OPTION#1**	**OPTION#2**	**OPTION#3**
Capital Cost	10	4.2	7.0*	10*
Operating and Maintenance Costs	15	7.0	7.9*	13.4*
Innovative Technology	5	5	4*	5
Totals	**30**	**16.2**	**18.9**	**28.4**
Environmental Criteria (21%)				
Permanent Impact on the Natural Environment	20	12	12	11
Temporary Impact on the Natural Environment	5	4	4	2
Totals	**25**	**16**	**16**	**13**
Social Criteria (54%)				
Location	10	10	10	10*
Permanent Impact on the Social environment	20	15	17	5
Temporary Impact on the Social Environment	5	4	4	2
Flexibility for Septage	10	1	1	10
Level of Acceptance by Villagers	10	6	7	4*
Public Acceptance by Residents outside the Village	10	10	6	10*
Totals	**65**	**46**	**45**	**41**
Total of Sums	**120**	**78.2**	**79.9**	**82.4**
Final Ranking		**3**	**2**	**1**

2.2 Selection of Preferred Option

This process did not provide a clear winner. However, because of the increased importance which the Township now places on O&M costs and the ability to handle septage for the Township, Option #3 became the clear winner and was selected as the preferred waste water treatment system for the village of Lanark.

3.0 PROCESS DESCRIPTION of PREFERRED OPTION

3.1 Design Flow Lanark Village is a rural community with a population of approximately 870 persons. There is no heavy industry and very few small businesses and so the waste water produced is and will be primarily residential quality.

The design flow of village sewage to the wastewater treatment plant (WWTP) is 460 cubic metres per day (cum/d) based on an average day domestic sewage production of 350 L/c/d and a 20 year equivalent design population of 1312 persons. The ESR actually shows 360L/c/d plus 40L/c/d I&I; however in the design phase, MOE Ottawa agreed to a design flow of 350L/c/d with no I&I since the project is using a vacuum collection system for wastewater (see Minutes of Meeting with MOE attached as Appendix A).
Actual flow at start up is anticipated to be approximately 220 cubic metres per day, less than one half the design flow.

3.2 Septage

If provincial legislation is passed banning the application of septage to land it will be advantageous for the Township to be able to provide septage treatment for Lanark Highlands residents. As well, by providing service to neighbouring townships this capability has potential to be a revenue generator. Therefore the Township asked NWC to include in their proposal a capability to treat septage.

During warm weather the EVC plant is designed to accept septage from Lanark Highlands and two neighbouring townships – approximately 9300 residences. Considering pump outs every three years and using 3800L (1000gal) tanks, 3100 pump outs carried out during seven months of warmer weather results in a design daily flow for septage of 54cum/d during the non-freezing months.

The septage handling facility consists of a lockable compartment which houses a pipe connection to which the septage hauler can connect his hose. Septage is then pumped through a pipe to the bottom of Cell #1.

3.3 Plant Description

The WWTP will be located on a 95 acre site to the west of the village.
The location of this site is show on the map in Figure 3.1.
The proposed plant layout on this site is shown in Figure 3.2.
The plant consists of an 8000 cu m covered retention cell #1 which acts as an anaerobic digester, a 12,500 cu m retention cell #2 which is a facultative lagoon providing treatment and storage capacity, recirculating intermittent filters (RIF), three towers, a control building and a septage handling facility.

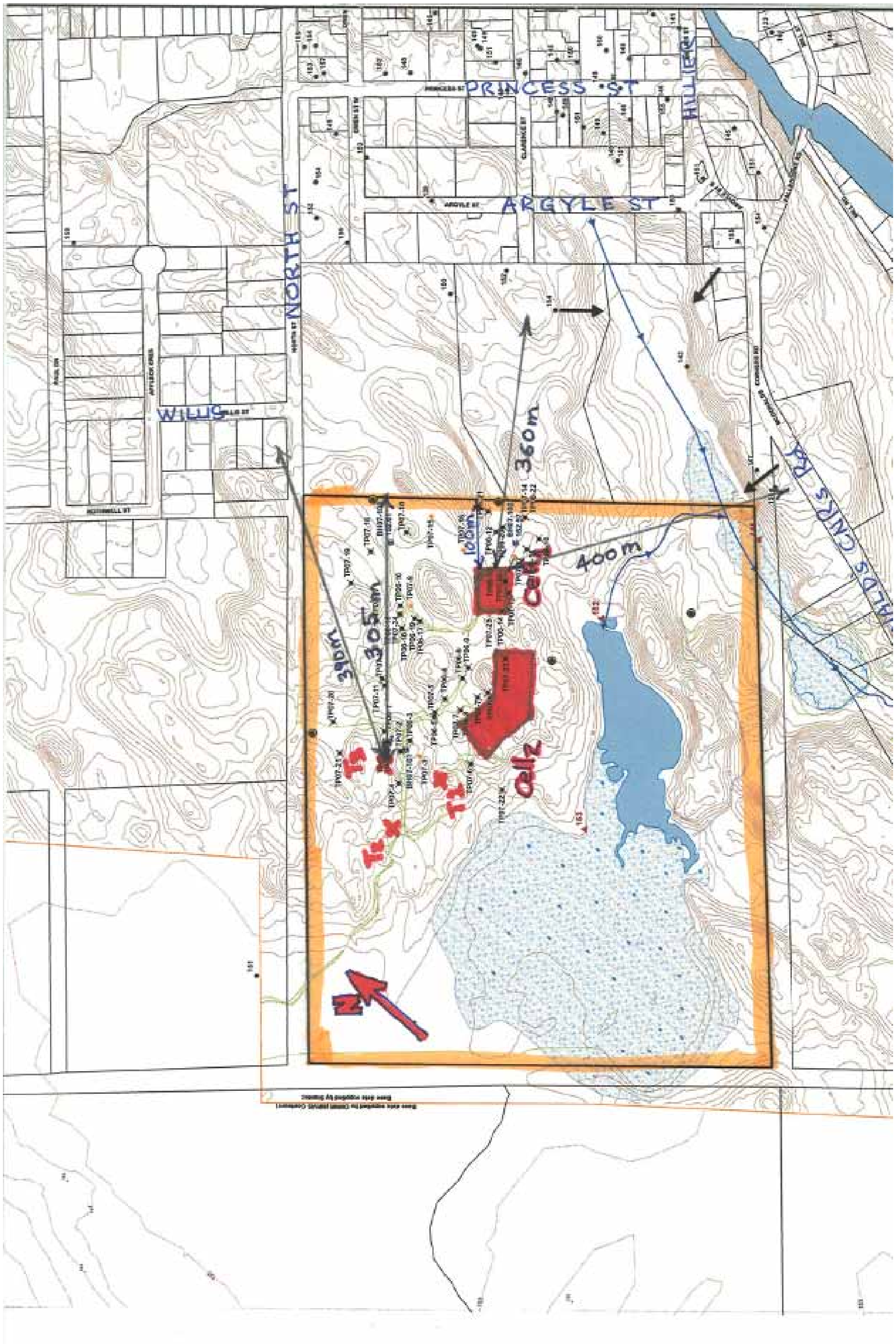
PRINCESS ST
HILLIER
ARGYLE ST
NORTH ST
WILLIS
360m
305m
380m
400m
100m
Cell 1
Cell 2
N

Figure 3.1 Site location

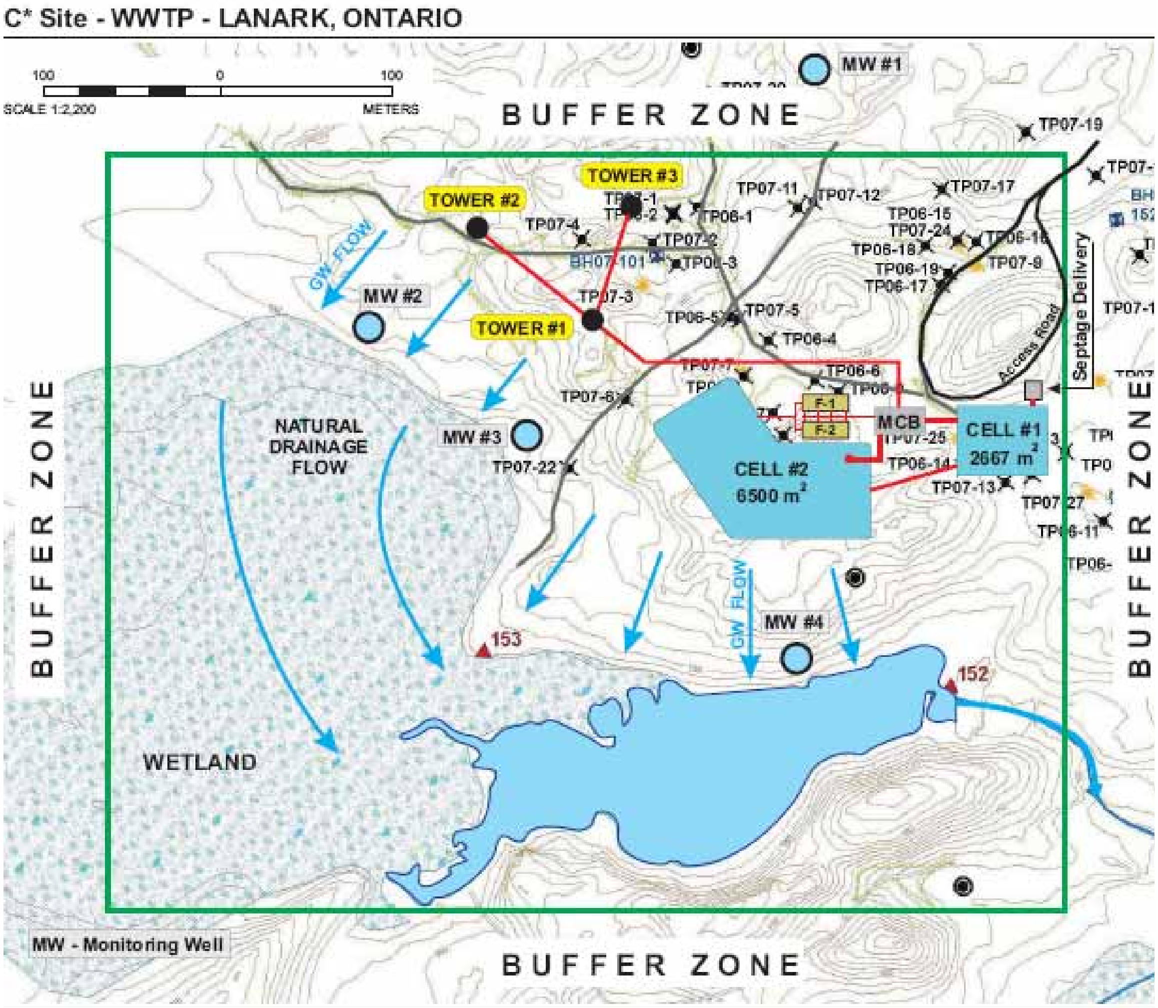

Figure 3.2 Plant Layout on the Site

3.4 Process Description

The process for both winter and warm weather operations is described in detail in Appendix B.

Winter Operations

The schematic of the plant for winter operation is shown in Figure 3.4.

In the winter, waste water is digested anaerobically in a covered retention cell #1 (retention time is a minimum of 17 days) and then passes to cell #2 which stores

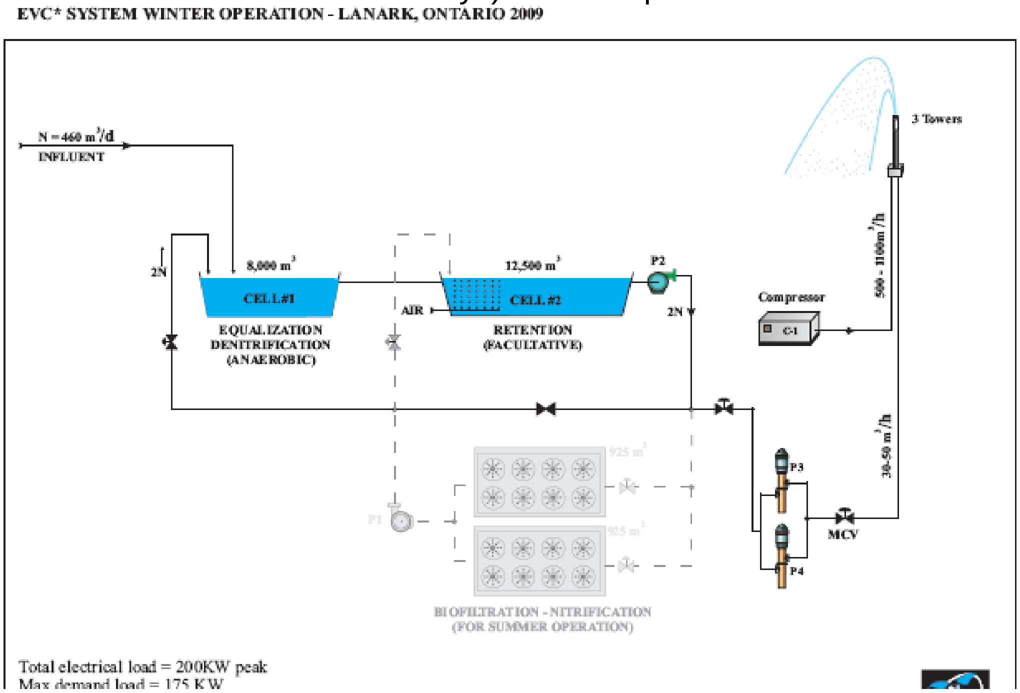

Figure 3.4 Schematic – Winter Operations

and provides further treatment. This cell allows for 27 days of storage and can be aerated as necessary to ensure against the production of odours. When temperature and wind conditions are acceptable, the treated effluent is pumped to nozzles on three towers where it is atomized with pressurized air and converted to snow. The atomizing process results in the stripping of gases such as carbon dioxide, hydrogen sulphide and ammonia which causes the pH of the wastewater to increase 1 to 2 pH units. This is sufficient to render phosphorus insoluble as the ionized ammonia slowly converts to ammonia gas in the snow pack. The gas is released (volatilized) to the atmosphere at undetectable levels. In sun light the ammonia breaks down to hydrogen and nitrogen, normally found in the atmosphere.

When water freezes it forms a pure water crystal and all impurities in suspension or solution within the droplet are forced to the outside of the crystal matrix. Before the snow begins to melt, solids, rejected from the crystals have gravitated to the ground matrix. As the snow eventually melts, the solids are left behind on the ground matrix. The very pure melt waters seep into the soil strata filtering any small particles not trapped on the soil surface and leaving these nutrients in the top 2-3 cms of the ground matrix.

The final treatment in the process involves vegetation which takes up a good deal of the water which evapotranspirates into the atmosphere as pure water vapour. The vegetation also provides further treatment by taking up nutrients and through phytoremediation. The phosphorus and nitrogen is utilized as fertilizer for the vegetation.

Warm Weather Operations

The Schematic is shown in Figure 3.5. During non-freezing conditions the effluent is treated to tertiary levels through the action of the two cells and by being circulated through Recirculating Intermittent Filters (RIF) three times. (See Figure 3.6)

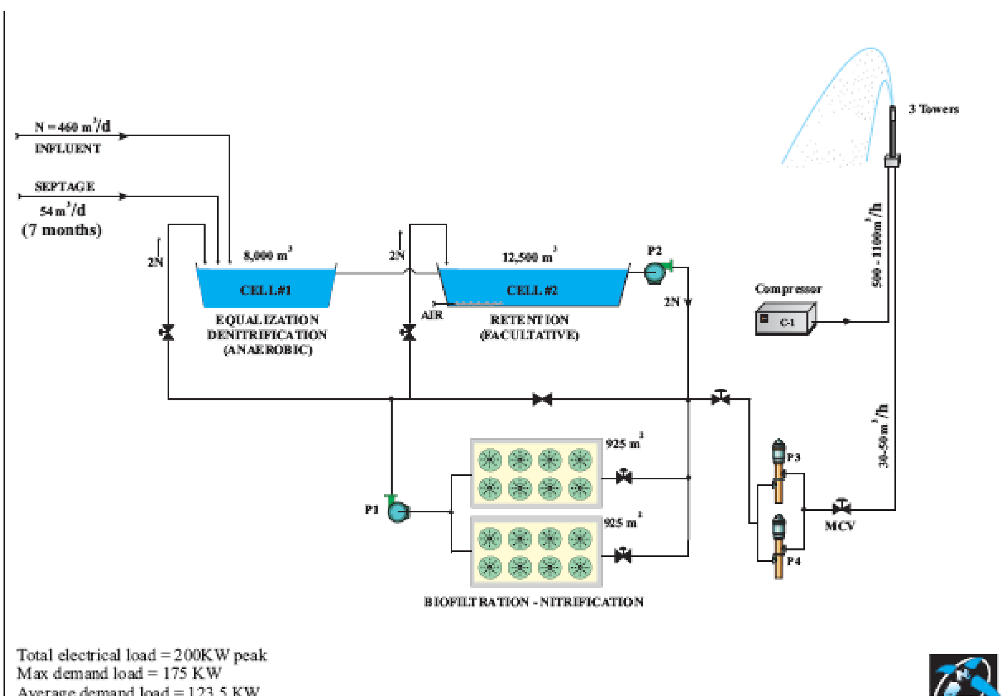

Figure 3.5 Process Schematic – Warm Weather Operation

The RIF System takes its suction on cell #2 and recycles the effluent back to cell #1. The process is designed to cycle effluent through the RIF three times to achieve tertiary level treatment. The performance of the RIF is not expected to deteriorate. In fact it may work better later than at the beginning. After some time, the biomass will develop and it will improve the quality of effluent.
Aeration will be installed in cell # 2, to ensure effective nitrification and prevent odours.

Figure 3.6 RIF Filter

The SCADA control system continuously monitors temperature, wind speed and direction and humidity. When atmospheric conditions are acceptable, the highly treated effluent from cell #2 is pumped to the nozzles at pressures up to 500 psi where it is atomized with compressed air to form very fine droplets. This allows controlled evaporation rates in the order of 50 - 70$^{\%}$ to be achieved reducing the actual amount of water being applied to the ground matrix. Gases such as carbon dioxide, hydrogen sulphide and ammonia are stripped raising the pH in a manner similar to winter operations rendering the phosphorus insoluble.

4.0 EFFLUENT DESIGN OBJECTIVES

For winter operations NWC's design objectives for the effluent melting from below the snow pact, based on data from Westport, are shown in Table 4.1 below. The values shown in the "EVC EXFILTRATION column are the design objectives.

Figure 3.7 Warm Weather Operation - Westport

Performance Summary

Primary Municipal Sewage Treatment followed by EVC* & Exfiltration

PARAMETER	INFLUENT	INFLUENT	LAGOON	LAGOON	EVC*	EVC*	EVC* + EXFILTRATION
	Low	High	Low	High	Low	High	
BOD_5 [mg/L]	120	250	6	20+	0	2	ND
SS [mg/L]	200	315	5	30	3	5	ND
pH	6.8	7.2	6.7	7.2	8	9	ND
Ammonia [mg/L]	7.5	40	7.5	40	0.1	0.1	ND
Organic N [mg/L]	1	10	1	10	0.2	0.2	ND
NO_2 [mg/L]	0.5	1	0.5	1	0.01	0.01	<0.01
NO_3 [mg/L]	1	2	1	2	0.1	0.1	<0.1
P_{tot} [mg/L]	5	15	1.5	6	0.01	0.1	ND
Fecal Coliforms	milions	milions	milions	milions	<4	<4	ND
Pathogens in Aerosols	NA	NA	NA	NA	ND	ND	NA
Coliphage in Aerosols	NA	NA	NA	NA	ND	ND	NA

Table 4.1 Design Objectives – Winter Operation

Cycle	Location	Action	Sewage	Septage	Mix	Ammonia	TSS	BOD5	TKN	Tot P	NO3	NOTES
		Influent	460 m3/d			25	210	190	40	7		
		Influent		54 m3/d		100	15,000	6,500	700	200		
Cycle 1	Cell # 1	Dilution			1542 m3/d	8	395	213	27	6	-0-	
"	Cell #1	Digestion				DC-3	DC-75	DC-60	DC-8	DC-5	ND	Anaerobic Denitrification-N2 release
"	Cell #2	Dilution				DC-2	DC-40	DC-38	DC-5	DC-4	ND	Aeration Algol growth removal
"	Cell #2	Bio Degr'n				DC-<1	DC-25	DC-11	DC-2	DC-3	IC-3	Dilution
"	RIF	Filter				DC-<1	DC-<2	DC-3	DC-<1	DC-2	IC-6	Aerobic Filtration NO3 increase Major reduction of Ammonia
Cycle # 2	Cell # 1	Dilution				ND	ND	DC-<1	DC-.7	DC-1.4	DC-2	Dilution
"	Cell # 1	Digestion				ND	ND	ND	DC-.5	DC-.8	DC-0.7	Anaerobic Digestion-N2 release
"	Cell # 2	Dilution				ND	ND	ND	DC-.3	DC-.5	DC-0.3	Dilution
	Cell # 2	Bio Degr'n				ND	ND	ND	ND	DC-.3	IC-1.5	Aeration
	RIF	Filter				ND	ND	ND	ND	DC-.1	IC-6	Aerobic Filtration
Cycle # 3	Cell # 1	Dilution				ND	ND	ND	ND	DC-0.05	DC-2	Dilution
"	Cell # 1	Digestion				ND	ND	ND	ND	DC-0.03	DC-2.5	Anaerobic Digestion N2 release
"	Cell # 2	Dilution				ND	ND	ND	ND	DC-<0.03	DC-<1.0	Aeration
"	Cell # 2	Bio Degr'n	>>>>>>			ND	ND	ND	ND	ND	DC-<1.0	Aeration DISCHARGE
"	RIF	Filter	To Cell # 1 to continue process-							new cycles	new cycles	Aerobic Filtration

N/D means non-detectable / measurements below MDL(min. detection Limit)
DC- means decrease in concentration by biodegradation or dilution(volumetric ratio of cell sizes)
IC- means increase in concentration by RIF aerobic filtering
ALL CONCENTRATIONS IN mg/l(milligrams per litre)

It is established on the basis that the total load and concentration of constituents, of the septage is added gradually, over the whole day. It is logical to lower the initial effect of the influent septage' concentrations to approximately1/4 of those indicated initially, for septage from the Design Manual.

Figure 4.2 Warm Weather Process Performance Cycling Through RIFs

For warm weather operation the process will achieve tertiary level treatment resulting in a nitrate concentration well below 5 mg/L. See Table 4.2 for NWC's estimated process performance through the two retention cells and the RIF's in series.

5.0 BUFFER AREAS

A100m buffer zone around the plant is shown in Figure 3.2.
The minimum distance from the retention cells to the nearest property line is approximately 110 m.
The minimum distance from a tower to the nearest property line is 130 m, however this is North St. and the property across the street is owned by the municipality and not zoned for development.
The minimum distance between a tower and the property line of property to the east designated for development is approximately 305m.
The minimum distance between a tower and the nearest current dwelling is approximately 390m.

6.0 IMPACTS ON THE ENVIRONMENT

6.1 Terrestrial Environment

Significant clearing has taken place on the property over the past years. Approximately seven additional hectaires will need to be cleared on the site for the access roads, retention ponds, filters, septage handling facility and Control Building.

6.2 Ground Water

As part of the ESR, Golder Associates Ltd assessed the potential impact of the MBR plant on the 95 acre site to the west of the village. They used a design average flow of 524.8 m3/day to the shallow bury trench system, and nitrate and total phosphorus concentrations of 5 mg/L and 1 mg/L respectively in the effluent going to ground.

The ESR concluded that, "with the combination of treatment and dilution by precipitation infiltration and surface runoff, the remaining nitrate and phosphorus concentrations in the treated effluent are not expected to result in unacceptable impacts to groundwater or surface water. Natural uptake by plants and microbiota in the wetland and pond may further reduce surface water concentrations."

In Appendix B, NWC makes the following points:

- the design objectives for Total Phosphorus and nitrates for the EVC* Plant are significantly below that for the MBR Plant (for example, NO3 < 1.0mg/L, Total Phosphorus: Non –Detectable);
- while the influent design flows are the same, the effluent is being applied to the ground matrix at an application rate reduced by 50-60% compared to the MBR plant because of evaporation from cell #2, process evaporation from spraying, both in summer and winter, sublimation losses during the winter, and evaporation from melting snow surfaces in the spring; and
- effluent from the EVC plant is being applied only during non-freezing weather and to the ground matrix rather than to a buried trench. Therefore vegetation and the upper topsoil layer can play a greater role in reducing hydraulic loading to ground water and providing further treatment through evapotranspiration and phytoremediation compared to the MBR plant. As well, the wetland and pond at the bottom of the site will be active and able to take up even more nutrients.

Furthermore, Golder (para 3.2 of their Report dated January 17, 2008) states the following with regard to background nitrate concentrations in the supply aquifer:

“Data from the wells to the north of the proposed sewage disposal area were reviewed to assess background nitrate concentrations in the supply aquifer. The average concentrations of the wells located along North St, immediately to the north and east of the site, are almost double the overall average (9.7 mg/L). The lowest concentration was measured at 3.2 mg/L and the highest concentration was measured at 19.1 mg/L. Wells along Affleck Crescent, Willis Street and Rothwell Street, located north of the subject property and North St. had measured average nitrate concentrations of 4.2, 2.5, and 1.5 mg/L respectively.”

Because the design objectives for the NWC proposal are below the MBR objectives and the background average nitrate levels, the proposed plant should have no adverse affect on the environment.

6.3 Surface Water

NWC states that the plant will result in zero direct surface discharge. Any surface runoff will be captured and directed to Cell #2 by means of ditching/site engineering.

However, inevitably some ground water originating from the plant will eventually pass through the wetlands and beaver flood at the south side of the site and eventually flow to the Clyde River.

The conclusions from the ESR can be applied to the EVC plant as stated for ground water. Again, an additional advantage of the EVC process is that effluent is primarily released/sprayed during the non-freezing months when the wetlands and beaver flood on the property are active and can further add to the uptake of nutrients beyond what is already deemed acceptable in the ESR.

The Mississippi Valley Conservation Authority will be requested to initiate a monitoring program for the stream leading to the Clyde to provide background data prior to construction.

6.4 Odours

This will be a major concern of villagers since the WWTP is located to the west of the village. The closest residence to a retention cell is approximately 360m to the east. For comparison purposes, in Westport the closest residence is approximately 190m to the east of lagoon #1. The houses on Highway #43 are approximately 340m east of the lagoon. Westport reports that odour has not posed a problem with their operation over the past 13 years. See Figure 6.1

The probability of odours from the proposed system is reduced because of the continuous flow through retention cell #2 throughout the year, the operation of the RIF, an aerobic process, in warm weather and the fluctuating levels in Cell #2 during the winter which results in a large air space over the cell surface providing air contact which helps keep the contents aerobic. Finally, there will be a capability to aerate the cell if necessary to assure against odour production.

The primary cell #1, is covered and if properly managed, produces primarily nitrogen, an odourless gas as a by-product of the denitrification process. The nitrified effluent from the RIF being recirculated through cell #1 will further reduce the risk of producing H2S by supplying nitrates as a source of oxygen for the bacteria and diluting the incoming wastewater.

For the first few years of operations the Township proposes to retain the services of an environmental consulting firm which has expertise in lagoon management to advise on odour management.

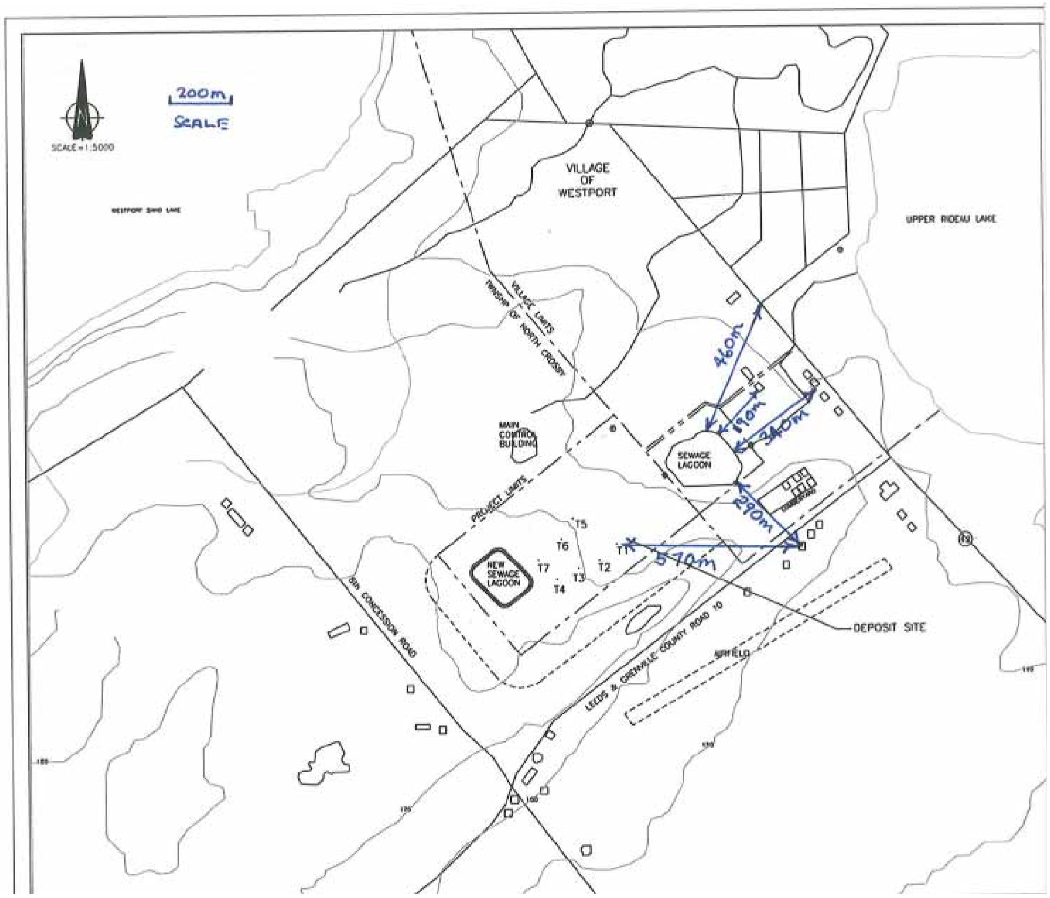

Figure 6.1 Westport Layout

6.5 Bacteria Survival and Aerosols

For warm weather operation, the combined retention times in retention cells #1 and #2 meet the requirements of MOE Design Guidelines for land application. The MOE Report – "Snowfluent – The Storage and Renovation of Sewage Effluent by Conversion to Snow" published in1985 concludes that after 19 days in the snowpack, the bacterial kill rate was in excess of 99.9%, typical of chlorinated secondary effluent. It concludes that:

- Aerosolization of bacteria resulting from the snow making process was similar to levels reported in literature for spray irrigation and adjacent to aeration sections of secondary treatment plants.
- Concentrations of pathogenic bacteria and coliphage were undetectable in the aerosol.
- Based on the above conclusions, the bacterial levels in the snow and aerosol do not pose significant health risks

The nearest habitable property is over 300m away from a tower, well beyond the minimum separation distance identified in the Ministry's standards. The Township intends to fence the property and post appropriate warning signs. Therefore, bacteria and aerosols are not deemed to be a threat to public health.

6.6 Noise

As detailed in Appendix B, sound level tests conducted at Westport indicate that noise from the towers will not impact on residences. Sound is very directional and the nozzles used in this application are pointed upwards.
The sound measured at 250m from the nozzles was less than 45Db which is the provincial standard for noise level outside the wall of any building used for accommodation. The minimum distance between a tower and a residence, both current and future is over 300m.

6.7 Safety

The Township intends to fence the property and post suitable warning signs to mitigate the risk of people/children falling into the retention cells.

6.8 Septage

Septage treatment could be provided for up to 9300 residents. The septage hauler's truck will hold three septic tanks worth of septage. Assuming pumpouts every four years, and that 75% of the pumpouts would be done during the seven warmer months, an average of four trucks per day could be expected at the treatment facility.
If this proves to be a social problem, haulage could be reduced.

7.0 MONITORING

7.1 Ground Water. Ground water would be monitored using up to 4 monitoring wells, possibly, 2 up-gradient and 2 down-gradient**.**

7.2 Surface Water. The site will be engineered to prevent any direct surface runoff from the site. It is possible that the infiltrated treated effluent could break out from ground water into the wetland and enter the pond. The waters would mix and then flow out as additional base flow for the receiving stream and Clyde River as identified in the ESR.

7.3 Topsoil. It is proposed that soil samples be taken and tested in a manner similar to Westport — every two years in the same locations. This would be finalized in discussion with MOE during the design phase.

8.0 SUMMARY OF COSTS

8.1 Capital Costs

The capital cost for the wastewater treatment plant inclusive of design, construction and commissioning, including the septage handling system, is estimated to be $3,500,000.

8.2 Operating and Maintenance Costs

The annual operating and maintenance cost including septage handling, power, labour, sampling/lab tests, consumables, transportation, communications and insurance is estimated to be $100,000.

APPENDIX A

ATTENDANCE:	Bryan Dickman	Ministry of the Environment of Ontario (MOE)
	Marcelle Jordan	CH2M Hill Canada Limited (CH2M Hill)
	Brian Hein	J.L. Richards & Associates Limited (JLR)
	Daniel Lefebvre	J.L. Richards & Associates Limited (JLR)

The meeting was held at MOE's Ottawa District Offices, 2440 Don Reid Drive, at 10:30 a.m., Friday, March 13, 2009

The following summary of the discussions of this meeting has been prepared to record and direct the project. Please advise the undersigned of any errors or omissions.

ITEM		ACTION
1.1	The purpose of this meeting was to review the design criteria for the vacuum sewage collection system proposed in the Village of Lanark.	
1.2	D. Lefebvre presented the document entitled: "Draft Sanitary Vacuum Collection System Design Criteria" (copy attached). B. Dickman indicated that his office generally supports the design criteria contained in this document. He suggested that the meeting minutes be used in support of the Application to the MOE for a Certificate of Approval.	JLR
1.3	M. Jordan suggested that the design criteria values outlined in the EA document be reviewed against the values presented at this meeting.	JLR
1.4	On the issue of lateral pipe separation requirements, it was agreed that a one metre wide pipe separation distance would suffice, given that the risk of cross contamination to the water supply system from a vacuum sewer is minimal.	
1.5	B. Hein suggested that a meeting or conference call could be held with MOE's Approvals Branch prior to a detailed application submission. B. Dickman agreed that this would be a good idea.	JLR

Prepared by:

J.L. RICHARDS & ASSOCIATES LIMITED

D. Lefebvre

SANITARY VACUUM COLLECTION SYSTEM DESIGN CRITERIA

TOWNSHIP OF LANARK HIGHLANDS
COMMUNAL SEWER AND WATER SERVICING

March 2009

FOR DISCUSSION PURPOSES

DRAFT

Prepared by:

J.L. RICHARDS & ASSOCIATES LIMITED
Consulting Engineers, Architects & Planners
864 Lady Ellen Place
Ottawa, Ontario
K1Z 5M2

DESIGN PERIOD AND TRIBUTARY AREA

The sanitary collection system will be designed for the 20-year horizon and the drainage limits will reflect those outlined in the Official Plan. Population and unit densities will also be in accordance with the Official Plan. The sewer will be sized to adequately accommodate the ultimate anticipated conditions.

DESIGN CRITERIA

Description	Per Capita Flow	Peaking Factor
Average daily domestic flow:	350 L/cap/d	Per Hamon Formula
Industrial Flow:	Case-by-case basis	Case-by-case basis
Commercial Flow:	28,000 L/ha/d	1.5
Industrial Flow:	28,000 L/ha/d	1.5

Infiltration allowance: 0 L/s/ha (Manufacturer recommends not using an allowance for infiltration)

PUMPED FLOWS

For purposes of vacuum design, any flow that enters the vacuum system via a pump will be expressed in terms of the actual discharge pump rate rather than the standard peak flow rate from the house.

DESIGN FLOW CALCULATION

The design sewage flow rate (Q) is computed by the following:

$$Q(d) = \frac{PqM}{86.4} + IA$$

Where:

- Q (d) = Peak domestic sewage flow (including extraneous flows) in L/s
- P = Design population, in thousands
- q = Average daily per capita domestic flow in L/cap/d (exclusive of extraneous flows)
- I = Unit of peak extraneous flow, in L/s/ha
- A = Gross tributary area in hectares
- M = Peaking factor (as determined from Harmon)

Peaking Factor Calculation (Harmon Formula)

$$M = 1 + \frac{14}{4 + P^{0.5}}$$

Minimum peaking factor = 2.5 (per Manufacturer)

PIPE DESIGN

Vacuum Pipe:

- Pipe sizes will be 4", 6", 8" and 10" for mains
- Design per Airvac requirements
- Pipes will be sized to handle the ultimate flow
- Pipe velocities will range from 15-18 fps (4.57 - 5.49 m/s)
- Pipe bury depth will generally be less than 6' (1.8 m) and may require insulation
- The installation of thrust blocks is not required by the Manufacturer.

Gravity Pipe (building sewer):

- 4" or 5" with a minimum slope of 2%

PIPE MATERIAL

- PVC SDR 21 double lipped gasketted pipe is proposed (Rieber gaskets are recommended by the Manufacturer).

PIT DESIGN

- Fiberglass pits will serve between 2 and 4 residential units
- Where the peak flow exceeds 3 gpm (0.19 L/s), a buffer tank (a larger pit) will be required.

VALVES

- Periodic installation of valves on branches will be proposed to isolate parts of the system.

SYSTEM ACCESS

- No access points to the system are proposed to avoid air leaks.

PIPE SEPARATION

- Since the sewage collection system is under vacuum, it is assumed that pipe separation can be less than the 2.4 m as prescribed in MOE's publication F-6-1. A minimum pipe separation of 1 m is currently proposed.

APPENDIX B

NWC PROCESS DESCRIPTION

APPENDIX C

TOWNSHIP REVIEW OF NWC REFERENCES AND TECHNOLOGY

In order to provide confidence that NWC's proposal would meet the Township's requirements and be compliant with MOE's requirements the following action was taken by staff:

1. MOE Kingston was consulted regarding the Westport Snowfluent system. MOE was happy with performance in that there has been no accumulation of metals and other inorganics in the soil matrix or groundwater at the treatment site. They have stated publicly that it is a good system.
2. Westport was asked to comment on the system and the support services provided by NWC. They are very happy with the performance of the system – compliant with MOE requirements, very few complaints with respect to odour or noise, low operating and maintenance costs – and with the support provided by NWC.
3. Discussions with the MOE Approvals official who issued the Certificate of Approval for Westport indicated a strong support for the technology while emphasizing that it is very site specific.
4. The management of a leachate treatment system near Chester, NS was consulted. NWC had recently installed a system similar to the one proposed for Lanark. Their comments along with the comments of ABL Environmental Consultants Ltd who were the design consultants for the project are attached. Both speak highly of both the company and the performance of the technology. Their comments are attached.
5. Some years ago NWC submitted a proposal to treat sewage at Munster Hamlet using a similar process. This proposal was reviewed by Conestoga Rovers and Associates and re-reviewed by XCG Consultants Ltd. In their report to the City of Ottawa dated December 2, 2002, they concluded that this technology was "expected to meet all required technical criteria for land application of wastewater at Munster Hamlet". They

reviewed and increased the cost estimates for this system and their approach was used to establish cost estimates for Lanark. Their review included discussions with Westport, with Carrabassett Valley Sanitary District in Maine, USA and with MOE.

6. Doug Huber of Huber Environmental Consulting was contracted to provide advice to the Township on NWC's proposal. He has had many years of experience in MOE in the London area, is an expert in lagoon management and conducted a two-winter trial on the Snowfluent technology. Based on a review of Golder's hydrogeological studies and NWC's proposal he is confident that the system proposed by NWC will meet the requirements of MOE on the proposed site.

From: David Daniels [ddaniels@district.chester.ns.ca]
Sent: Monday, February 09, 2009 6:37 PM
To: David Riis
Subject: RE: Northern Watertek

Good Evening David,

Our leachate treatment system consist of 5 parts; an equalization lagoon where all sources of contaminated water are collected and mixed, two re-circulating sand filters, Advanced Oxidation equipment, a retention lagoon where the treated water is stored and the EVC equipment supplied by Northern Water Teck.

All components of the system work very well except for the AO equipment. I mention this only as reference if Jeffery White makes a comment to this effect. We have de-commissioned this unit without any negative effect on the rest of the leachate treatment system. The main reason for the AO not performing lies with our engineering staff and nothing to due with Northern Water Teck and thier equipemnt.

The NWT equipment has work well from day one. Janusz, their engineer and system developer is wonderful. He designed the software to be very easy to use and understand. The ability to operate the equipment from a remote location has been very useful. I would assume Janusz would be a big part of your program, if so rest assured you will be treated very well. He has followed our system from day one and offers positive feedback on a regular basis.

Mr. White is also a valuable part of the team. He is very good at what he does, however I would not say he as "user friendly" as Janusz.

The equipment has met all expectations. The compressor, pump, tower and related parts have been without issue since the day they were installed. As any good operator will do, we have made a few operational improvements of our own. The major costs to date would be regular maintenance items. We carry very few spare parts.

The treated leachate, snow and mist, have met the discharge limits set out in our operating permit.

I would highly recommend NWT and this technology for the treatment of leachate. Our doors are always open. If you and your council wish to visit and "kick the tires" you are more than welcome. Just give me a call.

Regards,

David

From: T. Austin [taustin@ablenvironmental.com]
Sent: Thursday, February 05, 2009 5:58 PM
To: David Riis
Subject: Re: Northern Watertek

I have over 27 years expereince in water and wastewater process design. In my opiniion the EVC system is one of the few innovations in wastewater treatment that I have seen in my career. It has eliminated the need for surface water discharge which is very important in wastewater disposal. Land disposal has a much greater capacity to deal with residuals in the water than does a free flowing water. We are very pleased with the outcome of our selection. so to answer your questions:

1. as a company to deal with they delivered every thing they said they would deliver and they have offered excellent product support long after the warranty period has expired. They are very committed to thier product and its success. I wish every company had their level of committtment. They did everything they said they would do.

2. were there any surprises: we had two issues during the project. One was freezing of the tower which was due to the differing micro climate between the control building and the tower location which was in a forested area. This could have been anticipated had they spent a little more time at the site. It was corrected by removing trees around the tower to provide greater exposure. The other issue was that the tower drains did not work and caused freezing of the tower. This could have been avoided had an automated drain valve been provided in teh control building which was at a low elevation. We corrected the problem by installing a drain valve. I am not sure whether NWT was supplied by the contractor with all the drawings necessary to have properly interpreted the design so it may not have been the fault of NWT. The owner paid for the correction.

3. there were problems with the relationship between the contractor and NWT. This impacted the project and caused teh owner some distress during the project. I am not sure that this was all the fault of NWT and I am sure they were not fully paid by the Contractor, yet they have continued to support thier product and the owners operations.

4. NWT will approach any project in a very headstrong fashion and this made it difficult to work with them during the design. We were design engineers for the Municipality and had to depict the construction of the project such that it could be tendered. It was difficult to get information necessary to depict the general contractors work and the division of work among the trades. NWT felt that it was a design build while in fact it was a design tender and this lead to problems. If their work was separated into a sub contract to be given soley to them the project would flow better because I believe they are more used to that arrangment and it would lead to less conflicts.

5. they delivered the product for the amoutn budgeted before the tender.

6. the technology is more than satisfactory. It was not our intention that it would accomplish treatment and we built a very robust treatment process to remove most contaminants. However teh advanced oxidation component (by Purifics) failed to be able to treat wastewater having any biological matter and had to be bypassed. Therefore the EVC system has had to do some level of treatment to remove solids by precipitation and other means. We feel that it has provided additional resilience to the process and has performed admirably.

Hope this answers your questions. If you want to call me I would be happy to discuss anything above. I think on the whole this has been a very successful project and NWT is a very supportive technology provider.

Tom

T. Austin MSc. P. Eng.
ABL Environmental Consultants Ltd.
phone 902-466-0050
fax 902-469-4399

APPENDIX D

MOE COMMENTS ON NWC PROCESS

From: Mitchell, Vicki (ENE) [Vicki.Mitchell@ontario.ca]
Sent: Friday, May 22, 2009 2:08 PM
To: David Riis
Cc: Putzlocher, Bob (ENE); Dickman, Bryan (ENE); Taylor, Peter (ENE); Mahmood, Mansoor (ENE); Lam, Frederick (ENE)
Subject: Lanark Highlands ESR Addendum
Hi David,

Bob Putzlocher, Bryan Dickman and I have reviewed the draft addendum and have no concerns.

Bob Putzlocher comments that with respect to potential groundwater and surface water impacts, the previous hydrogeological and impact assessment remains relevant. No further site investigations are considered necessary. However, as the method of application varies from the previous proposal, the Regional Technical Support Section will review monitoring programs for both surface water and groundwater.

Bryan Dickman and Bob Putzlocher both comment that the groundwater and surface water issues (i.e. monitoring) can be addressed at the Approval stage, and that Environmental Assessment and Approvals Branch (EAAB) review of the treatment technology and design is the key factor in this ministry's review of the project.

I recommend that the figures in the addendum, particularly figure 3.1, be made larger in the final version of the addendum. It is not possible to read the map or the legend in figure 3.1.

In summary, we have no objection to Lanark Highlands finalizing the addendum and publishing the Notice of Filing of Addendum, as discussed in the Municipal Class Environmental Assessment. Once the 30 day public review period is finished, if there are no Part II Order requests then the municipality may proceed to obtain the Approval under the Ontario Water Resources Act. I understand that you have had discussions with EAAB staff about the technology, so I have copied EAAB on this email as well.

Thank you for providing the information in advance. If you have questions or concerns about the above comments, please contact me or any of the other reviewers.

Vicki Mitchell
Environmental Assessment Coordinator
Eastern Region

(613) 540-6852

APPENDIX D (Cont'd)

From: Mahmood, Mansoor (ENE) [Mansoor.Mahmood@ontario.ca]
Sent: Friday, May 22, 2009 2:37 PM
To: David Riis
Cc: Putzlocher, Bob (ENE); Dickman, Bryan (ENE); Taylor, Peter (ENE); Mitchell, Vicki (ENE)
Subject: Fw: Lanark WWTP

Attachments: Lanark Highlands Township - AB Comments.doc

Hi David
Please find attached the comments from our senior engineer from approvals branch.
The most important point is that there must be NO surface (or snow melt) runoff from the disposal field and NO aerosol drift-off during the snowfluent and spray irrigation operations. Approvals Branch would also like to highlight for all that we have some concerns that the technology would be able to achieve the high quality of the effluent claimed in the report, but would opine that a typical secondary effluent quality would be achievable and that would be good enough for spray irrigation. Unless the hydrogeological assessment was based on the high quality effluent claimed in the report. Approvals Branch do not have other concerns at this time.

Regards
Mansoor Mahmood

Sent from my BlackBerry Wireless Device

From: Lam, Frederick (ENE)
To: Mahmood, Mansoor (ENE)
Sent: Thu May 21 11:09:56 2009
Subject: RE: Lanark WWTP
Mansoor,

Attached is a word document with my comment on the proposed Lanark Highlands wastewater system. This is only regarding to the technical aspects. Other aspects such as Class EA, hydroG have to be provided by others.

Frederick Lam, P.Eng., M.Eng., LL.B.
Senior Wastewater Engineer
Wastewater Unit, Certificate of Approval Review Section
Environmental Assessment and Approvals Branch
Operations Division
Ministry of the Environment
2 St Clair Avenue West, 12 Floor
Toronto ON M4V 1L5
Tel 416 314 8186
Fax 416 314 8542

Wastewater Treatment and Snowfluent/Spray Irrigation Disposal System

Wastewater Treatment

The wastewater treatment system comprises an anaerobic stabilization cell followed a facultative cell with internal recycle from the second to the first cell. In some part of the report, the second cell is indicated to be aerated to ensure nitrification. During summer, the recycle stream from the second cell goes through an additional biofiltration process.

The hydraulic retention through the system is approximately 44 days at the proposed design capacity of 460 m3/d in winter and approximately 39 days at the proposed design capacity of 514 m3/d (including 64 m3/d of septage) in summer.

The Process Stage Performance data in tables 1 and 2 suggest the quality of the effluent from the system for winter and summer operations. The summer effluent quality is suggested to be non-detectable of almost all contaminants while the winter effluent quality is suggested to be much better than tertiary. However, the performance data is not supported by process calculations or literature references and are way beyond the typical technology based anticipated quality. If such high quality effluent can be achieved in the proposed wastewater treatment system, then discharge to surface water may be viable and the proposed disposal through snoweffluent/spray irrigation will not be necessary at all.

Nevertheless, with proper design, operation and maintenance, the proposed treatment system is capable of producing typical secondary treated effluent (25/25) in the winter. In the summer, the additional biofiltration process will enhance the quality of the effluent from the system however the effect may be offset by the co-treatment of septage which comprises about 12% of the design capacity.

Effluent Disposal

The effluent disposal system comprises snowfluent in winter and spray irrigation in summer. The proposed wastewater treatment system with proper design, operation and maintenance, will be capable of producing effluent of the required minimum quality for disposal through snowfluent and spray irrigation (25/25), subject to review and acceptance by Tech Support of the hydrogeoligical assessment of the disposal field.

The site plan in figure 2 indicates surface flow routes from the disposal field to the adjacent wetland. Apart from the application rates, it is very important to demonstrate that the topography of the field is such that there will be no runoff from the disposal field.

There must also be no aerosol or snowfluent drift off during disposal operations and supporting calculations must be included to demonstrate that the required buffer distances are provided.

Frederick Lam
Senior Review Engineer May 21, 2009