

1. TRAIL ROAD WASTE FACILITY AND NEPEAN LANDFILL SITE -
1997 ANNUAL MONITORING REPORT

COMMITTEE RECOMMENDATION

That Council receive for information the *Final Report for the 1997 Monitoring and Operating Program* for the Trail Road Waste Facility and Nepean Landfill Site.

DOCUMENTATION:

1. Environment and Transportation Commissioner's report dated 24 Sept 98 is immediately attached.
2. Extract of Draft Minute, 27 Oct 98, immediately follows the report and includes a record of the vote.

Our File/N/Réf. **50 15-95-0015-H**
Your File/V/Réf.

DATE 24 September 1998

TO/DEST. Coordinator
 Planning and Environment Committee

FROM/EXP. Environment and Transportation Commissioner

SUBJECT/OBJET **TRAIL ROAD WASTE FACILITY AND NEPEAN LANDFILL
SITE - 1997 ANNUAL MONITORING REPORT**

DEPARTMENTAL RECOMMENDATION

That the Planning and Environment Committee recommend that Council receive for information the *Final Report for the 1997 Monitoring and Operating Program* for the Trail Road Waste Facility and Nepean Landfill Site.

INTRODUCTION

In accordance with the terms and conditions of the Certificate of Approval for the Nepean Landfill Site (A 461301) and the Certificate of Approval for the Trail Road Waste Facility (A 461303), the Region of Ottawa-Carleton must submit an annual site progress and monitoring report to the Ontario Ministry of the Environment (MOE).

The *Final Report for the 1997 Monitoring and Operating Program* was submitted to the MOE. The purpose of this report is to provide information on the operational status of both the Trail Road Waste Facility and the closed Nepean Landfill Site. A copy of the Executive Summary as prepared by Golder Associates is attached as Annex A. A reference map of the sites and surrounding areas is attached as Annex B.

BACKGROUND

During 1997, the Trail Road Waste Facility and Nepean Landfill Site were in compliance with the terms and conditions of their respective certificates of approval. The 1997 monitoring and operating program report describes the monitoring, operating, and capital development activities at the Trail Road and Nepean sites during 1997.

Nepean Landfill Site

The Nepean Landfill Site began receiving waste in the early 1960's. It no longer receives waste and is closed. The site was regraded in 1991 to promote surface water run off and capping was completed in 1993. The final landscaping was completed in 1994.

The groundwater flow pattern is similar to that of previous years. The deep aquifer flows north towards the dewatering pond in the bufferland north of the Trail Road Waste Facility. The shallow aquifer flows south and west to spring-fed ponds in the bufferland. The extent of leachate migration in the deep aquifer is determined to be south of Cambrian Road on regional property. Leachate effects from the Nepean Landfill in the shallow aquifer occur west just beyond Moodie Drive and south on the Burnside property. The surface water in the upper reaches of the agricultural drain immediately west of Moodie Drive exceeds the Provincial Water Quality Objectives for ammonia and iron; however, further along the drain, prior to discharge to the Leamy Drain, all provincial surface water quality objectives are met.

Surface waters flow from the spring-fed ponds and the dewatering pond through a series of agricultural drains and eventually to the Jock River. The surface water quality southwest of the Nepean Landfill continues to exhibit minor leachate effects that are within livestock drinking water criteria. The Jock River water quality remains unaffected by surface water discharges from the closed Nepean Landfill Site.

Landfill gas migration is controlled by an active gas extraction system which was installed in 1993. The landfill gas is processed at the gas flaring station at the Trail Road Waste Facility. Data indicates that landfill gas impacts do not extend beyond the bufferlands owned by the Region.

Water supply wells on site and on adjacent private properties are no longer used for drinking water. Bottled water continues to be supplied as a precaution for staff at the landfill site and for some of the site's closest neighbours. The acquisition of additional bufferland and implementation of a remedial action plan as required by the MOE are underway as part of the regulatory closure plan. Over the years, the acquisition of several properties has been settled. The remaining properties are under negotiation and some may require expropriation and Ontario Municipal Board hearings.

Trail Road Waste Facility

The groundwater flow pattern is similar to that of previous years. The deep aquifer flows towards the spring-fed pond in the bufferland north of the Trail Road Waste Facility, known as the "dewatering pond". Leachate migration in the deep aquifer from the Trail Road Waste Facility is contained directly beneath the landfill. The shallow aquifer flows north-east and discharges as springs in the forested bufferland north of the filling area on the regional clay plain. Leachate effects in these areas are completely contained on the Region's property.

The surface waters from the dewatering pond and the springs in the bufferland forest, which flow north through agricultural and roadside ditches and eventually to the Jock River, meet Provincial Water Quality Objectives. The water quality of the Jock River remains unaffected by surface water discharges from the Trail Road Waste Facility.

In 1991, the landfill gas control system was switched from a passive venting system to an active gas extraction system that flares the gas at the flaring station. The active landfill gas extraction and flaring system continues to reduce greenhouse gas emissions. Landfill gas migration patterns are similar to that of previous years with movement south into an area where additional bufferland was acquired.

Water supply wells on site and on adjacent private properties are no longer used for drinking water. As a precaution, bottled water is provided.

The Trail Road Waste Facility received 219,879 tonnes of waste in 1997, of which 144,011 tonnes was landfilled. In 1996, the Trail Road facility received 220,165 tonnes of waste, of which 161,252 tonnes was landfilled. Based on historical trends, it is estimated that the site will reach approved capacity by the middle to late year 2006; however, these projections are likely conservative in light of current and future waste diversion options.

A permanent composting facility was built on the bufferland north of the Trail Road Waste Facility in 1994. All leaf and yard material received at the site in 1997 went to the permanent composting facility. In 1997, 16,983 tonnes of leaf and yard material and brush were received for composting. An additional 560 tonnes of commercial leaf and yard material and 382 tonnes of Christmas trees were brought to the composting facility. In 1996, 19,481 tonnes of residential leaf and yard waste were received at the composting facility. An additional 686 tonnes of commercial leaf and yard waste and 54 tonnes of Christmas trees were also received. All compost is sampled prior to leaving the site to ensure that MOE requirements are met. All of the compost produced in 1997 met the MOE requirements. The compost will be screened and sold in 1998.

The permanent Household Special Waste Depot accepted material from 11,073 vehicles in 1997 and 11,447 vehicles in 1996.

Capital and Operating Projects

The following projects were initiated or completed in 1997:

- installation of Stage 3 Interim Landfill Gas Collection System;
- installation of several new groundwater monitoring wells;
- testing of a temporary perimeter misting system for odour mitigation;
- continuation of the property acquisition program to provide bufferland, where required.

CONSULTATION

A presentation on the Trail Road Waste Facility and Nepean Landfill Site was given to the City of Nepean Public Works Committee in July 1998. A copy of the *Final Report for the 1997 Monitoring and Operating Program* for the Trail Road Waste Facility and the Nepean Landfill Site has been filed with the Regional Clerk's Department and is available for viewing.

FINANCIAL IMPLICATIONS

The monitoring program and subsequent report were prepared through a contract with Golder Associates Limited for 1997. Funds for the contract are budgeted for annually in the Solid Waste Division Operating Budget.

CONCLUSION

The Trail Waste Facility and Nepean Landfill Site continue to operate in accordance with the terms and conditions of their respective certificates of approval.

Approved by
M. J. E. Sheflin, P.Eng.

DR/PM/

Attach. (2)

EXECUTIVE SUMMARY

The Trail Road and Nepean Landfill were both in compliance with their Certificate of Approval during 1997.

The Regional Municipality of Ottawa-Carleton (RMOC) owns and operates both the Trail Road and Nepean Landfill sites. The Trail Road Landfill receives waste from most of Ottawa-Carleton.

The Nepean Landfill has not received municipal solid waste since 1980. The Nepean Landfill received final cover in 1993 incorporating an engineered geomembrane hydraulic barrier cap and active gas collection system.

The Trail Road Landfill has operated since 1980 to receive municipal solid waste. Trail Road Landfill is divided into distinct stages of operation. Stages 1 and 2 were designed based on a natural attenuation landfill. These stages were covered in 1988 and 1991, respectively, with a low permeability geomembrane cap to reduce leachate generation through infiltration. Stages 3 and 4, the approved final stages of the Trail Road Landfill, were both designed based on engineered containment and have a single composite bottom liner (clay and geomembrane) and leachate collection system. Landfilling currently takes place in Stage 3. Landfill gas is controlled at the site through an active gas collection system and flaring station for all capped stages and the closed Nepean Site. A groundwater and surface water monitoring program documents changes in groundwater and surface water quality and determines how they are being influenced by the landfill site.

OPERATIONS

Gross waste received in 1997 was 219,879 tonnes. The net amount of waste landfilled was 144,011 tonnes. Of the 75,868 tonnes of material diverted from the landfill, 57,899 tonnes was clean fill used at the site for daily and interim waste cover, dykes, roads and slopes.

As of November, 1997 the remaining theoretical air space in Stage 3 for waste material is 503,400 cubic metres. The Stage 4 design capacity is 1,920,000 cubic metres without final cover.

The estimated remaining capacity of Stages 3 and 4 is as follows:

ESTIMATED REMAINING CAPACITY OF STAGES 3 AND 4*

	Volume Remaining Below Approved Final Waste Contours (cu.m.)	Theoretical Stage Life from January 1, 1998 (years)	Theoretical Completion Date
Stage 3	503,400	1.5 to 2.0	early to mid 1999 to 2000
Stage 4	1,920,000	6 to 6.5	mid to late 2006

* Based on the 1990 development and operation plan.

The theoretical date includes the west sideslope area of Stage 3 which can only be filled on initiation of Stage 4.

Based on previous site experience, **landfilling in Stage 4 will likely commence** at least 12 months prior to the theoretical completion of Stage 3; that is, **by mid 1999**.

Capital works at Trail Road Landfill during 1997 included:

- Installation of Stage 3 Interim Gas Collection System
- Initiation of final design of the leachate forcemain
- Repairs to groundwater monitor M6B and installation of additional groundwater monitors
- Set-up and operation of a misting system to control odours from the Stage 3 cell.

During 1997, the **Trail Road Landfill operated in compliance** with its Provisional Certificate of Approval.

There were no operations or capital works ongoing at the Nepean Landfill Site during 1997. The only activity was:

- Selection of a consultant to design a groundwater collection and disposal system and implement the design selection

During 1997, **the Nepean Landfill was in compliance** with its Provisional Certificate of Approval.

ENVIRONMENTAL CONCLUSIONS

Leachate influence on groundwater is assessed on the basis of: 1) a physical hydrogeology approach that addresses the flow path and rate of groundwater moving in the groundwater system; 2) a chemical hydrogeology approach that addresses the alteration of groundwater quality by leachate influences. These two approaches must be combined to provide conclusive scientific evidence of influence of landfill leachate. This methodology was used to determine how surface water and groundwater quality are influenced by the landfill sites.

In the assessment of landfill influence, the study area was subdivided into discussion areas for the surface water and groundwater monitoring locations. The surface water discussion areas are shown on Figures 3.18, 3.19 and 3.20. The groundwater discussion areas are shown on Figure 3.13.

Two principal overburden aquifers, one shallow, one deep, are identified at Nepean and Trail Road Landfill sites. The groundwater monitoring program documents leachate influence in these aquifers.

Careful review of monitoring data and spatial analysis using a Geographical Information System has shown that bromide and boron are key parameters in the assessment of leachate influences at the sites. In the absence of boron and bromide, elevated chloride, alkalinity, iron, hardness, organic

carbon and nitrogen compounds in much of the groundwater near Trail Road and Nepean Landfills are attributed to manmade sources such as fertilizer, road salt and septic systems.

Upper bounds of linear groundwater flow velocity in the vicinity of both landfill sites has been determined to be in the order of several metres per year in the deep and shallow aquifer. Localized higher linear velocities of groundwater flow may occur due to increased horizontal gradients brought about by topography and geology.

The Nepean Landfill has existed since about 1960 or some 38 years, whereas Stages 1 and 2 have existed since about 1980 or some 18 years. These landfill areas are natural attenuation facilities, without engineered bottom containment. The estimated groundwater velocity, together with the age of the landfills, provides an indication of the maximum distance which leachate could have migrated in the groundwater beyond the waste. Therefore, under similar hydrogeologic conditions, leachate influences from Nepean Landfill would have migrated farther than those from Trail Road Landfill Stages 1 and 2.

The natural attenuation stages of the Trail Road Landfill influence groundwater quality in the shallow aquifer and deep aquifer. Leachate influence on the shallow aquifer extends to the north and is entirely contained on RMO property, as the shallow aquifer pinches out to the north on RMO property. Surface water discharge from the property to the northeast meets Provincial Water Quality Objectives (PWQO). Leachate effects on the upper part of the deep aquifer are identified directly below the landfill. Leachate effects on the deep aquifer from Trail Road Landfill have not been identified elsewhere. The chemical interpretation is consistent with the physical hydrogeology flow patterns and linear flow velocities. Water quality in other areas of the deep aquifer have elevated key parameters that are not necessarily attributed to the landfill site. These areas are on RMO property and are included in the ongoing monitoring program

Leachate effects from Nepean Landfill occur in the shallow aquifer to the west beyond Moodie Drive and south onto the Burnside property. Groundwater flow interpretation suggests that the main direction of leachate affected groundwater movement is to the west. The sand pinches out on the clay plain west of Moodie Drive and the groundwater discharges to the surface water system at this location. Exceedance of PWQO is measured at the headwaters of the surface water system for ammonia and iron. This surface water system is a series of agricultural ditches connected to Leamy Agricultural Drain that discharges to the Jock River. The total dissolved inorganic load in the surface water in Leamy Agricultural Drain is increased, however, input from leachate effects does not cause exceedance of PWQO. The chemical interpretation is consistent with the physical hydrogeology flow patterns and linear flow velocities.

No effects of leachate from the Nepean Landfill are measured in the deep aquifer at monitoring locations beneath the landfill or to the west and south. Leachate effects exist to the northeast of Nepean Landfill in the deep aquifer and extend beneath the northwest corner of the Trail Road Landfill property (refer to Northwest of Trail Road Landfill Area, Figure 3.13) and are measured in the bottom portion of the aquifer. Monitors completed in the middle portion of the deep aquifer beyond the northwest corner of the Trail Road Landfill property suggest that leachate effects have not reached Cambrian Road. The chemical interpretation is consistent with the physical hydrogeology flow patterns and linear flow velocities.

Dilute leachate effects at monitoring well M40 (situated within North of Trail Road Landfill Area II, Figure 3.13) in the deep upper aquifer have been measured since 1994. Based on the groundwater flow velocity and time frame of landfilling, the measured leachate influence is likely from the Nepean Landfill.

Methane generation from the Trail Road and Nepean Landfill sites continues as in previous years. Methane gas levels continue to be elevated along Trail Road south of Stages 1 and 2. However, no structures are present in these areas.

The upward trend in iron concentration in excess of PWQO at the dewatering pond was reversed and declined in 1997.

Iron concentrations in the shallow groundwater flow system are increasing in the general area between the dewatering pond and the composting facility, and could represent a future source of increasing iron in the downgradient receptor, which is the dewatering pond.

The additional groundwater monitors installed in 1997 were of great benefit in further addressing the physical hydrogeology and geochemistry at the site.

RECOMMENDATIONS

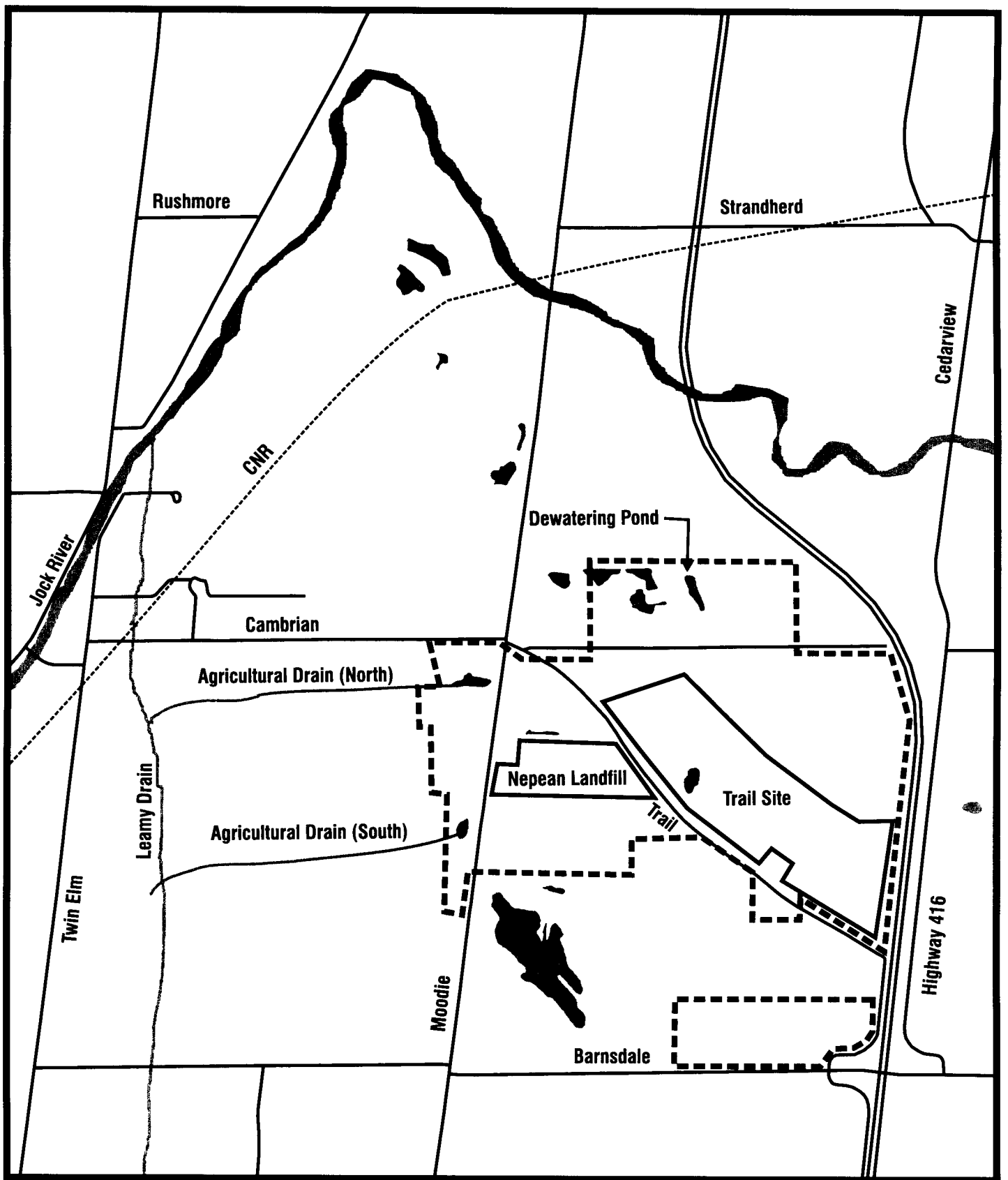
In the 1996 Annual Report, recommendations were provided for reductions to the site monitoring programs, and these revisions were approved by the MOEE. It is considered that these reductions to the programs remain justified. The monitoring program together with the technical justification are provided in Appendix N and are summarized here.

The monitoring program is based on the following main considerations:

- bromide and boron, together with chloride, are the most important leachate effect indicators;
- seasonal variations in leachate influences on groundwater quality do exist and need to be documented at key compliance locations, hence key monitors are suggested for three times yearly monitoring;
- build up a database of the vertical distribution of leachate effects northeast from the Nepean Landfill and near the Trail Road Landfill;
- effects of leachate on groundwater west, south and northwest of Nepean Landfill are well understood;
- surface water quality in the Jock River is not affected by leachate; discharging streams to the Jock River which receive water originating from the landfills all meet PWQO for the effects brought about by leachate and,
- little monthly variations exist at surface water monitoring locations, which is as expected since the streams are groundwater discharge fed and groundwater quality does not generally change rapidly.

In view of the current observations of increasing iron concentrations upgradient of the dewatering pond, it is recommended that the monitoring program be enhanced in that area to study the possible reasons that iron concentrations are increasing.

The scope of such study would consist of the installation of 5 to 7 additional shallow monitoring wells, an increased water quality monitoring frequency following discrete rainfall events or dry periods, and water quality monitoring specifically aimed at changes in redox conditions and organic indicators such as DOC, tannins and lignins and bacteria.



----- Approximate Bufferland Boundry

1. TRAIL ROAD WASTE FACILITY AND NEPEAN LANDFILL SITE -
1997 ANNUAL MONITORING REPORT
- Environment and Transportation Commissioner's report dated 24 Sept 98

Pat McNally, Director, Solid Waste Division, Keith Watson, Manager, Operations Branch and Dave Ryan, Acting Site Engineer, appeared before the Committee to brief them on the staff report. Mr. McNally noted the Monitoring Report is submitted annually to the Ministry of the Environment (MOE) as a requirement of the Region's Certificates of Approval for the Nepean and Trail Road Landfill sites. The report was submitted at the end of May and staff have recently received comments back from the MOE indicating they had done a review and had not taken any issues with the report.

Mr. Watson then went through the highlights of the reports.

Committee Chair Hunter noted the Executive Summary sets out the statistics for the tonnage of material received and the tonnage landfilled. As well, it mentions a comparison of 1996 and 1997 and shows that not only was less material received at Trail Road in 1997 compared to 1996 but it also shows that a significantly less proportion of that material was actually landfilled. The Chair took this to mean there was some success in diversion projects and he asked if this was a continuing trend. Mr. McNally agreed that staff have certainly seen a decreasing trend with respect to the residential waste and he pointed out, as a result the projected life of the landfill will be extended beyond what is currently approved.

Councillor Stewart noted the report states the Jock River water quality remains unaffected by surface water discharges from both the Nepean and Trail Road Landfill sites. However, it also mentions that the groundwater discharges into the surface water on the clay plain west of Moodie Drive, where there is an exceedance of the Provincial water quality standards. The surface water system in the Agricultural drains in this location connects up to the Leamy Drain and is then discharged into the Jock River. She asked staff if the groundwater, which is contaminated, is then getting into the Jock River via these drains. Mr. Watson replied, in the agricultural drainage system west of the Nepean landfill site, the Provincial water quality objectives are exceeded in the upper reaches of that water shed system. As the water moves down that system it is renovated or attenuated and by the time it reaches the Leamy agricultural drain it does not exceed the Provincial water quality objectives and therefore the Jock River shows no signs of anything from the Nepean or Trail Road Waste facilities.

Councillor Legendre had questions of staff concerning the life of the landfill. He noted in 1991/1992 there were approximately 8 years left in the life of the landfill; then three years later he was told his "children might not see the end of the life of the landfill site". Now in this report it estimates the completion date at 2006 (2009 in the Optimization Report). Mr. McNally replied the estimate of 2006 was based on projections done for a 1990 development and operational plan. Since that time, the Region has made a number of operational changes (in addition to the waste diversion programs) at the landfill site that have allowed it to make better use of the air space available. As well, a bigger, heavier compactor is used today than

what was used when the plan was done in 1990 and the other significant change is the handling of the leachate and the recirculation of the leachate which promotes the faster biodegradation and settlement of the landfill. He explained, with the waste diversion rates the Region is achieving, the number will not be 2006 but will be 2009 (with current practices).

Responding to further questions from Councillor Legendre concerning contaminants in the water, Mr. Watson explained some of the things that show up in the surface water as a result of the groundwater discharging in springs in the area west of Moodie Drive are things like ammonia. Ammonia is a nitrogen based compound that is actually absorbed by some of the water weeds and plants as it moves down the water course. As well, there is some dilution as it moves into the larger drain (i.e. the Leamy drain). He went on to say staff are keeping a close eye on it and the remedial action plan with the subdrain that will go around the perimeter of the Nepean landfill site will resolve this in the short term and the cap of the Nepean landfill site (which was done in 1991/92) will cut off the drainage in the long term.

Mr. McNally elaborated on the remedial system to be put in place on the buffer land so that contamination can be contained, Provincial water quality objectives are not exceeded and there is no impact on the Agricultural or Leamy drains. He stated in 1996, the Region did a preliminary design for this (to handle the contaminated groundwater from the Nepean site) which resulted in two options. One option was to do further design work on a wetland (to basically collect the water with an underground trench and pipe and run it through a natural wetland) and the other option was, once collected, to employ a sewer solution to the leachate at Trail Road. Mr. McNally noted the third element of the remediation plan which is the collector works and then either the wetland or piping is the outstanding step the Region still has to take. The MOE is aware of this plan and is looking for the Region to continue to make progress in this regard.

Councillor Legendre continued to express concern with what was happening with groundwater on the site. Mr. McNally stated this is a well monitored and well understood site. He explained in the lower aquifer, there is a clay layer that does not quite go completely underneath the landfill. The leachate that comes down and gets into the groundwater above the portion that has the clay liner flows across under Moodie Drive into the pond at monitoring site S-31 and ultimately flows down into the drain, so staff know what is happening in the upper aquifer. There is some leachate that by-passes the clay liner (because it is not continuous) and goes down into the deep aquifer and flows to the dewatering pond (which was created by aggregate excavation) so staff know where to watch for it. The water leaving the dewatering pond does not cause any problem as it flows down into the Jock River.

Councillor van den Ham questioned why Trail Road Landfill site would need to be open seven days a week. Mr. Watson responded on Saturday the site receives commercial waste from front end loaders (apartment buildings or commercial operations) and on Sunday it is strictly small loads from residents. The site is closed on Sunday in the winter months, as its use drops off, but there is a fairly steady demand through the spring, summer and fall period from residents wanting to dispose of material on a Sunday.

Councillor van den Ham had further questions concerning the recycling of the leachate. Mr. Watson replied the leachate has in it a biological activity (i.e. microbes, chemicals) that act on the garbage and make it decompose; and as well, wet garbage decomposes faster than dry garbage. He noted that landfills tend to be porous and drain very well, so they dry out and become dormant and stop decomposing. Recycling the leachate causes the waste to decompose and consolidate faster and actually provides more space (the Certificate of Approval provides for a block of air space of only 8,780,000 cubic metres) so the more garbage that can be packed in, the longer the site will last. Mr. Watson pointed out Stages 1 and 2 of the landfill do not have liners, they operate as natural attenuation sites (i.e. the leachate migrates out of the bottom of the landfill and enters the groundwater system, it migrates towards the dewatering pond and is monitored). Stage 3 is the active site that staff are actively managing the leachate, getting the leachate up into the garbage and trying to get the garbage to decompose as fast as possible.

Councillor McGoldrick-Larsen asked staff to provide a comparison of previous years of leachate volumes and content, as well as a brief overview of the volumes seasonally and the Region's capacity to manage those volumes. Mr. McNally was not able to provide a comparison of leachate volumes, however, he said the leachate number for 1997 was 57 million and staff project an increase in that for 1998. He pointed out the volumes for Stage 3, are to a large degree a function of the amount of moisture that falls on the open area. With respect to Stages 1 and 2 and the Nepean landfill site where caps are in place, the leachate volumes and strength are diminishing and as a result the contamination in the groundwater is also diminishing. Councillor McGoldrick-Larsen asked that staff provide her with the comparison information and she suggested this information should be included in future monitoring reports.

The Councillor then asked staff to provide information on the content of the leachate (e.g. metals and other components tested for) and whether or not there has been an increase in these components. Mr. McNally referred the Councillor to the Appendices of the Monitoring Report, which contain a complete summary of all of the testing results, the parameters tested for and the frequency. However, he noted this was strictly 1997 data and was not able to present any good comparative information. The Councillor expressed concern the report did not provide comparators and asked staff to compile this information for the public meeting on November 3. Mr. McNally said this would be done.

The Committee then considered the staff recommendation.

That the Planning and Environment Committee recommend that Council receive for information the *Final Report for the 1997 Monitoring and Operating Program for the Trail Road Waste Facility and Nepean Landfill Site.*

CARRIED