Appendix C

Existing Environmental Conditions

- **Existing Conditions Report**

Existing Conditions Report

AECOM

United Counties of Leeds and Grenville

Class EA for Four Lane Upgrade of CR43
Existing Conditions Report

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Project Number:

108480

Date:

August, 2009

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August 10, 2009

Project Number: 108480

Les Shepherd
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United Counties of Leeds and Grenville
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Dear Mr Shepherd

Re: Municipal Class Environmental Assessment for
Four Lane Upgrade of County Road 43, Kemptville Corridor
Existing Conditions Report

We are pleased to present the following existing conditions report for the above mentioned project. The report details the corridor's current conditions and predicted future conditions. The report also includes a number of specialist studies completed for the corridor. It is envisaged that this document will help with the evaluation of the various alternatives for the corridor including the location of the bridge.

Please contact this should you have any enquiries or require any further information.

Sincerely,
AECOM Canada Ltd.

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Executive Summary

This Study is a continuation of work that was undertaken by the United Counties of Leeds and Grenville in 2005/06. In April of 2006 the Counties issued a report entitled "United Counties of Leeds and Grenville, County Road 43 Corridor Master Plan." The purpose of the Master Plan was to address transportation needs associated with a rapidly growing and developing corridor.

The intent of the Master Plan was to provide a sufficient level of planning to meet environmental assessment (EA) requirements for all Schedule 'B' projects in the Study Area. A decision by the Steering Committee to widen the corridor to four through lanes in the Kemptville urban area (from Somerville Road westerly to Highway 416) put this portion into a Schedule 'C' category. Consequently the Master Plan recommended that more work be completed to meet the Environmental Assessment requirements of this part of the corridor. Recommendations for the remainder of the corridor (from Highway 416 easterly to South Gower Drive) do not involve widening and will consist of a series of Schedule A projects. Schedule 'A' projects are pre-approved and can proceed without further study. Construction of a roundabout is a Schedule 'A' project and may proceed at any time. Projects which are approved under the Planning Act may also proceed without an Environmental Assessment.

The Master Plan has considered alternative solutions to address the evolving transportation needs (Phase 1 and 2 of the Municipal Class EA process). Alternatives that have been considered include:

- Do Nothing
- Transportation Demand Management (TDM) measures
- Transportation System Management (TSM) measures
- Upgrade other East West routes (including new East West routes)
- Widen CR43 to 3 lanes
- Widen CR43 to 4 lanes
- Widen CR43 to 5 lanes

The Master Plan also looked in detail at alternative intersection controls, as these have significant impact on overall corridor requirements. The Master Plan has recommended that CR43 between Somerville Road and Highway 416 be developed as a four lane roundabout corridor. It is not the intent of this study to revisit that recommendation.

This study picks up at Phase 3 of the Municipal Class Environmental Assessment, looking at alternative design concepts. A team of technical specialists has been assembled to inventory existing corridor features and to consider how different designs would impact important features. The purpose of this Existing Conditions Report is to document the specialist's work. This report is to assist the Technical Steering Committee with its evaluation of alternatives.

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1. Introduction

AECOM has been retained by the United Counties of Leeds and Grenville to complete the Municipal Class Environmental Assessment for County Road 43 along the Kemptville Corridor from Somerville Road to the Ministry of Transportation boundary at Highway 416. This EA is to be completed in accordance with the 'Schedule C' requirements outlined in the "Municipal Class Environmental Assessment October 2000, as amended in 2007".

1.1 Purpose of Report

Phase 3 of the Municipal Class EA 'Schedule C' requirements is an evaluation of alternative design concepts for the preferred solution identified in Phase 2 (Phase 2 for this study was completed by the previous Master Plan study). This report has been completed to assist with the evaluation of alternate design concepts. This report includes a detail inventory of existing conditions in the study area focusing on the natural, social and economic environment. Separate specialist reports are appended and summarised in this report.

The following report provides an overview of the specialist studies completed previously for the Master Plan as well as the specialist studies completed for this 'Schedule C' environmental assessment.

1.2 Study Area

The primary study area for the new study is a stretch of County Road 43 located in North Grenville between Somerville Road (to the west of Kemptville Mall) and the Western MTO boundary (approx. location of the existing Colonnade development roundabout). County Road 43 is the former King's Highway which runs from the Town of Perth, in Lanark County through Smiths Falls across the United Counties of Leeds and Grenville from Merrickville to Kemptville, to connect with Highway 416. East of 416, County Road 43 continues across the United Counties of Stormont, Dundas and Glengarry to end at Alexandria, northeast of the City of Cornwall.

Figure 1 on the following page shows the study area through Kemptville.

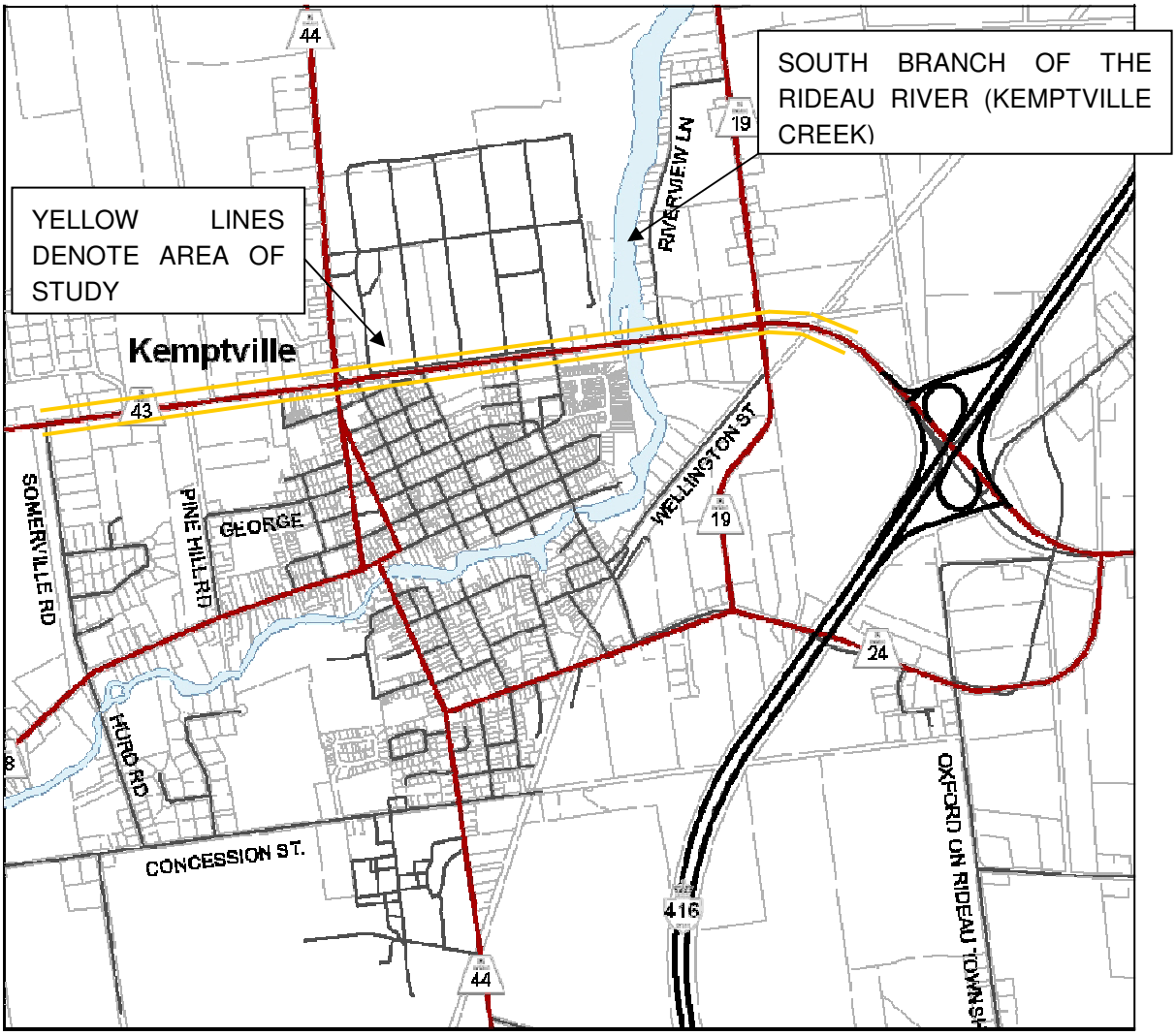


Figure 1 - Study Area

2. Studies Completed

The following is a summary of the specialist studies completed on the natural, social and economic environment in accordance with the Municipal Class EA 'Schedule C' requirements. Where a study has been completed as a standalone document the summary is smaller and the original document is appended to this report. Where a study has been completed but not as a standalone document it is detailed here.

2.1 Previous Studies

As noted previously the Corridor Master Plan for County Road 43 at Kemptville was completed in April of 2006. The Master Plan was completed in accordance requirements of the Municipal Class EA and was to address planning requirements for all 'Schedule A and B' projects. It was always understood that additional, more detailed environmental studies would be required for 'Schedule C' projects.

The Master Plan included significant study of existing transportation patterns, with projections of future needs. The work was completed in 2005. As that work is now four years old an updated study, including updated traffic counts, has been completed as a part of this study. A summary of this updated traffic report can be found in section 2.7 and the complete report can be found in Appendix C.

2.2 Stormwater Management

2.2.1 Introduction

The need for stormwater management, to mitigate the impacts of upgrading a two lane rural cross section to a four lane urban cross section (stormsewer+curb+gutter) has been assessed. Existing roadway drainage outlets to Kemptville Creek have been inventoried and future roadway drainage conditions have been assessed with respect to water quality and water quantity impacts on both the offsite ditches that convey flow from the roadway to Kemptville Creek, as well as on Kemptville Creek itself.

2.2.2 Existing Conditions

The existing drainage for County Road 43 in Kemptville has been reviewed and the results are illustrated in a drainage area plan, Figure 1 included in Appendix A, and an existing road profile, Figure 3, also included in Appendix A. County Road 43 between Somerville Road and the proposed roundabout west of the existing roundabout at County Road 10, is drained entirely by roadside ditches that outlet either directly to Kemptville Creek or to offsite ditches/stormsewers that eventually outlet to Kemptville Creek. None of these outlets currently have erosion protection to minimize impacts on Kemptville Creek. These ditches also convey flow

from adjacent lands. The drainage outlets and their existing catchments are identified in Table 1. Flows were modeled using the Rational Method and are reported in Table 3 – CR43 Existing Drainage Flows shown in Appendix A.

Table 1 - Drainage Outlet Summary

Outlet	U/S catchment	Drainage Comment
1:A	CA2a	Road drainage only - small
2:A	CA2b	Road drainage + some adjacent lands
3:A	CA2c	Road drainage + some adjacent lands
3:A	CA1	Road + large u/s drainage area - d/s of existing 1200mmCSP
4:A	CA3	Road + adjacent lands–confirm ditch size/cross road sewer
4:A	CA4	Kemptville Mall outlet
5:A	CA5	Road + adjacent lands – to ditch
D	CA6	Road + adjacent lands – to stormsewer outlet
C	CA7	Road + adjacent lands – (to Kemptville Creek direct)
C	CA8	Road + adjacent lands - (to Kemptville Creek direct)
B	CA9	Road (to Kemptville Creek direct)
F	CA11	Road + adjacent lands (to Kemptville Creek direct)
G	CA10	Road + adjacent lands (to Kemptville Creek direct)
6:E	CA13	Road + adjacent lands (Canadian Tire)
6:E	CA12	Road drainage
I	CA14 thru CA17	To Adams Creek via railside ditch and adjacent wetlands

2.2.3 Future Conditions

The flow comparison summarized below, suggests the impacts of increased CR43 imperviousness due to the road widening will not have an identifiable impact on Kemptville Creek flows. The proposed widening will have an urban cross section with stormsewer and curb and gutter roadway treatment. The anticipated roadway drainage outlets to Kemptville Creek are at sites A, B (including C), F (including G), E and D (via existing stormsewer).

Increases in flows to Kemptville Creek outlets are identified in Table 2 below and may be considered negligible when compared to the magnitude of flows in Kemptville Creek. It has also been confirmed that the offsite ditches that convey flow to Kemptville Creek will have sufficient capacity to convey increased flows to Kemptville Creek.

Table 2 - Existing and Future Flows (m3/s) at Kemptville Creek

Outlet	2 Year		5 Year		25 Year	
	Existing	Future	Existing	Future	Existing	Future
A	0.94	1.15	1.28	1.54	1.72	2.12
B	0.07	0.18	0.1	0.24	0.13	0.34
C	0.07	0.11	0.1	0.15	0.13	0.25
D	0.05	0.07	0.07	0.09	0.1	0.13
E	0.18	0.22	0.25	0.31	0.35	0.42
F	0.02	0.03	0.03	0.04	0.04	0.06
G	0.01	0.02	0.01	0.03	0.02	0.04
I	0.27	0.34	0.36	0.46	0.49	0.65
Total	1.63	2.12	2.2	2.86	2.98	4.01
Kemptville Creek		52.3		67.9		85.2

The offsite ditches are assumed to be of low fish habitat potential and therefore no mitigative treatment of roadway discharge will be required. However, there is a potential for water quality impacts on Kemptville Creek and its sensitive wetlands: where direct roadway discharge to the creek is anticipated, mitigation for water quality will be required. As well, erosion protection should be implemented at the outlets to minimise erosion impacts on Kemptville Creek.

2.2.4 Stormwater Management

As identified in the previous section, the increase in flows and velocities to both offsite ditches and Kemptville Creek do not warrant stormwater management measures: there are no *water quantity* concerns to mitigate. This does not suggest, however, that future land development would not require SWM: separate SWM studies should be undertaken to recommend and size SWM facilities for all future development that utilizes the roadway drainage outlets.

With regards to *water quality*, comparison of the 2 year flows for the roadway outlets (total) and Kemptville Creek suggests that there would be a negligible increase in overall water quality impacts in the offsite ditches and Kemptville Creek. However, local impacts to the environmentally sensitive wetlands in Kemptville Creek may exist and there will be an *overall* improvement in water quality from the study area, if Oil/Grit Separators (OGS) were installed at outlets B and F. The need for an OGS at outlet A is superseded by the water quality treatment inherent in the 1.5km+/-ditch between CR43 and outlet A. The need for an OGS at outlet E is superseded by the water quality treatment inherent in the 0.5km+/- ditch between CR43 and outlet E.

2.2.5 Conclusions and Recommendations

Based on the above assessments it can be concluded:

1. The increase in flows from the widening of CR43 from two lane rural to four lane urban is negligible.
2. The increase in flows, due to the proposed road widening, can be accommodated by the offsite drainage ditches that link roadway drainage to outlets A and E.
3. A future increase in water levels and velocities in Kemptville Creek, due to the proposed road widening, is negligible.
4. Any potential water quality impact on Kemptville Creek, due to the road widening, can be mitigated by the existing offsite ditch conveyance system or by Oil/Grit Separators placed where direct roadway discharge to the creek is anticipated.
5. Erosion protection should be considered at outlets B and F.

Based on these conclusions, it is recommended that:

- Oil/Grit separators be considered for water quality treatment where roadway drainage directly enters Kemptville Creek, ie. at outlets B and F, and that erosion protection for the outlets be considered at these sites, as well.

2.3 Bridge Study of Alternatives

2.3.1 Existing bridge background

Kemptville Bridge was constructed in 1955 and is a two span, concrete rigid frame bridge carrying two lanes of traffic over the South Branch of the Rideau River (Kemptville Creek) at a 0° Skew. It is located on CR43, approximately 1 km west of Highway 416. CR43 is classified as an urban arterial undivided road and is posted with a speed limit of 60 km/h over the bridge. The roadway has an asphalt surface and is approximately 9.7 m wide between the curbs.

The length of the bridge measured face to face of the abutments is 36.6 m. The intermediate pier consists of a solid concrete wall parallel to the abutments. The two spans are 17.8 m each.

2.3.2 Structural Assessment

A Condition Survey and Structural Evaluation of the bridge was undertaken by Harmer Podolak Engineering in 2008. A copy of the report is attached:

2.3.3 Alternative Solutions Considered

The Study identified the following alternative solutions for investigation:

- **Do nothing:** This alternative has been included to provide a base to which the other alternatives can be compared. Under this alternative, no measures to improve the condition of the structure are considered.
- **Rehabilitate the bridge with widening:** This alternative solution involves the rehabilitation of the existing bridge, repairs to the substructure, resurfacing the deck. In addition to rehabilitating the existing structure width would be increased to accommodate an additional two lanes.
- **Rehabilitate the bridge and a new two lane, one way traffic structure:** This alternative solution involves the rehabilitation of the existing bridge, repairs to the substructure, resurfacing the deck, widening to the north or south by adding a new adjacent structure.
- **Replace the bridge with a new four lane, two way traffic structure:** This alternative solution replaces the existing bridge with a new bridge at the same location, compliant with current design standards. This includes the provision of sidewalks and bike lanes.

2.3.4 Geometric Alternatives

2.3.4.1 Cross section

Two lane, one way traffic structure

Left Parapet	0.350 m
Left Shoulder	2.000 m (1.500 m if bridge longer than 50 m)
Lane	3.500 m
Lane	3.500 m
Bike Lane	2.000 m
Sidewalk	2.000 m
Right Parapet	0.350 m

Out to Out deck width is 13.700 m for bridges shorter than 50 m from abutment to abutment and 13.200 m for bridges greater than or equal to 50 m in length. The paved width of the bridge is 11.000 m or 10.500 m respectively.

Four Lane, two way traffic structure

Left Parapet	0.350 m
Sidewalk	2.000 m
Bike Lane	2.000 m
Lane	3.500 m
Lane	3.500 m
Median	1.000 m
Lane	3.500 m
Lane	3.500 m

Bike Lane	2.000 m
Sidewalk	2.000 m
Right Parapet	0.350 m

Out to Out deck width is 23.700 m for the bridge. The paved width is 18.000 m.

2.3.5 Span Arrangement

Single Span

All of the alternatives considered for adding new structure investigated the option of a single span structure 37.1 m from face of abutment to face of abutment to match the existing structure.

Two Span

A twin span structure was also investigated to match the existing openings and providing a pier. The clear opening for both spans was 17.950 m.

Three Span

A 90 m long three span structure with spans of 27 m, 36 m, and 27 m was considered to investigate the possible cost savings by increasing the structure length over the water and reducing the fill for the approaches.

2.3.6 Navigational Clearance

Three clearances were investigated for each new structure alternative. 3.350 m navigational clearance is what currently exist and represents the least grade raise to the existing road. 6.700 m clearance is the standard for the Rideau Canal system and would allow taller boats to travel further upstream. This clearance is the largest grade raise for the road. A third clearance of 4.875 was investigated as a compromise between the existing clear height and that of the Rideau Canal system.

2.3.7 Plan

Depending on the nature of the rehabilitation or replacement chosen, the resulting structure(s) for accommodating two way traffic can be achieved in one of three ways.

Rehabilitate the bridge with widening

The extra lanes of traffic will be accommodated by widening the existing bridge to the north and to the south.

Rehabilitate the bridge and a new two lane, one way traffic structure

The extra lanes of traffic will be accommodated by constructing the new bridge in 1 of 2 locations. It will be constructed either to the north or to the south of the existing structure.

Replace the bridge with a new four lane, two way traffic structure

The extra lanes of traffic will be accommodated by constructing the new bridge in stages. Depending on the need for the number of lanes required to be open at all times, and the allowable shift in the road alignment, the new bridge will have its centre line in 1 of 3 locations. It will either be slightly to the north, slightly to the south or in line with the centre of the approach roads.

2.3.8 Structural Cost Estimates

The cost estimates have been developed restricting the costs to the construction or rehabilitation of the bridge only. Cost for the construction of the approaches is developed in a separate report.

Do Nothing

The "Do Nothing" alternative was included as a benchmark for the assessment of the other planning alternatives. As the name suggests, the "Do Nothing" alternative involves no improvements to the deteriorating bridge or CR43 within the Study Area. There are no initial capital costs for this alternative and the on-going maintenance costs of the existing sub-standard and deteriorating structure were not calculated.

Rehabilitate the bridge with widening:

This alternative includes rehabilitating the existing bridge to restore its structural adequacy and provide a deck cross-section consistent with current standards. Rehabilitation would involve epoxy injection and concrete patches, deck resurfacing and repairs to the abutments and piers. This option would only permit one lane of traffic for the first stage of the rehabilitation.

The costs associated with this rehabilitation alternative of the bridge are as follows:

1.	Substructure repair costs	$ 25 000
2.	Deck resurfacing costs	$ 35 000
3.	Superstructure repair costs	$ 22 000
4.	new Structure cost ($5 250 x 410m^2)	$ 2 152 500
5.	**Contingency 10%**	**$ 223 500**
	Estimated Total Cost	***$ 2 458 000***

Rehabilitate the bridge and a new two lane, one way traffic structure:

This alternative includes rehabilitating the existing bridge to restore its structural adequacy and provide a deck cross-section consistent with current standards. Rehabilitation would involve epoxy injection and concrete patches, deck resurfacing and repairs to the abutments and piers. A new structure would be constructed adjacent to the existing structure, with sufficient space to permit construction of the new bridge, maintenance of both bridges, and removal of the existing bridge in the future. This option will permit two lanes of traffic open throughout construction by keeping traffic on the existing bridge while the new is built, and then switching the traffic to the new while the existing is being rehabilitated.

The costs associated with this rehabilitation alternative of the bridge are as follows:

1.	Substructure repair costs	$ 25 000
2.	Deck resurfacing costs	$ 35 000
3.	Superstructure repair costs	$ 22 000
4.	new Structure cost – varies:	minimum - $ 1 281 700
		maximum - $ 2 947 600
5.	**Contingency 10%**	**$ 303 000**
	Estimated Total Cost	***$ 1 666 700 (min)***
		$ 3 332 600 (max)

Replace the bridge with a new four lane, two way traffic structure:

This alternative replaces the existing deteriorating bridge with a new bridge which complies with acceptable design standards and provides the four lane cross section listed above. This option can be achieved while maintaining a minimum of one lane of traffic at all times, and potentially two lanes depending on the road alignment.

The costs associated with the bridge replacement are as the follows:

1.	Removal of the existing structure	$ 400 000
2.	Structure cost – varies:	minimum - $ 1 913 900
		maximum - $ 3 302 600
3.	**Contingency 10%**	**$ 370 000**
	Estimated Total Cost	***$ 2 683 900 (min)***
		$ 4 072 600 (max)

2.3.9 Structural Life Cycle Analysis

A level 2 life cycle analysis was carried out according to the MTO Structural Financial Analysis Manual. A discount rate of 6% was assumed along with a 75 year life span. Three models were used in the analysis, and each of the 46 options cost estimates were processed through one of the appropriate models. The life cycle analysis incorporates the demolition costs, replacement costs and some maintenance costs over the analysis period so that each option can be equally compared, instead of just construction costs for a new bridge.

Model 1 – Rehabilitation and Widening

This model assumes that the existing structure is rehabilitated and widened in year 0 of the analysis. In year 20 the original structure has reached the end of its life span and the entire structure is replaced with a new 4 lane bridge. In year 45 the new structure undergoes a minor rehabilitation and in year 70 it undergoes a major rehabilitation. Year 75 is the end of the life cycle analysis and the residual value of the structure is calculated. The present value for each milestone is calculated. The total of all the present values is presented as the life cycle cost.

Model 2 – Rehabilitation and New Structure

This model assumes that the existing structure is rehabilitated and a new two lane, one way traffic structure is constructed in year 0 of the analysis. In year 20 the existing structure is demolished and replaced with a new two lane, one way traffic structure. In year 25 of the analysis a minor rehabilitation is performed on the new structure. In year 45 a minor rehabilitation is performed on the replacement structure. In year 50 a major rehabilitation is performed on the new structure. In year 70 a major rehab is performed on the replacement structure. In year 75 the new structure is at the end of its life cycle and is replaced. A residual value is calculated for the other replacement structure. The present value for each milestone is calculated. The total of all the present values is presented as the life cycle cost.

Model 3 – New Bridge

This model assumes the existing bridge is demolished and replaced with a new four lane, two way traffic structure in year 0. In year 25 the new bridge undergoes a minor rehabilitation. In year 50 it undergoes a major rehabilitation. In year 75 the bridge has reached the end of its design life and is replaced. The present value for each milestone is calculated. The total of all the present values is presented as the life cycle cost.

2.4 Waterway Navigability

During both the Corridor Master Plan study and the current Class EA study a number of public open houses (POH) have been held to inform the public of Kemptville and surrounds of the study. POH's are a requirement of the Class EA process for both 'Schedule B' and 'Schedule C' projects and encourage the public to participate and provide input into the study process.

A number of comments reveal that there is support within the Kemptville community to increase the clear opening for water traffic under bridge over Kemptville Creek. This has triggered investigations to assess the potential for larger boats to access downtown Kemptville and benefit the community.

The current clearance level of the bridge is approximately 3.35m (11 feet). The current standard for the Rideau waterway is 6.7m (22 feet).

The following agencies were consulted for information on the requirements of the bridge and on current conditions upstream and downstream of the bridge: Parks Canada, Transport Canada, Rideau Valley Conservation Authority and local Marina's. The Bridge Study of Alternatives (Chapter 2.3) and Environmental Site Evaluation (Chapter 2.5 and Appendix D) also contain information relevant to this discussion.

2.4.1 Current Creek conditions

The South Branch of the Rideau River (Kemptville Creek) extends south from the Rideau River (Canal) passing through the towns of Kemptville, Oxford Mills and Patterson's Corners.

2.4.1.1 Rideau River to County Road 43

The County Road 43 Bridge crosses the Kemptville Creek approximately 3.7km south (and upstream) of the Rideau River. The creek along this section has a width ranging from 60m – 110m which narrows to 36m at the bridge. The navigable waters chart shows that there are two shallow sections between County Road 43 and the Rideau River where water levels are less than 1.22m (4 feet). These shallow sections significantly constrain the size and types of vessels that would want to pass under the CR43 Bridge. The remainder of this section of the creek has a water depth of at least 1.83m (6 feet).

The location of the shallow sections coincides with watercourses outletting from the Ferguson Forestry Centre. While dredging might offer temporary improvement, continuous sediment discharge would replace the dredged material. Ongoing dredging would be required.

Parks Canada has indicated that they would not accept or sign off on any possible dredging of the creek as it is a provincially significant wetland. Dredging of the creek would upset the natural habitat including fish habitat and spawning grounds. Nevertheless if dredging of the creek was approved and did occur to ensure the creek contains a minimum 1.83m depth for navigability, the navigability status of the creek would change and dredging would have to occur on a regular basis. This becomes a maintenance cost to parties such as

Parks Canada, The Rideau Valley Conservation Authority or Transport Canada. There has been no indication that any of these agencies would be prepared to assume this ongoing obligation.

2.4.1.2 County Road 43 to Bridge Street

The section of Kemptville Creek extending south of CR43 to Bridge Street is approximately 820m long and on average 40m wide, narrowing to 18m at Bridge Street Bridge. The depth in this section of the creek is expected to be 1.83m (6 feet), much the same as the creek north of the CR43 Bridge. The Bridge Street Bridge has a smaller clearance then the County Road 43 Bridge. The clearance is approximately 1.83m (6 feet) and is considered to be the major restriction to boating into downtown Kemptville.

This section of Kemptville Creek has been identified by the study team's biologist as a significant wetland community. She has expressed concerned that increased boating (increases in either size of vessels or numbers) would negatively impact this protected environment.

2.4.1.3 Bridge Street to Prescott Street (CR44)

Between the Bridge Street Bridge and the Prescott Street (CR44) Bridge the creek flows past downtown Kemptville. This section of the creek is approximately 750m long and only widens slightly from the Bridge Street Bridge before narrowing again to roughly 18m at the Prescott Street Bridge. The underside of the Prescott Street Bridge is approximately 3.6m (12 feet) from the river bottom. The depth of water at this section of the creek is expected to vary with an average depth of 0.6m – 3.3m.

2.4.1.4 Upstream of Prescott Street (CR44)

Beyond the Prescott Street Bridge the creek begins to narrow immediately and becomes much shallower. This part of the creed is not considered to be navigable for pleasure crafts.

2.4.1.5 Summary

The existing conditions of Kemptville Creek result in significant constraints to boat traffic notwithstanding the current height limitation at CR43 Bridge. Of most significance are the shallow sections downstream of the bridge and the minimal clearance upstream at Bridge Street Bridge. Conversion of the section between CR43 to Bridge Street to a busy recreational waterway would have detrimental impact on a protected wetland environment.

2.4.2 Required Height of the CR43 Bridge

The South Branch of the Rideau River (Kemptville Creek) has been recognised as a navigable waterway by Transport Canada. Accordingly, Transport Canada has been consulted regarding the required bridge clearance. The current soffit elevation of the bridge taken from the MTO drawings is 88.864m (291.35 feet) and the current clearance level of the bridge is approximately 3.35m (11 feet). Transport Canada requires 6.7m (22 feet) clearance for the main route of the Rideau Canal. However they have noted that this is not a

requirement for the South Branch of the Rideau River. Transport Canada has indicated that the navigability of the existing structure has been approved and that any new structure that matches or exceeds the existing vertical clearance will be acceptable.

2.4.3 Possible access

A phone survey was conducted on a number of Marina's within the Kemptville area to determine the type of boats capable and most likely to use the creek for recreational uses and to access downtown Kemptville.

The general consensus of the survey was that the bridge would not need to be lifted to 6.7m (22 feet) high as the majority of boats that would require 6.7m clearance would not be able to travel the creek. This is generally because of the required draught of the larger power and sail boats to navigate the relatively shallow creek.

Currently the majority of boats accessing the creek are small fishing and fibre glass boats, larger boats are often deterred by the navigation charts which note "*Kemptville Creek is navigable only by shallow draft vessels which do not require a vertical clearance greater than 8 ft*". The survey revealed that if a destination was made in Kemptville (i.e. a reason to access the creek) such as a place to dock and access downtown, the majority of boats expected to use the creek would be 8.5m – 10.7m (28 – 35 feet) long power boats. These boats commonly have a draft of 1m – 1.15m (40 – 45 inches) and require a clearance of 3.0m – 4.0m (10 – 13 feet). This height does not include radar which a number of boats have. These boats would also require the current Bridge Street Bridge to be raised.

Appendix C includes pictures of a number of possible types of boats within the size limits noted above that would possibly access Kemptville Creek if a destination was made at Kemptville.

2.4.4 Conclusion

In conclusion the South Branch of the Rideau River (Kemptville Creek) is a provincially significant wetland which is currently travelled by smaller fishing and fibre glass boats which can easily navigate under the County Road 43 Bridge. Larger boats do not access the creek as they are discouraged by shallow water depths downstream of the bridge. It would be expected that more boats would access the creek at the CR43 crossing if the creek were dredged, however, Parks Canada has indicated that dredging would not be permitted.

Upstream of the CR43 Bridge the Bridge Street Bridge is a significant constraint to boat traffic.

Transport Canada has indicated that the current height of the CR43 Bridge is acceptable. Given the other constraints on navigability of Kemptville Creek, raising the clearance at CR 43 would appear to have limited benefit.

2.5 Review of Environmental Site Evaluation

The final report of the Environmental Site Evaluation can be found in Appendix D. This report was completed by Mary Alice Snetsinger of Ecological Services and is dated June 17, 2009.

This report included a field study which was completed May 12, 2009 and correspondence with various agencies including the Ministry of Natural Resources.

2.5.1 Summary

The area was split into four sections:
Section A – Somerville Road to County Road 44
Section B – County Road 44 to Kemptville Creek
Section C – Kemptville Creek, South Branch of the Rideau River
Section D – Kemptville Creek to MTO boundary of Highway 416

It was found that there were no major ecological issues or concerns with sections A, B and D. The majority of area is cultural land and cultural meadow with minor areas of cultural plantation, cultural thicket, Black ash organic deciduous swamp and shallow marsh.

It was found that Section C is a major area of concern. The Kemptville creek is classed as a provincially significant wetland and along with the usual cultural meadow and cultural thicket this section is largely characterised by natural communities. These include free-floating wetland, submerged wetland, robust emergent wetland and tall shrub wetland. There were a number of flora and fauna found within these wetland areas which included submerged and floating aquatic plant life, cattails, large shrubs / small trees, fish nurseries, painted turtles, reports of other turtles from MNR. No species at risk were reported in the wetland evaluation and none were observed during field work. This does not mean that none are present in the area and typically it is not allowed to impact a Provincially Significant Wetland.

2.5.2 Recommendations

It is recommended that a more detailed Environmental Impact Statement (EIS) is conducted of the South Branch of the Rideau River (Kemptville Creek) to demonstrate the appropriateness of the proposed development. Other recommendations include:

- The expanded bridge has the potential to cause development or site alteration within a provincially significant wetland, in contravention of the Provincial Policy Statement.
- Design road and bridge upgrades to avoid or minimize the loss of wetland vegetation;
- Implement erosion and sediment control measures, as appropriate;
- Ensure that no in-water work is undertaken between March 15 and June 30, as recommended by MNR (2009).
- Minimize the increase in bridge-to-water clearance, as this encourages access by larger boats, which leads to disturbance of the creek habitat and species. It is noted that the existing clearance

permits fairly large boats to enter the creek from the main Rideau River, and that the shallow depths in the creek may limit an increase in the size of watercraft entering. Whether or not the cost of increasing clearance will create a useable access because of the relatively shallow water is debatable, but it is pointed out that species such as Map Turtles, if present, may be adversely affected by an increase in boat traffic. Many Midland Painted Turtles were observed during the field work.

- The expanded bridge will likely result in harmful alteration, disruption or destruction of fish habitat (a HADD) if any part of the bridge results in in-filling of fish habitat (including piers, footings, abutment or approaches below the high water level) or if there is any realignment of the channel itself. If bridge design cannot avoid such impact (and we note that the existing bridge has a central pier), there will be a requirement for compensation (creation or enhancement of fish habitat). Consider design to avoid impacts such as additional shoreline hardening, disturbance to bank stability, loss of riparian or wetland vegetation, obstructions that might impede fish migration, runoff from the widened road and bridge, etc.
- Implement standard mitigation measures, as appropriate, including but not necessarily limited to: compressing the work schedule to minimize the time period of disruption, selecting the least harmful materials and construction methods, ensuring fish passage around any temporary obstructions, ensuring in-stream flow rates are maintained as appropriate, and controlling siltation or sedimentation.
- Confirm that no Butternut trees will be affected by clearing once the final route is selected.

2.6 Review of Geotechnical Desktop Study

The final report of the Geotechnical Desktop Study can be found in Appendix D. This report was completed by William S. Beveridge, B. Eng and Joseph B. Bennett, P. Eng. of Inspec-sol Inc. and is dated July 28, 2009.

This report is a desktop study of the corridor area. The desktop study includes a literature review of various photographs, surveys, plans and existing geotechnical reports for the corridor and adjacent areas. A site visit was also conducted of the corridor. From this information preliminary geotechnical investigation recommendations have been included as part of this study.

2.6.1 Summary

The corridor was split into four areas:
Area 1 – Somerville Road to Future Pinehill Road
Area 2 – Future Pinehill Road to Water Treatment Plant Road
Area 3 – Water Treatment Plant Road to Riverview Lane (includes South Branch of the Rideau River)
Area 4 – Riverview Lane to MTO boundary of Highway 416
Each area is described including the land uses, current roadway and drainage system.

There are discussions regarding the soil types, bedrock and high water table for the corridor. These are explained and categorised within the breakdown of the individual areas of the study.

The roadway area is predominately characterized by the presence of gravel/boulder, sands or clay overlying bedrock. These soils vary in compaction and type until just above bedrock, where they become dense to hard. Bedrock is located entirely within the Beekmantown Formation and is predicted to be high in dolostone and sandstone. The depth and quality of Bedrock varies throughout the corridor. The water table is typically high within this area with water elevations ranging between close to surface level to 5m below the surface.

The major issues with the corridor are organic deposits within the area of the creek and the area immediately to the east of the creek which contains silty clays and sands. This with the high water table makes construction and foundation design difficult.

2.6.2 Recommendations

Recommendations have also been included for construction methods within the corridor including the excavation, dewatering, bedding and backfill of services and the road features including the bridge.

Further geotechnical investigations are recommended for the corridor and highly recommended for the areas with noted issues these would include detailed description and recommendations.

2.7 Review of Traffic Report

The final Traffic Report can be found in Appendix F. This report has been prepared by AECOM and provides details on the current and predicted future traffic conditions of the corridor. Recommendations have also been made on the timing of corridor upgrades and intersection configurations.

2.7.1 Summary

Traffic counts were completed in late April 2009 and are consistent with the predicted counts in the previous traffic report in 2005. This shows that the corridor obeys the same traffic patterns now as it has in the past, although traffic patterns are expected to change with the opening of the new Pinehill Rd extension. There has been no additional commercial / residential planning for the corridor outside what was allowed for in the original Master Plan.

The report confirms that a number of sections of the corridor are now operating at greater than planning capacity. One of the beyond capacity sections is the link which includes the bridge. The widening which includes the bridge should occur immediately as Phase 1 of the project to free the current restrictions of this link during peak hours. The exception is that the CR44 intersection may be widened now to provide additional capacity for the detour north when the bridge is under construction.

The recommended intersection controls are outlined in the report. Roundabouts should be included at Riverview Lane, Grenville Street, Mall access and Somerville Road with the construction of Pinehill Street currently occurring. There are four options for the three major intersections within the central stretch of the corridor. These include turning the three intersections into signals, roundabouts or combinations thereof. Timing of the construction of other intersections and sections of road is also mentioned in the report.

Details on current and recommended pedestrian and cycle facilities are included within the report. Pedestrian safety at two-lane roundabouts has been thoroughly researched. There are also a number of other pedestrian crossing devices including the HAWK system and signalised pedestrian crossing which be included to enhance pedestrian safety.

2.7.2 Recommendations

The update to the Master Plan traffic study has indicated that the previous study was developed upon solid assumptions and data. No significant changes to growth rates or patterns are expected in the CR 43 corridor.

Widening of the bridge is critical to enabling traffic to flow east/west through the corridor. Currently that section of CR 43 is over the planning capacity during the evening peak hour.

Two major points that have not changed since the original study are the need to build and connect pedestrian facilities throughout the corridor and the need to build and connect cycling facilities in the corridor.

2.8 Review of Traffic Noise Study

The final Traffic Noise Study Report can be found in Appendix G. This report has been prepared by AECOM and provides a summary description of the existing, future ‘do nothing’ and future ‘with improvements’ scenarios for the traffic noise conditions along the study corridor.

2.8.1 Summary

Analysis of the corridor was completed to determine possible Noise Sensitive Area’s (NSA) and determine if these areas will see an increase in noise when comparing the future ‘do nothing’ scenario to the future ‘with improvements’. The future ‘do nothing’ scenario models the noise for predicted increase in traffic on the current 2 lane Road. This is then compared to the future ‘with improvements’ scenario which models the predicted increase in traffic on the proposed 4 lane Road.

NSA’s have been identified in accordance defined in the MTO provincial highways Directive A-1 and only include residential dwellings as well as mixed use dwellings. The analysis of the corridor was completed in accordance with the Environmental Noise guidelines set by the MTO/MOE Protocol for highway construction.

The outdoor living areas are typically used as points of assessment for NSA's. Where noise levels increase from 0 – 5dB mitigation measures are generally not required. Mitigation measures are required when noise levels increase by more than 5dB.

There were 11 NSA's identified throughout the corridor. The maximum increase in noise modelled was at NSA 11 on the far eastern side of the corridor. The increase in noise at this point was 2dB which is perceived as no change.

2.8.2 Recommendations

The Kemptville road improvement project is expected to have negligible noise impact at all noise sensitive areas. Since the noise impact was calculated to be less than 5dB when comparing the expected ambient sound levels of the future "Do Nothing" and future "With Improvements" scenarios at all NSAs, no mitigation is required.

It is predicted that Construction Noise will be greater than the 5dB. Mitigation measures should be employed during construction and be consistent with all local By-Laws.

2.9 Review of Socio-Economic Study

The final Socio-economic Environment Report can be found in Appendix H. This report has been prepared by AECOM and provides a summary description of the existing socio-economic conditions along the study corridor.

2.9.1 Summary

In preparing the summary description, background information was assembled and reviewed, and applicable agencies were consulted regarding specific data files and other potential data sources. In addition, field reconnaissance activities were carried out in April 2009, to confirm and augment the secondary information reviewed. As a result an overview of the various land uses and key features along the corridor has been noted.

Sources consulted and discussed in the report include:

- Aerial photography;
- United Counties of Leeds and Grenville Official Plan;
- Municipality of North Grenville Official Plan;
- The Planning Act; and
- The Provincial Policy Statement.

The report discusses the Municipalities urban design guidelines for development proposals along the County Road 43 corridor.

Within the report there are various statistics on a number of aspects of the Municipality including population, employment etc. Other areas that were touched on include Noise sensitive areas, Recreation Trails, Emergency Service Providers and Schools.

2.9.2 Recommendations

This *Socio-economic Environment Report* provides a summary description of the existing social and economic conditions within the County Road 43 corridor. The land use in the Study Area is primarily designated *Highway Commercial* and the proposed improvements are consistent with the Municipality of North Grenville Official Plan. The study has not identified any constraints to widening of CR43 although it is noted that traffic must be maintained during construction to ensure passage for emergency vehicles.

2.10 Review of Archaeological Report

The final report of the Stage 1 Archaeological Assessment can be found in Appendix I. This report was completed by Kim Slocki and is dated July, 2009.

This report included a field study which was completed during the late winter months when snow still covered the ground. The report was completed in accordance with the Ontario Heritage Act (1990). The assessment also studied the various databases and agencies including the Ministry of Culture.

2.10.1 Summary

The report discusses two existing archaeological sites within two kilometres of the corridor which have been registered with the Ministry of Culture. These sites both have the cultural affiliation of Euro-Canadian. A historical map has also been provided which illustrates four structures within 100m from the corridor. Also included in the report is a table showing the history of occupation in southern Ontario.

Consequently this report has concluded that this site has features of archaeological potential and requires a Stage 2 Archaeological assessment. These features include:

- Registered archaeological sites within 250m,
- Presence of primary water course within 300m,
- Presence of secondary water course within 200m,
- Features indicating past presence of water source within 300m,
- Pockets of sandy soil in a heavy soil or rocky area,
- Evidence of early Euro-Canadian settlement within 300m,
- Associated with historic transportation route (railway, roadway).

2.10.2 Recommendations

A large area of the study corridor has been determined as undisturbed and is recommended for further study. This additional study would be a stage 2 archaeological assessment which would include a more detailed site evaluation and minor excavations.

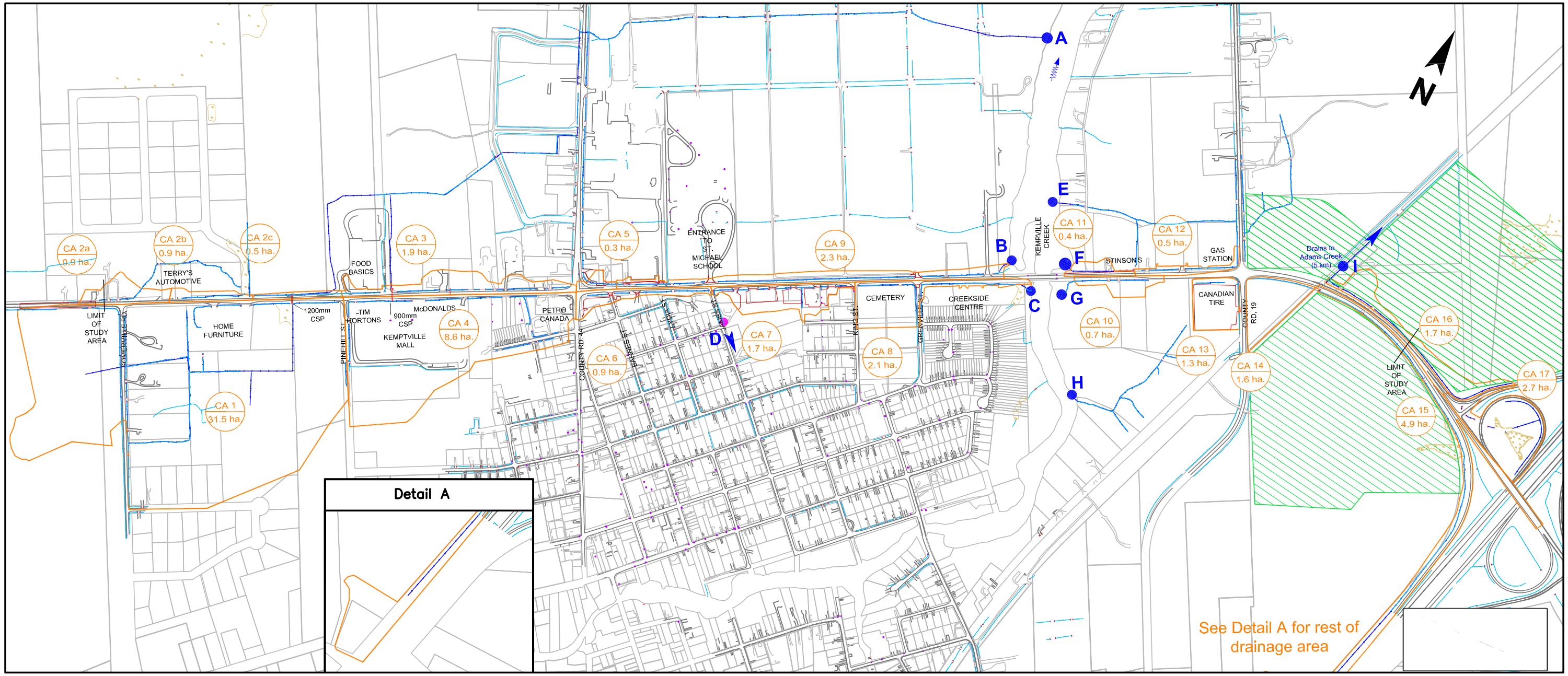
It has been noted that this Stage 1 assessment was conducted while snow still covered the ground and hence the recommended additional study maybe reduced during the Stage 2 assessment.

3. Summary

This report documents specialist's studies that have been undertaken to assess the current social, natural and economic conditions within the County Road 43 study area. The information included in this report has been gathered to assist the Technical Steering Committee with its evaluation of alternative designs.

Appendix A

Stormwater Study Figures and Tables



COUNTY ROAD 43 EXISTING DRAINAGE PLAN
Draft June 2009

- Drainage Sub Catachment Area
- Drainage Stream
- Major Drainage Outlet
- Catchbasin
- Outlet - Storm Sewer
- Future Development

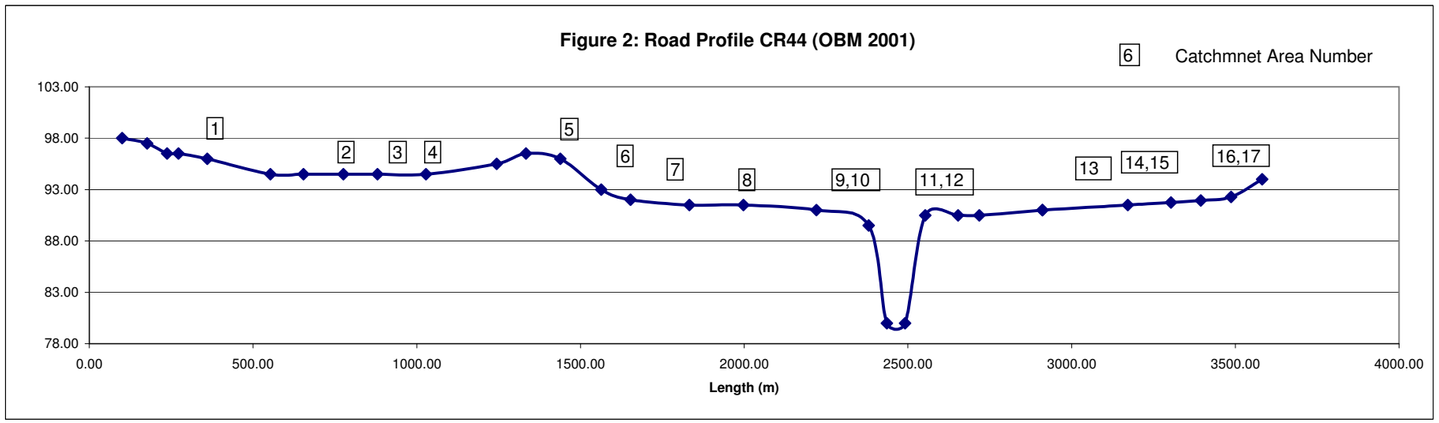
Table 2 - CR43 Existing Drainage Flows

CA	Site	All CA (m2)	No Rd	Rd only	C	Tc (min)	2 yr I (mm/hr)	2 yr Q (m3/s)	5 yr I (mm/hr)	5 yr Q (m3/s)	25 yr I (mm/hr)	25 yr	100yr I (mm/hr)	100yr
1	South - Sommervale - Whole CA	310572	305428	5144	0.10	30.0	37	**0.30**	50	**0.41**	69	**0.56**	85	**0.69**
--	CA1 road and ditch only	9409	4265	5144	0.41	6.9	95	**0.05**	129	**0.12**	180	**0.16**	222	**0.24**
2	North -Sommervale Rd	17988	7019	4025	0.44	60.5	24	**0.05**	32	**0.07**	44	**0.09**	53	**0.12**
3	North - Food Basics to CR 44	20440	14973	5467	0.45	29.8	37	**0.09**	50	**0.13**	69	**0.17**	85	**0.21**
4	South - KV mall to CR 44	114174	108707	5467	0.39	29.8	37	**0.46**	50	**0.61**	69	**0.85**	85	**1.04**
5	North East Corner Cr 43/44	2769	1517	1252	0.62	7.1	93	**0.04**	126	**0.06**	176	**0.08**	218	**0.10**
6	South CR44 to James St	8614	5328	3286	0.42	17.8	52	**0.05**	70	**0.07**	97	**0.10**	119	**0.12**
7	South James St to King St	17333	15171	2162	0.36	57.5	25	**0.04**	33	**0.06**	45	**0.08**	55	**0.10**
8	South King St. to KV Creek	21600	19185	2415	0.12	27.4	39	**0.03**	53	**0.04**	73	**0.05**	90	**0.06**
9	North - St.Michael's to KV Creek	22627	16363	6264	0.24	19.4	49	**0.07**	66	**0.10**	92	**0.13**	113	**0.17**
10	South - East of KV Creek	7091	5812	1279	0.14	30.1	37	**0.01**	50	**0.01**	69	**0.02**	84	**0.02**
11	North - East of KV Creek	4324	3134	1190	0.26	13.5	62	**0.02**	83	**0.03**	116	**0.04**	143	**0.04**
12	North MacEwen Gas	4895	3084	1811	0.34	20.6	47	**0.02**	64	**0.03**	88	**0.04**	108	**0.05**
13	South - Canadian Tire	13658	13658	0	0.59	10.4	73	**0.16**	99	**0.22**	137	**0.31**	169	**0.38**
14	South - CR19 to CPR	17367	16071	1296	0.06	13.4	62	**0.02**	84	**0.02**	116	**0.03**	143	**0.04**
15	South - CPR to 416	50711	32333	18378	0.27	45.0	29	**0.11**	38	**0.15**	53	**0.20**	65	**0.25**
16	North - CPR to Interchange	21582	17668	3914	0.14	25.1	42	**0.03**	56	**0.05**	77	**0.06**	95	**0.08**
17	North - NW interchange	27465	20587	6878	0.19	9.9	75	**0.11**	102	**0.14**	142	**0.20**	175	**0.25**

CR43 Future Drainage Flows

CA	Site	All CA (m2)	No Rd	Rd only	C	Tc (min)	2 yr I (mm/hr)	2 yr Q (m3/s)	5 yr I (mm/hr)	5 yr Q (m3/s)	25 yr I (mm/hr)	25 yr	100yr I (mm/hr)	100yr
1	South - Sommervale CA	313421	305428	7992.5	0.12	30.0	37	**0.37**	50	**0.50**	69	**0.68**	85	**0.84**
--	CA1 road and ditch only	9189	1196	7992.5	0.74	6.9	94	**0.15**	128	**0.21**	179	**0.29**	222	**0.41**
2	North Sommervale Rd	17988	9996	7992.5	0.42	60.5	24	**0.05**	32	**0.07**	44	**0.09**	53	**0.11**
3	North - Food Basics to CR 44	19081	11168	7913	0.65	29.8	37	**0.13**	50	**0.17**	69	**0.24**	85	**0.29**
4	South - KV mall to CR 44	114174	106261	7913	0.46	29.8	37	**0.54**	50	**0.72**	69	**1.00**	85	**1.22**
5	North East Corner Cr 43/44	2759	1094	1665	0.83	7.1	93	**0.06**	126	**0.08**	176	**0.11**	218	**0.14**
6	South CR44 to James St	8511	4301	4210	0.58	17.8	52	**0.07**	70	**0.09**	97	**0.13**	119	**0.16**
7	South James St to King St	17255	14010	3245	0.47	57.5	25	**0.05**	33	**0.07**	45	**0.10**	55	**0.12**
8	South King St. to KV Creek	21481	16237	5244	0.25	27.4	39	**0.06**	53	**0.08**	73	**0.11**	90	**0.13**
9	North - St.Michael's to KV Creek	23114.5	8206	14908.5	0.58	19.4	49	**0.18**	66	**0.24**	92	**0.34**	113	**0.41**
10	South - East of KV Creek	7106	4417	2689	0.32	30.1	37	**0.02**	50	**0.03**	69	**0.04**	84	**0.05**
11	North - East of KV Creek	4274	2457	1817	0.43	13.5	62	**0.03**	83	**0.04**	116	**0.06**	143	**0.07**
12	North MacEwen Gas	4799	2147	2652	0.54	20.6	47	**0.03**	64	**0.05**	88	**0.06**	108	**0.08**
13	South - Canadian Tire	13658	13337	321	0.69	10.4	73	**0.19**	99	**0.26**	137	**0.36**	169	**0.44**
14	South - CR19 to CPR	17367	14976	2391	0.12	13.4	62	**0.03**	84	**0.05**	116	**0.07**	143	**0.08**
15	South - CPR to 416	50711	30476	20235	0.34	45.0	29	**0.14**	38	**0.18**	53	**0.25**	65	**0.31**
16	North - CPR to Interchange	21582	16325	5257	0.21	25.1	42	**0.05**	56	**0.07**	77	**0.10**	95	**0.12**
17	North - NW interchange	27465	20587	6878	0.21	9.9	75	**0.12**	102	**0.16**	142	**0.23**	175	**0.28**

Figure 2: Road Profile CR44 (OBM 2001)



Appendix B

Bridge Study of Alternatives – Existing Details

Asset Inspection Report

Inspection Summary

Batch No: 1MBADES
Asset ID: 43213B KEMPTVILLE CREEK BRIDGE
Date 12/04/2001 Contact: G D DOUGA Phone:
Summary MBADES Import - 1999
Condition: 0.00
Total Needs 0.00
Approved By: Test

Asset Identification

County Rd CO RD 43 Year Built 1955 Road ID: 043222
Name KEMPTVILLE CREEK BRIDGE
Location 1.1 km E of CO.RD.#44

Roadside Environment	S
Municipal Number	
&Name	KEMPTVILLE CREEK BRIDGE
&Location	KEMPTVILLE CREEK BRIDGE
Asset Class	Bridge
Material	C - Cast in Place
Subtype	RF - Rigid Frame, Vert. Legs
Adjacent Bridge No	
Articulation	C - Continuous
Crss Typ	O-WAT, Over water
Deck Type	CC - Concrete, Cast in Place
Foundation Type	SF - Spread footings
Deck Area	488 (m2)
Deck Length	39 (m)
Deck Width	12.5 (m)
Lanes	2 (ea)
Dgn Deck Width	0 (m)
Dgn Dck Length	0 (m)
Trav Deck Wdth	9.7 (m)
Wearing Surf.	0 (m)
Owner Agency	LAG
Shared?	No

Condition Assessment

☐ Enter values manualy

Condition:	0.00
Improvement:	
Impr. %:	100.00
Impr. Cost:	0.00
Other Needs:	0.00
Total Needs:	0.00

Upper Limit 0.0

Condition Details

Field			UL	Comments
Superstructure	6.00	6.00	6.0	
Wearing Surface	6.00	6.00	6.0	
Deck Condition	6.00	6.00	6.0	
Expansion Joints	6.00	6.00	6.0	
Railings	6.00	6.00	6.0	
Substructure	6.00	6.00	6.0	
Coating	8.00	8.00	6.0	
Streams/Waterways	6.00	6.00	6.0	

Inspection Summary

Batch No: 2004_B
Asset ID: 43213B KEMPTVILLE CREEK BRIDGE
Date 11/09/2004 Contact: Luc Monette Phone: 613-828-4445
Summary
Condition: 40.00
Total Needs 11,000.00
Approved By: Consultant

Asset Identification

County Rd CO RD 43 Year Built 1955 Road ID: 043222
Name KEMPTVILLE CREEK BRIDGE
Location 1.1 km E of CO.RD.#44

Roadside Environment	S
Municipal Number	
&Name	KEMPTVILLE CREEK BRIDGE
&Location	KEMPTVILLE CREEK BRIDGE
Asset Class	Bridge
Material	C - Cast in Place
Subtype	RF - Rigid Frame, Vert. Legs
Adjacent Bridge No	
Articulation	C - Continuous
Crss Typ	O-WAT, Over water
Deck Type	CC - Concrete, Cast in Place
Foundation Type	SF - Spread footings
Deck Area	488 (m2)
Deck Length	39 (m)
Deck Width	12.5 (m)
Lanes	2 (ea)
Dgn Deck Width	0 (m)
Dgn Dck Length	0 (m)
Trav Deck Wdth	9.7 (m)
Wearing Surf.	0 (m)
Owner Agency	LAG
Shared?	No

Condition Assessment

☐ Enter values manualy

Condition:	40.00		
Improvement:			
Impr. %:	100.00		
Impr. Cost:	0.00		
Other Needs:	11,000.00		
Total Needs:	11,000.00	Upper Limit	0.0

Condition Details

Field		UL	Comments
Conventional closed	0.00	0.0	A few isolated spalls, concrete repairs and honey combing.
Reinforced concrete wingwall	0.00	0.0	Severe scaling and a few spalls noted. light to moderated s
Concrete rectangular columns /shaft	0.00	0.0	Poor: A few spalls isolated spalls and some severe scaling.
Steel Flex Beam on wood post barrier	0.00	0.0	Generally in good condition.
Soffit - Thick Slab	0.00	0.0	A fes isolated spalls, several concrete repairs, areas of sc
Sidewalks and Medians	0.00	0.0	Several transverse cracks, a few small spalls and uneven sur
Streams and Waterways	0.00	0.0	No visible flow obstruction.
Embankments	0.00	0.0	Generally in good condition.
Signs	0.00	0.0	Generally in good condition.
Wearning Surface	0.00	0.0	Light ravelling at edges of pavement.

Curb/Gutters	0.00	0.0	Moderate scaling.
Sidewalk	0.00	0.0	Pothole noted at structure on east approach. Patch pothole

Other Needs

Improvement	Description	Year	Percent	Override?		Cost
7	Repair concrete (Top of Deck)	2,009	0.00	☒	1	3,000.00
7	Repair concrete (side walk)	2,009	0.00	☒	1	1,000.00
7	Repair concrete(wing walls)	2,009	0.00	☒	1	2,000.00
007	Deack and Approaches- Rout and Seal	2,009	0.00	☒	1	5,000.00

Inspection Summary

Batch No: BR2008
Asset ID: 43213B KEMPTVILLE CREEK BRIDGE
Date 25/10/2008 Contact: Matt Thom Phone:
Summary
Condition: 40.00
Total Needs 11,000.00
Approved By: Consultant

Asset Identification

County Rd CO RD 43 Year Built 1955 Road ID: 043222
Name KEMPTVILLE CREEK BRIDGE
Location 1.1 km E of CO.RD.#44

Roadside Environment	S
Municipal Number	
&Name	KEMPTVILLE CREEK BRIDGE
&Location	KEMPTVILLE CREEK BRIDGE
Asset Class	Bridge
Material	C - Cast in Place
Subtype	RF - Rigid Frame, Vert. Legs
Adjacent Bridge No	
Articulation	C - Continuous
Crss Typ	O-WAT, Over water
Deck Type	CC - Concrete, Cast in Place
Foundation Type	SF - Spread footings
Deck Area	488 (m2)
Deck Length	39 (m)
Deck Width	12.5 (m)
Lanes	2 (ea)
Dgn Deck Width	0 (m)
Dgn Dck Length	0 (m)
Trav Deck Wdth	9.7 (m)
Wearing Surf.	0 (m)
Owner Agency	LAG
Shared?	No

Condition Assessment

☐ Enter values manualy

Condition: 40.00
Improvement:
Impr. %: 100.00
Impr. Cost: 0.00
Other Needs: 11,000.00
Total Needs: 11,000.00 Upper Limit 0.0

Condition Details

Field		UL	Comments
Foundation (below grade leve)-Other	0.00	4.0	No visible evidence of instability. Concrete deterioration
Wearing Surface	0.00	4.0	Longitudinal and transverse cracks. Large crack in asphalt
Metal drain pipes drainage	0.00	4.0	moderate corrosion to bottoms of drain pipes. Top of drains
Parapet Wall with single railing	0.00	4.0	Moderate scaling and a few small spalls.
Single hand railing	0.00	4.0	Single pipe hand railing generally in good condition.
Conventional closed	0.00	4.0	A few isolated spalls, concrete repairs and honey combing.
Reinforced concrete wingwall	0.00	4.0	Severe scaling and a few spalls noted. light to moderated s
Concrete rectangular columns /shaft	0.00	4.0	Poor: A few spalls isolated spalls and some severe scaling.
Steel Flex Beam on wood post barrier	0.00	4.0	Generally in good condition.
Soffit - Thick Slab	0.00	4.0	A fes isolated spalls, several concrete repairs, areas of sc

Sidewalks and Medians	0.00	4.0 Several transverse cracks, a few small spalls and uneven sur
Streams and Waterways	0.00	4.0 No visible flow obstruction.
Embankments	0.00	4.0 Generally in good condition.
Signs	0.00	4.0 Generally in good condition.
Wearning Surface	0.00	4.0 slicht transverse cracks, light ravelling at edge of pavemen
Curb/Gutters	0.00	4.0 Moderate scaling.
Sidewalk	0.00	4.0 Pothole noted at structure on east approach. Patch pothole

Other Needs

Improvement	Description	Year	Percent	Override?		Cost
7	Repair concrete (Top of Deck)	2,009	0.00	☒	1	3,000.00
7	Repair concrete (side walk)	2,009	0.00	☒	1	1,000.00
7	Repair concrete(wing walls)	2,009	0.00	☒	1	2,000.00
007	Deack and Approaches- Rout and Seal	2,009	0.00	☒	1	5,000.00

<+Element ID>	Description	Location	Perf Def	Mtce Need	TON	Asset ID	Description
1001-7	Concrete rectangular columns /shaft	Below Deck (at Pier)	00	08	1-5 years	43213B	KEMPTVILLE CREEK BRIDGE
1001-7	Concrete rectangular columns /shaft	Below Deck (at Pier)	00	08	1-5 years	43213B	KEMPTVILLE CREEK BRIDGE
101	Wearing Surface	Top of Deck	09	15	1-5 years	43213B	KEMPTVILLE CREEK BRIDGE
101	Wearing Surface	Top of Deck	09	15	1-5 years	43213B	KEMPTVILLE CREEK BRIDGE
104	Soffit - Thick Slab	Underside of Deck	00	08	1-5 years	43213B	KEMPTVILLE CREEK BRIDGE
104	Soffit - Thick Slab	Underside of Deck	00	08	1-5 years	43213B	KEMPTVILLE CREEK BRIDGE
106-4	Metal drain pipes drainage	N/S Edges of Deck	00	00	None	43213B	KEMPTVILLE CREEK BRIDGE
106-4	Metal drain pipes drainage	N/S Edges of Deck	00	00	None	43213B	KEMPTVILLE CREEK BRIDGE
1102-18	Steel Flex Beam on wood post barrier	E/W Approaches	00	00	None	43213B	KEMPTVILLE CREEK BRIDGE
1102-18	Steel Flex Beam on wood post barrier	E/W Approaches	00	00	None	43213B	KEMPTVILLE CREEK BRIDGE
1301-99	Foundation (below grade leve)-Other	Below Ground Level	00	00	None	43213B	KEMPTVILLE CREEK BRIDGE
1301-99	Foundation (below grade leve)-Other	Below Ground Level	00	00	None	43213B	KEMPTVILLE CREEK BRIDGE
1401	Streams and Waterways	N/S of Structure	00	00	None	43213B	KEMPTVILLE CREEK BRIDGE
1401	Streams and Waterways	N/S of Structure	00	00	None	43213B	KEMPTVILLE CREEK BRIDGE
1402	Embankments	E/W Abutments	00	00	None	43213B	KEMPTVILLE CREEK BRIDGE
1402	Embankments	E/W Abutments	00	00	None	43213B	KEMPTVILLE CREEK BRIDGE
1501	Signs	E Approaches	00	00	None	43213B	KEMPTVILLE CREEK BRIDGE
1501	Signs	E Approaches	00	00	None	43213B	KEMPTVILLE CREEK BRIDGE
1601	Wearning Surface	E/W Approaches	00	00	None	43213B	KEMPTVILLE CREEK BRIDGE
1601	Wearning Surface	E/W Approaches	00	00	None	43213B	KEMPTVILLE CREEK BRIDGE
1604	Curb/Gutters	N Edges of E/W Approache	00	00	None	43213B	KEMPTVILLE CREEK BRIDGE
1604	Curb/Gutters	N Edges of E/W Approache	00	00	None	43213B	KEMPTVILLE CREEK BRIDGE
1605	Sidewalk	S Edges of E/W Approache	00	17	1-5 years	43213B	KEMPTVILLE CREEK BRIDGE
1605	Sidewalk	S Edges of E/W Approache	00	17	1-5 years	43213B	KEMPTVILLE CREEK BRIDGE
301	Sidewalks and Medians	S Edge of Deck	00	08	1-5 years	43213B	KEMPTVILLE CREEK BRIDGE
301	Sidewalks and Medians	S Edge of Deck	00	08	1-5 years	43213B	KEMPTVILLE CREEK BRIDGE

26 Records

<+Element ID>	Description	Location	Perf Def	Mtce Need	TCN	Asset ID	Description
401-2	Parapet Wall with single railing	N/S Edges of Deck	00	00	None	43213B	KEMPTVILLE CREEK BRIDGE
401-2	Parapet Wall with single railing	N/S Edges of Deck	00	00	None	43213B	KEMPTVILLE CREEK BRIDGE
404-3	Single hand railing	N/S Edges of Deck	00	00	None	43213B	KEMPTVILLE CREEK BRIDGE
404-3	Single hand railing	N/S Edges of Deck	00	00	None	43213B	KEMPTVILLE CREEK BRIDGE
901-1	Conventional closed	E/W Abutments	00	08	1-5 years	43213B	KEMPTVILLE CREEK BRIDGE
901-1	Conventional closed	E/W Abutments	00	08	1-5 years	43213B	KEMPTVILLE CREEK BRIDGE
903-6	Reinforced concrete wingwall	E/W Abutments	00	08	1-5 years	43213B	KEMPTVILLE CREEK BRIDGE
903-6	Reinforced concrete wingwall	E/W Abutments	00	08	1-5 years	43213B	KEMPTVILLE CREEK BRIDGE

34 Records

Kemptville Creek Bridge Asset ID # 43213B											
Element	**Description**	**Location**	**Material**	**TON**	**Quantity**	**Exc.**	**Good**	**Fair**	**Poor**	**Perf Def**	**Mtce Need**
1301-99	Foundation (below grade leve)-Other	Below Ground Level	15	None	0	0	0	0	0	0	0
101	Wearing Surface	Top of Deck	2	1-5 years	429	0	380	0	49	9	15
106-4	Metal drain pipes drainage	N/S Edges of Deck	14	None	4	0	4	0	0	0	0
401-2	Parapet Wall with single railing	N/S Edges of Deck	12	None	123.2	0	110	12.2	0	0	0
404-3	Single hand railing	N/S Edges of Deck	14	None	112	0	112	0	0	0	0
901-1	Conventional closed	E/W Abutments	4	1-5 years	55	0	8.25	44	2.75	0	8
903-6	Reinforced concrete wingwall	E/W Abutments	4	1-5 years	51	0	12.75	35.7	2.55	0	8
1001-7	Concrete rectangular columns /shaft	Below Deck (at Pier)	4	1-5 years	55	0	15	40	0.5	0	8
1102-18	Steel Flex Beam on wood post barrier	E/W Approaches	14	None	120	0	120	0	0	0	0
104	Soffit - Thick Slab	Underside of Deck	4	1-5 years	341.2	0	51.2	273	17	0	8
301	Sidewalks and Medians	S Edge of Deck	4	1-5 years	66.3	0	59	6	1.3	0	8
1401	Streams and Waterways	N/S of Structure	22	None	1	0	1	0	0	0	0
1402	Embankments	E/W Abutments	22	None	1	0	1	0	0	0	0
1501	Signs	E Approaches		None	1	0	1	0	0	0	0
1601	Wearning Surface	E/W Approaches	2	None	582	0	541.45	28.05	12.5	0	0
1604	Curb/Gutters	N Edges of E/W Approaches	4	None	24	0	21.6	2.4	0	0	0
1605	Sidewalk	S Edges of E/W Approaches	2	1-5 years	34	0	33.5	0	0.5	0	17

Kemptville Creek Bridge Asset ID # 43213B

Improvement	Description	Type	Percent	Cost
7	Repair concrete (Top of Deck)	Rehab	0	3,000.00
7	Repair concrete (side walk)	Rehab	0	1,000.00
7	Repair concrete(wing walls)	Rehab	0	2,000.00
7	Deack and Approaches- Rout and Seal	Rehab	0	5,000.00

Appendix C

Waterway Navigability – Accessible Boats

1980 29' Bayliner 2950 Encounter Flybridge Sedan Yacht

1998-Silverton Yachts-352 Motor Yacht

1994 32' Carver 320 Voyager Yacht

2000-Sea Ray Boats-380 Sundancer

1973 Classic 1973 Chris Craft 30' Cruiser Yacht

24' Bayliner 2455 Ciera Sunbridge Express-Economical Yacht

Appendix D

Environmental Site Evaluation

Ecological Services
R.R. #1, 3803 Sydenham Road
Elginburg, Ontario K0H 1M0
Phone: (613) 376-6916; Fax: (613) 544-0072
E-mail: ecoserv@kos.net

ENVIRONMENTAL SITE EVALUATION

Municipality: North Grenville, Kemptville urban area

Location: County Road 43 in Kemptville, from Sommerville Road to Utility Corridor

Landowner: United Counties of Leeds & Grenville

Planning Application Reference: N/A

Description of Application: Four-lane upgrade of County Road 43 (CR-43)

Site Description: The study area is within the urban Kemptville area (Attachment 1), and most of the land would be classified as urban. We walked the entire route and assessed the Ecological Land Classification (ELC) based on the system developed for southern Ontario by Lee *et al.* (1998). The main area characterized by natural vegetation was associated with Kemptville Creek, the south branch of the Rideau River, and most of the natural heritage values in the study area are centered there.

A. Ecological Land Classification

ELC mapping was prepared for the study area; Attachments 2 to 5 show sections of the study area from west to east. ELC categories are generally as described by Lee *et al.* 1998.

Section A (Sommerville Road to County Road 44 or Rideau Street) – Attachment 2: This section of the study area is composed almost entirely of cultural communities.

- Cultural (CU) areas are those with essentially no vegetation cover, but hardened (paved) surfaces and buildings.
- Cultural Meadow (CUM) areas are characterized by tree and shrub cover of less than 25%, respectively. In this area, the CUM areas are lawns or other cleared areas. On the south side of CR-43 at Sommerville Road, the area designated as CUM shows woody vegetation in the aerial imagery, but the site has recently been cleared, leaving only a few (~ 75) scattered remnant trees.
- Cultural Plantation (CUP-3) is located in one small patch on the north side of CR-43. A cultural plantation has greater than 60% tree cover, but is a community resulting from human disturbance or management. Here, the plantation is dominated by coniferous trees, a mixture of species with no clear dominant.
- Black Ash Organic Deciduous Swamp (SWD 5-1) occurs in one block of land on the north side of CR-43. This type of habitat has over 25% tree or shrub cover and is dominated by water-tolerant species, here Black Ash with Largetooth Aspen and American Elm in the understory. The edges of this block were densely vegetated by the non-native and invasive shrub, European Buckthorn.

Section B (County Road 44 or Rideau Street to Kemptville Creek) – Attachment 3: This section of the study area is entirely composed of cultural communities.

- Cultural (CU) areas are those with essentially no vegetation cover, but hardened (paved) surfaces and buildings. This includes the property of the Ferguson Forest Center, which had bare soils with no vegetation at the time of the site visit.

• Cultural Meadow (CUM) areas are characterized by tree and shrub cover of less than 25%, respectively. In this area, the CUM areas are lawns.

Section C (Kemptville Creek, south branch of the Rideau River) – Attachment 4: this section of the study area was largely characterized by natural vegetation communities.

• Cultural Meadow (CUM) areas are characterized by tree and shrub cover of less than 25%, respectively. In this area, the CUM areas are lawns associated with development at the periphery of the riparian system.

• Cultural Thicket (CUT) areas are characterized by tree cover of 25% or less, and shrub cover of greater than 25%. Here the shrub vegetation was dominated by non-native species Tartarian Honeysuckle and European Buckthorn.

• ffW1 indicates a wetland vegetation community dominated by free-floating wetland plants, following the wetland evaluation protocol for southern Ontario (Environment Canada and Ministry of Natural Resources 1984), under which the Kemptville Creek Wetland, Part 3 was evaluated (McIntyre and Sine 1985). This is essentially an aquatic community, dominated by free-floating Lesser Duckweed, with submerged and floating-leaved aquatic plants. Our observations were consistent with the wetland mapping. This community would be designated SAM 1-4 by Lee *et al.*, a Pondweed Mixed Shallow Aquatic Type.

• suW2 indicates a wetland community dominated by submergent Eurasian Milfoil, with narrow-leaved emergent and floating-leaved aquatic plants. Again, our observations were generally consistent with that reported in the wetland evaluation. This community would be designated SAM 1-7 by Lee *et al.*, a Water Milfoil Mixed Shallow Aquatic Type.

• reM2 indicates a wetland community dominated by robust emergent Cattails, with groundcover vegetation below. Again, our observations were generally consistent with that reported in the wetland evaluation. This community would be designated MAS 3-1 by Lee *et al.*, a Cattail Organic Shallow Marsh Type.

• Additionally, we have mapped a 'ts' area, indicating a tall shrub-dominated vegetation community. This was not reported by McIntyre and Sine, but almost certainly represents a natural evolution of the wetland since the evaluation was undertaken 24 years ago. The original mapping shows a tiny area, unlabelled, where there is now a more substantial finger of land. Most of the finger is reM2 vegetation, but there is a small area of higher land that is dominated by tall shrubs and small trees, including Elderberry, Black Ash, Wild Black Currant and Cattails. This community would be designated SWT by Lee *et al.*, a Thicket Swamp community.

Section D (Kemptville Creek to just past the Utility Corridor) – Attachment 5: This section of the study area is almost entirely composed of cultural communities.

• Cultural Meadow (CUM) areas are characterized by tree and shrub cover of less than 25%, respectively. In this area, the CUM areas are mostly cleared lands, with only a few lawns.

• Cultural (CU) areas are those with essentially no vegetation cover, but hardened (paved) surfaces and buildings. This includes the area east of the utility corridor and south of CR-43, which had bare soils with no vegetation at the time of the site visit.

• Cultural Thicket (CUT) areas are characterized by tree cover of 25% or less, and shrub cover of greater than 25%. Most of this CUT area is dominated by non-native Tartarian Honeysuckle. We did not investigate the CUT area east of the traffic circle

as it is well beyond the CR-43 right-of-way, but we would anticipate similar vegetation communities.

- Shallow Marsh (MAS) was found in a couple of small patches on the north side of CR-43. The easterly of these appeared to have been created by road construction and manipulation of soils (see Attachment 6). The westerly patch may be connected to an area of Deciduous Swamp (SWD) further to the north, but we did not investigate this area as it is well beyond the CR-43 right-of-way.

B. Slopes

Most of the study area is flat, the original topography undoubtedly modified during the urbanization process. Slopes around the watercourse are quite steep adjacent to CR-43, and fairly gentle along the other shorelines. In general, slopes are well vegetated (site photographs are included in Attachment 6). Most of the creek near CR-43 is well buffered by cattails, but in some areas, particularly the shoreline north of CR-43 on the east side of Kemptville Creek, there has been shoreline hardening associated with urbanization.

C. Surface Water Quality and Quantity

Water quality in Kemptville Creek has been affected by urbanization and other land use (RVCA 2007). It is generally described as "good," but problem levels of bacteria, phosphorus and nitrogen, and low dissolved oxygen levels have been detected. One of the top five issues recognized by the Rideau Valley Conservation Authority is urbanization in the Kemptville area, and ensuring that ecosystem impacts are minimized. The maintenance or restoration of wetland cover is one objective for addressing this issue, due to the natural ability of wetland vegetation to absorb nutrients.

D. Setback Requirements

Maximizing setbacks from the creek and its associated wetland will mitigate the impact of the proposed widening on these natural heritage features. The balance of the study area has little ecological value or integrity, and the widening will have less impact. The existing setbacks from the creek and wetland are minimal, the fill associated with CR-43 creating the steep banks along the road-side portions of the wetland. Widening and possibly raising the bridge crossing has the potential to impact the wetland, reducing setbacks or intruding into the wetland. Intrusion into the wetland and bed of the creek will result in a loss of fish habitat, and may at least temporarily affect a number of wetland species.

Is the Proposed Development:	
A. In a Provincially Significant Wetland? The creek bed and riparian vegetation in the area of CR-43 are part of the provincially significant Kemptville Creek Wetland – Part 3. Widening and raising the bridge over Kemptville Creek both have potential to impact this wetland through wetland loss and/or disturbance.	Yes ☒ ☐ No
Adjacent to a Provincially Significant Wetland? Lands within 120 m of the wetland boundary are considered to be adjacent lands, and the proposed road widening will occur within these lands.	Yes ☒ ☐ No
B. In a Regionally Significant Wetland?	Yes ☐ ☒ No

Adjacent to a Regionally Significant Wetland?	Yes ☐ ☒ No
C. In/adjacent to an Unevaluated Wetland?	Yes ☐ ☒ No
D. In an Area of Natural and Scientific Interest?	Yes ☐ ☒ No
Adjacent to an Area of Natural and Scientific Interest?	Yes ☐ ☒ No
E. In the habitat of Species at Risk? No species at risk were reported in the wetland evaluation, and none were observed during field work (see Attachment 7). This does not mean that none are present in the area. Species that might reasonably be present include: ▪ Snapping Turtles (not reported in the wetland evaluation or observed; a species of Special Concern at the national level, though not considered at risk in Ontario) – habitat conditions appear suitable. ▪ Stinkpot Turtle (considered Threatened at both national and provincial levels). It is noted that we interviewed four workers on a roads crew currently working at the bridge site, and none had seen any turtles on the road; we found no dead animals in walking both sides of the route; and members of the Eastern Ontario Biodiversity Museum have reported no turtle kills at this site from their 15+ years of monitoring the roads (Schueler, personal communication). From this, we conclude that if these turtles are present, they are not using the bridge area at CR-43 to access nesting sites. We note that the Kemptville area falls at the eastern extreme of this turtle's range, but they could occur in this type of system. It is noted, furthermore, that the Ministry of Natural Resources has records of this species occurring in the general area (MNR 2009). ▪ Blanding's Turtle (considered Threatened at both national and provincial levels) – habitat conditions appear suitable. ▪ Northern Map Turtle (considered a species of Special Concern at both national and provincial levels) – the Kemptville area falls at the eastern extreme of this turtle's range, but it could occur in this type of system. This turtle species is particularly sensitive to disturbance. ▪ Least Bittern (considered a Threatened species at both national and provincial levels) is probably not present as this species is mainly found in marshes near the Great Lakes, and generally requires large, quiet marshes; as marshes decrease in size and human presence increases, the population declines in an area. However, the Ministry of Natural Resources has identified a potential for these birds based on habitat suitability modeling (MNR 2009). ▪ Butternut (considered Endangered at both national and provincial levels), this tree species was not observed during field work, despite specific effort to find Butternuts. Never a common tree, Butternuts are in serious decline for the past 15 years or so, due to a fungal infection (Butternut canker) that is killing these trees. Now protected under the *Endangered Species Act*, no Butternut tree can be removed without a health assessment and a permit from the Ministry of Natural Resources. ▪ Milk Snake (considered to be a species of Special Concern at both	Yes ☐ ☐ No None known.

national and provincial levels), it is widespread and locally common in southern Ontario, and could be present on some of the remnant uplands around the wetland.

Finally, the Natural Heritage Information Center (NHIC) database has an element occurrence record. The Gorgone Checkerspot is a butterfly mainly of the Great Plains. In Canada, it is mainly a prairie species. There are a few scattered historical records from southwestern and northern Ontario, but there were no recent eastern records and the species was considered to be extirpated in Ontario. However, in 1996 more than 12 colonies were discovered in eastern Ontario in a region bounded by Kemptville and Merrickville to the north and Spencerville and Brockville to the south. While this butterfly can be locally common or even abundant in the Prairies, particularly on hilltops, it is local and uncommon in eastern Ontario and is easily overlooked, even when present.

The species is flexible in its habitat requirements: the Gorgone Checkerspot is usually found in dry prairie and grassy hillside habitats in the west, but there are isolated colonies in open pine forests in the extreme northern parts of its range. It is found in abandoned fields and dry roadsides in Ontario, usually on sandy soil overlying limestone. The 1996 sightings by Catling were the first reports from eastern Canada in over a century. From the Canadian Biodiversity Information Facility: "More than a dozen colonies were found in eastern Ontario in 1996 in abandoned, dry sandy fields, roadsides, and hydrolines. These areas are not relict prairie sites where the species might have survived before the land was cleared for farming; however, most of the sites have enough native vegetation to suggest that relict prairie habitat formerly existed in the area. Its peculiar foodplant in Ontario (Black-eyed Susan) also suggests a long history of the species in the east."

NHIC lists this species as an S2 species, or one that is imperiled (because of rarity due to a "very restricted range, very few populations, steep declines, or other factors making it very vulnerable to extirpation"), but it is not listed by either COSEWIC or MNR as a species at risk. We noted the following points: most of the habitat in the study area is cultural habitat; this species is rare in Ontario because it is at the extreme limits of its distribution; Black-eyed Susan were not observed, but field work was done in early May, which is too early for flowering of that species; this is an existing transportation corridor; and the species is apparently secure globally, though it might be quite rare in parts of its range, especially at the periphery. With respect to satisfying policy and legislative requirements, this species is not listed under either the provincial *Endangered Species Act* or the federal *Species at Risk Act*.

Adjacent to habitat of Species at Risk?	Yes ☐ ☐ No None known.
F. In significant wildlife habitat? The main area of significance to wildlife is the habitat in and around Kemptville Creek (south branch of the Rideau River).	Yes ☐ ☒ No
Adjacent to significant wildlife habitat?	Yes ☐ ☒ No
G. Within 90 m of a waterbody? The study route crosses Kemptville Creek (south branch of the Rideau River).	Yes ☒ ☐ No
H. In fish habitat? Although no sampling of fish populations was undertaken for this assessment, several species of fish were observed during the course of the field work. These included Northern Pike and several different minnows. No evidence of nesting was observed, but the habitat appeared to offer ideal nesting substrate and it is assumed that this area has important fish habitat, both for spawning, nursery and feeding. In addition, the Ministry of Natural Resources has identified fish nursery areas beneath CR-43 (MNR 2009).	Yes ☒ ☐ No
Adjacent to fish habitat? Lands within 30 m of the creek are considered to be adjacent lands, and the proposed road widening will occur within these lands.	Yes ☒ ☐ No
I. Adjacent to Highly or Moderately Sensitive Lake Trout Lake?	Yes ☐ ☒ No
J. In a significant woodland? Woodland patches observed within the study corridor are small, patchy and fragmented. They retain little ecological integrity, and would not be considered to be significant for the purposes of the Provincial Policy Statement.	Yes ☐ ☒ No
Adjacent to a significant woodland?	Yes ☐ ☒ No
K. In a significant valleyland?	Yes ☐ ☒ No
Adjacent to a significant valleyland?	Yes ☐ ☒ No

In our opinion, is a more detailed Environmental Impact Statement (EIS) required to demonstrate the appropriateness of the proposed development? Yes ☒ ☐ No
If yes, which natural feature(s) should the assessment focus on? Kemptville Creek (south branch of the Rideau River) and its associated wetland, as well as adjacent lands.
Recommendations for Mitigation: ▪ The expanded bridge has the potential to cause development or site alteration within a provincially significant wetland, in contravention of the Provincial Policy Statement. Design road and bridge upgrades to avoid or minimize the loss of wetland vegetation; ▪ Implement erosion and sediment control measures, as appropriate; ▪ Ensure that no in-water work is undertaken between March 15 and June 30, as recommended by MNR (2009). ▪ Minimize the increase in bridge-to-water clearance, as this encourages access by larger boats, which leads to disturbance of the creek habitat and species. It is noted that the existing clearance permits fairly large boats to enter the creek from the main Rideau

River, and that the shallow depths in the creek may limit an increase in the size of watercraft entering. Whether or not the cost of increasing clearance will create a useable access because of the relatively shallow water is debatable, but it is pointed out that species such as Map Turtles, if present, may be adversely affected by an increase in boat traffic. Many Midland Painted Turtles were observed during the field work.

- The expanded bridge will likely result in harmful alteration, disruption or destruction of fish habitat (a HADD) if any part of the bridge results in in-filling of fish habitat (including piers, footings, abutment or approaches below the high water level) or if there is any realignment of the channel itself. If bridge design cannot avoid such impact (and we note that the existing bridge has a central pier), there will be a requirement for compensation (creation or enhancement of fish habitat). Consider design to avoid impacts such as additional shoreline hardening, disturbance to bank stability, loss of riparian or wetland vegetation, obstructions that might impede fish migration, runoff from the widened road and bridge, etc.
- Implement standard mitigation measures, as appropriate, including but not necessarily limited to: compressing the work schedule to minimize the time period of disruption, selecting the least harmful materials and construction methods, ensuring fish passage around any temporary obstructions, ensuring in-stream flow rates are maintained as appropriate, and controlling siltation or sedimentation.
- Confirm that no Butternut trees will be affected by clearing once the final route is selected.

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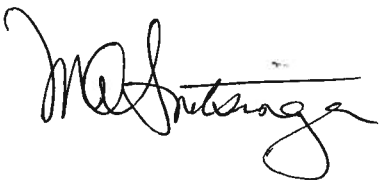
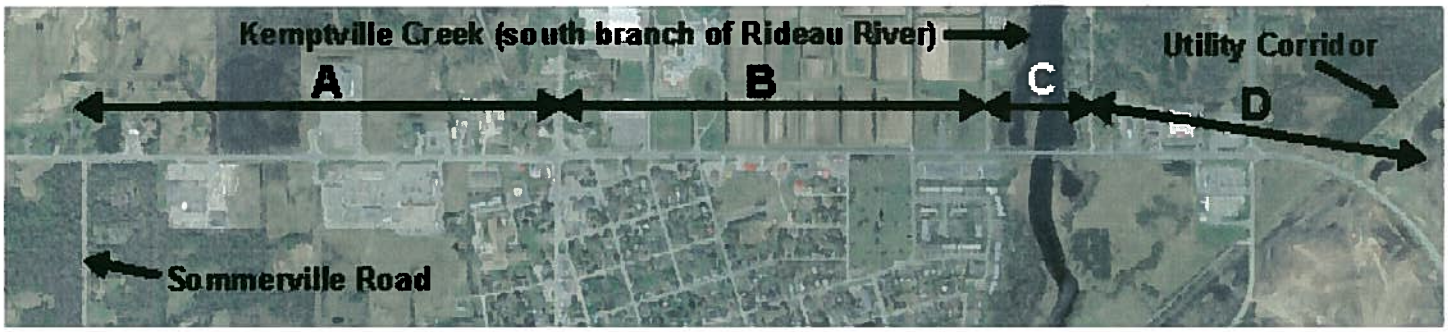
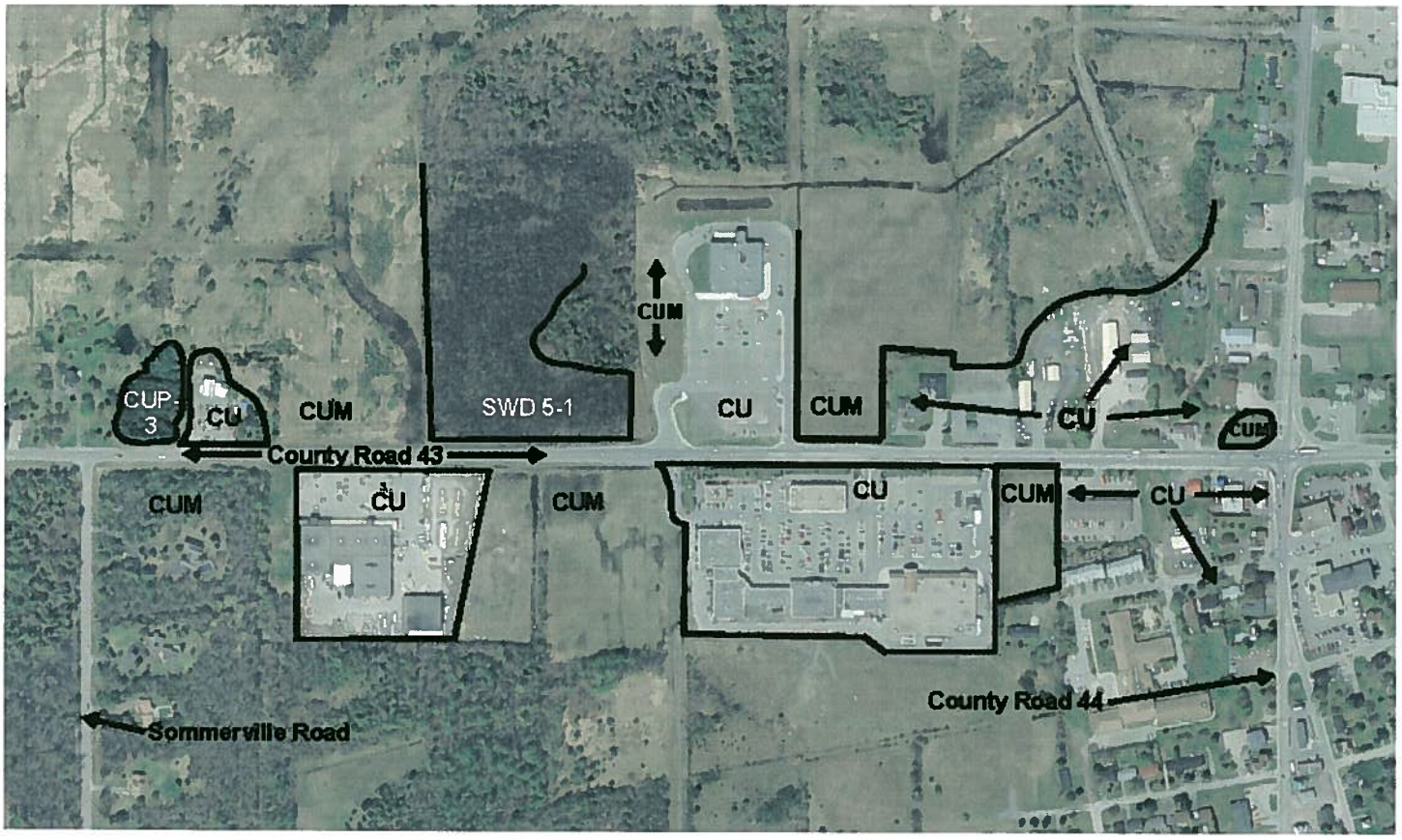
Schueler, Frederick. Personal communication. Bishop Mills Natural History Center. Phone: 613-258-3107.

Thompson, Shaun. District Ecologist, Kemptville office of the Ministry of Natural Resources. 613-258-8235.
Environmental Site Evaluation Completed By: Mary Alice Snetsinger
Date of Site Inspection: May 12, 2009
Signature: 
Date of Report: June 17, 2009

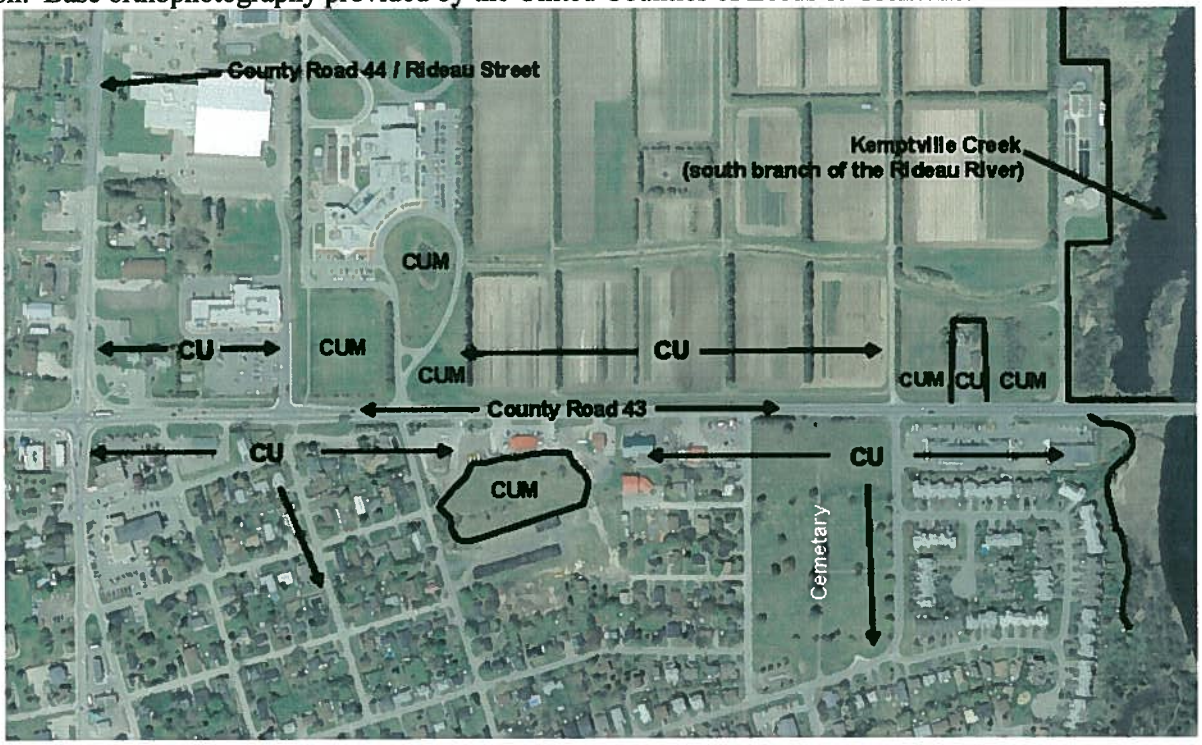
Attachment 1. General location of the study area, along County Road 43 in Kemptville. The four detailed sections are indicated below. Base orthophotography provided by the United Counties of Leeds & Grenville.



Attachment 2. Ecological land classification mapping (after Lee *et al.* 1998) along County Road 43 between Sommerville Road and County Road 44, Section A. CU = cultural land; CUM = Cultural Meadow; CUP = Cultural Plantation; and SWD 5-1 = Black Ash Organic Deciduous Swamp. See text for discussion. Base orthophotography provided by the United Counties of Leeds & Grenville.

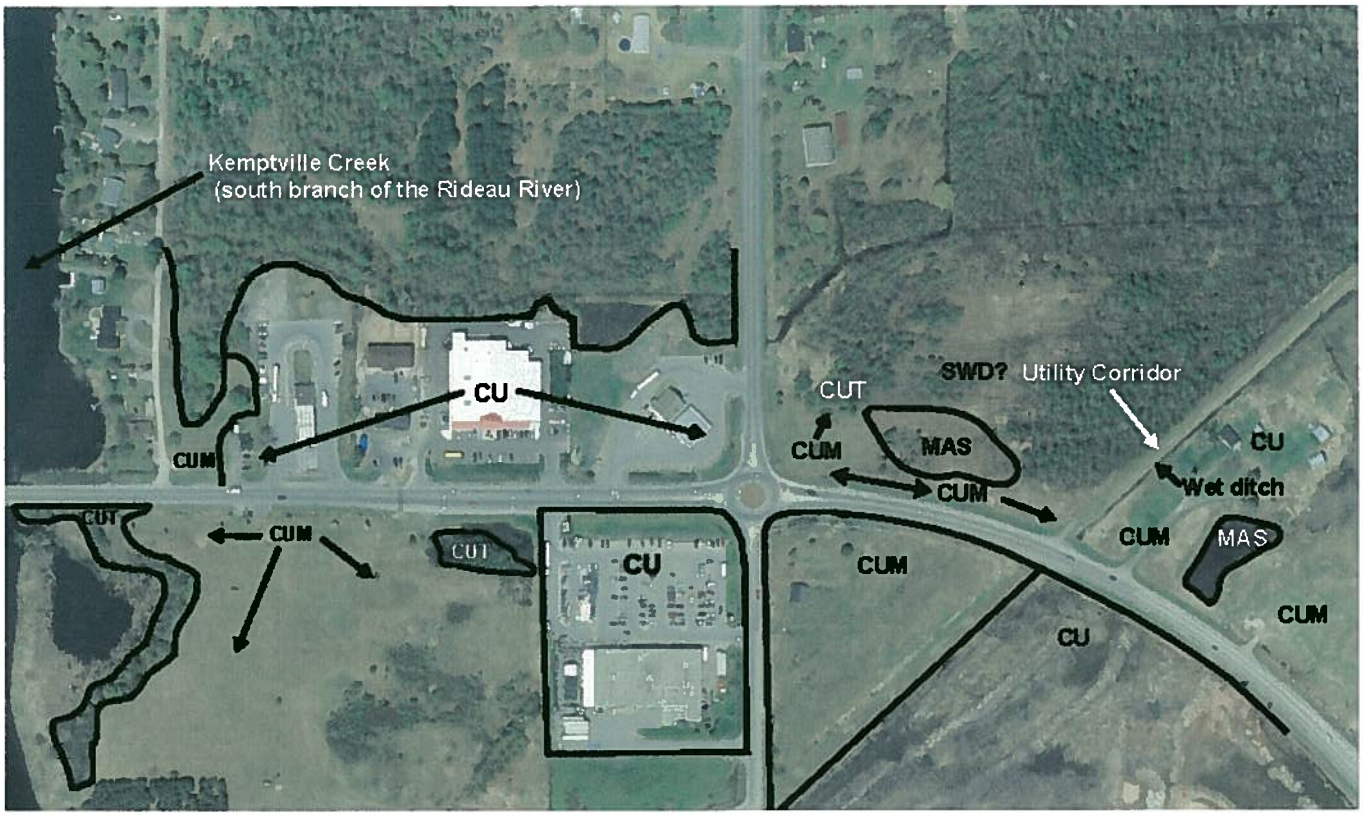


Attachment 3. Ecological land classification mapping (after Lee *et al.* 1998) along County Road 43 between County Road 44 (Rideau Street) and Kemptville Creek, Section B. CU = cultural land; CUM = Cultural Meadow. See text for discussion. Base orthophotography provided by the United Counties of Leeds & Grenville.



Attachment 4. Ecological land classification mapping (after Lee *et al.* 1998) along County Road 43 at Kemptville Creek (south branch of the Rideau River), Section C. CUM = Cultural Meadow; CUT = Cultural Thicket; ffW1 = free-floating wetland; suW2 = submerged wetland; reM2 = robust emergent wetland; and ts = tall shrub wetland. See text for discussion. Base orthophotography provided by the United Counties of Leeds & Grenville.

Attachment 5. Ecological land classification mapping (after Lee *et al.* 1998) along County Road 43 from Kemptville Creek to just east of utility corridor, Section D. CU = cultural land; CUM = Cultural Meadow; CUT = Cultural Thicket; MAS = Shallow Marsh; and SWD = Deciduous Swamp. See text for discussion. Base orthophotography provided by the United Counties of Leeds & Grenville.



Attachment 6. Site photographs taken by report author on May 12, 2009.

Photo 1. View to the south from the north side of CR-43, east side of Kemptville Creek. Note the steep slopes adjacent to CR-43, and the more gentle natural slopes further north from the road. The photo is annotated with some of the wetland vegetation types referred to in the report. Note also the bridge over the creek at the far right of the image, showing its existing clearance above the water surface.

Photo 2. View to the west along the south side of CR-43. Note the steep slopes immediately adjacent to CR-43. The Cultural Thicket area can be seen on the lower part of the slope, and Robust emergent (cattail) at its base.

Photo 3. View to the south along the channel of Kemptville Creek from the bridge over CR-43. Note robust emergent (cattail) vegetation on each side of the creek.

Photo 4. North side CR-43, west side of Kemptville Creek: view to the north, across the open ffW1 wetland type toward the finger of robust emergents and tall shrubs. The main channel of the creek is beyond the finger, in the far distance.

Photo 5. North side CR-43: view of the eastern shoreline of Kemptville Creek, with residential development and wetland pushed back to the water's edge.

Photo 6. View to the west along CR-43 towards the western end of the study area. Note the patch of Deciduous Swamp on the north side of the road, and the cultural natural of the balance of the lands.

Photo 7. North side CR-43, toward the east end of the study area. Note the area of Shallow Marsh, a small, isolated patch just north of the road.

Attachment 7. Species observed during field work on May 12, 2009.

7.A. Vascular plants observed in the County Road 43 study area on May 12, 2009. List modified from information at the Natural Heritage Information Center, maintained by the Ministry of Natural Resources (MNR) at <www.nhic.mnr.gov.on.ca/nhic_.cfm> S5 is considered to be extremely common and S4 to be a common species in Ontario; SNA is a non-native species for which a rarity ranking is not applicable; and '?' indicates some uncertainty in the rank assigned. None of the species observed is ranked as a species at risk by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) or by the Committee on the Status of Species at Risk in Ontario (COSSARO), nor are any tracked by the MNR.

Scientific Name	Common Name	SRANK	FAMILY
Acer negundo	Manitoba Maple	S5	ACERACEAE
Achillea millefolium var. millefolium	Common Yarrow	SNA	ASTERACEAE
Alnus incana	Speckled Alder	S5	BETULACEAE
Anemone canadensis	Canada Anemone	S5	RANUNCULACEAE
Asclepias syriaca	Common Milkweed	S5	ASCLEPIADACEAE
Bromus inermis ssp. inermis	Awnless Brome	SNA	POACEAE
Caltha palustris	Marsh Marigold	S5	RANUNCULACEAE
Carex crinita	Fringed Sedge	S5	CYPERACEAE
Carex granularis	Meadow Sedge	S5	CYPERACEAE
Cornus sericea	Red-osier Dogwood	S5	CORNACEAE
Elodea canadensis	Broad Waterweed	S5	HYDROCHARITACEAE
Equisetum palustre	Marsh Horsetail	S5	EQUISETACEAE
Equisetum pratense	Meadow Horsetail	S5	EQUISETACEAE
Fragaria virginiana	Virginia Strawberry	S5	ROSACEAE
Fraxinus americana	White Ash	S5	OLEACEAE
Fraxinus nigra	Black Ash	S5	OLEACEAE
Hemerocallis fulva	Orange Daylily	SNA	LILIACEAE
Impatiens capensis	Spotted Jewel-weed	S5	BALSAMINACEAE
Iris versicolor	Blueflag	S5	IRIDACEAE
Lemna minor	Lesser Duckweed	S5	LEMNACEAE
Lonicera tatarica	Tartarian Honeysuckle	SNA	CAPRIFOLIACEAE
Matteuccia struthiopteris	Ostrich Fern	S5	DRYOPTERIDACEAE
Nymphaea odorata ssp. odorata	White Water-lily	S5?	NYMPHAEACEAE
Onoclea sensibilis	Sensitive Fern	S5	DRYOPTERIDACEAE
Picea glauca	White Spruce	S5	PINACEAE
Pinus banksiana	Jack Pine	S5	PINACEAE
Pinus resinosa	Red Pine	S5	PINACEAE
Pinus strobus	Eastern White Pine	S5	PINACEAE
Populus grandidentata	Large-tooth Aspen	S5	SALICACEAE
Potamogeton pectinatus	Sago Pondweed	S5	POTAMOGETONACEAE

Prunus serotina	Black Cherry	S5	ROSACEAE
Quercus rubra	Northern Red Oak	S5	FAGACEAE
Ranunculus abortivus	Kidney-leaved Buttercup	S5	RANUNCULACEAE
Rhamnus cathartica	European Buckthorn	SNA	RHAMNACEAE
Ribes americanum	Wild Black Currant	S5	GROSSULARIACEAE
Rubus idaeus ssp. strigosus	Common Red Raspberry	S5	ROSACEAE
Salix nigra	Black Willow	S4?	SALICACEAE
Sambucus nigra ssp. canadensis	Common Elderberry	S5	CAPRIFOLIACEAE
Taraxacum officinale	Common Dandelion	SNA	ASTERACEAE
Thalictrum dioicum	Early Meadowrue	S5	RANUNCULACEAE
Thuja occidentalis	Eastern White Cedar	S5	CUPRESSACEAE
Tilia americana	American Basswood	S5	TILIACEAE
Toxicodendron radicans ssp. negundo	Poison Ivy	S5	ANACARDIACEAE
Typha angustifolia	Narrow-leaved Cattail	SNA	TYPHACEAE
Typha latifolia	Broad-leaf Cattail	S5	TYPHACEAE
Ulmus americana	American Elm	S5	ULMACEAE
Urtica dioica ssp. gracilis	Stinging Nettle	S5	URTICACEAE
Verbascum thapsus	Common Mullein	SNA	SCROPHULARIACEAE
Viola cucullata	Marsh Blue Violet	S5	VIOLACEAE
Viola pubescens var. pubescens	Downy Yellow Violet	S5	VIOLACEAE
Vitis riparia	Riverbank Grape	S5	VITACEAE

7.B. Bird species observed in the County Road 43 study area on May 12, 2009. List modified from information at the Natural Heritage Information Center, maintained by the Ministry of Natural Resources at <www.nhic.mnr.gov.on.ca/nhic_.cfm> S5B is considered to be extremely common and S4B to be a common breeding bird in Ontario. None of the species observed is ranked as a species at risk by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) or by the Committee on the Status of Species at Risk in Ontario (COSSARO), nor are any tracked by the MNR.

Scientific Name	Common Name	SRANK	FAMILY
Agelaius phoeniceus	Red-winged Blackbird	S5B	ICTERIDAE
Corvus brachyrhynchos	American Crow	S5B	CORVIDAE
Pandion haliaetus	Osprey	S4B	ACCIPITRIDAE
Quiscalus quiscula	Common Grackle	S5B	ICTERIDAE
Tachycineta bicolor	Tree Swallow	S5B	HIRUNDINIDAE
Turdus migratorius	American Robin	S5B	TURDIDAE
Tyrannus tyrannus	Eastern Kingbird	S5B	TYRANNIDAE

7.C. Herpetofauna observed in the County Road 43 study area on May 12, 2009. List modified from information at the Natural Heritage Information Center, maintained by the Ministry of Natural Resources at <www.nhic.mnr.gov.on.ca/nhic_.cfm> S5 is considered to be an extremely common species in Ontario. None of the species observed is ranked as a species at risk by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) or by the Committee on the Status of Species at Risk in Ontario (COSSARO), nor are any tracked by the MNR.

Scientific Name	Common Name	SRANK	COSEWIC	MNR	FAMILY
Chrysemys picta marginata	Midland Painted Turtle	S5			EMYDIDAE
Rana clamitans	Green Frog	S5			RANIDAE
Rana pipiens	Northern Leopard Frog	S5	NAR	NAR	RANIDAE

7.D. Mammals observed in the County Road 43 study area on May 12, 2009. List modified from information at the Natural Heritage Information Center, maintained by the Ministry of Natural Resources at <www.nhic.mnr.gov.on.ca/nhic_.cfm> S5 is considered to be an extremely common species in Ontario. None of the species observed is ranked as a species at risk by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) or by the Committee on the Status of Species at Risk in Ontario (COSSARO), nor are any tracked by the MNR.

Scientific Name	Common Name	SRANK	FAMILY
Marmota monax	Woodchuck	S5	SCIURIDAE
Procyon lotor	Northern Raccoon	S5	PROCYONIDAE

7.E. Fish observed in the County Road 43 study area on May 12, 2009. List modified from information at the Natural Heritage Information Center, maintained by the Ministry of Natural Resources at <www.nhic.mnr.gov.on.ca/nhic_.cfm> S5 is considered to be an extremely common species in Ontario. None of the species observed is ranked as a species at risk by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) or by the Committee on the Status of Species at Risk in Ontario (COSSARO), nor are any tracked by the MNR.

Scientific Name	Common Name	SRANK	FAMILY
Esox lucius	Northern Pike	S5	ESOCIDAE

Several other fish were observed, of several minnow or other small-bodied species, but identification cannot be positive as no direct sampling was undertaken.

Appendix E

Geotechnical Desktop Study

DESKTOP STUDY GEOTECHNICAL REVIEW
CLASS ENVIRONMENTAL ASSESSMENT
PROPOSED ROADWAY WIDENING
LEEDS AND GRENVILLE COUNTY ROAD No. 43
FROM SOMERVILLE ROAD TO HWY. 416 INTERCHANGE
THE « KEMPTVILLE CORRIDOR »
TOWN OF KEMPTVILLE, ONTARIO

Date: **July 28, 2009**	Reference: **T020613-A1**

INSPEC-SOL
ENGINEERING SOLUTIONS

INSPEC-SOL INC. 179 Colonnade Rd., Suite 400, Nepean, Ontario K2E 7J4 • Tel.: (613) 727-0895 • Fax: (613) 727-0581

Reference No.:T020613-A1

Ottawa, May 12, 2009 **(Revised July 28, 2009)**

Mr. Guy Laporte, P. Eng.
The United Counties of Leeds and Grenville
c/o AECOM
654 Norris Court
Kingston, Ontario
K7P 2R9

Re: Desktop Study Geotechnical Review of the
Class Environmental Assessment for the
Proposed Roadway Widening of
Leeds and Grenville County Road No. 43
From Somerville Road to Highway 416 Interchange
The "Kemptville Corridor"
Town of Kemptville, Ontario

Dear Mr. Laporte:

Inspec-Sol Inc. **(Inspec-Sol)** has completed a Desktop Study for aspects of the Class Environmental Assessment addressing the proposed four lane widening proposal of Leeds and Grenville County Road 43 within the limits of the Town of Kemptville.

We trust that this information meets with your approval. Please do not hesitate to contact us should any questions arise.

Yours very truly,

INSPEC-SOL INC.

William S. Beveridge, B.A., B.Eng.
Project Manager

Joseph B. Bennett, P. Eng
Vice-President

JBB/WSB/vl

Enclosures

Dist: Mr. Guy Laporte, Kingston Branch Manager AECOM (3)

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DRAWINGS

AERIAL PHOTOGRAPHY – AREA 1	Dwg. No. T020613-A1-01
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AERIAL PHOTOGRAPHY – AREA 2B	Dwg. No. T020613-A1-03
AERIAL PHOTOGRAPHY – AREA 2C	Dwg. No. T020613-A1-04
AERIAL PHOTOGRAPHY – AREA 3	Dwg. No. T020613-A1-05
AERIAL PHOTOGRAPHY – AREA 4A	Dwg. No. T020613-A1-06
AERIAL PHOTOGRAPHY – AREA 4B	Dwg. No. T020613-A1-07
PROVINCIAL BOREHOLE DATA – AREA 1	Dwg. No. T020613-A1-08
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PROVINCIAL BOREHOLE DATA – AREA 4A	Dwg. No. T020613-A1-13
PROVINCIAL BOREHOLE DATA – AREA 4B	Dwg. No. T020613-A1-14
ONTARIO SOILS	Dwg. No. T020613-A1-15
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BEDROCK	Dwg. No. T020623-A1-17
HISTORICAL GROUNDWATER DEPTHS	Dwg. No. T020613-A1-18

ENCLOSURES

SITE VISIT PHOTOLOG (APRIL 17, 2009)

WESTBOUND CR-43

West of Highway 416	ENCLOSURE No. 01
West of Colonnade Road	ENCLOSURE No. 01
West of Wellington Road	ENCLOSURE No. 02
East of Rideau River (South Branch)	ENCLOSURE No. 02
West of Rideau River (South Branch)	ENCLOSURE No. 03
East of Grenville Street	ENCLOSURE No. 03
East of King Street	ENCLOSURE No. 04
East of James Street	ENCLOSURE No. 04
East of Leeds and Grenville County Road No. 44	ENCLOSURE No. 05
West of Leeds and Grenville County Road No. 44	ENCLOSURE No. 05
East of Kemptville Mall	ENCLOSURE No. 06
East of Pine Hill Rd.	ENCLOSURE No. 06
West of Pine Hill Rd.	ENCLOSURE No. 07
East of Somerville Rd.	ENCLOSURE No. 07

EASTBOUND CR-43

APPENDICES

APPENDIX A

ROADWAY DRAWINGS (MTO, 1976) STA. 550+00 TO STA. 635+00 Sheets No. 21-26

APPENDIX B

BOREHOLE LOG LOCATION PLAN
(HOULE CHEVRIER)

APPENDIX C

BOREHOLE LOGS, TEST PITS and GRAIN SIZE DISTRIBUTIONS
(HOULE-CHEVRIER)

1.0 INTRODUCTION

Inspec-Sol, Inc. (**Inspec-Sol**) was authorized by Mr. Guy Laporte, of AECOM (Kingston Branch), on behalf Mr. Les Shepherd, of the United Counties of Leeds and Grenville, to conduct a Desktop Geotechnical Review to support the Class Environmental Assessment that is being completed for the proposed 4–lane widening and intersection control plan of the Leeds and Grenville County Road No. 43, (CR-43) from Somerville Road to Highway 416, "The Kemptville Corridor". The roadway is located within the Town limits of Kemptville, Ontario.

It is understood by **Inspec-Sol** that this report will be submitted to the United Counties of Leeds and Grenville by AECOM as part of a Class Environmental Assessment Study Design Report to be submitted to the United Counties of Leeds and Grenville.

This preliminary geotechnical review will include a desktop review of the subsoil, groundwater and bedrock conditions within the roadway section, delineate areas within the roadway widening requiring further geotechnical study, provide preliminary geotechnical recommendations for bridge, culvert, and light standard foundations, and provide preliminary construction recommendations.

The scope of work for **Inspec-Sol** consisted of the following activities:

- **Literature Review**: From aerial photographs obtained from the County of Leeds and Grenville, surveys obtained from the Ontario Geologic Survey, the Ministry of Natural Resources, and the Ministry of Transportation of Ontario, produce a set of drawings indicating problematic soil areas that may affect geotechnical design;
- **Review of Adjacent Geotechnical Reports**: Review completed geotechnical reports supplied by AECOM, (Client) that proximate to the subject roadway, in order to obtain preliminary geotechnical data and design parameters;
- **Field Reconnaissance**: From a site visit of the project, provide an overview and visual documentation of existing the site conditions;
- **Provide Construction Recommendations:** After completing the review of assembled data, provide a preliminary summary of issues addressing the proposed roadway widenings, structure foundations, and service installations.

2.0 LOCATION AND PROJECT DESCRIPTION

The proposed Leeds and Grenville County Road No. 43, (CR-43) widening project is located within the Town of Kemptville, in the North Grenville Township, in the United Counties of Leeds and Grenville, Ontario. The limits of the roadway widening are from the Somerville Road intersection to the westbound limits of the Highway 416 interchange, a length of approximately 3.5 km. A series of aerial photographs are attached as drawings No. T020613-A1-1 to T020613-A1-7, show the location of the existing roadway in the Town of Kemptville.

The existing roadway traverses through a developing urban area. The roadway includes nine at grade intersections, where two (2) are controlled by traffic lights and two (2) by roundabouts. The remaining five (5) at grade intersections are not controlled. Several retail businesses and mini-malls also have driveway access to the roadway.

There are two crossings over water within the project limits. Within Area One (1), the roadway crosses over a low lying wet area using a soil-steel bridge, and within Area Three (3), the roadway crosses over the Rideau River (South Branch) using a concrete bridge. There are also some small diameter culverts located beneath the access roads to CR43 and beneath CR43 itself.

3.0 LITERATURE REVIEW

3.1 General

A review of completed boreholes administered by the Ministry of Natural Resources, Environment and Transportation from numerous past projects was completed. A summary of the provincial borehole data and their locations are attached in drawing Dwgs. No. T020613-A1-08 to T020613-A1-14 (Provincial Borehole Data). Preliminary interpretations of the data is discussed below.

3.2 Physiography

The roadway section under review is located within the interface of the North Gower Drumlin Field mainly to the north of the roadway, and the Edwardsburg Sand Plain mainly to the south.

The North Gower Drumlin Field is characterised by glaciomarine and marine deposits, silt and clay, basin and quiet water deposits from the Champlain Sea. The lowlands in this area are occupied by Gleysolic soils (North Gower Clay Loam and Osgoode Loam) and drainage of both soils is relatively poor.

The Edwardsburg Sand Plain is characterised by sand, gravely sand, near shore and beach deposits. The bedrock and clay deposits are overlain with beds of glaciofluvial sand. The soils are mainly Granby sandy loam, and are known to be moderately acidic.

Excerpts of the topsoil and subsoil types and locations within the project area obtained from the Ontario Ministry of Natural Resources are attached in Drawings No. T020613-A1-15 (Ontario Soils) and No. T020613-A1-16 (Ontario Geological Survey (OGS) Quaternary Geology).

3.3 Bedrock

The roadway is located with the Beekmantown bedrock formation, characterized by dolostone and sandstone. The bedrock formation is attached in Drawing No. T020613-A1-17 (Ontario Geological Survey (Bedrock)).

3.4 Groundwater Elevations

The water table within the Drumlin Field is generally near the surface, as evidenced by frequent areas occupied by standing water (peat bogs and muck areas). Wetter areas are characterised by the presence of tamarack and black spruce trees.

The groundwater elevations within the roadway vary from primarily near surface elevations to isolated areas that extend to five (5) metres below existing grade. An estimated visual summary of the groundwater table, extrapolated from completed monitoring wells in the area by the Ministry of the Environment of Ontario is attached as Dwg. No. T020613-A1-18 (Approximate Historical Groundwater Depths).

4.0 DRAWING AND PHOTO REVIEW

4.1 General

The roadway project has been divided into four (4) study areas, each with separate and distinct features within the project. An aerial and roadway slope review was completed using Aerial Photographs provided by the United Counties of Leeds and Grenville, and existing Drawings provided by the Ministry of Transportation of Ontario (MTO). The areas are delineated in the Aerial Photographs attached as Dwgs. T020613-A1-1 to T020613-A1-7. A visual survey and photolog visit was completed at the site on Friday, April 17, 2009. Selected photographs of the Site visit are included in the Enclosures. The photographs and drawings were reviewed for roadway and commercial development, drainage patterns and site features pertaining to the project. The MTO drawings for the original Kings Highway No. 43 are attached in Appendix A for reference.

4.2 Area One (Somerville Road to Future Pine Hill Road)

Area One is mostly undeveloped, except for a Hardware store to the south and a residence to the north. The undeveloped areas are occupied by forest, grasslands, and a low lying area from east of the Hardware store to Pine Hill Road. Low lying areas are expected to collect seasonal surface water. An aerial photograph of Area One is attached as Drawing No. T020613-A1-1.

County Road 43 is a rural section, two lane undivided rural roadway with narrow gravel shoulders. The centerline of roadway slopes downwards from Somerville Road to approximately 395 m east of Somerville Road, then slopes upwards at it progresses towards Pine Hill Road. The roadway embankment within Area One varies from one (1) to two (2) metres in height.

The roadway pavement has a fair ride condition rating. Overall, the pavement surface contains slight severity ravelling, pavement edge and transverse cracking at low density, and slight severity wheel rutting throughout the area.

Roadway drainage is provided by open ditches on either side of the roadway, with culverts directing the water beneath access roadways. There was standing water in the ditches at the time of the site visit. The surface water drains eastwards to a culvert at the sump of a low lying wet area located approximately 395 m east of Somerville Road. East of the sump, the drainage

is somewhat stagnant until the intersection of Pine Hill Road. The low lying wet area is drained through a culvert beneath the roadway and continues east until Pine Hill Road, where it turns north.

Boreholes completed by the various Ministries in the Province of Ontario indicate that the predominant soil matrix in the western part of Area 1 consists of gravel and boulders overlying limestone bedrock for approximately the western 2/3 of the Area. The eastern 1/3 shows a low lying wet area, where the gravel and boulder layer is overlain by an increasingly thick layer of clay. Locations and descriptions of completed boreholes are shown in the Water Features, Geodetic Markers and Borehole Locations of the Kemptville Corridor (Area 1) drawing, attached as Dwg No T020613-A1-8.

4.3 Area Two (Future Pine Hill Road to Water Treatment Plant Road)

Area Two is mostly developed, consisting of a combination of small businesses, commercial centers, residential areas, a school and a nursery. The residential area is located east of Leeds and Grenville County Road 44 (Rideau St.) on a low sloped area. Aerial photographs of Area Two are attached as Drawings No. T020613-A1-2 to T020613-A1-4, inclusive.

County Road 43 is a rural and urban section with partial curb and gutter systems, using culverts to direct the water beneath access roadways. The two lane undivided urban roadway with narrow asphalt shoulders has been widened with additional turn lanes at intersections and large retail centre entrances. The centerline of roadway has a positive slope from Pine Hill Road to CR-44, then the slope becomes negative moving eastward towards the Water Treatment Plant Road. The roadway embankment is a maximum one-half (1/2) metre in height in small fill (grading) areas. The entire roadway within Area Two consists of small fills and cuts as CR-44 is approached.

The roadway pavement has a fair to poor ride condition rating. Overall, the pavement surface contains slight severity ravelling, alligator, pavement edge, longitudinal and transverse cracking at low density. The roadway also has slight severity wheel rutting throughout the area. The areas where the roadway has been widened to accommodate turn lanes has slight to moderate severity pavement edge cracking with some local cold patching throughout their interface to the existing roadway.

Roadway drainage is provided by open ditches on either side of the roadway. West of CR-44, the surface water drains westward to the low lying wet area in Area One. East of CR-44, the surface water drains eastward, beyond the Water Treatment Plant Road into Area Three. There are isolated pockets of standing water where the ditches have accumulated local blockages from roadway and forest debris.

Boreholes completed by the various Ministries in the Province of Ontario indicate that the predominant soil matrix in Area 2 is

Boreholes completed by the various Ministries in the Province of Ontario indicate that the predominant soil matrix in the western portion of Area 2 (Future Pine Hill Road Extension to Rideau Street) consists of a layer of clay overlying boulders, hardpan, or till which in turn overlies either sandstone or limestone. The predominant soil matrix in the middle portion of Area 2 (Rideau Street to James Street) consists of a clay and/or medium sand layer overlying limestone bedrock. The predominant soil matrix in the eastern portion of Area 2 is mainly clay overlying limestone. There are some isolated areas of fine sand and gravel over limestone. Locations and descriptions of completed boreholes are shown in the Water Features, Geodetic Markers and Borehole Locations of the Kemptville Corridor (Area 2) drawing, attached as Dwg No T020613-A1-9.

4.4 Area Three (Water Treatment Plant Road to Riverview Lane)

Area Three is comprised of the Kemptville Creek (Rideau River South Branch) and associated embankments. There are some residential developments set back from the edge of water at the east side of the Creek. An aerial photograph of Area Three is attached as Dwg No. T020613-A1-5.

County Road 43 is an open section with the bridge crossing using a curb and gutter system. Both approaches and the bridge itself support a two lane undivided urban roadway with narrow asphalt shoulders. The centerline of the roadway has a negative slope from the Water Treatment Plant Road to the centre of the Kemptville Creek then becomes positive moving east towards Riverview Lane. The roadway embankments quickly increase in height from approximately one-half (1/2) to five (5) metres from the Water Treatment Plant Road to the Kemptville Creek Bridge West Abutment, and after crossing the bridge, the embankment

slowly tapers down from approximately five (5) metres at the East Abutment to the original one-half (1/2) metre elevation at Riverview Lane.

The roadway pavement has a fair ride condition rating. Overall, the pavement surface contains slight severity ravelling, pavement edge and transverse cracking at low density, and slight severity wheel rutting throughout the area.

Roadway drainage is provided by open ditches on either side of the roadway. The ditches are narrow and deep on both sides of the Kemptville Bridge. The Kemptville Creek has the lowest elevation within the project limits. All drainage within Area Three is towards the Kemptville Creek. The drainage movement becomes stagnant alongside both embankments.

Boreholes completed by the various Ministries in the Province of Ontario and others indicate that the predominant soil matrix in Area 3 consists of a layer of fine silty sand overlying a silty clay, which in turn overlies glacial till and limestone bedrock. Near the western shores of the Kemptville Creek at the bridge crossing site, there is also an isolated organic deposit. Locations and descriptions of completed boreholes are shown in the Water Features, Geodetic Markers and Borehole Locations of the Kemptville Corridor (Area 3) drawing, attached as Dwgs No T020613-A1-11 and T020613A1-12. Additional borehole information provided by others is attached as Appendices B and C.

4.5 Area Four (Riverview Lane to Highway 416 Interchange)

Area Four is partially developed, consisting of a combination of service businesses, large retail outlets and commercial centres in various stages of development/construction. All of these businesses appear to be constructed on fill 'pads' to a maximum one-half (1/2) metre above the original grade. The undeveloped areas are mostly forests and grassy areas. Aerial photographs of Area Four are attached as Dwgs No. T020613-A1-6 to T020613-A1-7, inclusive.

County Road 43 is an open section with some areas using a curb and gutter system. The two lane undivided urban roadway with narrow asphalt shoulders has been widened with additional turn lanes at intersections, roundabouts and at large retail centre entrances. East of Colonnade Road, CR-43 has been widened to accommodate the Highway 416 interchange on and off ramps. The centerline of roadway slopes downward from Riverview Lane to Highway 416. The roadway embankment is a maximum one-half (1/2) to one (1) metre in height in small fill

embankment areas approaching Highway 416. There appears to be an additional lane under construction along the westbound lane.

The roadway pavement has a fair ride condition. Overall, the pavement surface contains slight severity ravelling, pavement edge and transverse cracking at low density, and slight severity wheel rutting throughout the Area.

Roadway drainage is provided by open ditches on either side of the roadway, with culverts directing the water beneath access roadways. Drainage activity is considerable between Colonnade Road and Leeds and County Road CR-44 (Rideau River Road). North of CR-43, the water movement is slightly stagnant, with slow drainage moving westwards to Leeds and County Road CR-19 (Wellington Street). South of CR-43, the water movement is more rapid, with drainage moving westwards towards Leeds and County Road CR-19 (Wellington Street). Drainage activity slows to almost stagnant west of Leeds and County Road CR-19 (Wellington Street) to Riverview Lane on both sides of CR-43. The ditches along the north side of CR-43 are narrow, and along the south side, considerably wider.

The water becomes stagnant just east of Riverview Lane. The ditches along the north side of CR-43 are narrow and shallow. There are isolated pockets of stagnant water as Riverview Lane is approached.

Boreholes completed by the various Ministries in the Province of Ontario and others indicate that the predominant soil matrix in Area 4 consists of interbedded layers of fine silty sand and silty clay, which in turn overlies glacial till and limestone bedrock. Locations and descriptions of completed boreholes are shown in the Water Features, Geodetic Markers and Borehole Locations of the Kemptville Corridor (Area 4) drawing, attached as Dwgs No T020613-A1-12, T020613A1-13, and T020613A1-14. Additional borehole information provided by others is attached as Appendices B and C.

5.0 PRELIMINARY GEOTECHNICAL COMMENTS

5.1 General

The preliminary recommendations provided in this review are based on the description and pre-construction requirements submitted by the Client for this roadway. After review of data obtained from preliminary surveys, aerial and site visit photography, and completed adjacent reports, the most significant geotechnical considerations for the design and construction of the roadway widening, associated bridge and light standard foundations and installation of service utilities (sanitary and storm water sewers) are as follows:

5.2 Subgrade Comments

5.2.1 General

The following comments on the subgrade are a summary of the soil and water conditions that will affect construction planning.

5.2.2 Area 1 (West) and Area 2 (West and Middle)

The predominant soil matrix for Areas 1 (West) and Area 2 (West and Middle) includes a relatively thin clay layer underlain by sand, gravel and boulders overlying bedrock and a relatively low water table.

5.2.3 Area 1 (East)

Area One (East) shows in increasingly thick clay layer overlying the sand, gravel and boulder layer over bedrock (as described in 5.2.2) with a water table near or at existing grade elevation.

5.2.4 Area 2 (East)

Area 2 (East) is mainly clay overlying limestone. There are some isolated areas of fine sand and gravel overlying the limestone. There should be a relatively low water table.

5.2.5 Area 3

Area 3 consists of a layer of fine silty sand overlying a silty clay, which in turn overlies glacial till and limestone bedrock. Near the western shores of the Kemptville Creek at the bridge crossing site, there is also an isolated organic deposit. There is a relatively high water table beneath the fill.

5.2.6 Area 4

Area 4 consists of interbedded layers of fine silty sand and silty clay, which in turn overlies glacial till and limestone bedrock. The water table is relatively high.

5.3 Preliminary Geotechnical Investigation Recommendations

5.3.1 General (All Areas)

It is understood that existing CR-43 will be widened from two (2) to four (4) lanes. Additional geotechnical investigations for the following issues are recommended:

1) Water levels vary considerably within the limits of this project and should be determined as part of the construction planning;
2) The bearing capacity and erosion characteristics of the roadway subgrade beneath the proposed widening areas for the entire length of the project;
3) The design of the light standard foundations in low lying areas, otherwise, the foundations should be designed as per Ontario Provincial Standards and Specifications;
4) The soil strata to one (1) metre below the pipe inverts for the proposed closed drainage system (curb, gutter and storm water sewers) will be required for the length of the project;
5) Any proposed storm water management facilities;
6) The presence of the high water table may create buoyancy (uplift) forces on planned manholes and catch basin structures if they are installed below the water table;
7) The foundations for the widened bridge structure of the Kemptville Creek Bridge will require boreholes to obtain an accurate soil stratum reading and design parameters;
8) The slope stability for widening of the east and west approach slopes to the Kemptville Creek Bridge. An investigation for slope is recommended;

5.3.2 Preliminary Comments – Pavement Structure (All Areas)

The existing pavement structure has a fair ride condition. Repair of the existing roadway distresses will involve localized patching and an overlay of sufficient thickness so that the pavement structure will support the predicted traffic loads. It is recommended that the widened areas be constructed prior to placement of the final overlay over the entire roadway.

5.3.3 Preliminary Comments – Road Subbase Platform (All Areas)

The loose soil (silty sand / sandy silt) usually found beneath the surface within most of the project limits may be a challenge to compact. The grain size distribution of selected soil samples from adjacent projects show either silty sand, sand, silty or silty clay native materials. The poor gradation curves suggest potential compaction difficulties. Refer to Appendix C for a map of the borehole locations, and Appendix D for borehole data and laboratory gradation curves from a proximate project. The use of a cement stabilized subgrade or importing Engineered Fill to construct the roadway sub-base in fill areas should be considered.

5.3.4 Preliminary Design – Kemptville Creek Bridge Foundation (Area 3)

The presence of organic material within the area of the proposed bridge crossing, deep foundations are suggested to support the bridge structure. Conventional piles are suggested, to be driven to the sound bedrock elevation.

5.4 Preliminary Geotechnical Investigation Recommendations

5.4.1 Excavation and Dewatering (All Areas)

All excavations should be completed and maintained in accordance with the Occupational Health and Safety Act (OHSA) requirements. The following recommendations for excavations should be considered to be a supplement to, not a replacement of, the OHSA requirements.

Groundwater seepage is expected at varying depths of excavation. Seepage conditions may vary (increase) during wet seasonal periods. It is anticipated that a significant amount of excavation will be performed beneath the existing water table. The native and fill materials should all be considered as OSHA Type 3 or 4 soils, depending on the location of the water table.

Excavation to competent subgrade soils is expected to be below the water table. Suitable temporary groundwater dewatering systems should be constructed as required. Proposed dewatering programs may require Permits to Take Water and water discharge control measures. The native soils below the water table would be considered as OSHA Type 4 soils.

5.4.2 Dewatering for Storm Water Drainage Pipe Installations (Areas 1 (East), 3 and 4)

Groundwater inflow within excavations for the storm water pipes is expected. It is anticipated that the proposed invert elevations of the pipes will be below the water table elevation. The volume of the inflow will be considerable and will require a substantial dewatering design program. Obtaining a Permit to Take Water should be anticipated. A well survey should be taken and the effects of short term dewatering on neighbouring structures should be examined. It is anticipated that soils will be a Type 3 or 4 soils, according to OSHA regulations.

5.4.3 Dewatering for Bridge and Bridge Approach Slope Widenings (Area 3)

Deep foundations using piles are expected for the widened bridge foundations. A cofferdam and temporary dewatering system should be expected for the widening of the bridge approach embankments.

5.4.4 Bedding for Service Trench Backfill (All Areas)

Bedding for service pipes should conform to type and dimension with local municipal requirements and Ontario Provincial Standard Specifications and Drawings (OPSS and OPSD). Dewatering systems will be required to ensure that the service pipe installations are completed in 'dry' conditions.

5.4.5 Roadway Backfill (All Areas)

Free-draining backfill should be obtained and placed beneath the roadway section as per OPSS and OPSD specifications. For backfill that would underlie paved areas, sidewalks or slabs-on-grade, each lift should be uniformly compacted to at least 98% Standard Proctor Maximum Dry Density (SPMDD). Backfill should not be placed in a frozen condition, nor placed on a frozen subgrade.

6.0 LIMITATIONS OF THE INVESTIGATION

This report is intended solely for the Client named. The material in it reflects our best judgment in light of the information available to **Inspec-Sol** at the time of preparation. No portion of this report may be used as a separate entity, it is written to be read in its entirety. Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties.

The recommendations made in this report are in accordance with our present understanding of the project. It is important to emphasize that a desktop review is, in fact, based on a review of the construction history of the area and comments are based on the results obtained from available data. It is, therefore, advisable to develop a scope of work (including field investigations) that will address any specific concerns within the project limits.

We trust that this report meets with your present requirements. Please do not hesitate to contact us should any questions arise.

INSPEC-SOL INC.

William S. Beveridge, B.Eng.
Project Manager

Joseph B. Bennett, P. Eng.
Vice-President

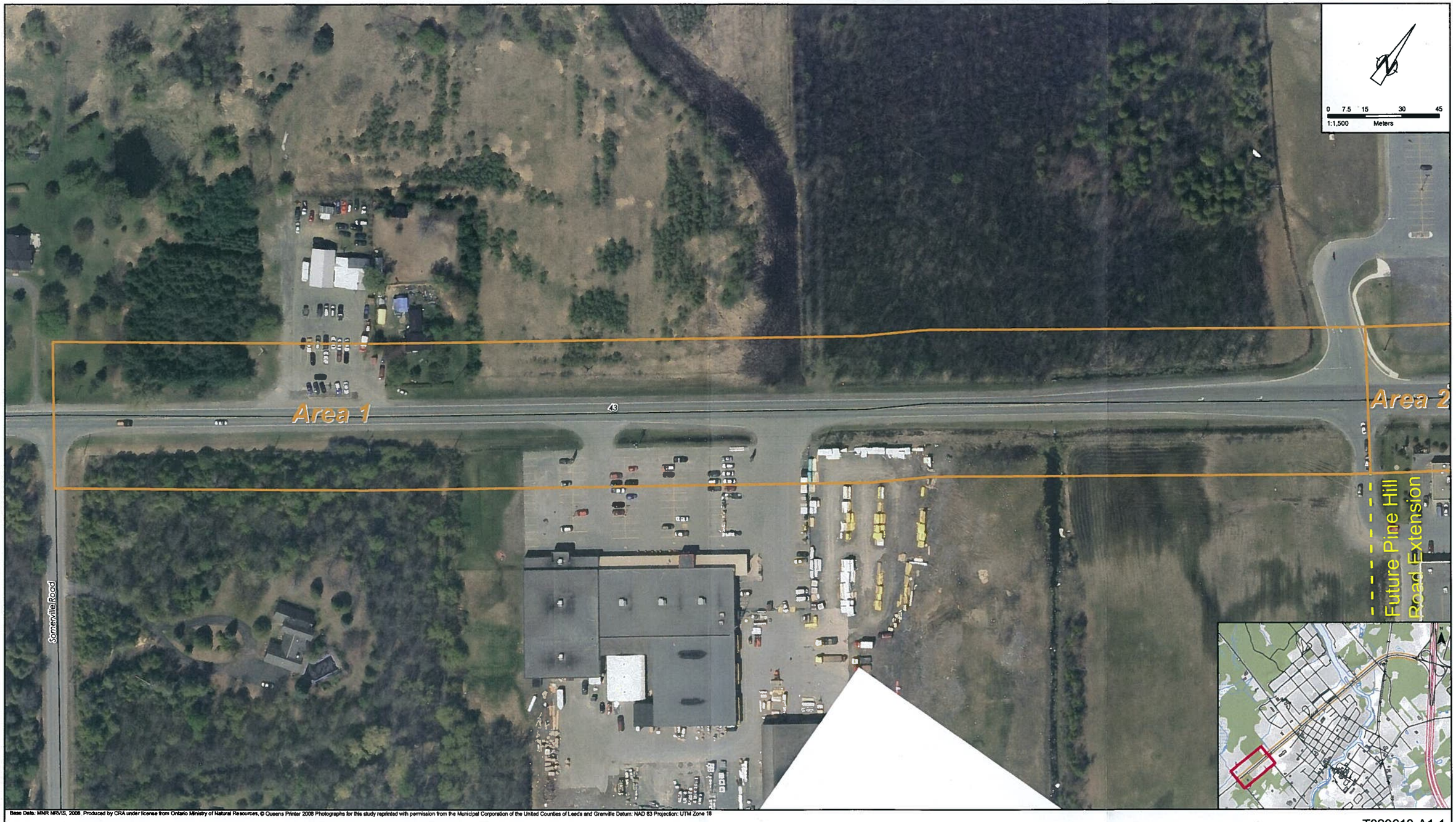
JBB/WSB/vl

Enclosures

Dist: Mr. Guy Laporte, Kingston Branch Manager AECOM (3)

DRAWINGS

AERIAL PHOTOGRAPHY – AREA 1
AERIAL PHOTOGRAPHY – AREA 2A
AERIAL PHOTOGRAPHY – AREA 2B
AERIAL PHOTOGRAPHY – AREA 2C
AERIAL PHOTOGRAPHY – AREA 3
AERIAL PHOTOGRAPHY – AREA 4A
AERIAL PHOTOGRAPHY – AREA 4B
PROVINCIAL BOREHOLE DATA – AREA 1
PROVINCIAL BOREHOLE DATA – AREA 2A
PROVINCIAL BOREHOLE DATA – AREA 2B
PROVINCIAL BOREHOLE DATA – AREA 2C
PROVINCIAL BOREHOLE DATA – AREA 3
PROVINCIAL BOREHOLE DATA – AREA 4A
PROVINCIAL BOREHOLE DATA – AREA 4B
ONTARIO SOILS
OGS QUARTERNARY GEOLOGY
BEDROCK
HISTORICAL GROUNDWATER DEPTHS



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Legend

- Study Area
- Freeway
- Expressway / Highway
- Arterial Street
- Recreation Pathway
- Railway

INSPEC·SOL ENGINEERING SOLUTIONS

T020613-A1-1

Project No.: T020613-A1
Class Environmental Assessment – Geotechnical Study
Aerial Photography of Kemptville Corridor
Leeds and Grenville County Road 43 from Somerville Road to Colonnade Road
Town of Kemptville, Ontario

T02060613-A1(REP001)GIS-WA001 May 11, 2009

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Legend

- Study Area
- Freeway
- Expressway / Highway
- Arterial Street
- Recreation Pathway
- Railway

INSPEC-SOL ENGINEERING SOLUTIONS

T020613-A1-2

Project No.: T020613-A1
Class Environmental Assessment – Geotechnical Study
Aerial Photography of Kemptville Corridor
Leeds and Grenville County Road 43 from Somerville Road to Colonnade Road
Town of Kemptville, Ontario

T02060613-A1(REP001)GIS-WA001 May 11, 2009

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Legend

- Study Area
- Freeway
- Expressway / Highway
- Arterial Street
- Recreation Pathway
- Railway

INSPEC·SOL ENGINEERING SOLUTIONS

T020613-A1-3

Project No.: T020613-A1
Class Environmental Assessment – Geotechnical Study
Aerial Photography of Kemptville Corridor
Leeds and Grenville County Road 43 from Somerville Road to Colonnade Road
Town of Kemptville, Ontario

T02060613-A1(REP001)GIS-WA001 May 11, 2009

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Legend

- Study Area
- Freeway
- Expressway / Highway
- Arterial Street
- Recreation Pathway
- Railway

INSPEC·SOL ENGINEERING SOLUTIONS

T020613-A1-4

Project No.: T020613-A1
Class Environmental Assessment – Geotechnical Study
Aerial Photography of Kemptville Corridor
Leeds and Grenville County Road 43 from Somerville Road to Colonnade Road
Town of Kemptville, Ontario

T02060613-A1(REP001)GIS-WA001 May 11, 2009

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Legend

- Study Area
- Freeway
- Expressway / Highway
- Arterial Street
- Recreation Pathway
- Railway

INSPEC·SOL ENGINEERING SOLUTIONS

T020613-A1-5

Project No.: T020613-A1
Class Environmental Assessment – Geotechnical Study
Aerial Photography of Kemptville Corridor
Leeds and Grenville County Road 43 from Somerville Road to Colonnade Road
Town of Kemptville, Ontario

T02060613-A1(REP001)GIS-WA001 May 11, 2009

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Legend

- Study Area
- Freeway
- Expressway / Highway
- Arterial Street
- Recreation Pathway
- Railway

INSPEC•SOL ENGINEERING SOLUTIONS

T020613-A1-6

Project No.: T020613-A1
Class Environmental Assessment – Geotechnical Study
Aerial Photography of Kemptville Corridor
Leeds and Grenville County Road 43 from Somerville Road to Colonnade Road
Town of Kemptville, Ontario

T02060613-A1(REP001)GIS-WA001 May 8, 2009

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Legend

- Study Area
- Freeway
- Expressway / Highway
- Arterial Street
- Recreation Pathway
- Railway

INSPEC•SOL ENGINEERING SOLUTIONS

T020613-A1-7

Project No.: T020613-A1
Class Environmental Assessment – Geotechnical Study
Aerial Photography of Kemptville Corridor
Leeds and Grenville County Road 43 from Somerville Road to Colonnade Road
Town of Kemptville, Ontario

T02060613-A1(REP001)GIS-WA001 May 8, 2009

2403246 *(126026)*
0 - 7.32 : Gravel Boulders
7.32 - 31.09 : Limestone

2402003 *(124820)*
0 - 6.4 : Boulders Gravel
6.4 - 7.01 : Medium Sand Gravel
7.01 - 57.91 : Limestone

2401337 *(124157)*
0 - 6.4 : Clay
6.4 - 6.71 : Gravel

2402576 *(125386)*
0 - 8.53 : Gravel Boulders
8.53 - 31.09 : Limestone

2402146 *(124960)*
0 - 1.22 : Clay
1.22 - 12.19 : Stones Gravel
12.19 - 14.33 : Limestone

2404476 *(126910)*
0 - 7.32 : Gravel Boulders
7.32 - 25.6 : Limestone

0 7.5 15 30 45
1:1,500 Meters

Area 1

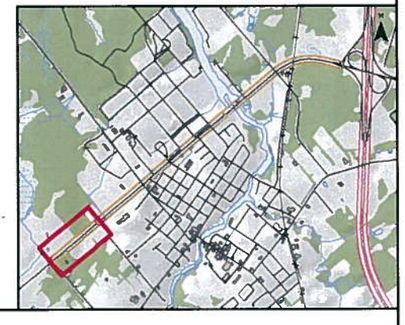
Area 2

43

95

Somerville Road

Future Pine Hill Road Extension



Base Data: MNR NRVIS, 2008. Produced by CRA under license from Ontario Ministry of Natural Resources, © Queens Printer 2008 Flow Direction: National Hydro Network , 2007 Boreholes: LIO Provincial Borehole Database, 2007 Datum: NAD 83 Projection: UTM Zone 18

Legend

- Study Area
- Building Point

Borehole Location Accuracy

- Within 5 metres
- Within 10 metres
- Within 20 metres
- Within 50 metres
- Within 100 metres
- Beyond 200 metres
- Needs Investigation

- Federal 3D Densification Network
- Canadian Base Network
- Primary Vertical Benchmarks
- Surface Water Flow Direction
- Railway
- Freeway
- Expressway / Highway
- Arterial Street
- Recreation Pathway
- Elevation (masl)
- Watercourse
- Water Area, Permanent
- Water Area, Seasonally Inundated
- Wetland Area, Permanent
- Wetland Area, Seasonally Inundated
- Building Footprint
- Wooded Area

INSPEC·SOL
ENGINEERING SOLUTIONS

T020613-A1-8

Project No.: T020613-A1
Class Environmental Assessment – Geotechnical Study
Water Features, Geodetic Markers and Borehole Locations of Kemptville Corridor
Leeds and Grenville County Road 43 from Somerville Road to Colonnade Road
Town of Kemptville, Ontario

T02060613-A1(REP001)GIS-WA005 May 11, 2009

2402188 (*125002*)
0 - 0.91 : Clay
0.91 - 3.66 : Stones Gravel
3.66 - 18.9 : Limestone

2410358 (*553582*)
0 - 17.98 : Previously Dug or Bored

2402149 (*124963*)
0 - 3.66 : Clay
3.66 - 5.49 : Stones Gravel
5.49 - 8.84 : Shale
8.84 - 17.68 : Limestone

(*611254*)
0 - 3.05 : Sand
3.05 - 7.32 : Clay
7.32 - : Bedrock

2401340 (*124160*)
0 - 5.18 : Clay Boulders
5.18 - 7.92 : Sandstone
7.92 - 15.24 : Limestone

2408224 (*130634*)
0 - 6.4 : Gravel Clay Stones
6.4 - 19.2 : Limestone

2410356 (*553580*)
0 - 17.68 : Previously Dug or Bored

2401343 (*124163*)
0 - 1.52 : Previously Dug or Bored
1.52 - 5.49 : Clay
5.49 - 12.8 : Limestone

2402462 (*125273*)
0 - 3.05 : Hardpan
3.05 - 5.49 : Rock Sand
5.49 - 10.67 : Limestone

2404447 (*126881*)
0 - 7.01 : Clay Stones
7.01 - 13.11 : Limestone

2401345 (*124165*)
0 - 8.53 : Clay
8.53 - 14.63 : Limestone

2410354 (*553578*)
0 - 1.83 : Fill Sandy Silt
1.83 - 4.88 : Gravel Till

2407367 (*129779*)
0 - 6.1 : Gravel Sand
6.1 - 30.78 : Limestone

Area 1

Area 2

Future Pine Hill Road Extension

43

44

95

95

Rideau Street

Elvira Street

0 7.5 15 30 45
1:1,500 Meters

Legend

- Study Area
- Building Point

Borehole Location Accuracy

- Within 5 metres
- Within 10 metres
- Within 20 metres
- Within 50 metres
- Within 100 metres
- Beyond 200 metres
- Needs Investigation

- Federal 3D Densification Network
- Canadian Base Network
- Primary Vertical Benchmarks
- Surface Water Flow Direction
- Railway
- Freeway
- Expressway / Highway
- Arterial Street
- Recreation Pathway
- Elevation (masl)
- Watercourse
- Water Area, Permanent
- Water Area, Seasonally Inundated
- Wetland Area, Permanent
- Wetland Area, Seasonally Inundated
- Building Footprint
- Wooded Area

INSPEC•SOL ENGINEERING SOLUTIONS

T020613-A1-9

Project No.: T020613-A1
Class Environmental Assessment – Geotechnical Study
Water Features, Geodetic Markers and Borehole Locations of Kemptville Corridor
Leeds and Grenville County Road 43 from Somerville Road to Colonnade Road
Town of Kemptville, Ontario

T02060613-A1(REP001)GIS-WA005 May 11, 2009

2410355 (*553579*)
0 - 11.28 : Previously Dug or Bored

(*611255*)
0 - 6.1 : Clay
6.1 - 14.63 : Limestone

2402175 (*124989*)
0 - 6.1 : Clay Boulders
6.1 - 14.63 : Limestone

(*611257*)
0 - 6.1 : Clay
6.1 - : Bedrock

345 (*124165*)
53 : Clay
- 14.63 : Limestone

2410359 (*553583*)
0 - 2.44 : Previously Dug or Bored

2401565 (*124385*)
0 - 9.14 : Medium Sand Boulders
9.14 - 18.29 : Limestone

2401344 (*124164*)
0 - 6.1 : Clay
6.1 - 12.19 : Limestone

(*611261*)
0 - 6.1 : Clay
6.1 - 12.19 : Limestone

0 7.5 15 30 45
1:1,500 Meters

Area 2

2404455 (*126889*)
0 - 1.52 : Sand Gravel Stones
1.52 - 7.01 : Gravel Boulders Packed
7.01 - 11.58 : Limestone Medium-grained

2410421 (*553645*)
0 - 0.61 : Sand
0.61 - 13.72 : Clay Stones
13.72 - 24.99 : Limestone

2402388 (*125201*)
0 - 0.91 : Gravel Fill
0.91 - 8.53 : Fine Sand Boulders
8.53 - 14.33 : Limestone

Rideau Street
Barnes Street
Elvira Street
Lydia North Street
James Street
Georgiana Street
Sanders Street
Kemahan Street
44
43
90
95

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Legend

- Study Area
- Building Point

Borehole Location Accuracy
- Within 5 metres
- Within 10 metres
- Within 20 metres
- Within 50 metres
- Within 100 metres
- Beyond 200 metres
- Needs Investigation

- Federal 3D Densification Network
- Canadian Base Network
- Primary Vertical Benchmarks
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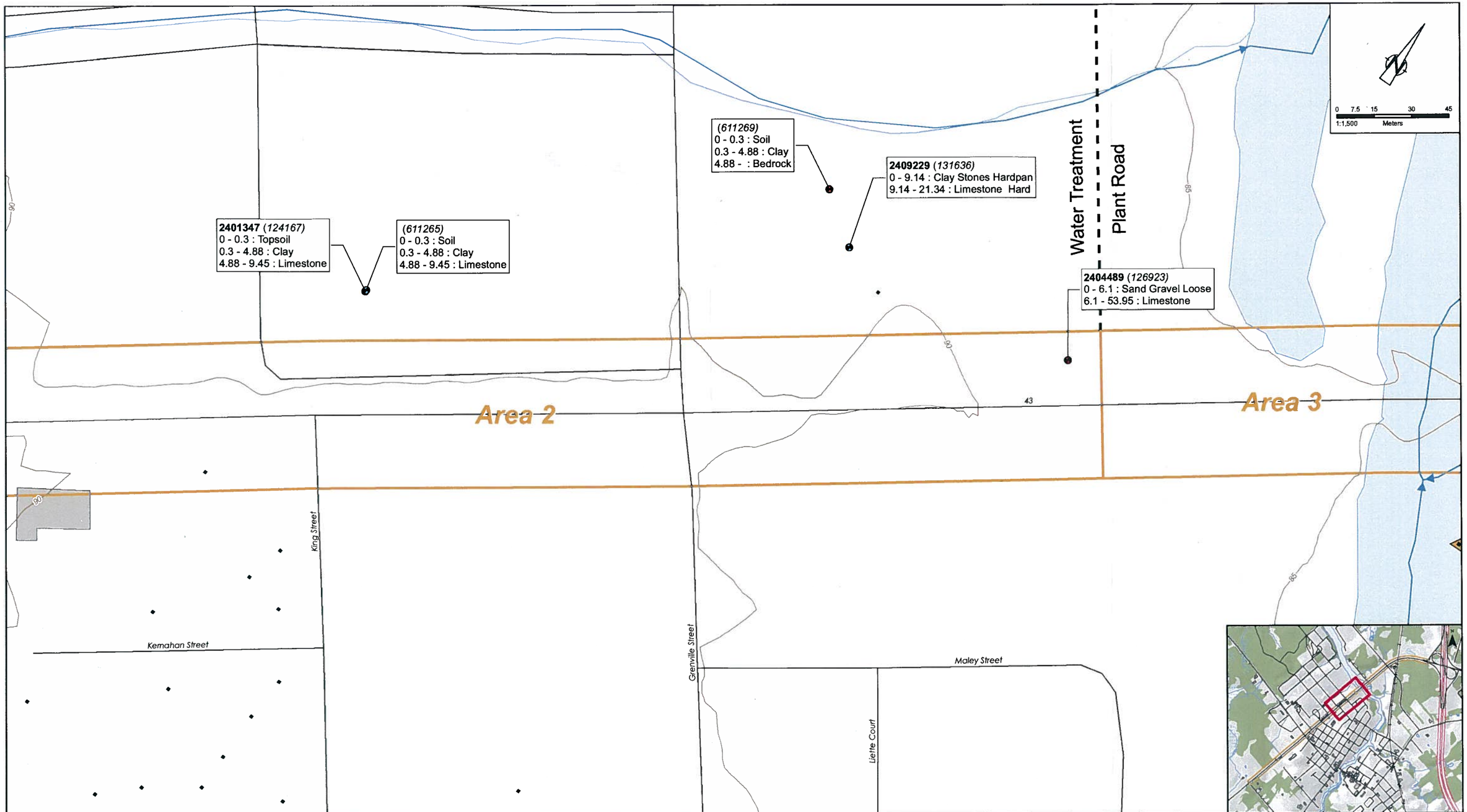
- Arterial Street
- Recreation Pathway
- Elevation (masl)
- Watercourse
- Water Area, Permanent
- Water Area, Seasonally Inundated
- Wetland Area, Permanent
- Wetland Area, Seasonally Inundated
- Building Footprint
- Wooded Area

INSPEC·SOL ENGINEERING SOLUTIONS

T020613-A1-10

Project No.: T020613-A1
Class Environmental Assessment – Geotechnical Study
Water Features, Geodetic Markers and Borehole Locations of Kemptville Corridor
Leeds and Grenville County Road 43 from Somerville Road to Colonnade Road
Town of Kemptville, Ontario

T02060613-A1(REP001)GIS-WA005 May 11, 2009



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Legend

- Study Area
- Building Point

Borehole Location Accuracy

- Within 5 metres
- Within 10 metres
- Within 20 metres
- Within 50 metres
- Within 100 metres
- Beyond 200 metres
- Needs Investigation

- Federal 3D Densification Network
- Canadian Base Network
- Primary Vertical Benchmarks
- Surface Water Flow Direction
- Railway
- Freeway
- Expressway / Highway
- Arterial Street
- Recreation Pathway
- Elevation (masl)
- Watercourse
- Water Area, Permanent
- Water Area, Seasonally Inundated
- Wetland Area, Permanent
- Wetland Area, Seasonally Inundated
- Building Footprint
- Wooded Area

iNSPEC•SOL ENGINEERING SOLUTIONS

T020613-A1-11

Project No.: T020613-A1
Class Environmental Assessment – Geotechnical Study
Water Features, Geodetic Markers and Borehole Locations of Kemptville Corridor
Leeds and Grenville County Road 43 from Somerville Road to Colonnade Road
Town of Kemptville, Ontario

T02060613-A1(REP001)GIS-WA005 May 11, 2009

2403262 (*126040*)
0 - 0.91 : Clay
0.91 - 2.74 : Sand
2.74 - 7.62 : Clay
7.62 - 10.06 : Stones Gravel
10.06 - 25.91 : Limestone Hard

2410434 (*553658*)
0 - 2.44 : Previously Dug or Bored

2410435 (*553659*)
0 - 3.05 : Clay Soft Packed
3.05 - 9.75 : Clay Packed
9.75 - 43.59 : Limestone Hard

2403374 (*126147*)
0 - 7.32 : Clay
7.32 - 36.58 : Limestone

Area 3

Area 4

Riverview Lane

0 7.5 15 30 45
1:1,500 Meters

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Legend

Study Area
Building Point

Borehole Location Accuracy
Within 5 metres
Within 10 metres
Within 20 metres
Within 50 metres
Within 100 metres
Beyond 200 metres
Needs Investigation

Federal 3D Densification Network
Canadian Base Network
Primary Vertical Benchmarks
Surface Water Flow Direction
Railway

Freeway
Expressway / Highway
Arterial Street
Recreation Pathway
Elevation (masl)
Watercourse

Water Area, Permanent
Water Area, Seasonally Inundated
Wetland Area, Permanent
Wetland Area, Seasonally Inundated
Building Footprint
Wooded Area

iNSPEC·SOL
ENGINEERING SOLUTIONS

T020613-A1-12

Project No.: T020613-A1
Class Environmental Assessment – Geotechnical Study
Water Features, Geodetic Markers and Borehole Locations of Kemptville Corridor
Leeds and Grenville County Road 43 from Somerville Road to Colonnade Road
Town of Kemptville, Ontario

T02060613-A1(REP001)GIS-WA005 May 11, 2009

(614073)
0 - 6.1 : Sand
6.1 - 10.06 : Clay
10.06 - 12.19 : Stones
12.19 - 21.34 : Limestone

2402147 *(124961)*
0 - 6.1 : Fine Sand
6.1 - 10.06 : Clay
10.06 - 12.19 : Stones Gravel
12.19 - 21.34 : Limestone

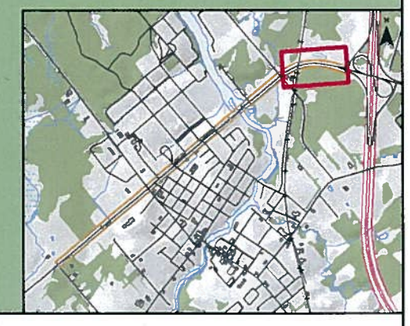
Area 4

0 7.5 15 30 45
1:1,500 Meters

43

3

Wellington Road



Legend

- Study Area
- Building Point

Borehole Location Accuracy

- Within 5 metres
- Within 10 metres
- Within 20 metres
- Within 50 metres
- Within 100 metres
- Beyond 200 metres
- Needs Investigation

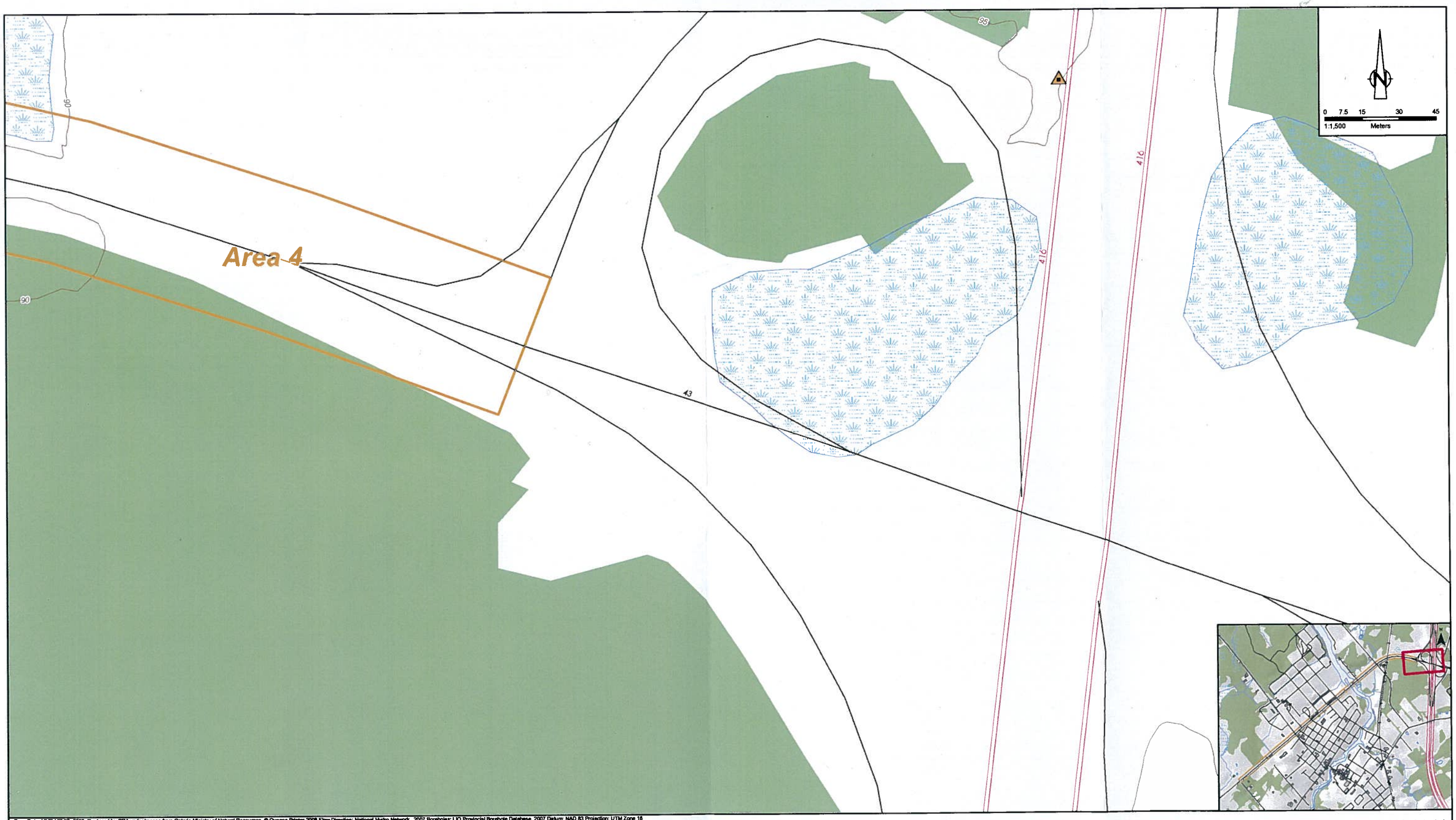
- Federal 3D Densification Network
- Canadian Base Network
- Primary Vertical Benchmarks
- Surface Water Flow Direction
- Railway
- Freeway
- Expressway / Highway
- Arterial Street
- Recreation Pathway
- Elevation (masl)
- Watercourse
- Water Area, Permanent
- Water Area, Seasonally Inundated
- Wetland Area, Permanent
- Wetland Area, Seasonally Inundated
- Building Footprint
- Wooded Area

INSPEC·SOL ENGINEERING SOLUTIONS

T020613-A1-13

Project No.: T020613-A1
Class Environmental Assessment – Geotechnical Study
Water Features, Geodetic Markers and Borehole Locations of Kemptville Corridor
Leeds and Grenville County Road 43 from Somerville Road to Colonnade Road
Town of Kemptville, Ontario

T02060613-A1(REP001)GIS-WA005 May 11, 2009



Base Data: MNR NRVIS, 2008. Produced by CRA under license from Ontario Ministry of Natural Resources, © Queens Printer 2008 Flow Direction: National Hydro Network , 2007 Boreholes: LIO Provincial Borehole Database, 2007 Datum: NAD 83 Projection: UTM Zone 18

Legend

- Study Area
- Building Point

Borehole Location Accuracy

- Within 5 metres
- Within 10 metres
- Within 20 metres
- Within 50 metres
- Within 100 metres
- Beyond 200 metres
- Needs Investigation

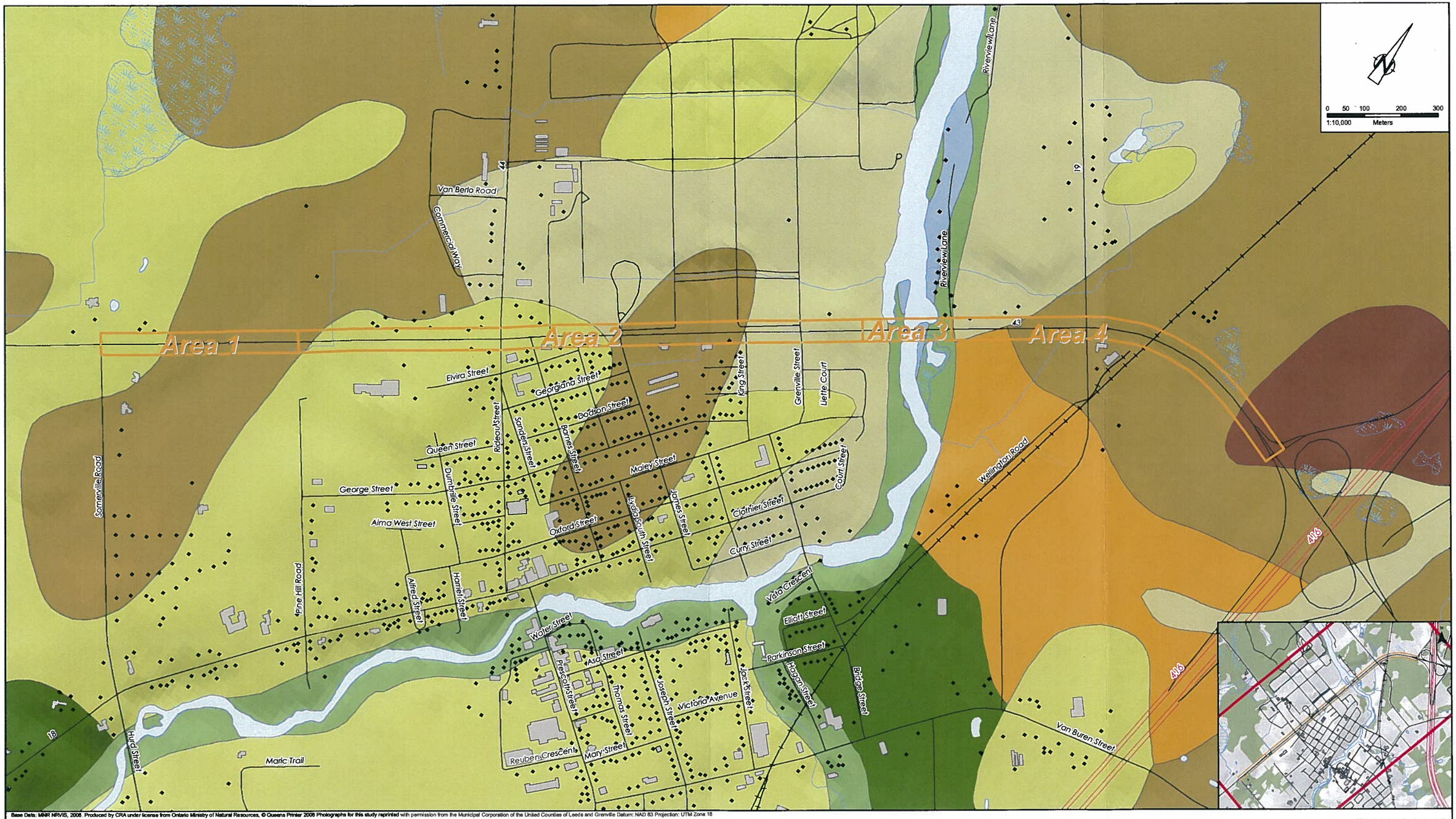
- Federal 3D Densification Network
- Canadian Base Network
- Primary Vertical Benchmarks
- Surface Water Flow Direction
- Railway
- Freeway
- Expressway / Highway
- Arterial Street
- Recreation Pathway
- Elevation (masl)
- Watercourse
- Water Area, Permanent
- Water Area, Seasonally Inundated
- Wetland Area, Permanent
- Wetland Area, Seasonally Inundated
- Building Footprint
- Wooded Area

INSPEC-SOL ENGINEERING SOLUTIONS

T02060613-A1(REP001)GIS-WA005 May 11, 2009

T020613-A1-14

Project No.: T020613-A1
Class Environmental Assessment – Geotechnical Study
Water Features, Geodetic Markers and Borehole Locations of Kemptville Corridor
Leeds and Grenville County Road 43 from Somerville Road to Colonnade Road
Town of Kemptville, Ontario



Base Data: MNR NRVIS, 2008. Produced by CRA under license from Ontario Ministry of Natural Resources, © Queens Printer 2008 Photographs for this study reprinted with permission from the Municipal Corporation of the United Counties of Leeds and Grenville Datum: NAD 83 Projection: UTM Zone 18

Legend

- Study Area
- Building Point
- Railway
- Freeway
- Expressway / Highway
- Arterial Street
- Recreation Pathway
- Watercourse
- Water Area, Permanent
- Water Area, Seasonally Inundated
- Wetland Area, Permanent
- Wetland Area, Seasonally Inundated
- Building Footprint

Soil Type

- Bottom Land
- Grenville
- Manotick
- Organics - Muck
- Rubicon
- St. Samuel
- Uplands
- Water

iNSPEC·SOL ENGINEERING SOLUTIONS

T020613-A1-15

Project No.: T020613-A1
Class Environmental Assessment – Geotechnical Study
Ontario Soils of Kemptville Corridor
Leeds and Grenville County Road 43 from Somerville Road to Colonnade Road
Town of Kemptville, Ontario

T020613-A1(REP001)GIS-WA002 May 12, 2009

Base Data: MNR NRVIS, 2008. Produced by CRA under license from Ontario Ministry of Natural Resources, © Queens Printer 2008 Ontario Geological Survey 2003. Surficial geology of Southern Ontario: Ontario Geological Survey, Miscellaneous Release–Data 128. Produced by CRA under license from Ontario Ministry of Northern Development and Mines, © Queens Printer 2000. Datum: NAD 83 Projection: UTM Zone 18

Legend

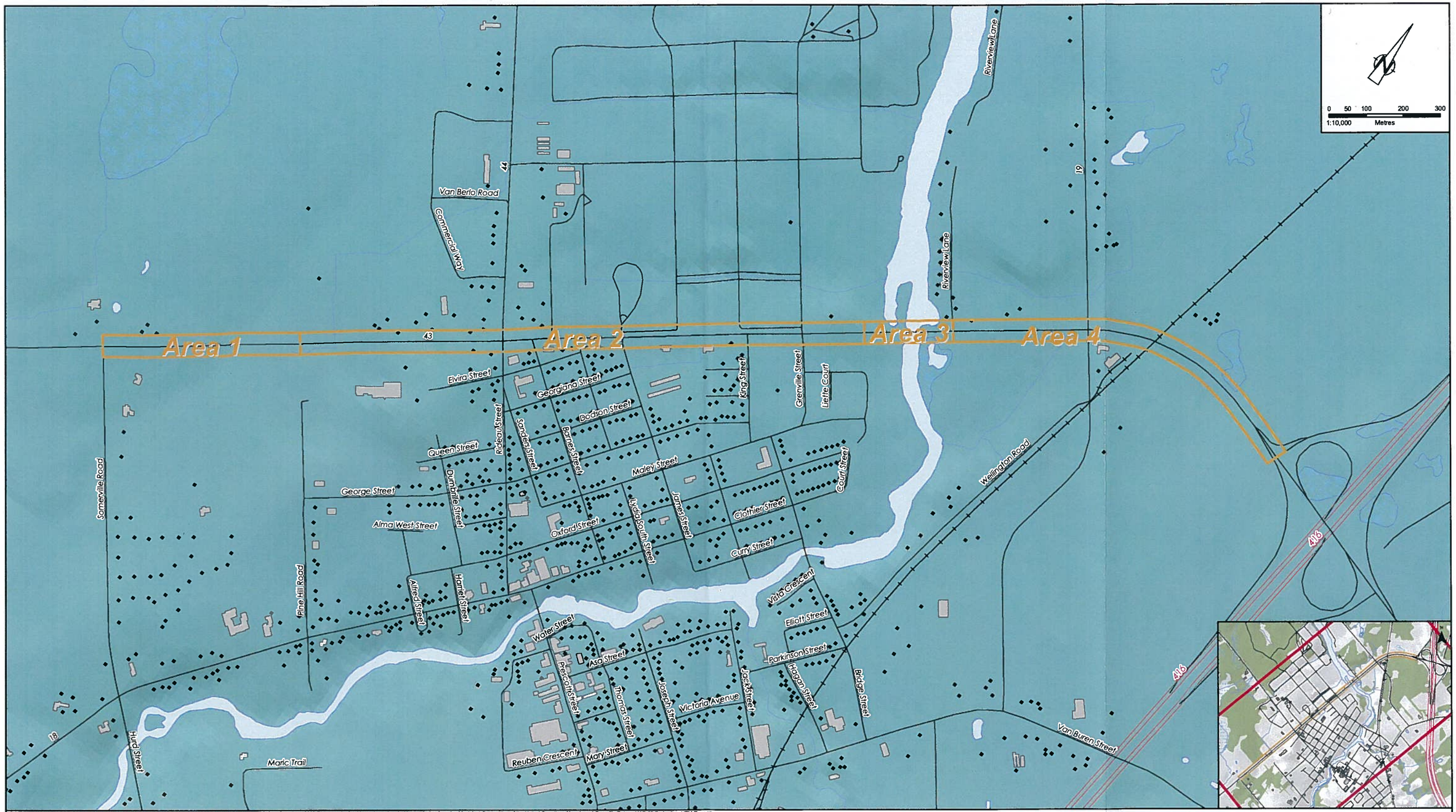
- Study Area
- Building Point
- Railway
- Freeway
- Expressway / Highway
- Arterial Street
- Recreation Pathway
- Watercourse
- Water Area, Permanent
- Water Area, Seasonally Inundated
- Wetland Area, Permanent
- Wetland Area, Seasonally Inundated
- Building Footprint
- 5b: Stone-poor, carbonate-derived silty to sandy till
- 10: Fine-textured glaciomarine deposits
- 11: Coarse-textured glaciomarine deposits
- 20: Organic deposits

INSPEC·SOL ENGINEERING SOLUTIONS

T020613-A1-16

Project No.: T020613-A1
Class Environmental Assessment – Geotechnical Study
OGS Quaternary Geology of Kemptville Corridor
Leeds and Grenville County Road 43 from Somerville Road to Colonnade Road
Town of Kemptville, Ontario

T02060613-A1(REP001)GIS-WA003 May 11, 2009



Base Data: MNR NRVIS, 2008. Produced by CRA under license from Ontario Ministry of Natural Resources, © Queens Printer 2008 Photographs for this study reprinted with permission from the Municipal Corporation of the United Counties of Leeds and Grenville Datum: NAD 83 Projection: UTM Zone 18

Legend

- Study Area
- Building Point
- Railway
- Freeway
- Expressway / Highway
- Arterial Street
- Recreation Pathway
- Watercourse
- Water Area, Permanent
- Water Area, Seasonally Inundated
- Wetland Area, Permanent
- Wetland Area, Seasonally Inundated
- Building Footprint

Bedrock

- 53 Dolostone, sandstone: Beekmantown Gp.

INSPEC-SOL ENGINEERING SOLUTIONS

T020613-A1-17

Project No.: T020613-A1
Class Environmental Assessment – Geotechnical Study
OGS Bedrock of Kemptville Corridor
Leeds and Grenville County Road 43 from Somerville Road to Colonnade Road
Town of Kemptville, Ontario

T02060613-A1(REP001)GIS-WA004 May 11, 2009

Area 1 | Area 2 | Area 3 | Area 4

0 50 100 200 300
1:10,000 Meters

Somerville Road
Pine Hill Road
Hutt Street
Maric Trail
George Street
Alma West Street
Van Berlo Road
Commercial Way
Alfred Street
Harriet Street
Dumbrille Street
Queen Street
Rideau Street
Elvira Street
Georgiana Street
Sanders Street
Barnes Street
Dodson Street
Maley Street
Oxford Street
Lydia South Street
James Street
King Street
Grenville Street
Liette Court
Court Street
Clothier Street
Curry Street
Water Street
Asa Street
Prescott Street
Thomas Street
Joseph Street
Victoria Avenue
Reuben Crescent
Mary Street
Jack Street
Vista Crescent
Elliott Street
Parkinson Street
Hagan Street
Bridge Street
Riverview Lane
Riverview Lane
Wellington Road
Van Buren Street
416
416

Base Data: MNR NRVIS, 2008. Produced by CRA under license from Ontario Ministry of Natural Resources, © Queens Printer 2008 Datum: NAD 83 Projection: UTM Zone 18

Legend

- Study Area
- Approximate Groundwater Depth (m)
- Freeway
- Expressway / Highway
- Arterial Street
- Recreation Pathway
- Railway
- Watercourse
- Water Area, Permanent
- Water Area, Seasonally Inundated
- Wetland Area, Permanent
- Wetland Area, Seasonally Inundated
- Building Footprint

INSPEC•SOL ENGINEERING SOLUTIONS

T020613-A1-18

Project No.: T020613-A1
Class Environmental Assessment – Geotechnical Study
Approximate Historical Groundwater Depth of Kemptville Corridor
Leeds and Grenville County Road 43 from Somerville Road to Colonnade Road
Town of Kemptville, Ontario

T02060613-A1(REP001)GIS-WA006 May 11, 2009

ENCLOSURES

SITE VISIT PHOTOLOG (ENCLOSURES 1 TO 17, INCLUSIVE)

KEMPTVILLE CORRIDOR
DESKTOP STUDY GEOTECHNICAL REVIEW
LEEDS AND GRENVILLE COUNTY ROAD 43
KEMPTVILLE, ONTARIO

West of Highway 416

West of Colonnade Road

KEMPTVILLE CORRIDOR
DESKTOP STUDY GEOTECHNICAL REVIEW
LEEDS AND GRENVILLE COUNTY ROAD 43
KEMPTVILLE, ONTARIO

West of Wellington Road

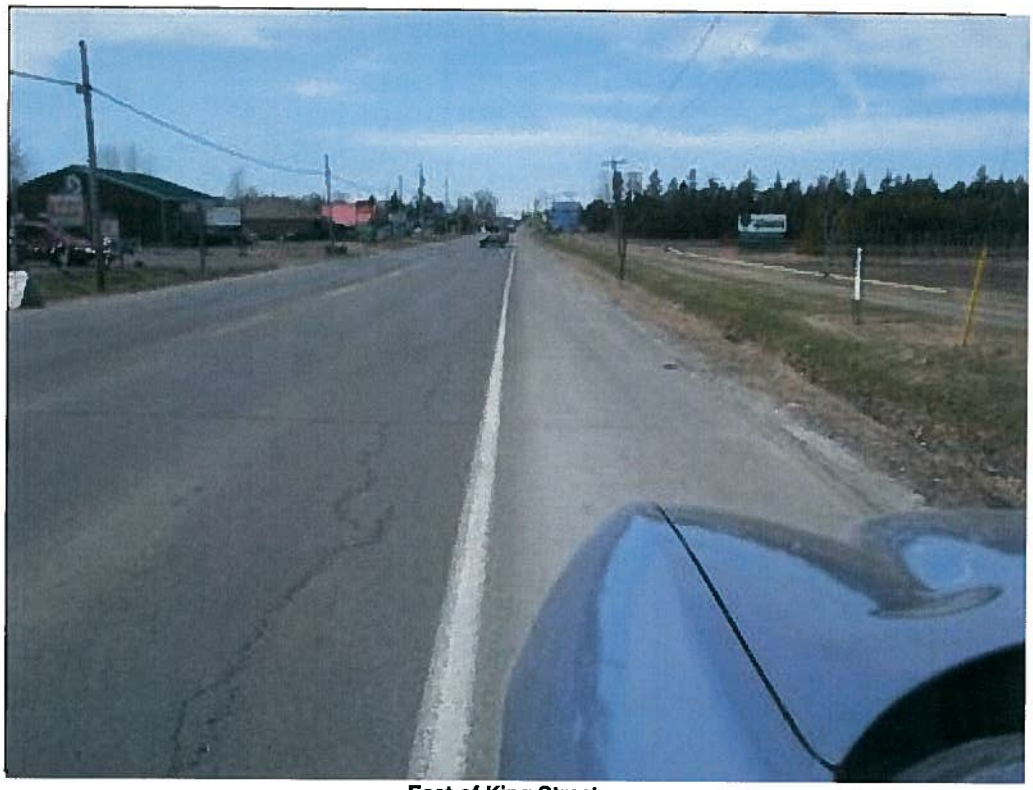
East of Rideau River (South Branch)

KEMPTVILLE CORRIDOR
DESKTOP STUDY GEOTECHNICAL REVIEW
LEEDS AND GRENVILLE COUNTY ROAD 43
KEMPTVILLE, ONTARIO

West of Rideau River (South Branch)

East of Grenville Street

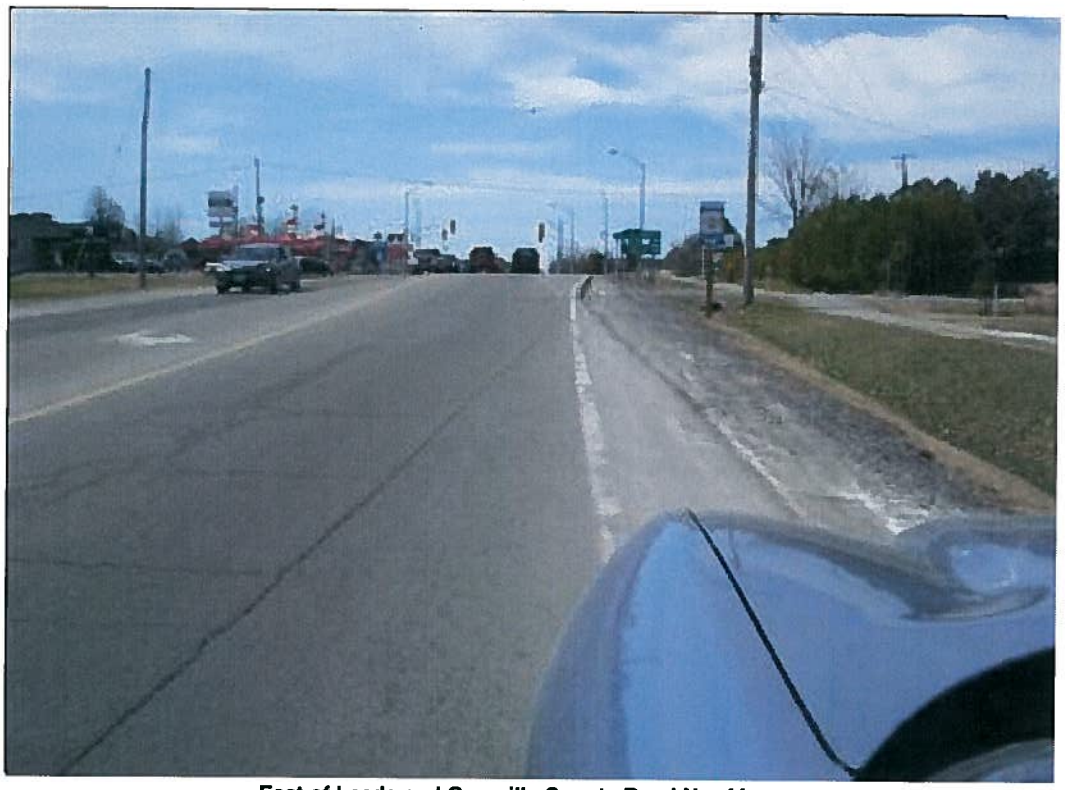
KEMPTVILLE CORRIDOR
DESKTOP STUDY GEOTECHNICAL REVIEW
LEEDS AND GRENVILLE COUNTY ROAD 43
KEMPTVILLE, ONTARIO



East of King Street

East of James Street

KEMPTVILLE CORRIDOR
DESKTOP STUDY GEOTECHNICAL REVIEW
LEEDS AND GRENVILLE COUNTY ROAD 43
KEMPTVILLE, ONTARIO



East of Leeds and Grenville County Road No. 44

West of Leeds and Grenville County Road No. 44

KEMPTVILLE CORRIDOR
DESKTOP STUDY GEOTECHNICAL REVIEW
LEEDS AND GRENVILLE COUNTY ROAD 43
KEMPTVILLE, ONTARIO

East of Kemptville Mall

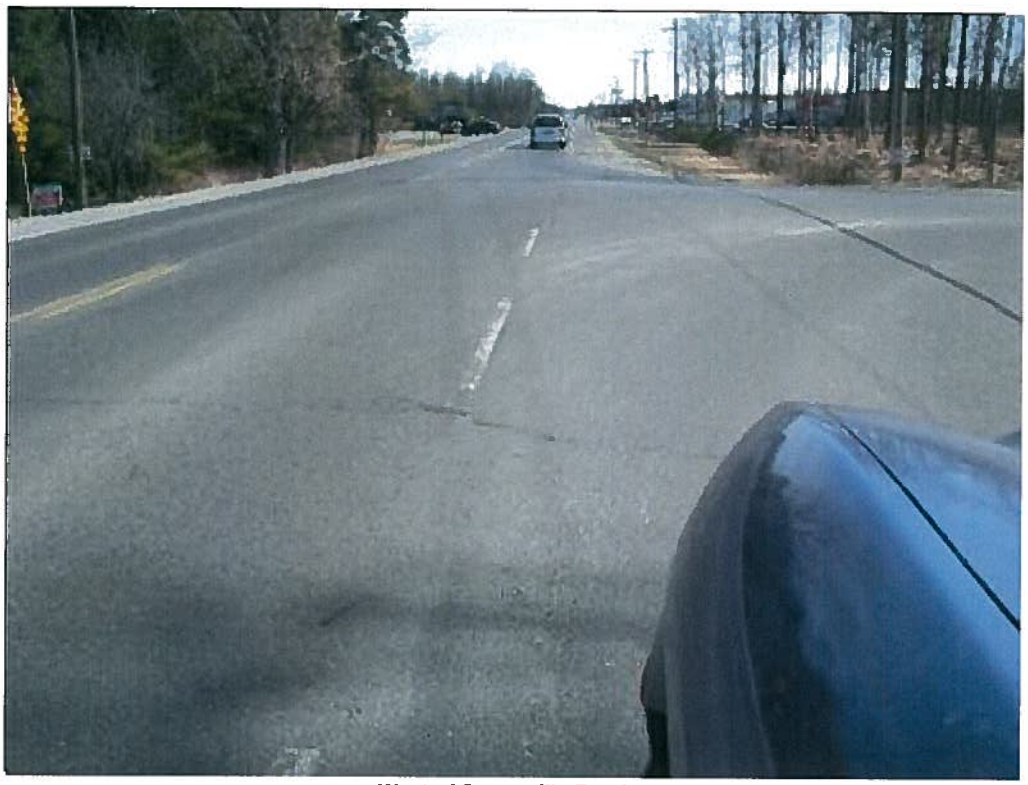
East of Piney Hill Road

KEMPTVILLE CORRIDOR
DESKTOP STUDY GEOTECHNICAL REVIEW
LEEDS AND GRENVILLE COUNTY ROAD 43
KEMPTVILLE, ONTARIO

West of Piney Hill Road

East of Somerville Road

KEMPTVILLE CORRIDOR
DESKTOP STUDY GEOTECHNICAL REVIEW
LEEDS AND GRENVILLE COUNTY ROAD 43
KEMPTVILLE, ONTARIO



West of Somerville Road

East of Somerville Road

KEMPTVILLE CORRIDOR
DESKTOP STUDY GEOTECHNICAL REVIEW
LEEDS AND GRENVILLE COUNTY ROAD 43
KEMPTVILLE, ONTARIO

West of Piney Hill Road

Wetland West of Piney Hill Road

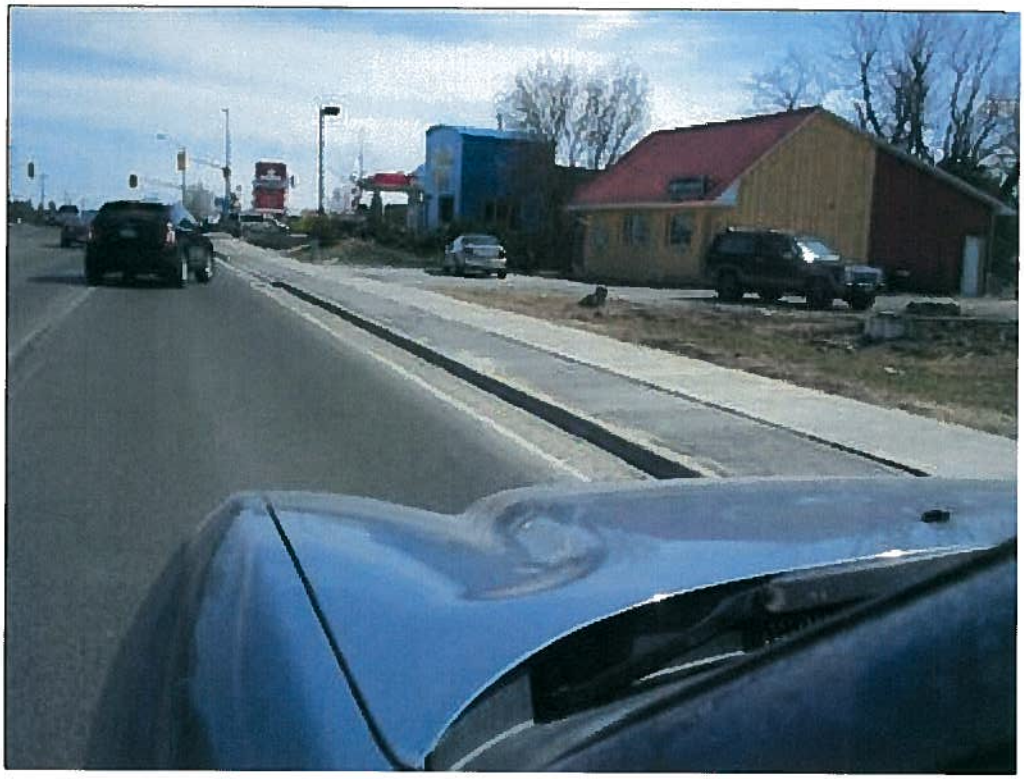
KEMPTVILLE CORRIDOR
DESKTOP STUDY GEOTECHNICAL REVIEW
LEEDS AND GRENVILLE COUNTY ROAD 43
KEMPTVILLE, ONTARIO

East of Piney Hill Road

West of Main Entrance Kemptville Mall

KEMPTVILLE CORRIDOR
DESKTOP STUDY GEOTECHNICAL REVIEW
LEEDS AND GRENVILLE COUNTY ROAD 43
KEMPTVILLE, ONTARIO

East of Cornerstone Mall



West of Leeds and Grenville County Rd. No. 44

KEMPTVILLE CORRIDOR
DESKTOP STUDY GEOTECHNICAL REVIEW
LEEDS AND GRENVILLE COUNTY ROAD 43
KEMPTVILLE, ONTARIO

East of Leeds and Grenville County Rd. No 44

West of Community Square Mall Entrance (North Side)

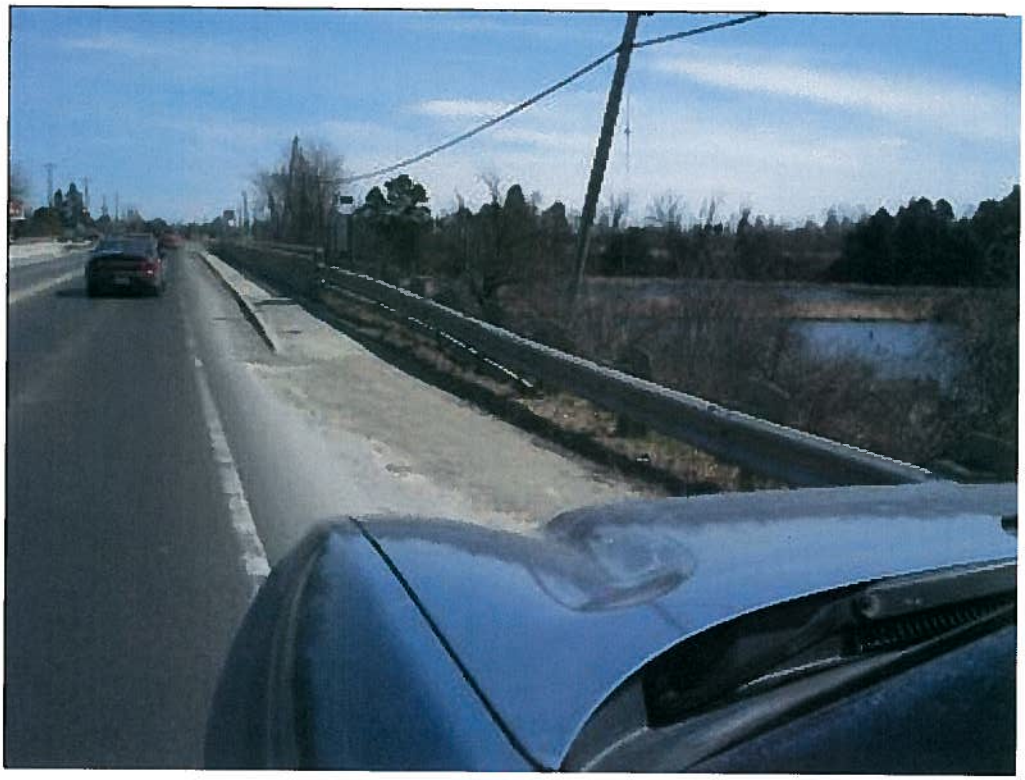
KEMPTVILLE CORRIDOR
DESKTOP STUDY GEOTECHNICAL REVIEW
LEEDS AND GRENVILLE COUNTY ROAD 43
KEMPTVILLE, ONTARIO

West of James Street

West of King Street

KEMPTVILLE CORRIDOR
DESKTOP STUDY GEOTECHNICAL REVIEW
LEEDS AND GRENVILLE COUNTY ROAD 43
KEMPTVILLE, ONTARIO

East of Grenville Street



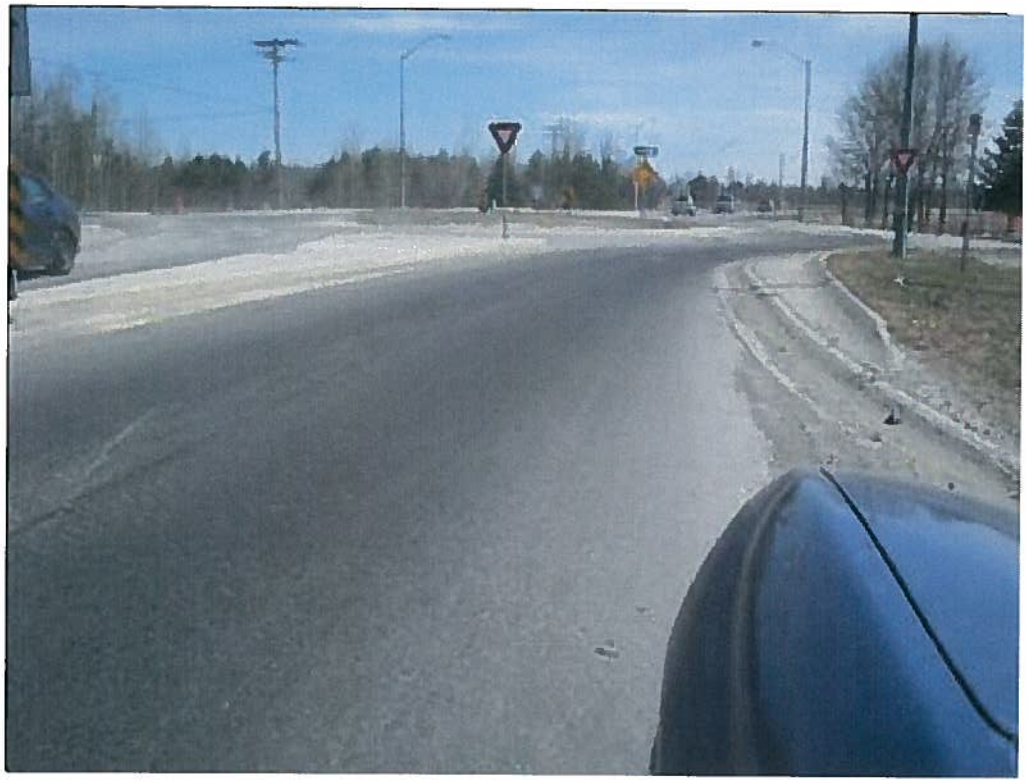
West Approach Rideau River (South Branch)

KEMPTVILLE CORRIDOR
DESKTOP STUDY GEOTECHNICAL REVIEW
LEEDS AND GRENVILLE COUNTY ROAD 43
KEMPTVILLE, ONTARIO

East Approach Rideau River (South Branch)

West of Wellington Street

KEMPTVILLE CORRIDOR
DESKTOP STUDY GEOTECHNICAL REVIEW
LEEDS AND GRENVILLE COUNTY ROAD 43
KEMPTVILLE, ONTARIO



Wellington Street Roundabout

Colonnade Road Roundabout

KEMPTVILLE CORRIDOR
DESKTOP STUDY GEOTECHNICAL REVIEW
LEEDS AND GRENVILLE COUNTY ROAD 43
KEMPTVILLE, ONTARIO

West of Highway 416 Interchange

APPENDICES

APPENDIX A

PROVINCIAL ROADWAY DRAWINGS
KINGS HIGHWAY 43
STA. 550+00 TO STA. 635+00 Sheets No. 21-26
ONTARIO MINISTRY OF TRANSPORATION, 1976

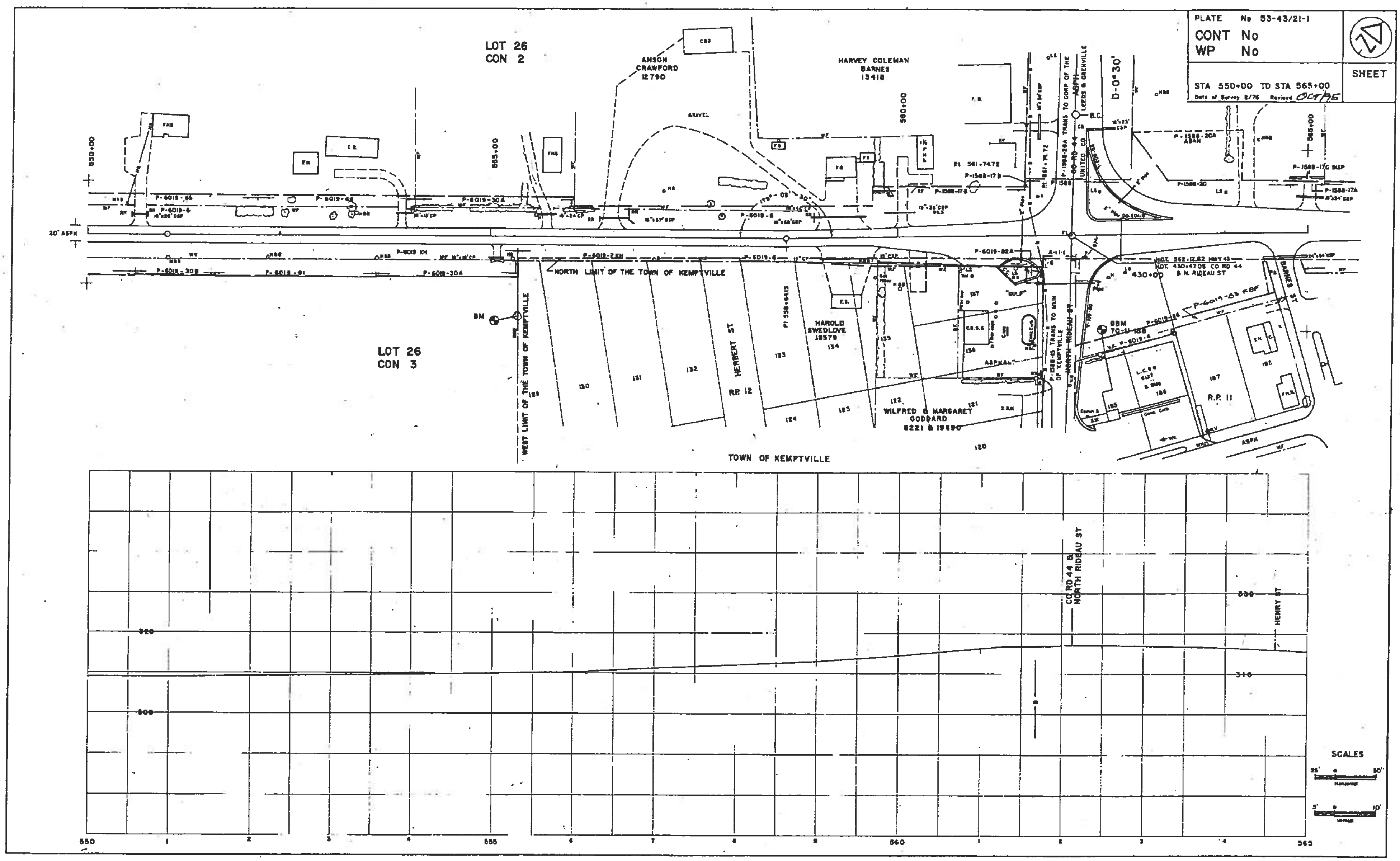
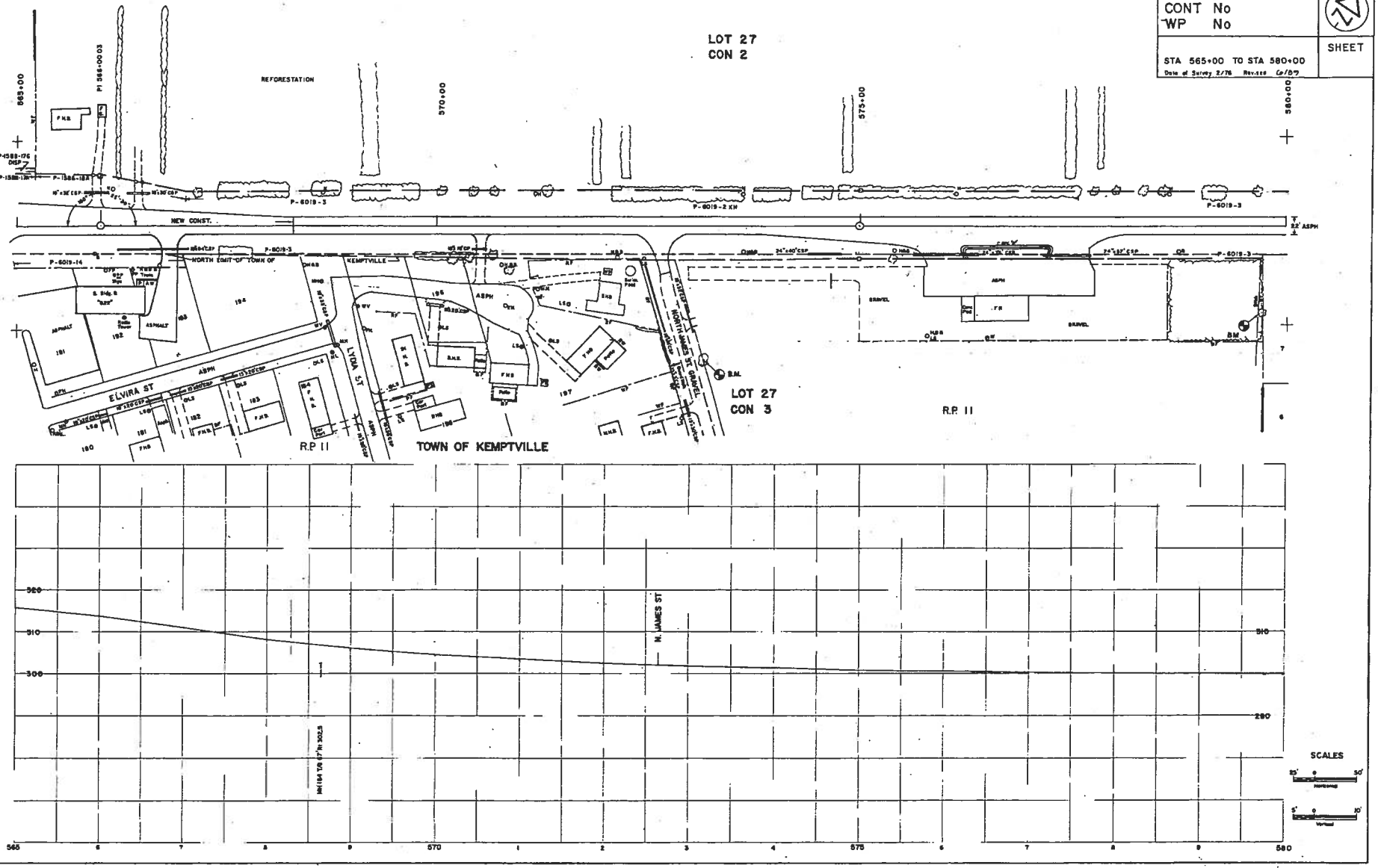


PLATE No 53-43/21-1
CONT No
WP No
SHEET
STA 550+00 TO STA 565+00
Date of Survey 2/76 Revised OCT/95
LOT 26
CON 2
ANSON
CRAWFORD
12790
HARVEY COLEMAN
BARNES
13418
D-0°30'
LOT 26
CON 3
NORTH LIMIT OF THE TOWN OF KEMPTVILLE
WEST LIMIT OF THE TOWN OF KEMPTVILLE
HERBERT ST
R.P. 12
HAROLD
SWEDLOVE
18579
WILFRED & MARGARET
GODDARD
6221 & 19690
TOWN OF KEMPTVILLE
NORTH RIDEAU ST
BARNES ST
R.P. 11
CO RD 44 &
NORTH RIDEAU ST
HENRY ST
SCALES
20' ASPH
550+00
555+00
560+00
565+00
53-43 21-1
53-43

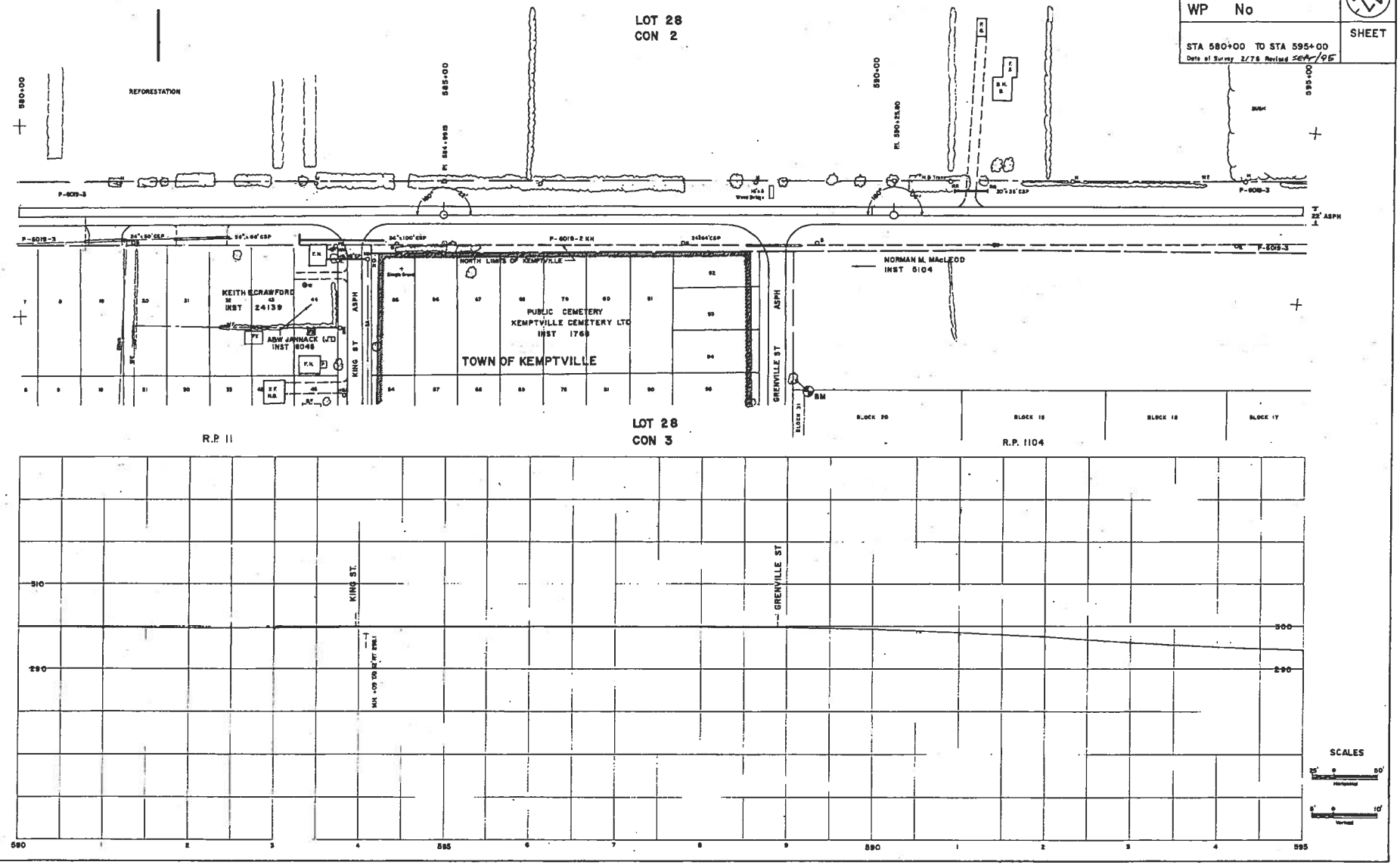
PLATE No 53-43/22-1
CONT No
WP No
SHEET
STA 565+00 TO STA 580+00
Date of Survey 2/76 Revised 6/79



DB-ES-44

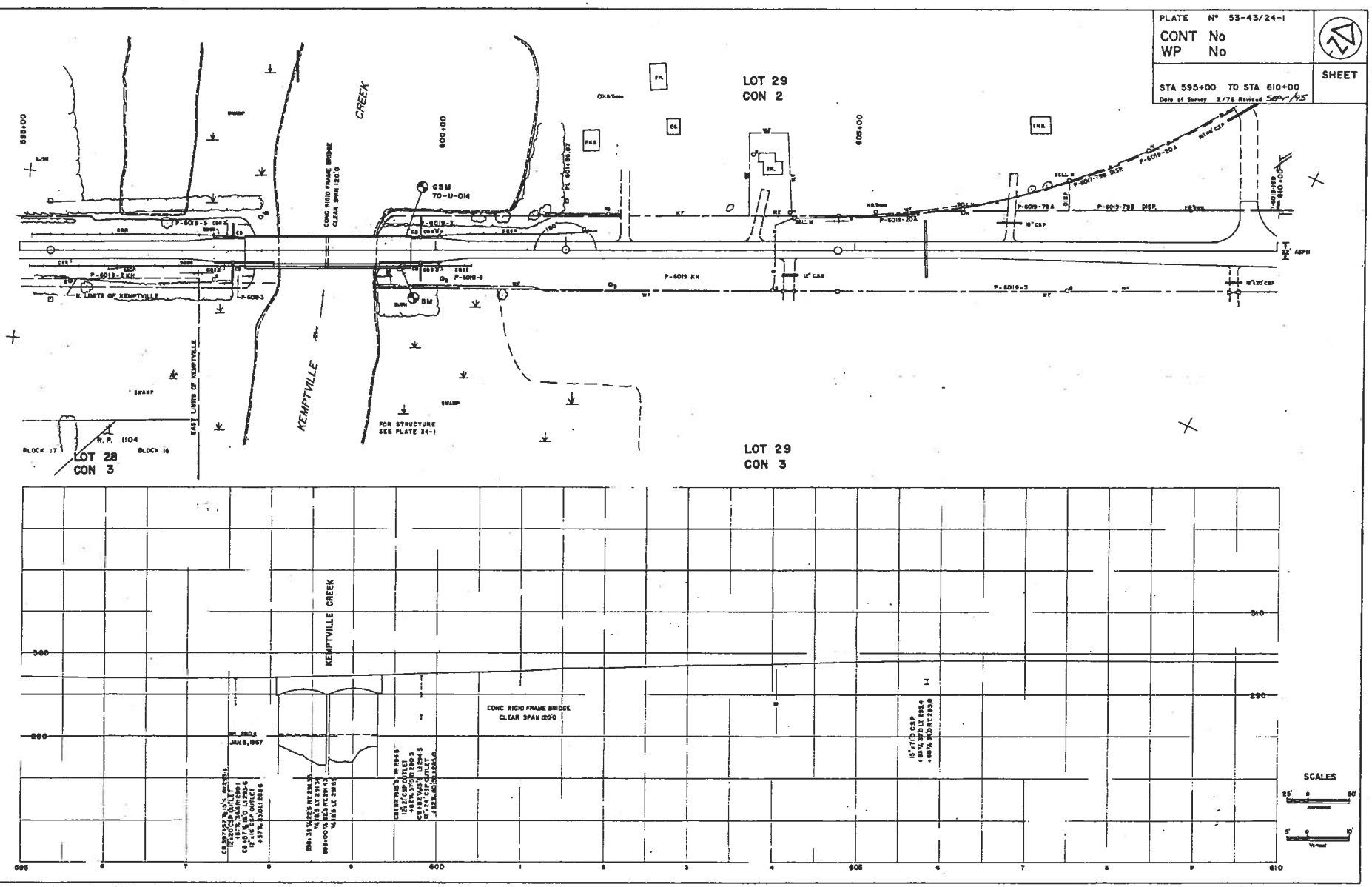
53-43 23-1

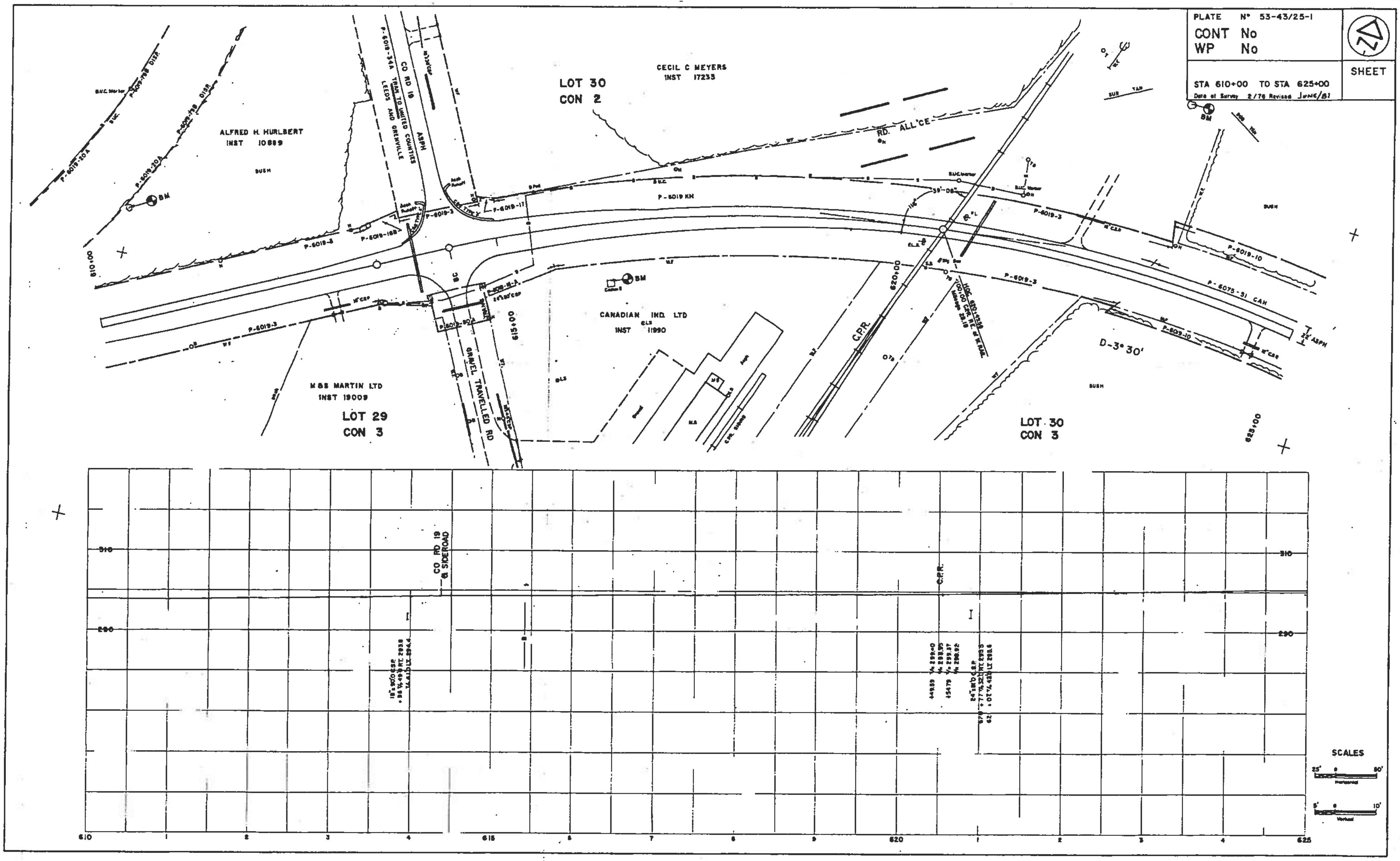
PLATE N° 53-43/23-1
CONT No
WP No
SHEET
STA 580+00 TO STA 595+00
Date of Survey 2/76 Revised SEPT/85



53-43 24-1

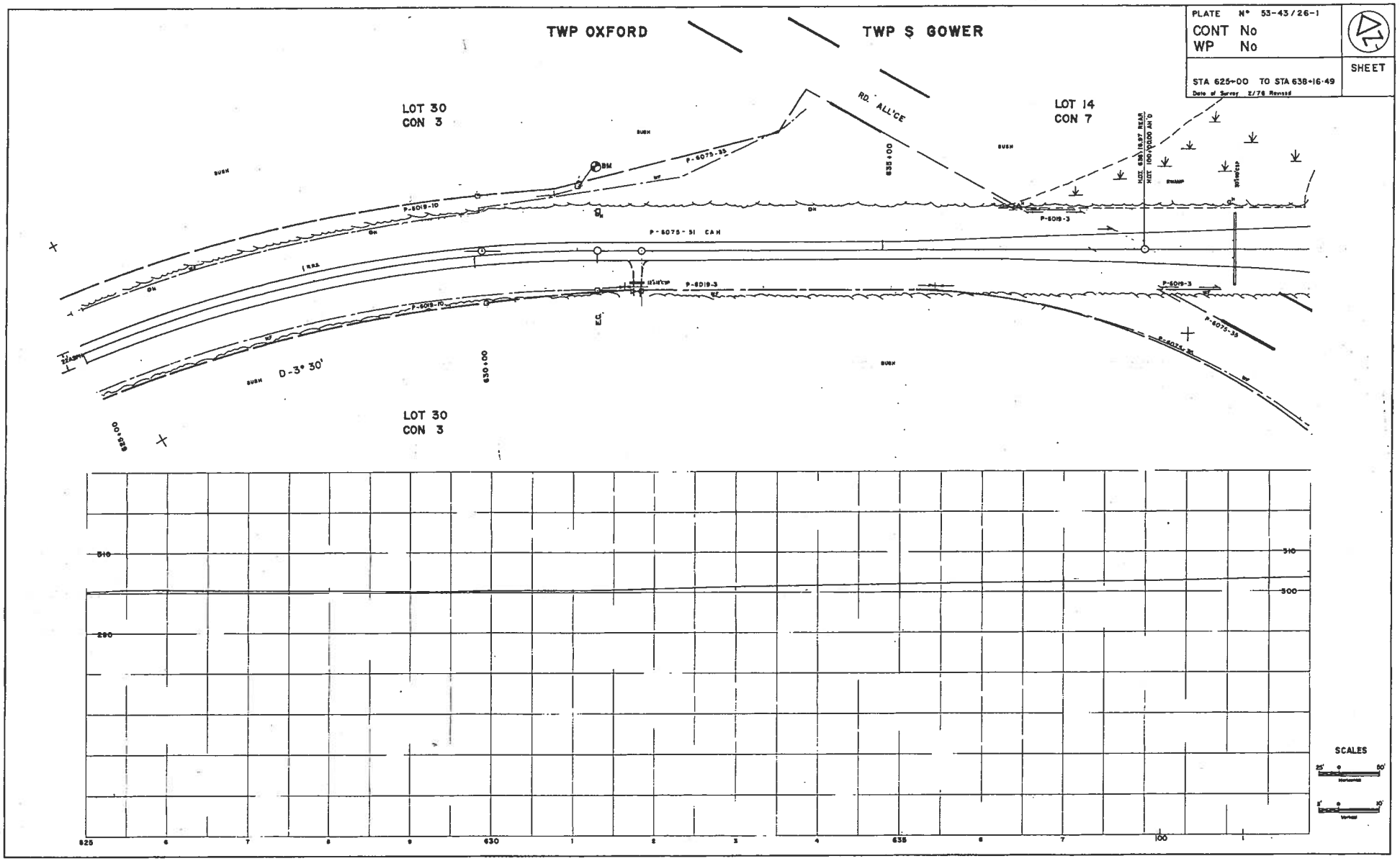
PLATE N° 53-43/24-1
CONT No
WP No
STA 595+00 TO STA 610+00
Date of Survey 2/76 Revised Sept/85
SHEET





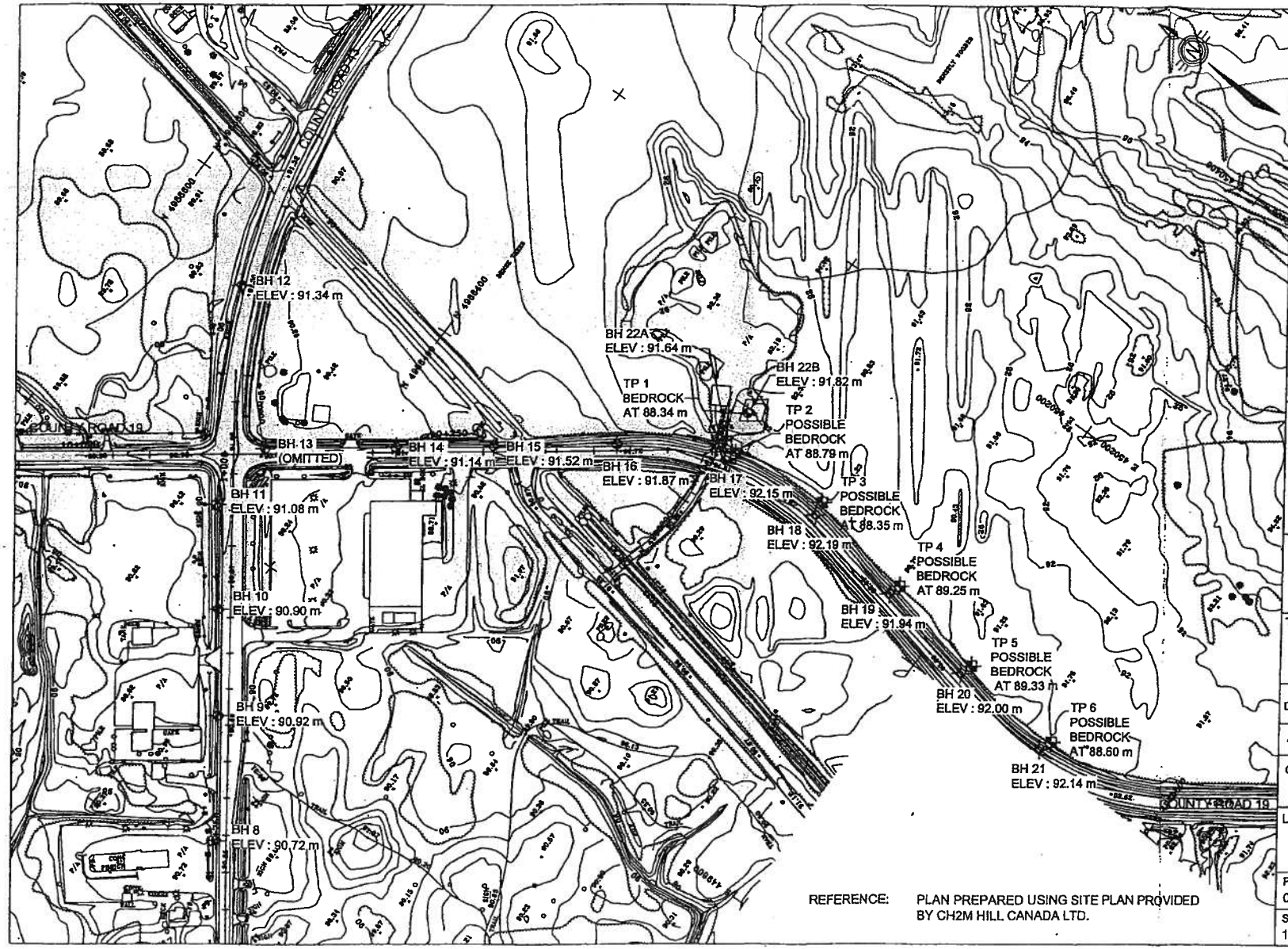
DB-E3-44

53-43 25-1


TWP OXFORD
TWP S GOWER
PLATE N° 53-43/26-1
CONT No
WP No
SHEET
STA 625+00 TO STA 638+16.49
Date of Survey 2/76 Revised
LOT 30
CON 3
LOT 14
CON 7
RD. ALL'CE
BM
P-6019-10
P-6075-35
P-6075-51 CAH
P-6019-3
P-6019-10
P-6075-35
P-6075-36
635+00
630+00
625+00
D-3° 30'
E.C.
BUSH
SWAMP
WF
SCALES
510
500
490
625
630
635
100

APPENDIX B

BOREHOLE LOG LOCATION PLAN
HOULE CHEVRIER REPORT No. 07-688



REFERENCE: PLAN PREPARED USING SITE PLAN PROVIDED BY CH2M HILL CANADA LTD.

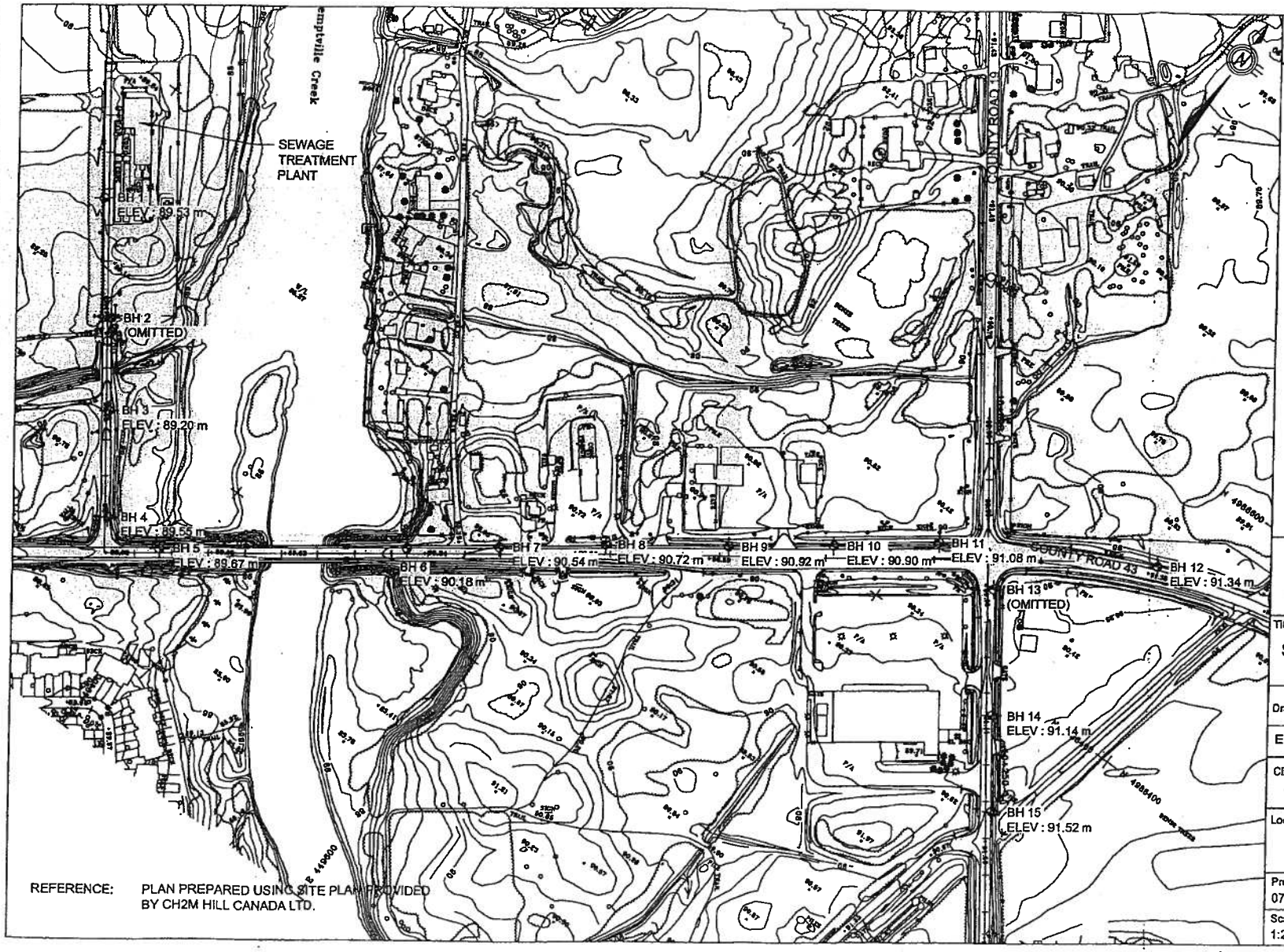
LEGEND

BH # APPROXIMATE BOREHOLE LOCATION IN PLAN

TP # APPROXIMATE TEST PIT LOCATION IN PLAN

Houle Chevrier Engineering

Title: SITE PLAN	FIGURE 2B
Drawn by: A.N.	Approved by: A.F.C.
Client: CH2M Hill Canada Ltd.	
Location: COUNTY ROAD 19	
Project No. 07-688	
Scale 1:2500	Date JANUARY 2008



REFERENCE: PLAN PREPARED USING SITE PLAN PROVIDED BY CH2M HILL CANADA LTD.

LEGEND

BH # APPROXIMATE BOREHOLE LOCATION IN PLAN, PRESENT INVESTIGATION BY HOULE CHEVRIER ENGINEERING LTD.

Houle Chevrier Engineering

Title: SITE PLAN	FIGURE 2A
Drawn by: E.G.	Approved by: A.F.C.
Client: CH2M Hill Canada Ltd.	
Location: COUNTY ROAD 43	
Project No. 07-688	
Scale 1:2500	Date JANUARY 2008

APPENDIX C

SOIL BOREHOLE AND GRADATION DATA
HOULE CHEVRIER REPORT No. 07-688

PROJECT: 07-688

LOCATION:

BORING DATE:

RECORD OF BOREHOLE 13

SHEET 1 OF 1

DATUM: Geodetic

SPT HAMMER:

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	SOIL PROFILE: STRATA PLOT	SOIL PROFILE: ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80)	SHEAR STRENGTH Cu, kPa (20 40 60 80) nat. V- + Q-● rem. V- ⊕ U-○	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-7} 10^{-6} 10^{-5} 10^{-4})	WATER CONTENT, PERCENT Wp W Wl (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0		Ground Surface											
		BOREHOLE OMITTED											
				3.00									
1													
2													
3													
4													
5													
6													
7													
8													
9													
10													

BOREHOLE RECORD 07-688 BH'S.GPJ MHECL.GDT 3/13/08

DEPTH SCALE

1 to 50

Houle Chevrier Engineering Ltd.

LOGGED:

CHECKED AC

PROJECT: 07-688

LOCATION: Refer to Site Plan, Figure 2

BORING DATE: December 07, 2007

RECORD OF BOREHOLE 14

SHEET 1 OF 1

DATUM: Geodetic

SPT HAMMER: 63.6 kg; drop 0.76 m

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat. V - +, rem. V - ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-7} 10^{-6} 10^{-5} 10^{-4}) / WATER CONTENT, PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0	Power Auger 200 mm Diameter Hollow Stem	Ground Surface		91.14							
		ASPHALT		0.09							
		Grey brown sand and gravel, some silt (BASE / SUBBASE MATERIAL)			1	CS			O		
1					2	50 DO	20		O		
				89.87							
		Dark grey brown silty sand, some organic material (POSSIBLE FORMER TOPSOIL)		1.27							
				89.34							
2		Loose to compact grey brown to grey fine to coarse grained SAND, trace to some silt		1.80	3	50 DO	12		O		
					4	50 DO	7		O	M	
				88.09							
		Soft to Firm grey SILTY CLAY		3.05	5	50 DO	WH	⊕ + ⊕ +	O		
					6	50 DO	WH	⊕ + ⊕ +	O		
				85.35							
6		End of borehole		5.79							Groundwater level in open hole not observed. Samples wet below 2.13m depth.
7											
8											
9											
10											

BOREHOLE RECORD 07-688 BHS.GPJ MHECL.GDT 3/13/08

DEPTH SCALE

1 to 50

Houle Chevrier Engineering Ltd.

LOGGED: R.F.

CHECKED AC

PROJECT: 07-688

RECORD OF BOREHOLE 15

SHEET 1 OF 1

LOCATION: Refer to Site Plan, Figure 2

DATUM: Geodetic

BORING DATE: December 07, 2007

SPT HAMMER: 63.6 kg; drop 0.75 m

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat. V: + ; rem. V: ⊕ ; Q: ● ; U: ○)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-7} 10^{-6} 10^{-5} 10^{-4}) / WATER CONTENT, PERCENT (Wp, W, Wl; 20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0	Power Auger 200 mm Diameter Hollow Stem	Ground Surface		91.52							
		Grey to grey brown sand and gravel, some silt (BASE / SUBBASE MATERIAL)			1	CS				M	Cement Sand
1					2	50 DO	19				
				90.15							Sand ▽
		Compact grey brown SILTY SAND and GRAVEL		1.37	3	50 DO	17				Bentonite seal
2				89.24							
		Loose grey fine to coarse SAND, trace silt		2.28	4	50 DO	8			M	
3				88.17	5	50 DO	3				19 mm diameter hand slotted PVC pipe
		Firm grey SILTY CLAY		3.35							
4					6	50 DO	1			MH	
					7	50 DO	WH				
5											
				85.73							
		End of borehole		5.79							Groundwater level in well screen at 1.38 m below ground surface on January 7, 2008.
6											
7											
8											
9											
10											

DEPTH SCALE

1 to 50

Houle Chevrier Engineering Ltd.

LOGGED: R.F.

CHECKED: AC

BOREHOLE RECORD 07-688 BH'S.GPJ MHECL.GDT 3/13/08

PROJECT: 07-688

LOCATION: Refer to Site Plan, Figure 2

BORING DATE: December 06, 2007

RECORD OF BOREHOLE 16

SHEET 1 OF 1

DATUM: Geodetic

SPT HAMMER: 63.6 kg; drop 0.76 m

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m
0	Power Auger 200 mm Diameter Hollow Stem	Ground Surface		91.87			
		Grey brown sand and gravel, some silt (BASE / SUBBASE MATERIAL)			1	AS	
				91.32 / 0.55	2	CS	
1		Loose to compact grey brown fine to coarse grained sand, trace silt and gravel (FILL)			3	50 DO	17
					4	50 DO	7
2		Dark grey brown silty sand, some organic material (POSSIBLE FORMER TOPSOIL)		89.89 / 2.03			
		Very stiff to stiff grey SILTY CLAY			5	50 DO	11
3					6	50 DO	7
				88.09 / 3.79			
4		Very loose to loose brown SILT; trace clay, some gravel, some silty clay layers			7	50 DO	4
					8	50 DO	3
5					9	50 DO	7
6		End of borehole		85.93 / 5.94			
7							
8							
9							
10							

SAMPLES

DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m: 20 40 60 80

SHEAR STRENGTH Cu, kPa: 20 40 60 80 — nat. V - + ● — rem. V - ⊕ U - ○

HYDRAULIC CONDUCTIVITY, k, cm/s: 10^{-7} 10^{-6} 10^{-5} 10^{-4}

WATER CONTENT, PERCENT: Wp 20 — W 40 60 — Wl 80

ADDITIONAL LAB. TESTING: M; MH

PIEZOMETER OR STANDPIPE INSTALLATION: Native Backfill

Groundwater conditions not observed.

BOREHOLE RECORD 07-688 BHS.GPJ MHECL.GDT 3/27/08

DEPTH SCALE

1 to 50

Houle Chevrier Engineering Ltd.

LOGGED: R.F.

CHECKED: AC

PROJECT: 07-698

LOCATION: Refer to Site Plan, Figure 2

BORING DATE: December 06, 2007

RECORD OF BOREHOLE 17

SHEET 1 OF 1

DATUM: Geodetic

SPT HAMMER: 63.6 kg; drop 0.76 m

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80)	SHEAR STRENGTH Cu, kPa (nat V - +, rem. V - ⊕, U - O; 20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-7} 10^{-6} 10^{-5} 10^{-4})	WATER CONTENT, PERCENT (Wp, W, Wl; 20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0	Power Auger 200 mm Diameter Hollow Stem	Ground Surface		92.15									
		Grey brown sand and gravel, some silt (BASE / SUBBASE MATERIAL)		91.62 0.53	1	CS							
		Compact grey brown fine to coarse grained SAND, trace to some silt, trace gravel (FILL)			2	CS							
1					3	50 DO	23						
					4	50 DO	17						
2		Dark grey brown silty sand, some organic material (POSSIBLE FORMER TOPSOIL)		90.19 1.96									
		Very stiff grey brown SILTY CLAY		89.71 2.44	5	50 DO	35						Native Backfill
3		Compact grey brown to grey silty sand, trace clay, some gravel, cobbles and boulders, (GLACIAL TILL)			6	50 DO	94						
4					7	50 DO	36						
					8	50 DO	59						
5		End of borehole Practical auger refusal		87.24 4.91									Groundwater conditions not observed.
6													
7													
8													
9													
10													

DEPTH SCALE

1 to 50

Houle Chevrier Engineering Ltd.

LOGGED: R.F.

CHECKED: AC

BOREHOLE RECORD 07-688 BH'S.GPJ MHECL.GDT 3/13/08

PROJECT: 07-688

LOCATION: Refer to Site Plan, Figure 2

BORING DATE: December 06, 2007

RECORD OF BOREHOLE 18

SHEET 1 OF 1

DATUM: Geodetic

SPT HAMMER: 63.5 kg; drop 0.76 m

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80)	SHEAR STRENGTH Cu, kPa (nat. V - + Q - ● rem. V - ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-7} 10^{-6} 10^{-5} 10^{-4})	WATER CONTENT, PERCENT (Wp — W — Wl; 20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0	Power Auger 200 mm Diameter Hollow Stem	Ground Surface		92.19									
		Grey brown sand and gravel, some silt (BASE / SUBBASE MATERIAL)		91.69 0.50	1	CS							
1		Compact grey brown fine to medium grained SAND, trace to some silt, trace gravel (FILL)			2	CS							
					3	50 DO	26						
				90.67 1.52									
2		Compact grey brown to grey silty sand, trace clay, some gravel, cobbles and boulders, becoming sand and gravel at depth (GLACIAL TILL)			4	50 DO	28						
					5	50 DO	24						
3					6	50 DO	10						
4					7	50 DO	>50						
		End of borehole Practical auger refusal		88.00 4.19									
5													
6													
7													
8													
9													
10													

PIEZOMETER OR STANDPIPE INSTALLATION:
- Cement
- Sand
- Bentonite seal
- Sand
- 19 mm diameter hand slotted PVC pipe

Groundwater level in well screen at 1.66 m below ground surface on January 7, 2008.

DEPTH SCALE

1 to 50

Houle Chevrier Engineering Ltd.

LOGGED: R.F

CHECKED: A.C

BOREHOLE RECORD 07-688 BHS.GPJ MHECL.GDT 3/13/08

PROJECT: 07-688

LOCATION: Refer to Site Plan, Figure 2

BORING DATE: December 05, 2007

RECORD OF BOREHOLE 19

SHEET 1 OF 1

DATUM: Geodetic

SPT HAMMER: 63.5 kg; drop 0.76 m

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80)	SHEAR STRENGTH Cu, kPa (20 40 60 80) nat. V - + rem. V - ⊕ Q - ● U - ○	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-7} 10^{-6} 10^{-5} 10^{-4})	WATER CONTENT, PERCENT Wp W Wl (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0	Power Auger 200 mm Diameter Hollow Stem	Ground Surface		91.94									
		Grey brown sand and gravel, some silt (BASE / SUBBASE MATERIAL)		91.41 / 0.53	1	CS							
					2	CS							
1		Grey brown fine to coarse grained SAND, trace to some silt and gravel (FILL)			3	50 DO	22						
					4	50 DO	10						
2				89.84 / 2.10									Native Backfill
		Brown to grey SILT, trace clay, with silty sand and silty clay seams			5	50 DO	10						
3				88.76 / 3.18									
		Compact grey brown to grey silty sand, trace clay, some gravel, cobbles and boulders, (GLACIAL TILL)			6	50 DO	22						
4					7	50 DO	37						
		End of borehole Practical auger refusal		87.62 / 4.32									Groundwater conditions not observed.
5													
6													
7													
8													
9													
10													

BOREHOLE RECORD 07-688 BHS.GPJ MHECL.GDT 3/13/08

DEPTH SCALE

1 to 50

Houle Chevrier Engineering Ltd.

LOGGED: R.F

CHECKED: AC

PROJECT: 07-688

LOCATION: Refer to Site Plan, Figure 2

BORING DATE: December 05, 2007

RECORD OF BOREHOLE 20

SHEET 1 OF 1

DATUM: Geodetic

SPT HAMMER: 63.6 kg; drop 0.76 m

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat. V - +, rem. V - ⊕; Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-7} 10^{-6} 10^{-5} 10^{-4}) / WATER CONTENT, PERCENT (Wp W Wl; 20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0	Power Auger 200 mm Diameter Hollow Stem	Ground Surface		92.00							
		Grey brown silty sand and gravel (BASE / SUBBASE MATERIAL)		91.52	1	AS				M	
				0.48							
1		Loose to compact grey brown fine to medium and fine to coarse grained sand, trace to some silt, trace gravel (FILL)			2	CS					
					3	50 DO	22				
2					4	50 DO	9				Native Backfill
		Very dense grey brown to grey silty sand, trace clay, some gravel, cobbles and boulders, (GLACIAL TILL)		90.02 1.98							
					5	50 DO	84			MH	
3											
					6	50 DO	50 for 3cm				
4											
					7	50 DO	>100				
		End of borehole Practical auger refusal		87.89 4.11							Groundwater conditions not observed.
5											
6											
7											
8											
9											
10											

BOREHOLE RECORD 07-688 BHS.GPJ MHECL.GDT 3/13/08

DEPTH SCALE

1 to 50

Houle Chevrier Engineering Ltd.

LOGGED: R.F.

CHECKED: AC

PROJECT: 07-688

LOCATION: Refer to Site Plan, Figure 2

BORING DATE: December 05, 2007

RECORD OF BOREHOLE 21

SHEET 1 OF 1

DATUM: Geodetic

SPT HAMMER: 63.6 kg; drop 0.76 m

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat. V - ● rem. V - ⊕ Q - ● U - ○)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-7} 10^{-6} 10^{-5} 10^{-4}) / WATER CONTENT, PERCENT (Wp W Wl)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0	Power Auger 200 mm Diameter Hollow Stem	Ground Surface		92.14							Cement
		Grey to grey brown sand and gravel, some silt (BASE / SUBBASE MATERIAL)		91.61 / 0.53							
1		Loose to compact grey brown fine to coarse grained SAND, trace silt and gravel (FILL)			1	50 DO	22				Sand
				90.70 / 1.45							
2		Grey brown SILT, trace clay and sand			2	50 DO	8				Bentonite seal
				90.06 / 2.08							Sand
3		Dense to very dense grey brown silty sand, trace clay, some gravel, cobbles and boulders, becoming sand and gravel at depth (GLACIAL TILL)			3	50 DO	72				
					4	50 DO	73				
4					5	50 DO	106				
		Split spoon refusal at 4.27m End of borehole		87.87 / 4.27							Groundwater level in well screen at 1.50 m below ground surface on January 7, 2008.
5											
6											
7											
8											
9											
10											

BOREHOLE RECORD 07-688 BHTS.GPJ MHECL.GDT 3/13/08

DEPTH SCALE

1 to 50

Houle Chevrier Engineering Ltd.

LOGGED: R.F.

CHECKED: AC

PROJECT: 07-588

RECORD OF BOREHOLE 22A

SHEET 1 OF 1

LOCATION: Refer to Site Plan, Figure 2

DATUM: Geodetic

BORING DATE: December 07, 2007

SPT HAMMER: 63.6 kg; drop 0.76 m

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat. V - +, rem. V - ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-7} 10^{-6} 10^{-5} 10^{-4}) / WATER CONTENT, PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0	Power Auger 200 mm Diameter Hollow Stem	Ground Surface		91.64							
		Grey brown sand and gravel, some silt and cobbles (FILL)		91.41	1	CS			O		
		Dark brown fine to medium grained SAND, some silt trace gravel.		0.23 91.06							
1		Compact to very dense grey brown silty sand, trace clay, some gravel, cobbles and boulders (GLACIAL TILL)		0.58	2	50 DO	21		O		
					3	50 DO	109		O		
2		Practical auger refusal		89.68 1.96							Groundwater level in open hole not observed.
		End of borehole									
3											
4											
5											
6											
7											
8											
9											
10											

DEPTH SCALE

1 to 50

Houle Chevrier Engineering Ltd.

LOGGED: R.F.

CHECKED: AC

BOREHOLE RECORD 07-588 BHS.GPJ MHECL.GDT 3/13/08

PROJECT: 07-688

LOCATION: Refer to Site Plan, Figure 2

BORING DATE: December 07, 2007

RECORD OF BOREHOLE 22B

SHEET 1 OF 1

DATUM: Geodetic

SPT HAMMER: 63.6 kg; drop 0.76 m

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-7} 10^{-6} 10^{-5} 10^{-4})	SHEAR STRENGTH Cu, kPa (nat. V - +, rem. V - ⊖; Q - ●, U - ○) (20 40 60 80)	WATER CONTENT, PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0	Power Auger 200 mm Diameter Hollow Stem	Ground Surface		91.82									
		TOPSOIL		91.72 0.10									
		Dark brown fine to medium grained SAND, some silt trace gravel.			1	CS							
1		Dense to very dense grey brown silty sand, trace clay, some gravel, cobbles and boulders (GLACIAL TILL)		91.32 0.50	2	50 DO	39						
2					3	50 DO	63					MH	
					4	50 DO	>50						
3		Practical auger refusal End of borehole		89.08 2.74									Groundwater level in open hole not observed.
4													
5													
6													
7													
8													
9													
10													

DEPTH SCALE

1 to 50

Houle Chevrier Engineering Ltd.

LOGGED: R.F.

CHECKED:

BOREHOLE RECORD 07-688 BH'S.GPJ MHECL.GDT 3/13/08

PROJECT: 07-688

RECORD OF TEST PIT 1

SHEET 1 OF 1

LOCATION: Refer to Site Plan, Figure 1

DATUM: Geodetic

DATE OF EXCAVATION: January 24, 2008

TYPE OF EXCAVATOR: Backhoe

DEPTH SCALE METRES	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV / DEPTH (m)	SAMPLE NUMBER	SHEAR STRENGTH, Cu (kPa): Natural, V - + / Remoulded, V - ⊕ (20 40 60 80)	WATER CONTENT (PERCENT): Wp — W — Wl (20 40 60 80)	ADDITIONAL LAB. TESTING	WATER LEVEL IN OPEN TEST PIT OR STANDPIPE INSTALLATION
0	Ground Surface		91.64					
	Grey brown silty sand (FILL MATERIAL)		91.34					
	Dark brown silty sand (FORMER TOPSOIL)		91.24 / 0.40					
1	Red brown SAND, some silt		90.44 / 1.20					
	Grey brown silty sand, some gravel, cobbles and boulders (GLACIAL TILL)							
2								
3			88.34 / 3.30					▽
	Fractured BEDROCK							
	Refusal on bedrock End of test pit		87.94 / 3.70					Water level at 3.3m below ground surface 15 minutes after excavating on January 24, 2008.
4	Notes: 1. Hard digging in dense glacial till below 1.8 metres depth. 2. Groundwater inflow at 2.1 metres below ground surface and from the bedrock.							
5								
6								
7								
8								
9								
10								

TESTPIT_RECORD_07-688 TP'S.GPJ MHECL.GDT 3/13/08

DEPTH SCALE

1 to 50

Houle Chevrier Engineering Ltd.

LOGGED: A.N

CHECKED: AC

PROJECT: 07-688

LOCATION: Refer to Site Plan, Figure 2

BORING DATE: December 12, 2007

RECORD OF BOREHOLE 1

SHEET 1 OF 1

DATUM: Geodetic

SPT HAMMER: 63.6 kg; drop 0.76 m

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0	Power Auger 200 mm Diameter Hollow Stem	Ground Surface		89.53					
		ASPHALT		0.09					
		Grey brown sand and gravel, some silt (BASE / SUBBASE MATERIAL)			1	CS		M	Cement
					2	AS			Sand
				88.84					
1		Compact to very dense brown silty sand, some gravel, occasional cobble, 25mm thick organic layer at 1.5m below ground surface (FILL)		0.69					Bentonite seal
					3	50 DO	66		Sand
2					4	50 DO	23	M	
3					5	50 DO	13		19 mm diameter hand slotted PVC pipe
					6	50 DO	36		Sand
				85.87					
4		Practical auger refusal at 3.2m End of borehole 3.66m		3.66					Groundwater level in well screen at 2.85 m below ground surface on January 7, 2008.
5									
6									
7									
8									
9									
10									

DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m: 20 40 60 80

SHEAR STRENGTH Cu, kPa: nat, V - + Q - ● rem, V - ⊕ U - ○ (20 40 60 80)

HYDRAULIC CONDUCTIVITY, k, cm/s: 10^{-7} 10^{-5} 10^{-3} 10^{-1}

WATER CONTENT, PERCENT: Wp W Wl (20 40 60 80)

BOREHOLE RECORD 07-688 BH'S.GPJ MHECL.GDT 3/13/08

DEPTH SCALE

1 to 50

Houle Chevrier Engineering Ltd.

LOGGED: R.F.

CHECKED AC

PROJECT: 07-688

LOCATION:

BORING DATE:

RECORD OF BOREHOLE 2

SHEET 1 OF 1

DATUM: Geodetic

SPT HAMMER:

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	SOIL PROFILE: STRATA PLOT	SOIL PROFILE: ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (20 40 60 80) nat. V - + Q - ● rem. V - ⊕ U - O	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-7} 10^{-6} 10^{-5} 10^{-4}) / WATER CONTENT, PERCENT Wp W Wl (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0		Ground Surface									
		BOREHOLE OMITTED									
1											
2											
3				3.00							
4											
5											
6											
7											
8											
9											
10											

BOREHOLE RECORD 07-688 BH'S.GPJ MHECL.GDT 3/13/08

DEPTH SCALE

1 to 50

Houle Chevrier Engineering Ltd.

LOGGED:

CHECKED: AC

PROJECT: 07-688

RECORD OF BOREHOLE 3

SHEET 1 OF 1

LOCATION: Refer to Site Plan, Figure 2

DATUM: Geodetic

BORING DATE: December 12, 2007

SPT HAMMER: 63.6 kg; drop 0.76 m

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat. V - + Q - ● rem. V - ⊕ U - ○)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-7} 10^{-6} 10^{-5} 10^{-4}) / WATER CONTENT, PERCENT (Wp W Wl)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0	Power Auger 200 mm Diameter Hollow Stem	Ground Surface		89.20							
		ASPHALT		0.08	1	CS					Cement
		Brown sand and gravel, some silt, (BASE / SUBBASE MATERIAL)			2	CS					Sand
		Dark grey brown silty sand, trace organic material (FILL)		88.44 0.76 / 88.24 0.96	3	50 DO	39			M	
1		Dense grey brown silty sand, some gravel and silty sand (FILL)			4	50 DO	31				Bentonite seal
											Sand
		Dark grey brown sandy silt and clayey silt, trace organic material and roots (ALLUVIUM)		86.79 2.41	5	50 DO	5				
2											
		Very stiff grey brown SILTY CLAY (Weathered Crust)		86.31 2.89	6	50 DO	13				19 mm diameter hand slotted PVC pipe
3		End of borehole		85.54 3.66							
4											Groundwater level in well screen at 2.57 m below ground surface on January 7, 2008.
5											
6											
7											
8											
9											
10											

BOREHOLE RECORD 07-688 BHS.GPJ MHECL.GDT 3/13/08

DEPTH SCALE

1 to 50

Houle Chevrier Engineering Ltd.

LOGGED: R.F

CHECKED AC

PROJECT: 07-688

RECORD OF BOREHOLE 4

SHEET 1 OF 1

LOCATION: Refer to Site Plan, Figure 2

DATUM: Geodetic

BORING DATE: December 11, 2007

SPT HAMMER: 63.6 kg; drop 0.76 m

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa nat. V. + rem. V. ⊕ (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-7} 10^{-6} 10^{-5} 10^{-4}) / WATER CONTENT, PERCENT Wp W Wl (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0	Power Auger 200 mm Diameter Hollow Stem	Ground Surface		89.55							
		ASPHALT		0.05	1	CS				M	
		Grey brown sand and gravel, some silt (BASE / SUBBASE MATERIAL)			2	CS					
				88.79							
1		Compact grey brown silty clay and silty sand, some gravel (FILL)		0.76	3	50 DO	26				
2					4	50 DO	12			M	
				87.27							
		Dark grey brown silty clay and silty sand, trace organic material and roots (ALLUVIUM)		2.28	5	50 DO	6				
3				86.66							
		Very stiff grey brown SILTY CLAY, (Weathered Crust)		2.89	6	50 DO	3				
				85.89							
		End of borehole		3.66							
4											
5											
6											
7											
8											
9											
10											

BOREHOLE RECORD 07-688 BH'S.GPJ MHECL.GDT 3/13/08

DEPTH SCALE

1 to 50

Houle Chevrier Engineering Ltd.

LOGGED: R.F.

CHECKED:

PROJECT: 07-688

LOCATION: Refer to Site Plan, Figure 2

BORING DATE: December 12, 2007

RECORD OF BOREHOLE 5

SHEET 1 OF 1

DATUM: Geodetic

SPT HAMMER: 63.6 kg; drop 0.76 m

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat. V - +, rem. V - ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-7} 10^{-6} 10^{-5} 10^{-4}) / WATER CONTENT, PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0	Power Auger 200 mm Diameter Hollow Stem	Ground Surface		89.67							
		ASPHALT		0.08	1	CS				M	Cement
		Grey brown sand and gravel, some silt (BASE / SUBBASE MATERIAL)			2	CS				M	
				88.91							
1		Compact brown and grey brown silty sand and sand, some gravel (FILL)		0.76	3	50 DO	28				Sand
2					4	50 DO	17				
					5	50 DO	22			M	
3					6	50 DO	10				Bentonite seal
				85.81							
4		Organics		3.91	7	50 DO	10				
		Very stiff grey brown SILTY CLAY, scattered trace organic material (Weathered Crust)									
5					8	50 DO	11				Sand
				84.34							
		Very dense grey brown silty sand, trace clay, some gravel, cobbles and boulders (GLACIAL TILL)		5.33	9	50 DO	120			MH	
6					10	50 DO	52				19 mm diameter hand slotted PVC pipe
				82.81							
7		End of borehole Practical Auger Refusal		6.86							Groundwater level in well screen at 3.62 m below ground surface on January 7, 2008
8											
9											
10											

DEPTH SCALE

1 to 50

Houle Chevrier Engineering Ltd.

LOGGED: R.F.

CHECKED: AC

BOREHOLE RECORD 07-688 BH'S.GPJ MHECL.GDT 3/27/08

PROJECT: 07-688

LOCATION: Refer to Site Plan, Figure 2

BORING DATE: December 11, 2007

RECORD OF BOREHOLE 6

SHEET 1 OF 1

DATUM: Geodetic

SPT HAMMER: 63.6 kg, drop 0.76 m

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat. V - + rem. V - ⊕ Q - ● U - ○)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-7} 10^{-6} 10^{-5} 10^{-4}) / WATER CONTENT, PERCENT (Wp W Wl)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0	Power Auger 200 mm Diameter Hollow Stem	Ground Surface		90.18							
		ASPHALT		0.08	1	CS					Cement
		Grey brown sand and gravel, some silt (BASE / SUBBASE MATERIAL)			2	CS					
				89.47							
1		Loose to compact brown fine to medium grained sand, trace silt (FILL)		0.71	3	50 DO	12				
2					4	50 DO	3			M	
					5	50 DO	3				Sand
3											
				86.83	6	50 DO	3				
		Dark grey brown silty sand, trace organic material (POSSIBLE FORMER TOPSOIL)		3.40							
4		Very stiff grey brown SILTY CLAY, (Weathered Crust)			7	50 DO	2				▽
5					8	50 DO	3			MH	Bentonite seal
					9	50 DO	5				
6					10	50 DO	3				
											Sand
7		Grey layered SILTY CLAY, CLAYEY SILT and SILT		83.32 6.86	11	50 DO	5				
		Dense grey silty sand, trace clay, some gravel, cobbles and boulders (GLACIAL TILL)		82.71 7.47							
8		Practical Auger Refusal End of borehole		82.18 8.00	12	50 DO	53				19 mm diameter hand slotted PVC pipe
9											Groundwater level in well screen at 3.9 m below ground surface on January 7, 2008.
10											

DEPTH SCALE

1 to 50

Houle Chevrier Engineering Ltd.

LOGGED: R.F.

CHECKED: AC

BOREHOLE RECORD 07-688 BYS.GPJ MHECL.GDT 3/13/08

PROJECT: 07-688

LOCATION: Refer to Site Plan, Figure 2

BORING DATE: December 11, 2007

RECORD OF BOREHOLE 7

SHEET 1 OF 1

DATUM: Geodetic

SPT HAMMER: 63.6 kg; drop 0.76 m

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m
0	Power Auger 200 mm Diameter Hollow Stem	Ground Surface		90.54			
		ASPHALT		0.07	1	CS	
		Grey brown sand and gravel, becoming fine to medium sand, some gravel (BASE / SUBBASE MATERIAL)			2	CS	
1				89.73			
		Brown fine to medium and fine to coarse sand, trace silt (FILL)		0.81	3	50 DO	10
				88.71	4	50 DO	4
2		Organics		1.88			
		Brown fine to coarse SAND, trace to some silt					
				88.07			
		Very stiff grey brown SILTY CLAY, (Weathered Crust)		2.47	5	50 DO	5
3				87.49			
		Stiff grey SILTY CLAY		3.05	6	50 DO	3
4							
		End of borehole		86.27 4.27			
5							
6							
7							
8							
9							
10							

SAMPLES

DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m: 20 40 60 80

SHEAR STRENGTH Cu, kPa: nat. V - + Q -● rem. V - ⊕ U -○ (20 40 60 80)

HYDRAULIC CONDUCTIVITY, k, cm/s: 10^{-7} 10^{-6} 10^{-5} 10^{-4}

WATER CONTENT, PERCENT: Wp W Wl (20 40 60 80)

ADDITIONAL LAB. TESTING: M

PIEZOMETER OR STANDPIPE INSTALLATION

BOREHOLE RECORD 07-688 BH'S.GPJ MHECL.GDT 3/13/08

DEPTH SCALE

1 to 50

Houle Chevrier Engineering Ltd.

LOGGED: R.F.

CHECKED: AC

PROJECT: 07-688

LOCATION: Refer to Site Plan, Figure 2

BORING DATE: December 10, 2007

RECORD OF BOREHOLE 8

SHEET 1 OF 1

DATUM: Geodetic

SPT HAMMER: 63.5 kg; drop 0.76 m

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80)	SHEAR STRENGTH Cu, kPa (20 40 60 80) nat. V - + rem. V - ⊕ Q - ● U - ○	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-7} 10^{-6} 10^{-5} 10^{-4})	WATER CONTENT, PERCENT Wp W Wl (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0	Power Auger 200 mm Diameter Hollow Stem	Ground Surface		90.72									
		ASPHALT		90.62 0.10									
		Grey brown sand and gravel, some silt (BASE / SUBBASE MATERIAL)			1	CS						M	
				90.14 0.58	2	CS						M	
1		Brown fine to medium sand, some silt, trace gravel (FILL)		89.71 1.01	3	50 DO	13						
		Dark grey brown silty sand, some organic material (POSSIBLE FORMER TOPSOIL)		89.15 1.57									
2		Loose brown SAND, trace to some silt			4	50 DO	7					M	
				88.13 2.59	5	50 DO	8						
3		Very stiff grey brown SILTY CLAY, with silt seams (Weathered Crust)			6	50 DO	2						
				86.99 3.74									
4		Stiff grey SILTY CLAY			7	50 DO	WH						
				86.30 4.42									
		End of borehole											
5													
6													
7													
8													
9													
10													

PIEZOMETER OR STANDPIPE INSTALLATION:
- Cement Sand
- Bentonite seal
- Sand
- 19 mm diameter hand slotted PVC pipe

Groundwater level in well screen at 1.67 m below ground surface on January 7, 2008.

DEPTH SCALE
1 to 50

Houle Chevrier Engineering Ltd.

LOGGED: R.F

CHECKED: AC

BOREHOLE RECORD 07-688 BH'S.GPJ MHECL.GDT 3/13/08

PROJECT: 07-688

LOCATION: Refer to Site Plan, Figure 2

BORING DATE: December 10, 2007

RECORD OF BOREHOLE 9

SHEET 1 OF 1

DATUM: Geodetic

SPT HAMMER: 63.6 kg; drop 0.76 m

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat. V - + ; rem. V - ⊕) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-7} 10^{-6} 10^{-5} 10^{-4}) / WATER CONTENT, PERCENT (Wp W Wl; 20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0	Power Auger 200 mm Diameter Hollow Stem	Ground Surface		90.92							
		ASPHALT		0.05	1	CS			O		
		Grey brown sand and gravel, trace silt (BASE / SUBBASE MATERIAL)		90.52 0.40	2	CS			O		
		Grey brown fine to medium sand, some silt and gravel (FILL)		90.16 0.76							
1		Dark grey brown silty sand, some organic material (POSSIBLE FORMER TOPSOIL)		89.98 0.94	3	50 DO	9		O		
		Loose grey brown SAND, some silt			4	50 DO	6		O	M	
2				88.86 2.06							
		Very stiff to stiff grey SILTY CLAY			5	50 DO	4		O		
3				87.87 3.05							
		Grey SILT, some clay, with silty clay seams			6	50 DO	2		O	MH	
				87.01 3.91							
4		Compact grey brown silty sand, trace clay, some gravel (GLACIAL TILL)			7	50 DO	17		O		
				86.50 4.42							
		End of borehole									
5											
6											
7											
8											
9											
10											

DEPTH SCALE

1 to 50

Houle Chevrier Engineering Ltd.

LOGGED: R F

CHECKED: AC

BOREHOLE RECORD 07-688 BH'S.GPJ HHECL.GDT 2/13/08

PROJECT: 07-688

LOCATION: Refer to Site Plan, Figure 2

BORING DATE: December 10, 2007

RECORD OF BOREHOLE 10

SHEET 1 OF 1

DATUM: Geodetic

SPT HAMMER: 63.6 kg; drop 0.76 m

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m
0	Power Auger 200 mm Diameter Hollow Stem	Ground Surface		90.90			
		ASPHALT		0.08	1	CS	
		Grey brown sand and gravel, trace silt (BASE / SUBBASE MATERIAL)		90.35 0.55	2	CS	
1		Loose brown fine to coarse sand, trace silt and gravel (FILL)			3	50 DO	9
				89.07 1.83	4	50 DO	5
2		Loose brown to grey fine to coarse SAND, trace to some silt			5	50 DO	7
				88.16 2.74			
3		Stiff grey SILTY CLAY			6	50 DO	2
4		End of borehole		86.63 4.27			
5							
6							
7							
8							
9							
10							

DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m: 20, 40, 60, 80

SHEAR STRENGTH Cu, kPa: 20, 40, 60, 80 — nat. V - +, rem. V - ⊕, Q - ●, U - ○

HYDRAULIC CONDUCTIVITY, k, cm/s: 10^{-7}, 10^{-6}, 10^{-5}, 10^{-4}

WATER CONTENT, PERCENT: Wp, W, Wl; 20, 40, 60, 80

ADDITIONAL LAB. TESTING

PIEZOMETER OR STANDPIPE INSTALLATION

Groundwater level in open hole not observed. Samples wet starting at 1.5m depth.

DEPTH SCALE

1 to 50

Houle Chevrier Engineering Ltd.

LOGGED: R.F.

CHECKED: AC

BOREHOLE RECORD 07-688 BH'S.GPJ MHECL.GDT 3/13/08

PROJECT: 07-688

LOCATION: Refer to Site Plan, Figure 2

BORING DATE: December 10, 2007

RECORD OF BOREHOLE 11

SHEET 1 OF 1

DATUM: Geodetic

SPT HAMMER: 63.6 kg; drop 0.76 m

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80); SHEAR STRENGTH Cu, kPa (nat. V - +, rem. V - ⊖, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-7} 10^{-6} 10^{-5} 10^{-4}); WATER CONTENT, PERCENT (Wp, W, Wl; 20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0	Power Auger 200 mm Diameter Hollow Stem	Ground Surface		91.08							
		ASPHALT									
		Grey brown sand and gravel, some silt (BASE / SUBBASE MATERIAL)		0.08	1	CS					Cement Sand
					2	CS					Bentonite seal
1		Loose grey brown fine to medium grained sand, some silt and gravel (FILL)		90.32 0.76	3	50 DO	9				
		Dark grey brown silty sand, some organic material (POSSIBLE FORMER TOPSOIL)		89.81 1.27							
		Loose brown fine to coarse grained SAND, some silt		89.41 1.67	4	50 DO	5				
2		Compact grey SILTY SAND		88.88 2.21	5	50 DO	11			MH	Sand
3		Firm grey SILTY CLAY		88.03 3.05	6	50 DO	2	⊕ + ⊕ +			19 mm diameter hand slotted PVC pipe
4		End of borehole		86.81 4.27							Groundwater level in well screen at 1.39 m below ground surface on January 7, 2008.
5											
6											
7											
8											
9											
10											

DEPTH SCALE

1 to 50

Houle Chevrier Engineering Ltd.

LOGGED: R.F.

CHECKED: AC

BOREHOLE RECORD 07-688 BH'S.GPJ MHECL.GDT 3/13/08

PROJECT: 07-688

LOCATION: Refer to Site Plan, Figure 2

BORING DATE: December 10, 2007

RECORD OF BOREHOLE 12

SHEET 1 OF 1

DATUM: Geodetic

SPT HAMMER: 63.6 kg; drop 0.76 m

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m; SHEAR STRENGTH Cu, kPa (nat. V - +, rem. V - ⊕, Q -●, U -○)	HYDRAULIC CONDUCTIVITY, k, cm/s; WATER CONTENT, PERCENT (Wp, W, Wl)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0	Power Auger 200 mm Diameter Hollow Stem	Ground Surface		91.34							
		Grey brown sand and gravel, some silt (BASE / SUBBASE MATERIAL)		91.06 / 0.28	1	CS			O		
		Brown fine to coarse grained sand, some silt (FILL)			2	CS			O		
1				90.28 / 1.06	3	50 DO	3		O		
		Dark grey brown silty sand, some organic material (POSSIBLE FORMER TOPSOIL)		89.69 / 1.65							
2		Loose to compact brown to grey fine to medium grained and fine to coarse grained SAND, trace to some silt			4	50 DO	10		O		
					5	50 DO	9		O		
3					6	50 DO	5		O		
4					7	50 DO	1		O		
		Firm grey SILTY CLAY		87.07 / 4.27							
		End of borehole		86.92 / 4.42							
5											
6											
7											
8											
9											
10											

Groundwater level in open hole not observed. Samples wet starting at 1.8m depth

DEPTH SCALE

1 to 50

Houle Chevrier Engineering Ltd.

LOGGED: R.F

CHECKED: AC

BOREHOLE RECORD 07-688 BH'S.GPJ MHECL.GDT 3/13/08

PROJECT: 07-688

RECORD OF TEST PIT 2

SHEET 1 OF 1

LOCATION: Refer to Site Plan, Figure 1

DATUM: Geodetic

DATE OF EXCAVATION: January 24, 2008

TYPE OF EXCAVATOR: Backhoe

DEPTH SCALE METRES	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLE NUMBER	SHEAR STRENGTH, Cu (kPa) — Natural, V - +; Remoulded, V - ⊕ (20, 40, 60, 80)	WATER CONTENT (PERCENT) — Wp, W, Wl (20, 40, 60, 80)	ADDITIONAL LAB. TESTING	WATER LEVEL IN OPEN TEST PIT OR STANDPIPE INSTALLATION
0	Ground Surface		90.39					
	Dark brown silty sand (TOPSOIL)		90.09 / 0.30					
1	Grey brown silty sand, some gravel, cobbles and boulders (GLACIAL TILL)							▽ Water level at 1.1m below ground surface 15 minutes after excavating on January 24, 2008.
			88.79 / 1.60					
2	Practical refusal to excavating on possible bedrock End of test pit Notes: 1. Surface water inflow from the ditch obscured observation of the soil and bedrock conditions. Therefore, the soil and bedrock depths should be considered as approximate only.							
3								
4								
5								
6								
7								
8								
9								
10								

TESTPIT_RECORD 07-688 TP'S.GPJ MHECL.GDT 3/13/08

DEPTH SCALE

1 to 50

Houle Chevrier Engineering Ltd.

LOGGED: A.N

CHECKED: AC

PROJECT: 07-688

RECORD OF TEST PIT 3

SHEET 1 OF 1

LOCATION: Refer to Site Plan, Figure 1

DATUM: Geodetic

DATE OF EXCAVATION: January 24, 2008

TYPE OF EXCAVATOR: Backhoe

DEPTH SCALE METRES	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLE NUMBER	SHEAR STRENGTH, Cu (kPa) — Natural, V - +, Remoulded, V - ⊕ (20, 40, 60, 80)	WATER CONTENT (PERCENT) — Wp, W, Wt (20, 40, 60, 80)	ADDITIONAL LAB. TESTING	WATER LEVEL IN OPEN TEST PIT OR STANDPIPE INSTALLATION
0	Ground Surface		90.50					
	Dark brown silty sand (TOPSOIL)		90.30 / 0.20					
	Brown SAND, some silt		90.00 / 0.50					
1	Grey brown silty sand, some gravel, cobbles and boulders (GLACIAL TILL)							
2			88.35 / 2.15					
	Possible fractured BEDROCK		88.05 / 2.45					
	Practical refusal to excavating on possible bedrock End of test pit Notes: 1. Surface water inflow from the ditch obscured observation of the soil and bedrock conditions. Therefore, the soil and bedrock depths should be considered as approximate only. 2. Groundwater inflow observed from the bedrock.							Water level at 0.5m below ground surface 15 minutes after excavating on January 24, 2008.
3								
4								
5								
6								
7								
8								
9								
10								

DEPTH SCALE
1 to 50

Houle Chevrier Engineering Ltd.

LOGGED: A.N.

CHECKED: AC

TESTPIT_RECORD 07-688 TPS.GPJ MHECL.GDT 3/13/08

PROJECT: 07-688

RECORD OF TEST PIT 4

SHEET 1 OF 1

LOCATION: Refer to Site Plan, Figure 1

DATUM: Geodetic

DATE OF EXCAVATION: January 24, 2008

TYPE OF EXCAVATOR: Backhoe

DEPTH SCALE METRES	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLE NUMBER	SHEAR STRENGTH, Cu (kPa) (Natural, V - +; Remoulded, V - ⊕) 20 40 60 80	WATER CONTENT (PERCENT) Wp W Wl 20 40 60 80	ADDITIONAL LAB. TESTING	WATER LEVEL IN OPEN TEST PIT OR STANDPIPE INSTALLATION
0	Ground Surface		90.98					
	Dark brown silty sand (TOPSOIL)		90.85 / 0.13					
	Brown SAND, some silt		90.47 / 0.51					
1	Grey brown silty sand, some gravel, cobbles and boulders (GLACIAL TILL)							▽
			89.25 / 1.73					
2	Practical refusal to excavating on possible bedrock End of test pit Notes: 1. Surface water inflow from teh ditch obscured observation of the soil and bedrock conditions. Therefore, the soil and bedrock depths should be considered as approximate only.							Water level at 0.97m below ground surface 10 minutes after excavating on January 24, 2008.
3								
4								
5								
6								
7								
8								
9								
10								

DEPTH SCALE

1 to 50

Houle Chevrier Engineering Ltd.

LOGGED A.N.

CHECKED AC

TESTPIT_RECORD 07-688 TP'S.GPJ MHECL.GDT 3/13/08

PROJECT: 07-688

RECORD OF TEST PIT 5

SHEET 1 OF 1

LOCATION: Refer to Site Plan, Figure 1

DATUM: Geodetic

DATE OF EXCAVATION: January 24, 2008

TYPE OF EXCAVATOR: Backhoe

DEPTH SCALE METRES	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLE NUMBER	SHEAR STRENGTH, Cu (kPa) — Natural, V - ; Remoulded, V - ⊕ (20 40 60 80)	WATER CONTENT (PERCENT) — Wp, W, Wl (20 40 60 80)	ADDITIONAL LAB. TESTING	WATER LEVEL IN OPEN TEST PIT OR STANDPIPE INSTALLATION
0	Ground Surface		90.51					
	Dark brown silty sand (TOPSOIL)		90.33 / 0.18					
	Brown SAND, some silt		89.81					
1	Grey brown silty sand, some gravel, cobbles and boulders (GLACIAL TILL)		0.70 / 89.33					
	Possible fractured BEDROCK		1.18					
2	Practical refusal to excavating on possible bedrock End of test pit		88.49 / 2.02					Water level at 1.22m below ground surface 10 minutes after excavating on January 24, 2008.
3	Notes: 1. Surface water inflow from the ditch obscured observation of the soil and bedrock conditions. Therefore, the soil and bedrock depths should be considered as approximate only.							
4								
5								
6								
7								
8								
9								
10								

DEPTH SCALE

1 to 50

Houle Chevrier Engineering Ltd.

LOGGED: A N

CHECKED:

TESTPIT_RECORD_07-688 TPS.GPJ_MHECL.GDT 3/13/08

PROJECT: 07-688

RECORD OF TEST PIT 6

SHEET 1 OF 1

LOCATION: Refer to Site Plan, Figure 1

DATUM: Geodetic

DATE OF EXCAVATION: January 24, 2008

TYPE OF EXCAVATOR: Backhoe

DEPTH SCALE METRES	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)
0	Ground Surface		90.50
	Dark brown silty sand (TOPSOIL)		90.27 / 0.23
1	Brown SILY SAND		89.38 / 1.12
	Grey brown silty sand, some gravel, cobbles and boulders (GLACIAL TILL)		88.60 / 1.90
2	Practical refusal to excavating on possible bedrock End of test pit Notes: 1. Surface water inflow from the ditch obscured observation of the soil and bedrock conditions. Therefore, the soil and bedrock depths should be considered as approximate only.		
3			
4			
5			
6			
7			
8			
9			
10			

SAMPLE NUMBER

SHEAR STRENGTH, Cu (kPa)
Natural, V - +
Remoulded, V - ⊕
20 40 60 80

WATER CONTENT (PERCENT)
Wp W Wl
20 40 60 80

ADDITIONAL LAB. TESTING

WATER LEVEL IN OPEN TEST PIT OR STANDPIPE INSTALLATION

Water level at 1.5m below ground surface 10 minutes after excavating on January 24, 2008.

DEPTH SCALE
1 to 50

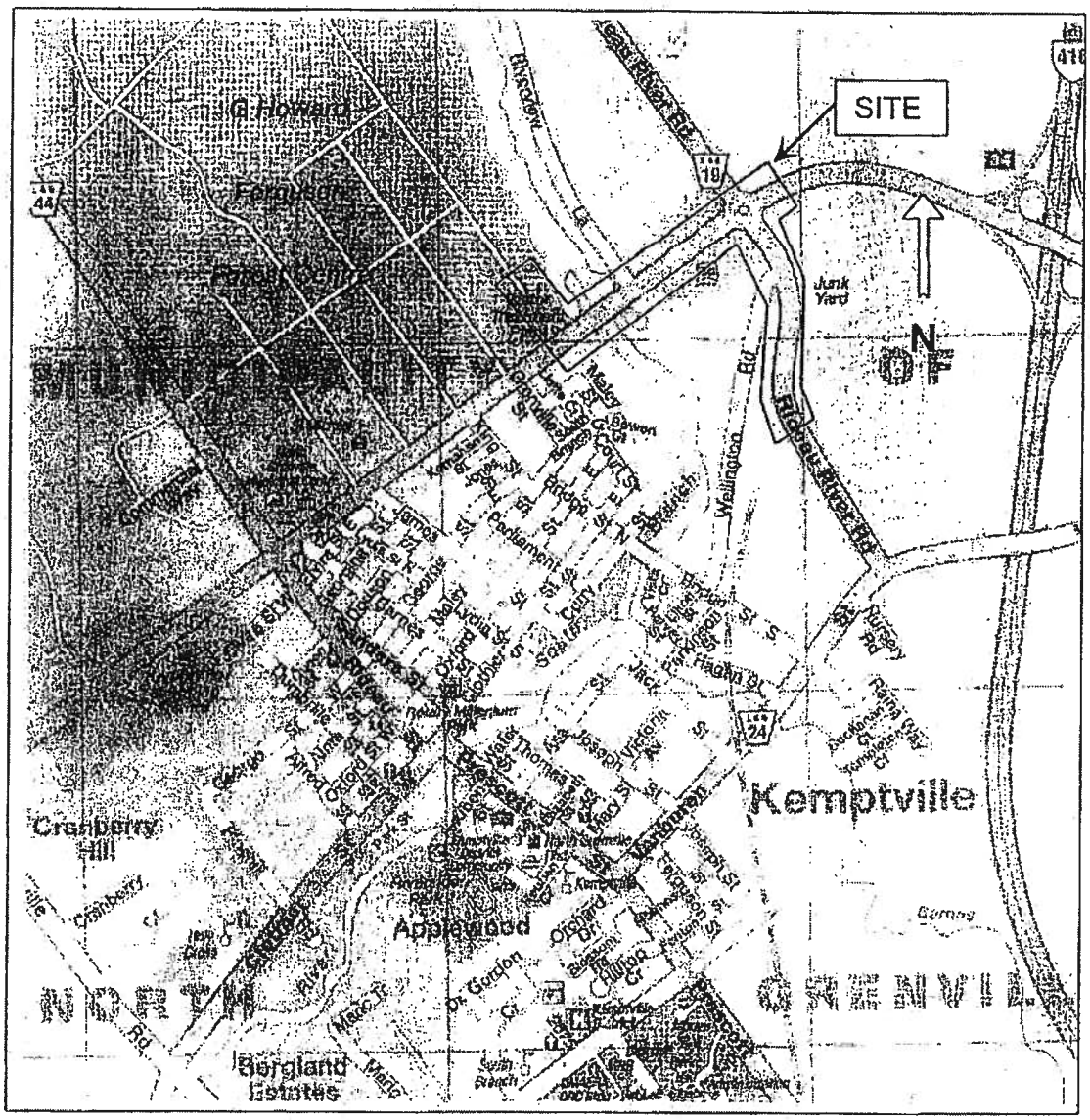
Houle Chevrier Engineering Ltd.

LOGGED: AN

CHECKED:

TESTPIT RECORD 07-688 TP'S.GPJ MHECL.GDT 3/13/08

KEY PLAN	FIGURE 1



SCALE
N.T.S

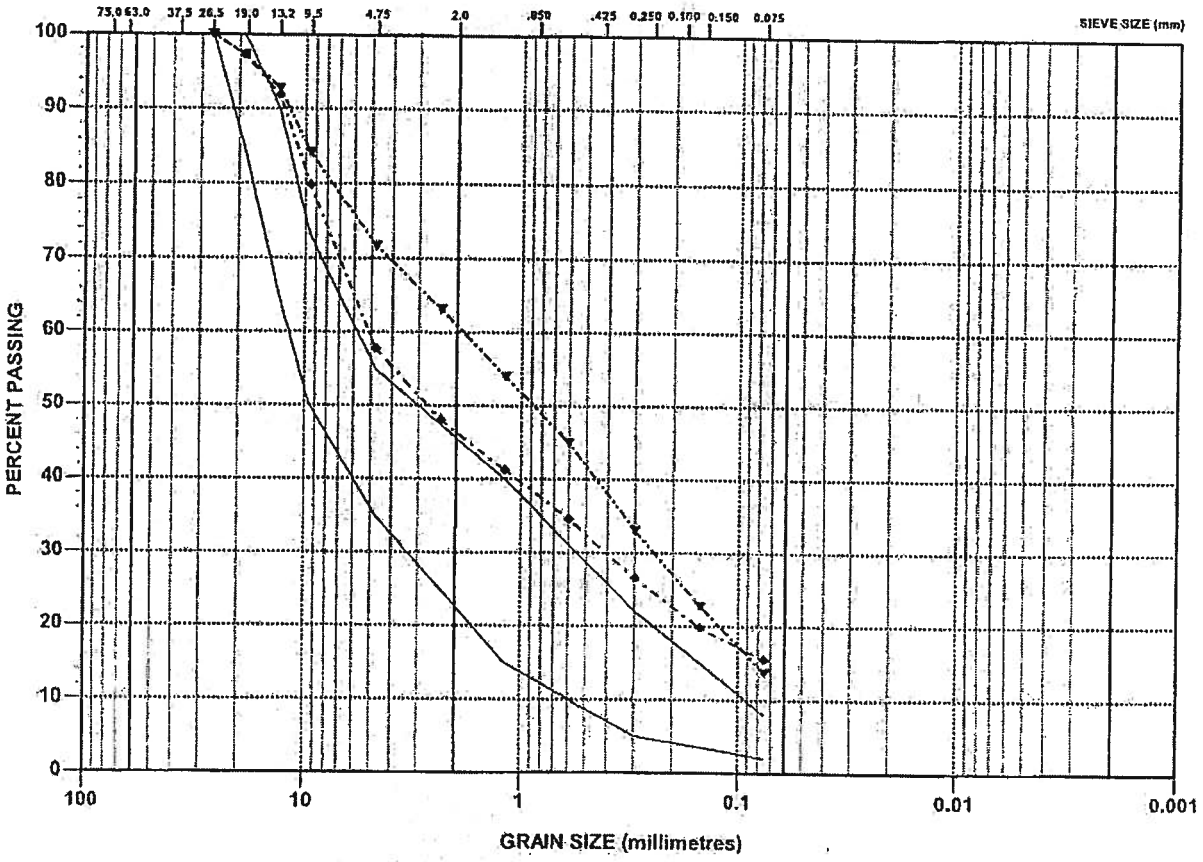
Houle Chevrier Engineering

Date: March 2008

Project: 07-688

GRAIN SIZE DISTRIBUTION
BASE / SUBBASE
ACCESS ROAD

FIGURE 3



COBBLE	COARSE	MEDIUM	FINE	COARSE	MEDIUM	FINE	SILT	CLAY
	GRAVEL			SAND			FINE GRAINED	
MODIFIED M.I.T. CLASSIFICATION								

LEGEND
- OPSS Granular A
- BH 1 SAMPLE 1
- BH 4 SAMPLE 1

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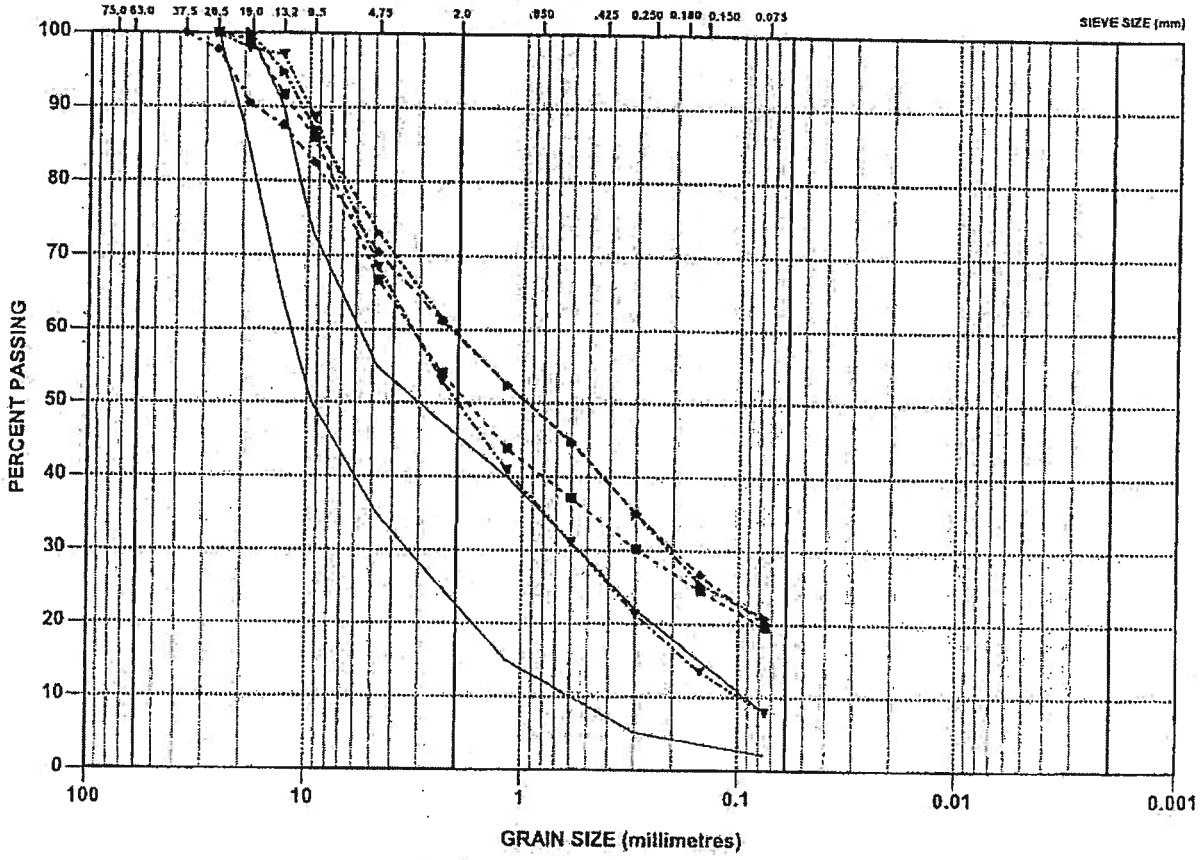
Date February 2008

Project 07-688

GRAIN SIZE DISTRIBUTION.
BASE / SUBBASE
COUNTY ROAD 43

FIGURE 4



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	GRAVEL			SAND			FINE GRAINED	
MODIFIED M.I.T. CLASSIFICATION								

LEGEND

- OPSS Granular A
- BH 5 SAMPLE 1
- BH 5 SAMPLE 2
- BH 8 SAMPLE 1
- BH 8 SAMPLE 2

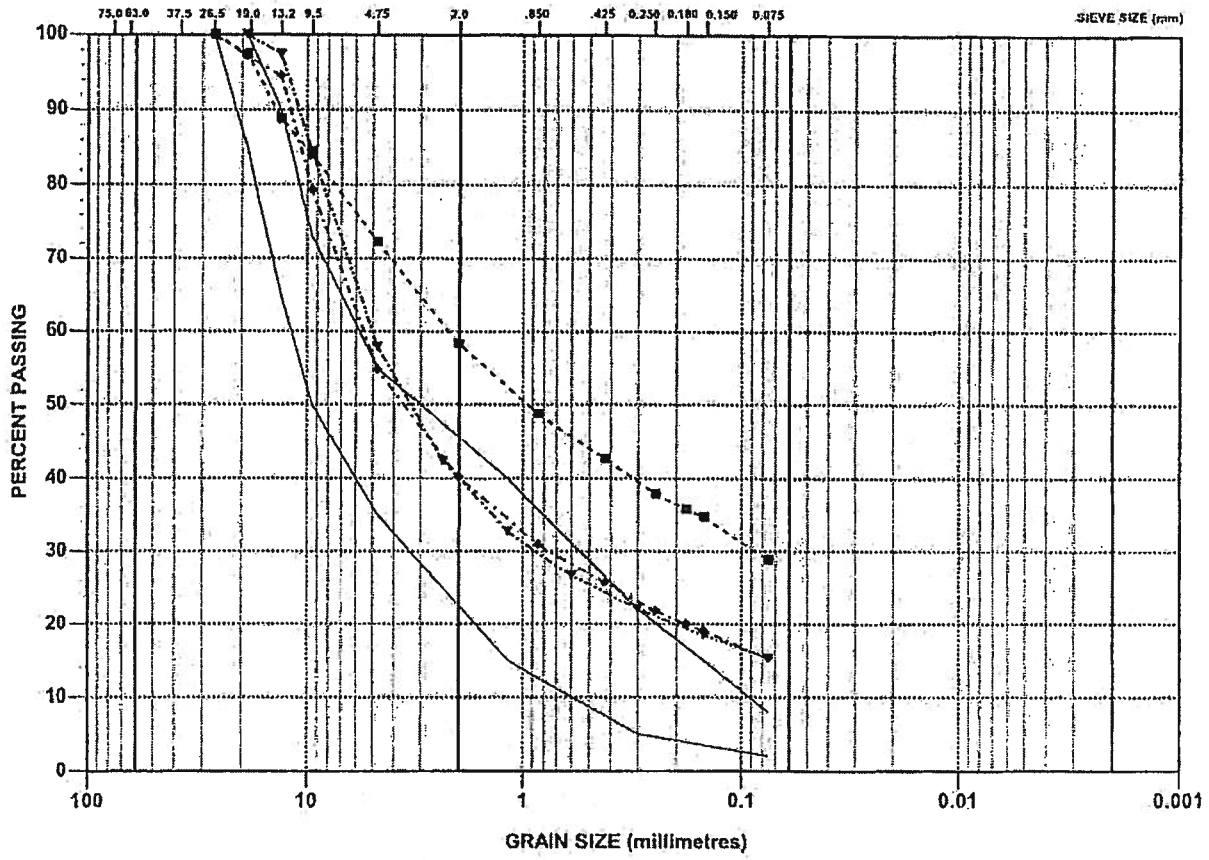
Houle Chevrier Engineering

Date February 2008

Project 07-688

GRAIN SIZE DISTRIBUTION
BASE / SUBBASE
COUNTY ROAD 19

FIGURE 5



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	GRAVEL			SAND			FINE GRAINED	
MODIFIED M.I.T. CLASSIFICATION								

LEGEND

- OPSS Granular A
- BH 15 SAMPLE 1
- BH 16 SAMPLE 1
- BH 20 SAMPLE 1

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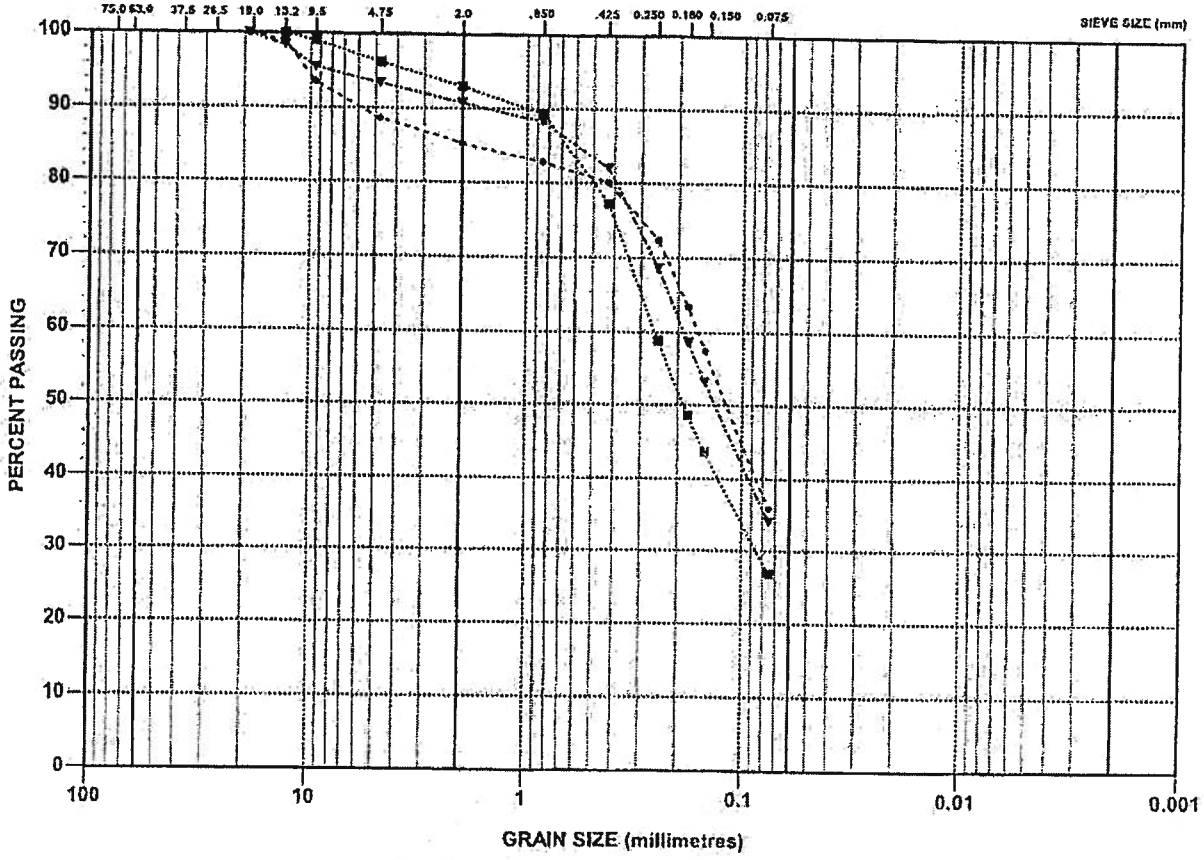
Date February 2008

Project 07-688

GRAIN SIZE DISTRIBUTION
FILL MATERIAL -
ACCESS ROAD TO TREATMENT PLANT

FIGURE 6



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MODIFIED M.I.T. CLASSIFICATION								

LEGEND		
BH 1	SAMPLE 4
BH 3	SAMPLE 3
BH 4	SAMPLE 4

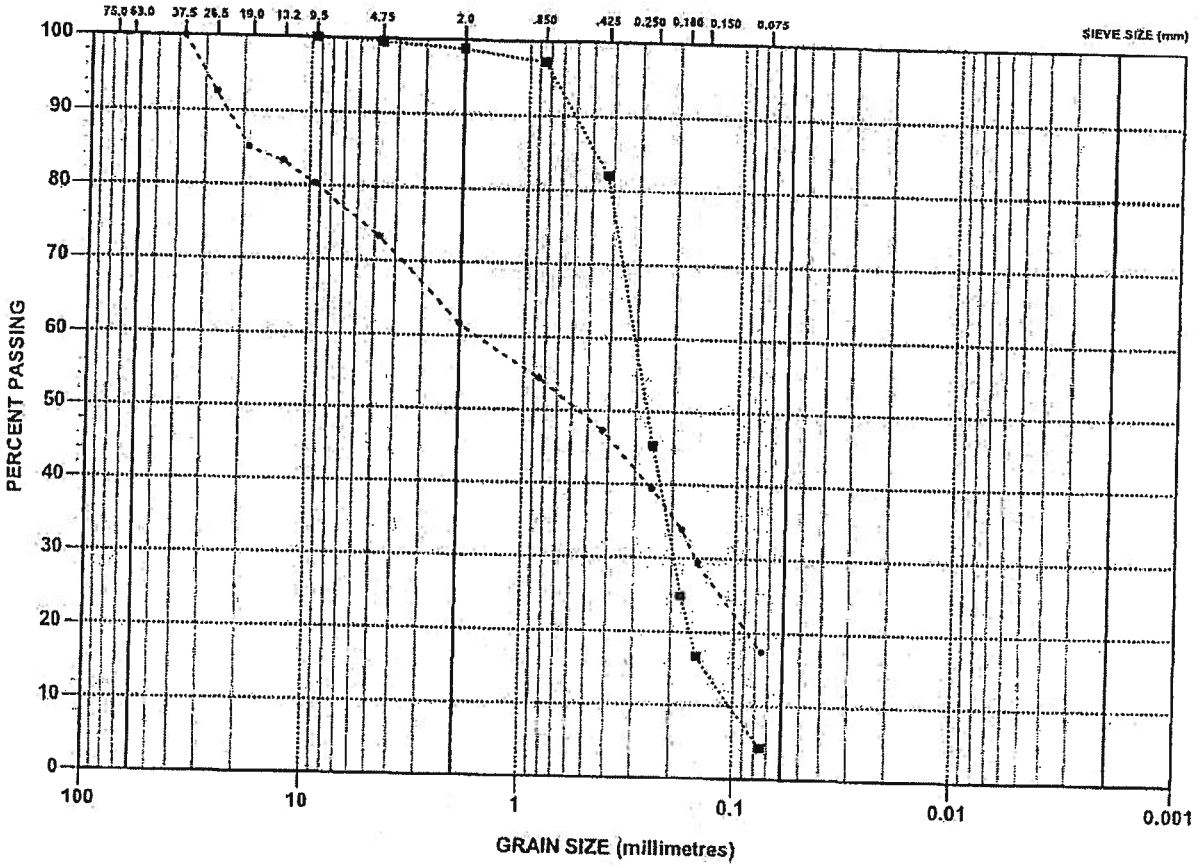
Houle Chevrier Engineering

Date February 2008

Project 07-688

GRAIN SIZE DISTRIBUTION
FILL MATERIAL -
APPROACH EMBANKMENT AT KEMPTVILLE CREEK BRIDGE

FIGURE 7



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MODIFIED M.I.T. CLASSIFICATION								

LEGEND

BH 5 SAMPLE 5

BH 6 SAMPLE 4

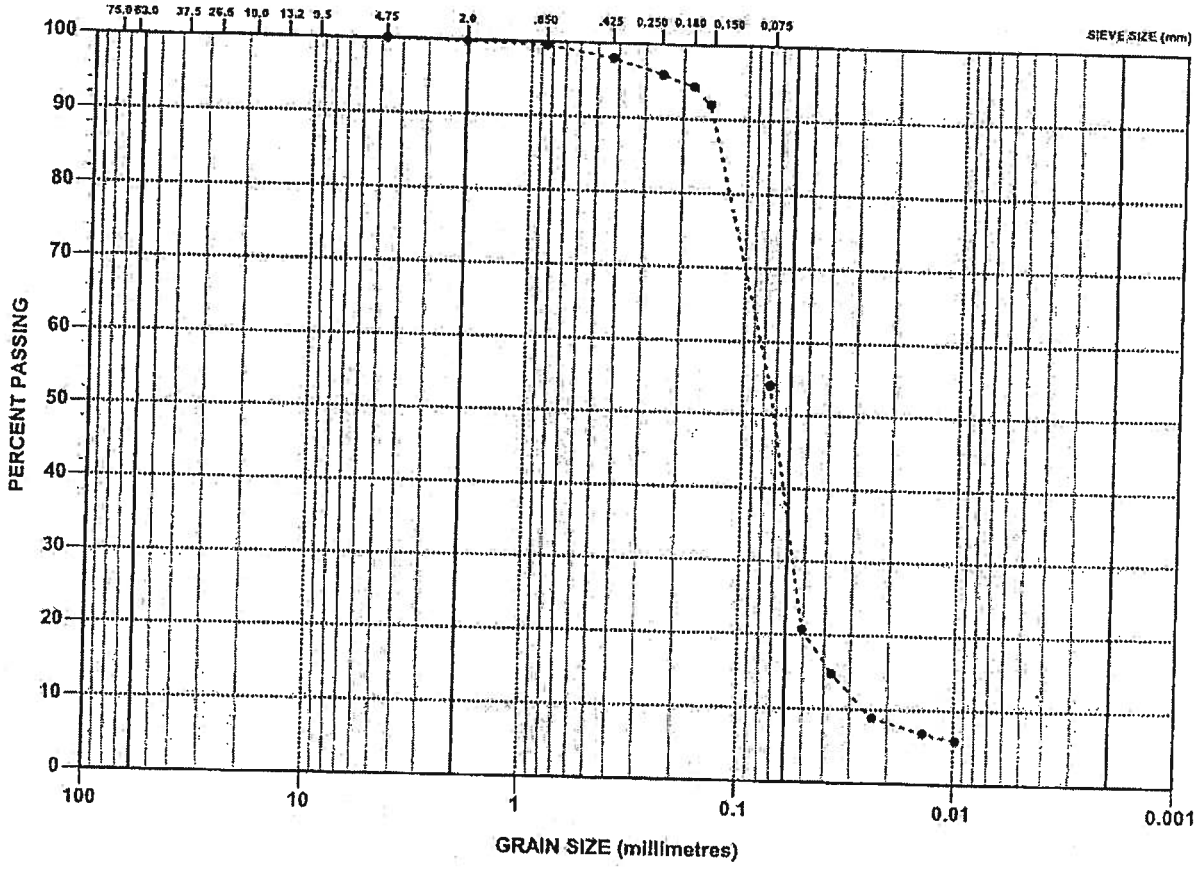
Houle Chevrier Engineering

Date February 2008

Project 07-688

GRAIN SIZE DISTRIBUTION
NATIVE SILTY SAND

FIGURE 8



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MODIFIED M.I.T. CLASSIFICATION

LEGEND
BH 11 SAMPLE 5

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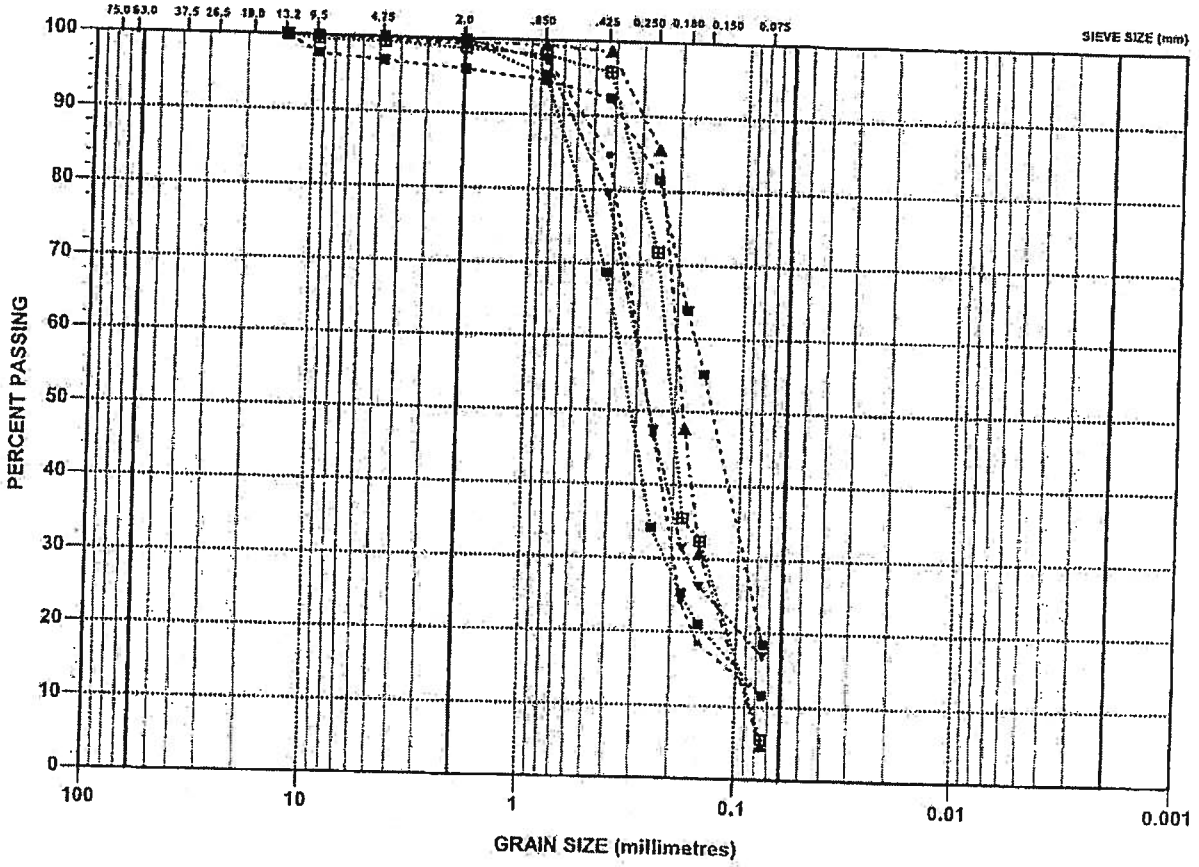
GRAIN SIZE DISTRIBUTION
NATIVE SAND

FIGURE 9



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	GRAVEL			SAND			FINE GRAINED	
MODIFIED M.I.T. CLASSIFICATION								

LEGEND		
	BH 7	SAMPLE 4
	BH 8	SAMPLE 4
	BH 9	SAMPLE 4
	BH 12	SAMPLE 5
	BH 14	SAMPLE 4
	BH 15	SAMPLE 4

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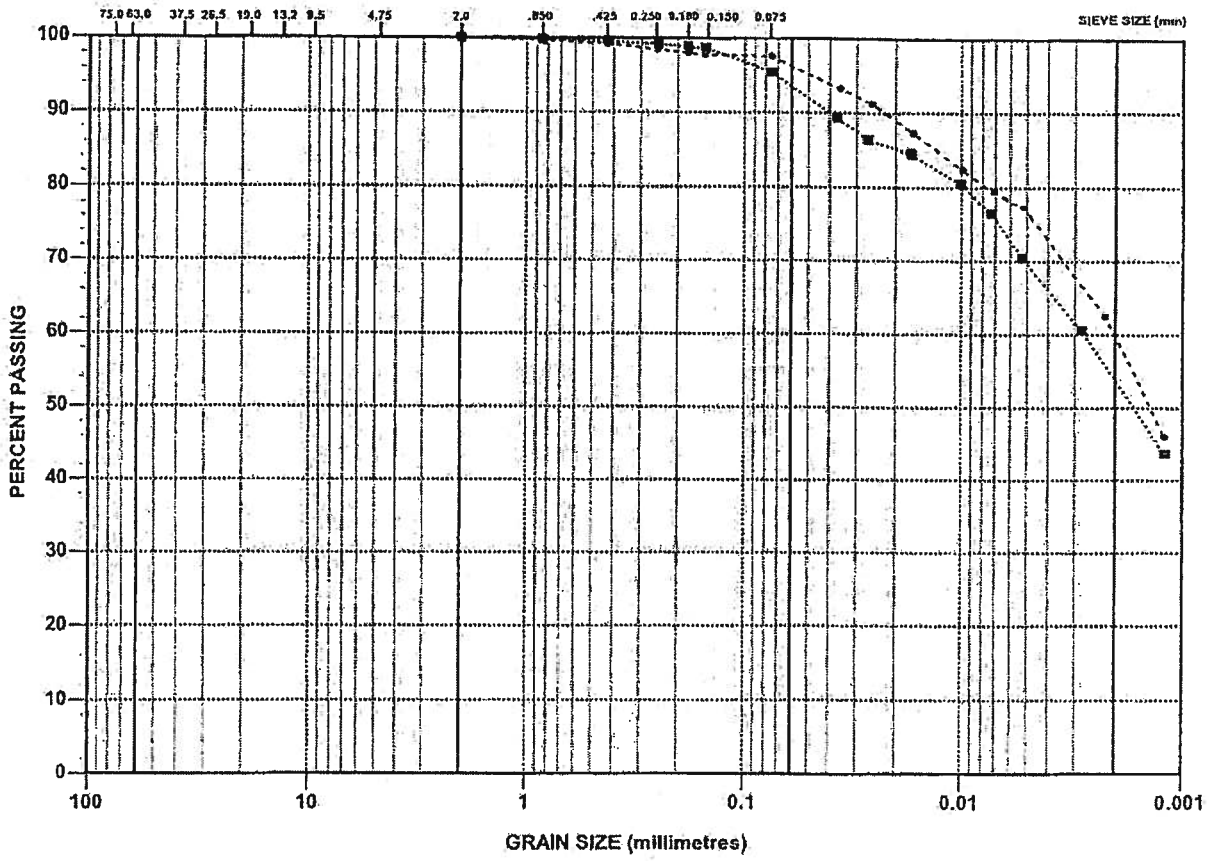
Date February 2008

Project 07-688

GRAIN SIZE DISTRIBUTION
- NATIVE SILTY CLAY -

FIGURE 10



COBBLE	COARSE	MEDIUM	FINE	COARSE	MEDIUM	FINE	SILT	CLAY
	GRAVEL			SAND			FINE GRAINED	
MODIFIED M.I.T. CLASSIFICATION								

LEGEND

BH 6 SAMPLE 8

BH 15 SAMPLE 6

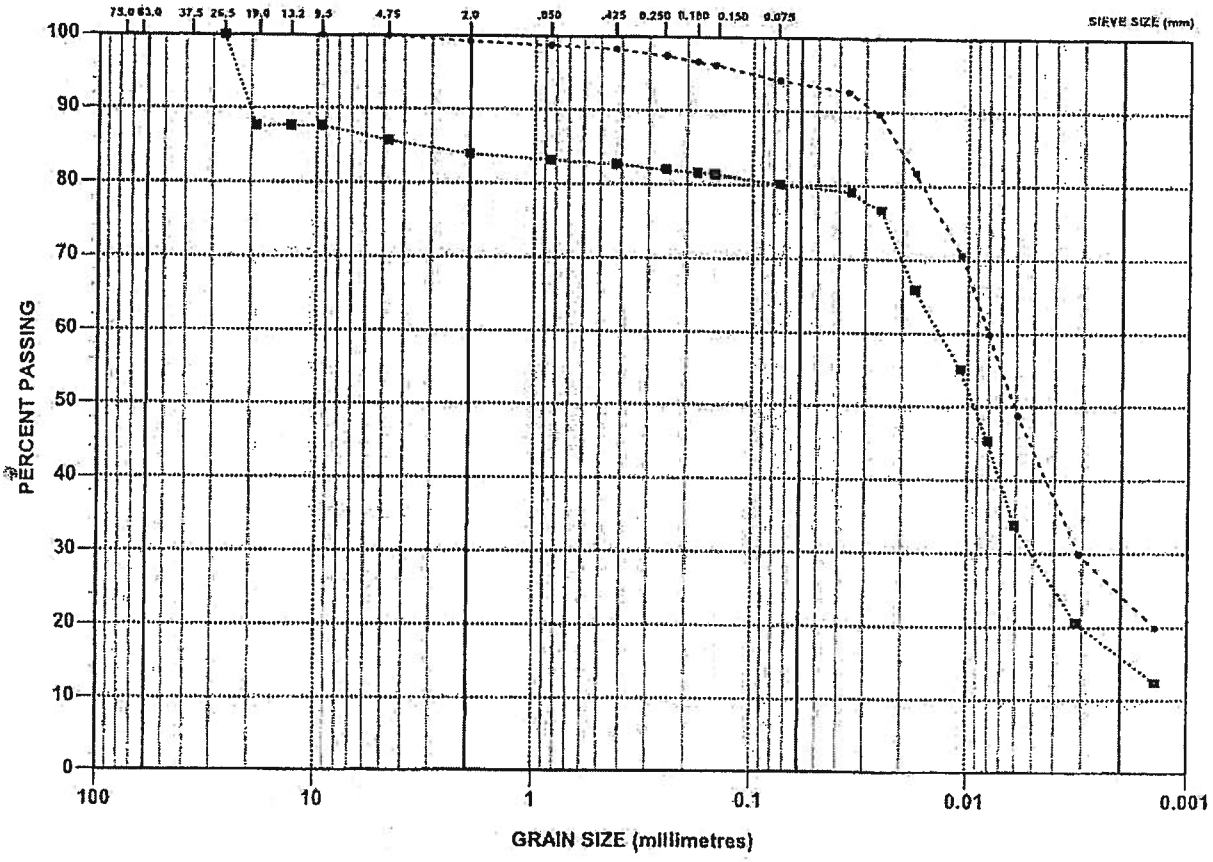
Houle Chevrier Engineering

Date January 2008

Project 07-656

GRAIN SIZE DISTRIBUTION
NATIVE CLAYEY SILT, SILT

FIGURE 11



COBBLE	GRAVEL			SAND			SILT	CLAY
	COARSE	MEDIUM	FINE	COARSE	MEDIUM	FINE	FINE GRAINED	

MODIFIED M.I.T. CLASSIFICATION

LEGEND

BH 9 SAMPLE 6

BH 16 SAMPLE 9

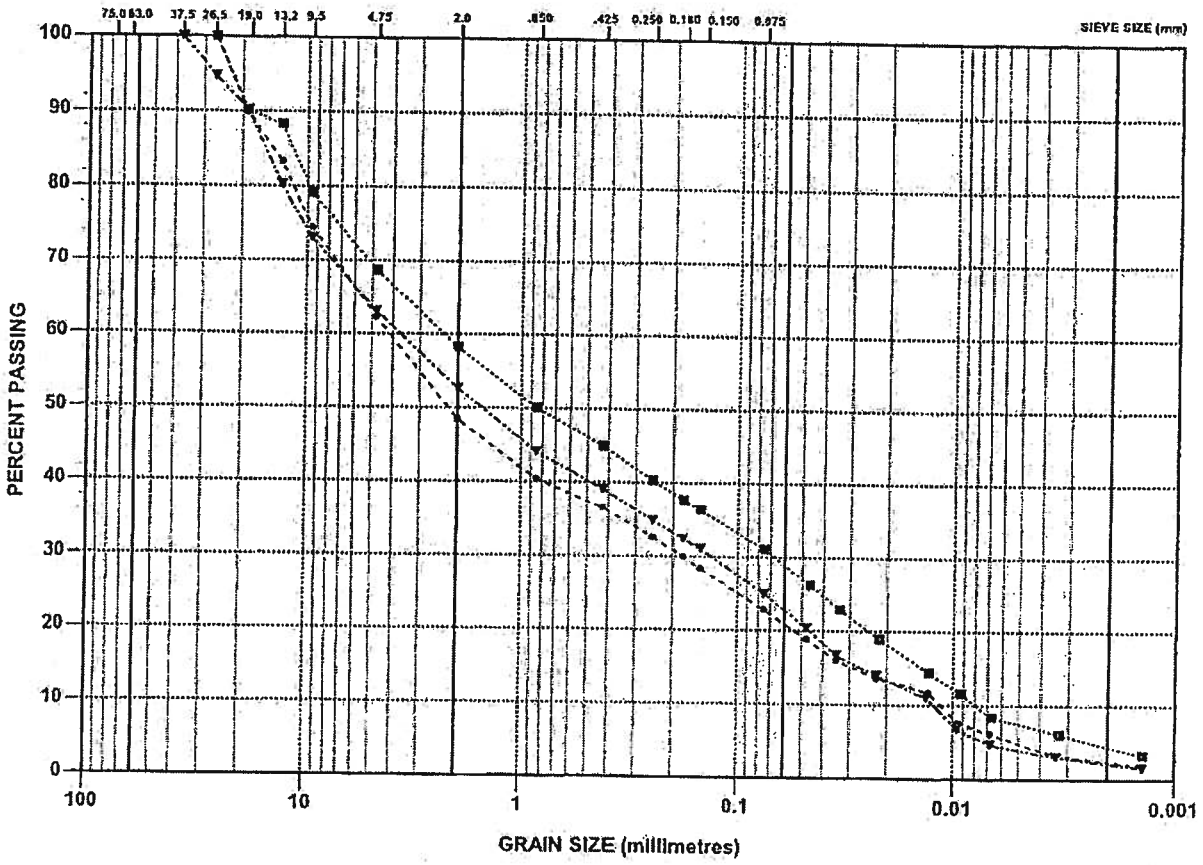
Houle Chevrier Engineering

Date February 2008

Project 07-688

GRAIN SIZE DISTRIBUTION
- GLACIAL TILL -

FIGURE 12



COBBLE	GRAVEL			SAND			SILT	CLAY
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MODIFIED M.I.T. CLASSIFICATION

LEGEND

--●--	BH 5	SAMPLE 9
···■···	BH 20	SAMPLE 5
--▼--	BH 22B	SAMPLE 3

Houle Chevrier Engineering

Date: January 2008

Project: 07-656

Appendix F

Traffic Report

AECOM

United Counties of Leeds and Grenville

Traffic Report

Prepared by:

AECOM Canada Ltd.
654 Norris Court, Kingston, ON, Canada K7P 2R9
T 613.389.3703 F 613.389.6729 www.aecom.com

Project Number:

108480

Date:

August 1, 2009

Statement of Qualifications and Limitations

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The information, data, recommendations and conclusions contained in the Report:

- are subject to the budgetary, time, scope, and other constraints and limitations in the Agreement and the qualifications contained in the Report (the "Limitations");
- represent Consultants' professional judgement in light of the Limitations and industry standards for the preparation of similar reports;
- may be based on information provided to Consultant which has not been independently verified;
- have not been updated since the date of issuance of the Report and their accuracy is limited to the time period and circumstances in which they were collected, processed, made or issued;
- must be read as a whole and sections thereof should not be read out of such context;
- were prepared for the specific purposes described in the Report and the Agreement;
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This Statement of Qualifications and Limitations is attached to and forms part of the Report.

June 30, 2009 Project Number: 108480

Mr. Les Sheppard
Director of Works, Planning Services and Asset Management
United Counties of Leeds and Grenville
25 Central Avenue West, Suite 100
Brockville, Ontario K6V 4N6

Dear Mr. Sheppard:

Re: Updated Traffic Report for the Class EA of County Road 43, Kemptville Corridor.

Please find attached the updated Traffic Report for County Road 43 between Somerville Road in the west and the MTO boundary of Highway 416 in the east.

The report details the existing conditions of the corridor and provides recommendations for improvements to the corridor in the interim and the future.

Please contact this office should you have any enquiries.

Sincerely,
AECOM Canada Ltd.

Stephen Sargeant, P.Eng., PTOE
stephen.sargeant@aecom.com

Encl.

cc:

Signature Page

Report Prepared By:

Stephen Sargeant, P.Eng., PTOE
Transportation Engineer

Report Reviewed By:

Guy Laporte, P.Eng.
Project Manager

Executive Summary

A traffic study was conducted for the CR 43 corridor between Highway 416 and Somerville Road in Kemptville, Ontario. The study consisted of a review of previous traffic studies and planning studies, confirmation of the underlying land use assumptions, collection of new traffic data at key points in the corridor, updating the future traffic projections, and evaluation of the existing traffic volumes and future projections.

The assumptions of the previous studies have not materially changed and were appropriate to use in the updated study. Land uses have remained consistent with the information that was used in the Corridor Master Plan.

The new counts recorded a maximum one-hour directional volume of 995 vehicles immediately west of CR 19. This indicates the westbound lane is currently above the planning capacity during the PM peak hour.

Improperly utilized pedestrian controls and other crossing issues were identified in the area between James Street and CR 44.

Mainline volumes of 30,000 vehicles per day can be expected on the busiest section of CR 43 by 2029. West of Somerville Road the 2029 future projections are 14,000 vpd which can be accommodated by a two-lane cross section, depending on access locations.

The major conclusion is that by 2019, the corridor will require two through lanes in each direction from Highway 416 to Somerville Road. The continued growth in the area will increase traffic volumes and exceed the the planning criteria for the corridor.

Recommended improvements include: widening of the corridor, upgrades to the intersection control and major intersections, access management, installation of pedestrian and cyclist facilities, and installation of design elements to accommodate visual and mobility impaired pedestrians.

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List of Tables

Appendices

A. Appendix Title
B. Appendix Title

1. Introduction

AECOM has been retained by the United Counties of Leeds and Grenville to conduct a transportation study as part of the Schedule C component of a Municipal Class Environmental Study being undertaken for County Road 43 (CR 43) through Kemptville.

1.1 Scope

The object of the study is to determine improvements associated with the widening of CR 43 to four through lanes (two eastbound and two westbound) as has previously been recommended as part of the County Road 43 Corridor Master Plan in 2005. It is expected that the major traffic issues with the widening of CR 43 will be centred around the proposed bridge widening on CR 43 and the existing traffic signals.

This study builds upon the Master Plan and includes an update of traffic volumes and projections in the corridor. This study was conducted in parallel to the development of an access management plan for the corridor.

2. Study Area

The study area for this project extends along CR 43 from the intersection of Somerville Road to the MTO boundary of Highway 416. This is an approximate distance of 3.2 km. The Study Area is illustrated in **Figure 1.** This is a smaller area than the study area for the CR 43 Master Plan as the proposed widening does not include any of CR 43 east of Highway 416. Adjacent properties are considered part of the study area as their access points have a direct impact on CR 43.

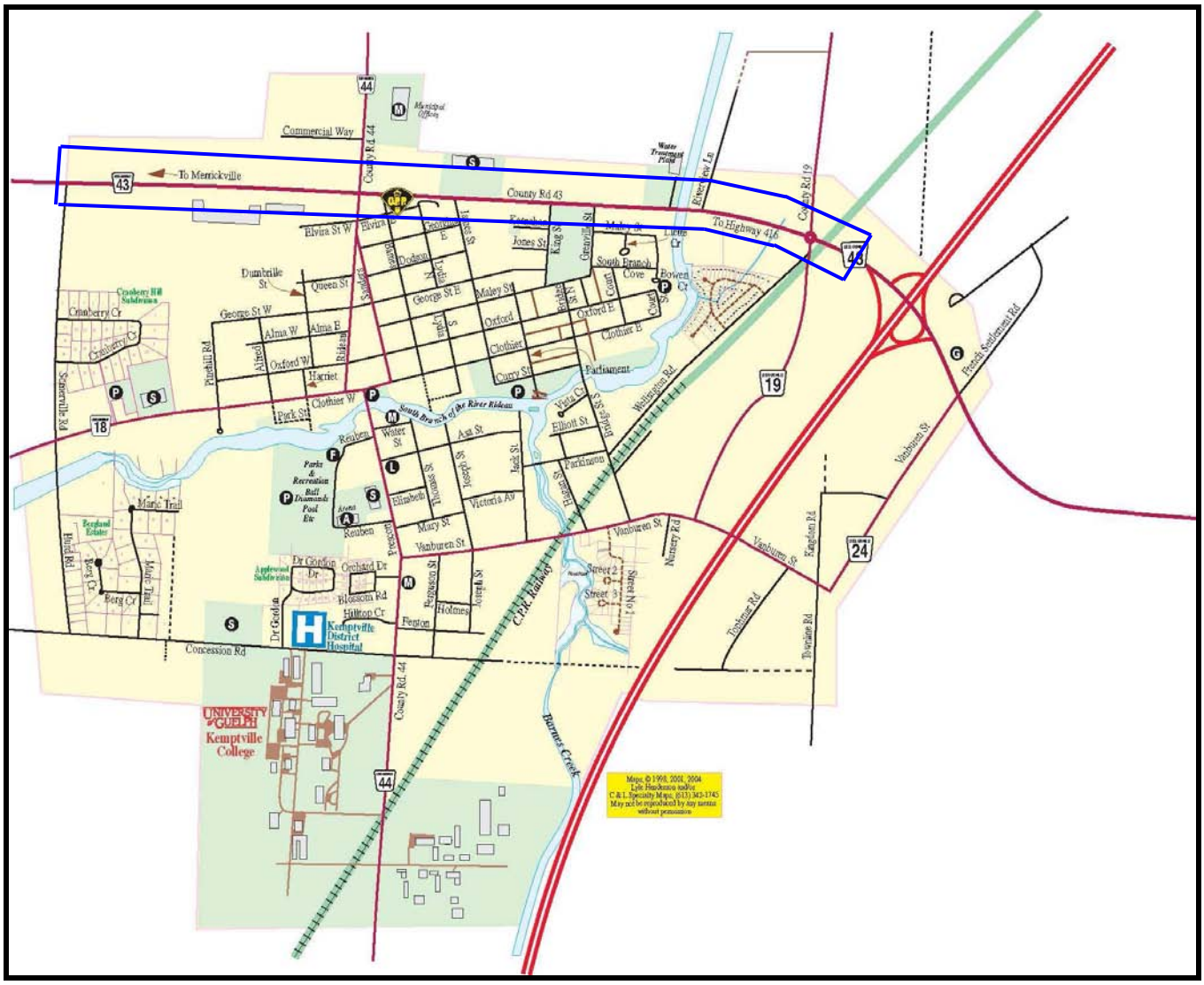


Figure 1 – Study Area

3. Existing Conditions

3.1 Background Information and Data

A number of reference documents were used in completing this study. Standard applicable codes and government policies were followed. The following documents were used as part of the development of the study.

- *Microsimulation of a Roundabout – A Reality Test* – Keen, S; Ma, T; and Sargeant, S
- Traffic impact study for Colonnade commercial development southwest of Highway 416 by Novatec.
- *County Road 43 Corridor Study – County Road 22 to Somerville Road, Kemptville* by TSH. November 2005. Includes all of the documents referenced in the previous study.
- Previous traffic counts
- Ontario Ministry of Transportation Traffic Database

3.2 Site Inspection

AECOM staff conducted site inspections on multiple occasions including April 28 and 29, 2009 when the traffic data collection occurred. Observations were recorded with video tape, photographs and field notes. Appendix A contains photos taken during the site inspection.

3.3 Traffic Counts

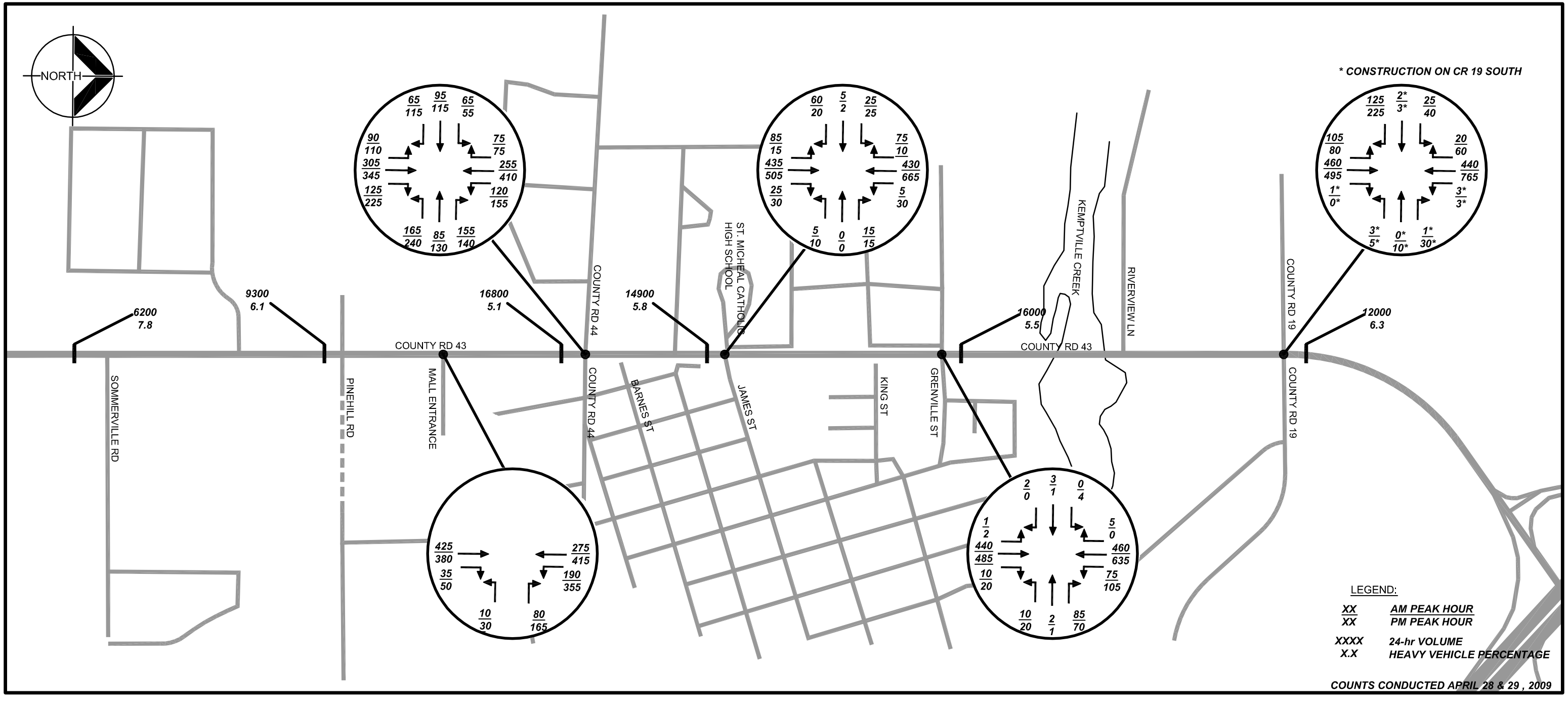
Traffic counts represent a snapshot of corridor operations. A typical operational day may include delays, lost tourists, minor accidents and/or construction. The transportation study for the CR 43 Master Plan included traffic counts at 15 intersections during June 2005. A complete reproduction of those counts was not necessary to update the traffic data. AECOM staff and our sub-consultant Ritchie Traffic Services completed counts at five key intersections and four strategic points between intersections. The counts were delayed from early April due to poor weather and the Easter holiday. During the afternoon count on the 28th it rained briefly while the other counts on the 29th had good weather. Both days were representative of typical operations in the corridor as school was in session, no major events were underway and road construction activities were at a minimum. **Figure 2** illustrates the peak hour counts and the daily totals for the April 2009 counts.

3.4 Links

The recorded link volumes in the corridor are a measure of the capacity between intersections. The CR 43 Master Plan used 900 vehicles per hour (vph) as the planning level at which a single lane is considered at capacity. Each direction of the link is considered independently. That metric is also being used to evaluate link capacity for this study.

Figure 2- Existing Traffic Volumes

AECOM Project #108480 COUNTY ROAD 43 CORRIDOR CLASS EA
JULY 2009



The maximum recorded one-hour directional volume was 995 vehicles immediately west of CR 19. This indicates the westbound lane is currently above the planning capacity during the PM peak hour. The peak one-hour, two-way volume was 1436 vehicles between Kemptville Mall Access and CR 44 between 4:15 and 5:15 pm.

3.5 Intersection Operations

The five intersections counted were analyzed using Synchro version 7 (build 614) and Sidra Intersection following the Highway Capacity Manual parameters. The existing intersection configuration was used, with traffic volumes, truck percentages and peak hour factors from the 2009 traffic counts conducted by AECOM. The Sidra Intersection and Synchro outputs include multiple measures of effectiveness, including level of service (LOS) and volume to capacity ratio (v/c) for each approach and the overall intersection. LOS is defined in terms of average control delay per vehicle, according to the criteria of the Highway Capacity Manual. The LOS criteria are summarized in **Table 1**

Table 1 - Intersection Level of Service Criteria

Level of Service	Average Control Delay (Seconds per Vehicle)	
	Signals and Roundabouts	Stop Signs
A	≤ 10	≤ 10
B	> 10 - 20	> 10 - 15
C	> 20 - 35	> 15 - 25
D	> 35 - 55	> 25 - 35
E	> 55 - 80	> 35 - 50
F	> 80	> 50

Detailed Synchro and Sidra Intersection analysis printouts are available upon request. **Table 2** summarizes the analysis results in terms of a 2009 LOS and v/c for each intersection.

The intersection operations analysis showed that all through and turning movements at these intersections are operating below capacity. The exiting left turns at the Kemptville Mall and St. Michael's High School experience long delays (LOS F) during the afternoon peak hour. During the peak periods, the minor street movements experience acceptable delays.

CR 19 - During the traffic counts the intersection at CR 19 was in a disrupted state yet continued to operate at an acceptable level of service. As part of a utility upgrade disruption, the circulating roadway and truck apron in the northwest and southeast quadrants had been excavated and backfilled with gravel. Vehicles travel more slowly than usual through the roundabout but overall capacity was not significantly impacted. The circulating roadway of that roundabout has subsequently been repaired. At the same time, the exit of the south leg of the intersection (CR 19) was closed. The overall intersection LOS during the AM peak hour was "A" with the lowest LOS being "B" for the southbound approach. During the PM peak hour the overall LOS was "B" with the lowest LOS being "C" for the southbound approach.

Table 2 – 2009 Level of Service

Intersection	Control Type	Approach or Lane	Peak Hour			
			AM		PM	
			LOS	v/c	LOS	v/c
County Road 19	One-lane roundabout (south leg partially closed due to construction)	Eastbound	A	0.47	A	0.50
		Westbound	A	0.46	A	0.76
		Northbound	B	0.04	B	0.09
		Southbound	B	0.25	C	0.69
		Overall	**A**	**0.47**	**B**	**0.76**
Grenville Street	Stop Sign North and South	Eastbound	A	0.00	A	0.00
		Westbound	A	0.08	A	0.08
		Northbound	C	0.24	C	0.24
		Southbound	C	0.03	C	0.03
James Street/ St. Michael's School	Stop Sign North and South	Eastbound	A	0.09	A	0.02
		Westbound	A	0.01	A	0.03
		Northbound	C	0.08	D	0.15
		Southbound Left	E	0.23	F	0.27
		Southbound Right	B	0.12	B	0.05
County Road 44	Traffic Signal	Eastbound Left	A	0.24	A	0.41
		Eastbound Through	A	0.49	A	0.05
		Eastbound Right	A	0.09	A	0.16
		Westbound Left	A	0.34	A	0.31
		Westbound Through	A	0.40	B	0.60
		Westbound Right	A	0.05	A	0.05
		Northbound Left	A	0.43	B	0.57
		Northbound Through	A	0.15	A	0.21
		Northbound Right	A	0.11	A	0.10
		Southbound Left	A	0.17	A	0.13
		Southbound Through	A	0.17	A	0.19
		Southbound Right	A	0.05	A	0.08
		Overall	**A**	**0.46**	**A**	**0.59**
Kemptville Mall Access	Stop Sign South	Eastbound	A	0.29	A	0.27
		Westbound Through	A	0.20	A	0.27
		Westbound Left	A	0.18	B	0.36
		Northbound Left	D	0.07	F	0.48
		Northbound Right	B	0.15	B	0.29

Grenville Street – This Stop-sign controlled intersection has no turn lanes on any of the approaches. During the AM peak hour the lowest LOS was "C" for the northbound approach. During the PM peak hour the lowest LOS was "C" for the northbound approach.

James Street/St. Michael's High School – This intersection is slightly offset. This Stop-sign controlled intersection has no turn lanes on any of the approaches. During the AM peak hour the lowest LOS was "E" for the southbound left turn. During the PM peak hour the lowest LOS was "F" for the southbound left turn. The school rush is very brief but intense enough to cause disruption to corridor operations.

CR 44 – The signal was operating in normal fashion. The overall intersection LOS during the AM peak hour was "A" with all turn lanes operating at LOS "A". During the PM peak hour the overall LOS was "A" with the lowest LOS being "B" for the westbound through and northbound left turn.

Kemptville Mall Entrance - This Stop-sign controlled intersection has a left turn lane on CR 43 that allows the westbound through traffic to proceed unimpeded. During the AM peak hour the lowest LOS was "D" for the northbound left turn. During the PM peak hour the lowest LOS was "F" for the northbound left turn.

The two-lane roundabout at the entrance to the Colonnade development southeast of Highway 416 is built but has not been opened to full operation.

3.6 Pedestrians

The conducted counts included tracking of pedestrians within the corridor. The only location that had more than five pedestrians in any hour was the signalized intersection of CR 43 and CR 44. These pedestrians were high school students on their lunch break. Compliance with the pedestrian signals was poor and students also crossed outside of the crosswalk area. As shown in **Photo 1**, students crossed diagonally through the right turn bypass lane after walking on the shoulder.

Photo 1 - Pedestrians Out of Crosswalk

Facilities for pedestrians in corridor are limited to segments of sidewalk illustrated in **Figure 3**. At the traffic signal at CR 44, there are pedestrian signal heads on the south and east crosswalks with none on the west and north legs due to a lack of sidewalks in the northwest quadrant. The pedestrian crossing on the bypass lane is correctly unmarked and is not used by the students as intended. **Photo 2** illustrates the intended path of pedestrians versus the observed path of students.

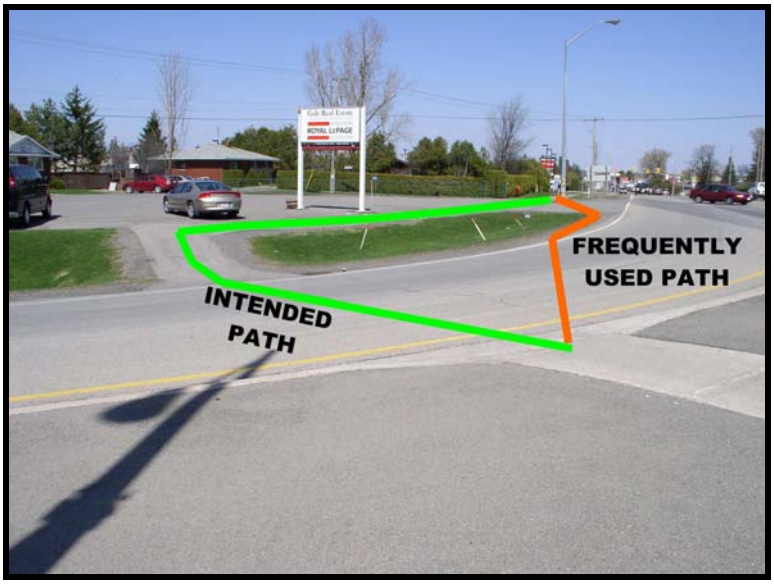


Photo 2 - Intended Path Versus Frequently Used Path

3.7 Cyclists

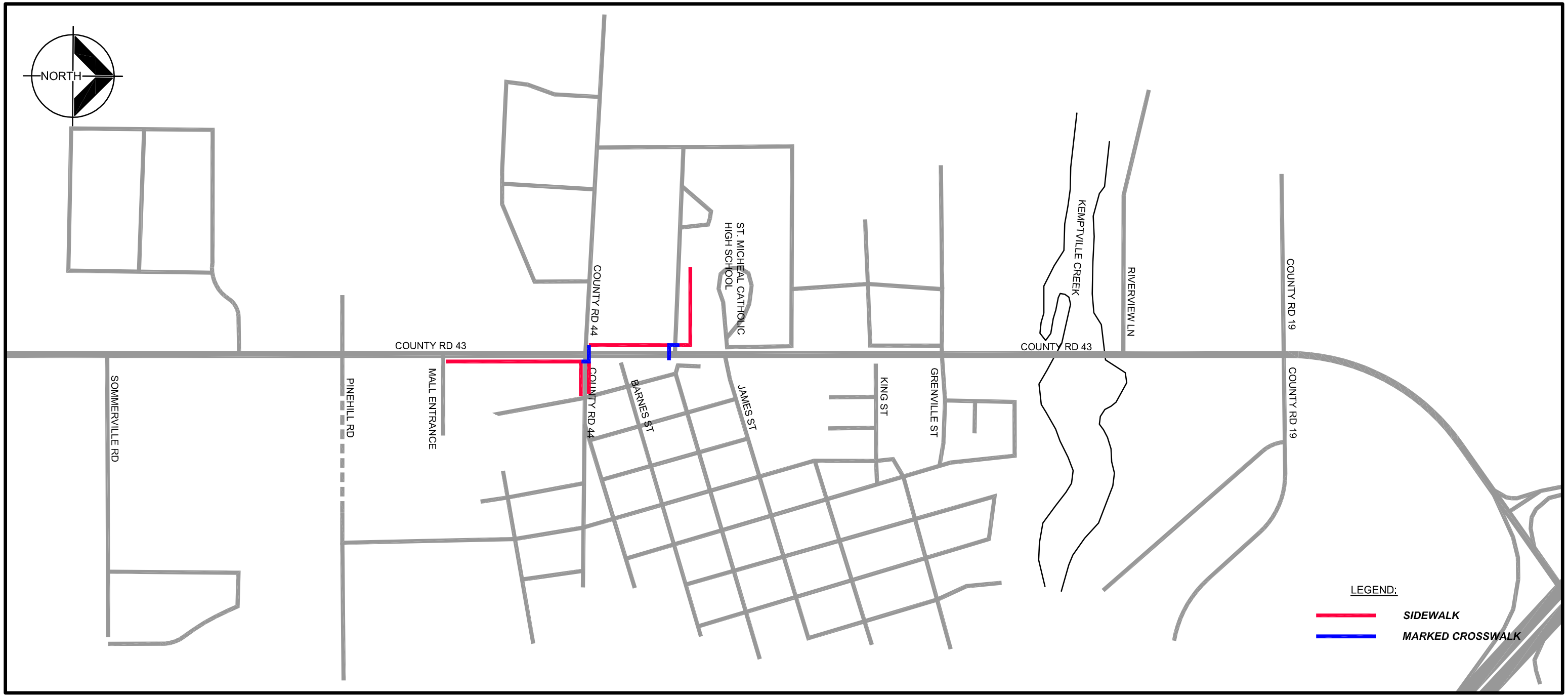
During our counts there were no cyclists recorded. This is not an indication of true demand as there is a lack of cycling facilities in the corridor. The high volumes and lack of shoulders or sidewalks along the entire length makes cycling within the corridor an unpleasant option.

3.8 Trucks

The counts recorded 5.0% medium heavy trucks and 0.7% large heavy trucks. All indications are that these percentages will remain constant over time. The corridor is designated as an oversized truck route within the United Counties.

Figure 3 - Pedestrian Facilities

AECOM Project #108480 COUNTY ROAD 43 CORRIDOR CLASS EA
JULY 2009



4. Future Conditions

4.1 Traffic Volumes Projections

The planned development for the area has remained relatively constant from 2005 to 2009. As such, there are no new major developments that were not considered in the Master Plan Study. To determine the future volumes in the corridor, the Master Plan Study involved an extensive consideration of future developments, historic trends and land use in the corridor. It was recognized that growth in the corridor would be non-linear with much of the growth occurring in the first 10 years of the 20-year planning window. The 2009 counts indicate that the growth over the past four years has averaged 3.7% per year. The amount of development that has been completed since 2005 plus the growth in background traffic corresponds to observed growth. Therefore, we are confident the previous projections were valid and can be built upon.

The extension of Pinehill Road will be completed in 2009 thereby providing a new route for residents wishing to access the corridor and/or the Kemptville Mall. This will cause a change in traffic patterns in that area. The other major, approved projects in the corridor are the Oxford Village subdivision and the Colonnade commercial development. Both of these projects will create major increases to corridor volumes.

Figures 4 and 5 illustrate the 2019 and 2029 projected volumes for the corridor.

4.2 Links

Mainline volumes of 30,000 vehicles per day can be expected on the busiest section of CR 43 by 2029. The absence of alternate east/west corridors in the area reduces the possibility of drivers choosing alternate routes once volumes increase. West of Somerville Road the 2029 future projections are 14,000 vpd which can be accommodated by a two-lane cross section, depending on access locations.

The mid-term projections (2019) show volumes that cannot be accommodated by the existing two-lane cross-section. As noted in Section 3.4, there are already segments of the corridor that have demands above the 900 vph planning capacity. Before 2019, the corridor will require two through lanes in each direction from Highway 416 to Somerville Road. The 2005 study identified that need to be required prior to 2015 and our analysis indicates that the widening could commence immediately to accommodate the existing demand.

4.3 Intersection Operations

The growth along the corridor will create additional operational problems at the key intersections and at minor access points. As mainline volumes increase there are fewer gaps available for vehicle to make turns. On a two-lane roadway with no turn lanes, vehicles waiting to make a turn block all of the vehicles behind them. This is already occurring during peak hours at the Stop-sign controlled intersections in the corridor.

Figure 4- Future Volumes 2019

AECOM Project #108480 COUNTY ROAD 43 CORRIDOR CLASS EA
JULY 2009

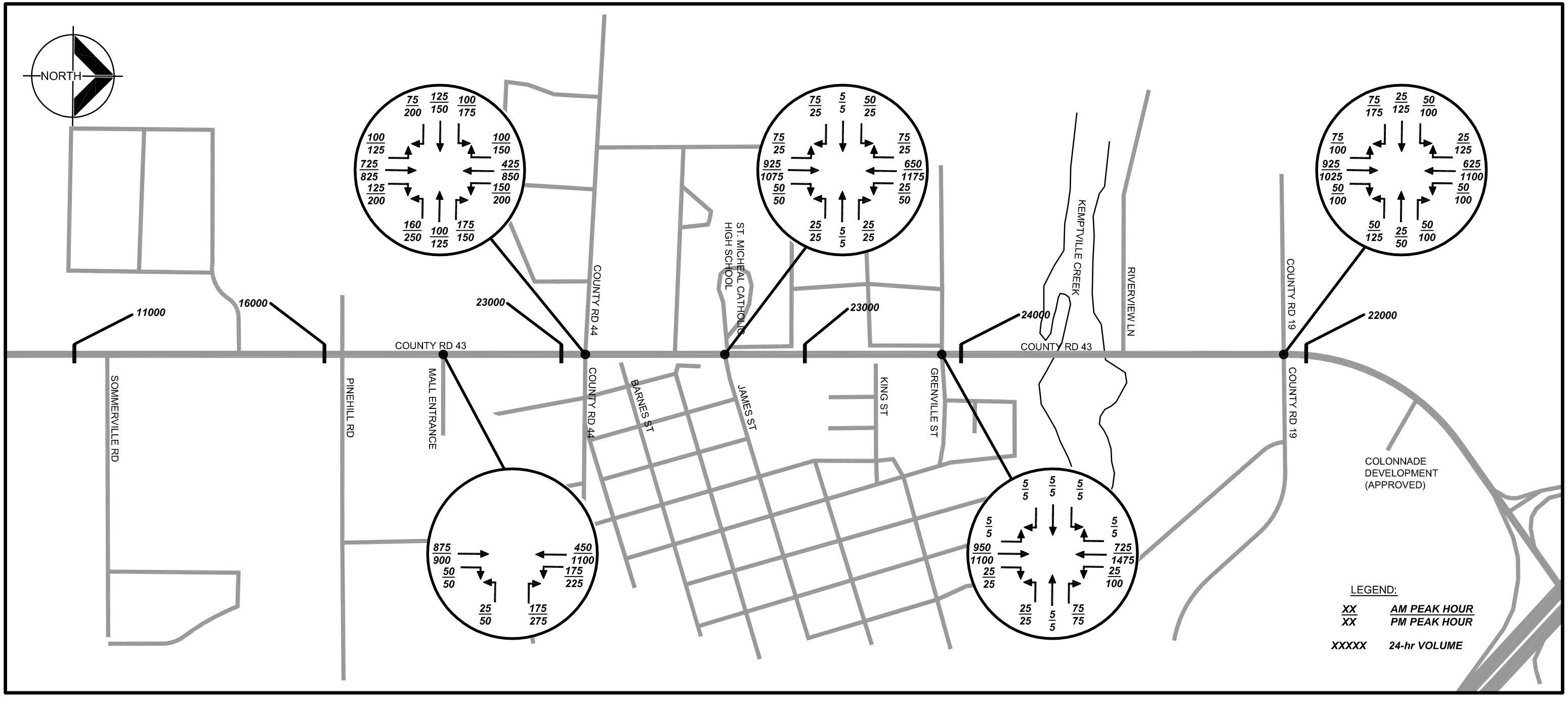


Figure 5- Future Volumes 2029

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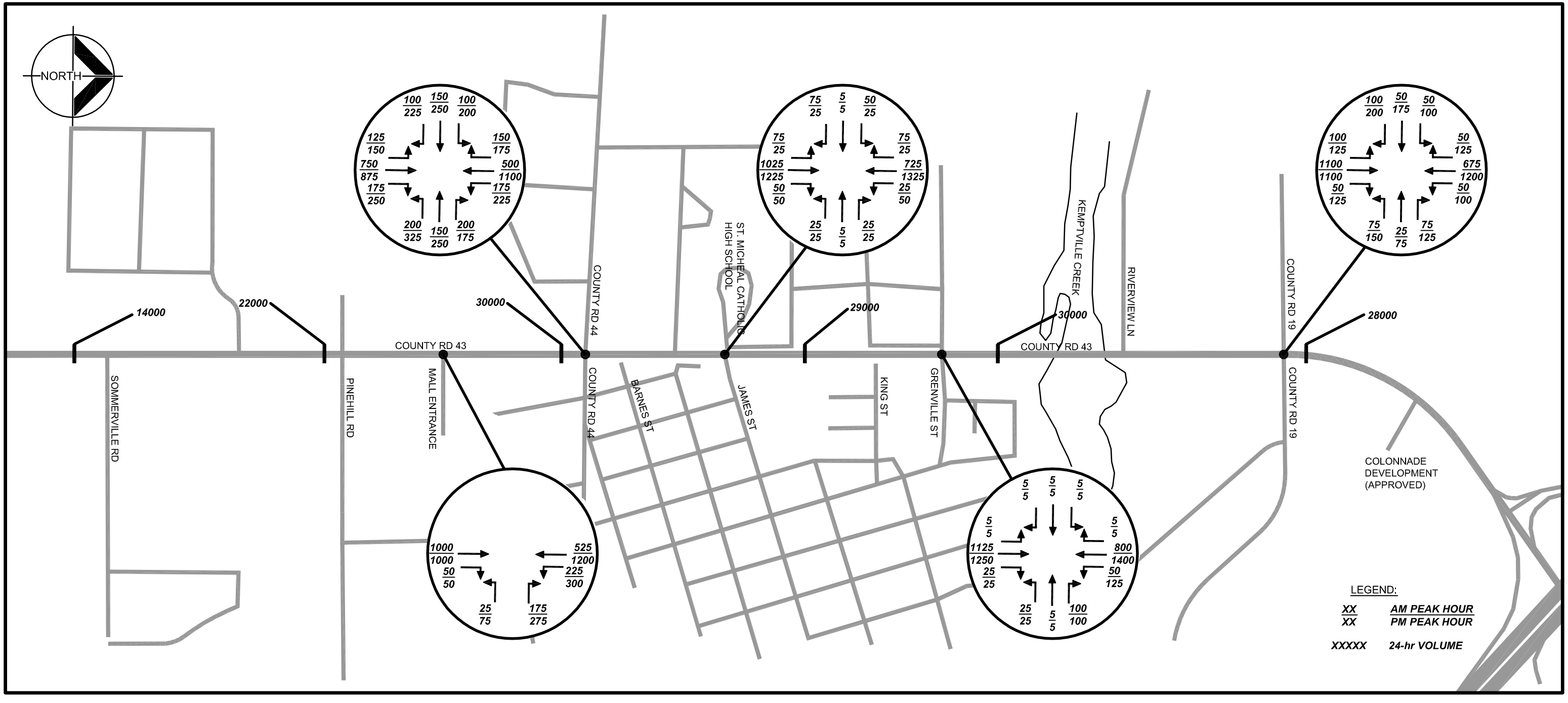

4.4 Pedestrians and Cyclists

The completion of the Oxford Village Subdivision residential development will introduce more pedestrians and cyclists to the area, particularly the west end of the corridor. Continued development of commercial parcels will create additional destinations for these pedestrians and cyclists. As long as the urban form of the new developments is conducive to pedestrian and cyclist use, CR 43 will require a network that connects the growing demand.

5. Potential Improvements

5.1 Intersections

Widening of the corridor will necessitate upgrading the traffic control at all of the major intersections. Each of the intersections that currently have roundabouts as their control device are built to their ultimate configuration (Colonnade Development Access) or can be expanded to two-lane operation (CR 19 and Pinehill). The Stop-sign controlled intersections at Somerville Road, Oxford Subdivision, Kemptville Mall, James Street, Grenville Street and Riverview Lane all can upgraded to two-lane roundabout control. The existing traffic signals at CR 44 and at Community Square commercial plaza cannot accommodate the future demand without major upgrades including pole relocation/replacement, new control hardware and additional signal hardware.

The following section describes the potential improvements at each major intersection in the corridor.

1. Colonnade Development Access west of Highway 416 – The long-term intersection design was completed as part of the new commercial development located to the south. Minor changes to signing and striping may be required when the north leg of the intersection is constructed.

2. County Road 19 – Upgrade to a two-lane roundabout and replace the asphalt truck apron with a design that corresponds to the state of the practice. Install pedestrian crossings.

3. Riverview Lane – Relocate slightly to the east and construct major entrance into parcels to the south. Control of this intersection should be a two-lane roundabout to provide U-turn opportunities for the properties to the east of Riverview Lane.

4. Grenville Street – Upgrade traffic control to two-lane roundabout. Install pedestrian crossings.

5. King Street – Restrict to right-in/right-out only through the installation of a raised median on CR 43.

6. Barnes Street – Upon redevelopment of the properties adjacent to Barnes, close the street south of CR 43 and relocate access points. In the interim, as part of the widening of CR 43, install a raised median on CR 43 which will restrict movements to right turns only. This is consistent with the Master Plan report.

7. James Street/St. Michael's High School – see Section 5.2.

8. Community Square entrance – see Section 5.2.

9. CR 44 – see Section 5.2.

10. Kemptville Mall Entrance – Upgrade traffic control to a two-lane roundabout and align future access on north side. Install pedestrian crossings.

11. Pinehill Street – upgrade to a two-lane roundabout when volumes dictate.

12. Oxford Village development access – Construct the ultimate two-lane roundabout with planning for an interim configuration that can be used until widening of CR 43 is completed. Install pedestrian crossings.

13. Somerville Road – Upgrade traffic control to a roundabout.

14. Other entrances – Consistent with access control plan, limit all new access to only right-in/right-out movements if roundabouts exist a reasonable distance upstream and downstream of the access point.

5.2 Central Segment

The recommendations from the Master Plan traffic report included traffic signals at two intersections: James Street and CR 44. However, the assumption of a signal at James Street assumed the old pedestrian signal would be relocated to James Street. Prior to completion of the final Master Plan report, it was decided that the intersection of James Street would become a roundabout and a new traffic signal was installed at the entrance to the Community Square commercial plaza. This access also provides a connection to the North Grenville Municipal Centre. The old pedestrian signal was replaced with the Community Square signal.

The lead author of the Master Plan traffic report was not prepared to support two-lane roundabouts in an area with high pedestrian demand. At the time of the issuance of the traffic report there was little documentation on operations at North American installations of two-lane roundabouts. However, in the four years since there have been multiple professional papers and studies addressing that issue. As such, we are revisiting the recommendations pertaining to the segment of the corridor that is impacted by the decision to install traffic signals over roundabouts. The review of this "central segment" included, A) determination if roundabouts are now an appropriate traffic option, and, B) what configurations are possible given any changes from 2004. The segment includes the three intersections of CR 44, Community Square and James

Street. The upstream and downstream design implications of the control choice (median or turn lane) are included.

AECOM staff has been closely involved with roundabout research and policy development and is confident that two-lane roundabouts are appropriate for the subject locations. This recommendation is based on the corridor's volumes, percentage of heavy vehicles, design speed, anticipated pedestrian volumes, and adjacent land uses. Roundabouts are an efficient and safe traffic control device and with proper design consideration, pedestrian issues can be addressed in an effective manner.

As mentioned earlier, all of the existing traffic controls require major modification/reconfiguration as part of the corridor widening. Therefore, all control options are available at each of the intersections. Based on inclusion of roundabouts as a viable control option, four alternative configurations have been considered for the central segment:

- Do nothing – Traffic signals at CR 44 and Community Square with a roundabout at James Street – This is the configuration if the original recommendation Master Plan report is followed.
- Roundabout "A" – Two-lane roundabouts at all three intersections. Replacement of all controls with two-lane roundabouts and no turn restrictions.
- Roundabout "B" – Two-lane roundabouts at CR 44 and James Street with a raised median at Community Square. Replacement of controls with roundabouts and restriction of Community Square to right-in/right-out movements only. This is the configuration that would have been recommended in the Master Plan report if two-lane roundabouts had been considered appropriate.
- Roundabout "C" – Two-lane roundabouts at CR 44 and James Street with a modified signal at Community Square. No southbound left turns would be permitted with the design. Pedestrian crossing would be signalized.

5.2.1 Do nothing

This alternative assumes the corridor is widened to four lanes plus turn lanes at the CR 44 and Community Square intersections. Operations would be successful but would require tight coordination of both signals due to their close proximity. The requirement to coordinate the signals will reduce the opportunities for actuated control at each of the intersections.
Positives: Provides all turns movement at Community Square access, provides signal controlled pedestrian crossings, provides sufficient capacity to accommodate future demand.
Negatives: Requires strict monitoring and control of signal timings to maintain successful operations, inflexible timing options, longest north/south pedestrian crossing distances, short intersection spacing complicates signing.

5.2.2 Roundabout "A"

Two-lane roundabouts at all three intersections would provide the greatest level of access to the adjacent properties. It would require additional property to the south at Community Square to accommodate the design.

Positives: Provides all turns movement all three accesses, provides pedestrian crossings, provides sufficient capacity to accommodate future demand, allows raised median between roundabouts particularly to the west of CR 44.
Negatives: Short intersection spacing between Community Square and James Street makes complicates signing.

5.2.3 Roundabout "B"

Positives: Provides all turns movement at for St. Michael's High School and James Street, provides pedestrian crossings, provides sufficient capacity to accommodate future demand, allows raised median between roundabouts particularly to the west of CR 44, decreases the number of conflict points in corridor.
Negatives: Eliminates direct left turns in and out of Community Square access (replaced by U-turns at adjacent intersections). Eliminates north/south pedestrian crossing at Community Square.

5.2.4 Roundabout "C"

Essentially the same as Roundabout "B" but with a modified signal at Community Square access. The signal would be on the east side of the intersection and would provide pedestrians a signalized crossing point. The artificial gaps in the traffic, created by the signal, would also provide opportunity for an eastbound left turn movement into the Community Square access.
Positives: Provides all turns movement at for St. Michael's High School and James Street, provides pedestrian crossings, provides sufficient capacity to accommodate future demand, allows raised median between roundabouts particularly to the west of CR 44, decreases the number of conflict points in corridor.
Negatives: Eliminates direct left turns out of Community Square access (replaced by U-turns at CR 44 roundabout).

5.3 Pedestrians

Any improvements for pedestrians will be significant due to the absence of current facilities. All of the intersections in the corridor should be designed with pedestrian crosswalks that are wheelchair accessible and contain design elements for the visually and mobility impaired.

The only site-specific consideration should be the pedestrian connections (if possible) between the sidewalks on CR 43 and the creek bank of Kemptville Creek. If a trail is planned along the creek, pedestrian connectivity should be included in the bridge design.
The Ontario Traffic Conference (OTM) is currently preparing Book 15 of the Ontario Traffic Manual which is titled Pedestrian Control and Protection. This is a new document that will address pedestrian issues including design and warranting of facilities. That document will be the primary reference upon its completion. In the absence of a completed reference document, practitioners should continue to use the best available professional information.

Considerations for the corridor may include:

- Pedestrian crossovers

- HAWK beacons (**H**igh-Intensity **A**ctivated cross**W**al**K**) which provide signalized pedestrian crossings
- Designs being considered by the OTC committee
- Detectible surfaces using truncated domes/cones (see **Photo 3**)

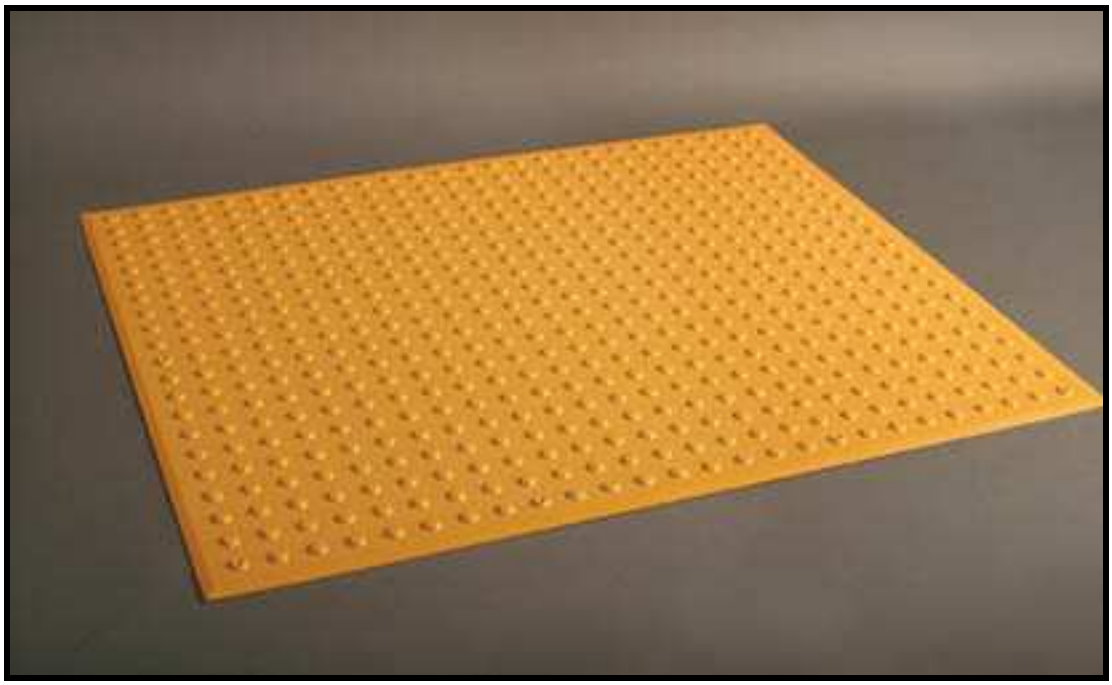

Photo 3 - Truncated Domes on Reflective Surface

5.4 Cyclists

With almost no existing facilities, all improvements for cyclists represent major progress for the cycling mode. We are not making any changes to the recommendations from the Master Plan report which included provision for bicycle facilities (on-street or off-street). Where on-street facilities are included adjacent to two-lane roundabouts, bike ramps must be designed into the intersection. This will provide the safest opportunities for cyclists to exit the roadway, dismount and negotiate the two-lane roundabouts as pedestrians.

5.5 Signing

The corridor currently has a mix of old and new signs. Guide signs, advisory signs and regulatory signs should be inventoried and removed/replaced as necessary. Superfluous signs (advertising, yard sales, private signs, etc.) should be removed from the public right of way.

6. Conclusions and Recommendations

Our update to the Master Plan traffic study has indicated that the previous study was developed upon solid assumptions and data. No significant changes to growth rates or patterns are expected in the CR 43 corridor.

Widening of the bridge is critical to enabling traffic to flow east/west through the corridor. Currently that section of CR 43 is over the planning capacity during the evening peak hour.

Two major points that have not changed since the original study are the need to build and connect pedestrian facilities throughout the corridor and the need to build and connect cycling facilities in the corridor.

Appendix G

Traffic Noise Study

AECOM

United Counties of Leeds and Grenville

County Road 43 (CR43) Road Widening Traffic Noise Study

Prepared by:

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Project Number:

108480

Date:

August 4, 2009

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Revision Log

Revision #	Revised By	Date	Issue / Revision Description
0	Leaman Chow	June 29, 2009	Draft for discussion
1	Leaman Chow	July 28, 2009	Update figures and report body according to review notes

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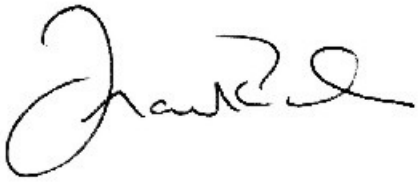
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Executive Summary

AECOM was retained to prepare a traffic noise study on behalf of The United Counties of Leeds and Grenville, for the County Road 43 (CR43) road widening project. The purpose of the study was to assess the resulting noise impact of widening CR43 from two lanes to four between Somerville Road and Highway 416.

Noise sensitive areas (NSA) in this study were identified as defined in the Ministry of Transportation Provincial Highways Directive A-1 (QST A-1). Furthermore, each NSA's qualification for noise mitigation was evaluated by comparing the expected ambient sound level of the future "Do Nothing" and future "With Improvements" scenarios to obtain the change in noise level above ambient (noise impact) as outlined in the MTO/MOE Protocol for Dealing with Noise Concerns During the Preparation, Review and Evaluation of Provincial Highways Environmental Assessments guidelines.

Noise sensitive areas considered in this study included residential dwellings as well as mixed use commercial / residential buildings. The noise impact for each NSA is expected to be negligible (less than 5dB increase). Therefore according to the MTO/MOE protocol, since the expected noise impact is predicted to be less than 5dB no noise mitigation is required due to the widening of CR43.

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1. Introduction

AECOM was retained to prepare a traffic noise study on behalf of The United Counties of Leeds and Grenville, for the County Road 43 (CR43) road widening project. The purpose of the study was to assess the resulting noise impact of widening CR43 from two lanes to four between Somerville Road and Highway 416.

See Figure 1 for an illustration of the study area.

Figure 1. CR43 Study Area

2. Environmental Noise Guidelines

2.1 MTO / MOE Protocol for Highway Construction

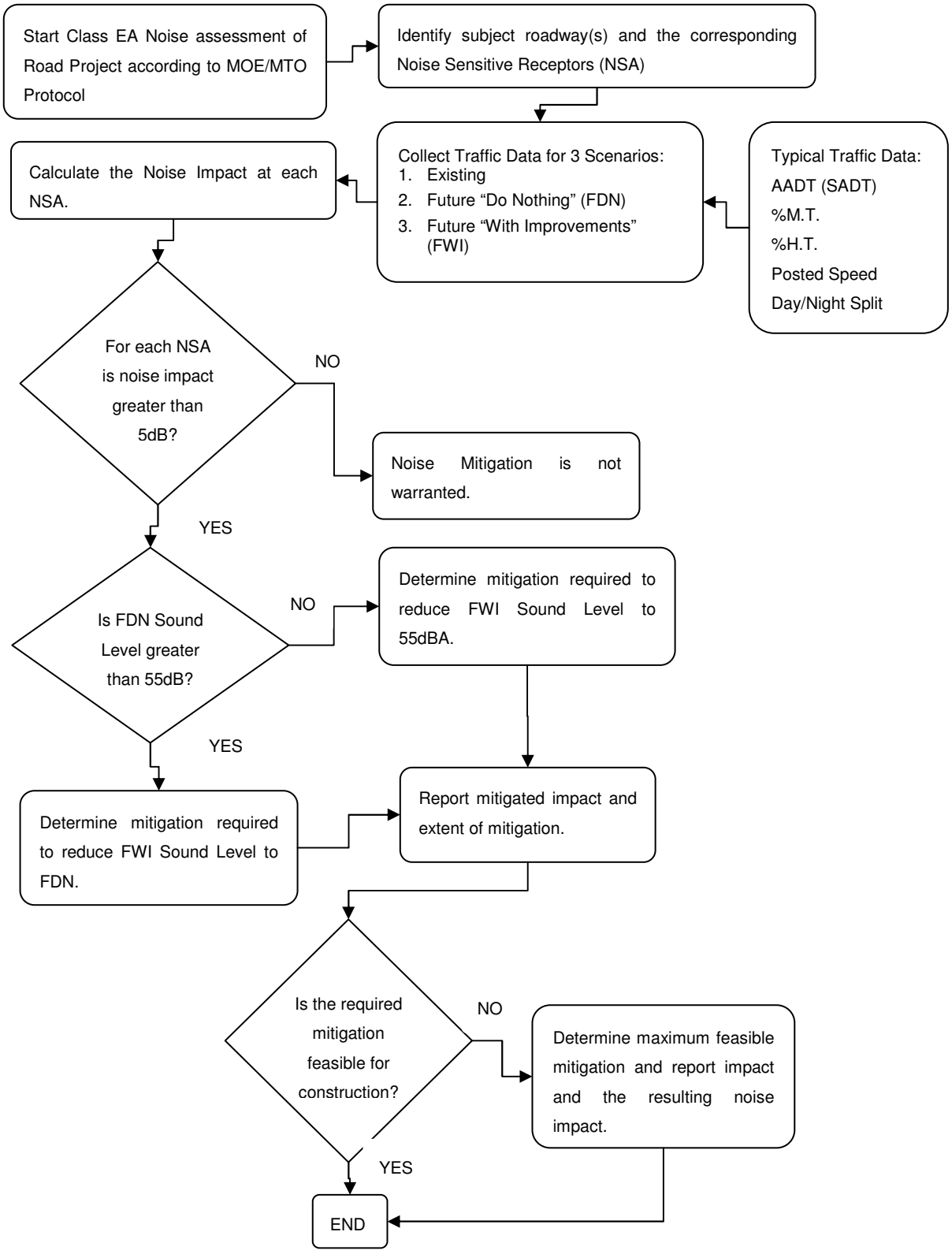
The MOE does not have specific noise guidelines related to the improvement or expansion of roadways. However, the MOE does have a protocol (Reference #2) with the MTO relating to Provincial Highway Expansions.

The MOE/MTO protocol states that if the expected impact (change in noise level above ambient) of implementing roadway improvements is expected to be within 0-5dB no mitigation effort is required. However, if the change in noise level above ambient is expected to be greater than 5dB investigation of mitigation effort is required. The objective sound level is specified as the greater of the predicted future "Do Nothing" ambient or 55 dBA. Table A and Figure 2 below represent the mitigation effort required based on the expected noise impact of implementing any proposed roadway improvements.

Table A. MTO/MOE Protocol for Dealing with Noise Concerns during the Preparation, Review and Evaluation of Provincial Highways Environmental Assessments (Reference #2)
Summary of Mitigation Effort

Change in Noise Level Above Ambient	Mitigation Effort Required
0 - 5 dB change	– None
> 5 dB change	– Investigate noise control measures on right-of-way. – If project cost is not significantly affected introduce noise control measures within the right-of-way. – Noise control measures, where introduced, should achieve a minimum of 5 dB attenuation, over first row receivers. – Mitigate to ambient, as administratively, economically, and technically feasible.

Figure 2. MOE / MTO Protocol Assessment Flowchart



2.2 MTO Quality and Standards Directive (QST A-1)

Noise investigation procedures and mitigation criteria for provincial highways and their effect on noise sensitive areas are also described in the MTO Quality and Standards Directive A-1 (Directive QST A-1, Reference #1). This directive contains information that complements the MTO/MOE Protocol for Highway Construction guideline for determining the requirement and feasibility of mitigation efforts. Additionally, the appendices found in the directive describe in detail the definitions of terminology used in evaluating road traffic noise.

3. Noise Sensitive Areas

Land uses designated as noise sensitive by the MTO directive QST A-1 consist of the following:

- Private homes such as single family residences
- Townhouses
- Multiple unit buildings, such as apartments with OLA's for use by all occupants
- Hospitals, nursing homes for the aged, where there are OLA's for the patients

Land uses that do not qualify as noise sensitive by the MTO directive QST A-1 consist of the following:

- Apartment balconies above ground floor
- Educational facilities (except dormitories with OLA's)
- Churches
- Cemeteries
- Parks and picnic areas which are not inherently part of a NSA
- Day care centres
- All commercial and industrial

There are a number of residential noise sensitive areas (NSAs) within the study area. Figure 3 to Figure 6 below identify receptor locations along CR43 which were assessed. Other dwellings with similar setback and orientation to the roadway will receive similar sound exposures and associated noise impacts. Dwellings further removed from the roadway will receive reduced sound exposures due to increased distance attenuation.

Figure 3. CR43 Points of Reception Somerville Rd. to Pinehill Rd

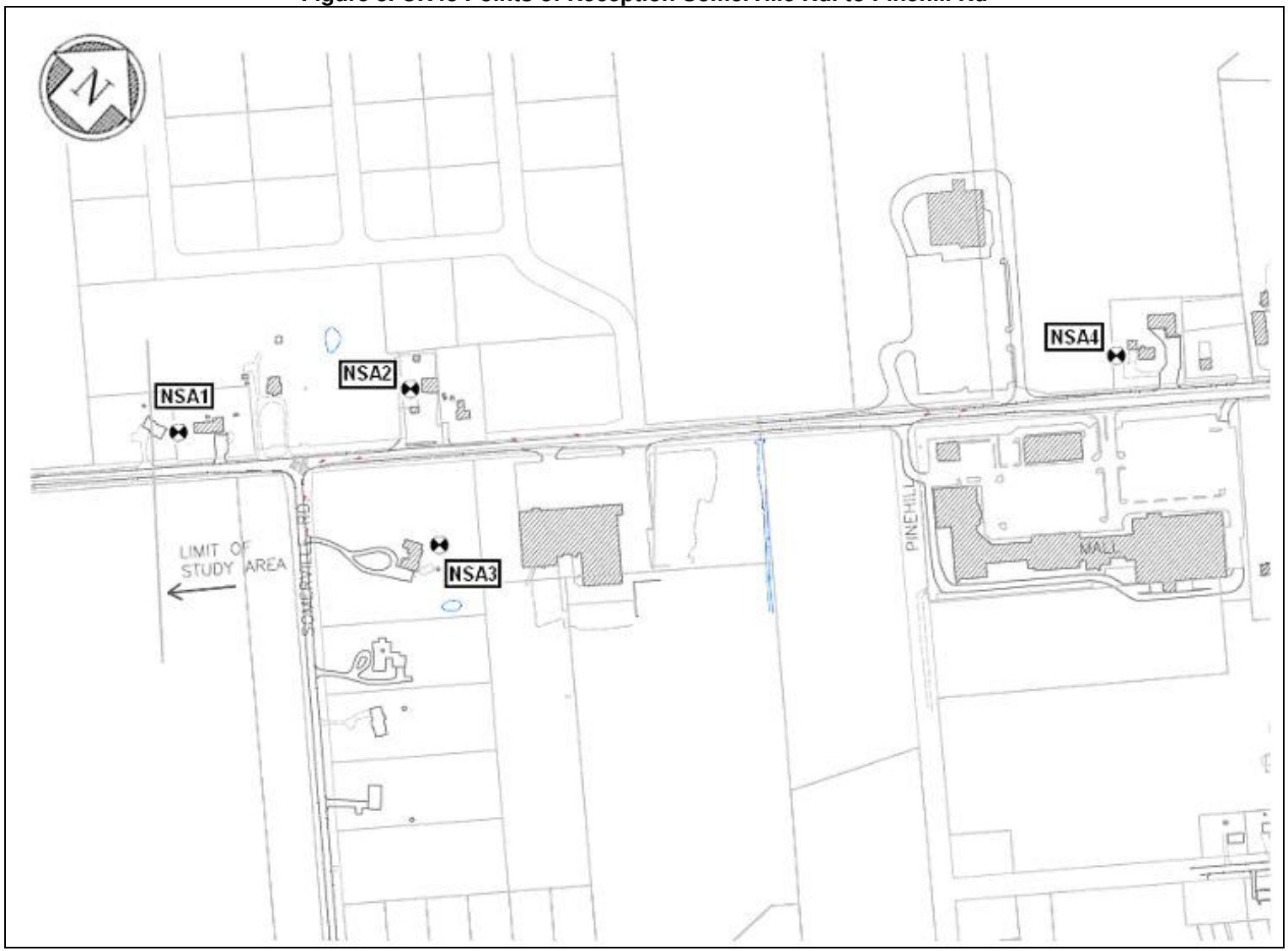


Figure 4. CR43 Points of Reception County Road 44

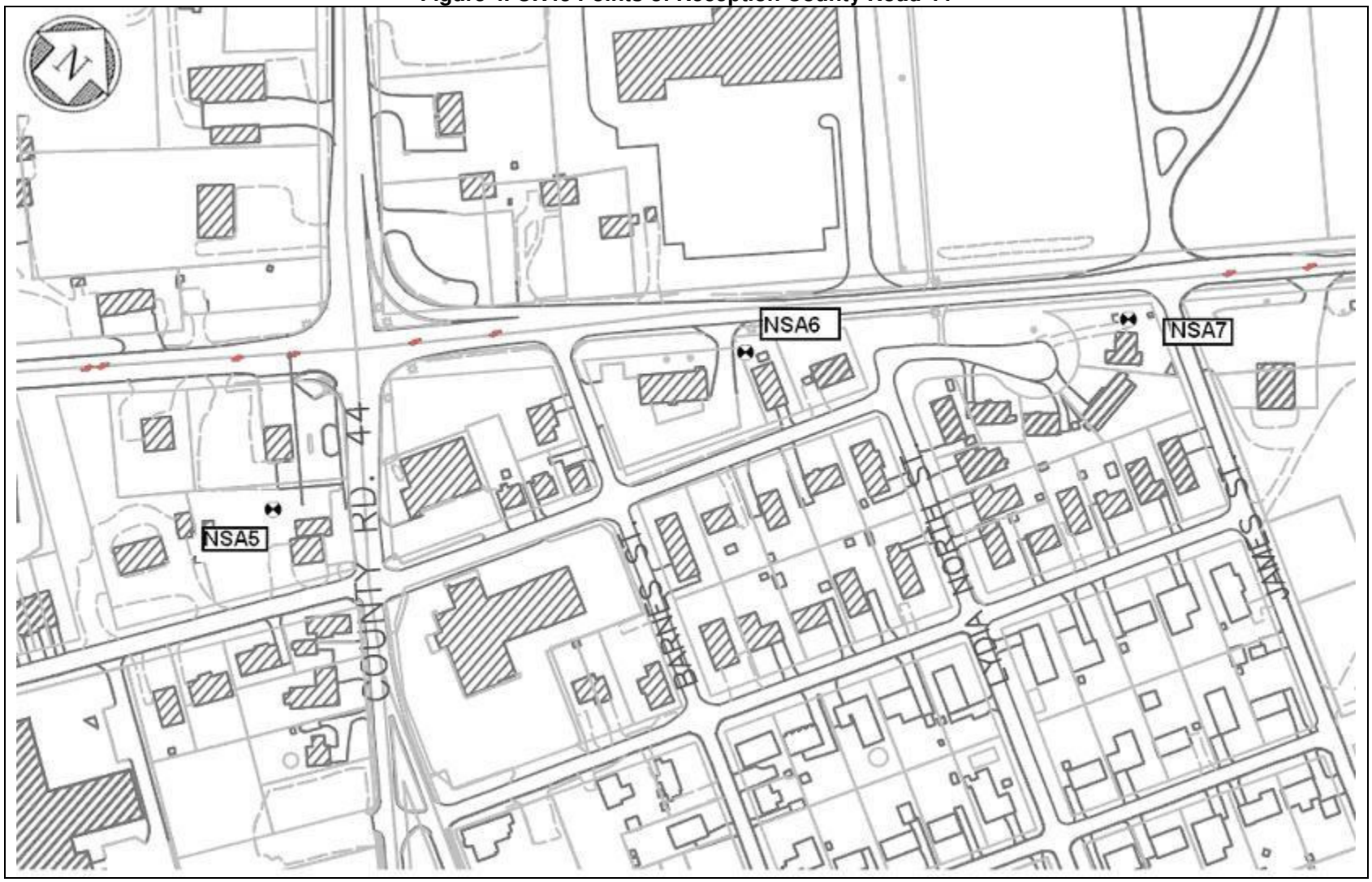
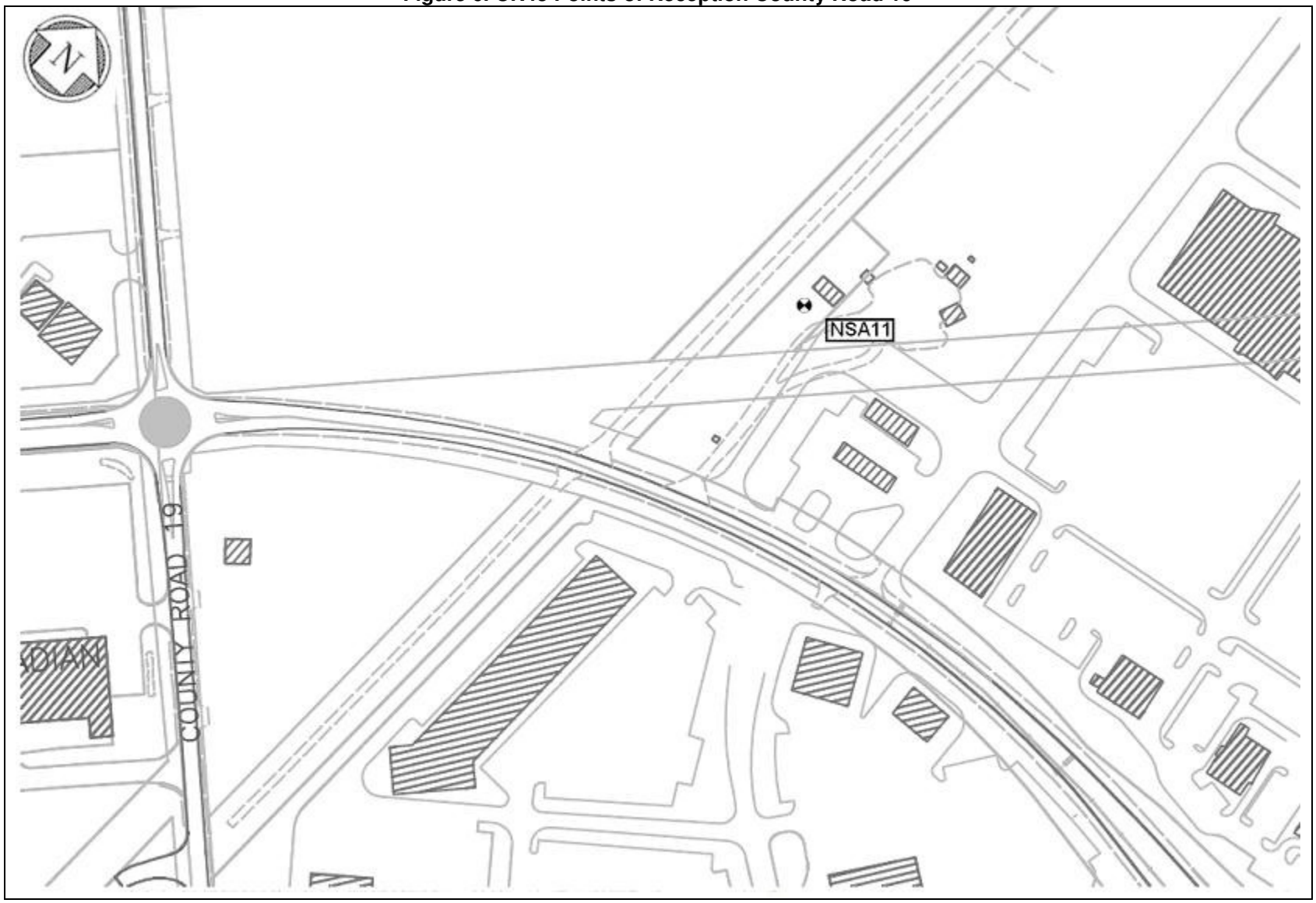


Figure 5. CR43 Points of Reception Grenville St to Riverview Lane

Figure 6. CR43 Points of Reception County Road 19



According to QST A-1, Outdoor Living Areas (OLAs) are typically used as points of assessment for noise sensitive areas. OLAs include an area at ground level, adjacent to the wall of a building associated with an identified NSA which accommodates outdoor living activities. This area may be situated on any side of the NSA with a typical distance of 3m from the dwelling wall and a vertical height of 1.2m. Although MTO directive QST A-1 defines the height of an OLA to be 1.2m above ground, a height of 1.5m was used in the assessment of NSAs in accordance with the MOE Noise Assessment Criteria in Land Use Planning guideline LU-131 (Reference #3). Priority was given to MOE guidelines in instances where discrepancies between the MTO and MOE existed.

Additional NSAs of interest which do not represent the typical scenario (OLA only located in one main area) have been included (NSA1 and NSA4) to address potential noise concerns due to the impact of the proposed roadway. These additional NSAs have been included since secondary locations that may act as OLAs (side yards) exist due to the size and configuration of the properties.

The MTO/MOE protocol recognizes that an important assessment criterion for existing dwellings is the change in sound exposure above ambient sound levels. Any change between 0-5dB requires no mitigation effort; whereas, any change greater than 5dB requires further investigation of noise control measures. Table B complements the MTO/MOE protocol and represents the perceived impact of changes in sound level.

Table B. Perceived Impact of Increased Sound Levels

Increase Sound Level Above Ambient (dB)	Perception	Perceived Impact
0 to 3	No Change	Nil
4 to 5	Perceptible Change	Low
6 to 9	Almost twice as loud	Medium
10 and Greater	Twice as loud or greater	High

4. Noise Impact Assessment

4.1 Traffic Data

Traffic information for the roadway widening project was provided in the form of AADT for the existing roadway conditions as well as the future “With Improvments” scenario. Additionally, the future “Do Nothing” traffic volumes were projected from existing values to the year 2029 using a 2.3% growth rate producing AADT2029 estimates. Furthermore, it is our understanding that a 10% increase in road traffic volume is expected during the summer months. AADT volumes were increased by 10% to estimate the summer average daily traffic volumes (SADT) which represent the worst case traffic volume scenarios.

Medium trucks represent 5% of the SADT and heavy trucks represent 0.7% of the SADT. Truck percentages are not expected to change over time. Traffic counts on CR43 indicate that 94% of the daily traffic occurs between the hours of 0700 and 2300 (Daytime) and the remaining 6% occurs between the hours of 2300 and 0700 (Night-time).

The road traffic data is summarized in Table C below and provided in Appendix A.

Table C. Road Traffic Data

Roadway/Traffic Noise Source	Existing SADT(1) (year 2009)	Future SADT(2) (Do Nothing) (year 2029)	Future SADT(1) (With Improvements) (year 2029)	Medium Trucks (% of SADT)	Heavy Trucks (% of SADT)	Day/Night Split (% of SADT)	Posted Speed (Kph)
CR43 West of Somerville Rd	6820	10747	15400	5	0.7	94/6	50
CR43 Between Somerville Rd & Pinehill Rd	10285	16208	24200	5	0.7	94/6	50
CR43 Between Pinehill Rd & Rideau St	18480	29122	33000	5	0.7	94/6	50
CR43 Between Rideau St & Grenville St	16445	25915	31900	5	0.7	94/6	50
CR43 Between Grenville St & Wellington St	17600	27735	33000	5	0.7	94/6	50
CR43 East of Wellington St	13200	20801	30800	5	0.7	94/6	50

(1) Traffic volumes were obtained from correspondence with Steve Sergeant, AECOM Transportation Engineer. (Stephen.Sargeant@AECOM.com ; 1.613.389.3703)

(2) Future AADT (Do Nothing) volumes were estimated by using available AADT data for existing conditions and applying 2.3% growth rate per year. Future SADT (Do Nothing) volumes were estimated by applying an additional factor of 10% to the calculated future (Do Nothing) AADT volumes.

4.2 Procedure

Sound exposures were calculated using STAMSON V5.04-ORNAMENT, which is a prediction model produced and accepted by the MOE.

The topography within the study limits has been neglected as site observations indicated that the area is relatively flat. Using the road traffic data, daytime (Leq,Day) sound exposures were calculated at each receptor location. $Leq_{,24}$ sound exposures were not calculated since CR43 and the surrounding roadways are not considered freeways or highways. $Leq_{,16}$ sound exposures were used to assess daytime levels and included 94% of the 24 hour traffic volume (SADT). To assess the noise impact, the predicted future "Do

Nothing" sound exposures (year 2029) were compared to those of the predicted future "With Improvements" sound exposures (year 2029).

Ambient sound levels in the vicinity of the noise sensitive areas are dominated by road traffic noise from CR43, all other noise sources were ignored in the ambient sound level calculations. This is a conservative approach since, in the noise impact assessment; any secondary sources would tend to reduce the significance of sound exposure changes (i.e. impact) due to CR43.

4.3 Results

Table 4 shows for each identified receptor, the existing (2009) sound exposures, the future (2029) sound exposures with and without the proposed road improvements, and the resulting noise impact (i.e. change between scenarios).

Table D. Unmitigated Noise Assessment Results

Location	Existing Leq, Day (dBA)	Future Leq, Day (dBA)		Noise Impact (dB)	Preceived Noise Impact
		"Do Nothing"	"With Improvements"		
NSA1	54	56	57	1	Nil
NSA2	55	57	58	1	Nil
NSA3	50	52	53	1	Nil
NSA4	57	59	60	1	Nil
NSA5	52	53	54	1	Nil
NSA6	62	64	65	1	Nil
NSA7	62	64	65	1	Nil
NSA8	63	65	65	0	Nil
NSA9	53	55	56	1	Nil
NSA10	49	51	51	0	Nil
NSA11	49	51	53	2	Nil

In many cases the sound exposures are above the 55dBA objective limit set by the MTO/MOE guideline with the implementation of the proposed road widening. However, since the noise impact at all NSAs is expected to be less than 5 dB no mitigation effort is required. Additionally, the perceived impact as defined in Table B at all NSAs would be considered nil when compared to the future "Do Nothing" scenario. Table E below summarizes the results of assessing noise impact and mitigation needs.

Table E. Noise Assessment Results

Location	Future (2029) "Do Nothing" $Leq_{,Day}$ (dBA)	Future (2029) "With Improvements" $Leq_{,Day}$ (dBA)		Noise Impact[2] (dB)		Recommended Mitigation Measures	Perceived Noise Impact with Mitigation Measures[3]	Noise Reduction Achieved[4] (dB)
		No Mitigation	Mitigated[1]	No Mitigation	Mitigated[1]			
NSA1	56	57	-	1	-	None	-	No Mitigation Required
NSA2	57	58	-	1	-	None	-	No Mitigation Required
NSA3	52	53	-	1	-	None	-	No Mitigation Required
NSA4	59	60	-	1	-	None	-	No Mitigation Required
NSA5	53	54	-	1	-	None	-	No Mitigation Required
NSA6	64	65	-	1	-	None	-	No Mitigation Required
NSA7	64	65	-	1	-	None	-	No Mitigation Required
NSA8	65	65	-	0	-	None	-	No Mitigation Required
NSA9	55	56	-	1	-	None	-	No Mitigation Required
NSA10	51	51	-	0	-	None	--	No Mitigation Required
NSA11	51	53	-	2	-	None	-	No Mitigation Required

(1) Mitigated value not shown if mitigation is not recommended. Calculations showing the effects of mitigation for all NSAs are presented in Appendix B.

(2) The noise impact was calculated by subtracting the [Future (2029) "Do Nothing"] sound level from the [Future (2029) "With Improvements" - Mitigated] sound level.

(3) The perceived noise impact, as per Table B, with mitigation installed where indicated.

(4) Noise reduction is calculated by subtracting the [Future (2029) "With Improvements" - Mitigated] sound level from the [Future (2029) "With Improvements" - No Mitigation] sound level. A minimum acceptable noise reduction of 5 dB must be achieved for a sound barrier to be considered effective enough to justify construction.

4.4 Noise Mitigation

All of the noise sensitive areas considered in the study have a nil impact when comparing the noise levels of the future "Do Nothing" and future "With Improvements" scenarios. The resulting noise impact is predicted to be less than 5dB for all NSAs and therefore no noise mitigation is necessary according to the MTO/MOE protocol. (also refer to Table A and Figure 2)

4.5 Construction Noise

Construction noise is temporary and unavoidable. The effect of construction noise at all NSAs is dependant on various factors such as time of operation and size of equipment. Recommendations relating to the management of construction noise include:

- Adherence to applicable local bylaws. Instances where adherence to the local bylaws is not possible and mitigation is not feasible an exemption should be obtained from the municipality before construction.
- Construction equipment noise emissions should comply with MOE guideline NPC-115.
- Contract documents provided to the contractor should contain general noise control measures to mitigate the noise impact at noise sensitive areas including two standard clauses regarding equipment noise:
    - Unnecessary noise caused by faulty or non-operating components must be addressed by regularly maintaining all equipment.
    - Duration of construction equipment idling is to be restricted to the minimum time necessary to complete the specific task.
- A noise complaint process may be set in place similar to the MTO directive QST A-1:
    - Any initial complaint from the public will require verification by the County that all noise control measures to be applied are in effect. The County will investigate any noise concerns, advise the contractor of any problems, and enforce its contract.
    - Notwithstanding compliance with any noise control measures identified in the contract documents, a persistent complaint will require the County to undertake a field investigation to determine noise level emissions. Where noise level emissions, for that construction equipment in use, exceed the sound level criteria for construction equipment contained in the MOE Model Municipal Noise Control Bylaw, the County shall require the contractor to comply with the sound level criteria where quieter alternative equipment is reasonably available. When this occurs, the County shall pay the contractor for costs incurred. Where a quieter alternative is not reasonably available, the equipment in use will be accepted.

5. Conclusions and Recommendations

The CR-43 road improvement project is expected to have negligible noise impact at all noise sensitive areas. Since the noise impact was calculated to be less than 5dB when comparing the expected ambient sound levels of the future “Do Nothing” and future “With Improvements” scenarios at all NSAs, no mitigation is required.

6. References

The following references were used in the preparation of this report:

1. MTO Provincial Highways Directive A-1 (QST A-1)
2. MTO/MOE, “A Protocol for Dealing with Noise Concerns during the Preparation, Review and Evaluation of Provincial Highways Environmental Assessments”, February 1986
3. MOE, “Noise Assessment Criteria in Land Use Planning Publication LU-131”, October 1997

--- End of Report ---

Appendix A. Traffic Data

Table A1. Additional Annual Average Daily Traffic (AADT) Volume Information

Traffic Volume Breakdown[1]	Factor (%)
Medium Heavy Trucks	5
Large Heavy Trucks	0.7
Summer Average Daily Traffic (SADT)	110
Day / Night Traffic Split	94 / 6

(1) Traffic volume information was obtained from correspondence with Steve Sergeant, AECOM Transportation Engineer. (Stephen.Sargeant@AECOM.com ; 1.613.389.3703)

Figure - FUTURE VOLUMES

AECOM Project #108480 COUNTY ROAD 43 CORRIDOR CLASS EA
JUNE 2009

Appendix B. Traffic Noise Level Calculations

Source(**Do Nothing Volumes**)	AVAILABLE AADT DATA Year	AADTe or 1hr or #Trains	SADTe or 1hr or #Trains	PROJECTED(FUTURE) AADT DATA Growth Rate/ Year	to Year	AADTf or #Autos or #Trains	SADTf or #Autos or #Trains	%M.T. or #MT or #Loc	%H.T. or #HT or #Cars	Speed Limit (kph)	Road Only Parameters Grade %	Pavement Type	Day/Night Split
CR43 West of Sommerville Rd	2009	6200	6820	2.30%	2029	9770	10747	5.00%	0.70%	50	0%	1	94/6
CR43 Between Sommerville Rd & Pinehill Rd	2009	9350	10285	2.30%	2029	14734	16208	5.00%	0.70%	50	0%	1	94/6
CR43 Between Pinehill Rd & Rideau St	2009	16800	18480	2.30%	2029	26474	29122	5.00%	0.70%	50	0%	1	94/6
CR43 Between Rideau St & Grenville St	2009	14950	16445	2.30%	2029	23559	25915	5.00%	0.70%	50	0%	1	94/6
CR43 Between Grenville St & Wellington St	2009	16000	17600	2.30%	2029	25213	27735	5.00%	0.70%	50	0%	1	94/6
CR43 East of Wellington St	2009	12000	13200	2.30%	2029	18910	20801	5.00%	0.70%	50	0%	1	94/6

PROJECT NAME: CR43 Class EA

PROJECT NUMBER: 108480 ENGINEER: Leaman Chow

BASE DRAWING: Environmental Assessment DATE: June 17, 2009

2009 "EXISTING"

ENSA#.TE RECEIVER	SOURCE	UNMITIGATED/EXISTING θ1	θ2	TOPO	WOODS	No. Rows	@ Density	Ground Surface Type	Receiver Height (r) (Day/Night) (m)	Source Receiver Dist (m)	Elevation Change (e) (m)	Leq(Day) or Leq(1hr) (dBA)	Leq (Night) (dBA)	MITIGATED/FUTURE θ1	θ2	TOPO	WOODS	No. Rows	@ Density	Ground Surface Type	Receiver Height (r) (Day/Night) (m)	Source Receiver Dist (m)	Barr θ1	Barr θ2	Barrier Height (m)	Barrier Receiver Distance (m)	Elevation Change (e) (m)	Source Ground Elevation (m)	Receiver Ground Elevation (m)	Base of Barrier Elevation (m)	Leq(Day) or Leq(1hr) (dBA)	Leq (Night) (dBA)
NSA1	CR43 West of Sommerville Rd	-90	90	1	0	0	0	1	1.5/4.5	35	-	**53.82**	45.28																		
	TOTAL											**53.82**	45.28																		
NSA2	CR43 Between Sommerville Rd & Pinehill Rd	-90	90	1	0	0	0	1	1.5/4.5	40	-	**54.64**	46.07																		
	TOTAL											**54.64**	46.07																		
NSA3	CR43 Between Sommerville Rd & Pinehill Rd	-90	90	1	0	0	0	1	1.5/4.5	80	-	**49.64**	41.29																		
	TOTAL											**49.64**	41.29																		
NSA4	CR43 Between Pinehill Rd & Rideau St	-90	90	1	0	0	0	1	1.5/4.5	40	-	**57.19**	48.69																		
	TOTAL											**57.19**	48.69																		
NSA5	CR43 Between Pinehill Rd & Rideau St	-90	-60	1	0	0	0	1	1.5/4.5	60	-	**43.82**	35.74																		
	CR43 Between Rideau St & Grenville St	65	90	1	0	0	0	2	1.5/4.5	60	-	**50.71**	39.99																		
	TOTAL											**51.52**	41.38																		
NSA6	CR43 Between Rideau St & Grenville St	-90	90	1	0	0	0	1	1.5/4.5	20	-	**61.67**	52.95																		
	TOTAL											**61.67**	52.95																		
NSA7	CR43 Between Rideau St & Grenville St	-90	90	1	0	0	0	1	1.5/4.5	18	-	**62.43**	53.68																		
	TOTAL											**62.43**	53.68																		
NSA8	CR43 Between Grenville St & Wellington St	-90	90	1	0	0	0	1	1.5/4.5	40	-	**62.73**	53.93																		
	TOTAL											**62.73**	53.93																		
NSA9	CR43 Between Grenville St & Wellington St	-90	0	1	0	0	0	1	1.5/4.5	45	-	**53.11**	44.60																		
	TOTAL											**53.11**	44.60																		
NSA10	CR43 Between Grenville St & Wellington St	-90	90	1	0	0	0	1	1.5/4.5	125	-	**48.76**	40.56																		
	TOTAL											**48.76**	40.56																		
NSA11	CR43 East of Wellington St	-90	90	1	0	0	0	1	1.5/4.5	100	-	**49.12**	40.99																		
	TOTAL											**49.12**	40.99																		

Source(**Do Nothing Volumes**)	AVAILABLE AADT DATA Year	AADTe or 1hr or #Trains	PROJECTED(FUTURE) AADT DATA Growth Rate/ Year	to Year	AADTf or #Autos or #Trains	SADTf or #Autos or #Trains	%M.T. or #MT or #Loc	%H.T. or #HT or #Cars	Speed Limit	Road Only Parameters Grade %	Pavement Type	Day/Night Split
CR43 West of Sommerville Rd	2009	6200	2.30%	2029	9770	10747	5.00%	0.70%	50	0%	1	94/6
CR43 Between Sommerville Rd & Pinehill Rd	2009	9350	2.30%	2029	14734	16208	5.00%	0.70%	50	0%	1	94/6
CR43 Between Pinehill Rd & Rideau St	2009	16800	2.30%	2029	26474	29122	5.00%	0.70%	50	0%	1	94/6
CR43 Between Rideau St & Grenville St	2009	14950	2.30%	2029	23559	25915	5.00%	0.70%	50	0%	1	94/6
CR43 Between Grenville St & Wellington St	2009	16000	2.30%	2029	25213	27735	5.00%	0.70%	50	0%	1	94/6
CR43 East of Wellington St	2009	12000	2.30%	2029	18910	20801	5.00%	0.70%	50	0%	1	94/6

PROJECT NAME: CR43 Class EA

PROJECT NUMBER: 108480 ENGINEER: Leaman Chow

BASE DRAWING: Environmental Assessment DATE: June 17, 2009

2029 "DO NOTHING SCENARIO"

FNNSA#.TE		UNMITIGATED/EXISTING												MITIGATED/FUTURE																			
RECEIVER	SOURCE	θ1	θ2	TOPO	WOODS	No. Rows	@ Density	Ground Surface Type	Receiver Height (r) [Day/Night] (m)	Source Receiver Dist (m)	Elevation Change (e) (m)	Leq(Day) or Leq(1hr) (dBA)	Leq (Night) (dBA)	θ1	θ2	TOPO	WOODS	No. Rows	@ Density	Ground Surface Type	Receiver Height (r) [Day/Night] (m)	Source Receiver Dist (m)	Barr θ1	Barr θ2	Barrier Height (m)	Barrier Receiver Distance (m)	Elevation Change (e) (m)	Source Ground Elevation (m)	Receiver Ground Elevation (m)	Base of Barrier Elevation (m)	Leq(Day) or Leq(1hr) (dBA)	Leq (Night) (dBA)
NSA1	CR43 West of Sommerville Rd	-90	90	1	0	0	0	1	1.5/4.5	35	-	**55.80**	47.33																			
	TOTAL											**55.80**	47.33																			
NSA2	CR43 Between Sommerville Rd & Pinehill Rd	-90	90	1	0	0	0	1	1.5/4.5	40	-	**56.62**	48.14																			
	TOTAL											**56.62**	48.14																			
NSA3	CR43 Between Sommerville Rd & Pinehill Rd	-90	90	1	0	0	0	1	1.5/4.5	80	-	**51.62**	43.37																			
	TOTAL											**51.62**	43.37																			
NSA4	CR43 Between Pinehill Rd & Rideau St	-90	90	1	0	0	0	1	1.5/4.5	40	-	**59.16**	50.63																			
	TOTAL											**59.16**	50.63																			
NSA5	CR43 Between Pinehill Rd & Rideau St	-90	-60	1	0	0	0	1	1.5/4.5	60	-	**45.80**	37.67																			
	CR43 Between Rideau St & Grenville St	65	90	1	0	0	0	2	1.5/4.5	60	-	**52.68**	41.86																			
	TOTAL											**53.49**	43.26																			
NSA6	CR43 Between Rideau St & Grenville St	-90	90	1	0	0	0	1	1.5/4.5	20	-	**63.65**	54.94																			
	TOTAL											**63.65**	54.94																			
NSA7	CR43 Between Rideau St & Grenville St	-90	90	1	0	0	0	1	1.5/4.5	18	-	**64.41**	55.66																			
	TOTAL											**64.41**	55.66																			
NSA8	CR43 Between Grenville St & Wellington St	-90	90	1	0	0	0	1	1.5/4.5	40	-	**64.70**	55.97																			
	TOTAL											**64.70**	55.97																			
NSA9	CR43 Between Grenville St & Wellington St	-90	0	1	0	0	0	1	1.5/4.5	45	-	**55.09**	46.64																			
	TOTAL											**55.09**	46.64																			
NSA10	CR43 Between Grenville St & Wellington St	-90	90	1	0	0	0	1	1.5/4.5	125	-	**50.73**	42.61																			
	TOTAL											**50.73**	42.61																			
NSA11	CR43 East of Wellington St	-90	90	1	0	0	0	1	1.5/4.5	100	-	**51.09**	42.89																			
	TOTAL											**51.09**	42.89																			

Source(**Do Nothing Volumes**)	AVAILABLE AADT DATA Year	AADTe or 1hr or #Trains	PROJECTED(FUTURE) AADT DATA Growth Rate/ Year	to Year	AADTf or #Autos or #Trains	SADTf or #Autos or #Trains	%M.T. or #MT or #Loc	%H.T. or #HT or #Cars	Speed Limit (kph)	Road Only Parameters Grade %	Pavement Type	Day/Night	Split
CR43 West of Sommerville Rd	2009	6200	-	2029	14000	15400	5.00%	0.70%	50	0%	1	94/6	
CR43 Between Sommerville Rd & Pinehill Rd	2009	9350	-	2029	22000	24200	5.00%	0.70%	50	0%	1	94/6	
CR43 Between Pinehill Rd & Rideau St	2009	16800	-	2029	30000	33000	5.00%	0.70%	50	0%	1	94/6	
CR43 Between Rideau St & Grenville St	2009	14950	-	2029	29000	31900	5.00%	0.70%	50	0%	1	94/6	
CR43 Between Grenville St & Wellington St	2009	16000	-	2029	30000	33000	5.00%	0.70%	50	0%	1	94/6	
CR43 East of Wellington St	2009	12000	-	2029	28000	30800	5.00%	0.70%	50	0%	1	94/6	

PROJECT NAME: CR43 Class EA

PROJECT NUMBER: 108480 ENGINEER: Leaman Chow

BASE DRAWING: Environmental Assessment DATE: June 17, 2009

2029 "WITH IMPROVEMENTS"

FINSA#.TE RECEIVER	SOURCE	UNMITIGATED θ1	θ2	TOPO	WOODS	No. Rows	@ Density	Ground Surface Type	Receiver Height (r) [Day/Night] (m)	Source Receiver Dist (m)	Elevation Change (e) (m)	Leq(Day) or Leq(1hr) (dBA)	Leq (Night) (dBA)	MITIGATED/FUTURE θ1	θ2	TOPO	WOODS	No. Rows	@ Density	Ground Surface Type	Receiver Height (r) [Day/Night] (m)	Source Receiver Dist (m)	Barr θ1	Barr θ2	Barrier Height (m)	Barrier Receiver Distance (m)	Elevation Change (e) (m)	Source Ground Elevation (m)	Receiver Ground Elevation (m)	Base of Barrier Elevation (m)	Leq(Day) or Leq(1hr) (dBA)	Leq (Night) (dBA)
NSA1	CR43 West of Sommerville Rd	-90	90	1	0	0	0	1	1.5/4.5	35	-	**57.35**	48.73																		
	TOTAL											**57.35**	48.73																		
NSA2	CR43 Between Sommerville Rd & Pinehill Rd	-90	90	1	0	0	0	1	1.5/4.5	40	-	**58.35**	49.84																		
	TOTAL											**58.35**	49.84																		
NSA3	CR43 Between Sommerville Rd & Pinehill Rd	-90	90	1	0	0	0	1	1.5/4.5	80	-	**53.36**	45.06																		
	TOTAL											**53.36**	45.06																		
NSA4	CR43 Between Pinehill Rd & Rideau St	-90	90	1	0	0	0	1	1.5/4.5	40	-	**59.70**	51.20																		
	TOTAL											**59.70**	51.20																		
NSA5	CR43 Between Pinehill Rd & Rideau St	-90	-60	1	0	0	0	1	1.5/4.5	60	-	**46.34**	38.25																		
	CR43 Between Rideau St & Grenville St	65	90	1	0	0	0	2	1.5/4.5	60	-	**53.58**	42.80																		
	TOTAL											**54.33**	44.11																		
NSA6	CR43 Between Rideau St & Grenville St	-90	90	1	0	0	0	1	1.5/4.5	20	-	**64.55**	55.80																		
	TOTAL											**64.55**	55.80																		
NSA7	CR43 Between Rideau St & Grenville St	-90	90	1	0	0	0	1	1.5/4.5	18	-	**65.31**	56.53																		
	TOTAL											**65.31**	56.53																		
NSA8	CR43 Between Grenville St & Wellington St	-90	90	1	0	0	0	1	1.5/4.5	40	-	**65.46**	56.71																		
	TOTAL											**65.46**	56.71																		
NSA9	CR43 Between Grenville St & Wellington St	-90	0	1	0	0	0	1	1.5/4.5	45	-	**55.84**	47.38																		
	TOTAL											**55.84**	47.38																		
NSA10	CR43 Between Grenville St & Wellington St	-90	90	1	0	0	0	1	1.5/4.5	125	-	**51.49**	43.35																		
	TOTAL											**51.49**	43.35																		
NSA11	CR43 East of Wellington St	-90	90	1	0	0	0	1	1.5/4.5	100	-	**52.80**	44.58																		
	TOTAL											**52.80**	44.58																		

Appendix C. Glossary of Terms and Acronyms

"1/N octave band"	means a band of frequencies integrally divided from an octave band. The u.l.f. equals 21/N times the l.l.f. *A commonly used frequency band is the 1/3 octave band.*
"A-weighting"	means a frequency weighting characteristic intended to approximate the relative sensitivity of the normal human to sound of different frequencies over a specified sound level range. *Sound level measurements for the purpose of determining hazard to hearing are always A-weighted.*
"dBA"	means a decibel of noise measured on a sound level meter using the A weighting network
"decibel"	means a unit of measurement, in this case of sound pressure level, and equal to 20 times the logarithm (base 10) of the ratio of the pressure of a sound divided by the reference sound pressure of 20 Pa (0 dB). *A doubling of sound pressure results in an increase of 6 dB; a tenfold increase in sound pressure results in an increase of 20 dB.*
"equivalent sound level"	sometimes denoted Leq, means the value of the constant sound level, exposure to which would result in exposure to the same total A-weighted energy as would the specified time-varying sound if the constant sound level persisted over an equal duration - measured in dBA
"frequency"	means the rate in Hertz (Hz) - previously denoted cycles per second, at which a physical event is repeated. *Normal human hearing extends over a range of frequencies from about 15 Hz to about 15 kHz. Noise at higher frequencies is more disturbing and is more hazardous, but is more easily blocked or absorbed than is sound of low frequency. Sound which is concentrated at a particular, or narrow band of, frequency is more disturbing. (See tonality)*
"noise emission"	means sound radiating from, or leaving, a source.
"noise exposure"	means sound arriving at a receptor.
"noise sensitive receptor (NSA)"	is a location that may be disturbed by noise. This can include, but is not limited to, residences, schools, daycares, hospitals, and retirement homes.
"octave band"	means a band of frequencies where the upper limiting frequency (u.l.f.) is twice the lower limiting frequency (l.l.f.). *Octave bands are identified by their centre-frequencies. The octave bands standardized for acoustic measurements include those centred at 31.5, 63, 125, 250, 500, 1000, 2000, 4000, & 8000 Hz.*
"outdoor living area (OLA)"	means area at ground level, adjacent to a NSA and accommodating outdoor living activities. This area may be situated on any side of the NSA. The usual distance from the dwelling unit wall is 3 m. The vertical height is 1.2 m above the existing round surface. Where unknown, the side closest to the highway should be assumed. Paved areas for multiple dwelling

	residential units may not be defined as an OLA.
"sound pressure"	means the instantaneous difference between the actual pressure and the average or barometric pressure at a given location.
"tonality"	means a characteristic of a sound which can be identified through the sensation of pitch.
"transmission loss (TL)"	the measure of the airborne sound insulation provided by a partition. *Expressed in decibels (dB) it is a measure of ratio of the acoustic energy striking the partition relative to the energy which is transmitted through it.*

Appendix H

Socio-Economic Study

AECOM

United Counties of Leeds and Grenville

Class Environmental Assessment for the Four Lane Upgrade of County Road 43, Kemptville Corridor Socio-Economic Environment Report

Prepared by:

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Project Number:

14-150196

Date:

July 13, 2009

Statement of Qualifications and Limitations

The attached Report (the "Report") has been prepared by AECOM Canada Ltd. ("Consultant") for the benefit of the client ("Client") in accordance with the agreement between Consultant and Client, including the scope of work detailed therein (the "Agreement").

The information, data, recommendations and conclusions contained in the Report:

- are subject to the budgetary, time, scope, and other constraints and limitations in the Agreement and the qualifications contained in the Report (the "Limitations");
- represent Consultants' professional judgement in light of the Limitations and industry standards for the preparation of similar reports;
- may be based on information provided to Consultant which has not been independently verified;
- have not been updated since the date of issuance of the Report and their accuracy is limited to the time period and circumstances in which they were collected, processed, made or issued;
- must be read as a whole and sections thereof should not be read out of such context;
- were prepared for the specific purposes described in the Report and the Agreement;
- in the case of subsurface, environmental or geotechnical conditions, may be based on limited testing and on the assumption that such conditions are uniform and not variable either geographically or over time.

Unless expressly stated to the contrary in the Report or the Agreement, Consultant:

- shall not be responsible for any events or circumstances that may have occurred since the date on which the Report was prepared or for any inaccuracies contained in information that was provided to Consultant;
- makes no representations whatsoever with respect to the Report or any part thereof, other than that the Report represents Consultant's professional judgement as described above, and is intended only for the specific purpose described in the Report and the Agreement;
- in the case of subsurface, environmental or geotechnical conditions, is not responsible for variability in such conditions geographically or over time.

Except as required by law or otherwise agreed by Consultant and Client, the Report:

- is to be treated as confidential;
- may not be used or relied upon by third parties.

Any use of this Report is subject to this Statement of Qualifications and Limitations. Any damages arising from improper use of the Report or parts thereof shall be borne by the party making such use.

This Statement of Qualifications and Limitations is attached to and forms part of the Report.

Signature Page

Report Prepared By:

Corinne Latimer, Environmental Planner

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Appendices

1. Introduction

1.1 Background

In April 2006, the United Counties of Leeds and Grenville issued a report entitled "United Counties of Leeds and Grenville County Road Master Plan". The goal of the Master Plan was to create a long-range (20-year) plan to meet projected transportation needs while adhering to principles of good highway design and environmental management. This study concluded that the County Road 43 from Somerville Road to Highway 416 corridor should be upgraded to a four lane road. Widening of an existing road is a trigger for further study under the Municipal Class Environment Assessment.

In 2008, the United Counties of Leeds and Grenville retained the services of AECOM Canada to complete the Class Environmental Assessment and Preliminary Design of the Four Lane Upgrade of County Road 43 Kemptville Corridor Class EA Study, as a result of the recommendations made in the 2006 Roads Master Plan. This study is being carried out as a Schedule "C" project under the Municipal Class Environmental Assessment process, which is approved under the *Ontario Environmental Assessment Act*.

The primary study area is the County Road 43 extending from Somerville Road to the Western MTO boundary at the Highway 416 corridor (near the Colonnade development roundabout) in the Township of North Grenville, United Counties of Leeds and Grenville. The Municipality is located south of the Rideau River approximately 50 kilometres (km) directly south of Ottawa.

1.2 Purpose of the Report

This Socio-economic Environment Report, prepared by Corinne Latimer, AECOM Canada Ltd., provides a summary description of the existing socio-economic conditions along the study corridor. In preparing the summary description, background information was assembled and reviewed, and applicable agencies were consulted regarding specific data files and other potential data sources. In addition, field reconnaissance activities were carried out in April 2009, to confirm and augment the secondary information reviewed.

2. Socio-Economic Environment

2.1 Review of Background Studies and Secondary Source Information

A number of secondary information sources (e.g. maps, reports) were used to characterize the Study Area Corridor. Much of the datasets collected were obtained from the municipalities. Sources consulted included:

- Aerial photography;
- United Counties of Leeds and Grenville Official Plan; and
- Municipality of North Grenville Official Plan.

2.2 Regional Setting, Economy and Population

County Road 43 is located within the Municipality of North Grenville in the town of Kemptville. The Municipality has a land area of 350 km² and a population of 14,198 (Statistics Canada, 2007) which is projected to grow to 16,891 in 2021, and 18,810 in 2031 (J.L. Richards & Associates Ltd, 2008). It is noted that the United Counties had a total population of 99,206 in 2006 (Statistics Canada, 2007) which is projected to grow to 110,400 in 2021 and 115,400 in 2031 (J.L. Richards & Associates Ltd, 2008). In North Grenville, the median family income in 2006 was $31,799 (Statistics Canada, 2007). The table below summarizes employment in North Grenville by industry, where business and other services provide 46.3% of the employment in the community.

Table 1. Employment by Industry (Statistics Canada, 2006)

Industry		
	Total Experienced Labour Force 15 years and over	7,820
	Agriculture and other resource-based industries	3.6%
	Construction and Manufacturing	13.7%
	Wholesale and Retail Trade	15.2%
	Finance and Real Estate	4%
	Healthcare, social and educational services	17%
	Business and other services	46.3%

In 2001, 43.7% of the resident labour force worked outside of the Municipality (Statistics Canada, 2007). The majority of those residents working outside of the Municipality commuted to Ottawa, Merrickville-Wolford and Gatineau/Hull.

2.3 Existing Land Uses

On April 17, 2009, a site visit was completed to determine the existing land uses along the corridor. Appendix A provides an overview of the corridor and the existing land uses along the corridor.

Figure 1. Study Area

During the site reconnaissance the following key features were identified.

- Four (4) hardware/building/farming supply stores and one (1) lumber storage yard.
- Two (2) grocery stores.
- Two (2) automotive dealers, one (1) auto parts business and one (1) automotive service.
- Four (4) gas stations.
- Six (6) restaurants.
- Four (4) shopping centres, including: Kemptville Mall, Corner Stone Mall, Community Square and Creekside Centre.
- One (1) Insurance broker, real estate agent, dentist and a number of small businesses.
- One (1) LCBO.
- One (1) canoe and kayak rental near the Kemptville Creek Bridge.
- Four (4) residential properties were identified and a number of vacant development properties at the east and west end of the corridor.
- The Forest Ferguson Centre is located between St. Michael Catholic High School and Grenville Street. It is a not for profit corporation that provides nursery stock to the community.
- Cemetery on King Street near County Road 43.
- Sidewalk on south side of County Road 43 between east end of Kemptville Mall and County Road 44 and a sidewalk on north side of County Road 43 between east end of Community Square (at lights) and County Road 44. There is also a sidewalk on the south side of the Kemptville Creek bridge
- Hydro lines follow along the south side of County Road 43 from Somerville Road to just west of County Road 44 then crosses diagonally through a Building Supply store. There are also hydro lines along north and south side of County Road 43 from east of County Road 44 to eastern limits of study area.
- Speed limit drops to 40 km (when lights flashing) for the St. Michael Catholic High School zone, between a restaurant and the Community Square shopping centre.

The Municipality of North Grenville also has a Waste Water Treatment Plant on the north side of the County Road 43, west of the Kemptville Creek Bridge.

2.4 Planning Policies and Designated Land Uses

2.4.1 Provincial Planning Policies

The Planning Act

The *Planning Act* (2005) sets out the ground rules for land use planning in Ontario and describes how land uses may be controlled, and who may control them. Pursuant to the *Planning Act*, the Province of Ontario is the primary planning authority in Ontario. The *Planning Act* enables the Province to delegate some of its planning authority to the upper-tier municipalities (e.g., counties and regional/district municipalities, as well as planning boards) while retaining control through the approval process. Municipalities must conform to approved policies of the Provincial government and its agencies.

Provincial ministries, municipal councils, planners and other stakeholders implement the *Act* when such actions include:

- Preparing Official Plans and planning policies that guide future development considering provincial interests, such as protecting and managing natural resources; and
- Regulating and controlling land uses through zoning by-laws and minor variances.

Provincial Policy Statement

The *Provincial Policy Statement* (PPS) is the complimentary policy document to the *Planning Act* (2005). Issued under the authority of Section 3 of the *Planning Act*, the PPS provides direction on matters of provincial interest related to land use planning and development and promotes the provincial "policy-led" planning system that recognizes and addresses the complex inter-relationship among environmental, economic and social factors in land use planning (MMAH, 2005).

The *Planning Act* requires that the PPS be reviewed periodically to ensure its policies are still effective. The new PPS (2005) took effect on March 1, 2005 and provides for enhanced protection of the environment by identifying the significance of the natural heritage system and water resources, including natural hazards and water quality, air quality and energy use. The new policies also provide for intensification and brownfields development to ensure the maximum use of sewer, water and energy systems, roads and transit. The PPS also provides for more transit-friendly land use patterns using intensification and more compact, higher density development, as a means of bringing more people closer to the transit routes (MMAH, 2005).

2.4.2 Municipality of North Grenville

2.4.2.1 Official Plan

The Municipality of North Grenville completed its Five Year Official Plan Review as mandated by the Province under the provisions of Section 26(1) of the *Planning Act*. The last Official Plan review was conducted in 1998-99, and the previous Official Plan came into effect on June 2, 2000. The current Official Plan was adopted by Council on May 11, 2009.

The underlying community values of the Official Plan state that:
1. North Grenville is comprised of supportive, caring, and friendly people – which is reflected in local organizations;
2. North Grenville believes in economic self-sustainability of community; and
3. Environmental sustainability is a core value of the North Grenville Community.

The Study Area is located in the *Schedule 'B' – Urban Service Area* where the majority of residential, commercial and business growth and development in the Municipality will take place (See Appendix B). This *Urban Service Area* will ensure sustainable growth by providing a commuter community for the Ottawa-Carleton Region, and reduce the pressure for rural non-farm development in rural areas.

Land use in the Study Area is primarily designated *Highway Commercial*, with pockets of residential areas between CR 44 and the south branch of the River Rideau, and agricultural land uses on the north side of CR 43 between James Street and the south branch of the River Rideau. Land use adjacent to the south branch of the River Rideau is designated as *Floodplain Hazards* and is designated a Provincially Significant Wetland (PSW).

2.4.2.2 Future Development

Section 10.9 Special Study Area – County Roads 43 and 44 Corridor, provides urban design guidelines for development proposals along the County Road 43 corridor. These guidelines include:

- Road widening right-of-way dedications;
- Sidewalk dedication;
- Appropriate entrances and exits;
- Landscaping provisions;
- Un-intrusive signage;
- Placement of utilities underground; and
- Appropriate roadway illumination and traffic control lights.

2.5 Noise Sensitive Areas

Section 12.14 of the draft Official Plan describes residential areas as noise sensitive areas. It further states that the appropriateness of the development of any proposed major source of noise (non-residential) in close proximity to existing residential development will be considered.

2.6 Recreation Trails

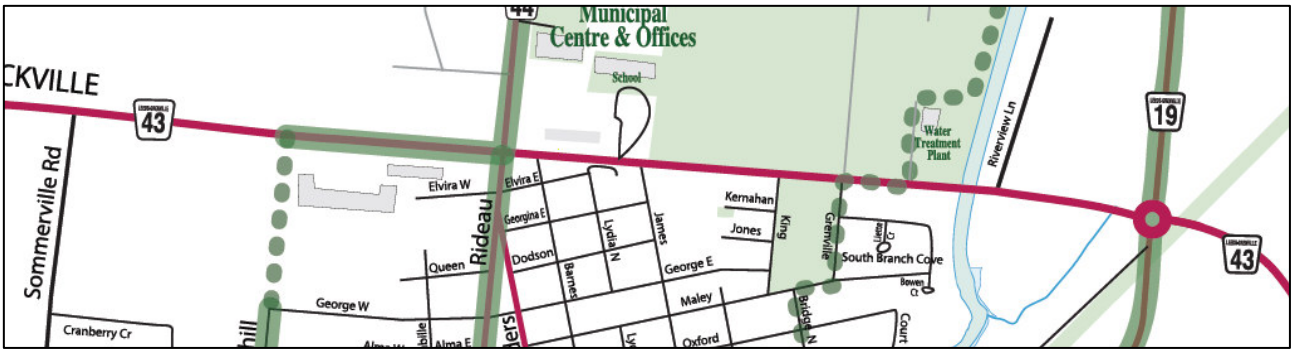
North Grenville has a variety of trails throughout the community. The North Grenville Trail system has 150 kilometres of existing rails, urban streets, rural roads and waterways. The trails consist of walking and hiking trails, and well maintained roads that can be used for horseback, bicycle, and automobile. The North Grenville Trail system is made up of:

- Ferguson Forest Centre Management Trail;

- Limerick Forest Chalet Trail,
- Rideau Canal Lockstation – Burrits Rapids Tip-to-Tip Trail; and
- University of Guelph – Kemptville Campus Agroforestry Trail.

(Municipality of North Grenville, 2009)

Figure 2. North Grenville Trails in the Study Area



(Municipality of North Grenville, 2009)

At the east end of the study area, the County Road 19 paved trail intersects with County Road 43 at the roundabout and continues southwards to Vanburen. The Turtle walking trail intersects County Road 43 near the water treatment plant. It provides a connection to the paved trails of County Road 44 (through the Management Trail) and County Road 18. The County Road 44 paved trail intersects County Road 43 and follows the roadway westwards to the Pinehill walking trail and then heads south connecting to County Road 18. Both trails are marked with directional signage.

The Planning Department for the Municipality of North Grenville does not have planning guidelines for the North Grenville Trails system, but is reviewing the implementation of sidewalks along the outer urban streets and within future residential developments.

2.7 Emergency Service Providers

Emergency services in the Municipality of North Grenville include police, fire and ambulance coverage. Police services are provided by the Ontario Provincial Police (OPP) and are located on County Road 43.

The Fire Department is located on Reuben Crescent, and is comprised of 38 volunteers and one fire chief. The department services a 415 km² area including the Municipality of North Grenville and adjacent communities.

Ambulatory services are provided by the United Counties of Leeds and Grenville. The Kemptville District Hospital is located on Concession Road and the emergency services garage is located at County Road 44 approximately 1 km north of County Road 43.

2.8 Schools

St. Michael Catholic High School is located on County Road 43 near James Street and is one of two high schools located in the community. The high school is buffered from County Road 43 by a long entrance way and recreational field.

3. Conclusions

This *Socio-economic Environment Report* provides a summary description of the existing social and economic conditions within the County Road 43 corridor. The land use in the Study Area is primarily designated *Highway Commercial* and the proposed improvements are consistent with the Municipality of North Grenville Official Plan.

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Appendix I

Stage 1 Archaeological Assessment

ARCHEOWORKS INC.

Stage 1 Archaeological Assessment (AA) of:
County Road 43
Within parts of Lots 24 thru 30, Concessions 2&3
Municipality of North Grenville
County of Leeds and Grenville
Ontario

Project #: 148-LG3190-09
Licencee/#: Sarah De Decker/P305
CIF#: P305-004-2009

Revised July 2009

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Executive Summary

Archeoworks Inc. was retained by *AECOM* to conduct a Stage 1 archaeological assessment for County Road 43, between Somerville Road (to the west of Kemptville Mall) and the western *Ministry of Transportation* (MTO) boundary (approximate location of the existing Colonnade development roundabout), in the Municipality of North Grenville, County of Leeds and Grenville. The objective of this document is to determine what archaeological impacts might occur during the widening of the County Road 43 study corridor, and thus, archaeological potential was identified by conducting background research and undertaking a non-intrusive field review of the study corridor to accommodate upcoming construction activities. The Stage 1 research, reported herein, was conducted under the project direction of Ms. Sarah De Decker, in accordance with the *Ontario Heritage Act* (1990) under an archaeological consulting licence (P305).

Background research has determined that two registered archaeological sites are located within a two-kilometre radius of the study corridor, indicating potential for encountering additional archaeological sites during a Stage 2 field investigation. Although this is a small number of sites, this is likely due to the paucity of archaeological survey within proximity of the study area rather than an absence of past human activity. Furthermore, the study corridor is bisected by Kemptville Creek and a review of the study area within the *History of Leeds and Grenville, 1879* indicates that four homestead structures and one historic railway route are located within 100 metres of its limits. Therefore, a review of the physical and historical context supports potential for locating archaeological resources within undisturbed portions of the study corridor boundaries.

A review of base plans and the existing road alignment revealed that proposed improvements are to occur both within and beyond the current road right-of-way (ROW). Observed disturbances consist of the existing road ROW, sidewalks, graded boulevards, associated gravel shoulders, drainage ditching and commercial and industrial development beyond the ROW limits. Physiographic conditions negatively affecting archaeological potential consist of the low-lying and wet areas surrounding Kemptville Creek. Due to the low archaeological potential classification of these areas listed above, archaeological testing is not warranted. Undisturbed locations, mostly located beyond the ROW limits, are comprised of woodlot, fallow and agricultural fields as well as grassed commercial and cemetery frontages. Due to the high archaeological potential classification of this study corridor, all sections assessed to be undisturbed will require further Stage 2 field investigations.

Project Personnel:

Project/Field Director:

Sarah De Decker

Field Review Archaeologist:

Sarah De Decker

Report Preparation:

Sarah De Decker
Jessica Marr

Graphics:

Sarah De Decker
Nimal R Nithiyanantham

Contents

Introduction

Archeoworks Inc. was retained by *AECOM* to conduct a Stage 1 archaeological assessment for County Road 43, between Somerville Road (to the west of Kemptville Mall) and the western *Ministry of Transportation* (MTO) boundary (approximate location of the existing Colonnade development roundabout), in the Municipality of North Grenville, County of Leeds and Grenville (***see Figure 1***). The "United Counties of Leeds and Grenville, County Road 43 Corridor Master Plan" (April 2006) concluded that upgrading this section of County Road 43 to a four lane road was required to accommodate projected regional growth. Thus, the objective of this document is to determine what archaeological impacts might occur during the upgrading of the County Road 43 study corridor by conducting background research and reviewing the existing conditions of the corridor area. This Stage 1 assessment is being done to satisfy requirements for a Schedule "C" project, under a Municipal Class Environmental Assessment.

The Stage 1 research, reported herein, was conducted under the project direction of Ms. Sarah De Decker, in accordance with the *Ontario Heritage Act* (1990) under an archaeological consulting licence (P305). Permission to review and assess the archaeological potential of the subject lands was granted on March 3, 2009.

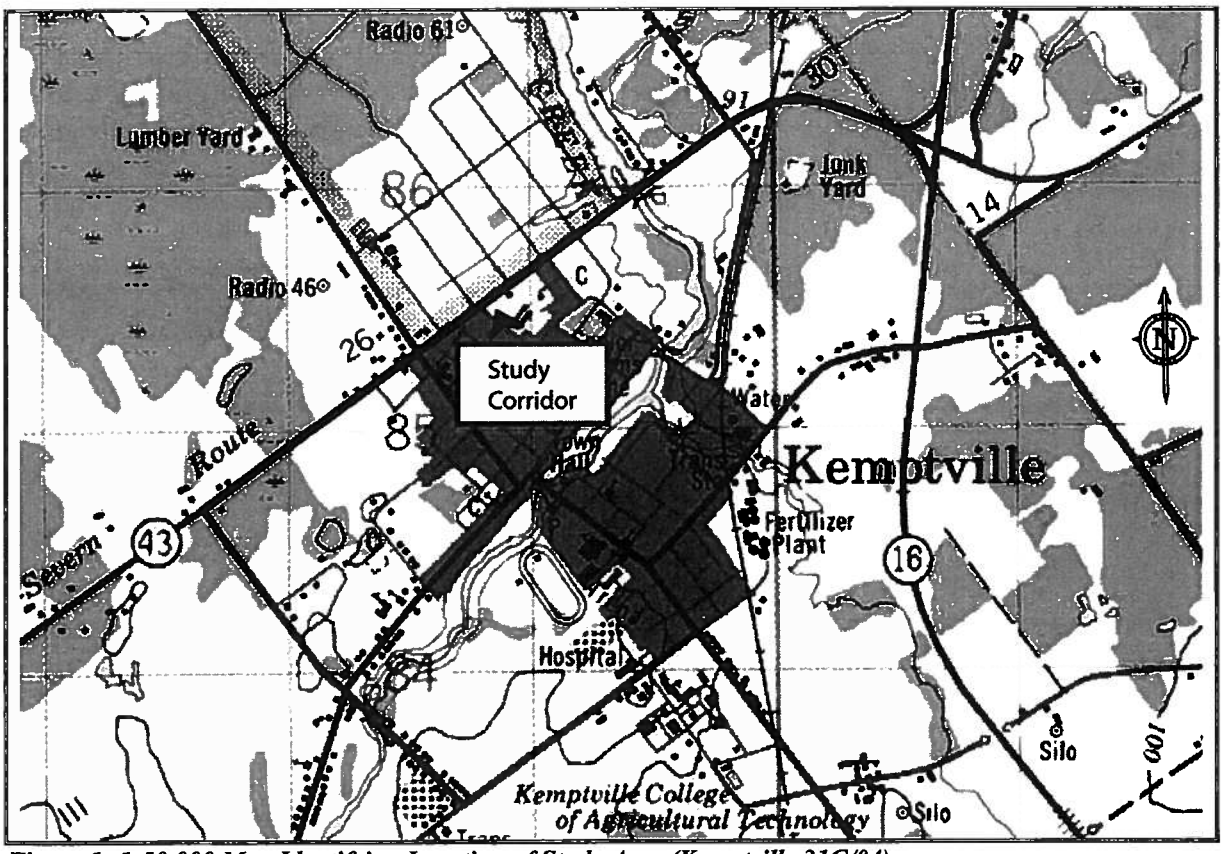

Figure 1: 1:50,000 Map Identifying Location of Study Area (Kemptville 31G/04)

1.0 Determining Archaeological Potential

The Stage 1 background research is conducted to evaluate the study corridor's potential to contain archaeological resources. Potential is assessed based on a combination of physical and historical features, as well as the proximity of previously identified archaeological sites. If potential is established anywhere within the study area limits, a Stage 2 assessment must be conducted to confirm the presence of archaeological resources. The *Checklist for Determining Archaeological Potential, Standards and Guidelines for Consultant Archaeologists final draft Unit 1C* summarizes those features which are used to assess archaeological potential, as well as the integrity of any such resources and the impact of proposed development/construction activities.

1.1 Registered Archaeological Sites

In order that an inventory of archaeological resources could be compiled for this study corridor, the site record forms for registered sites housed at the *Ministry of Culture (MCL)* were consulted. Each site is registered according to the Borden System, which is an archaeological numbering system used throughout Canada to track archaeological sites and the artifacts that come from them. The specific area under review is located within Borden Block BgFv. According to the *Ministry of Culture* site registry files, only two archaeological sites have been registered within a 2000 metre radius of the study corridor (***see Table 1)***. This small number of sites is likely due to the paucity of archaeological survey within proximity of the study area, rather than an absence of past human activity. Furthermore, based on mapping received from the *Ministry of Culture*, we can confirm that at least one previously identified archaeological site is located within 250 metres of the County Road 43 study corridor, and as such, undisturbed portions of the study area within 250 metres of this site are considered to have archaeological potential for the recovery of archaeological remains.

Table 1: Sites within Two Kilometres of the Study Area

Borden #	Name	Cultural Affiliation	Type
BgFv-1	Lewis/Bennett	Euro-Canadian	Homestead
BgFv-2	Salamander Ranch	Euro-Canadian	Undetermined

Having noted the presence of these sites in relation to the study area, it might be useful to place them in the proper context by reviewing the cultural history of occupation in Southern Ontario provided in ***Table 2*** below.

Table 2: History of Occupation in Southern Ontario

Period	Archaeological Culture	Date Range	Attributes
PALEO-INDIAN			
Early	Gainey, Barnes, Crowfield	11,000 - 10,400 BP	Small nomadic hunter-gatherer bands. Fluted projectile points
Late	Holcombe, Hi-Lo, Lanceolate	10,400 - 9,500 BP	Small nomadic hunter-gatherer bands. Lanceolate projectile points
ARCHAIC			
Early	Side-notched, corner notched, bifurcate-base	9,500 – 8,000 BP	Small nomadic hunter-gatherer bands; first notched and stemmed points, and ground stone celts.

Middle	Otter Creek , Brewerton	8,000 – 4,500 BP	Small territorial hunter-gatherer bands; wider variety of ground stone tools; first copper tools; bone tools
Late	Narrow, Broad and Small Points Normanskill, Lamoka, Genesee, Adder Orchard etc.	4,500 – 2,800 BP	More numerous territorial hunter-gatherer bands; increasing use of exotic materials and artistic items for grave offerings; regional trade networks
WOODLAND			
Early	Meadowood, Middlesex	2,800 – 2,000 BP	Introduction of pottery, burial ceremonialism; panregional trade networks
Middle	Point Peninsula	2,000 – 1,200 BP	Cultural and ideological influences from Ohio Valley complex societies; incipient horticulture
Late	Algonquian, Iroquoian	1,200 - 700 BP	Transition to larger settlements and agriculture
	Algonquian, Iroquoian	700 – 600 BP	Establishment of large palisaded villages (Iroquoian)
	Algonquian, Iroquoian	600 – 400 BP	Tribal differentiation and warfare (Iroquoian)
HISTORIC			
Early	Huron, Odawa, Algonquin	AD 1600 – 1650	Tribal displacements
Late	Six Nations Iroquois, Ojibway, Algonquin	AD 1650 – 1800s	Migrations and resettlement
	Euro-Canadian	AD 1800 - present	European immigrant settlements

1.2 Physical Features

An investigation of the study corridor's physical features was conducted to aid the researcher in developing an argument for archaeological potential based on the environmental conditions of the study corridor. Environmental factors such as close proximity to water, soil type, and nature of the terrain, for example, can be used as predictors to determine where human occupation may have occurred in the past.

The study area falls within the Edwardsburg Sand Plain physiographic region. The bedrock and bolder clay is covered with a nearly level or slightly undulating bed of sand with occasional hummocks and ridges. The sand is glacio-fluvial in origin and has been evenly spread out due to the waves from the late stages of the Champlain Sea (Chapman 1967: 343).

In terms of archaeological potential, potable water is arguably the single most important resource necessary for any extended human occupation or settlement. As water sources have remained relatively stable in southern Ontario since post-glacial times, proximity to water can be regarded as a useful index for the evaluation of archaeological site potential. Indeed, distance from water has been one of the most commonly used variables for predictive modeling of site location. In fact, the *Ministry of Tourism, Culture and Recreation* (now the *Ministry of Culture*) primer on archaeology, land use planning and development in Ontario stipulates that undisturbed lands within 300 metres of a primary water source, and undisturbed lands within 200 metres of a secondary water source, are considered to be of high archaeological potential (1997: pp.12-13). The County Road 43 study corridor is bisected by Kemptville Creek, as well as marsh lands located at its western limits. Therefore, undisturbed

portions of the study corridor within 300 metres of these water sources are considered to have potential for the recovery of archaeological remains (***see Table 3***).

1.3 Historical Features

To assess a study area's potential for the recovery of historic remains, several documents are reviewed in order to gain an understanding of the land-use history. These specifically include the *Illustrated Historical Atlases* for the Counties of Ontario. A review of the study area within the *History of Leeds and Grenville, 1879,* illustrates the County Road 43 study corridor is located within Lots 24 to 30, between Concession 2 and 3, in the historic Township of Oxford (***see Figure 2***). Four homestead structures are illustrated to be within 100 metres of the study corridor; Lot 24, Concession 3 was owned at the time by D. Holden and J. Bennett with one structure illustrated within 100 metres of the study corridor. Lot 25, Concession 3 was owned at the time by W.H. Boltorn and T.H with one structure illustrated within 100 metres of the study corridor. Lot 27, Concession 2 has two structures within 100 metres of the study corridor. Although no owner for this property is listed, these structures may be associated with the historic village of Kemptville, located to the south of County Road 43. Furthermore, the early historic railway route bisects the study corridor within Lots 29 and 30. Therefore, with four historic homestead structures and a historic transportation route within 100 metres of the study corridor, potential for the recovery of archaeological resources within undisturbed portions of it limits is confirmed (***see Table 3***). Finally, it is noted that the course of the Kemptville Creek has proven to be changeable, and at that time crossed the County Road 43 study corridor further west than its present day course.

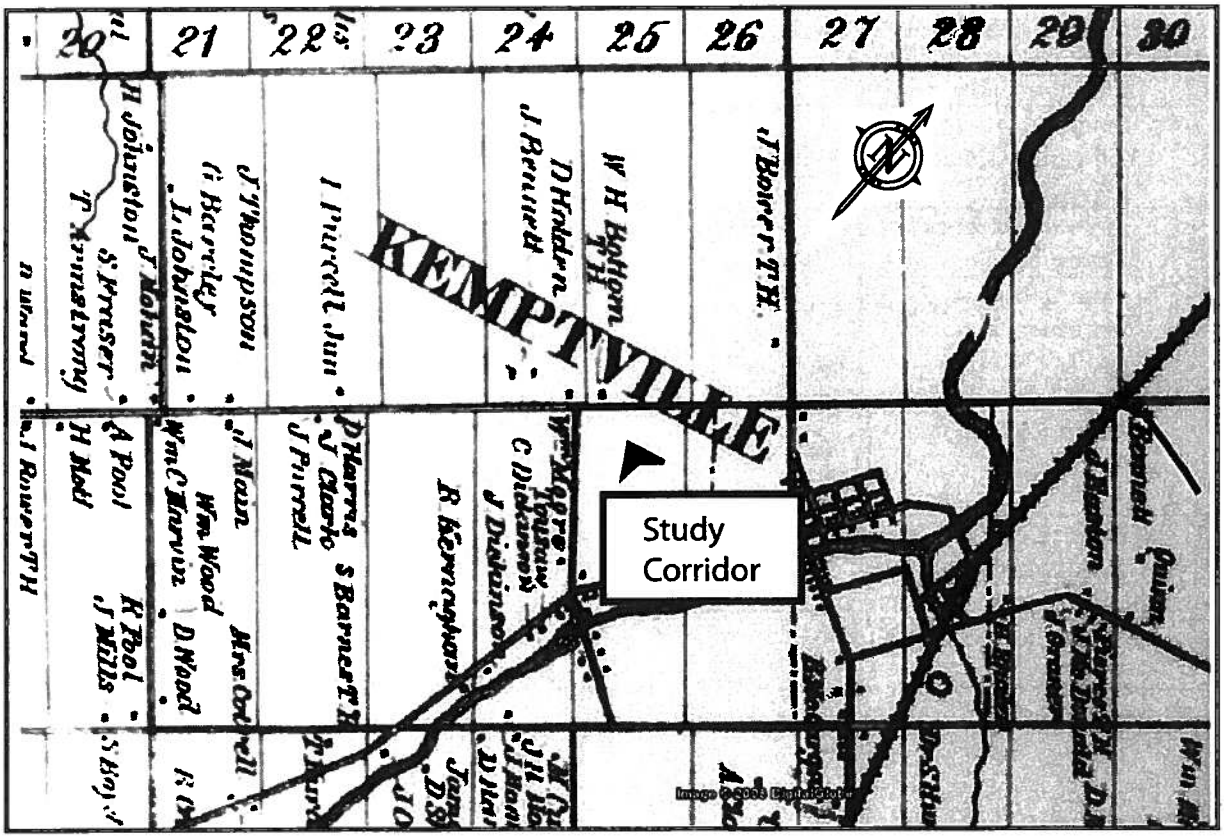

Figure 2: Historical Map of Study Area

1.4 Confirmation of Archaeological Potential

Based on the proximity of previously identified archaeological sites as well as certain physical and historical features within proximity to the study corridor, we have confirmed that the County Road 43 study corridor has potential for the recovery of archaeological resources within undisturbed portions of its limits (***see Table 3***).

Table 3: Checklist for Determining Archaeological Potential

	Feature of Archaeological Potential	**Yes**	**No**	**Not Available**	**Comment**
1	Registered Archaeological Sites within 250 metres	X			If Yes, potential confirmed
2a	Presence of primary watercourse within 300 metres of the study area (lakes, rivers, streams, creeks)	X			If Yes, potential confirmed
2b	Presence of secondary watercourse within 200 metres of the study area (springs, marshes, swamps, intermittent streams)	X			If Yes, potential confirmed
2c	Features indicating past presence of water source within 300 metres (former shorelines, relic water channels, beach ridges)	X			If Yes, potential confirmed
3	Elevated topography (eskers, drumlins, large knolls, plateaux)		X		If Yes to two or more of 3-9, potential confirmed
4	Pockets of sandy soil in a heavy soil or rocky area	X			If Yes to two or more of 3-9, potential confirmed
5	Distinctive land formations (waterfalls, rock outcrops, caverns, mounds)		X		If Yes to two or more of 3-9, potential confirmed
6	Evidence of early Euro-Canadian settlement within 300 metres	X			If Yes to two or more of 3-9, potential confirmed
7	Associated with historic transportation route (railway, roadway etc.)	X			If Yes to two or more of 3-9, potential confirmed
8	Associated with food or scarce resource harvest areas (migratory routes, spawning areas, chert outcrops)		X		If Yes to two or more of 3-9, potential confirmed
9	Contains property designated under the Ontario Heritage Act		X		If Yes to two or more of 3-9, potential confirmed
10	Local knowledge			X	If Yes, potential confirmed
11	Recent (post-1960) disturbance confirmed extensive and intensive		X		If Yes, no potential

2) Field Review

A review of base plans and the existing road alignment revealed that, despite snow-cover present during the field review, proposed improvements are to occur both within and beyond the current road ROW (***see Appendix A***). Disturbances and physiographic factors resulting in low archaeological potential and, thus, precluding the need for further assessment, consist of the low-lying and wet areas surrounding Kemptville Creek, the existing road ROW, sidewalks, graded boulevards, associated gravel shoulders, drainage ditching and commercial and industrial development beyond the ROW limits (***see Plates 1-10)***.

Undisturbed locations, mostly located beyond the ROW limits, are comprised of woodlot, fallow and agricultural fields as well as grassed commercial frontages. Due to the high archaeological potential classification of this study corridor, all sections assessed to be undisturbed will require further Stage 2 field investigation ***(see Appendix A, Plates 1-10)***. Furthermore, one cemetery has been identified, located on the south side of County Road 43, between King Street and Grenville Street (***see Appendix A***). Stage 2 test-pit investigations will be required within this segment, and possibly Stage 3 testing depending on the proximity of existing grave shafts to proposed construction. This will be determined by carefully reviewing the cemetery grounds and a map illustrating burial plot locations, which will need to be undertaken during the Stage 2 assessment. If it is determined that construction is to occur 10 metres or closer to existing grave shafts, topsoil stripping will need to be undertaken within this section following the limits of the cemetery, to ensure there will be no impacts to unmarked graves/human remains.

3) Conclusions and Recommendations

The Stage 1 archaeological assessment for County Road 43, between Somerville Road (to the west of Kemptville Mall) and the western *Ministry of Transportation* (MTO) boundary (approximate location of the existing Colonnade development roundabout), in the Municipality of North Grenville, County of Leeds and Grenville, Ontario has indicated that, based on the visual documentation of suitable topography and proximity of water sources and historical features, there is potential for the recovery of archaeological resources within undisturbed portions of the corridor limits.

In light of these results, the following recommendations are presented:

1. A Stage 2 archaeological field assessment of all identified undisturbed locations should be conducted prior to construction activities, to minimize impacts to heritage resources. Should significant archaeological resources be encountered, additional background research or fieldwork may be required by the *Ministry of Culture*.

2. A careful review of the cemetery grounds, between King Street and Grenville Street, and a map illustrating burial plot locations, will need to be undertaken during the Stage 2 assessment. If it is determined that construction is to occur 10 metres or closer to existing grave shafts, topsoil stripping will need to be undertaken within this

section, following the limits of the cemetery, to ensure there will be no impacts to unmarked graves/human remains.

3. This report is filed with the *Ministry of Culture* in compliance with Section 65 (1) of the *Ontario Heritage Act*. The ministry reviews reports to ensure that the licensee has met the terms and conditions of the licence and archaeological resources have been identified and documented according to the standards and guidelines set by the ministry, ensuring the conservation, protection and preservation of the heritage of Ontario. It is recommended that construction not proceed before receiving confirmation that the *Ministry of Culture* has entered the report into the provincial register of reports and that there are no further archaeological concerns.

4. Should previously unknown or unassessed deeply buried archaeological resources be uncovered during development, they may be a new archaeological site and therefore subject to Section 48 (1) of the *Ontario Heritage Act*. The proponent or person discovering the archaeological resources must cease alteration of the site immediately and engage a licensed archaeologist to carry out archaeological fieldwork, in compliance with Section 48 (1) of the *Ontario Heritage Act*. The office of the Heritage Operations Unit, *Ministry of Culture* (416-314-7143) should be contacted immediately.

5. Any person discovering human remains must immediately notify the office of the Heritage Operations Unit, *Ministry of Culture* (416-314-7143), the police or coroner, and the Registrar of Cemeteries, Cemeteries Regulation Unit, *Ministry of Government Services* (416-326-8404).

Under Section 6 of Regulation 881 of the *Ontario Heritage Act*, *Archeoworks Inc.* will, "keep in safekeeping all objects of archaeological significance that are found and all field records that are made."

4) Bibliography

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1879 ***History of Leeds and Grenville, Ontario***. Brockville.

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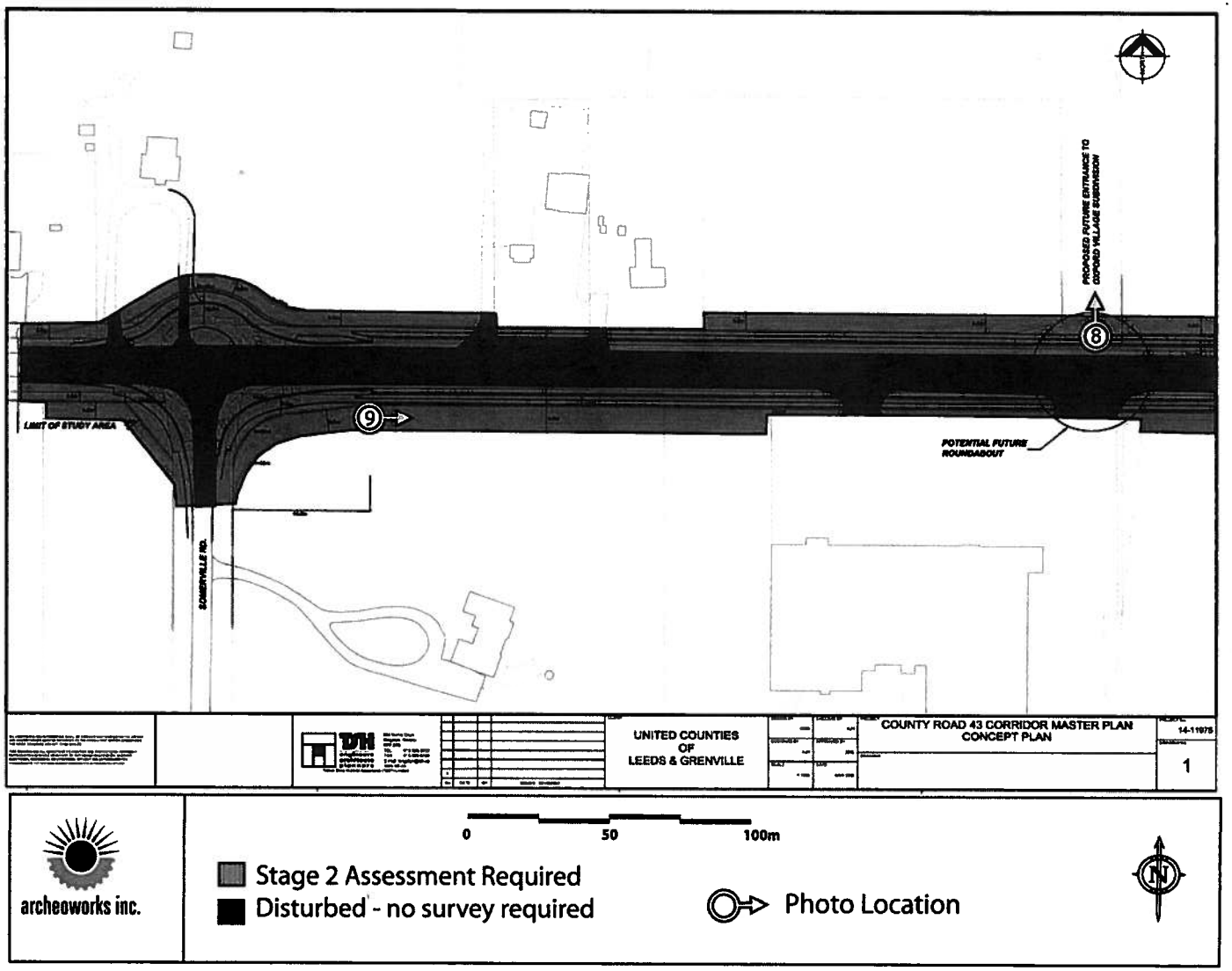
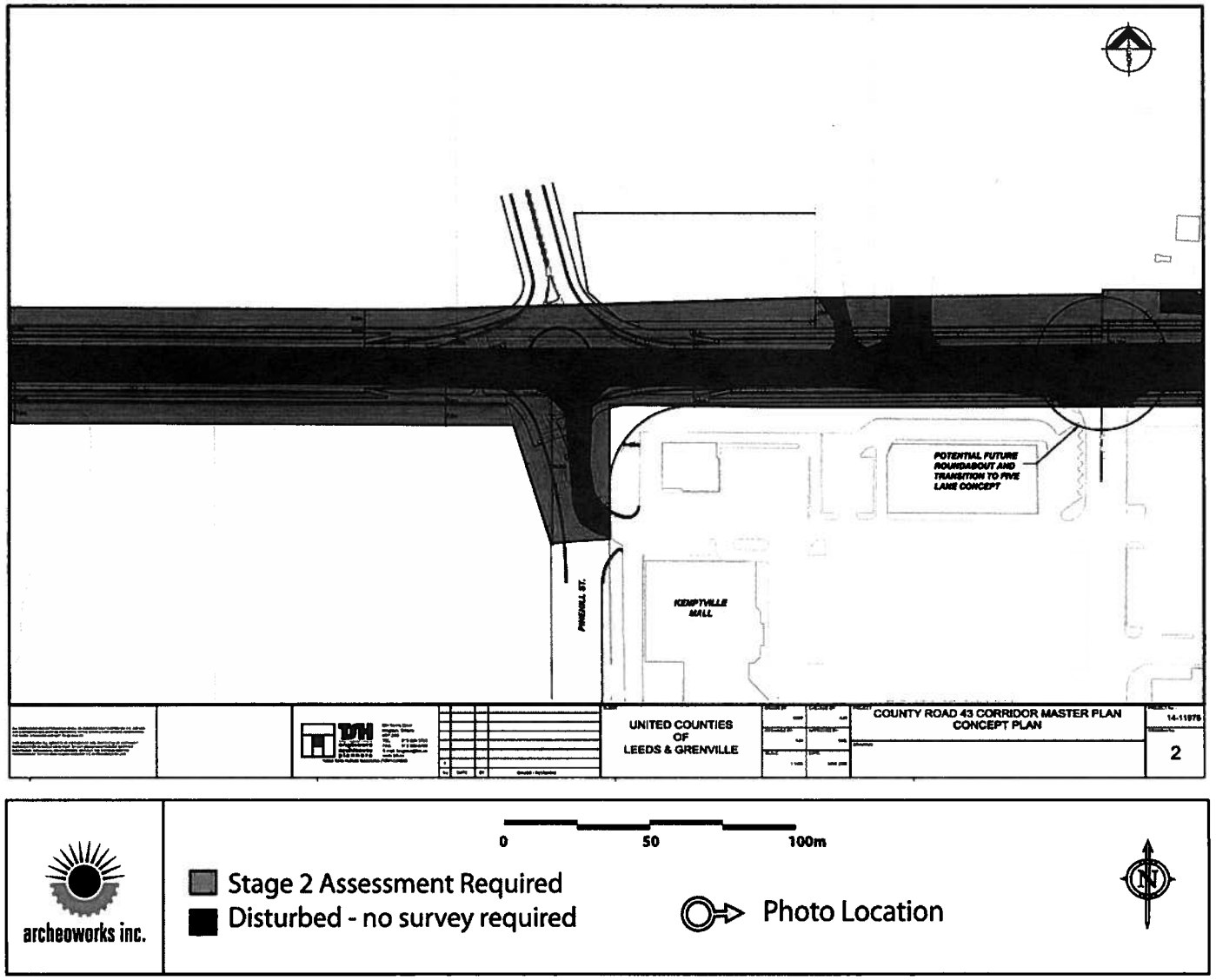
1997(revised 1998) ***Conserving a Future for our Past: Archaeology, Land Use Planning & Development in Ontario. An Educational Primer and Comprehensive Guide for Non-Specialists.*** Cultural Programs Branch, Archaeology & Heritage Planning Unit. Toronto.

Ontario *Ministry of Culture*
2006 ***Final Draft: Standards and Guidelines for Consulting Archaeologists.*** http://www.culture.gov.on.ca/english/culdiv/heritage/arch_custsvc_draft_final.html

Appendix A: Design Plan*

**Figures were created based on photographs taken during the winter season with snow cover, thus, the areas warranting fieldwork may be subject change during the Stage 2 archaeological assessment.*




POTENTIAL FUTURE ROUNDABOUT AND TRANSITION TO FIVE LANE CONCEPT
KEMPTVILLE MALL
PINEHILL ST.
UNITED COUNTIES OF LEEDS & GRENVILLE
COUNTY ROAD 43 CORRIDOR MASTER PLAN CONCEPT PLAN
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archeoworks inc.
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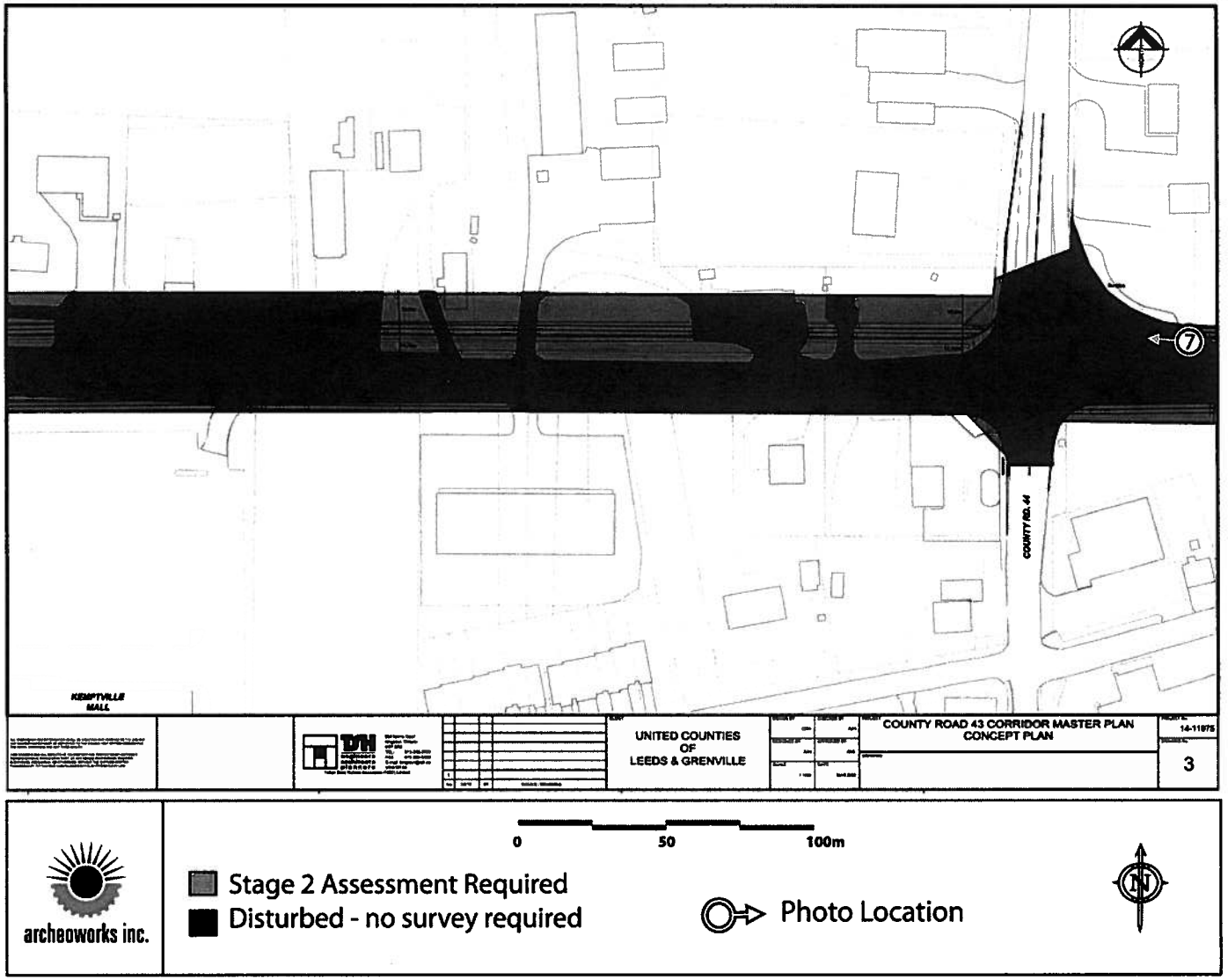
100m
Stage 2 Assessment Required
Disturbed - no survey required
Photo Location
N


KEMPTVILLE MALL
COUNTY RD. 44
7
UNITED COUNTIES OF LEEDS & GRENVILLE
COUNTY ROAD 43 CORRIDOR MASTER PLAN CONCEPT PLAN
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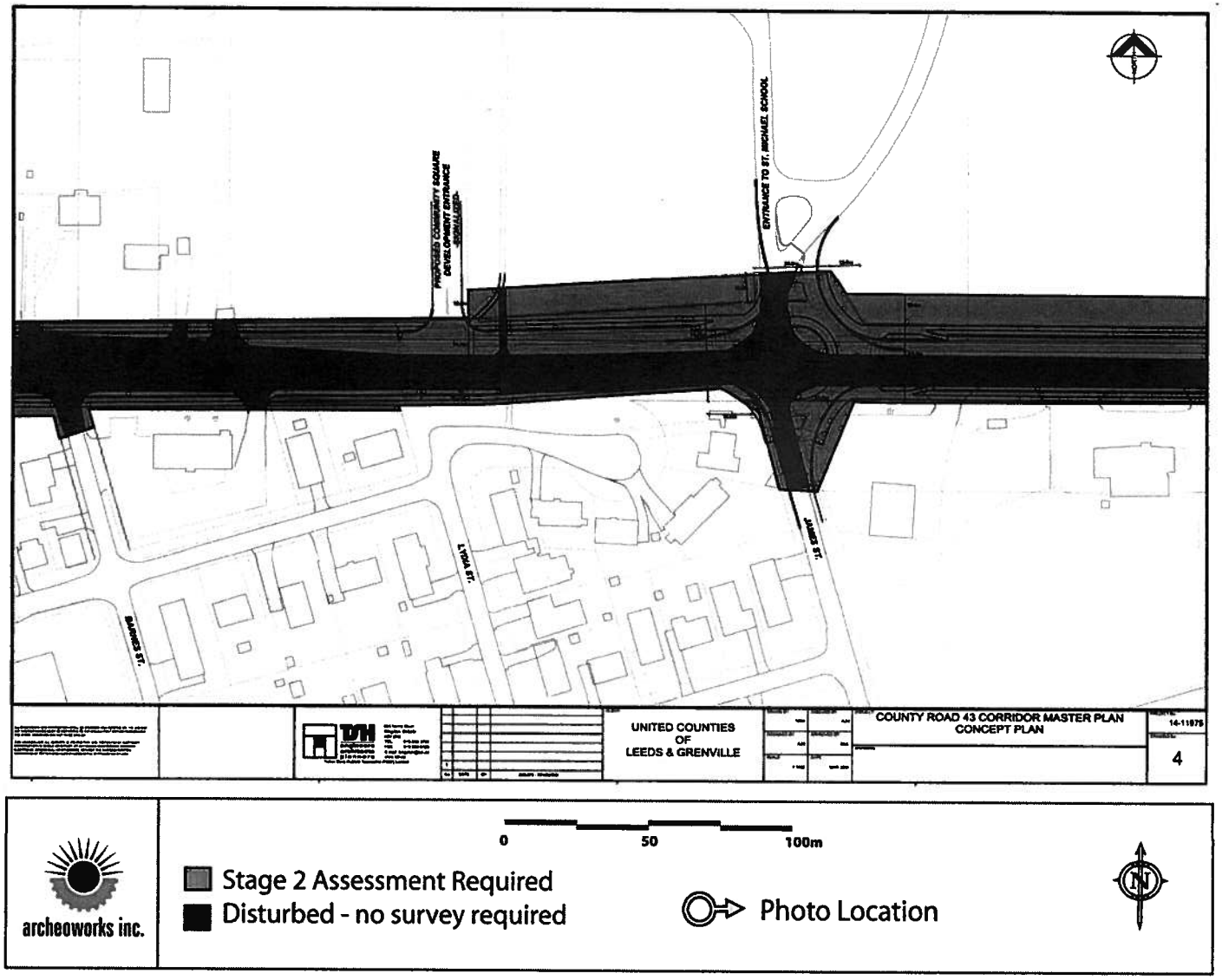
Disturbed - no survey required
Photo Location
archeoworks inc.


PROPOSED COMMUNITY SQUARE DEVELOPMENT ENTRANCE -SIGNALIZED-
ENTRANCE TO ST. MICHAEL SCHOOL
LYDIA ST.
BARNES ST.
JAMES ST.
UNITED COUNTIES OF LEEDS & GRENVILLE
COUNTY ROAD 43 CORRIDOR MASTER PLAN CONCEPT PLAN
14-11875
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archeoworks inc.
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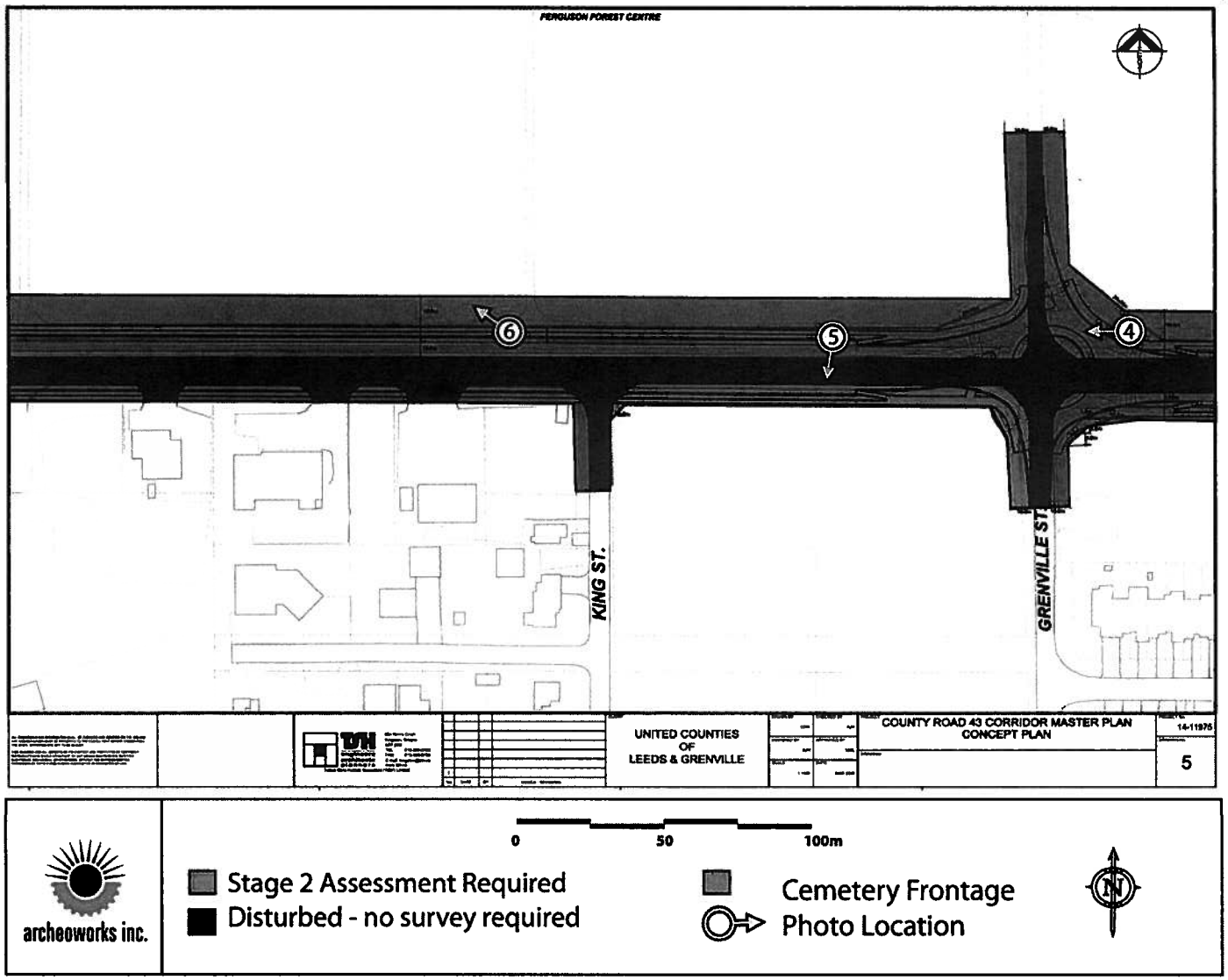
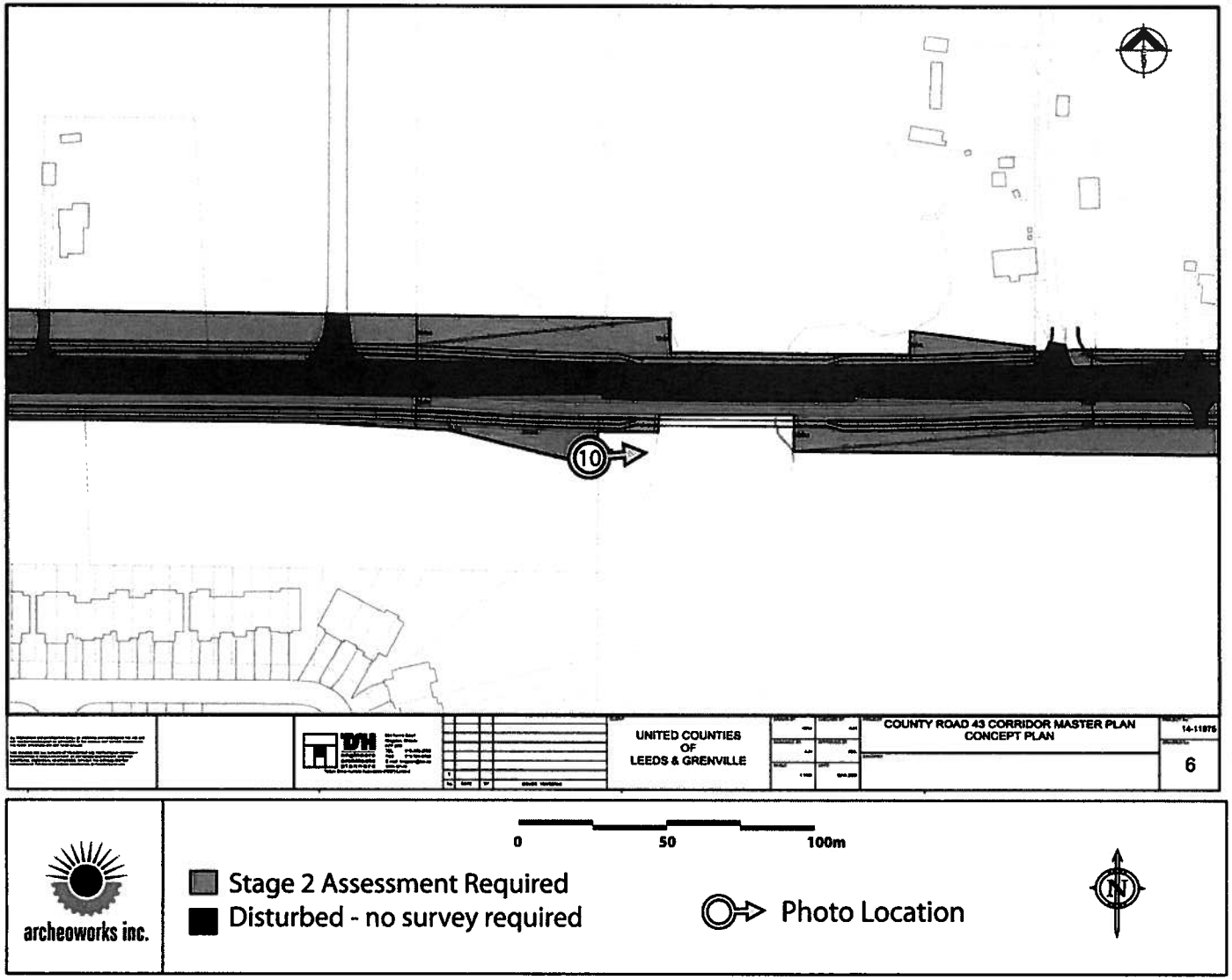
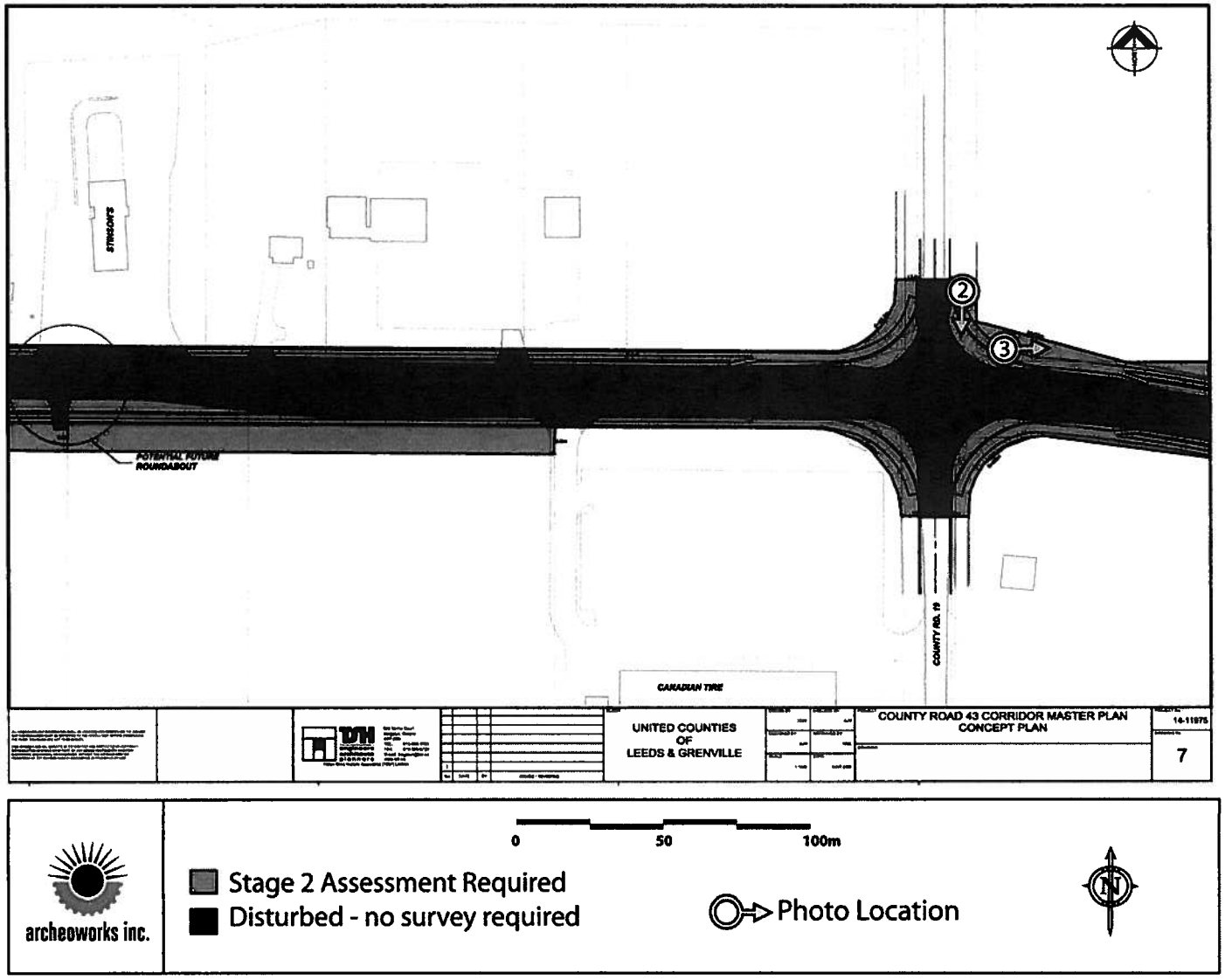
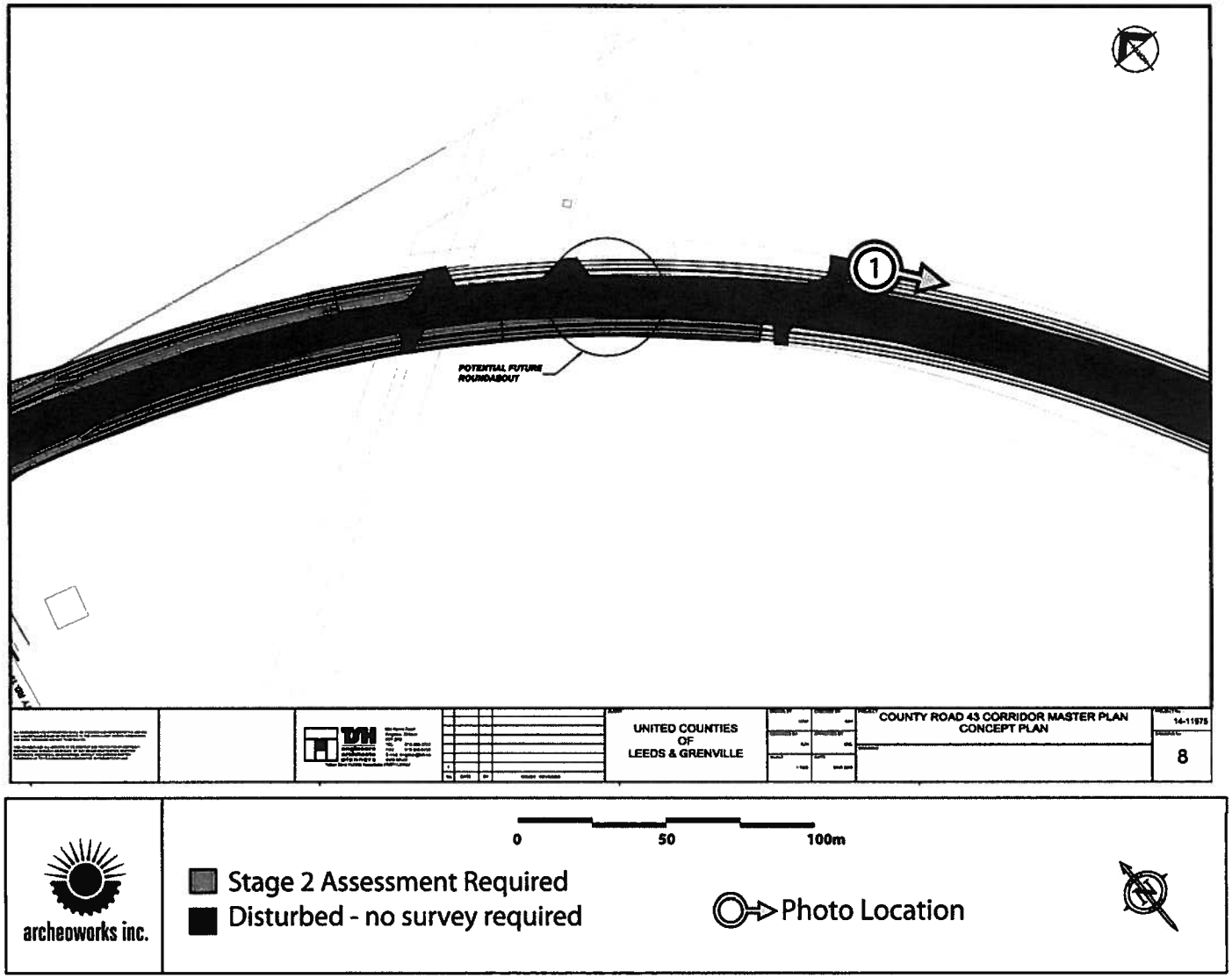
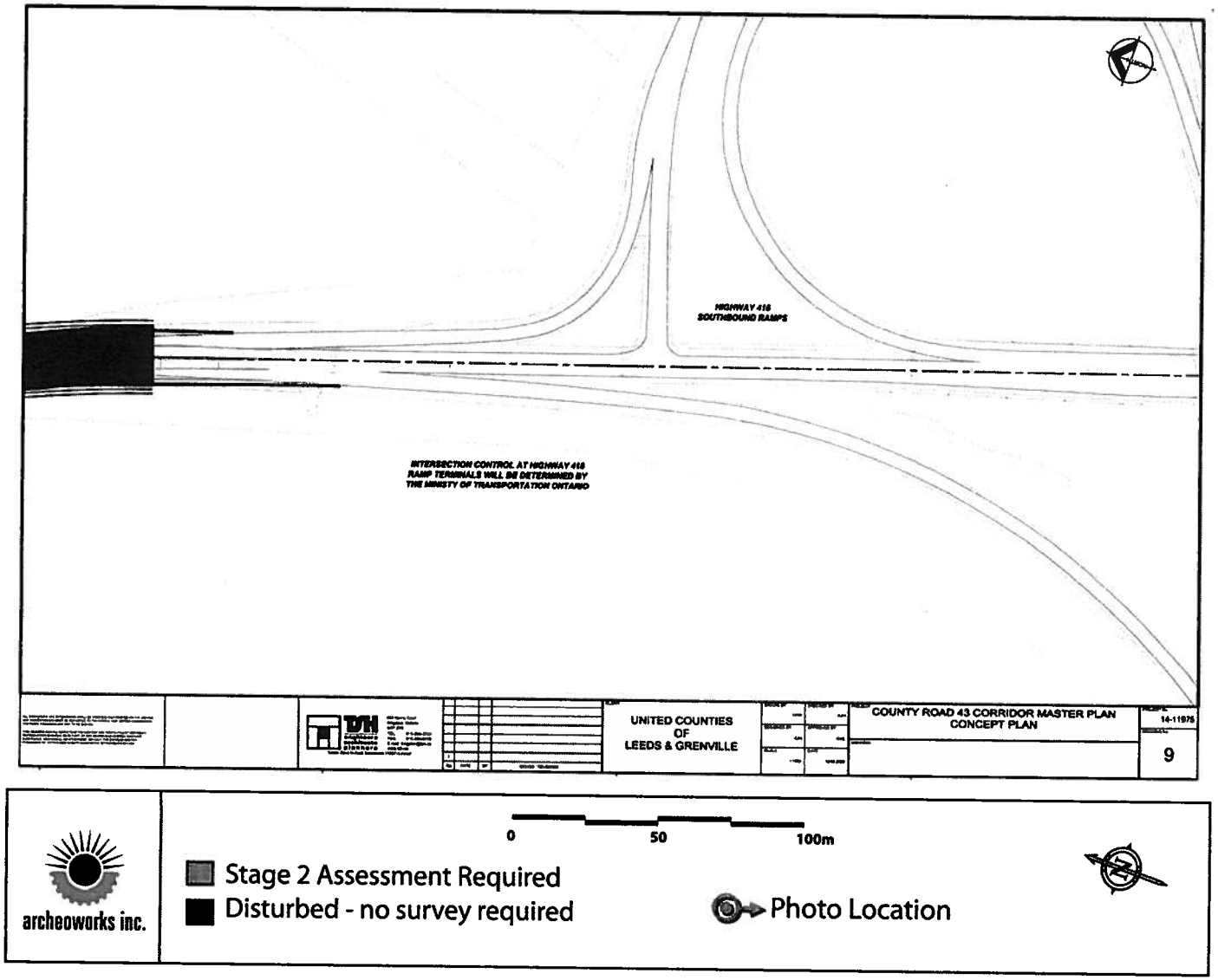
Stage 2 Assessment Required
Disturbed - no survey required
Photo Location
N


FERGUSON FOREST CENTRE
6
5
4
KING ST.
GRENVILLE ST
UNITED COUNTIES OF LEEDS & GRENVILLE
COUNTY ROAD 43 CORRIDOR MASTER PLAN CONCEPT PLAN
14-11975
5
archeoworks inc.
0
50
100m
Stage 2 Assessment Required
Disturbed - no survey required
Cemetery Frontage
Photo Location
N


10
UNITED COUNTIES OF LEEDS & GRENVILLE
COUNTY ROAD 43 CORRIDOR MASTER PLAN CONCEPT PLAN
14-11875
6
archeoworks inc.
0
50
100m
Stage 2 Assessment Required
Disturbed - no survey required
Photo Location
N


STINSON'S
POTENTIAL FUTURE ROUNDABOUT
CANADIAN TIRE
COUNTY RD. 19
2
3
UNITED COUNTIES OF LEEDS & GRENVILLE
COUNTY ROAD 43 CORRIDOR MASTER PLAN CONCEPT PLAN
14-11975
7
archeoworks inc.
0
50
100m
Stage 2 Assessment Required
Disturbed - no survey required
Photo Location
N


1
POTENTIAL FUTURE ROUNDABOUT
UNITED COUNTIES OF LEEDS & GRENVILLE
COUNTY ROAD 43 CORRIDOR MASTER PLAN CONCEPT PLAN
14-11975
8
archeoworks inc.
0
50
100m
Stage 2 Assessment Required
Disturbed - no survey required
Photo Location


HIGHWAY 416
SOUTHBOUND RAMPS
INTERSECTION CONTROL AT HIGHWAY 416
RAMP TERMINALS WILL BE DETERMINED BY
THE MINISTY OF TRANSPORTATION ONTARIO
UNITED COUNTIES
OF
LEEDS & GRENVILLE
COUNTY ROAD 43 CORRIDOR MASTER PLAN
CONCEPT PLAN
14-11975
9
archeoworks inc.
0
50
100m
Stage 2 Assessment Required
Disturbed - no survey required
Photo Location

Appendix B: Plates

Plate 1: *Looking south-east along CR43 at 416 interchange at undisturbed fallow fields beyond disturbed right-of-way*

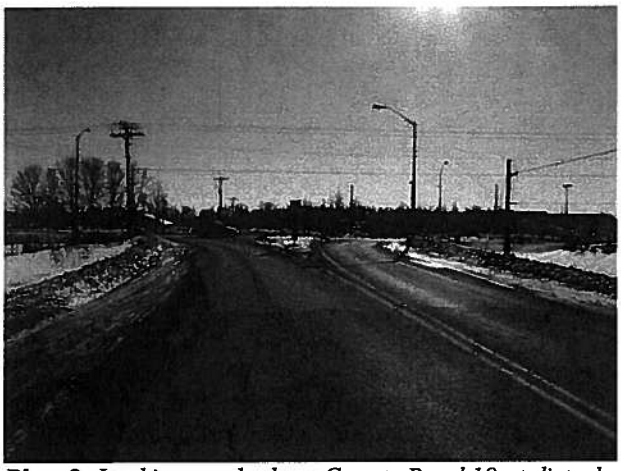


Plate 2: *Looking south along County Road 19 at disturbances associated with the roundabout intersection with County Road 43*

Plate 3: *Looking east along north side of County Road 43 from CR 19 roundabout at disturbances associated with ditching. Note undisturbed fallow fields beyond ROW limits*

Plate 4: *Looking west along County Road 43 on northern side of Grenville St. Intersection at undisturbed fields beyond disturbed right-of-way*

Plate 5: *Looking south at Cemetery grounds on the south side of County Road 43*

Plate 6: *Looking west along County Road 43 at the Ferguson Forestry Centre and undisturbed fields beyond disturbed right-of-way*

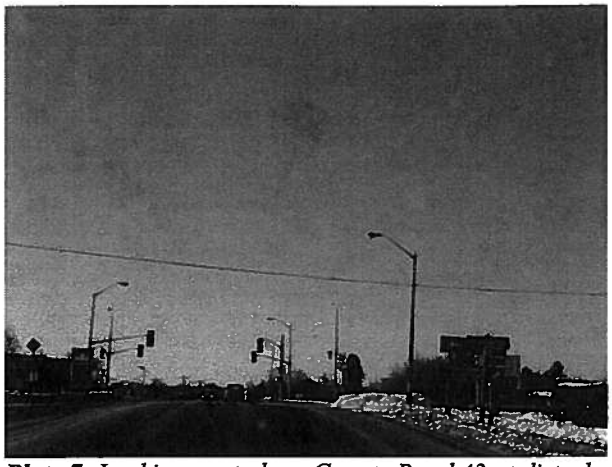


Plate 7: *Looking west along County Road 43 at disturbances associated with the County Road 44 intersection*

Plate 8: *Looking north on County Road 43 at future Oxford Village site at undisturbed fallow field beyond disturbed right-of-way*

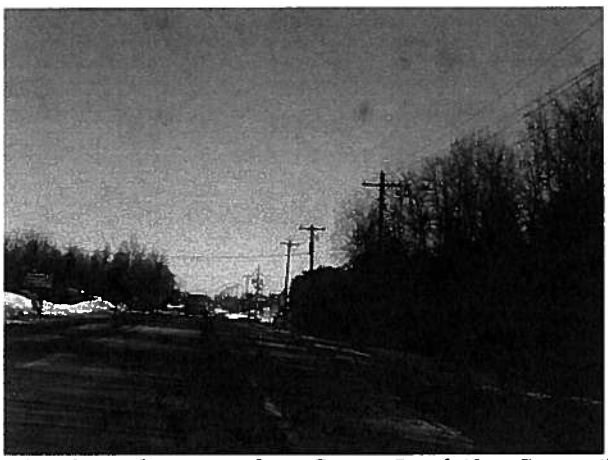


Plate 9: *Looking east along County Road 43 at Somerville Road at undisturbed woodlot beyond disturbed right-of-way*

Plate 10: *Looking east at open fields on the southside of Kemptville Creek from Creekside centre*