

REGION OF OTTAWA-CARLETON
RÉGION D'OTTAWA-CARLETON

MEMORANDUM
NOTE DE SERVICE

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

DATE 12 September 2000

TO/DEST. The Chair and Members of Council

FROM/EXP. Director, Solid Waste Division
Environment and Transportation Department

SUBJECT/OBJET **TRAIL ROAD AND NEPEAN LANDFILL SITES -
1999 ANNUAL MONITORING REPORT**

INTRODUCTION

This report is for the information of the Chair and Members of Council.

In accordance with the terms and conditions of the *Certificate of Approval A461301* for the Nepean Landfill Site, and the Trail Road Waste Facility *Certificate of Approval A461303*, the Region of Ottawa-Carleton must submit an annual site progress and monitoring report to the Ontario Ministry of the Environment (MOE).

A report prepared for the Region of Ottawa-Carleton by Golder Associates titled *Trail Road and Nepean Landfill Sites Report for the 1999 Monitoring and Operating Program* was submitted to the MOE in May 2000. The purpose of this report is to provide information to the MOE on the environmental and operational status of both the Trail Road Waste Facility and the closed Nepean Landfill Site. A copy of the Executive Summary is attached as Annex A. A reference map of the sites and surrounding areas is attached as Annex B.

DISCUSSION

The Trail Road Waste Facility and Nepean Landfill Site are in compliance with the terms and conditions of their respective certificates of approval. The 1999 monitoring and operating program report describes the monitoring, operating, and capital development activities at the Trail Road and Nepean sites during 1999.

Information Previously Distributed

To be listed on Planning and Environment
Committee Agenda of 26 September 2000

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 in 1999 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. Leachate migration in the deep aquifer extends beneath the northwest corner of the Trail Road Landfill property and is measured in the bottom portion of the aquifer. Leachate effects from the Nepean Landfill Site, in the shallow aquifer, occur west just beyond Moodie Drive and to the south.

The surface water in the upper reaches of the south agricultural drain, immediately west of Moodie Drive, exceeds the *Provincial Water Quality Objectives* (PWQO) for ammonia, boron and iron. However, farther along the agricultural drain, prior to discharge to the Leamy Drain, all provincial surface water quality objectives are met. Sampling in 1999 indicated the presence of volatile organic compounds in the upper reaches of the agricultural drain immediately west of Moodie Drive. Concentrations of these parameters are less than the PWQO criteria. These compounds are not detected farther along the drain, prior to discharge to the Leamy Drain. The surface water quality southwest of the Nepean Landfill continues to exhibit minor leachate effects but water quality remains within livestock drinking water criteria.

Surface waters flow from the spring-fed ponds to the west and from the dewatering pond to the north through a series of agricultural drains and eventually to the Jock River. The absence of leachate indicator parameters indicates that 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 Waste Facility. Data indicates that landfill gas impacts do not extend beyond the bufferlands owned by the Region.

As a precaution against landfill effects, water supply wells on adjacent private properties are no longer used for consumption. Bottled water continues to be supplied. 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, several property acquisitions have been completed. 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 dewatering pond in the bufferland north of the Trail Road Waste Facility site. Leachate migration, from Stages 1 and 2 in the deep aquifer from the Trail Road Waste Facility site, is contained directly beneath the landfill. The shallow aquifer flows northeast and discharges 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 PWQO at the site boundaries. The water quality of the Jock River remains unaffected by surface water discharges from the Trail Road Waste Facility landfill site.

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. The landfill gas collection system was expanded in 1998 to include Stage 3 of the landfill site. A series of gas collection wells was installed into the refuse and modifications to the existing leachate underdrain collection system were made to allow for the collection of landfill gas generated in the active stage (Stage 3) of the Trail Road Waste Facility landfill site.

As a precaution, water supply wells on site and on adjacent private properties are no longer used for consumption, bottled water is provided. Several private water supply wells near the landfill site were tested at the owners' request. No leachate indicators were found in any of the wells.

The Trail Road Waste Facility landfill site received 233,239 tonnes of waste in 1999, of which 160,273 tonnes were landfilled. In 1998, the Trail Road Waste Facility landfill site received 254,211 tonnes of waste, of which 148,903 tonnes were landfilled. It is estimated that the site will reach approved capacity by 2009.

A permanent composting facility has been in operation on the bufferland north of the Trail Road Waste Facility landfill site since 1994. In 1999, 23,152 tonnes of residential leaf and yard material and brush, 558 tonnes of commercial leaf and yard material, and 492 tonnes of Christmas trees were received at the permanent composting facility. In 1998, 42,752 tonnes of residential leaf and yard waste were received at the composting facility, and an additional 591 tonnes of commercial leaf and yard waste and 382 tonnes of Christmas trees were received. The large quantities of leaf and yard waste received in 1998 are directly attributed to the January 1998 ice storm. Compost is sampled prior to leaving the site to ensure that MOE requirements are met. All of the compost produced in 1999 met the MOE requirements.

During its operation in 1999, from 17 April to 11 December, the permanent *Household Special Waste* (HSW) Depot accepted material from 10,710 vehicles. In 1998, material was received from 11,459 vehicles. An MOE audit of the HSW Depot in 1999 determined the operation to be generally acceptable with some minor operational inconsistencies and a new requirement for a *Certificate of Approval* (Air). The operational corrective actions were completed and confirmed. The C of A (Air) was received in July 2000.

Capital and Operating Projects

The following projects were initiated or completed in 1999:

- installation of microturbine at landfill gas flaring station;
- installation of several new groundwater monitoring wells;
- initiation of the leachate pipeline route selection study;
- initiation of the Trail Road Landfill Site Optimization/Expansion Environmental Assessment;
- application for a Certificate of Approval (Air) for the HSW depot; and
- continuation of the property acquisition program to provide bufferland, where required.

Finally, the report recommends adjustments to the monitoring programs to ensure compliance with the C of A and to protect the health and safety of neighbours, staff and the environment.

CONSULTATION

The public consultation process is not applicable. A copy of the *Report for the 1999 Monitoring and Operating Program* for the Trail Road Waste Facility and the Nepean Landfill Site has been filed with the Regional Clerk's Department. Quarterly meetings are held with the local MOE office to discuss operations at the Trail Road Waste Facility. Although not specific to the annual monitoring report, there was considerable contact and dialogue with the public regarding issues related to the proposed routing for a leachate pipeline and the treatment and handling of both contaminated groundwater and leachate as well as the Optimization/Expansion Environmental Assessment (EA).

FINANCIAL IMPLICATIONS

The monitoring program and subsequent report were prepared through a contract with Golder Associates Limited for 1999. Funds for the contract are budgeted for annually in the Solid Waste Division Operating Budget. The contract with the consultant is reviewed annually and will continue through 2000.

CONCLUSION

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

Approved by
P. McNally, P.Eng.

DR/mm

Attach. (2)

**TRAIL ROAD AND NEPEAN LANDFILL SITES
REPORT FOR THE 1999 MONITORING AND OPERATING PROGRAM**

EXECUTIVE SUMMARY

The Region of Ottawa-Carleton (Region) owns both the Trail Road and Nepean Landfill sites. The Region is responsible for the environmental maintenance of the Nepean Landfill and operates the Trail Road Landfill. The Trail Road Landfill receives non-hazardous solid 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. The 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 composite bottom liner (clay and geomembrane) and leachate collection system. Landfilling in 1999 took place in Stages 3 and 4. Landfill gas is controlled at the site through an active gas collection system and flaring station for all capped stages, the active Stage 3 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 1999 was 233,239 tonnes. The net amount of waste landfilled was 160,273 tonnes. Waste diverted from the landfill was 24,463 tonnes. Clean fill (48,503 tonnes) was used at the site for daily and interim waste cover, dykes, roads and slopes, and makes up the balance of the gross waste tonnage.

As of December 1999, the remaining theoretical air space in Stage 3 for waste material is 243,000 cubic metres. The Stage remaining for design capacity is 1,762,000 cubic metres. Both of these values are 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 (m³)	Calculated Stage Life from January 1, 2000 (years)	Theoretical Completion Date
Stage 3	243,000	1	mid 2003*
Stage 4	1,762,000	8 to 9	2009

* It is not anticipated that Stage 3 will approach closure condition in 2001 or 2002, because the west side slope of Stage 3 can only be filled as the adjoining part of Stage 4 is filled.

During 1999, the following major activities and capital works projects were undertaken by the Region at the Trail Road Landfill site:

- Installation of microturbine pilot at flaring station;
- Initiation of the leachate pipeline route selection study;
- Initiation of the Trail Road Landfill Site Optimization/Expansion Environmental Assessment;
- Installation of new groundwater monitoring wells south and west of Stages 3 and 4. Repair of monitoring wells at BH12 and M6B.

A routine inspection of the Household Special Waste Depot completed by the MOE on November 29, 1999 noted selected operational deficiencies which were subsequently addressed by the Region. Further details can be found in the Annual Report for the Household Special Waste Depot in Appendix L of this report.

At the end of 1999, the **Trail Road Landfill operated in compliance** with its Provisional Certificate of Approval.

An engineered design study is underway for a leachate-affected groundwater interceptor to be installed just south of Nepean Landfill. Capital Works at the Nepean landfill involved abandonment, decommissioning and replacement of monitoring well M51-2, the installation of a monitoring well adjacent to monitoring well BH16-1, and downhole geophysics on this well. Abandonment and decommissioning of wells M-1, M-2, M81-1 and M81-2 was also completed. The latter four wells were threatened to be damaged by the pit extraction operation to the south of Nepean Landfill. These well abandonment and replacement activities are described in Appendix O. During 1999, **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 3.19, 3.20 and 3.21. 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 has shown that bromide and to some degree boron are key parameters in the assessment of leachate influences at the sites. In the absence of boron and bromide, and together with the physical hydrogeology interpretation, elevated chloride, alkalinity, iron, hardness, organic carbon and nitrogen compounds in much of the groundwater near Trail Road and Nepean Landfills are attributed to artificial sources such as fertilizer, road salt (dust control and de-icer) and septic systems or changes in recharge conditions due to landscaping/land use changes leading to a change in mineral dissolution. Organic carbon in groundwater near Trail Road Landfill is attributed to high organic content of subsurface materials.

Upper bounds of linear groundwater flow velocity in the vicinity of both landfill sites have 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 40 years, whereas Trail Road Stages 1 and 2 have existed since about 1980 or 20 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, due to 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 (Stages 1 and 2) influence groundwater quality in the shallow and deep aquifer. Leachate influence on the shallow aquifer extends a limited distance to the northeast and is entirely contained on Regional property, as the shallow aquifer pinches out to the north on Regional property. Surface water discharge from the property to the northeast does not show any evidence of leachate. 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. Interpretation of groundwater flow information suggests that the maximum extent of leachate effects from the Trail Road Landfill in the deep aquifer is somewhere beneath lined Stages 3 and 4. 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 Regional property and are included in the ongoing monitoring program.

Because the influence of landfill leachate on groundwater from the Trail Road Landfill is located within the property boundaries, the site is operating in compliance with the MOE Reasonable Use Guideline B-7.

Leachate effects from Nepean Landfill occur in the shallow aquifer to the west beyond Moodie Drive and also to the south. The absence of leachate effects in the shallow aquifer to the northwest of Nepean Landfill beyond Moodie Drive were noted in 1999. However, groundwater flow interpretation suggests that the main direction of leachate affected groundwater movement is to the southwest. The shallow aquifer pinches out on the clay plain west of Moodie Drive and the groundwater discharges to the surface water system at this location.

Concentrations of unionized ammonia (ammonium), boron and iron in excess of Provincial Water Quality Objectives (PWQO) were measured at the headwaters of the surface water system west of Moodie Drive. These concentrations generally meet PWQO prior to discharge to Leamy Drain. Also, some volatile organic compounds are encountered in this surface water system. The volatile organic compounds are no longer detectable prior to discharge into Leamy Drain. This surface water system is a series of agricultural ditches connected to Leamy Drain that discharges to the Jock River. Surface water in Leamy Drain has increased concentrations of inorganic dissolved constituents along its flow path. A large component of this increase is attributed to agricultural practices, and a component of inorganic constituents is from the Nepean Landfill. The combined sum of chemical loading from the landfill and agricultural practices does not result in exceedance of the PWQO for parameters attributed to the landfill.

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 north of Nepean Landfill in the deep aquifer and extend beneath the northwest corner of the Trail Road Landfill property, and are measured in the middle and bottom portion of the aquifer. Monitors completed in the upper portion of the deep aquifer beyond the northwest corner of the Trail Road Landfill stages suggest that leachate effects are near Cambrian Road (M83). The chemical interpretation is consistent with the physical hydrogeology flow patterns and linear flow velocities.

Dilute leachate effects at monitoring well M40 (situated just north of Stage 4) in the upper deep 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.

Landfill gas generation from the Trail Road and Nepean Landfill sites continues as in previous years. Landfill gas levels continue to be elevated along Trail Road south of Stages 1 and 2. However, the only structure is on Regional property and is equipped with methane gas alarms.

An increase in what appears to be leachate impact was observed in 1999 at M-2 near Moodie Drive to the southwest of the Nepean Landfill. Further definition of leachate effects in the shallow aquifer in this area, by sampling existing groundwater monitors to the south and west of M-2, would be an appropriate action. Detailed recommendations are provided in the recommendations section of the report.

Dewatering Pond

It is interpreted that landfill leachate effects have not reached the dewatering pond in either the shallow or deep aquifer systems. Although there are upward vertical hydraulic gradients from the bedrock to the basal portion of the deep aquifer, there are negligible vertical gradients between the lower and upper portions of the deep aquifer in the vicinity of the dewatering pond. Horizontal gradients indicate the dewatering pond area to be a groundwater/discharge feature for the deep aquifer locally.

Shallow groundwater discharges at the southeast corner and outlet of the dewatering pond result in distinct iron-staining, organic sheen, and vegetation growth. An iron rich groundwater plume in the upper – near surface deep aquifer originating from a fill pile on the dewatering pond property is the likely source (Golder, 1999). Iron concentrations exceeded the PWQO for 1999 in the outlet from the dewatering pond. The iron levels in the dewatering pond were cyclical, with higher values during the fall months and lower values in the summer. The concentrations were comparable with the 1998 measured values.

The discharges from the Trail Road and Nepean Landfill sites do not influence the quality of water in the Jock River.

Key Recommendations

Annual groundwater sampling and water level measurements in April is recommended at selected groundwater monitors. Where exceptions in this monitoring frequency are proposed, it is recommended that additional groundwater monitoring events occur during the months of July and November. A proposed groundwater monitoring program is presented in Appendix N.

In 1999 possible leachate effects were detected at monitor M83-1 in the upper/middle part of the deep aquifer immediately south of Cambrian Road. In the absence of groundwater monitors in the vicinity of M83-1 north of Cambrian Road, consideration should be given to initially sample monitors M83-1 and M83-2, the surface water ponds north of Cambrian Road, the nearby monitoring location M60-1, and the monitoring wells in the direction toward the dewatering pond (M62-1, M63-1, and M92-1) three times annually. A corresponding frequency in water level monitoring is recommended.

In light of the significant increases in reference parameter concentrations observed at BH16-1 (just east of Nepean Landfill) since late 1998, a new monitoring well (BH16A) was installed in 1999 adjacent to borehole BH16-1. In order to better define the extent and origin of interpreted leachate in this well and surrounding area, a three times annual sampling of the following nearby existing locations (upper to middle deep aquifer) is recommended: BH16A-1, O-1, P-1, M58-1 and M107-1. A corresponding frequency in water level monitoring is recommended.

Increases in leachate parameter concentrations were observed at M-2 (shallow aquifer) in 1999. This location (monitors M-1 and M-2) was abandoned in early 2000. Further definition of leachate effects in this area is warranted. In order to achieve further definition, sampling of the following locations is recommended on the basis of three times annually:

- groundwater sampling at monitors K and L located south of former monitor M with a corresponding frequency in water level monitoring.
- surface water sampling at the ditch located west of the Goldie Mohr Property (west of Moodie Drive).

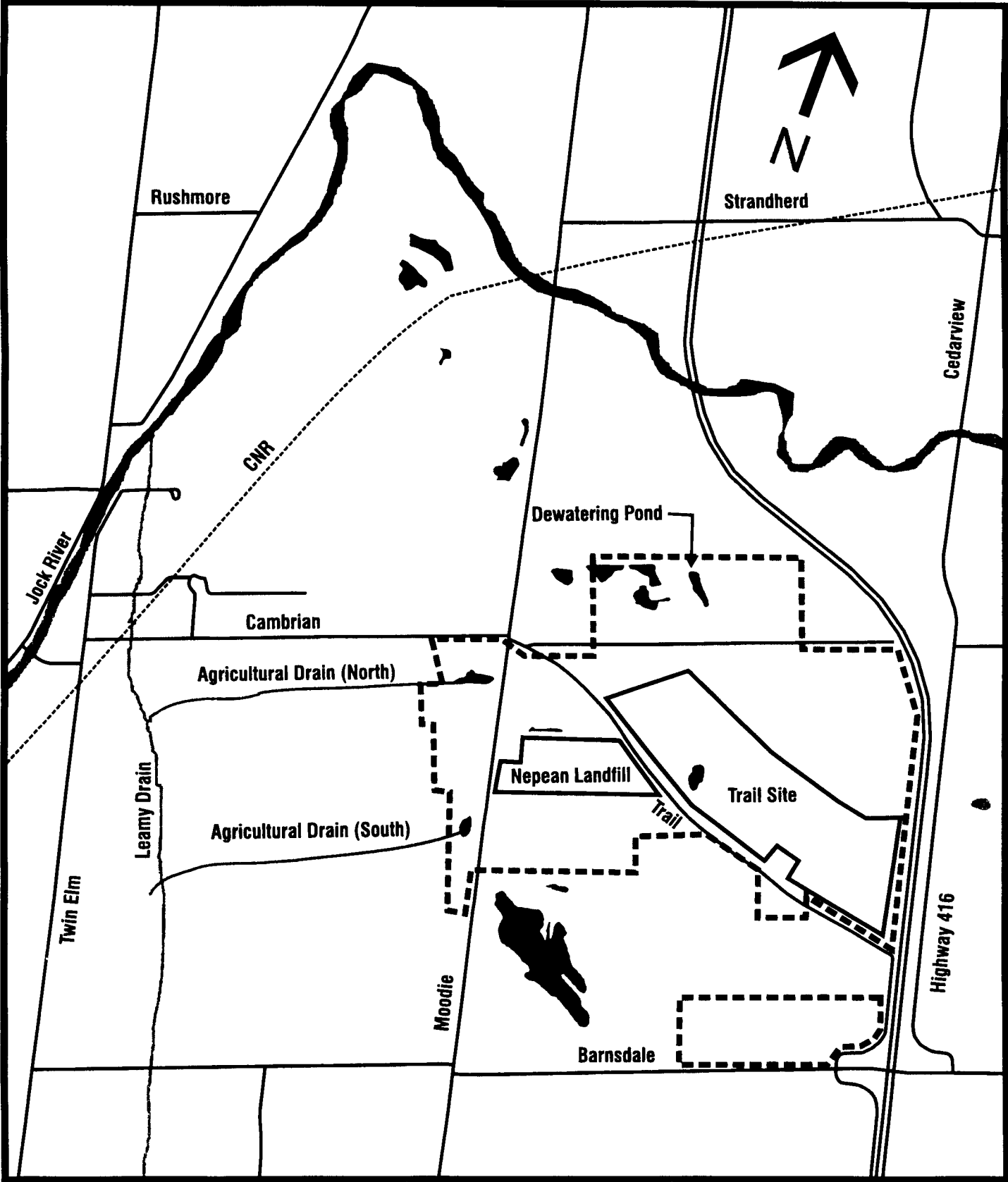
Groundwater monitoring location M81 was abandoned in early 2000. No replacement monitoring location is required.

The monitoring of VOCs at the Trail Road and Nepean Landfill sites in 1999 was found to be of use in determining absence or presence of leachate impacted groundwater and in the monitoring of leachate movement. Continued monitoring of VOCs in groundwater is recommended as proposed in the 1998 Annual Monitoring and Operating Report (Golder, 1999).

The dewatering pond plays an important role in the groundwater migration patterns in the upper deep aquifer north of Cambrian Road. The outlet northeast of the dewatering pond carries all discharge water from the pond and is sampled three times yearly. The construction of a v-notch weir at the dewatering pond outlet would be valuable for determining the total discharge from the dewatering pond to the Jock River.

The water levels in the west ponds, on the dewatering pond property, are currently measured with a single staff gauge. The installation of at least one more staff gauge would allow for better insight into the hydraulic connection between the west ponds and the dewatering pond.

It is recommended that landfill gas monitoring at the site be expanded to include monitoring of locations as indicated in Appendix N. Upgrading of landfill gas monitoring locations south of the Trail Road Landfill and west of the Nepean Landfill may improve the confidence in observed results.



----- *Approximate Bufferland Boundry*