

REGION OF OTTAWA-CARLETON
RÉGION D'OTTAWA-CARLETON

MEMORANDUM
NOTE DE SERVICE

Our File/N/Réf. **50 14-96-0002-V**
Your File/V/Réf.

DATE 30 June 1999

TO/DEST. Co-ordinator
 Planning and Environment Committee

FROM/EXP. Director, Engineering Division
 Environment and Transportation Department

SUBJECT/OBJET **NEPEAN LANDFILL CONTAMINATED GROUNDWATER
 & TRAIL ROAD LANDFILL LEACHATE TREATMENT
 AND DISPOSAL**

DEPARTMENTAL RECOMMENDATION

That the Planning and Environment Committee recommend to Council:

- 1. The creation of a programme to investigate new and emerging technologies for the treatment of leachate from the Trail Road Landfill site and leachate contaminated groundwater from the Nepean Landfill site;**
- 2. That staff be directed to include a submission of \$500,000 in the 2000 Capital Budget to fund this programme.**

BACKGROUND

On 14 April 1999, Council carried the following recommendations from the Planning and Environment Committee:

1. Approve the off-site conveyance of leachate from the Trail Road Waste Facility and leachate contaminated groundwater from the Nepean Landfill site by pipeline to the R.O. Pickard Environmental Centre for treatment and disposal;
2. Authorize the Environment and Transportation Department to undertake a pipeline route selection process.

3. That staff explore options for a biological treatment pilot project of leachate and contaminated groundwater including partnering with the research community, the private sector and interested communities and that a report be brought to Committee within a year at most.
4. That staff prepare a report on the feasibility of using a constructed wetland to manage contaminated groundwater for the Nepean Landfill site, and that RMOC seek participation with the private sector, Environment Canada or NRC in a pilot project to assess new and emerging technologies to treat leachate with a constructed wetland, and that this report be forwarded to the Committee considering the “landfill optimization study”.

Council further carried the following motions:

RESOLVED THAT the following words be added to Recommendation No. 1: “subject to monitoring and ongoing reporting to Council by the Region’s Health Department”.

RESOLVED THAT the RMOC seek participation with the private sector, Environment Canada and /or the broader research community in a pilot project to assess and explore biological treatment, or other new and emerging technologies to treat leachate with a constructed wetland, or other technologies, and that this report be forwarded to the Committee considering the “landfill optimization study”.

The following motion (Motion No. 66) was put to Council and lost, but was forwarded for reconsideration at the 28 April 1999 Council meeting:

BE IT RESOLVED THAT, subject to design approval, RMOC construct an engineered wetland at the Nepean Landfill site to treat the contaminated groundwater.

On 28 April 1999 Council re-considered Motion No. 66 and carried the following motion:

RESOLVED THAT Council refer Motion No. 66 to the Planning and Environment Committee for further reconsideration as to:

- Current comment from MOE
- Review of the Bufferlands Study

DISCUSSION

Background

The Region’s landfill sites generate two separate and distinct wastewater streams that must be managed in a cost-effective and environmentally responsible manner. The percolation of rainwater and snow melt through the garbage at the Trail Road Landfill produces a high strength leachate that is captured in the landfill liner of Stage 3 and in Stage 4 in the future. The leachate

is currently transported by tanker trucks to the R.O. Pickard Environmental Centre for treatment. Groundwater in the bufferland near the unlined Nepean Landfill site is contaminated with leachate that is migrating away from the site and has periodically discharged to the surface outside the Region's property. In order to correct this problem, it has been approved by Council to proceed with the construction of a pipeline to transport both wastewater streams to the central wastewater collection system and eventual treatment at the R.O. Pickard Environmental Centre. The first phase will be a route selection process that will include extensive public consultation.

As part of the closure and long term management of the Nepean Landfill, the MOE required that the Region obtain additional bufferlands and mitigate the effects of leachate contamination of the groundwater. It should be noted that the contaminated groundwater is a relatively low-strength wastewater compared to either the Trail Road leachate or typical domestic sewage. It was initially proposed by staff to construct an engineered wetland to treat the groundwater and this project was first identified in the 1997 Capital Budget. However, with the proposal of a pipeline for leachate it was recognized that an opportunity existed to combine the two wastewaters for transport and ultimate treatment at the R.O. Pickard Environmental Centre thus avoiding the cost of constructing and the complexity of operating an engineered wetland, while still ensuring an environmentally responsible means of treatment and disposal. The cost of the wetland has been estimated at approximately \$700,000 plus an additional \$100,000 for the required environmental assessment study.

Engineered Wetlands

An engineered wetland is basically a constructed marshland that utilizes vegetation and animal life to simulate a natural wetland. Treatment of the wastewater is accomplished by a combination of biological, physical, chemical and adsorption processes. Engineered wetlands have been used fairly extensively and successfully in the treatment of domestic wastewaters. Like any other treatment process, the suitability of an engineered wetland for the treatment of a particular wastewater, such as leachate or leachate contaminated groundwater, must be based on a consideration of the characteristics and limitations of the technology. The limitations of biological treatment systems are of particular concern since process upsets can result in lengthy periods of poor performance while the biological process re-establishes itself. Unlike the activated sludge biological treatment process employed at the R.O. Pickard Environmental Centre, a wetland process cannot be easily adjusted for changes in wastewater characteristics or weather conditions. For most contaminants in wastewater, the performance of a modern secondary treatment plant like the R.O. Pickard Environmental Centre would be superior to an engineered wetland. The advantages of natural systems for wastewater treatment lie in lower capital and operating costs and their simplicity of operation.

It should be recognized that the use of wetland for the treatment of wastewaters such as leachate or leachate contaminated groundwater is an emergent technology, with very limited application experience in cold climates. The actual treatment processes involved in an engineered wetland are not as well understood as are the physical, chemical and biological processes employed in traditional treatment plants and as a consequence it would be necessary to conduct pilot treatability tests for the waste stream prior to final facility design. This would involve testing

different plant species to assess relative performance, the effects of temperature and weather on the effluent quality, etc., over a period of at least two growing seasons.

With respect to the applicability for treating the groundwater at the Nepean Landfill site, there is a concern that the wetland would not be capable of consistently meeting the effluent criteria that would be imposed by the MOE for discharge to the Jock River, particularly in the winter. Although this could be mitigated by the addition of a storage lagoon, the option remains to discharge the wetland effluent to the leachate pipeline and ensure the protection of the Jock River from any treatment upset. It should be noted that the construction of an engineered wetland in the Nepean/Trail Road bufferland may generate objections from local landowners concerned about odours, mosquitoes and visual impacts.

Assessment of Local Wetland Treatment Facilities

On 28 May 1999, staff conducted a tour of several local wetland treatment facilities. In attendance were Regional staff, several engineering consultants, staff from Alfred College, a representative from the MOE, three members of the Citizen Review Committee for Waste Management of Ottawa-Carleton and one member of the Sewer Action Committee for Barrhaven.

The tour visited the Huneault Landfill site where a relatively weak leachate is treated using a peat filter followed by an engineered wetland. The intent of the system was to produce an effluent that could be discharged directly to an adjacent natural marshland. However, the effluent produced has been of inadequate quality for discharge, primarily because of elevated levels of boron, and is currently used for dust suppression on the landfill property. The system is only operated during the frost-free period and receives approximately one-third of the total leachate from the site. The remainder is trucked to the R.O. Pickard Environmental Centre for treatment. The peat filter appears to play a major role in the treatment process in removing contaminants. However, after four to five years of operation it is reaching saturation for a number of contaminants and the effluent quality from the entire system is deteriorating. The operator plans to replace the peat filter next winter at an estimated cost of \$100,000.

The tour next visited the Dignard Dairy Farm where an engineered wetland is used to treat the wastes from over 200 cattle in the form of manure and runoff from the cattle yard. The process consists of series of deep and shallow ponds that discharge to a surface overland flow system. Although the strength of the wastewater is very high, the flow rate through the system is very slow resulting in virtually no final discharge. No process performance data was provided but the effluent is apparently of high quality.

The tour then proceeded to the Alfred College facility in Alfred which is affiliated with the University of Guelph and now houses the Ontario Rural Wastewater Centre (ORWC). The ORWC is a centre for research to promote environmentally sustainable development of rural and unsewered areas through the use of effective wastewater treatment and disposal techniques with emphasis on low cost natural treatment processes. Alfred College was involved in the design and operation of the Dignard Dairy Farm wetland and is developing a research wetland treatment system at the Alfred sewage lagoon site. This consists of a series of shallow and deep ponds with a number of experimental polishing systems to evaluate different materials for contaminant

adsorption. The facility was under construction with plants having just been planted and consequently it was not receiving wastewater effluent from the lagoons.

On-site Pre-treatment of Leachate

The September 1998 study conducted by CG&S entitled “Leachate Treatment and Disposal Options” recommended that the Region consider the use of on-site pre-treatment of the leachate prior to transporting it to the R.O. Pickard Environmental Centre for final treatment in order to alleviate public concerns with the conveyance of raw leachate. It was estimated that this option would increase the 20 year cost of construction and operations by approximately \$2.2 million. The suggested process train included an equalization basin, primary treatment with chemical precipitation, biological treatment using the activated sludge process and mechanical dewatering of the resulting sludge. An engineered wetland, with a lagoon for winter storage, could be considered as an alternative to an activated sludge process, but the other process steps would still be required. The dewatered sludge may present a disposal problem since it would likely be classified as a hazardous waste.

On site pre-treatment would have the added benefit of potentially bringing the leachate into compliance with the Region’s Sewer Use By-law. Laboratory data indicates that the By-law limits are exceeded for BOD₅ and total nitrogen, and periodically exceeded for total suspended solids and chlorides. There are also a number of chemicals present in trace amounts that are not approved for discharge and the By-law as it presently exists has no mechanism for accepting this material. The CG&S study indicated that the best available treatment technologies for removing these contaminants could cost from \$3.6 to as much as \$8.75 million, with annual operating costs up to \$800,000.

Comments from the Ministry of the Environment

The MOE has provided further comments on the issue of management of Trail Road leachate and groundwater contamination in the Nepean Landfill Bufferland as detailed in the attached correspondence and summarized below:

- The MOE continues to support the construction of a pipeline to convey both wastestreams to the R.O. Pickard Environmental Centre for treatment.
- The Ministry would support a research initiative and assist with technical staff support and chemical analytical work, but is unable to contribute any direct funding.
- The Pilot testing of a constructed wetland with discharge to the pipeline and ultimate treatment at the R.O. Pickard Environmental Centre would not require a Certificate of Approval.
- A Certificate of Approval would be required for a full scale engineered wetland.
- A surface discharge to the Jock River watershed would require an individual surface water assimilation study and full wastewater treatability study.
- The Ministry notes that the Jock River is a Policy 2 watercourse and very stringent discharge quality criteria and monitoring requirement would be imposed.
- The Ministry is very concerned that work proceed as quickly as possible to resolve the groundwater contamination problem and that any work on research not delay the timing of the pipeline.

Observations

Throughout the dialogue that has taken place concerning leachate and contaminated groundwater, Council has indicated its support to continue to be leaders in the protection of the environment and in support of new and developing technologies. This is consistent with other initiatives such as the water treatment pilot plant operation at Britannia, the Cogen facility at the R.O. Pickard Environmental Centre, and the Carlsbad Springs trickle feed water distribution system.

The question becomes how best to achieve similar goals in this case. An engineered wetland would cost in the order of \$800,000 to treat contaminated groundwater that only barely exceeds the Provincial Water Quality Objectives (PWQO). As an alternative, that funding could be directed to a research programme to look at both leachate and contaminated groundwater to investigate, bench test, and potentially to pilot selected technologies in order to evaluate the net environmental impact after pre-treatment at the landfill and final treatment at the R.O. Pickard Environmental Centre. Building from the strength of our wastewater treatment facility, environmental benefits could be leveraged by seeking on site solutions specifically designed to work in conjunction with the R.O. Pickard Environmental Centre rather than in isolation.

Leachate Treatment Research Programme

In order to implement any of the options for on-site treatment of either leachate or leachate contaminated groundwater, and also to comply with Council direction to involve the private sector, government agencies, research institutions and other stakeholders in the assessment of new and emerging technologies, funding for a research programme will be needed. The programme could include some or all of the following:

- a preliminary screening of technologies for detailed analysis and pilot testing, including engineered wetlands, treatment lagoons, physical/chemical treatment, activated sludge, attached growth biological processes, microfiltration, reverse osmosis, peat filtration, membrane filtration, etc.
- invite government agencies such as the MOE, Environment Canada, etc. to participate.
- invite research institutions such as the NRC and local universities to participate.
- invite private sector firms to contribute by participation in pilot process and equipment demonstrations.
- conduct pilot testing.
- evaluate surface water and groundwater factors specific to the Jock River watershed.
- evaluate and publish results.
- forward appropriate recommendations to Committee and Council.

A budget of \$500,000 is recommended to fund the programme and would include the cost of additional technical staff, consultants, laboratory testing, construction of facilities for pilot testing of various technologies, test equipment, materials and supplies, etc.

*Approved by
J. Miller, P.Eng.*

DWM/jw

Attach.

Ministry of the
Environment

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June 24, 1999

Mr. Pat McNally
Director, Solid Waste Division
Region of Ottawa-Carleton
Trail Waste Facility
4475 Trail Road
Nepean, Ontario
K0A 2Z0

Dear Mr. McNally,

RE: Leachate Management - Trail Waste Facility and Nepean Landfill Site

This is further to your letter of June 22, 1999 in which you asked for this Ministry's position or comment on a number of questions related to leachate and contaminated groundwater management at the above sites. I have now had an opportunity to review these questions and discuss them with and obtain input from staff in other Branches of this Ministry.

This Ministry supports the findings of the report entitled "Region of Ottawa - Carleton Trail Road landfill Site Leachate Treatment and Disposal Options" to construct a pipeline to convey both the leachate and contaminated groundwater to the R.O. Pickard Centre for treatment. Research into the treatment of leachate and leachate contaminated groundwater by alternative methods is also encouraged. While this Ministry is unable to commit any direct funding for a partnership program at this time, support services could be provided. This would include chemical analytical work and technical reviews and advice.

With respect to research, a pilot scale engineered wetland would be an option worth some consideration. It should be noted however, that discussions with Ministry staff have indicated that constructed wetlands have seasonal operational difficulties and would therefore require secondary facilities to ensure that discharge criteria are not exceeded at any time. Provisions would therefore be necessary to collect the effluent from the pilot plant for further treatment at the R.O. Pickard Centre prior to discharge. A Certificate of Approval would not be required for a pilot plant with no direct discharge to surface water or groundwater.

Mr. Pat McNally

June 25, 1999

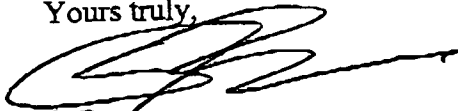
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The construction of a full-scale engineered wetland would require a Sewage Works Certificate of Approval. To determine the required discharge criteria, an individual surface water assimilation study would be required as well as a full wastewater treatability study. Considering the discharge point (i.e. a seasonally dry drain) which discharges ultimately to the Jock River (a degraded Policy 2 receiving water); very stringent discharge criteria and monitoring requirements would be applicable.

This Ministry is very concerned that work proceed on the proposed pipeline as soon as possible. This groundwater contamination problem was originally identified in 1995. In May 1997 the Ministry and Region of Ottawa-Carleton agreed on an abatement program with a scheduled return to compliance date of 1999. Any work on research programs should not interfere with the timing of the pipeline installation. Recent progress with respect to the contaminated groundwater at the Nepcan Landfill Site is unsatisfactory and must be resolved without further delay.

I would appreciate meeting with you by September 30, 1999 to review and formalize a revision to the schedule for the project.

Yours truly,



S. Burgis
District Manager

DSH/th