TOWNSHIP OF BONNECHERE VALLEY
EGANVILLE SEWAGE TREATMENT PLANT
BIOSOLIDS / SEPTAGE DEWATERING FACILITY
GEOTUBE / SEPTAGE PILOT PROJECT

FINAL REPORT

MARCH 2010

Prepared for

OPERATIONS COMMITTEE
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Table of Contents

APPENDICES

Aerial photo courtesy of Don Bishop

EGANVILLE SEWAGE TREATMENT PLANT

&

BIOSOLIDS / SEPTAGE DEWATERING FACILITY

1 INTRODUCTION

1.1 Background

The following is a brief overview of the development of the Geotube / Septage Pilot Project.

- In 2004 the Ontario Ministry of the Environment promoted the development of Master Plans for the Management of Biosolids and Septage at the County level.
- The County of Renfrew retained Dillon Consulting to conduct a Master Planning Study under the Environmental Assessment Act to determine the best alternative, (which is cost-effective and socially and environmentally acceptable) for the treatment and disposal of septage and sewage sludge within Renfrew County.
- The Final Report June 2005, County of Renfrew Biosolids and Septage Management Plan, documents the completion of Phase 1 and 2 of the Municipal Class Environmental Assessment. The Report is available on County of Renfrew website: (http://www.countyofrenfrew.on.ca/publicworks/envirostudies.htm)
- Concurrent to the Master Planning Study the Township of Bonnechere Valley undertook a Pilot Project at the Eganville Sewage Treatment Plant in 2005 to evaluate the suitability of the Geotube technology for septage and biosolids treatment.
- A technical report, Eganville Septage Geotube Pilot Plant Project, February 2006, was prepared for the septage processing portion of the pilot project and outlined the setup, operation and results with recommendations for future operations.
- In March 2006 the Ministry of the Environment provided a $100,000.00 grant to the County of Renfrew to assist in the evaluation of two septage treatment technologies, Geotube dewatering and lime stabilization.
- In July 2006 Bonnechere Valley Township presented a “Design and Budget Proposal for a Geotube / Septage Project at the Eganville Sewage Treatment Plant” to the County’s Septage Technical Steering Committee.
- In March 2007 the Ministry of the Environment provided an additional $105,000 grant to the County of Renfrew.
- The total grant of $205,000 was disbursed as follows: $116,000 to the Township of Bonnechere Valley to assist in the implementation of the Geotube / Septage Pilot Project, $84,000 to the Township of Horton to assist in the implementation of the Lime Stabilization Pilot Project and $5,000 was retained by the County of Renfrew for Technology Transfer Workshops.

1.2 Objectives

The objectives of this Report are to:

- Satisfy the requirements of the “Agreement” between the County of Renfrew / Ministry of the Environment and the Township of Bonnechere Valley.
- Outline the results of the Geotube / Septage Pilot Project and make recommendations with respect to implementation of full scale septage management facilities.

2 PROJECT DEVELOPMENT

2.1 Project Initiation, Preliminary Design and Approval

- The Township of Bonnechere Valley Council approved the commencement of the project to develop a Biosolids/Septage Management Facility at the Eganville Sewage Treatment Plant (STP) in January 2007.
- A Schedule "B" Municipal Class Environmental Assessment was completed.
- J.L. Richards & Associates Limited was retained to assist in the design and approval process.
- A Design Brief and associated drawings were prepared and submitted to the Ministry of Environment for approval in July 2007.
- A Certificate of Approval for the project was received in September 2007.

2.2 Process Design

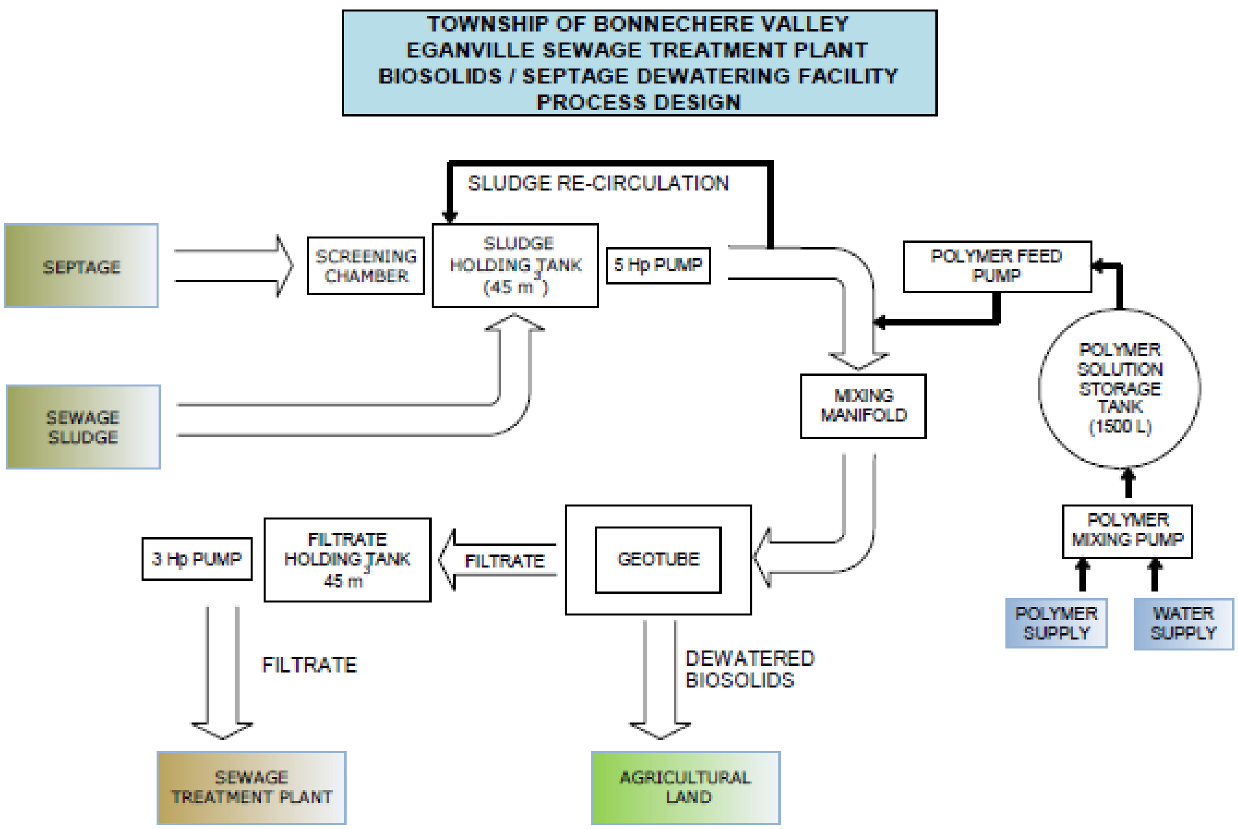
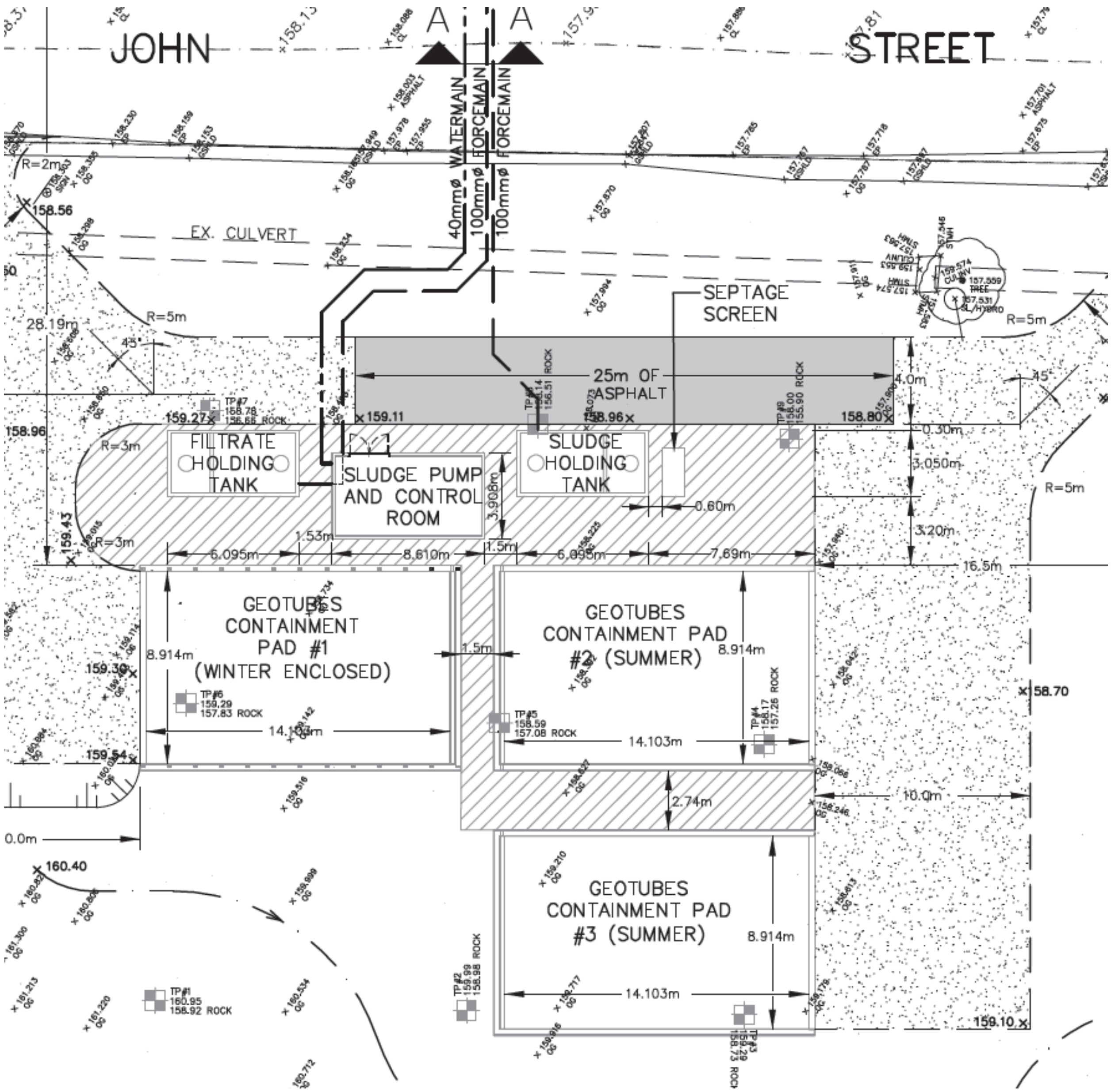


FIGURE 1

A. POLLEY 20/08/08

2.3 Site Plan



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2.4 Construction

The Township of Bonnechere Valley decided to act as General Contractor for the construction of the project and utilize municipal staff and equipment whenever possible. With the assistance of J.L. Richards & Associates Limited "Contract Documents" were prepared for the basic components: (1) Site Preparation, (2) Concrete Works, (3) Mechanical/Electrical and (4) Buildings.

Thomas Cavanagh Construction Limited was awarded the Site Preparation Contract and started in September 2007 with the excavation, engineered fill placement and drainage improvements. They were subsequently retained to provide equipment and fill as required throughout the project.

The two 45 m^3 (10,000 gal) concrete tanks were purchased from and installed by MacGregor Concrete Products (Beachburg) Ltd. in October 2007.

Boudens Building Systems Ltd. was awarded the Concrete Works Contract which included the three Geotube containment pads, septage discharge chamber and the control building floor/foundation slab. Concrete work started in October 2007 and continued through to the end of February 2008.

Harrington Mechanical Ltd. with Rondeau Electric Ltd. as a subcontractor was awarded the Mechanical/Electrical Contract which included all piping, valves, pumps, controls; polymer feed system, heating and electrical. Work started in November 2007 and continued until commissioning in June 2008.

Additional automatic flow controls and level sensors were installed by Stroma Engineering in February 2009.

Tony Zomers was awarded the Control Building Contract which was erected in February 2008.

The winter operations building (greenhouse) was purchased from Paul Boers Ltd. and erected by Boudens Building Systems Ltd. in March 2008.

Additional site works including storm sewer and catch basin replacement, road excavation, sewer and water line installation, ground water control, fill placement and compaction, landscaping, etc were undertaken by utilizing municipal staff, municipal equipment and rental equipment.

2.5 Capital Costs

The following chart provides a general outline of costs associated with the development, design, approval and construction of the Biosolids / Septage Management Facility.

ACTIVITY	2007 & 2008
PROJECT DEVELOPMENT, DESIGN & MANAGEMENT	$130,000
ENGINEERING	$100,000
SITE WORKS	$135,000
CONCRETE WORKS	$200,000
TANKAGE	$30,000
MECHANICAL & ELECTRICAL	$250,000
BUILDINGS	$50,000
MISC MATERIALS & SUPPLIES	$60,000
TOTAL	$955,000

3 COMMISSIONING

- Substantial completion of the facility occurred in April 2008
- “Start Up Notification” as required by Condition 10.(1) of Certificate of Approval No 3865-75PJAR was issued to the Ministry of the Environment on April 7, 2008
- The polymer system was commissioned by the PFE Systems Inc. representative on April 16, 2008
- All three Flygt pumps and control systems were commissioned by the ITT Water & Wastewater Inc. representative on April 17, 2008
- The polymer make down system was commissioned by Drew-Ashland Canada representative on April 17, 2008
- The municipality commissioned the facility on April 17, 2008 and started to process sewage sludge from the Eganville STP
- Septage was received from Georges Septic Pumping and then processed on April 29, 2008
- Verification that “Substantial Completion of the Proposed Works” was issued by J.L. Richards & Associates Ltd. on May 15, 2008 as required by Condition 4.1 of Certificate of Approval No 3865-75PJAR
- An “Official Opening” was held on June 26, 2008

4 BIOSOLIDS / SEPTAGE DEWATERING FACILITY

4.1 Facility Components

The basic components of the facility are:

- Paved access road
- Septage/biosolids receiving area
- Sludge storage tank
- Process/control building
- Geotube drainage pads
- Winter processing building
- Filtrate storage tank

4.2 Septage / Biosolids Receiving Area and Sludge Holding Tank

- Septage is received from hauled sewage contractors, typically a 9 m^3 (2000 gal) tanker truck and unloaded by gravity via 3” or 4” Ø hose to a discharge chamber with a ½ “ bar screen. This discharge chamber can also be used to receive biosolids from other municipal sewage treatment plants.
- The discharge chamber is connected to a 45 m^3 (10,000 gal) concrete holding tank which also has a direct line from the Eganville sewage treatment plant for transferring digested sewage sludge for processing.
- A 5 Hp Flygt submersible pump is located in the holding tank and is used to transfer septage and sewage sludge to the Geotubes. The pump is also used to re-circulate septage to produce a homogenized mixture suitable for processing.

BAR SCREEN INSIDE

DISCHARGE CHAMBER

4.3 Processing Control Building

4.3.1 Building Construction:

- The foundation is a poured concrete slab on grade with all electrical and process lines formed in.
- The 14'X24'building is wood framed, insulated and clad with metal siding on the interior and exterior.
- The building is heated with a 5Kw electric forced air unit and ventilated with a cold air inlet and a variable speed fan exhaust.
- Access is via a 76" wide double metal door.

4.4 Process Control:

4.4.1 Sludge Tank Odour Control System

- When septage is being dumped into the sludge holding tank the Odour Control System is turned on creating a negative pressure in the tank. The odorous air is drawn through a carbon based filter removing all odours before it is discharged via a vent to the outside.
- The system is also used when required while mixing septage or receiving biosolids.

4.4.2 Process Piping and Controls

The piping and control setup provides the following functions:

- Sample Ports 1 & 2 – for collecting samples for analysis and for process management
- Polymer Injection Ports 1, 2 &3 – for polymer injection into sludge
- Sight glass for visual observation of flow
- Plug Valves 1, 2 & 3 – for controlling direction of flow, recirculation in sludge tank or discharge to Geotubes
- Sludge Tank Level Indicator – for process management and pump control
- Sludge Flow Meter – for process management (flow rate) and record keeping (volume processed)
- Knife Gate Valve – for mixing polymer into sludge
- Mixing Manifold – for additional mixing and reaction time prior to discharge to Geotubes
- PLC Panel – Micrologic 1100 Controller with HMI - for pump and flow control
- VFD Sludge Pump Control Panel

4.4.3 Polymer System

Liquid Polymer Make Down System

Polymer Solution Storage Tank

Polymer Feed Pump and Control Panel

- The polymer system is designed to use a concentrated liquid polymer (cationic polyacrylamide)
- The liquid polymer make down system mixes water and the concentrated polymer to a pre-determined solution percentage
- The polymer solution storage tank has a capacity of 1500 litres and is equipped with a mixer
- A progressive cavity pump feeds the polymer solution into the mixing manifold
- The VFD control panel manages the operation of the pump

4.5 Geotube Containment Pad

- There are three 30'X50' concrete Geotube containment pads.
- The bottom of each pad is sloped at 1% to a drainage trough for the collection of filtrate
- Each pad can accommodate two 30' circumference X 46' long Geotubes
- The Geotubes are laid on top of a drainage mesh to promote dewatering
- Each Geotube has a calculated input capacity of approximately 600 cubic metres (132,000 gal.) of liquid sludge at 2.5% solids
- After dewatering to approximately 25% solids each Geotube will produce approximately 65 cubic metres of sludge

4.6 Filtrate Management System

SCREENED FILTRATE COLLECTION TROUGH

FILTRATE FORCE MAIN CONTROLS

FILTRATE HOLDING TANK

- Filtrate from the Geotube Containment Pad collection troughs flows by gravity via underground piping to the 45 m^3 (10,000 gal) filtrate concrete storage tank
- A 3 Hp Flygt submersible pump located in the tank is controlled by floats and when the tank is full the filtrate is pumped to the head works of the sewage treatment plant across the road
- The pump control panel, flow meter, sample port and valving are located inside the control building

4.7 Winter Operations

- A greenhouse structure has been placed over one of the Geotube containment pads to allow for winter operations
- The structure is an inflated double wall polyethylene cover with polycarbonate end walls
- The west end has two 8’ wide doors to allow access for removal of the dewatered sludge
- There are two unit heaters which will supplement the natural solar heating and a ventilation system to remove excess heat and moisture

5 OPERATIONS

5.1 RECEIVING SEPTAGE

Only a limited volume of septage was available as arrangements had to be made with three local Septage Haulers to divert a supply of septage from their normal field spreading operations to the facility for processing. From April 2008 to December 2009 approximately 677 m^3 of septage was received.

The septage receiving station worked as planned and did not cause any adverse situations. Typically the haulers would contact facility staff the day before delivery to ensure capacity would be available in the storage tank for their load and to avoid conflict with the biosolids processing operation.

On arrival at the facility the hauler would connect to the receiving station with a 3" Ø transfer hose and discharge by gravity via the screening chamber into the 40 m^3 storage tank. The odour management system is turned on during this operation. Discharge time for a 9 m^3 (2000 gal) tanker varied from 30 to 45 minutes. During discharge the ½" bar screen was checked on a regular basis and if necessary was raked to remove the collected debris. Once empty the transfer hose was flushed and then disconnected. The hauler would then record his name, date and volume of septage delivered into the on-site log book for record keeping purposes.

5.2 PROCESSING SEPTAGE

5.2.1 Storage Tank

When a sufficient volume of septage has been received to fill the 40 m^3 storage tank (approximately five truck loads) and in preparation for processing, the septage is re-circulated with the 5Hp submersible sludge pump. The re-circulation pre-conditions the septage by breaking down the larger solids and producing a well blended liquid sludge. Samples are collected at Sample Port #1 to observe the condition of the septage and to perform jar tests. During the re-circulation process the odour management system is operational.

5.2.2 Polymer Solution

In preparation for processing the septage into the Geotubes a batch of polymer solution is made up from the liquid concentrate. Based on the observed quality of the septage and jar testing a 0.4% to 0.8% polymer solution is made up. The volume of polymer solution made up varies from 800 to 1200 litres based on the volume of septage to be processed.

5.2.3 Geotube

For the Septage Pilot a GT500 Geotube Unit (30' X 50') was deployed onto the drainage pad at location 2B and connected to the sludge manifold with a 4" Ø discharge hose with quick disconnect fittings.

5.2.4 Processing

The following steps describe a typical processing operation:

- Septage is re-circulated in the storage tank until well blended.
- The polymer feed pump is initially set to a predetermined feed rate, typically in the 10 to 15 Litres per minute (Lpm) range and then programmed to start and stop with the sludge pump.
- The sludge pump is started and after a flow is established the flow rate is typically set in the range of 8 to 10 Litres per sec (Lps).
- Within a few minutes of the starting the process samples are collected at Sample Port #2 to determine the consistency of the floc being formed and to observe the solids/liquid separation.
- Adjustments are made either to the flow rate or the polymer feed rate to achieve a desired floc formation and a good solids/liquid separation.
- The quality of the filtrate discharging from the Geotube is observed for clarity which indicates the degree of solids/liquid separation occurring inside the Geotube.
- The ongoing process is monitored by collecting samples from Sample Port #2. Adjustments are made to either the flow rate or polymer feed rate to maintain an optimum solids/liquid separation.

6 MONITORING

6.1 Volume

From April to December 2008 approximately 502 cubic metres of septage was processed into one 30’X50’ Geotube. At the end of the year the height of dewatered septage in the Geotube was approximately 0.6 of a metre. This would equate to approximately 35 cubic metres of dewatered septage in the 10% solids range.

From July to December 2009 an additional 175 cubic metres of septage was processed into the same Geotube.

6.2 Raw Septage Analysis

During 2008 composite samples were taken from septage batches in June through October and submitted to a certified lab (Caduceon) for analysis. Additional sampling was done in conjunction with the Ministry of the Environment (MOE) in November and analysis provided by the MOE Toronto Lab.

During 2009 composite samples were taken from septage batches in August, September and December with analysis being provided by the MOE Toronto Lab.

The analyses are summarized in Appendix 1 with lab analysis reports in Appendix 4.

6.3 Septage Filtrate Analysis

During 2008 composite samples were taken from septage batches in June through October and submitted to a certified lab (Caduceon) for analysis. Additional sampling was done in conjunction with the Ministry of the Environment (MOE) in November and analysis provided by the MOE Toronto Lab.

During 2009 composite samples were taken from septage batches in August, September and December with analysis being provided by the MOE Toronto Lab.

The analyses are summarized in Appendix 1 with lab analysis reports in Appendix 4.

6.4 Dewatered Septage Analysis

A composite sample was taken in November 2008 from the dewatered septage in the Geotube in conjunction with the Ministry of the Environment (MOE) and analysis provided by the MOE Toronto Lab.

During 2009 composite samples were taken from septage batches in August, September and December with analysis being provided by the MOE Toronto Lab.

The analyses are summarized in Appendix 1 with lab analysis reports in Appendix 4.

The analysis summary is restricted to selected parameters however the lab analysis reports contain a far broader range of parameters and is provided for those who wish to further evaluate the process.

6.5 Septage Comparison

The results of the septage analysis were reviewed and specific parameters related to the land application criteria of biosolids were selected for comparison purposes.

PARAMETER	RAW		FILTRATE		DEWATERED	MOE*
METALS	mg/L	mg/Kg (calculated)	mg/L	mg/Kg (calculated)	mg/Kg dry	mg/Kg dry
Arsenic	0.024	1.5	<0.001	<0.7	5	170
Cadmium	0.30	1.8	<0.005	<3.5	1.9	34
Chromium	0.232	14.5	0.050	35.7	18	2800
Cobalt	0.100	6.3	<0.005	<3.5	1.2	340
Copper	5.547	346	0.027	19	505	1700
Lead	0.475	29.6	<0.02	<14	32	1100
Mercury	0.011	0.68	<0.02	<14	0.2 (wet)	11
Molybdenum	0.125	7.8	<0.02	<14	7.7	94
Nickel	0.211	13.1	<0.02	<14	16	420
Selenium	0.039	2.4	<0.002	<1.4	5	34
Zinc	10.905	681	0.056	40	1045	4200

*Table 1: Criteria for Metal Content in Sewage Biosolids

PARAMETER	RAW		FILTRATE		DEWATERED
NUTRIENTS	mg/L	mg/Kg (calculated)	mg/L	mg/Kg (calculated)	mg/Kg
Ammonia	132	8306	125	89285	N/A
Phosphorus	189	11825	7	437	16
TKN	480	30000	166	118571	26
PHYSICAL					
BOD	3761		413		N/A
Total Solids	16000		1400		14%
Total Suspended Solids	9400		121		N/A
MICROBIOLOGICAL					
E. coli (c/1g dry)	260,000 – 2,300,000				1,500 - 30,000**

** Samples taken within several weeks of raw septage being processed into Geotube.

7 BIOSOLIDS

Although the main purpose of this report is to discuss the septage pilot project the facility was also designed to process biosolids generated from the Eganville Sewage Treatment Plant on a year round basis. The general observations and monitoring results from this activity are presented in the following sections as they directly relate to the success of the overall concept of utilizing the Geotube technology.

7.1 Receiving Biosolids

Aerobically digested biosolids from the Eganville Sewage Treatment Plant are transferred directly to the 40 m^3 storage tank via a 4" Ø force main. Transfer is initiated by the operator and is then automatically controlled by level sensors within the storage tank to prevent overfilling.

During the winter of 08/09 and 09/10 the Cobden Sewage Treatment Plant contracted the haulage of their aerobically digested biosolids to the Eganville facility for processing and disposal. The tanker truck operator delivering the biosolids utilized the same receiving station and procedure as the septage haulers.

7.2 Processing Biosolids

The processing of biosolids followed the same procedure as described previously for septage.

(DIGESTED SLUDGE PRIOR TO POYMERIZATION)) (GEOTUBE FILTRATE)

GEOTUBE DURING FILL CYCLE WITH POLYMERIZED DIGESTED SEWAGE SLUDGE

(DIGESTED SLUDGE PRIOR TO POYMERIZATION)) (GEOTUBE FILTRATE)

7.3 Winter Operations

Winter operations were designed into the facility by the erection of a greenhouse over one of the concrete containment pads. During the winter of 08/09 two Geotubes were utilized for biosolids generated by the Eganville STP and the Cobden STP and for the winter of 09/10 one Geotube was utilized. Weather conditions in 09/10 permitted the use of the Geotubes located outside into late January.

7.4 Monitoring

7.4.1 Volume

From April 2008 to the end of December 2008 approximately 997 cubic metres of aerobically digested sewage sludge was transferred over from the Eganville STP and processed. In 2009 approximately 1146 cubic metres from the Eganville STP and 180 cubic metres from the Cobden STP were processed. For 2008 and 2009 a total of 2323 cubic metres were processed. A summary of the volumes processed and Geotubes utilized is attached as Appendix 2.

7.4.2 Analysis

A summary of the aerobically digested sewage sludge analysis from the Eganville STP is attached as Appendices 2 and 3.

Additional sampling and analysis was done on the dewatered biosolids for comparison purposes and the results are attached as Appendices 2 and 3.

A comparison summary of the results is provided below:

PARAMETER	BIOSOLIDS		DEWATERED				MOE*
METALS	2008	2009	2008 Sludge		2009 Sludge		
mg/Kg			Geotube 3A(1)	Geotube 2A(1)	Geotube 1A(1)	Geotube 1B(2)	
Arsenic	1.14	3.89	10	6	14	14	170
Cadmium	1.42	1.40	10	4	6	5	34
Chromium	11.96	10.33	103	102	162	245	2800
Cobalt	1.61	1.53	14	14	27	27	340
Copper	350.81	384.93	3200	3153	4585	4736	1700
Lead	20.86	11.13	177	182	405	300	1100
Mercury	1.01	1.05	7	5	8	8	11
Molybdenum	5.12	3.02	22	22	27	36	94
Nickel	10.19	8.33	66	66	117	136	420
Selenium	3.03	4.28	11	4	2	4	34
Zinc	341.87	276.65	2955	2985	3225	3445	4200

*Table 1: Criteria for Metal Content in Sewage Biosolids

PARAMETER	BIOSOLIDS		DEWATERED			
	2008	2009	2008 Sludge		2009 Sludge	
NUTRIENTS			Geotube 3A(1)	Geotube 2A(1)	Geotube 1A(1)	Geotube 1B(2)
	mg/l	mg/l	mg/g (dry)	mg/g (dry)	mg/g (dry)	mg/g (dry)
Ammonia	12.69	8.14				
Phosphorus	682	680	29	32	40	32
TKN			33	31	39	30
PHYSICAL						
Total Solids	2%	2%	14%	14%	11%	11%
MICROBIOLOGICAL						
E. coli			5400	<10000	<10000	<10000

7.5 Dewatered Biosolids

On October 27, 2009 during the technology demonstration event Geotube 2A(1) was opened and the contents removed utilizing a front end loader. The composition of the dewatered biosolids varied from an outer dry friable brownish layer to a centre core of more greyish material. No significant odour was observable from the dewatered biosolids as it was removed from the opened Geotube. The material was easily loaded onto a dump truck and hauled away for utilization at one of the Townships approved "Organic Soil Conditioning Sites". Once deposited on site the material was then loaded onto a farm manure spreader for distribution on the approved fields.

CONDITION OF DEWATERED BIOSOLIDS AFTER 12 MONTHS FROM LAST FILL

8 FINANCIAL

8.1 Operational Costs

To determine the operational costs associated with dewatering biosolids and septage utilizing the Geotube technology the following activities were considered.

ACTIVITY	COST PER CUBIC METRE OF LIQUID SEWAGE SLUDGE / SEPTAGE PROCESSED
Labour (STP Operator)	$5.00
Chemical (polymer)	$1.40
Electrical	$ 2.25
Geotube	$12.00 ($6.00)*
Disposal (agricultural utilization)	$4.00 ($2.00)**
Total	$24.65 ($16.65)
* Geotubes not utilized to full capacity due to operational changes, estimated actual cost for full utilization would be $6.00 / m^3	
** Disposal cost high due to difficulty of removing semi-solid sludge from Geotubes in greenhouse. Future operations will have significant reduction in equipment and labour costs therefore it is estimated that it will be $2.00 or less per cubic metre.	

Additional details on how these operational costs were calculated are provided on the attached "Project Work Sheets" in Appendix 5.

8.2 Amortized Capital Costs

Although a portion of the capital costs were covered by government grants the remaining capital was borrowed by the Municipality over a 15 year term. Based on current interest rates the annual payback is approximately $33,000 and is included in the annual budget for the overall sewage operations. For 2009 this would equate to $25 per cubic metre of biosolids processed due to the limited volume. An increase in volume processed would reduce the per cubic metre cost.

8.3 Cost Comparisons

Prior to the development and utilization of the Biosolids / Septage Dewatering Facility by the Eganville STP biosolids were field spread during the summer and hauled to ROPEC in Ottawa for disposal during the winter. Based on a review of the 2005, 2006 and 2007 activities the cost per cubic metre of biosolids removed from the Eganville STP was approximately $25. This does not include any related municipal labour or other activities.

Additional details on how these cost comparisons were calculated are provided on the attached "Project Work Sheets" in Appendix 5.

9 TECHNOLOGY TRANSFER

9.1 Tours

A broad spectrum of interested parties toured the facility during 2008 and 2009 to view the management of septage and biosolids utilizing the Geotube technology. Representatives from many Municipalities across Ontario attended the facility and in fact several Municipalities came back a number of times to review and discuss biosolids and septage solutions for their own area. Additionally septage haulers from around the Province visited on numerous occasions including the Executive of OASIS.

9.2 Public Technology Demonstration Events

Public technology demonstration events were held on October 22, 2008 and on October 27, 2009 which provided an opportunity for interested parties to view the processing of both septage and biosolids utilizing the Geotube technology. Additionally in October 2009 a Geotube containing dewatered sewage sludge was opened and observed by those in attendance. Technical documentation on the process was available for those interested. Attendees included representation from the general public, the agricultural community, municipalities, consulting firms, septage haulers and provincial agencies.

9.3 Information Requests

As a result of the tours, demonstration days and general awareness of the Biosolids / Septage Dewatering Facility numerous requests were made for detailed information on all aspects of the operation from the public's perspective to polymer solution concentrations and pump capacities.

9.4 Bishop Water Technologies

Don Bishop, Kevin Bossy and Mathew Green of Bishop Water Technologies have likely been the greatest disseminators of information in regards to the applicability of the Geotube technology for the dewatering of septage and biosolids. Their involvement in the project from its inception has facilitated a full understanding of infrastructure needs, process management, sludge quality and utilization opportunities. Additionally their involvement in other projects utilizing Geotube technology has enhanced the overall knowledge base available to potential users.

10 DISCUSSION

10.1 Design and Construction

During the development of the project and the Municipal Class EA process a simple basic design evolved that carried through to final design, approval and construction. Site conditions were challenging and increased the overall capital costs as did the winter construction phase.

Several design element modifications have been identified that could be considered for future projects or retrofits.

10.1.1 Geotube Capacity

The initial design was based on the calculated capacity of Geotubes based on the assumption of a dewatered sludge at 25% solids. In fact to achieve this it would be necessary to cycle the filling of the Geotube over at least a two year period with several winter freeze cycles prior to removal. As a result the available drainage pad lay down area becomes the restrictive element for the overall capacity of the facility. It may be more appropriate to design on a 15% solids target and ensure that there is additional drainage pad lay down area if possible.

10.1.2 Drainage Pads

The concrete pad design works well for the containment of the Geotube and for the drainage of the resultant filtrate. Having one end open with just a small lip allows easy access for a front end loader to remove the contents of the Geotube. The size of the pads should be maximized based on site conditions to allow for the largest Geotubes possible. This will significantly increase the overall capacity of the facility and provide for longer retention times to achieve higher % solids and greater stabilization of the organics.

10.2 Operations

The management of the Biosolids / Septage Dewatering Facility is part of the overall responsibility of the Water and Sewage Department. Sewage treatment plant staff operates the facility on an as needed basis with typical batches being in the 30 cubic metre range and taking about 1\2 day to process. All of the equipment is typical to what is found in a normal sewage and/or water plant operation so no additional qualifications are required above the normal onsite training.

10.3 Full Scale Operations

The intent of the Geotube / Septage Pilot Project was to demonstrate the feasibility of using this technology for the management and treatment of septage in light of the Provincial Policy Statement requirements and other proposed legislative restrictions on the spreading of untreated septage on land.

Although the final disposition of the dewatered septage contained within the Geotube has not been established the evaluation of the process has clearly demonstrated that this is a viable management and treatment option.

The analysis and observations to date have confirmed the following:

- that the septage will dewater adequately to allow for easy removal from the Geotube and transportation offsite
- odour during processing and storage is minimal
- metal and nutrient analysis are within the current MOE biosolids guidelines
- pathogens are significantly reduced and easily meet the MOE biosoilds guidelines
- the resultant dewatered septage is similar in nature to dewatered biosolids but with lower metal and pathogen content
- the dewatered septage has the potential for use as an agricultural soil amendment similar to biosolids or as a compost feed stock

10.4 Financial Viability

Based on a review of the capital costs in 2007 and 2008 and operational costs during 2008 and 2009 an understanding of the financial viability of utilizing the Geotube technology for the management of septage and biosolids has started to emerge.

As identified in the report it has been established that the current operational cost of managing a cubic metre of septage and/or biosolids at this facility is approximately $25.00 with the acknowledgement that the Geotube and disposal costs will be reduced based on improved operations bringing the per metre cost down to approximately $17.00 or less. Additionally it is acknowledged that savings could also be expected by increasing the scale of the operation.

The capital cost of this facility was affected by a number of factors which may not apply to other undertakings. Initial planning and development of a new technology concept would not be required as for this facility. Additionally site conditions and winter construction significantly affected the cost. Also the facility had to be established remote from the sewage plant therefore requiring additional infrastructure. If the pumping and polymer injection system could be housed in existing structures significant cost savings could be realized. If sludge drying beds or sludge storage facilities existed there could also be significant savings related to the required lay down area and drainage system for the Geotubes.

10.5 Additional Municipal Benefits

10.5.1 Provincial Policy Statement

The Provincial Policy states in Section 1.6.4 Sewage and Water, Subsection 1.6.4.1e) that there will be an “allowance of lot creation only if there is confirmation of sufficient reserve sewage system capacity including treatment capacity for septage”.

By the establishment of the Biosolids/Septage Dewatering Facility at the Eganville STP the Township of Bonnechere Valley is fully compliant with this section of the Provincial Policy Statement and can now encourage and accommodate both urban and rural development.

Although a specific dollar value cannot be provided for this benefit it has to be considered in the overall financial viability of the Biosolids/Septage Dewatering Facility.

10.5.2 Additional Revenue

By providing a winter disposal service for biosolids from other small municipal sewage treatment plants in the area on a cost plus basis a revenue stream is generated which helps offset some of the operational costs.

If and when there is a need to receive septage from the local haulers a fee structure will be established which will also offset some of the overall operational costs.

Currently the entire capital and operating cost of the facility is financed by the serviced population of the Village of Eganville. By bringing in additional outside revenue there would be an equalization of financial responsibilities.

10.5.3 Future Financial Stability

With the establishment of the Biosolids/Septage Dewatering Facility at the Eganville STP the Township of Bonnechere Valley is no longer dependent on outside providers of biosolids or septage management services. This removes the potential for excessive rate increases in both hauling and disposal along with the real possibility of being denied access to ROPEC.

10.5.4 Eganville STP Operations

The ability to remove biosolids from the aerobic digesters on a regular basis improves their operational efficiency and enhances the overall operation of the STP. This is especially true during the winter months when the digesters were thickened to reduce the volume and frequency of hauling to ROPEC in Ottawa.

Additionally the ability to store dewatered biosolids on site for extended periods of time allows for flexibility in the agricultural utilization program.

11 CONCLUSIONS

Geotube technology is a viable process for the dewatering and stabilization of septage.

The end product is suitable for agricultural soil amendment or compost feed stock.

12 RECOMMENDATION

Geotube technology be considered as an acceptable treatment process for septage.

13 ACKNOWLEDGEMENTS

The success of the Geotube / Septage Pilot Project and the establishment of a full scale permanent Biosolids / Septage Dewatering Facility for the Township of Bonnechere Valley was definitely a team effort.

The following people and organizations played a significant role in this endeavour and need to be acknowledged for their contribution:

Mayor Zig Mintha and Councillors Mervin Buckwald, Cairine Cybulski, Charlotte Neitzel and Bob Peltzer of the Township of Bonnechere Valley,

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Dave Darch, the Operations Committee and staff of the County of Renfrew,

And of course many others who provided encouragement, direction, advice and opinions, all of which are gratefully acknowledged.

14 SUPLEMENTAL REPORT

At the writing of this report the Geotube containing the dewatered septage is still on the drainage pad at the facility waiting final testing for % solids, metals, nutrients and pathogens. Once this testing is complete and a decision made as to the disposition of the dewatered septage a supplemental report will be filed.