

**RESPONSE TO PRESENTATION TO COUNCIL REGARDING
PROPOSED ADDENDUM TO ESR APRIL 08
NOVEMBER 10, 2009 BY THERESA SCOTT**

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NOVEMBER 19, 2009**

1. AFFORDABILITY

QUESTION/CONCERN:

- **Despite previous traditional 2/3 government funding, Lanark Village residents have never been able to provide the remaining one-third of project costs by themselves.**
- **The Village's financial capability remains unimproved since Stantec's 2008 ESR assessment.**
- **The current financial plan for capital costs places the municipal financial burden on Village households.**

ANSWER:

If Federal and Provincial Governments contribute a further one third/one third to the project, total funding would amount to approximately 90% of the \$28.5 million total project cost.

It should also be noted that from the beginning of this process the Council has been looking for a solution that is environmentally friendly, affordable and innovative. The Township believes that this proposal is the most environmentally friendly option, the only affordable option (it is estimated that a mechanical plant discharging to the Clyde would incur O&M plus capital reserve costs in excess of \$90 per month per household compared to \$71) and it is innovative (which puts us in a good position to obtain green funds from the Federation of Canadian Municipalities).

2. Proposed individual user's financial costs

A. QUESTION/CONCERN:

Village households will contribute at least 75% of the expected municipal portion, and then be asked to contribute again a similar amount to pay for "hidden installation fees" not included in the project estimated costs.

ANSWER:

Staff is proposing a user-pay basis for covering the capital cost of the systems. The only anomaly to this is the "economic stimulus" contribution.

B. QUESTION/CONCERN:

It is unclear how the municipality can guarantee a fixed monthly payment plan over an extended period of years if the homeowner chooses not to pay the total upfront costs; or has the municipality the ability to turn away residents if municipality's borrowing capacity becomes too great.

ANSWER:

The Township will not exceed its borrowing capacity under the proposed financing plan.

C. QUESTION/CONCERN:

There is very little to suggest that village households will not be again also assuming the majority of the system operating costs through user fees, even though there will be other users of the system.

ANSWER:

Staff proposes to apply a ‘user-pay’ policy to the water/sewage/septage systems for Operating and Maintenance and Capital Reserve costs.

Thus the Township ratepayers (excluding villagers) will pay the capital cost for the septage treatment capability, and homeowners using the septage treatment plant will pay for the operating and maintenance and the capital reserve costs.

D. QUESTION/CONCERN:

- **All LH taxpayers stand to benefit from the proposed system installation, yet everyone appears not to be equal contributors towards capital costs installation.**

ANSWER:

See answer to 2A and 2C above.

E. QUESTION/CONCERN:

- **If the major financial contributor, that being government funding sources, is possibly “rethinking” it’s investment return; why should it differ for the second most financial contributor to the project, the Village residents?**

ANSWER:

Township’s position is that Council has a legal and moral responsibility to resolve the underlying problem(s) which results in many villagers having unsafe drinking water at their taps. If higher levels of government do not provide the necessary funding to do this then responsibility shifts to those levels of government.

3. The ESR Addendum proposal and process is felt to be lacking:

CONCERN:

The ESR Addendum proposal and process is felt to be lacking:

- **in consideration of the financial impact to the residents being served, both from capital (startup)and operating costing standpoints.**
- **In providing a dedicated line of communication to Village residents separately, in an effort to keep them abreast of any new policy changes and project directions that would impact them with further financial burdens.**

ANSWER:

The ESR Addendum reduces capital cost for sewage treatment by a factor of three and the Operating and Maintenance Cost by more than 30% in comparison to the sewage treatment plant proposed in the ESR. Thus the Addendum proposes significant savings to villagers, not increased financial burden.

The Northern Watertek proposal is arguably the only affordable solution for the village as long as the 'Lagoon to Mississippi' option is not considered acceptable by Council.

4. SUMMER LAND APPLICATION OF EFFLUENT

A. CONCERN:

- **Pathogens and bacteria removal during summer process**

ANSWER:

The NWC proposal meets the organic loading and hydraulic retention time criteria found in the Design Guidelines for Sewage Works 2008, Ministry of the Environment, PIBS 6879 for land application without disinfection. In fact MOE only requires secondary treatment (lagoon treatment) compared to the tertiary level treatment in the NWC process.

Bacteria in sewage systems oxidize the various contaminants (BOD, ammonia, total kjeldahl nitrogen, etc.) in raw sewage. Treatment processes such as extended aeration or activated sludge maintain suspended high concentrations to provide a surface for the bacteria and food to come in contact with one another. The concentration of suspended solids in a storage lagoon is much lower and thus it takes longer to treat the wastewater than in a mechanical plant. Bacteria are typically attached to the solids which are on the bottom of the lagoon. Also ultra violet light from the sun, protozoa present in the lagoon (that feed on bacteria) and settling all reduce the concentrations in the actual surface water of the lagoon.

The addition of the recirculating filter during the summer operation means the effluent going to the nozzles is expected to be of at least tertiary quality. Low levels of bacteria and viruses in the effluent means low to no measurable bacteria and/or viruses in the aerosol.

Bacteria concentrations are also reduced during spraying by sunlight and desiccation of the water droplet.

Spray irrigation of wastewater is practiced around the world. The main reason it is not used in Ontario is the land requirements not a lack of confidence in the process.

B. CONCERN:

- **Spray drift**

ANSWER:

As stated in 4A the bacteria levels in the effluent going to the towers would be below the levels MOE would be concerned with.

In addition, the control system for the process monitors wind speed and direction and only allows spraying when conditions will ensure no aerosol drift off the site. NWC plans

to remove only the minimum trees necessary which means the forest on the site would further mitigate any risk of aerosol drift.
The buffer zone adds to the safety margin.
During the design/Certificate of Approval process MOE would ensure that aerosol drift off-site would not occur.

C. CONCERN: surface runoff

ANSWER:

No surface runoff would be allowed – during the design, MOE would ensure that the permeability of the soils is sufficient to accommodate the hydraulic load from melt water and spraying in order to prevent any ponding or surface run-off.
As a contingency measure the site would be engineered through ditching along the contours to collect any runoff and direct this to Cell#2.

D. Summer odour

ANSWER:

This is a major concern of villagers which the Addendum addresses in para 6.4.
Odours would not be a problem based on the following:

1. Odour is not an issue in Westport where distances to nearest residences are less than in Lanark.
2. The operation of the RIF, (an aerobic process) would further reduce the chances of odours being produced compared to Westport.
3. The recirculation of effluent back to Cell#1 would further reduce the chances of odours being produced compared to Westport.
4. There is a capability to aerate Cell#2 as required which would further reduce the chances of odours being produced compared to Westport.
5. For the first few years the Township would retain the services of Doug Huber (an expert in lagoon management) on an as required basis to address any issues should they arise.

E. CONCERN:

Effect of abnormal summertime conditions on process with respect to decreased solar ultra-violet radiation and increased humidity levels

ANSWER:

The NWC process is based on weather statistics for Lanark and includes a safety factor to ensure that the design flows can be handled. As a contingency, sufficient storage is incorporated to allow carry-over from summer to winter operation. Also, spray irrigation is not required on a daily basis and thus no spray irrigation will occur on rainy days or days with high relative humidity.

F. Further contamination of the groundwater aquifer(s) and surface water

Answer:

Appendix J of the ESR Phase 4 Report includes a Preliminary Site Investigation Report by Stantec and two reports by Golder:

- Results of Test Pit Excavation Program – February 8, 2006; and
- Assessment of Potential Impact from Proposed Subsurface Infiltration of Treated Sewage – January 17, 2008.

The Stantec Report provides a description of the property including site access and clearings, ground elevations and topography, and environmental constraints.

The Golder Reports conclude that based on a nitrate concentration of 5 mg/L and a total phosphorus concentration of less than 1 mg/L the application of treated effluent to the leaching beds would not result in unacceptable impacts to groundwater or surface water.

MOE has accepted this Report.

Compared to the mechanical plant, the effluent from the NWC proposal would be of a higher quality (lower nitrates and lower total phosphorus) and lower quantity (due to sublimation/evaporation at the nozzles and in the snowpack).

In addition effluent is applied to the surface of the soil predominantly when plants are active and thus benefits from photoreduction (chemical reduction under the influence of radiant energy (light)), phytoremediation (use of plants including their roots to break down and uptake contaminants) as well as the oxidization and reduction of contaminants by the prokaryote organisms present in the upper layers of the soil.

The Addendum therefore concludes that the NWC plant would not adversely affect the ground water or wetlands and beaver flood.

MOE has concurred with this conclusion in their preview of the Addendum as long as NWC can illustrate to MOE Approvals during the design process that their plant can achieve the performance stated. Based on discussions with MOE and Doug Huber, Township staff is convinced that this performance can be achieved both summer and winter.

This would be confirmed by MOE during the Certificate of Approval Process.

G. QUESTION:

- **Is summer spraying and RIF's design only addressing the need to accommodate septage from 9300 additional homes?**

ANSWER:

No. The RIF design is an integral part of the sewage/septage treatment system which removes such constituents as phosphorus, BOD, ammonia, total kjeldahl nitrogen, bacteria and suspended solids and plays an important role in getting nitrate level down well below that proposed in the ESR. The RIFs would be there even if Council decided not to treat septage.

Summer spraying acts to reduce the loading on ground water compared to snowfluent alone in that the annual flow is applied over more than eight months of the year versus the four month melt season for the snow banks with snowfluent alone.

NWC also states that summer spraying will reduce operating costs since the pumping flow rates and hence power consumption required to pump the effluent to the towers is reduced by processing the annual flow over eleven months versus over four months for snowfluent.

Finally, by spraying in the warm months the size of the cells (storage capacity) can be reduced significantly thereby reducing costs.

H. QUESTION:

- **Is it a proven technology that has been demonstrated to work safely and environmentally friendly for municipal wastewater treatment disposal?**

ANSWER:

The combination of cells and RIF's is a proven combination in Ontario as is spray irrigation. What is new in NWC's process is that the design calls for recirculation of effluent three times through RIF's and cell#1 to achieve the very low nitrate levels and the high level of evaporation achieved by atomising the treated effluent at the nozzles with compressed air to reduce the loading on the soil. Thus it can be seen as an enhanced spray irrigation process. Enhanced in that spray irrigation only requires secondary level treatment (lagoon treatment) of the effluent prior to land application. NWC's process achieves tertiary level treatment by using the RIFs and recirculation, and it achieves reduced loading on ground water due to the high levels of evaporation at the nozzles.

The process (summer and winter) in operation in Chester N.S. treats leachate from a landfill – in many ways a more difficult task – as well as effluent from a septage treatment lagoon and has exceeded the expectations of the engineering firm which oversaw design and construction.

Westport is in the process of increasing the capacity of their plant by spraying in warm weather. They are well along in the process of amending their Certificate of Approval and MOE sees no problems. In their case they will have less treatment (via two lagoons without the RIFs) prior to land application.

As stated in Appendix C of the Addendum, NWC proposed the same process for Munster Hamlet a few years back. Two engineering firms reviewed this proposal and concluded it would meet MOE requirements.

Both MOE Approvals in Toronto and MOE Kingston (who review the ESR Addendum) have reviewed this proposed Addendum and believe there are no ‘show-stoppers’.

With respect to environmental friendliness this process offers the best alternative. It is able to reduce nitrates down well below the 5mg/L level for the ESR proposal, achieves 50% evaporation or greater at the nozzles thus reducing the loading on the ground water, and applies this highly treated effluent to the land predominantly when the plants and top soil are active which allows uptake of water/nutrients further reducing the quantity/improving the quality of water going to ground water in comparison to the mechanical plant in the ESR proposal.

Therefore staff is confident that the process would obtain MOE approval and remain compliant.

5. QUESTION/CONCERN: PAYING FOR SEPTAGE TREATMENT

- **It is unclear how much additional financial burden is placed on the Village residents as a result of designing the wastewater treatment facility to accept septage from outside the immediate wastewater collection serviced area.**
- **The system is NOT designed to serve only Village residents' wastewater needs, it seems to fulfill many other purposes and agendas**
- **Is it being driven by Townships need to have a septage plan?**
- **What would a Lanark Highlands Septage Plan resemble without a Lanark Village Wastewater Facility?**
- **Future development within Lanark Village would not be dependent on finding septage treatment solution, as they could be incorporated into any municipal wastewater infrastructure that existed within the Village.**

Has Council placed an increased financial burden directly on 312 residences within the boundaries of the Village of Lanark to satisfy future Township septage management needs?

ANSWER:

The estimated cost to provide a septage treatment capability in the Village Sewage Treatment Plant was provided by Northern Watertek Corporation (NWC). This cost would be born by Township Taxpayers not including villagers, i.e. users pay. Likewise the cost of operating and maintaining and for the capital reserve for the septage treatment portion of the sewage treatment plant would be born by those home owners having their septic tanks pumped. The cost share for Township residents presented at the Public

Meeting should have referred to non-village residents. Villagers would share in the cost for municipal buildings and economic stimulation.

Although septage treatment was not included in the terms of reference for the ESR, from the very beginning of this project Council has considered it important that the septage requirements of the Township be considered by this project. Septage handling was included as a selection criteria for selecting the preferred sewage treatment plant during Phase 3 of the ESR process. Because the NWC proposal is able to handle septage the treatment thereof has been included in the treatment plant at this point. Council could vote to reduce or remove this capability.

6. SITE SELECTION PROCESS

A. QUESTION/CONCERN:

It is difficult to trace to what degree environmental site evaluation factors of the North St. Site were weighed into the site selection process

ANSWER:

The following factors inputted into the decision to locate the NWC Treatment Plant on the North St. site:

- Extensive hydrogeological studies had been completed on the property as part of the ESR process. These concluded that the site could handle the design treated effluent flow with no adverse impact on the environment. Because the effluent from the NWC proposal was of a higher quality (lower nitrates) and lower quantity (due to sublimation/evaporation at the nozzles) and the effluent was being applied in warm weather when plants, trees and roots would uptake further water and constituents the Addendum concluded that the NWC plant would not adversely affect the ground water or wetlands and beaver flood. MOE has concurred in this conclusion.
- NWC much preferred this site to alternatives because of the soil characteristics, the abundance of trees, the slope on the property and the existence of the wetlands as a further polisher.
- The Township had already purchased this property;
- Selecting another site would have incurred substantial additional cost for hydrogeological studies;
- A shorter force main from the pumping station would mean lower capital and operating costs
- Comparisons with Westport with respect to distances to nearest residences indicated that odour and noise would not be a problem with this site.

B. QUESTION/CONCERN:

It is uncertain to what degree was the site evaluated with respect to natural environmental conditions

ANSWER:

Appendix J of the ESR Phase 4 Report includes a Preliminary Site Investigation Report by Stantec and two reports by Golder:

- Results of Test Pit Excavation Program – February 8, 2006; and
- Assessment of Potential Impact from Proposed Subsurface Infiltration of Treated Sewage – January 17, 2008.

The Stantec Report provides a description of the property including site access and clearings, ground elevations and topography, and environmental constraints. These are available at the Township Office.

The Golder Reports conclude that based on a nitrate concentration of 5 mg/L and a total phosphorus concentration of less than 1 mg/L the application of treated effluent to the leaching beds would not result in unacceptable impacts to groundwater or surface water.

MOE has accepted this Report.

The effluent from the NWC proposal would be of a higher quality (lower nitrates and lower total phosphorus) and lower quantity (due to sublimation/evaporation at the nozzles). In addition treated effluent would be applied to the surface of the soil predominantly when the plants are active and thus benefits from photoreduction (chemical reduction under the influence of radiant energy (light)), phytoremediation (use of plants including their roots to break down and uptake contaminants) as well as the oxidation and reduction of contaminants by the prokaryote organisms present in the upper layers of the soil.

The Addendum therefore concludes that the NWC plant would not adversely affect the ground water or wetlands and beaver flood.

MOE has concurred with this conclusion in their preview of the Addendum as long as NWC can illustrate to MOE Approvals during the design process that their plant can achieve the performance stated. Based on discussions with MOE and Doug Huber, Township staff is convinced that this performance can be achieved both summer and winter.

C. QUESTION/CONCERN:

It is unclear if a site environmental inventory was done for both summer and winter conditions

ANSWER:

See Answer to 6A and B.

D. QUESTION/CONCERN:

The suitability of the preferred wastewater facility site is questioned due to,

- **the presence of shallow overburden and bedrock fractures near the ground surface**
 - **from a groundwater contamination aspect**
 - **from a surface chemical depositing aspect**

ANSWER:

See answer to 6B above. Additional geotechnical studies would be necessary in the final selection of tower and cell sites.

With regard to “surface chemical depositing”, MOE data from Westport has shown no trend upwards of constituents either in the topsoil or the groundwater. This means the plants/topsoil are dealing with these constituents. As a contingency, should any trending upwards be noted, the plants could be harvested and disposed of off-site as required.

E. QUESTION/CONCERN:

- **the effects of site deforestation of site having an impact on soil erosion and wind pattern discernment**

ANSWER:

No erosion problems are anticipated – soil disturbed during construction would be sowed with vegetation and if necessary protected with straw in the first year of operation. Erosion is prevented by the contour ditches which are in place to catch melt water/ summer spray to encourage infiltration into the soil.

Regarding “wind pattern discernment”, no affect on wind patterns is anticipated due to the forested nature of the lands surrounding the tower and cell sites.

F. QUESTION/CONCERN:

- **the effect to the adjacent wetlands**

ANSWER:

See answer to 6B above.

G. QUESTION/CONCERN:

- **the effect of the site location to neighbouring residential locations (ie nitrate plume migration, truck traffic, noise, nuisance spray drift)**

ANSWER:

Regarding nitrate plume migration, again para 6B applies. Based on Westport’s data there would be **no** affect on ground water because of the action of topsoil, plants (and in Lanark’s case trees) and roots to uptake constituents like nitrates and phosphorus. It needs to be realized that the neighbouring houses are on septic tanks which at best will result in nitrate levels in excess of 10 mg/L in the effluent going to the leaching beds and then to ground water.

If anything it is anticipated that the NWC plant would result in the lowering of groundwater nitrate levels which along North St are on average 9.7 mg/L and for the village as a whole, 5 mg/L according to Golder’s second Report listed in Answer 7C, p.7.

Regarding truck traffic, as stated in the proposed Addendum, it is anticipated that approximately four trucks per day would use the treatment plant if all residences in three Townships are serviced. This traffic could be reduced by reducing the number of residences served and/or by providing another access road to North St. from Forbes Rd.

Regarding noise, based on Westport experience and the tests done by NWC (see Addendum, Appendix B, p.21) noise will not affect neighbours.

Regarding ‘nuisance spray drift’, see the answer to 4A and B.

H. QUESTION/CONCERN:

If the proposal goes through in which only portions of the village become the serviced areas, what planning is in place to ensure that off-site contamination from wastewater and septage treatment activities does not impact non-serviced residents?

ANSWER:

See answer to 6G above.

7. ENVIRONMENTAL ISSUES – SUMMER PROCESS

A. QUESTION: If the Snowfluent process works on the premise of turning wastewater into frozen droplets, how do we understand the process that allows summer processed spray to kill pathogens or bacteria?

ANSWER:

See Answer to Question 4A.

B. QUESTION: What bacteria and pathogens are contained within the droplets of water that are sprayed out in the summer process?

ANSWER:

The water being sprayed may contain a variety of bacteria and viruses that are contained within the intestinal tract of the residents connected to the sewage system. If a resident has specific type of salmonellae bacteria present in their body it is possible that salmonellae bacteria may be present in the spray but that it the purpose of the MOE Guidelines relating to retention times and buffer distances between spray fields and potential receptors. The water being sprayed will probably contain nonpathogenic forms of coliform bacteria, Ecoli, nitrogen reducing bacteria, sulphur reducing bacteria, fecal bacteria and various forms of pseudomonas bacteria. The system being proposed meets the MOE Guidelines which are established based on science. The lower the bacterial concentration in the wastewater being sprayed, the lower to non-detectable concentration that will be found in the aerosol.

Much of the literature relating to aerosols and water reuse relates to agricultural reuse of the partially treated wastewater. If contaminated spray irrigated water comes in contact with strawberries, bean sprouts, lettuce or any crop used for direct human consumption there is a risk of the consumer becoming ill. There is also a risk for the field works. This risk can be from inhalation of the bacteria/viruses or direct contact on either the skin or clothing. That is the reason the World Health Organization (WHO) has proposed minimum standards of wastewater treatment used for unrestricted irrigation of agricultural crops. Health Canada also has rules as the type of water that can be used on any produce imported into Canada.

The proposed spray area in Lanark will not be used for agricultural production and in fact signed to discourage trespassing and use by the general public. The intent of the buffer zone is to minimize contact with the general public and provide a safety zone.

No carry over of aerosols off-site would be allowed by MOE.

C. QUESTION: Where was testing done for the summer processing of wastewater using the Northern Watertek method?

ANSWER:

Summer testing of the spray irrigation process was done at Westport just down the road in 1998. Because the wastewater lagoon contained between less than 10 Colony Forming Units (CFU's) and a non-detectable concentration of Ecoli bacteria at the start of the study no bacterial aerosol sampling was undertaken. If there is no Ecoli in the wastewater being sprayed, it automatically infers that none should be contained within any aerosols. The Northern Watertek proposal meets the Ministry guidelines for buffer areas.

D. QUESTION: Where can residents of Lanark Village access these studies for the summer process testing and the results of this testing?

ANSWER:

The Report on the Village of Westport Wastewater Treatment Plant Spray Irrigation Report 1998 is available at the Township Office. NWC would require the signing of a non-disclosure agreement with NWC. This information is not in the public domain, and as such is proprietary to NWC. No Westport funds or other Government monies were used to carry out this process R&D.

E. QUESTION:

Were the **summer processing** studies test results referenced when the decision was made for the Northern Watertek system as the preferred system by Lanark Council?

ANSWER:

The Council was briefed by NWC on both the winter and summer processes and referenced the Westport spray irrigation trial. The Township Engineer had reviewed the Westport summer spray trial report.

F. QUESTION:

Is there a site that presently employs this **summer process** of Northern Watertek?

ANSWER:

See Answer to Question 4H.

8. BACTERIA

A. QUESTION:

What happens to the accumulated winter “snow bank” if we have a summer much as we had in 2009. There was plenty of rain and hardly any sunshine. If the “snowpack” needs solar ultra-violet radiation to effectively kill any cells containing bacteria that remain in the ‘snowpack’.

ANSWER:

Bacteria is killed by the freezing and thawing action, not by ultra-violet affect in the snowpack.

B. QUESTION:

What is the back up plan for killing this bacteria if solar ultra-violet radiation is minimal in a summer season? Does the run off distributed onto the ground containing these cells have a greater opportunity to enter the aquifer and further contaminate the Village drinking water as well as the surrounding environment?

ANSWER:

See answer to Question 4A.

9. ENVIRONMENTAL

A. QUESTION:

How is it going to be ensured that the spray process in the summer will not blow all over the area if there are winds?

ANSWER:

It is expected that as suggested in the MOE Design Guidelines, maximum wind speeds will be established for this specific site based on the physical parameters. This criterion is expected to be included as a condition on the Certificate of Approval issued by the Ministry of the Environment.

The control system monitors wind speed and direction and does not allow spraying when it could result in aerosol or snow drift off-site.

Also, it is NWC's intent to maintain as many trees as possible on the site and not just a perimeter tree screen as allowed by the guidelines. The predicted water droplet fallout zone has been mathematically modeled by NWC to help establish the application area. The size of the buffer area will meet the Ministry of the Environment's Design Guidelines.

B. QUESTION: Has it been determined how the Northern Watertek system will affect the wetlands within the snow/water disbursement area? How will this process affect the beaver habitat at the back of the seniors' residence?

ANSWER:

This is in part a repeat of the answer to 4F.

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MOE has concurred with this conclusion in their preview of the Addendum as long as NWC can illustrate to MOE Approvals during the design process that their plant can achieve the performance stated. Based on discussions with MOE and Doug Huber, Township staff is convinced that this performance can be achieved both summer and winter.

This would be confirmed by MOE during the Certificate of Approval Process.

The affect on the existing beaver habitat should be no different if the water is applied to the surface of the ground versus to the subsurface. The water level in the pond is controlled by the beaver activity and the invert of the connection to the stream. There is no plan to modify the outflow structure so there should be no change in beaver habitat as a result of the proposed wastewater treatment system.

C. QUESTION: Has the environmental footprint been assessed for this process? Where can this information be obtained for perusal?

ANSWER:

The “footprint” can be found in the Addendum, para 6 which addresses impacts on:

- Terrestrial environment
- Ground Water;
- Surface Water;
- Odours;
- Bacteria Survival and Aerosols;
- Noise;
- Safety; and
- Septage (truck traffic).

D. QUESTION: Who will be doing the testing of the system for the new summer processing (and winter testing) to ensure the system is doing what it is supposed to be doing in both the winter and summer? Will these results be readily available to Village Residents and where will this information be kept?

ANSWER:

The Township will be responsible for providing a licensed Wastewater Treatment Operator or Professional Engineer to operate the wastewater treatment plant. The Township would need to decide between doing this in-house or contracting out. Certified personnel would be required.

Routine monitoring is required as part of any wastewater treatment plant Certificate of Approval issued by the Ministry. The routine monitoring (chemical and bacteriological) is normally undertaken by the operator. For Westport this includes soil samples and monitoring well samples.

The cost of the monitoring is part of the municipal operating costs and this information would be available in the Annual Monitoring Report prepared by the municipality or their consultant in fulfillment of a standard condition on most Certificates of Approval. It is the municipalities' intentions to have this information available at the municipal offices. This Report would then be passed to MOE for review.

The Report would be available to any resident.

E. QUESTION:

With all references for the Northern Watertek system emphasizing *winter processing* of wastewater, Lanark Village residents are highly concerned that they are not being used as guinea pigs for the MOE and Northern Watertek to determine the health effects and longevity of both the system and the exposure of the people to biological matter.

ANSWER:

MOE would not allow anyone to be used as guinea pigs, but your concern is understood. This is a repeat of the Answer to 4H.

The combination of cells and RIF's is a proven combination in Ontario as is spray irrigation. What is new in NWC's process is that the design calls for recirculation of effluent three times through cell#1 to achieve the very low nitrate levels and the treated effluent is then atomized at the nozzles with compressed air to achieve a high level of evaporation to reduce the loading on the soil. Thus it can be seen as an enhanced spray irrigation process. Enhanced in that spray irrigation only requires secondary level treatment (lagoon treatment) of the effluent prior to land application. NWC's process achieves tertiary level treatment by using the RIFs and recirculation, and it achieves reduced loading on ground water due to the high levels of evaporation at the nozzles. The process (summer and winter) is in operation in Chester N.S. treating leachate from a landfill – in many ways a more difficult task – and effluent from a septage lagoon and has exceeded the expectations of the engineering firm which oversaw design and construction.

Westport is in the process of increasing the capacity of their plant by spraying in warm weather. They are well along in the process of amending their Certificate of Approval and MOE sees no problems. In their case they will have less treatment (via two lagoons without the RIFs) prior to land application.

As stated in Appendix C of the Addendum, NWC proposed the same process for Munster Hamlet a few years back. Two engineering firms reviewed this proposal and concluded it would meet MOE requirements.

Both MOE Approvals in Toronto and MOE Kingston (who review the ESR Addendum) have reviewed this proposed Addendum and believe there are no 'show-stoppers'.

With respect to environmental friendliness this process offers the best alternative. It is able to reduce nitrates down well below the 5mg/L level for the ESR proposal, achieves 50% evaporation at the nozzles thus reducing the loading on the ground water, and applies highly treated effluent to the land predominantly when the plants and top soil are active which allows uptake of water/nutrients further reducing the quantity/improving the quality of water going to ground water in comparison to the mechanical plant in the ESR proposal.

Therefore staff is confident that the process would obtain MOE approval and remain compliant.

The plant could be moved further wet on the site if concerns remain.

F. QUESTION:

If water borne diseases or bacteria are destroyed in winter by below freezing temperatures as they are sprayed out into the environment, according to the Northern Watertek design, what assurance do we have that disease and bacteria are being destroyed in the summer processing months when being sprayed out into the environment? This is of great concern for the Village residents and a full explanation of this concern needs to be addressed.

ANSWER:

See Answer to Question 4A.

10. CONSULTANT RELATED

A. QUESTION: If the advanced oxidation component of the snowfluent system cannot treat wastewater that has biological matter and has to be by-passed, thereby removing solids by precipitation and other means, why would we consider such a system? Would this not be an environmental disaster for our aquifer and a very serious health issue for the Village?

ANSWER:

The "advanced oxidation component" referred to is not part of the NWC system. In the Chester, N.S. plant it was added by the Engineering Consulting firm responsible for design because they believed it necessary. It turned out that it could not do its intended job and had to be bypassed. This meant an additional load on the NWC process which handled it "admirably" according to ABLenvironmental, the consulting firm.

B. QUESTION: If phosphorous is present as a product of this Snowfluent process, how will this phosphorus affect the Clyde River and the wetlands situated in the disbursement field of the towers and beyond?

ANSWER:

NWC claims that the total Phosphorus (TP) reaching ground water would be non-detectable with both summer and winter processes. This is borne out for the winter process by the Westport data. For the summer process, NWC claims that the RIFs/cell combination is capable of getting the phosphorus levels down to non-detectable levels. Even if this does not happen, the effluent is then applied to the top soil so the plants and trees can uptake what is there before the phosphorus gets to ground water. During the preliminary review of the proposal conducted by the Ministry of the Environment Approvals Branch, they suggested that if the expected effluent quality could be achieved, consideration should be given to discharging the effluent directly to a nearby watercourse. The municipality opted to stick to the original proposal where all treated wastewater is infiltrated into the ground and there is “No Direct Discharge” to any surface watercourse. Increased eutrophication of the Clyde River as a result of the proposed wastewater treatment process should not be a concern.

D. QUESTION: Has the Snowfluent design been corrected to eliminate the issue of the tower freezing? What was the design change and has it been tested to prove its reliability?

ANSWER:

Tower/nozzle freezing has not been a problem in Westport. The problem in Chester was caused by manually operating the system at zero wind speed which resulted in the spray dropping straight down and freezing on the tower. The automatic control system does not allow spraying at wind speeds below 3 km/hr.

With respect to the tower drains freezing, NWC had been provided with a profile that was incorrect as to the elevation of the Tower compared to the pump house. The tower was lower than the drawings showed so drainage to the pump house was blocked. The lesson learned was that it would have been safer to let NWC do the site engineering which would be the intent in Lanark. NWC would be responsible for design and construction and thus accountable for correct operation and compliancy with the Certificate of Approval.

E. QUESTION: Will the same nozzles be used for both summer and winter wastewater distribution?

ANSWER:

Yes.

11. CH2MHILL's QUESTIONS

A. QUESTION: What were the reason(s) given by CH2MHILL's for their refusal to involve themselves in Northern Watertek's proposal?

ANSWER:

No reasons were given.

Appendix C of the Addendum outlines the steps taken by the Township to ensure that the NWC proposal was viable and the firm reliable/competent.

B. QUESTION: What were the questions tabled by CH2MHILL that they felt were pertinent to the proposal submitted by NWT?

ANSWER:

The questions are attached.

C. QUESTION: What were the MOE's responses to these questions tabled by CH2MHILL?

ANSWER:

Most of the answers are covered in the proposed ESR Addendum which has been reviewed in draft by MOE and will again be reviewed both when the final Addendum is submitted and during the Certificate of Approval process.

Some of the questions (for example, whether the cells will use a clay or a synthetic liner) would be answered during the design process and reviewed by MOE.

Some of the questions/answers are straight forward and required no review (for example, does the treatment plant require a water supply?).

All questions have been answered to the satisfaction of the Township and Huber Environmental.

D. QUESTION: Where would Lanark Village residents go to attain these documents for perusal?

ANSWER:

The Township Engineer.

E. QUESTION: What are the site specific constraints for this Watertek process in our Village and where could one find this information?

ANSWER:

The site specific constraints are contained in the ESR Addendum and include the following:

- No surface runoff from the process is allowed;
- No adverse affect on ground water allowed. MOE's "Reasonable Use Guideline" applies which means the treatment plant is not allowed to adversely affect a well on an adjacent property.
- No aerosol drift off the site;
- Retention times in lagoons/cells must meet MOE minimums to ensure suitable reduction in bacteria levels prior to spraying.

- Noise from the site not to exceed provincial standards.

MOE is the source of this type of information.

12. GENERAL

A. QUESTION: How do you compare a leaching treatment process with the process proposed by Northern Watertek for Lanark Village residents?

ANSWER:

The “leaching treatment process” in this question could refer to the system previously approved in the ESR that included a “tile leaching bed” or the leachate treatment system designed and built by Northern Watertek near Chester, N.S. treating landfill leachate plus septage. Answers are provided for each possibility.

A tile leaching process is where partially treated wastewater water is discharged into a tile system to spread the wastewater over the tile field and the water then percolates through the soil. In comparison to the ESR mechanical plant option, in the Northern Watertek proposal, the water is applied to the surface of the ground where the water then percolates through the full depth of the soil (not just from the bottom invert of the distribution pipe) to the water table or bedrock. Also in the Northern Watertek proposal, the wastewater is treated to a better quality prior to infiltration into the soil. Water applied by spray irrigation also has the benefits of photoreduction (chemical reduction under the influence of radiant energy (light)), phytoremediation (use of plants including their roots to break down and uptake contaminants) along with the oxidization and reduction of contaminants by the prokaryote organisms present in the upper layers of the soil.

In comparison to the NWC process in Chester which treats landfill leachate and septage combined, the leachate wastewater has much higher concentrations of the various contaminants, more exotic contaminants and is harder to biologically treat than domestic sewage. The BOD and ammonia concentrations are typically more than 10 to 20 times the strength of domestic wastewater. Raw landfill leachate also typically has heavy metal concentrations that can be toxic, includes various Polycyclic Aromatic Hydrocarbons (PAH’s), high phenols and dissolved solids and is coloured. The waste is not as biologically easy to treat as domestic wastewater.

B. QUESTION: Why does Snowfluent (now Northern Watertek) keep changing their name if it is the same owner and process? If anything goes wrong with the processing (or there are process/health related concerns related to the processing) and the company changes their name again, which company do we chase down for living up to the warranties or any mal-functioning processes etc.?

ANSWER:

It is suggested that the issue is not that NWC keeps changing their name, but rather that clients like the Township use various names for their process in an attempt to aid understanding. For example, most people are aware of the “Snowfluent System” in

Westport so the Township has often used this term rather than Envapocrystallization which is NWC's term for the combined winter summer operation. NWC is the federally incorporated successor to J.A.White and Associates Ltd.- the owner and developer of the Snowfluent, EVC and other processes. NWC is currently a involved in projects in Alberta, Ontario, Quebec, Nova Scotia, Bosnia, the West Indies, Panama, South America, and the USA. MOE Kingston recently recommended the NWC process to a community in Kawartha Lakes to address an emergency remediation situation.

C. QUESTION: With all references emphasizing winter processing of wastewater, we are wondering if Lanark Village residents are being used as guinea pigs for the MOE and Snowfluent to be studied to determine the health effects and longevity of both the system and the exposure of the people to biological matter. If water borne diseases or bacteria are destroyed in winter by below freezing temperatures as they are sprayed out into the environment, according to the Snowfluent design, what assurance do we have that these diseases and bacteria are being destroyed in the warmer months that are above freezing when being sprayed out into the environment? This needs to be explained to the Village residents.

ANSWER:

See the response to Question 9E.

13. COST

A. QUESTION: What is the expected cost of electrical power to run the Snowfluent system?

ANSWER:

\$25,000 per year

B. QUESTION: Have water prices been estimated/determined for Lanark Village residents? If they have, how were these determined or what formula was used for this?

ANSWER:

The estimated average cost per month per household for water and sewer if only the village core is serviced is:

Operation and Maintenance:	\$58
Capital Reserve:	<u>\$13</u>
Total	\$71

The actual cost would be based on a base rate plus a metered rate.

This estimate is based on Stantec's estimate for O&M costs for the water system, the vacuum sewage collection system and the forcemain system, and on NWC's estimate for the sewage/septage treatment plant. The latter was adjusted based on consultations with Westport and a review of a proposal for Munster Hamlet which had been reviewed by two engineering consulting firms.

If the entire village is serviced the total figure drops to \$65 per month.

C. QUESTION: What happens if we do not receive grants from the governments?

ANSWER:

There would be no municipal sewer project.

D. QUESTION: As it has been noted in the letters of reference in Appendix A, B, and C pertaining to the “inter-personal skills” of Snowfluent (aka Northern Watertek), is it a prudent business decision to be considering this firm for this process? Would this not perhaps be a potential for cost over-run should personalities clash?

ANSWER:

There is no doubt that Mr White can be a difficult person to work with at times; however, a positive working relationship has been established with the Township.

Westport and Chester are quick to point out that NWC delivered their product on time, within budget and the technology met all expectations. They have also been very pleased with the support received post-commissioning.

The Township is confident that this will also happen in Lanark.

The Township’s approach has been “if this is the best solution from environmental friendliness and affordability aspects then this is the technology we want.”

From the beginning of this process the Council has been looking for a solution that is environmentally friendly, affordable and innovative. The Township believes that this proposal is the most environmentally friendly option available, the only truly affordable option (it is estimated that a mechanical plant discharging to the Clyde would incur O&M plus capital reserve costs in excess of \$80 per month per household) and it is innovative (which puts us in a good position to obtain green funds from the Federation of Canadian Municipalities).

E. QUESTION: If the MOE satisfies all concerns of Lanark Village residents and the Snowfluent process is accepted by the residents, would it be possible for different methods of payments to be utilized for residents in the village who are in a certain net income bracket?

ANSWER:

Yes. Staff will look further into this issue when the project goes ahead (i.e. funding is received).

F. QUESTION: Where did the \$600k plus money from the sale of the PUC disappear to and why are we dipping into the \$7 million fund? What are we spending \$800k on?

ANSWER:

As presented at the Public Meeting the PUC funds were spent as follows:

Township Share of ESR Costs:	\$348,000
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Land Acquisition:	\$106,848
Preliminary Design and related Township Admin	<u>\$158,152</u>
Total:	\$613,000

The \$800,000 is the cost to complete the detail design, the drawings and the tender documents.

G. QUESTION: If the snowfluent project goes ahead in Lanark Village and the summer discharge turns out to contaminate the aquifer whereby the water is not potable, is Northern Watertek financially responsible to the Village for clean up of the aquifer? If not, then who is? Does Lanark Township Council have a back-up plan in place should this occur?

ANSWER:

A very hypothetical question considering the information provided above.

There would be a compliancy guarantee written into the contract for a minimum of two years (to be negotiated).

Further, The MOE Certificate of Approval would provide assurance of compliance.

14. WATER

The water side is not affected by the ESR Addendum; however answers are provided below to the questions presented.

CONCERNS:

- **The target for water supply is 17.4 L/s.**
- **After more than 24 hours of pumping, it was determined TW1 and TW2 could only supply 9.1 L/S.**
- **However, when when TW-2 was pumped at its' test discharge rate, drawdown of a neighbouring well occurred ...causing concern as the neighbouring property also contains a septic tank discharge field, indicating possible well cone of influence could be experienced at other well sites.**
- **Stantec's ESR indicates "It is anticipated a well field of 4 to 6 wells could be required", yet minimum buffer zones need to be respected (between the service wells, to adjacent residential wells)**
- **Stantec indicates,**
"The Township needs to complete a well exploration program in an effort to secure sufficient source water capacity. The two test wells identify a good source however additional wells are required to meet the design requirements."
- **Stantec also indicates**

“In light of the current regulatory environment, it is suggested that a full GUDI review of the wells be completed once it is decided to proceed with the communal water supply project.”

It is unclear if additional testing has been done (as suggested Golder would do so in Spring 2009); including a 72 hour drawdown of existing wells.

Until such results are made public, the ability of the proposed well field to supply a safe and sufficient water supply is questionable.

ANSWER:

Part 2.2 of the Preliminary Design Report states that two additional wells (#3 and4) have now been drilled and the report concludes that “these existing four wells appear to have sufficient safe yield capacity to satisfy the design demands.”

Pump tests on the four wells would be necessary to confirm this conclusion. The pump tests and a Well Head Protection Study have been put on hold until funding is received to reduce project cost to villagers. The delay would not affect schedule which is dictated in this project by the in-ground piping.

15. ALTERNATIVES

1. Revisit Stantec’s ESR Table 3-14 and Council instructions for weighting criteria; it is unclear where summer use of Snowfluent at the North St. Site has been addressed in Addendum Table 2.2.

ANSWER:

NWC’s proposal for winter and summer application was not considered by Stantec. Snowfluent (winter application) and spray irrigation were treated separately.

2. The SCO TERRA proposal for a mechanical plant situated on the same North Street property.

ANSWER:

This is an alternative although it has downsides:

- O&M plus Capital Reserve Cost is estimated at \$85 per month per household vs \$65 for the NWC proposal
- The Clyde has high background phosphorus levels and MOE may decide against the option.

The process would probably involve a mechanical plant discharging to a dry ditch and thence to the beaver flood/ creek/ Clyde River. MOE could require a storage lagoon to store treated effluent during the summer months.

3. Elimination of septage acceptance, and in turn, possible elimination of summer applications

ANSWER:

The two do not go together. If summer application is eliminated the size of the cells would increase to provide the necessary storage and thus costs would increase.

Council could decide to reduce or remove the septage treatment capability.

4. Investigate new technology for upgrading private systems.

ANSWER:

This option would not be endorsed by the ESR nor would it be supported by the Medical Officer of Health.

In April, 2003 at the end of Phase 2 of the ESR the Township insisted that Stantec carry a 'Private Well Upgrade' option into Phase 3 as a fall-back should insufficient funding be available for the full municipal system which the ESR had selected as the preferred option.

The 'Private Well Upgrade' option would have installed a municipal sewage system to remove all sewage from the village, brought all wells up to code, monitored the aquifer and installed in-house filtration systems as required on an interim basis until the aquifer cleansed itself.

In the Phase 3 Report Stantec and Golder would not endorse this option listing twelve arguments supporting their position including the statement: "Golder has noted that there is a chance of the aquifer to cleanse itself, however there is also a chance it may never cleanse itself. Improperly constructed private wells and abandoned wells may also contribute to continued contamination of the aquifer by allowing rapid transport of surface water runoff to the groundwater table due to the overall fractured rock conditions."

Thus the EA process does not support any private system upgrade as a permanent solution to the safe drinking water problem.

16. ARTICLES OF INTEREST

<http://www.ncbi.nlm.nih.gov/pubmed/345967?ordinalpos=1&itool=PPMCLayout.PPMCAppController.PPMCArticlePage.PMCPubmedRA&linkpos=3>

[Appl Environ Microbiol.](#) ,1978 Feb;35(2):290-6.

Airborne enteric bacteria and viruses from spray irrigation with wastewater.

[Teltsch B, Katzenelson E.](#)

The relationship between bacterial concentrations in wastewater used for spray irrigation and in the air was examined. Aerosolized coliforms were detected when their concentration was 10(3)/ml or more in the wastewater. Relative humidity and solar irradiation appeared to affect viable bacteria in the air; a positive correlation was found between relative humidity and the number of aerosolized bacteria. The correlation between solar irradiation and bacterial level, on the other hand, was negative. During night irrigation, up to 10 times more aerosolized bacteria were detected than with day irrigation. Wind velocity did not play an important role in the survival of aerosolized

bacteria. Echovirus 7 was isolated in 4 out of 12 air samples collected 40 m downwind from the sprinkler.

In this article 10(3) coliform bacteria is 1,000 CFU/ml which is equivalent to 100,000 CFU /100 ml. At the start of the summer spray irrigation experiment at Westport, the Ecoli concentration (which is only 1 of many types of coliform bacteria) ranged from non-detectable to less than 10 CFU's /100 ml. Even after stronger wastewater was added to provide more nutrients for grass growth, the maximum Ecoli concentration measured was 4,600 CFU/100 ml. It is expected that the bacterial quality of the treated wastewater being spray irrigated will be much less than this maximum value.

<http://jeq.scijournals.org/cgi/content/full/34/1/42>

Published in J. Environ. Qual. 34:42-48 (2005).

Sources of Pathogenic Microorganisms and Their Fate during Land Application of Wastes,

Charles P. Gerba^{a,*} and James E. Smith, Jr.^b

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<http://www.ehproject.org/PDF/ehkm/water-reuse2004.pdf>

EPA/625/R-04/108 September 2004

Guidelines for Water Reuse

U.S. Environmental Protection Agency, Municipal Support Division Office of Wastewater Management Office of Water Washington, DC
Technology Transfer and Support Division National Risk Management Research Laboratory Office of Research and Development Cincinnati, OH

<http://www.epa.gov/nrmrl/pubs/625r06016/625r06016whole.pdf>

EPA/625/R-06/016 September 2006

Process Design Manual

Land Treatment of Municipal Wastewater Effluents

Land Remediation and Pollution Control Division
National Risk Management Research Laboratory
Office of Research and Development
U.S. Environmental Protection Agency, Cincinnati, Ohio

<http://www.ene.gov.on.ca/publications/6879e.pdf>

ISBN 978-1-4249-8438-1

Design Guidelines for Sewage Works, 2008

Ministry of the Environment Ontario

Questions Regarding EVC Technology as Applicable to the Village of Lanark

1. Summer Wastewater Treatment What are the disinfection requirements associated with applying EVC – treated effluent to land during warm weather operation.
2. Summer Wastewater Treatment: What is the specific purpose for the recirculating intermittent filters (RIF) in the process during warm weather? Is this a proprietary technology or a sand filter? What kind of maintenance (backwashing/cleaning) is required for the filters? I understand that slow sand filters in the Ontario area are currently being decommissioned as they can be unreliable in the Ontario climate.
3. Lagoon Storage: What will the requirements be for the lagoon storage area in terms of lining (geosynthetic membrane or clay)? Lanark is well known for the large rock quantities near the surface. Given that you have said there will be no additional cost for further geotechnical studies, how do you intend to confirm the suitability of the location for the storage lagoons and to validate an approach to lagoon construction and lining requirements?
4. Solids Storage: What length of time/volume is included in the design of cell 1 and cell 2 for solids storage?
5. Design Basis – What raw wastewater characterization will be completed upon which the system will be designed? The design flow in the proposal is 150,000 cu m/year which is slightly above the design flow identified in the ESR for the 2006 equivalent population. I understand that reliability in treating this flow is assured in the design by using only 65% of the average hours available for snow making. The proposal goes on to say that the 20 year build out would be accommodated by simply increasing the hours of operation, but does this not increase the risk that insufficient cold weather will be available? What is the “utilization factor” for the 20 year build out? Although we may never get to the 20 year figure, we need some assurance that MOE will agree to the 20 year build out in the C of A.
6. Phosphorus Removal: My understanding is that one result of the stripping off of gases at the nozzles is that phosphorus precipitates out and is taken up by plant life. Please verify that no chemical phosphorus removal will be required to meet the reasonable use guidelines and/or surface water runoff to local water bodies.
7. Septage Treatment: What impact would the higher strength and intermittent waste from septage treatment have on the treatment process? What allowance will be made in the wastewater characterization for this waste? What MOE requirements would need to be met to receive this type of waste?
8. Land Requirement: Your proposal calls for a total of 42.5 acres of land for the process including 25 acres of buffer. What site layout design will be done to

- confirm a suitable layout is available on the proposed property given that there is a large wetland area and rock outcropping constraints?
9. Setbacks: Your proposal does not include proposed setbacks. Because the site is relatively close to residential areas we are concerned about odour, noise, spray contaminants, etc. What setbacks are required by MOE? Will the odour emissions due to spray aerosols require larger setbacks to the east of the process? Will the noise levels meet provincial requirements for sound levels at the property line for the properties immediately to the east of the treatment site?
 10. Sampling/Performance Compliance: Your proposal mentions the installation of monitoring wells to monitor compliance for ground water. You do not mention a requirement for soil sampling in the area of the snowpack/spray area as is the case at Westport. How do you see compliance with MOE Certificate of Approval criteria being determined? Is it possible that the snow storage area may require a partial lining or underdrain system either for regulatory sampling and compliance purposes or to facilitate collection of meltwater for further treatment. Would a Section 9 air permit be required due to volatilization of ammonia, H₂S, and potentially bacteria?
 11. Geotechnical – What studies will be conducted to verify the sub-surface conditions at the proposed site are suitable for infiltration of the snow melt and will not result in runoff to the nearby wetland and/or Clyde River as surface water runoff. It is our understanding that this system will be required to meet the reasonable use guideline for groundwater, as would the currently proposed sub-surface disposal field.
 12. Air Pollution: Given that ammonia and hydrogen sulphide volatilize during effluent atomization/freezing, is there an air quality issue? Is the H₂S an odour and/or health and safety issue. Apparently air-borne bacteria were observed during research conducted by Alberta Agriculture & Food (Alberta 2001a). Is this a safety issue for the public and/or operations & maintenance staff? What setbacks to property lines would be needed?
 13. Performance Data: The Township would like the following performance data, ideally from independent third-party evaluations of the technology to validate the stated claims of performance for the Snowfluent technology: length of time for snow to melt (at various storage depths), meltwater production versus time, amount of ammonia volatilization, amount of volatilization of other compounds (e.g. VOCs), fraction of water loss from evaporation/sublimation, and mass fraction of constituents (e.g. COD, BOD, TSS, TKN, TP, metals, toxicity, etc.) in meltwater as a function of meltwater cumulative volume discharged from the snowpack. Preference would be given to data and data in the public domain in the form of peer-reviewed scientific reports
 14. Snow Storage Area Design: What set-backs to the property line are needed? How is meltwater managed (infiltration or surface discharge)? What grading is required? What plants would be needed for nutrient/water uptake?
 15. Disinfection: Given that some bacteria are able to survive the freeze/thaw process (U.S. Army Corps of Engineer's Technical Report ERDC/CRREL TR-00-9 included as Appendix N in the ESR Phase 3 Preliminary Report rev 1.0 dated March, 2004) is there a need for an additional disinfection system for winter operation?

16. Meltwater Management: The proposal states that *no surface discharge will be considered except under completely controlled and monitored circumstances*. How does one ensure that there is normally no surface discharge? How does one monitor the process to ensure no surface discharge? When it is necessary to have surface discharge, how will your process capture and treat this - there does not appear to be a pump in the proposal to deal with surface discharge? How much of the water and/or pollutants would be taken up by the growing vegetation? Is harvesting required to prevent the build up of nutrients/pollutants in the soil? If so, what frequency would be required and where would the harvested vegetation be disposed?
17. Climate Change: The sizing of the system (number of towers, nozzles, and pumps) is based on an assumed number of days that the system can make snow based on historical temperature records for the proposed location from the last 62 years. However, climate change is causing both higher mean winter temperatures (e.g. 6 of the warmest 10 years have occurred within the last 10 years (Environment Canada 2002)) and more severe extreme events. Therefore, should the sizing criteria instead rely on more recent temperature data? What about extreme events such as January 2008 when the temperature changed from (approximate temperatures) -10°C to +10°C and practically all the snow melted very quickly? How would such an event affect the design/operation of the meltwater management system?
18. Operation and Maintenance: The proposal shows annual operation and maintenance costs of \$45,000. Would NWC be willing to operate the system for us for an initial period of five years at that rate? What type and frequency of maintenance would be required? Do the nozzles or any other component need to be replaced and at what frequency? Is the pre-fab building insulated? Is it heated, ventilated? If so, are these costs included in you estimated power costs? What is involved in the maintenance of a RIF and are these included in your maintenance cost estimates? Does the maintenance cost include 20 year replacement of mechanical, electrical instrumentation and controls equipment? If not, what is this cost estimated to be?
19. Water Supply Does the building need a water supply and if so is this included in the cost estimate?
20. Drawings/Manuals: What drawings and manuals will be provided?
21. Training: What operator/maintainer training would be provided if the Township decides to operate and maintain this system?

