



**ALTERNATIVE FOUNDATION ASSESSMENT REPORT
FOR
HIGHWAY 11 ACCESS REVIEW FROM
HIGHWAY 534 TO HIGHWAY 654
MUNICIPALITIES OF POWASSAN AND CALLANDER
TOWNSHIPS OF SOUTH HIMSWORTH AND NORTH HIMSWORTH
G.W.P. NO. 5379-06-00
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TABLE OF CONTENTS

1. INTRODUCTION	1
2. SITE DESCRIPTION	4
3. SITE ASSESSMENT PROCEDURES	6
3.1 General	6
3.2 Reference Documents and Literature Review	6
3.3 Site Reconnaissance	7
3.3.1 Site Reconnaissance Notes	7
4. INFERRED SUBSURFACE CONDITIONS.....	10
4.1 General	10
4.2 Drainage	13
5. FOUNDATION ASSESSMENT AND RANKING.....	13
5.1 Criteria Used In Assessing Alternatives	13
5.1.1 Extent of Soft Ground/Swamps (Tables S-1 and SC-1)	14
5.1.2 Groundwater Conditions (Tables S-2 and SC-2).....	14
5.1.3 Structure Foundations (Tables S-3 and SC-3)	14
5.1.4 Embankment Settlement (Tables S-4 and SC-4)	15
5.1.5 Embankment Stability (Tables S-5 and SC-5).....	15
5.1.6 Construction Feasibility (Tables S-6 and SC-6)	15
5.2 Weighting of Evaluation Criteria for Interchange Alternatives (Tables S-1 to S-6 and SC-1 to SC-6).....	16
5.3 Scoring of Foundation Criteria for Structure Alternatives (Tables S-7 and SC-7)	18
6. ALTERNATIVE STRUCTURE LOCATIONS REVIEW AND RECOMMENDATIONS.....	21
6.1 General	21
6.2 Embankment Design	22
6.3 Embankment Stability	22
6.4 Embankment Settlements	23
6.5 Structure Foundations	24
6.6 Construction Considerations	24
6.7 Assessment of Advantages and Disadvantages.....	25



7. PREFERRED STRUCTURE ALTERNATIVES.....	27
7.1 Preferred Structure Location Overview	27
7.1.1 South Section.....	27
7.1.2 Central Section.....	27
7.1.3 North Section	28
7.2 Additional Studies	28
8. CLOSURE	29

Table 1 – Recommended Locations for Foundation Investigations
Structures and Culverts

Table S-1 – Soft Ground/Swamps for Interchange Locations

Table S-2 – Groundwater Conditions for Interchange Locations

Table S-3 – Structure Foundations for Interchange Locations

Table S-4 – Embankment Settlement for Interchange Locations

Table S-5 – Embankment Stability for Interchange Locations

Table S-6 – Construction Feasibility for Interchange Locations

Table S-7 – Scoring of Foundation Criteria (Interchanges)

Table SC-1 – Soft Ground/Swamps for Access Scenarios

Table SC-2 – Groundwater Conditions for Access Scenarios

Table SC-3 – Structure Foundations for Access Scenarios

Table SC-4 – Embankment Settlement for Access Scenarios

Table SC-5 – Embankment Stability for Access Scenarios

Table SC-6 – Construction Feasibility for Access Scenarios

Table SC-7 – Scoring of Foundation Criteria (Access Scenarios)

Figure 1 – Project Location Map

Figure 2 – Site Geology



Drawing A – Key Map for Interchanges

Drawing B – Legend for Interchange locations

Drawings B1 to B3 – Plans – Interchange Alternatives for South, Central and North Sections

Drawing SC-A – Key Map for Access Scenarios

Drawing SC-B – Legend for Access Scenarios

Drawings SC-1 to SC-3 – Plans - Access Scenarios

Appendix A – List of Reference Documents

Appendix B – MOE Well Records

Appendix C – Site Photographs 1 to 20

ALTERNATIVE FOUNDATION ASSESSMENT REPORT
for
Highway 11 Access Review from Highway 534 to Highway 654
Municipalities of Powassan and Callander
Townships of South Himsworth and North Himsworth
G.W.P. No. 5379-06-00

1. INTRODUCTION

This report provides the alternate interchange location foundation assessment for a section of Highway 11 that extends from Highway 534 to Highway 654 in the Municipalities of Powassan and Callander, North Bay area. The study was carried out for the Ministry of Transportation of Ontario (MTO) on behalf of Stantec Consulting Ltd. (Stantec).

The study corridor extends from the Highway 534 and Highway 11 interchange, about Sta. 24+000 Township of South Himsworth (TSH) in the Municipality of Powassan to Highway 654, about Sta. 17+000 Township of North Himsworth (TNH) in the Municipality of Callander. The chainage equation change of the existing highway alignment occurs at the following Stations:

Sta. 29+974.380 Twp South Himsworth/Municipality of Powassan = Sta. 10+000.000
Twp North Himsworth/ Municipality of Callander

This section of Highway 11 is a four-lane highway and the median is presently about 30 m wide. Traffic access to the highway occurs at five at-grade intersections located at McCharles Line/Main Street, Peever Line/Golf Course Line, Hills Siding Road, Watson Road and Rivers Road.

This study involves the review of the alternatives for a fully controlled access to the subject section of Highway 11 including interchange options that are intended to remove all existing at-grade accesses. Consequently, the project will entail the future construction of a new interchange and with grade separation structures. Upon completion of the preliminary reviews, the study area was divided into three sections: south, central and north. The south and north sections include two alternatives and the central section has three alternatives as shown on the attached Key Map (Drawing A) and are described below.



- South Section [Highway 534 to Sta. 28+750 (TSH) (Peever Line / Golf Course Line)]
 - Alternative S1- Interchange at Sta. 28+350 (Includes underpass at Sta. 25+900)
 - Alternative S2- Underpass at Sta. 28+350 (Peever Line / Pine Tree Way)
- Central Section [Sta. 28+750 (TSH) (Peever Line / Golf Course Line) to Sta. 13+350 (TNH) (Watson Road)]
 - Alternative C1- Interchange at Sta. 10+700 (South of Hills Siding Road)
 - Alternative C2- Interchange at Sta. 11+630 (North of Hills Siding Road)
 - Alternative C3- Underpass at Sta. 11+125 (At Hills Siding Road)
- North Section [Sta. 13+350 (TNH) (Watson Road) to Highway 654]
 - Alternative N1- Underpass at Sta. 15+575 (Rivers Road East / Wookey Road)
 - Alternative N2- Underpass at Sta. 15+900 (Rivers Road East / Stone Road)

In addition to above listed underpass locations, Stantec developed access scenarios with service road network and underpass locations as shown on the attached Key Map (Drawing SC-A) and Drawings SC-1 to SC-3. These scenarios are as follows:

• **Access Scenario 1**

- Underpass at Sta. 25+900 (TSH) (Oakwood Road/Main Street)
- Underpass at Sta. 28+350 (TSH) (Peever Line/Pine Tree Way)
- New West Side Road between Oakwood Road and Realigned Peever Line (access option)
- New Access Roads from Oakwood Road to MTO Patrol Yard and Powassan Sewage Basins
- Underpass at Sta. 11+125 (TNH) (At Hills Siding Road)
- New East Side Road from Truck Inspection Station to Realigned Hills Siding Road
- Underpass at Sta. 15+575 (TNH) (Rivers Road East/Wookey Road)
- New East Side Road between Watson Road and Rivers Road West
- Connecting Road between Rivers Road West and Stone Road
- Rivers Road East southerly extension

• **Access Scenario 2a**

- Underpass at Sta. 25+900 (TSH) (Oakwood Road/Main Street)
- Underpass at Sta. 28+350 (TSH) (Peever Line/Pine Tree Way)
- New West Side Road from Oakwood Road to MTO Patrol Yard and Powassan Sewage Basins



- New West Side Road from McCharles Line to Sta. 26+900 (TSH) (Highway 11 chainage)
- Underpass at Sta. 10+700 (TNH) (South of Hills Siding Road)
- New East Side Road from the existing Hills Siding Road to 600 m south of the east Truck Inspection Station
- Latour Crescent extension to northerly to Watson Road
- Underpass at Sta. 15+575 (TNH) (Rivers Road East/Wookey Road)
- New West Side Road between Hamilton Printers (Sta. 14+550 (TNH), Highway 11 chainage) and Rivers Road West
- Connecting Road between Rivers Road West and Stone Road
- Rivers Road East southerly extension

• **Access Scenario 2b**

- Underpass at Sta. 25+900 (TSH) (Oakwood Road/Main Street)
- Underpass at Sta. 28+350 (TSH) (Peever Line/Pine Tree Way)
- New West Side Road from Oakwood Road to MTO Patrol Yard and Powassan Sewage Basins
- New West Side Road from McCharles Line to Sta. 26+900 (TSH) (Highway 11 chainage)
- Underpass at Sta. 11+630 (TNH) (North of Hills Siding Road)
- New East Side Road from the realigned Hills Siding Road to 600 m south of the east Truck Inspection Station
- Latour Crescent northerly extension to Watson Road
- Underpass at Sta. 15+575 (TNH) (Rivers Road East/Wookey Road)
- New West Side Road between Hamilton Printers (Sta. 14+550 (TNH), Highway 11 chainage) and Rivers Road West
- Connecting Road between Rivers Road West and Stone Road
- Rivers Road East southerly extension

• **Access Scenario 3**

- Underpass at Sta. 25+900 (TSH) (Oakwood Road/Main Street)
- Underpass at Sta. 28+350 (TSH) (Peever Line/Pine Tree Way)
- New West Side Road from Oakwood Road to MTO Patrol Yard and Powassan Sewage Basins
- New West Side Road from McCharles Line to Sta. 26+900 (TSH) (Highway 11 chainage)
- Underpass at Sta. 11+125 (TNH) (At Hills Siding Road)
- New East Side Road from the realigned Hills Siding Road to 600 m south of the east Truck Inspection Station



- Latour Crescent northerly extension to Watson Road
- Underpass at Sta. 15+900 (TNH)
- New West Side Road between Watson and Rivers Road West
- Connecting Road between Wookey Road and Stone Road
- Rivers Road East southerly extension

Stantec provided site plans of the study corridor illustrating the interchange alternatives and access scenarios. The purpose of this assessment was to identify the geologic features and hydrogeology along the highway corridor and to assess the potential impact of these features on the design and construction of the possible structures listed above. All elevations in this report are expressed in metres.

2. SITE DESCRIPTION

The study area is located about 23 km south of North Bay in the Geographic Townships of North Himsworth and South Himsworth and Municipalities of Powassan and Callander. The study section of Highway 11 being reviewed extends from Highway 534 to Highway 634. A Project Location Map (Figure 1) is enclosed for reference.

Land uses in the vicinity of the highway corridor within the study limits include commercial and residential areas mostly south of Peever Line/ Golf Course Line and a number of residential areas and farmhouses and industrial/commercial activity from Quality Hardwoods at Latour Crescent and scattered recreational and commercial areas along the other Highway 11 sideroads.

The Powassan MTO Patrol Yard and Sewage Basin are present west of Highway 11. The Powassan Mini Storage is located about 400 m south of Peever Line/Golf Course Line and the Highway 11 at-grade crossing at the Pine Tree Way. Highview Golf Course and Driving Range are present at the north and south Golf Course Line and just east of Highway 11. Truck Inspection Stations are located to the east and west of Highway 11 at Watson Road.

A TransCanada Pipe Lines Ltd. (TCPL) facility is located east of the Highway 11 and follows the Highway 11 northerly about 800 m east of the Highway 11 at the Hills Siding Road and about 50 m east at Sta.15+200 (TNH).



Currently, Highway 11 at-grade intersections and structures along the study corridor include the following:

ROAD	STATION	STRUCTURE	STATION
McCharles Line/ Main Street	26+395(S)	Bear Creek Culvert (Site 44-317/1)	27+125(S)
Peever Line/Golf Course Line	28+740(S)	Unnamed Creek Culvert (Site 44-318/1)	27+790(S)
Hills Siding Road	11+140(N)	Boleau Creek Culvert (Site 44-264/1)	11+240(N)
Watson Road	13+330(N)	Windsor Creek Culvert (Site 44-319/1)	14+435(N)
Rivers Road West	15+080(N)		

Note: (S) refers to South Himsworth Township and (N) refers to North Himsworth Township

In addition to the above listed at-grade crossings, a number of sideroads adjacent to Highway 11 are present in the study area as follows:

ROAD	LOCATED AT	APPROXIMATE START STATION	APPROXIMATE END STATION
Oakwood Road	West of Highway 11	Sta. 25+500(S)	Peever Line
Pine Tree Way	East of Highway 11	Highway 534/ Clark Street	Sta. 28+750(S) (Golf Course Line)
Latour Crescent	West of Highway 11	Sta. 28+800(S) (Peever Line)	Sta. 11+900(N)
Wookey Road	West of Highway 11	North of Rivers Road West	Highway 654
Stone Road	West of Highway 11	Sta. 16+000(N)	Highway 654

Note: (S) refers to South Himsworth Township and (N) refers to North Himsworth Township

From about 500 m south of the McCharles Line/Main Street, the topographic levels within the Highway 11 corridor rise about 13 m northerly from about elevation 260 to elevation 273 at about Sta. 26+600 (South Himsworth Township). The topographic levels north of this section to Bear Creek Crossing drop about 18 m along the highway corridor from about elevation 273 to



elevation 255 and the lowest grade levels are found at the crossings of Bear Creek and unnamed creek at Sta. 27+790 (South Himsworth Township). The next section of the Highway 11 corridor rises about 21 m from elevation 255 to elevation 276 at Sta. 29+500. The topographic levels in the 425 m long section from north of Sta. 29+700 to Sta. 10+100 (North Himsworth Township) drop about 11 m from elevation 276 to elevation 265. To the north of this section, (Sta. 10+100 to Sta. 12+800) the Highway 11 corridor is generally level between elevation 265 and elevation 260. Then the topographic levels drop gradually about 36 m in 3.2 km to elevation 224 at Sta. 16+000 and drop further towards the Wasi River valley, which is located immediately south of Highway 654.

The study area is located in the Huronian Area of the Canadian Shield where the typical geology comprises of bedrock outcrops alternating with swamps, glaciofluvial, ground moraine deposit and glaciolacustrine deposits. A Site Geology map (Figure 2) showing the distribution of soils and the known bedrock depths along the alignment is included with this report.

3. SITE ASSESSMENT PROCEDURES

3.1 General

The foundation evaluation involved a review of the available geological, topographical and hydrogeological mapping, existing geotechnical reports, aerial photographs and construction drawings for the existing highway. A field visual reconnaissance was carried out to verify the inferred data. Subsurface explorations, in-situ testing and sampling were not carried out in accordance with the terms of reference for the study.

3.2 Reference Documents and Literature Review

The general physiographic conditions along the corridor and the seven alternate interchange locations were obtained primarily from existing geological maps and reports from the MTO GEOCRES library. Well records which were obtained from the MOE supplemented the data.



The documents and literature reviewed in whole or in part for this study are listed in Appendix A. The list reflects the selected data that contains geotechnical content relevant to the assessment. The list of the wells considered for the project is included in Appendix B.

The delineation of swamps and water courses/bodies as well as the location of significant earth deposits (silt/sand) and rock outcrops along the study corridor were interpreted from maps including Ontario Base Maps and aerial photographs provided by Stantec and the Ministry of Natural Resources (MNR).

3.3 Site Reconnaissance

An initial reconnaissance visit of the existing alignment and the adjacent lands within the study corridor was carried out on April 17, 2008. A follow-up second site visit was carried out on March 25, 2009. The site reconnaissance visits consisted of a drive-by and walk-through of selected sections of Highway 11 and adjacent lands.

The alternative structure locations were identified by unique colours as shown in Drawing B (Legend) and reproduced on the following drawings attached to this report:

- Drawing B1– South Section Alternatives S1 and S2
- Drawing B2– Central Section Alternatives C1 to C3
- Drawing B3– North Section Alternatives N1 and N2
- Drawings SC-1 to SC-3 – Access Scenarios 1, 2a, 2b and 3

The ground truth checks verified the surficial geology and drainage conditions inferred from the literature and map reviews. Relevant natural features in selected areas of the corridor were photographed. The locations of 20 representative site photographs are indicated on Drawings B1 to B3 and SC-1 to SC-3. The photographs are included in Appendix C.

3.3.1 Site Reconnaissance Notes

Travelling north on Highway 11 from the Highway 534 interchange, the terrain conditions are typical of the Northern Ontario landscape - gently undulating to rolling with extensive swamp



areas, bedrock outcrops or with thin veneer soil cover over bedrock, glaciolacustrine plains and localized glaciofluvial deposits.

The terrain along the Highway 11 corridor north of the Highway 534 interchange (Town of Powassan) comprised gently undulating plains with frequent rock exposures at the ditch lines. (Photographs 1, 2, 4 and 7).

From the south end of the project to a point between Peever Line and Hills Siding Road, the plains are typically grass covered or are being used as farmland established on glaciolacustrine deposits (silts and clayey silts). These areas appear to be well drained. (Photographs 1 and 3). The Bear Creek and unnamed creek are the major drainage course in this zone, flowing westerly to Lake Nipissing (Photograph 11 shows the creek at Oakwood Road).

The next section of the corridor includes the Hills Siding Road and Watson Road intersections and is typically wet with extensive swampy areas (Photographs 5 and 6). The Boleau Creek crosses this area flowing westerly immediately north of Hills Siding Road toward Lake Nipissing (Photograph 6).

This Hills Siding Road/Watson Road zone of wet swampy terrain also contains scattered rock cuts and outcrops (Photograph 4) including those noted at the existing Truck Inspection Station immediately south of the Watson Road intersection.

The northernmost section of the Highway 11 corridor north of Rivers Road within the project is somewhat similar to the southernmost section, where bedrock outcrops are scattered in grassed glaciolacustrine plains (Photograph 7).

McCharles Line

The terrain along McCharles Line is characterized by relatively steep grade changes. West of the Highway 11 intersection where the highway embankment is about 6 m high (Photograph 8) to about 180 m from the intersection, the grade slopes down about 4 m. From this point, the grade



rises westerly for about 200 m where rock is exposed on both sides of the road (Photograph 9). West of this point the road grade again slopes down towards the intersection with Oakwood Road.

The typical subsoil type in the McCharles Line alignment is likely to include silts and sands, with occurrences of clayey silts in the western sections.

Oakwood Road

North of the intersection of McCharles Line, Oakwood Road appears to traverse a rock ridge environment. The topography is relatively level but undulating, with slopes alternating to the east and west beyond the road allowance.

Scattered rock outcrops were noted within the 1,000 m section north of McCharles Line (Photograph 10. Other exposures at 120, 160, 320 and 500 m). This section is within a glaciofluvial deposit containing sands and silts. Gravel pits are operational within this area.

The road grade of Oakwood Road drops sharply at the 1,000 m distance from McCharles Line to a glaciolacustrine plain marked by the crossing of the Bear Creek (Photograph 11). The valley is being used as farmland and is about 400 m wide. The road grade rises again northerly reaching a crest about 1,800 m north of McCharles Line (Photograph 12). The subsoil type in this well-drained plain is likely to comprise of clayey silts and silts.

At the crest of the road, rock outcrops that were noted in the ditch line (Photograph 13) mark the edge of a rock ridge running transversely to the road alignment.

Northerly from the crest, the terrain slopes down towards the crossing of a small tributary of the Bear Creek and rises again to the intersection with Peever Line (Photograph 14). A rock outcrop is visible north of Peever Line in the same photograph (Photograph 14).

Oakwood Road is a gravel surface road between McCharles Line and Peever Line.



Peever Line

The terrain along Peever Line east of Oakwood Road is undulating and characterized by farms in the western section and a residential use in the eastern section.

The western 500 m section of Peever Line east of Oakwood Road crosses a glaciolacustrine deposit probably containing mostly silts and clayey silts. The area is drained by tributaries of the Bear Creek (Photograph 15).

This section is characterized by extensive farmland to the north and south of Peever Line (Photographs 15 and 16). The surficial soil likely contains a significant content of cobbles and boulders (Photograph 17).

From about 500 m east of Oakwood Road to the Highway 11 intersection, Peever Line crosses a glaciofluvial deposit where numerous scattered bedrock outcrops are encountered (Photographs 18 and 20. Other exposures at 700, 850, 990, 1,180 and 1,270 m east of Oakwood Road).

Peever Line also crosses short embankments straddling depressions between rock outcrops (Photograph 19). This section is heavily treed along the roadway (Photograph 18).

4. INFERRED SUBSURFACE CONDITIONS

4.1 General

The site is located in the area of the Canadian Shield where extensive glaciation has occurred. This project is located within the physiographic region known as the Number 11 Strip. This area is comprised of a narrow strip of land that follows Highway 11 from Gravenhurst to North Bay. The local topography is undulating as the highway traverses areas which alternate between steep rock ridges and low lying, swampy areas. The native overburden soils consist mainly of fine sands and silts, generally classified as Berriedale fine sand and Magnetawan silt. Glaciofluvial deposits occupy a short distance of the corridor at north of Powassan.



The alignment traverses several different geological units:

- Wetland areas containing peat, silt, sand and clay deposits, typical of the Northern Ontario Region
- Glaciolacustrine plains comprising sands and silts
- Bedrock knobs, where the granite bedrock is overlain by a relatively shallow soil cover
- Bedrock outcrops, where the bedrock is exposed or under a relatively thin soil veneer
- Glaciofluvial kame deposits

The study area of Highway 11 is located within the Central Gneiss Belt. The bedrock in this area consists of Precambrian rock of Mesoproterozoic age. The predominant bedrock types in the area are gneisses (biotite and hornblende gneisses), migmatites and felsic igneous rocks (granodiorites and granites). The local bedrock along this section of highway undulates from near or at ground surface and locally dipped to more than 20 m below the ground surface; a few bedrock outcroppings are present along the route.

The anticipated extent of the major physiographic units and geology along the study corridor is shown on the enclosed Drawings B1 to B3 and SC-1 to SC-3. The legends and symbols used are provided on the Legend, Drawing B.

The approximate average extent of these physiographic/geologic formations along Highway 11 is generally summarized below with reference to the existing alignment chainage.



APPROXIMATE CHAINAGE	PREDOMINANT GEOLOGIC UNIT	LENGTH (m)	PERCENT OF TOTAL (%)
24+000 to 26+100 (South Himsworth Twp)	Glaciolacustrine Plain [GL (P)]	2,100	16.2
26+100 to 26+800	Glaciofluvial- Kame [GF (K)]	700	5.4
26+800 to 27+500	Wetland/swamps within glaciolacustrine deposits and bedrock knobs [GL (P) + BR (N)]	700	5.4
27+500 to 29+975	Wetland/swamps within glaciolacustrine deposits and bedrock covered with veneer of soils [GL (P) + BR (V)]	2,975	22.9
10+000 to 10+500 (North Himsworth Twp)			
10+500 to 15+000	Bedrock knobs and wetland/swamps within ground moraine deposits and bedrock knobs [BR (N)+ M (G)]	4,500	34.7
15+000 to 17+000	Wetland/swamps within glaciolacustrine deposits and bedrock covered with veneer of soils [GL (P) + BR (V)]	2,000	15.4
TOTAL LENGTH		12,975	100.0

The average extent of the geologic units is approximate and will vary for the NBL and SBL of the highway.



4.2 Drainage

Generally, surface water runoff along the study corridor drains into streams, such as the Bear Creek, unnamed creek at Sta. 27+790, Boleau Creek, Windsor Creek and its tributaries and other unnamed creeks, swamps and scattered ponds. The Wasi River flows about 1.5 km north of the north study limit. These streams flow generally to the west where Lake Nipissing is located.

Groundwater is inferred typically near ground surface (less than 1 m deep) in the low-lying areas and near creeks. Higher groundwater levels than those in the creeks were recorded previously in boreholes drilled in the Boleau Creek and Windsor Creek flood plains.

5. FOUNDATION ASSESSMENT AND RANKING

5.1 Criteria Used In Assessing Alternatives

The terms of reference for this project identified six criteria to be considered from a foundation perspective, as follows:

- Extent of Soft Ground
- Groundwater Conditions
- Structure Foundations
- Embankment Settlement
- Embankment Stability
- Construction Considerations

A rationale for what each criterion represents and a method for measuring and evaluating each criterion was developed. The results of the evaluation are provided in Tables S-1 to S-6 for the structure alternatives. A discussion of the assessment criteria follows.



5.1.1 Extent of Soft Ground/Swamps (Tables S-1 and SC-1)

The potential impact of soft ground and/or swamps for each alternative interchange location was evaluated on the basis of the total length of the alternative with inferred soft ground/swamps between 0 and 3 m deep; 3 and 10 m deep; and over 10 m deep.

For the purpose of this discussion, soft ground/swamps less than 3 m deep that may be excavated with conventional backhoe equipment were considered the most favourable. Soft and/or swamp grounds that are between 3 and 10 m deep typically requires a long-stick excavator and are of intermediate favourability. The treatment of areas with soft ground/swamps over 10 m deep need special equipment such as drag lines or require non-conventional treatment (wick drains, preloading) and are the least favourable.

5.1.2 Groundwater Conditions (Tables S-2 and SC-2)

The extent of each interchange alternative with inferred groundwater at depths greater than 5 m (most favourable condition); between 1 and 5 m deep; and between 0 and 1 m deep (least favourable condition) were employed to assess the potential impact of this criterion.

The greater the groundwater depth the easier structures and embankments are to construct and the better the performance of embankments.

5.1.3 Structure Foundations (Tables S-3 and SC-3)

The type of foundation required to support bridges, interchange structures and major culverts was employed to assess the potential impact of this criterion. Shallow foundations were considered to be the most favourable and deep foundations the least favourable. The favourability of integral abutment foundations was considered to fall between the shallow and deep type of foundations. The potential foundation type was estimated based on the inferred type and quality of founding subgrade materials along each route alternative.



5.1.4 Embankment Settlement (Tables S-4 and SC-4)

Evaluation of embankment settlement was based on the total length of structure alternatives over compressible materials. For evaluation purposes, the compressible soils were grouped into less than 3 m deep; 3 to 10 m deep; and more than 10 m deep zones. Each of these groups was further divided into potentially sandy or clayey deposits.

The most favourable condition was defined as the swamp areas containing less than 3 m of compressible deposits of a sandy nature (for example, loose sand), and the least favourable conditions are in areas with compressible deposits of soft clayey soils deeper than 10 m.

5.1.5 Embankment Stability (Tables S-5 and SC-5)

The potential impact of embankment stability was evaluated on the basis of the total length of embankment and composition of the founding material. Conventional embankments that require little or no excavation and use conventional slope configurations were considered the most favourable, followed in decreasing favourability by embankments that require significant subexcavation, embankments that may require toe-stabilizing berms and (the least favourable) sections that may contain deeper than 10 m soft clays or sections with twinning of high embankments requiring pre-loading and wick drains.

5.1.6 Construction Feasibility (Tables S-6 and SC-6)

The impact of construction feasibility was considered on the basis of the number of structures (bridge and major culvert) required on each alternative for Table S-6 and the number and type of structures and the length of swamp sections, in conjunction with the inferred founding conditions for Table F-6. In addition, embankments in swamps requiring conventional construction were considered most favourable and those requiring special construction were considered least favourable.



5.2 Weighting of Evaluation Criteria for Interchange Alternatives (Tables S-1 to S-6 and SC-1 to SC-6)

A weighting system was developed to enable selection of the preferred interchange location. The weighting system involved two factors:

- A favourability factor F to score the assessment for each of the evaluation criteria based on the foregoing discussion. The F values ranged from 5 for the most favourable to 1 for the least favourable.
- An impact weight B_i to reflect the significance of each of the six criteria on the design and construction of the highway. The impact weight for all criteria totals 1.00. The six evaluation criteria were compared in terms of relative importance and impact and assigned an individual impact weight as presented below:

EVALUATION CRITERION	IMPACT WEIGHT, B_i
Soft Ground/Swamp	0.10
Groundwater Conditions	0.15
Structure Foundations	0.25
Embankment Settlement	0.20
Embankment Stability	0.20
Construction Feasibility	0.10
TOTAL	1.00

The more important the individual evaluation criterion was considered for the design and/or construction of the highway, the higher the impact weight assigned. A value of 0 would be assigned if the criterion was deemed to have no impact on alternative route selection for the specific project.



The favourability factors, F , used in Tables S-1 to S-6 and SC-1 to SC-6, and the impact weights, B_i , used in the scoring Tables S-7 and SC-7 are summarized in the following table.

EVALUATION CRITERION	IMPACT WEIGHT, B_i	FAVOURABILITY FACTOR, F						TABLE	
		MOST		AVERAGE		LEAST			
Soft Ground/ Swamps	0.10	Based on relative length and depth of soft ground (SG) and/or swamps (SWP):						S-1 and SC-1	
		SG or SWP 0 to 3 m Deep		SG or SWP 3 to 10 m Deep		SG or SWP Over 10 m Deep			
		F=5		F=3		F=1			
Groundwater Conditions	0.15	Based on inferred groundwater (G/W) depth:						S-2 and SC-2	
		G/W Deeper than 5 m		G/W 1 to 5 m		G/W 0 to 1 m			
		F=5		F=3		F=1			
Structure Foundations	0.25	Based on estimated type of foundation requirements:						S-3 and SC-3	
		Shallow Found.		Integral abutment		Deep Found.			
		F=5		F=4		F=3			
Embankment Settlement	0.20	Based on length of sections with compressible soil within three depth ranges:						S-4 and SC-4	
		Less than 3 m deep		3 to 10 m deep		Deeper than 10 m			
		Silty/ Sandy	Clayey	Silty / Sandy	Clayey	Silty / Sandy	Clayey		
		F=5	F=4	F=4	F=3	F=2	F=1		
Embankment Stability	0.20	Based on estimated type of construction required to establish embankment on competent ground:						S-5 and SC-5	
		Conventional Embankment		Significant Subexcavation		Toe-Stabilizing Berms Required			Potential Pre-Loading/ Wick Drains
		F=5		F=3		F=2			F=1
Construction Feasibility	0.10	Based on the required number of structures						S-6 and SC-6	
		Bridge Foundation			Culverts				
		Shallow		Deep		New			Extension
		F=5		F=4		F=4			F=5

The computations provide Weighted Favourability Values A_i for each subsection. For example, with reference to Table S-1, Soft Ground/Swamps Evaluation Criterion, the weighted favourability value A_1 for the embankment alternative was obtained by multiplying the Favourability factor F by the length of alignment for which the condition is applicable and dividing by the total length of the soft ground or swamp in the subsection, as presented below:



DEPTH RANGE (m)	LENGTH (m)	FAVOURABILITY FACTOR, F
0 – 3	1025	5
3 – 10	880	3
>10	200	1

$$A_2 = \text{Weighted Favourability Value} = \frac{(1025 \times 5) + (880 \times 3) + (200 \times 1)}{1025 + 880 + 200} = 3.78$$

The weighted favourability value, A_i , computed for each subsection is provided on Tables S-1 to S-6 and SC-1 to SC-6.

5.3 Scoring of Foundation Criteria for Structure Alternatives (Tables S-7 and SC-7)

For the scoring of the foundation criteria, each of the Favourability Values A_i was normalized to ratios of 1.0. The Normalized Favourability Values, N_i , shown next to each A_i on the table eliminate the effect of unrelated A_i numbers on the Scores and provide a meaningful input of the Impact Weights on the final rankings. This is achieved by dividing each Weighted Favourability Value A_i by the highest A_i amongst all Alternatives for the criterion, and thus making all Normalized Favourability Values less than 1.00.

The interchange alternatives were scored by adding the N_i for each of the evaluation criteria multiplied by the Impact Weight, B_i for the criterion. The Scores based on the N_i values (multiplied by 5 to produce values higher than 1.00 for ease of comparison) are shown on Tables S-7 and SC-7.



An example of the computation of the Scores is provided below, for reference. The example is the calculation of the Normalized Score of **4.65** for the Interchange alternative S2 which was obtained as follows:

EVALUATION CRITERIA	SOFT GROUND/ SWAMPS	GROUNDWATER CONDITIONS	STRUCTURE FOUNDATIONS	EMBANKMENT SETTLEMENT	EMBANKMENT STABILITY	CONSTRUCTION FEASIBILITY
TABLE NO.	S-1	S-2	S-3	S-4	S-5	S-6
IMPACT WEIGHT, B_i	0.10	0.15	0.25	0.20	0.20	0.10
S2	A2	3.53	3.45	4.00	3.64	4.24
	Ni	0.93	1.00	0.89	0.92	0.96
Note: For south section, the following are the highest A_i values						
Highest A_i	3.78	3.45	4.50	3.94	4.43	12.90

$$\text{Normalized Score S2} = 5[(3.53/3.78) \times 0.10 + (3.45/3.45) \times 0.15 + (4.00/4.50) \times 0.25 + (3.64/3.94) \times 0.20 + (4.24/4.43) \times 0.20 + (11.35/12.90) \times 0.10]$$

Normalized Score S2 = 4.65

[The ratios in brackets represent each of the N_i values, such as $(3.53/3.78) = 0.93$]

These Scores and Rankings of the foundation evaluation for each of the south, central and north sections are provided in Table S-7 and the results are summarized below:

INTERCHANGE ALTERNATIVES		SCORE	RANKING
S1	Interchange at Sta. 28+350(S) (Note 1) (Combination of Parclo A and Diamond)	4.96	1
S2	Interchange at Sta. 28+350(S)	4.65	2
C1	Interchange at Sta. 10+700(N) (South of Hills Siding Road)	4.64	1
C2	Interchange at Sta. 11+630(N) (North of Hills Siding Road)	4.65	1
C3	Underpass at Sta. 11+125(N) (At Hills Siding Road)	4.28	3
N1	Underpass at Sta. 15+575(N)	5.00	1
N2	Underpass at Sta. 15+900(N)	4.58	2

Note 1. Includes Underpass at Sta. 25+900 (Oakwood Road and Main Street Connection)
 (S) refers to South Himsworth Township
 (N) refers to North Himsworth Township



The results indicated that structure alternative S1 for the south section, alternatives C1 and C2 for the central section and alternative N1 for the north section have the highest Score of 4.96, 4.64, 4.65 and 5.00 respectively.

The Score obtained in Table SC-7 was used to obtain the scores for the Access Scenarios. These Scores were arrived at by following the example calculation of the Normalized Score of **4.75** for Access Scenario SC2b:

EVALUATION CRITERIA	SOFT GROUND/ SWAMPS	GROUNDWATER CONDITIONS	STRUCTURE FOUNDATIONS	EMBANKMENT SETTLEMENT	EMBANKMENT STABILITY	CONSTRUCTION FEASIBILITY
TABLE NO.	S-1	S-2	S-3	S-4	S-5	S-6
IMPACT WEIGHT, B _i	0.10	0.15	0.25	0.20	0.20	0.10
SC2b	A1	3.23	3.25	4.60	3.57	4.32
	N1	0.79	0.96	1.00	0.92	0.98
Highest A _i	4.10	3.39	4.60	3.88	4.42	13.44

$$\text{Normalized Score SC2b} = 5[(3.23/4.10) \times 0.10 + (3.25/3.39) \times 0.15 + (4.60/4.60) \times 0.25 + (3.57/3.88) \times 0.20 + (4.32/4.42) \times 0.20 + (13.19/13.44) \times 0.10]$$

Normalized Score SC2b = 4.75

[The ratios in brackets represent each of the N_i values, such as (3.23/4.10) = 0.79]

ACCESS SCENARIOS	SCORE	RANKING
Access Scenario 1	4.74	2
Access Scenario 2a	4.89	1
Access Scenario 2b	4.75	2
Access Scenario 3	4.60	4



The Scores for the four access scenarios indicated that Access Scenarios 2a and 2b and Scenario 1 have close highest Scores of 4.89, 4.75 and 4.74, respectively and are practically equivalent in terms of foundation favourability. The Access Scenario 3 has a lower Score of 4.60.

The selection of the Preferred Route also depends on other parameters or facets that are being analysed by Stantec.

6. ALTERNATIVE STRUCTURE LOCATIONS REVIEW AND RECOMMENDATIONS

6.1 General

From the structure foundation design and construction perspective, the structure alternative that incorporates the highest scoring is preferred. It is considered that the interchange alternative for south section alternative S1 has a higher Score of 4.96 than alternative S2 (4.65); for the central section, Alternatives C1 and C2 have the highest Scores of 4.64 and 4.65 compared with alternative C3 (4.28); and the north section alternative N1 has a higher final Score of 5.00 compared with alternative N2 (4.58), as shown on Table S-7. Therefore, these three structure alternatives S1, C1 or C2 and N1 are preferable over the remaining structure alternatives for the south, central and north sections.

It is noted that access scenario 2a which includes underpass alternative 2a to the south of Hills Siding Road has the highest Score of 4.89 as shown on Table SC-7. This score is close and practically equivalent to the Scores of 4.75, 4.74 for the access scenarios 2b and 1. Therefore, either of those three access scenarios is preferable over the access scenario 3 (Score of 4.60).

The preferred structure location/access scenario should be selected to achieve bedrock or competent soil subgrade and avoid swamp areas, while minimizing the length of new construction that would be required for the ramps and sideroads. Embankments constructed over bedrock or competent soil subgrade will be easier to drain; will be relatively easier to construct; will perform



better; and will be subjected to only minimal post-construction settlements and therefore will require less maintenance.

6.2 Embankment Design

Considering the construction of new ramps service roads and sideroads, the alternatives S2 for the south section, C3 for central section and N1 for north section traverse comparatively shorter sections of wet and swampy soils than those in alternatives S1, C1, C2 and N2. Consequently, embankment design of alternatives S2, C3 and N1 would be relatively more straightforward.

The embankments should be made of rockfill in sections requiring construction below the water table or in swampy terrain. Elsewhere embankments could be constructed of earth fill, including the zones above the rockfill. Embankment design and construction procedures for rockfill and earth fill embankments shaped at 1.25H:1V and 2H:1V respectively above original grades should be suitable for this project. Embankment geometry through swamps should include a minimum 2 m wide bench on both sides according to Northern Region Directive 98-200.

For preliminary evaluation purposes the design of embankments through swamps should allow for subexcavation of soft and compressible soils to depths typically less than 3 m. Locally, deeper deposits of soft and compressible soils may occur up to about 10 m deep. At these locations the slope of the rockfill below existing grade should be taken as 1.25H:1V. Also as a guideline for preliminary design, the rockfill line should be carried at least 2.0 m above the water level in the swamps where earth fill is used in combination with rockfill to construct the embankments. Above grade, the embankments constructed with earth fill will be stable at 2H: 1V slopes or flatter above the water table. Rockfill embankments should also be stable at 1.25H: 1V slopes or flatter.

6.3 Embankment Stability

It is anticipated that limited subexcavation of soft soils and organics (less than 3 m) will be typically required for construction of the roadway embankments. Most of the alignment alternatives traverse similar geologic formations comprising glaciolacustrine deposits containing



sands and silts. However, construction of embankments up to 8 m high for crossing roads and ramps are also expected in view of the undulation topography along the corridor and for approach embankment to the contemplated structures.

The requirement to use non-standard slope configurations for the new embankments to achieve stable conditions, such as toe-stabilizing berms or preloading / surcharging with wick drains and/or a wider median width to preserve the stability of the existing embankments depends on the design embankment height and local depth of soft ground. On this project, these requirements are considered to be unlikely.

6.4 Embankment Settlements

It is anticipated that the post-construction settlement of embankments founded on bedrock or competent glaciolacustrine soil deposits will be minimal. Significant settlements may occur in the wet and swampy areas located at the west approaches and/or west service roads for the south, central and north alternatives. Also, the embankments for alternatives located within the creek flood plains, particularly the Boleau Creek flood plain at the Hills Siding Road may undergo significant settlements.

The magnitude and rate of the settlements will depend on the thickness and nature of the soils in each of the swamps and may exceed MTO criteria if placed on very soft to firm clayey soils and/or may affect existing embankments/structures which are in close proximity. These settlements should be evaluated during future preliminary or detail design studies.



6.5 Structure Foundations

The type of foundations of the structures is likely to comprise shallow foundations (spread footings) on bedrock for alternatives S1 and S2 west abutments and alternatives C1, C2, N1 and N2 both abutments. Alternative C3 structure foundation is likely to include piles driven to bedrock. The foundation for the underpass at Sta. 25+900 (south of McCharles Line) most likely include a shallow foundation alternative on competent soils or structural fill.

The type of foundation (shallow or deep) will depend ultimately on the road grades at the structures and structural design concepts. Foundation material for deep pile foundations is expected to consist of competent glaciolacustrine soils or bedrock. Cobbles and boulders are anticipated in the ground moraine deposit north of Hills Siding Road.

It is also considered that integral abutments on piles are feasible at the both underpass locations. The need for rock trenches, to accommodate the minimum free pile length of 5 m will depend on the final road grades.

Foundations for culverts are expected to include competent native soils or rockfill.

6.6 Construction Considerations

It is anticipated that the typical embankment construction will be accomplished with conventional methods since the alignment traverses competent glaciolacustrine deposits for the most part with areas covered by shallow deposits mantling bedrock and bedrock outcrops.

Non-conventional construction procedures for swamp excavation or embankment widening would only be required to reduce post-construction settlements to tolerable levels or to twin embankments through soft deposits without negative effects on the stability of the existing embankments. Special construction methods may include the use of lightweight fill, wick drains and/or staged construction.



6.7 Assessment of Advantages and Disadvantages

The following tables were presented to overview assessments of advantages and disadvantages, costs and risk/consequences interchange alternatives from the foundation perspective.

INTERCHANGE ALTERNATIVE DESCRIPTION	ADVANTAGES	DISADVANTAGES
SOUTH SECTION		
Alternative S1 Interchange at Sta. 28+350 Includes underpass at Sta. 25+900 (South Himsworth Twp)	<ul style="list-style-type: none"> Structure foundations for I/C location at Sta. 28+350 may be founded on integral abutments on pile foundation Foundations for underpass at Sta. 25+900 may be founded on spread footing on competent native soils or structural fill Moderate cost for structure foundation 	<ul style="list-style-type: none"> The east of approach embankment at I/C location will be over possible wet and swampy terrain with possible artesian conditions Requires extension of culvert for unnamed creek at Sta. 27+790 Requires a new culvert for W-S ramp over open water/wet swamp at Sta. 28+000 (Highway 11 Chainage)
Alternative S2 Underpass at Sta. 28+350	<ul style="list-style-type: none"> Structure foundations for underpass at Sta. 28+350 may be founded on integral abutments on pile foundation Moderate cost for structure foundation 	<ul style="list-style-type: none"> Requires 4 new culverts for West Service Road Requires construction of West Service Road over swamp and bedrock sections
CENTRAL SECTION		
Alternative C1 Underpass at Sta. 10+700 (South of Hills Siding Road) (North Himsworth Twp)	<ul style="list-style-type: none"> Structure foundations for underpass at about Sta. 10+700 may be founded on bedrock Lower to moderate cost for structure foundation 	<ul style="list-style-type: none"> Requires extension of Boleau Creek bridge at Latour Crescent Requires a new culvert for Boleau Creek crossing at Hills Sliding Road Realignment Most part of the east approach embankments located on Boleau Creek flood plain/possible swamp Erosion protection will be required for approach embankments Requires realignment of Latour Crescent over a swamp



INTERCHANGE ALTERNATIVE DESCRIPTION	ADVANTAGES	DISADVANTAGES
Alternative C2 Underpass at Sta. 11+630 (North of Hills Siding Road)	<ul style="list-style-type: none"> Structure foundations for underpass at about Sta. 11+630 may be founded on bedrock Lower to moderate cost for structure foundation 	<ul style="list-style-type: none"> Approach embankment partially over swamps Requires a new culvert for Boleau Creek crossing at Latour Crescent Realignment Requires a new culvert for unnamed creek at Sta. 12+180
Alternative C3 Underpass at Sta. 11+125 (At Hills Siding Road)	<ul style="list-style-type: none"> Structure foundations for underpass may be founded on integral abutments on pile foundation 	<ul style="list-style-type: none"> Requires a new culvert for Boleau Creek crossing at Hills Sliding Road Realignment Approach embankments located on possible swamp High cost for structure foundation
NORTH SECTION		
Alternative N1 Underpass at Sta15+575 (500 m north of Rivers Road/Highway 11 At-grade Crossing)	<ul style="list-style-type: none"> Structure foundations for underpass at about Sta. 15+575 may be founded on bedrock/shallow bedrock Lower to moderate cost for structure foundation 	<ul style="list-style-type: none"> Requires a new culvert for unnamed creek crossing at Connecting Road between Rivers Road West and Stone Road Connecting Road to cross swamp area Erosion protection will be required for approach embankments
Alternative N2 Underpass at Sta15+900 (825 m north of Rivers Road/Highway 11 At-grade Crossing)	<ul style="list-style-type: none"> Structure foundations for underpass at about Sta. 15+900 may be founded on bedrock/shallow bedrock Lower to moderate cost for structure foundation 	<ul style="list-style-type: none"> Requires a new culvert for Windsor Creek crossing at Rivers Road East southerly extension Connections to Rivers Road East and Wookey Road cross swamp area May affect TransCanada pipeline R.O.W.



7. PREFERRED STRUCTURE ALTERNATIVES

7.1 Preferred Structure Location Overview

7.1.1 South Section

Stantec indicated that the preferred structure alternatives include alternative S1 for south section (interchange at approximate Sta. 28+350, about 400 m south of the intersection of Peever Line/Golf Course Line) and also includes an underpass structure at Sta. 25+900 (Oakwood Road/ Main Street). This alternative S1 is shown on the enclosed Drawing B1.

This interchange alternative includes an underpass over the existing Highway 11 northbound and southbound lanes at Sta. 28+350 and Sta. 25+900, associated ramps, a new west service road between Sta. 27+400 (McCharles Line) and Sta. 26+950 and new access roads for MTO Patrol Yard and Powassan Sewage Basin at the southern study limits.

The Score for the preferred interchange location at the south section from a Foundations perspective (alternative S1) was 4.96 and was higher than the other alternative S2 (Score 4.65).

7.1.2 Central Section

Stantec indicated that the preferred structure location for central section is alternative C3 located at approximate Sta. 11+125 (at the Hills Sliding Road). This alternative C3 is shown on the enclosed Drawing B2.

This alternative includes an underpass over the existing Highway 11 northbound and southbound lanes, Hills Sliding Road realignment (about 0.6 km) and Latour Crescent realignment (0.4 km).

The Score for the preferred interchange location for the central section (C3) was 4.28, being the lowest of the interchange alternatives from a Foundations perspective.



7.1.3 North Section

Stantec indicated that the preferred structure location for north section is alternative N1 located at approximate Sta. 15+575 (about 500 m north of the Rivers Road/ Highway 11 at-grade crossing). This alternative N1 is shown on the enclosed Drawing B3.

This alternative includes an underpass over the existing Highway 11 northbound and southbound lanes at Sta. 15+575, Rivers Road East southerly extension and connecting road between Rivers Road West and Stone Road.

The Score for the preferred structure location at the north section from a Foundations perspective (alternative N1) was 5.00 and was higher than the other alternative N2 (Score 4.58).

7.2 Additional Studies

The preliminary assessments in this report are based on literature reviews and site reconnaissance only. The recommendations are intended for planning purposes only. Additional data should be obtained by conducting subsurface investigation(s) to confirm the data inferred during these studies. In particular, the depth and extent of organic/soft/wet soils in swamps and low-lying areas should be investigated.

The potential bridge and interchange structure locations, underpass structures and major culvert locations should also be investigated. The bedrock at each location should be carefully delineated both longitudinally and transversely and proven with cores to confirm that the preferred sites are adequate for the construction of the structures.

The recommended locations for foundations investigations for bridges and culverts are listed in the enclosed Table 1. The recommended locations for foundation investigations on swamp crossings were listed in the separate Alternate Route Geotechnical Assessment Report.



8. CLOSURE

This report was prepared by Ms. N.S Balakumaran, BSc and Mr. C.M.P. Nascimento, P. Eng., Senior Project Engineer and reviewed by Mr. B.R. Gray, MEng, P.Eng., MTO Designated Principal Contact.

Yours very truly,

Peto MacCallum Ltd.

**NOTE: Hard copies signed
and stamped**

Carlos M. P. Nascimento, P. Eng.
Senior Project Engineer

**NOTE: Hard copies signed
and stamped**

Brian R. Gray, MEng, P. Eng.
MTO Designated Principal Contact

CN/BRG:nb-nk



TABLE 1
RECOMMENDED LOCATIONS FOR FOUNDATION INVESTIGATIONS
STRUCTURES AND CULVERTS
PREFERRED STRUCTURE LOCATIONS

SECTION	PROPOSED WORKS	STATIONS ⁽¹⁾	EXISTING DATA
SOUTH	Highway 11 (Mainline)		
	Underpass at Highway 11	Sta. 25+900(S)	—
	Interchange Underpass at Highway 11	Sta. 28+350(S)	—
	Culvert Extension for Unnamed Creek (Site 44-318/1)	Sta. 27+790(S)	Bedrock at 6 m depth
	Highway 11 Ramp E/W-S		
	Culvert at Swamp Crossing	Opposite Sta. 28+000(S)	—
CENTRAL	Highway 11 (Mainline)		
	Underpass at Highway 11	Sta. 11+125(N)	Bedrock at 3 to 8 m depth ⁽²⁾
	Hills Siding Road Realignment		
	Culvert for Boleau (Boulder) Creek Crossing	Opposite Sta. 11+125(N)	Bedrock at 3 to 8 m depth ⁽²⁾
NORTH	Highway 11 (Mainline)		
	Underpass at Highway 11	Sta. 15+575(N)	Possible rock outcrop
	Connecting Road from Rivers Road West to Stone Road		
	Culvert for Tributary of Windsor Creek and swamp crossing	Opposite Sta. 15+850(N)	—

NOTES: (1) Chainages may vary for northbound and southbound mainlines to be confirmed / refined during detailed design.
 (2) Based on previous Boleau (Boulder) Creek investigation data.
 (S) Refers to South Himsworth Township.
 (N) Refers to North Himsworth Township.



TABLE S-1– SOFT GROUND/SWAMPS

INTERCHANGE ALTERNATIVES		SOFT GROUND/SWAMPS DEPTHS AND FAVOURABILITY						WEIGHTED FAVOURABILITY VALUE(A _i)	
		L1	F1	L2	F2	L3	F3		
		Depth Range (0 - 3 m)		Depth Range (3 - 10 m)		Depth Range (>10 m)			
S1	Interchange at Sta. 28+350 ^S (Note 1) (Combination of Parclo A and Diamond)	1025	5	880	3	200	1	3.78	A ₁
S2	Underpass at Sta. 28+350 ^S (Peever Line / Pine Tree Way)	550	5	580	3	200	1	3.53	A ₂
C1	Underpass at Sta. 10+700 ^N (South of Hills Siding Road)	1385	5	140	3	200	1	4.37	A ₃
C2	Underpass at Sta. 11+630 ^N (North of Hills Siding Road)	100	5	1460	3	40	1	3.08	A ₄
C3	Underpass at Sta. 11+125 ^N (At Hills Siding Road)	–	5	350	3	75	1	2.65	A ₅
N1	Underpass at Sta. 15+575 ^N (Rivers Road East / Wookey Road)	–	5	750	3	–	1	3.00	A ₆
N2	Underpass at Sta. 15+900 ^N (Rivers Road East / Stone Road)	–	5	850	3	150	1	2.70	A ₇

NOTES: Embankment lengths (L1, L2, L3) measured at ramps and approach fills

Enter weighted favourability value A_i in Table S-7.

^S refers to South Himsworth TWP and ^N refers to North Himsworth TWP

Note 1: Includes underpass at Sta. 25+900 (Oakwood Road / Main Street connection).



TABLE S-2– GROUNDWATER CONDITIONS

INTERCHANGE ALTERNATIVES		GROUNDWATER DEPTHS AND FAVOURABILITY						WEIGHTED FAVOURABILITY VALUE(Ai)	
		L1	F1	L2	F2	L3	F3		
		Depth Range (>5m)		Depth Range (1 - 5m)		Depth Range (0 -1 m)			
S1	Interchange at Sta. 28+350 ^S (Note 1) (Combination of Parclo A and Diamond)	3150	5	2650	3	2105	1	3.26	A ₁
S2	Underpass at Sta. 28+350 ^S (Peever Line / Pine Tree Way)	2340	5	835	3	1330	1	3.45	A ₂
C1	Underpass at Sta. 10+700 ^N (South of Hills Siding Road)	350	5	925	3	1725	1	2.08	A ₃
C2	Underpass at Sta. 11+630 ^N (North of Hills Siding Road)	1900	5	500	3	1950	1	2.98	A ₄
C3	Underpass at Sta. 11+125 ^N (At Hills Siding Road)	–	5	600	3	425	1	2.17	A ₅
N1	Underpass at Sta. 15+575 ^N (Rivers Road East / Wookey Road)	1750	5	–	3	750	1	3.80	A ₆
N2	Underpass at Sta. 15+900 ^N (Rivers Road East / Stone Road)	1425	5	–	3	1000	1	3.35	A ₇

NOTES: Enter weighted favourability value A_i in Table S-7.

^S refers to South Himsworth TWP and ^N refers to North Himsworth TWP

Note 1: Includes underpass at Sta. 25+900 (Oakwood Road / Main Street connection).



TABLE S-3– STRUCTURE FOUNDATIONS

INTERCHANGE ALTERNATIVES		CONTEMPLATED STRUCTURE/INTERCHANGE SITE										WEIGHTED FAVOURABILITY VALUE(Ai)	
		South Section				Central Section				North Section			
		Highway 11 Underpass At Sta. 25+900		Highway 11 Underpass At Sta. 28+350		Highway 11 Underpass At Sta. 10+700 ⁽¹⁾ Sta. 11+630 ⁽²⁾ Sta. 11+125 ⁽³⁾		Boleau Creek Bridge Widening/New Bridge at Latour Crescent		Highway 11 Underpass At Sta. 15+575 (*) Sta. 15+900 (**)			
		Type	F1	Type	F2	Type	F3	Type	F4	Type	F5		
S1	Interchange at Sta. 28+350 ^S (Note 1) (Combination of Parclo A and Diamond)	A	5	B	4	–	–	–	–	–	–	4.50	A ₁
S2	Underpass at Sta. 28+350 ^S (Peever Line / Pine Tree Way)	–	–	B	4	–	–	–	–	–	–	4.00	A ₂
C1	Underpass at Sta. 10+700 ^N (South of Hills Siding Road)	–	–	–	–	A	5	B	4	–	–	4.50	A ₃
C2	Underpass at Sta. 11+630 ^N (North of Hills Siding Road)	–	–	–	–	A	5	B	4	–	–	4.50	A ₄
C3	Underpass at Sta. 11+125 ^N (At Hills Siding Road)	–	–	–	–	B	4	–	–	–	–	4.00	A ₅
N1	Underpass at Sta. 15+575 ^N (Rivers Road East / Wookey Road)	–	–	–	–	–	–	–	–	A	5	5.00	A ₆
N2	Underpass at Sta. 15+900 ^N (Rivers Road East / Stone Road)	–	–	–	–	–	–	–	–	A	5	5.00	A ₇

NOTES: Enter weighted favourability value Ai in Table S-7.

A: Shallow Foundation, F = 5

B: Deep Foundation: Integral Abutments, F = 4; Others, F=3

Note 1: Includes underpass at Sta. 25+900 (Oakwood Road / Main Street connection).

^S refers to South Himsworth TWP and ^N refers to North Himsworth TWP

⁽¹⁾ Alternate C1 Sta. (Highway 11 Chainage) ⁽²⁾ Alternate C2 Sta. (Highway 11 Chainage) ⁽³⁾ Alternate C3 Sta. (Highway 11 Chainage)

(*) Alternate N1 Sta. (Highway 11 Chainage) (**) Alternate N2 Sta. (Highway 11 Chainage)



TABLE S-4– EMBANKMENT SETTLEMENT

INTERCHANGE ALTERNATIVES		SUBSOIL TYPE AND FAVOURABILITY FACTOR						WEIGHTED FAVOURABILITY VALUE(Ai)	
		Less than 3 m Deep		3-10 m Deep		Deeper than 10 m			
		L1	L2	L3	L4	L5	L6		
		Silty/Sandy (F1=5)	Clayey (F2 =4)	Silty/Sandy (F3=4)	Clayey (F4 =3)	Silty/Sandy (F5=2)	Clayey (F6 =1)		
S1	Interchange at Sta. 28+350 ^S (Note 1) (Combination of Parclo A and Diamond)	2425	1025	2650	880	725	200	3.94	A ₁
S2	Underpass at Sta. 28+350 ^S (Peever Line / Pine Tree Way)	1260	550	1065	580	850	200	3.64	A ₂
C1	Underpass at Sta. 10+700 ^N (South of Hills Siding Road)	875	1385	400	140	–	200	4.05	A ₃
C2	Underpass at Sta. 11+630 ^N (North of Hills Siding Road)	50	100	450	1810	–	40	3.23	A ₄
C3	Underpass at Sta. 11+125 ^N (At Hills Siding Road)	–	–	600	350	–	75	3.44	A ₅
N1	Underpass at Sta. 15+575 ^N (Rivers Road East / Wookey Road)	–	–	–	750	–	–	3.00	A ₆
N2	Underpass at Sta. 15+900 ^N (Rivers Road East / Stone Road)	–	–	–	850	–	150	2.70	A ₇

NOTE: Enter weighted favourability value A_i in Table S-7.

^S refers to South Himsworth TWP and ^N refers to North Himsworth TWP

Note 1: Includes underpass at Sta. 25+900 (Oakwood Road / Main Street connection).



TABLE S-5– EMBANKMENT STABILITY

INTERCHANGE ALTERNATIVES		EMBANKMENT REQUIRING SPECIAL OR CONVENTIONAL DESIGN				WEIGHTED FAVOURABILITY VALUE(A _i)	
		L1	L2	L3	L4		
		Conventional Embankment (F1 = 5)	Embankment Requiring Subexcavation (F2 = 3)	Embankment Requiring Toe- Stabilizing Berms (F3 = 2)	Embankment Requiring pre- loading/ Wick Drains (F4 = 1)		
S1	Interchange at Sta. 28+350 ^S (Note 1) (Combination of Parclo A and Diamond)	6250	1525	580	–	4.43	A ₁
S2	Underpass at Sta. 28+350 ^S (Peever Line / Pine Tree Way)	3175	780	350	200	4.24	A ₂
C1	Underpass at Sta. 10+700 ^N (South of Hills Siding Road)	1275	1525	–	200	3.72	A ₃
C2	Underpass at Sta. 11+630 ^N (North of Hills Siding Road)	2750	1500	100	–	4.24	A ₄
C3	Underpass at Sta. 11+125 ^N (At Hills Siding Road)	600	425	–	–	4.17	A ₅
N1	Underpass at Sta. 15+575 ^N (Rivers Road East / Wookey Road)	1750	750	–	–	4.40	A ₆
N2	Underpass at Sta. 15+900 ^N (Rivers Road East / Stone Road)	1425	550	300	150	3.93	A ₇

NOTE: Enter weighted favourability value A_i in Table S-7.

^S refers to South Himsworth TWP and ^N refers to North Himsworth TWP

Note 1: Includes underpass at Sta. 25+900 (Oakwood Road / Main Street connection).



TABLE S-6– CONSTRUCTION FEASIBILITY

INTERCHANGE ALTERNATIVES		STRUCTURES/EMBANKMENT REQUIRING SPECIAL CONSTRUCTION						WEIGHTED FAVOURABILITY VALUE(A _i)	
		No of Structure Foundations		No of Major Culvert Foundations		Swamps L (m)			
		Shallow Foundation (F=5)	Deep Foundation (F=4)	To be Constructed (F=4)	To be Extended (F=5)	Convenional (F=5)	Special (F=1)		
S1	Interchange at Sta. 28+350 ^S (Note 1) (Combination of Parclo A and Diamond)	1	1	1	1	1525	580	12.90	A ₁
S2	Underpass at Sta. 28+350 ^S (Peever Line / Pine Tree Way)	–	1	4	–	780	550	11.35	A ₂
C1	Underpass at Sta. 10+700 ^N (South of Hills Siding Road)	1	1	1	–	1525	200	13.04	A ₃
C2	Underpass at Sta. 11+630 ^N (North of Hills Siding Road)	1	1	2	–	1500	100	13.25	A ₄
C3	Underpass at Sta. 11+125 ^N (At Hills Siding Road)	–	1	1	–	425	–	13.00	A ₅
N1	Underpass at Sta. 15+575 ^N (Rivers Road East / Wookey Road)	1	–	–	1	750	–	15.00	A ₆
N2	Underpass at Sta. 15+900 ^N (Rivers Road East / Stone Road)	1	–	1	1	550	450	12.70	A ₇

NOTES: Enter weighted favourability value A_i in Table S-7.

Bridge Foundations Favourability: Shallow F=5 and Deep F=4; Culvert Favourability: New F=4; Extension F=5;

Swamps Favourability: conventional treatment F=5, special treatment F=1

^S refers to South Himsworth TWP and ^N refers to North Himsworth TWP

Note 1: Includes underpass at Sta. 25+900 (Oakwood Road / Main Street connection).



TABLE S-7 – SCORING OF FOUNDATION CRITERIA (INTERCHANGES)

EVALUATION CRITERIA		SOFT GROUND/ SWAMPS		GROUNDWATER CONDITIONS		STRUCTURE FOUNDATIONS		EMBANKMENT SETTLEMENT		EMBANKMENT STABILITY		CONSTRUCTION FEASIBILITY		NORMALIZED SCORE	RANKING
TABLE No.		S1		S2		S3		S4		S5		S6			
IMPACT WEIGHT, Bi		0.10		0.15		0.25		0.20		0.20		0.10			
INTERCHANGE ALTERNATIVES		Ai	Ni	Ai	Ni	Ai	Ni	Ai	Ni	Ai	Ni	Ai	Ni		
S1	Interchange at Sta. 28+350 ^S (Note 1) (Combination of Parclo A and Diamond)	3.78	1.00	3.26	0.95	4.50	1.00	3.94	1.00	4.43	1.00	12.90	1.00	4.96	1
S2	Underpass at Sta. 28+350 ^S (Peever Line / Pine Tree Way)	3.53	0.93	3.45	1.00	4.00	0.89	3.64	0.92	4.24	0.96	11.35	0.88	4.65	2
C1	Underpass at Sta. 10+700 ^N (South of Hills Siding Road)	4.37	1.00	2.08	0.70	4.50	1.00	4.05	1.00	3.72	0.88	13.04	0.98	4.64	1
C2	Underpass at Sta. 11+630 ^N (North of Hills Siding Road)	3.08	0.70	2.98	1.00	4.50	1.00	3.23	0.80	4.24	1.00	13.25	1.00	4.65	1
C3	Underpass at Sta. 11+125 ^N (At Hills Siding Road)	2.65	0.61	2.17	0.73	4.00	0.89	3.44	0.85	4.17	0.98	13.00	0.98	4.28	3
N1	Underpass at Sta. 15+575 ^N (Rivers Road East / Wookey Road)	3.00	1.00	3.80	1.00	5.00	1.00	3.00	1.00	4.40	1.00	15.00	1.00	5.00	1
N2	Underpass at Sta. 15+900 ^N (Rivers Road East / Stone Road)	2.70	0.90	3.35	0.88	5.00	1.00	2.70	0.90	3.93	0.89	12.70	0.85	4.58	2

NOTES: Enter weighted favourability value Ai in Table S-7.

Ai - Weighted Favourability Value

Ni - Normalized Favourability Value

^S refers to South Himsworth TWP and ^N refers to North Himsworth TWP

Note 1: Includes underpass at Sta. 25+900 (Oakwood Road / Main Street connection).



TABLE SC-1– SOFT GROUND/SWAMPS

ACCESS SCENARIOS		SOFT GROUND/SWAMPS DEPTHS AND FAVOURABILITY						WEIGHTED FAVOURABILITY VALUE(Ai)	
		L1	F1	L2	F2	L3	F3		
		Depth Range (0 - 3 m)		Depth Range (3 - 10 m)		Depth Range (>10 m)			
SC1	Access Scenario 1	650	5	2155	3	625	1	3.01	A ₁
SC2a	Access Scenario 2a	2585	5	990	3	400	1	4.10	A ₂
SC2b	Access Scenario 2b	650	5	2610	3	240	1	3.23	A ₃
SC3	Access Scenario 3	650	5	2175	3	425	1	2.67	A ₄

NOTES: Embankment lengths (L1, L2, L3) measured at ramps and approach fills
 Enter weighted favourability value A_i in Table SC-7.

TABLE SC-2– GROUNDWATER CONDITIONS

ACCESS SCENARIOS		GROUNDWATER DEPTHS AND FAVOURABILITY						WEIGHTED FAVOURABILITY VALUE(Ai)	
		L1	F1	L2	F2	L3	F3		
		Depth Range (>5m)		Depth Range (1 - 5m)		Depth Range (0 -1 m)			
SC1	Access Scenario 1	6035	5	3835	3	3430	1	3.39	A ₁
SC2a	Access Scenario 2a	4880	5	2935	3	3975	1	3.15	A ₂
SC2b	Access Scenario 2b	4830	5	2360	3	3500	1	3.25	A ₃
SC3	Access Scenario 3	4680	5	2925	3	3250	1	3.26	A ₄

NOTES: Enter weighted favourability value Ai in Table SC-7.

TABLE SC-3– STRUCTURE FOUNDATIONS

ACCESS SCENARIOS		CONTEMPLATED STRUCTURE/INTERCHANGE SITE										WEIGHTED FAVOURABILITY VALUE(Ai)	
		South Section				Central Section				North Section			
		Highway 11 Underpass At Sta. 25+900		Highway 11 Underpass At Sta. 28+350		Highway 11 Underpass At Sta. 10+700 ⁽¹⁾ Sta. 11+125 ⁽²⁾ Sta. 11+630 ⁽³⁾		Boleau Creek Bridge Widening/New Bridge at Latour Crescent		Highway 11 Underpass At Sta. 15+575 (*) Sta. 15+900 (**)			
		Type	F1	Type	F2	Type	F3	Type	F4	Type	F5		
SC1	Access Scenario 1	A	5	B	4	B	4	—	—	A	5	4.50	A ₁
SC2a	Access Scenario 2a	A	5	B	4	A	5	B	4	A	5	4.60	A ₂
SC2b	Access Scenario 2b	A	5	B	4	A	5	B	4	A	5	4.60	A ₃
SC3	Access Scenario 3	A	5	B	4	B	4	—	—	A	5	4.40	A ₄

NOTES: Enter weighted favourability value A_i in Table SC-7.

A: Shallow Foundation, F = 5

B: Deep Foundation: Integral Abutments, F = 4; Others, F=3

⁽¹⁾ Scenario 2a Sta. (Highway 11 Chainage) ⁽²⁾ Scenarios 1 and 3 Sta. (Highway 11 Chainage) ⁽³⁾ Scenario 2b Sta. (Highway 11 Chainage)

(*) Scenarios 1 and 2a and 2b Sta. (Highway 11 Chainage) (**) Scenario 3 Sta. (Highway 11 Chainage)



TABLE SC-4– EMBANKMENT SETTLEMENT

ACCESS SCENARIOS		SUBSOIL TYPE AND FAVOURABILITY FACTOR						WEIGHTED FAVOURABILITY VALUE(Ai)	
		Less than 3 m Deep		3-10 m Deep		Deeper than 10 m			
		L1	L2	L3	L4	L5	L6		
		Sandy/Silty (F1=5)	Clayey (F2 =4)	Sandy/Silty (F3=4)	Clayey (F4 =3)	Sandy/Silty (F5=2)	Clayey (F6 =1)		
SC1	Access Scenario 1	2135	650	3835	2155	1125	625	3.61	A ₁
SC2a	Access Scenario 2a	1375	2935	2860	1220	—	400	3.88	A ₂
SC2b	Access Scenario 2b	550	650	2760	2840	—	240	3.57	A ₃
SC3	Access Scenario 3	150	1000	3375	2405	—	425	3.44	A ₄

NOTE: Enter weighted favourability value Ai in Table SC-7.



TABLE SC-5– EMBANKMENT STABILITY

ACCESS SCENARIOS		EMBANKMENT REQUIRING SPECIAL OR CONVENTIONAL DESIGN				WEIGHTED FAVOURABILITY VALUE(A _i)	
		L1	L2	L3	L4		
		Conventional Embankment (F1 = 5)	Embankment Requiring Subexcavation (F2 = 3)	Embankment Requiring Toe- Stabilizing Berms (F3 = 2)	Embankment Requiring pre- loading/ Wick Drains (F4 = 1)		
SC1	Access Scenario 1	9870	2730	600	100	4.42	A ₁
SC2a	Access Scenario 2a	7785	3705	100	400	4.22	A ₂
SC2b	Access Scenario 2b	7310	3030	150	200	4.32	A ₃
SC3	Access Scenario 3	7375	2780	550	150	4.28	A ₄

NOTE: Enter weighted favourability value A_i in Table SC-7.



TABLE SC-6– CONSTRUCTION FEASIBILITY

ACCESS SCENARIOS		STRUCTURES/EMBANKMENT REQUIRING SPECIAL CONSTRUCTION						WEIGHTED FAVOURABILITY VALUE(Ai)	
		No of Structure Foundations		No of Major Culvert Foundations		Swamps L (m)			
		Shallow Foundation (F=5)	Deep Foundation (F=4)	To be Constructed (F=4)	To be Extended (F=5)	Conventional (F=5)	Special (F=1)		
SC1	Access Scenario 1	2	2	10	—	2730	700	12.68	A ₁
SC2a	Access Scenario 2a	3	2	5	—	3705	500	13.12	A ₂
SC2b	Access Scenario 2b	3	2	4	—	3030	350	13.19	A ₃
SC3	Access Scenario 3	2	2	6	1	2780	150	13.44	A ₄

NOTES: Enter weighted favourability value A_i in Table SC-7.

Bridge Foundations Favourability: Shallow F=5 and Deep F=4; Culvert Favourability: New F=4; Extension F=5;

Deep Swamps Favourability: conventional treatment F=5, special construction treatment F=1



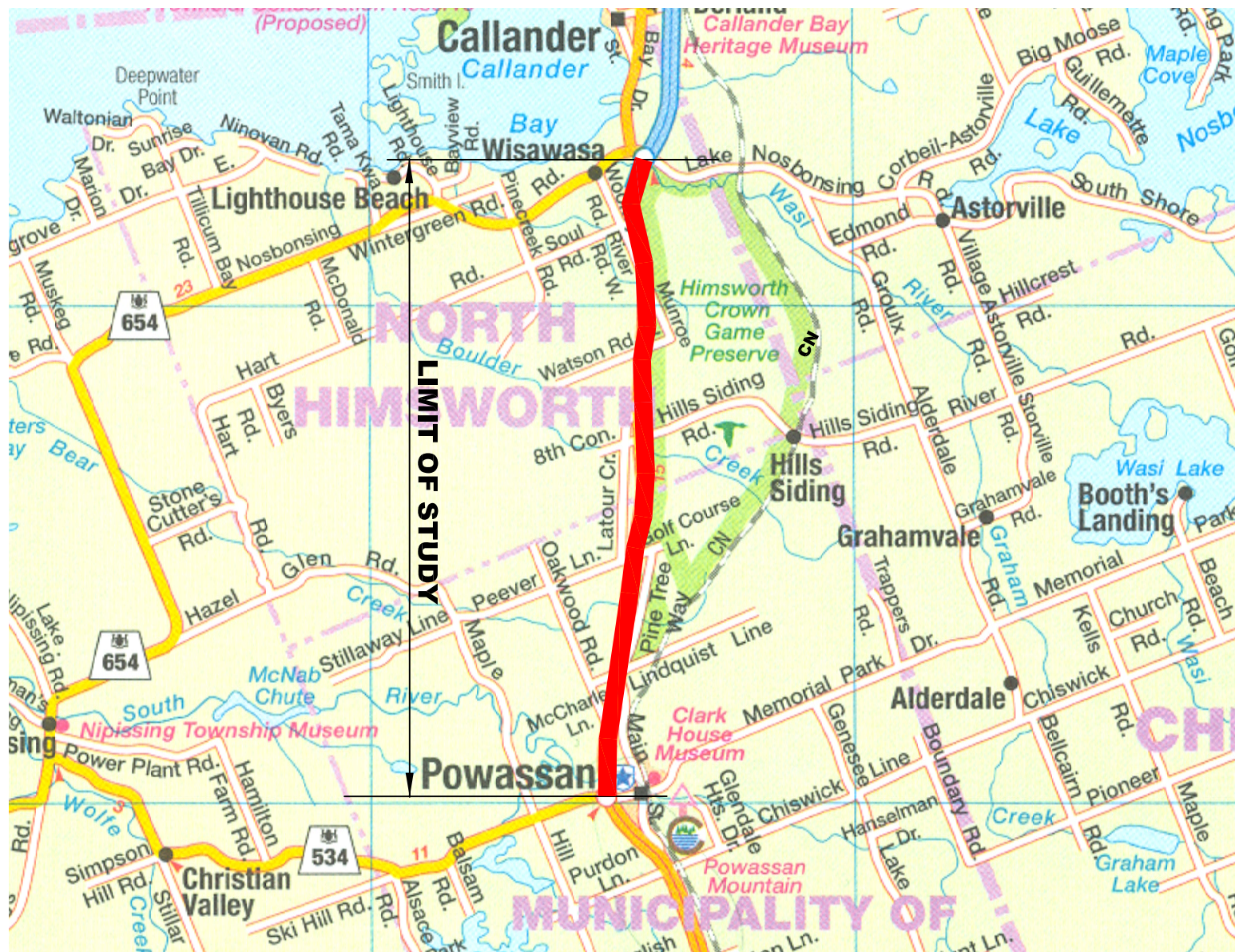
TABLE SC-7 – SCORING OF FOUNDATION CRITERIA (ACCESS SCENARIOS)

EVALUATION CRITERIA		SOFT GROUND/ SWAMPS		GROUNDWATER CONDITIONS		STRUCTURE FOUNDATIONS		EMBANKMENT SETTLEMENT		EMBANKMENT STABILITY		CONSTRUCTION FEASIBILITY		NORMALIZED SCORE	RANKING
TABLE No.		S1		S2		S3		S4		S5		S6			
IMPACT WEIGHT, Bi		0.10		0.15		0.25		0.20		0.20		0.10			
ACCESS SCENARIOS		Ai	Ni	Ai	Ni	Ai	Ni	Ai	Ni	Ai	Ni	Ai	Ni		
SC1	Access Scenario 1	3.01	0.74	3.39	1.00	4.50	0.98	3.61	0.93	4.42	1.00	12.68	0.94	4.74	2
SC2a	Access Scenario 2a	4.10	1.00	3.15	0.93	4.60	1.00	3.88	1.00	4.22	0.95	13.12	0.98	4.89	1
SC2b	Access Scenario 2b	3.23	0.79	3.25	0.96	4.60	1.00	3.57	0.92	4.32	0.98	13.19	0.98	4.75	2
SC3	Access Scenario 3	2.67	0.65	3.26	0.96	4.40	0.96	3.44	0.89	4.28	0.97	13.44	1.00	4.60	4

NOTES: Enter weighted favourability value Ai in Table SC-7.

Ai - Weighted Favourability Value

Ni - Normalized Favourability Value



REFERENCE: THIS FIGURE WAS REPRODUCED FROM MAPARTS MAP OF NORTH BAY.

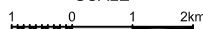
GEOCREs No. 31L-139

PROJECT LOCATION MAP

HIGHWAY 11

ACCESS REVIEW AT THE NORTH ENTRANCE TO POWASSAN
From Highway 534 to Highway 654

PLAN
SCALE



Stantec Consulting Ltd.

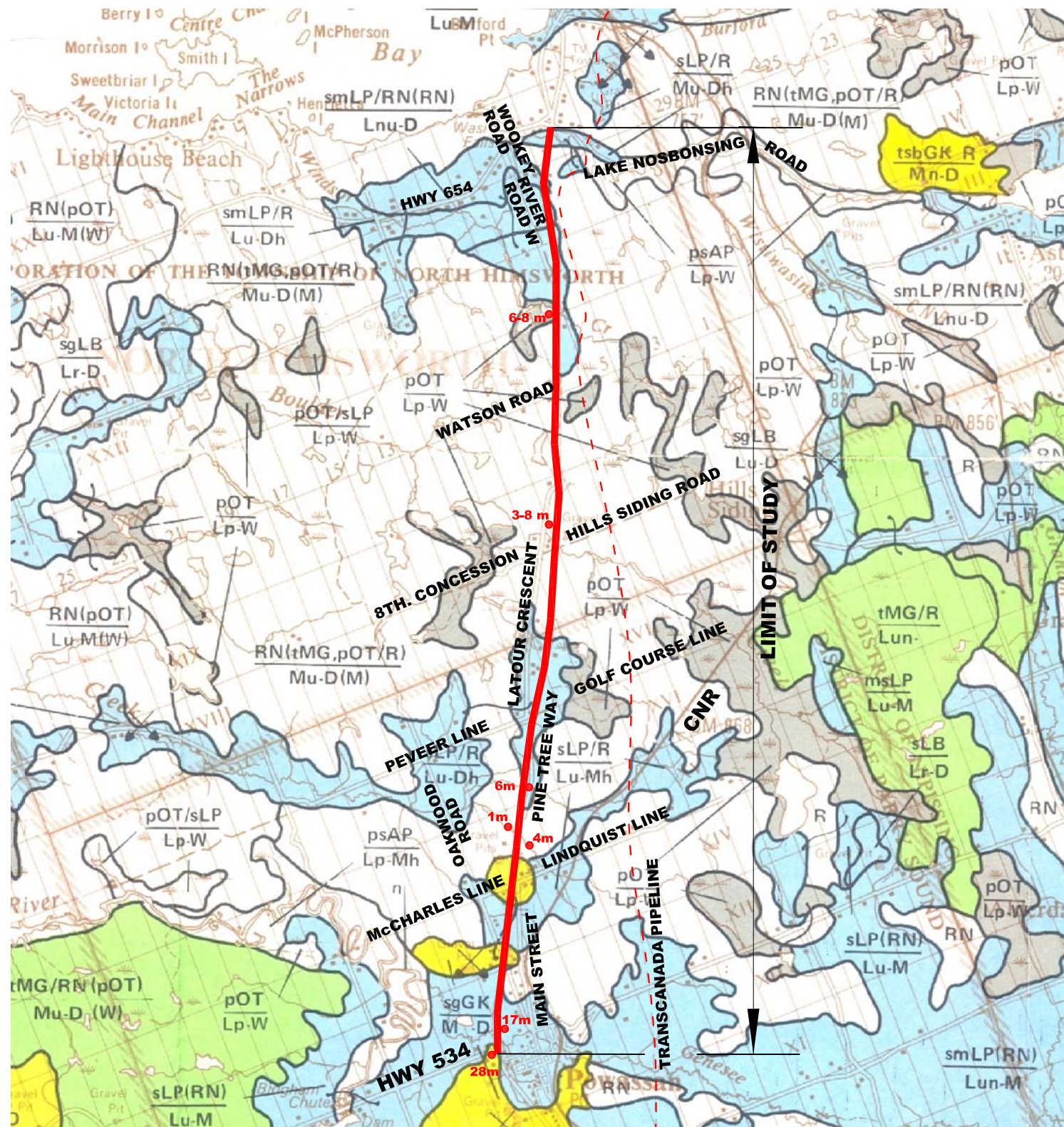
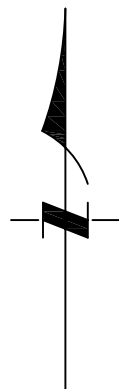


HIGHWAY 11
G.W.P. 5379 - 06 - 00

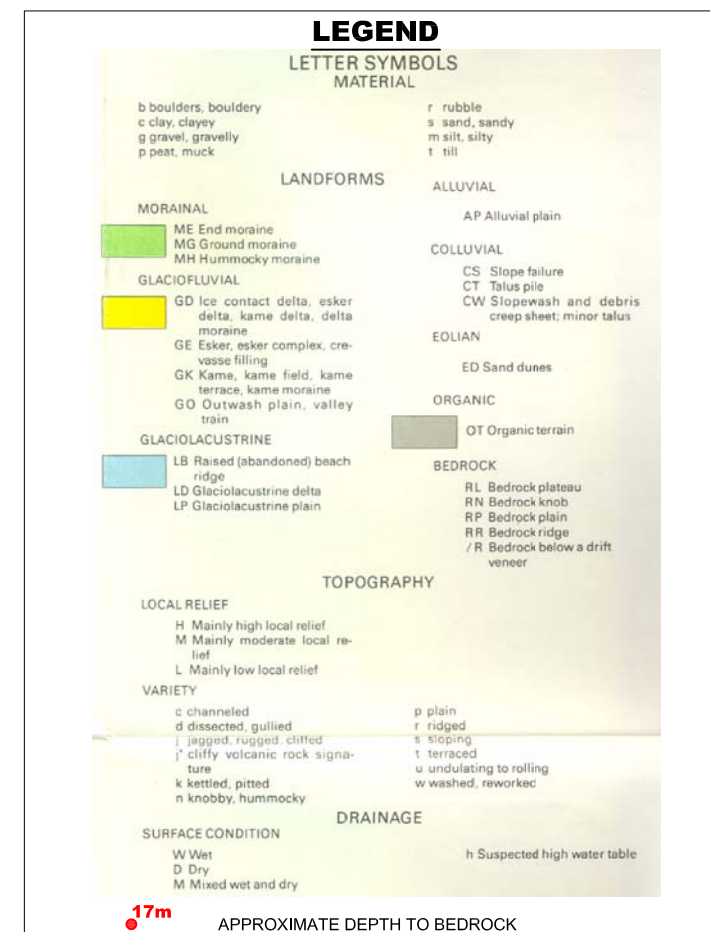
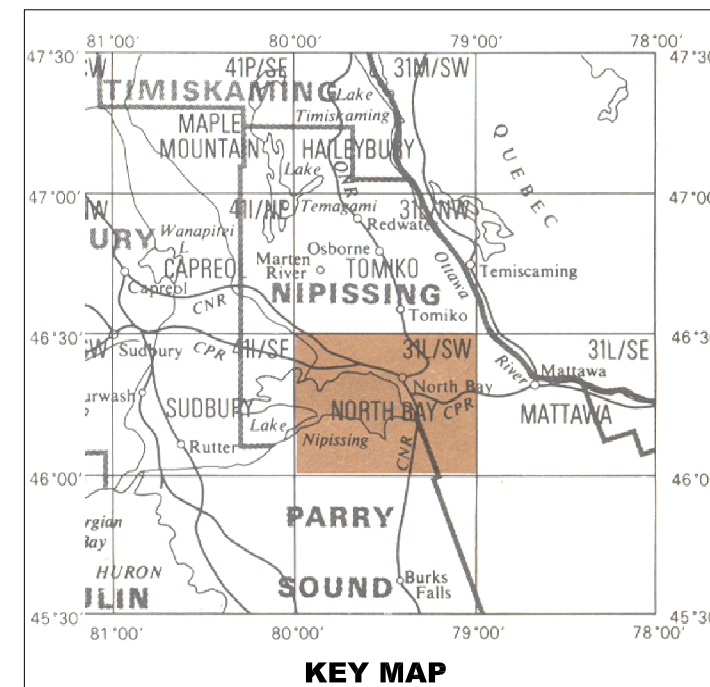


FIGURE
1

METRIC



REFERENCE: THIS DRAWING WAS REPRODUCED FROM ONTARIO GEOLOGICAL MAP 5041 FROM THE MINISTRY OF NATURAL RESOURCES, NORTHERN ONTARIO ENGINEERING GEOLOGY TERRAIN STUDY, DATA BASE MAP FOR NORTH BAY, SCALE: 1 : 100,000, PUBLISHED 1979.



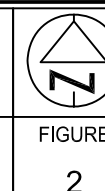
GEOCRES No. : 31L-139

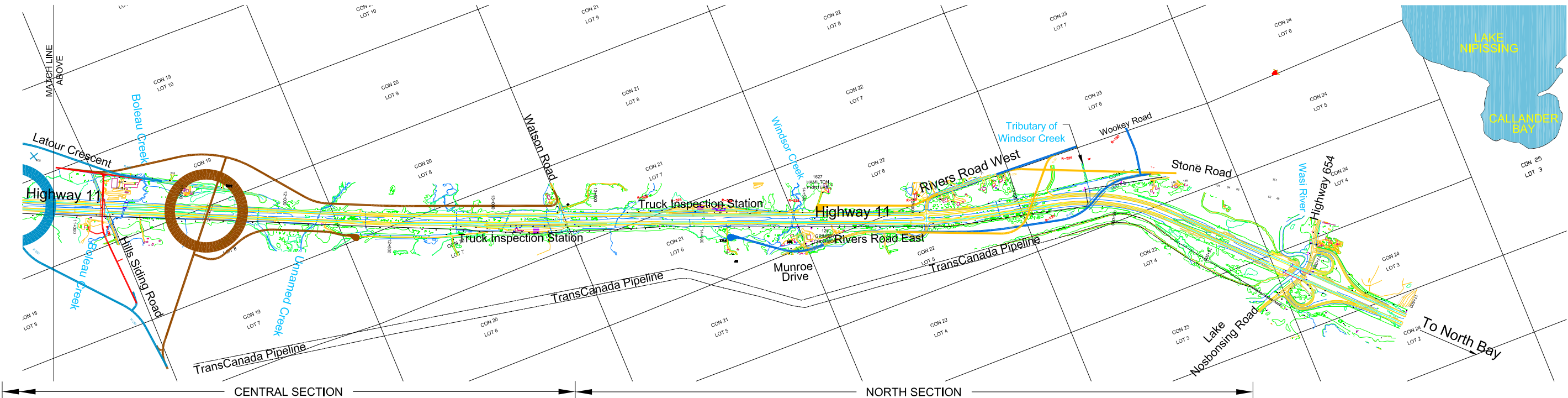
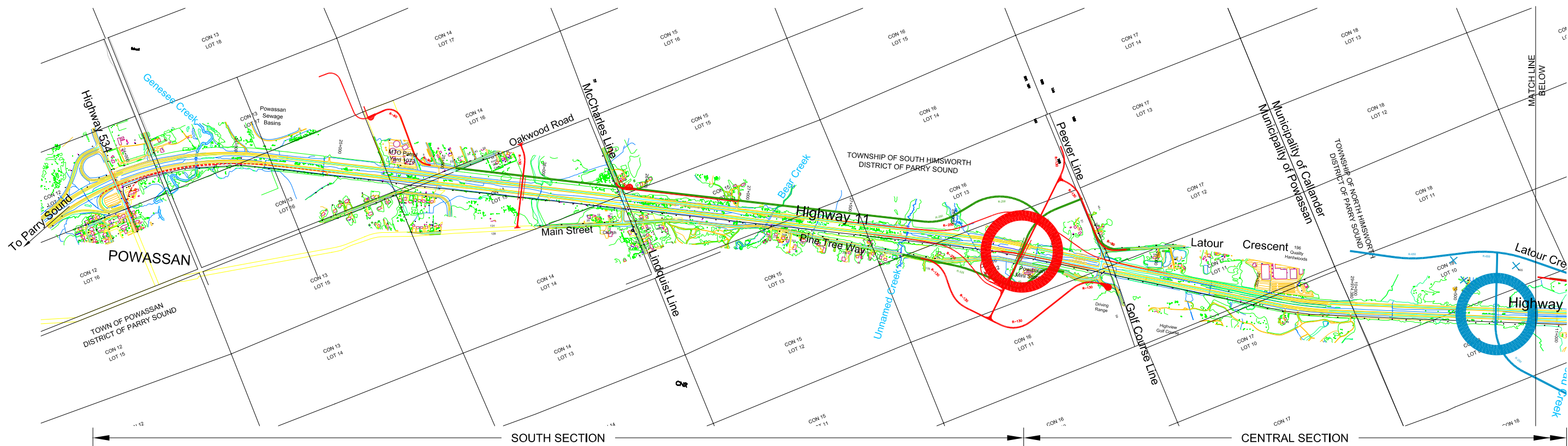
SITE GEOLOGY - SOILS AND BEDROCK DEPTHS HIGHWAY 11 ACCESS REVIEW AT THE NORTH ENTRANCE TO POWASSAN From Highway 534 to Highway 654

METRIC



HIGHWAY 11
G.W.P. 5379 - 06 - 00





LEGEND:

SOUTH ALTERNATIVES

- ALTERNATIVE S1 (PREFERRED)
- ALTERNATIVE S2

CENTRAL ALTERNATIVES

- ALTERNATIVE C1
- ALTERNATIVE C2
- ALTERNATIVE C3 (PREFERRED)

NORTH ALTERNATIVES

- ALTERNATIVE N1 (PREFERRED)
- ALTERNATIVE N2

REFERENCE: THIS DRAWING WAS REPRODUCED FROM THE DRAWING - 689_Design_Alternatives (1).dwg, PREPARED BY STANTEC CONSULTING LTD., AND DOWNLOADED FROM THEIR FTP SITE ON JUNE 22, 2009.

GEOCRES No. : 31L-139

<p>KEY MAP</p> <p>HIGHWAY 11</p> <p>ACCESS REVIEW AT THE NORTH ENTRANCE TO POWASSAN</p> <p>From Highway 534 to Highway 654</p>	<p>PLAN SCALE</p> <p>500m 0 250 500m</p>		<p>HIGHWAY 11</p> <p>GWP No. 5379-06-00</p>	<p>DRAWING</p> <p>A</p>
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METRIC

NOTES:

1. BEDROCK OUTCROPS SHOWN ON PLAN ARE BASED ON EXISTING CONSTRUCTION DATA, SITE RECONNAISSANCE AND AERIAL PHOTOGRAPHS. THE SYMBOLS ON THE PLANS INDICATE THE LOCAL PRESENCE OF THE BEDROCK UNIT AND DO NOT REPRESENT THE FULL EXTENT OF EACH ROCK OUTCROP.

2. THE EXTENT OF SWAMPS, WATER BODIES AND FILL AREAS IS AS INTERPRETED FROM SITE RECONNAISSANCE AND AERIAL PHOTOGRAPHS. THE AREAS EXTENT SHOWN ON THE PLANS REPRESENT ESTIMATES ONLY AND ACTUAL AREAS MAY VARY FROM THOSE SHOWN.

3. ESTIMATED DEPTH TO COMPETENT GROUND AND OR BEDROCK IN SWAMPS IS BASED ON GEOLOGICAL EVIDENCE, DESKTOP LITERATURE SEARCH DATA AND LIMITED SITE RECONNAISSANCE INFORMATION AND MAY VARY SUBSTANTIALLY WITHIN THE LIMITS OF THE SWAMP.

4. THE GEOLOGIC UNIT SYMBOLS SHOWN ON THE PLANS REPRODUCE THOSE SHOWN ON GEOLOGIC MAPPING OF THE AREA AND ARE ONLY A GENERAL REPRESENTATION OF BEDROCK AND SOIL UNITS.

5. THE PLANS ARE AN ENCLOSURE TO THE ALTERNATIVE STRUCTURE LOCATION SELECTION STUDY PREPARED BY PETO MACCALLUM LTD. THE DATA ON THESE PLANS MUST BE READ IN CONJUNCTION WITH THE REPORT.

6. THE DETAIL SHOWN ON THE PLAN IS CONSIDERED APPROPRIATE FOR ALTERNATIVE STRUCTURE LOCATION SELECTION PURPOSES. WHEN THE PREFERRED STRUCTURE LOCATIONS HAVE BEEN SELECTED, A SUBSURFACE INVESTIGATION SHOULD BE UNDERTAKEN TO DELINEATE THE STRATIGRAPHIC CONDITIONS ON A SITE SPECIFIC BASIS FOR PRELIMINARY AND DETAILED DESIGN PURPOSES.

LEGEND:

SOUTH ALTERNATIVES

ALTERNATIVE S1 (PREFERRED)

ALTERNATIVE S2

CENTRAL ALTERNATIVES

ALTERNATIVE C1

ALTERNATIVE C2

ALTERNATIVE C3 (PREFERRED)

NORTH ALTERNATIVES

ALTERNATIVE N1 (PREFERRED)

ALTERNATIVE N2

BEDROCK OUTCROP (R O/C)

SOFT GROUND / SWAMP

ANTICIPATED DEPTH (metres) TO COMPETENT MATERIAL/BEDROCK

WATER BODY

GF (K) GLACIOFLUVIAL (KAME)

GL (P) GLACIOLACUSTRINE (PLAIN)

BR (V) BEDROCK (VENEER OVER BEDROCK)

BR (N) BEDROCK (KNOBS)

M (G) GROUND MORaine

PHOTOGRAPH NUMBER (ARROW SHOWS DIRECTION OF VIEW)

GEOCRES No.: 31L-139


METRIC


LEGEND

HIGHWAY 11

ACCESS REVIEW AT THE NORTH ENTRANCE TO POWASSAN

From Highway 534 to Highway 654

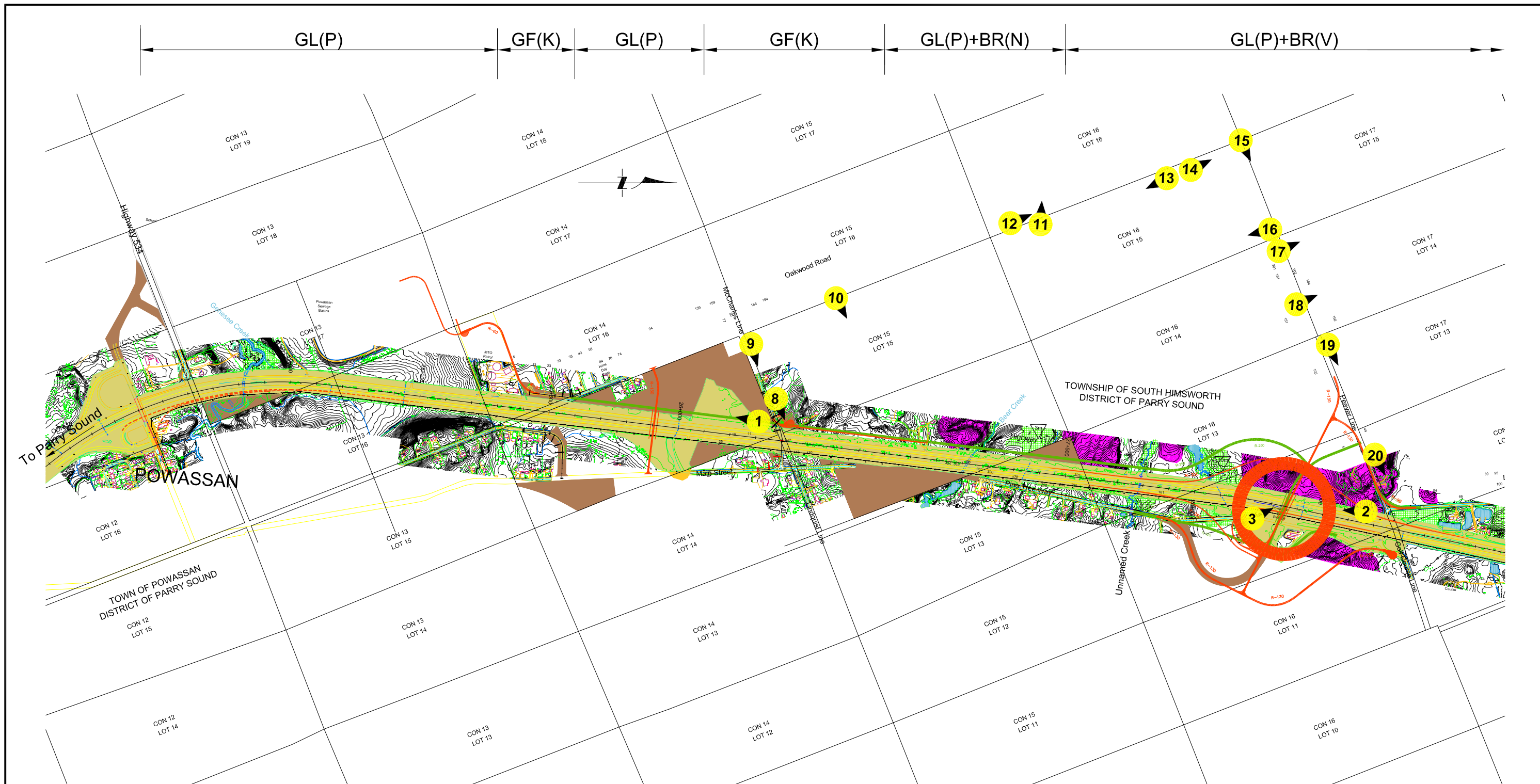




HIGHWAY 11

GWP No. 5379-06-00

DRAWING
B

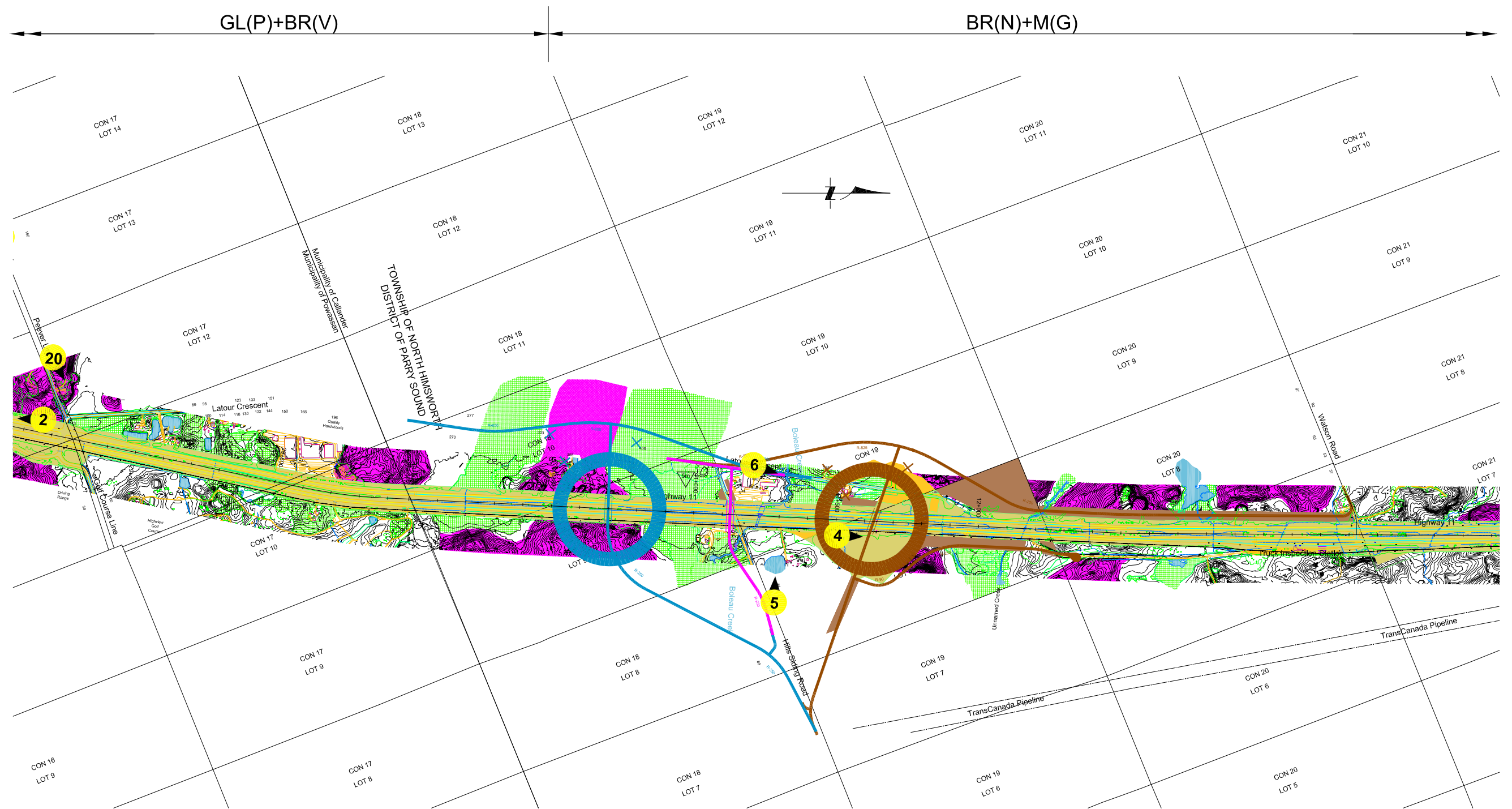


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GEOCRES No. : 31L-139

LEGEND:

- ALTERNATIVE S1 (PREFERRED)
- ALTERNATIVE S2



GEOCRES No. : 31L-139

LEGEND:

- ALTERNATIVE C1
- ALTERNATIVE C2
- ALTERNATIVE C3 (PREFERRED)

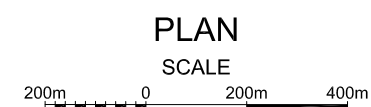
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CENTRAL SECTION (THREE ALTERNATIVES)

HIGHWAY 11

ACCESS REVIEW AT THE NORTH ENTRANCE TO POWASSAN
From Highway 534 to Highway 654

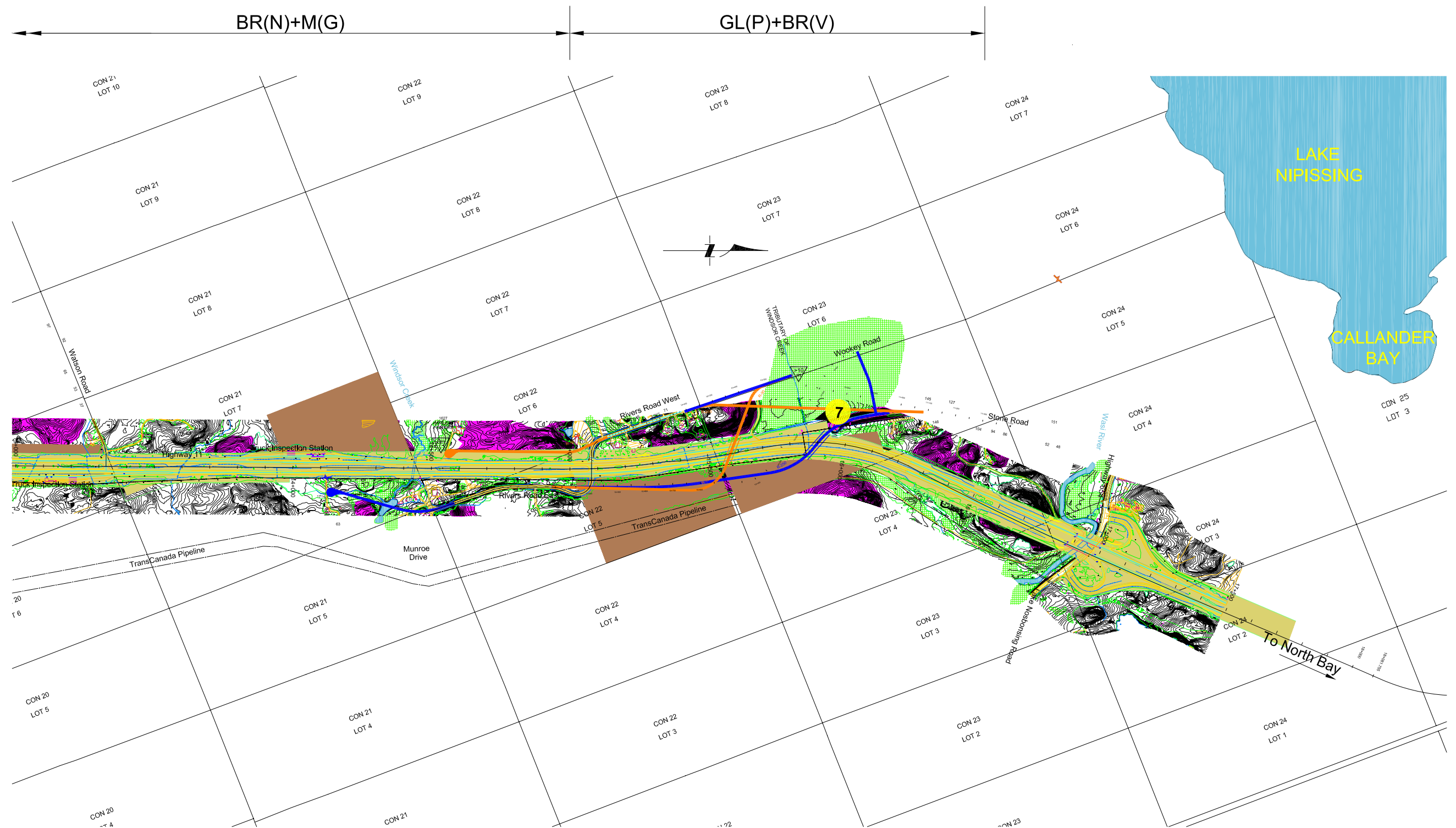
METRIC



HIGHWAY 11
G.W.P. 5379 - 06 - 00



DRAWING
B2



GEOCREs No. : 31L-139

LEGEND:

- ALTERNATIVE N1 (PREFERRED)
- ALTERNATIVE N2

REFERENCE: THIS DRAWING WAS REPRODUCED FROM THE DRAWING - 689_Design_Alternatives (1).dwg, PREPARED BY STANTEC CONSULTING LTD., AND DOWNLOADED FROM THEIR FTP SITE ON JUNE 22, 2009.

CENTRAL SECTION (THREE ALTERNATIVES) HIGHWAY 11 ACCESS REVIEW AT THE NORTH ENTRANCE TO POWASSAN From Highway 534 to Highway 654

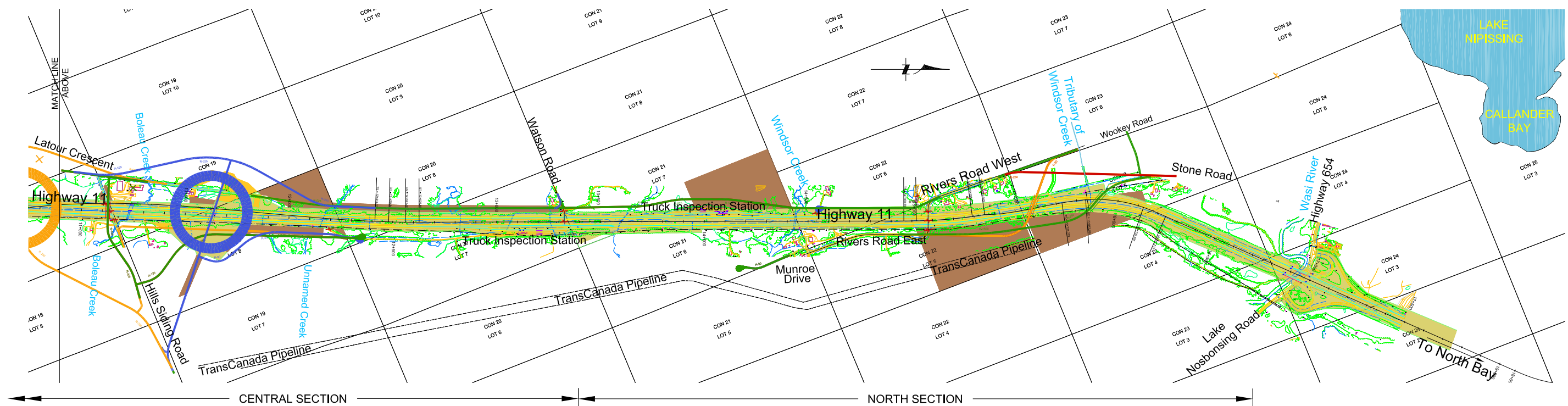
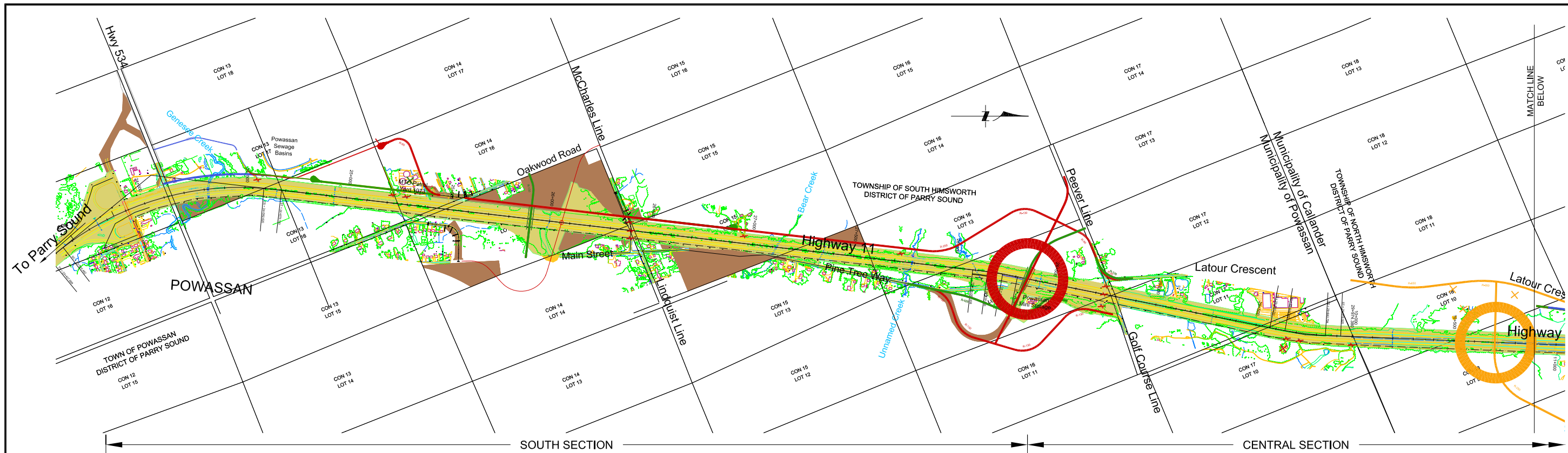
METRIC

PLAN
SCALE
200m 0 200m 400m



HIGHWAY 11
G.W.P. 5379 - 06 - 00

DRAWING
B3



REFERENCE: THIS DRAWING WAS REPRODUCED FROM THE DRAWING - 689_Design_Alternatives (1).dwg,
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LEGEND:

- | | |
|--|--|
| — ACCESS SCENARIO 1 | — ACCESS SCENARIO 2b |
| — ACCESS SCENARIO 2a | — ACCESS SCENARIO 3 |

GEOCRES No. : 31L-139

KEY MAP HIGHWAY 11

ACCESS REVIEW AT THE NORTH ENTRANCE TO POWASSAN
From Highway 534 to Highway 654

METRIC



HIGHWAY 11
G.W.P. 5379 - 06 - 00



DRAWING
SC-A

NOTES:

- 1. BEDROCK OUTCROPS SHOWN ON PLAN ARE BASED ON EXISTING CONSTRUCTION DATA, SITE RECONNAISSANCE AND AERIAL PHOTOGRAPHS. THE SYMBOLS ON THE PLANS INDICATE THE LOCAL PRESENCE OF THE BEDROCK UNIT AND DO NOT REPRESENT THE FULL EXTENT OF EACH ROCK OUTCROP.
- 2. THE EXTENT OF SWAMPS, WATER BODIES AND FILL AREAS IS AS INTERPRETED FROM SITE RECONNAISSANCE AND AERIAL PHOTOGRAPHS. THE AREAS EXTENT SHOWN ON THE PLANS REPRESENT ESTIMATES ONLY AND ACTUAL AREAS MAY VARY FROM THOSE SHOWN.
- 3. ESTIMATED DEPTH TO COMPETENT GROUND AND OR BEDROCK IN SWAMPS IS BASED ON GEOLOGICAL EVIDENCE, DESKTOP LITERATURE SEARCH DATA AND LIMITED SITE RECONNAISSANCE INFORMATION AND MAY VARY SUBSTANTIALLY WITHIN THE LIMITS OF THE SWAMP.
- 4. THE GEOLOGIC UNIT SYMBOLS SHOWN ON THE PLANS REPRODUCE THOSE SHOWN ON GEOLOGIC MAPPING OF THE AREA AND ARE ONLY A GENERAL REPRESENTATION OF BEDROCK AND SOIL UNITS.
- 5. THE PLANS ARE AN ENCLOSURE TO THE ALTERNATIVE STRUCTURE LOCATION SELECTION STUDY PREPARED BY PETO MACCALLUM LTD. THE DATA ON THESE PLANS MUST BE READ IN CONJUNCTION WITH THE REPORT.
- 6. THE DETAIL SHOWN ON THE PLAN IS CONSIDERED APPROPRIATE FOR ALTERNATIVE STRUCTURE LOCATION SELECTION PURPOSES. WHEN THE PREFERRED STRUCTURE LOCATIONS HAVE BEEN SELECTED, A SUBSURFACE INVESTIGATION SHOULD BE UNDERTAKEN TO DELINEATE THE STRATIGRAPHIC CONDITIONS ON A SITE SPECIFIC BASIS FOR PRELIMINARY AND DETAILED DESIGN PURPOSES.

LEGEND:

ACCESS SCENARIOS

- ACCESS SCENARIO 1
- ACCESS SCENARIO 2a
- ACCESS SCENARIO 2b
- ACCESS SCENARIO 3

- BEDROCK OUTCROP (R O/C)
- SOFT GROUND / SWAMP
- ANTICIPATED DEPTH (metres) TO COMPETENT MATERIAL/BEDROCK
- WATER BODY
- GF (K) GLACIOFLUVIAL (KAME)
- GL (P) GLACIOLACUSTRINE (PLAIN)
- BR (V) BEDROCK (VENEER OVER BEDROCK)
- BR (N) BEDROCK (KNOBS)
- M (G) GROUND MORaine
- PHOTOGRAPH NUMBER (ARROW SHOWS DIRECTION OF VIEW)

GEOCRES No. : 31L-139

LEGEND
HIGHWAY 11

ACCESS REVIEW AT THE NORTH ENTRANCE TO POWASSAN
From Highway 534 to Highway 654

METRIC

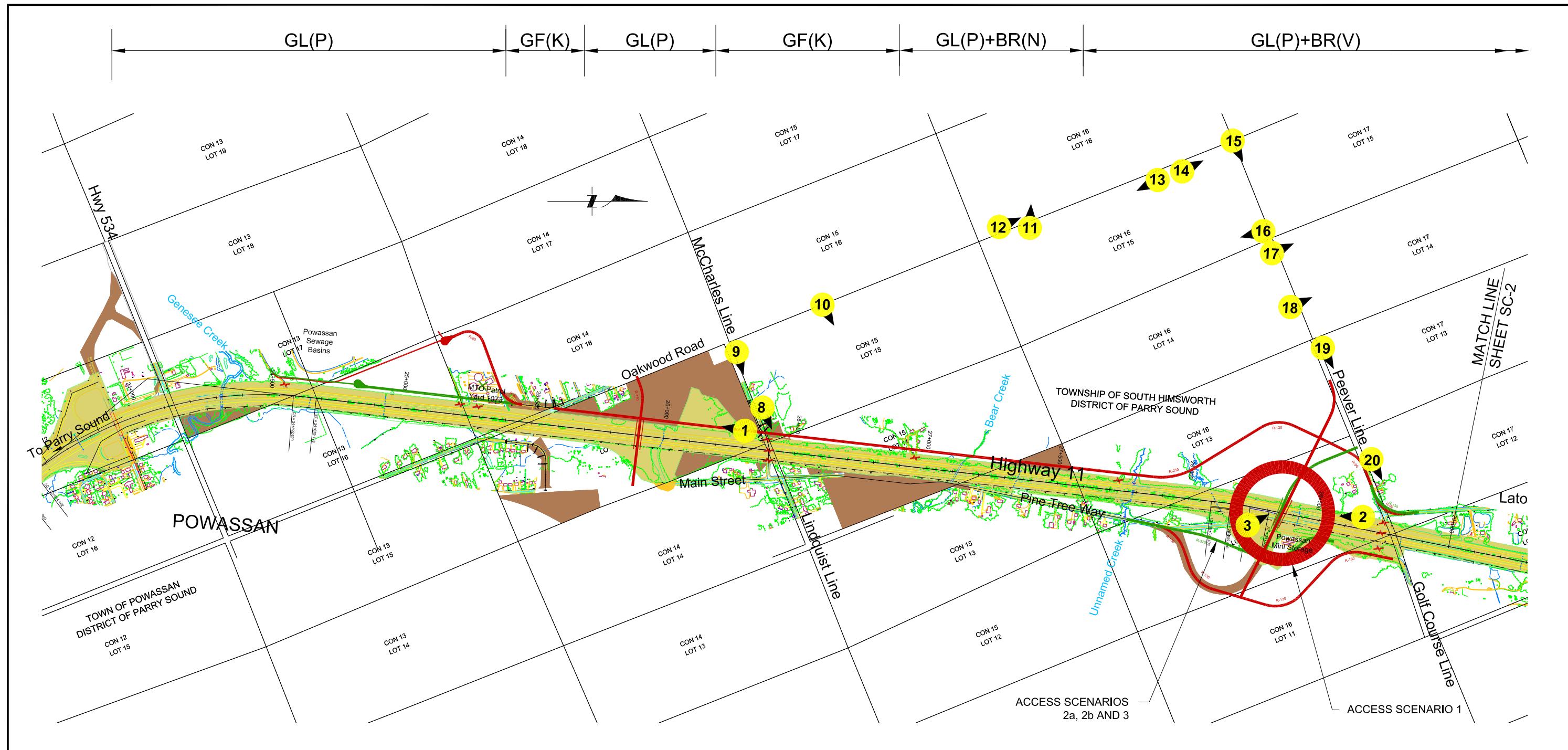




HIGHWAY 11

G.W.P. 5379 - 06 - 00

DRAWING
SC-B



GEOCRES No. : 31L-139

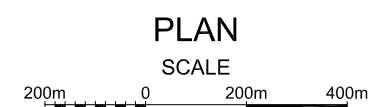
LEGEND:

- ACCESS SCENARIO 1
- ACCESS SCENARIO 2a
- ACCESS SCENARIO 2b
- ACCESS SCENARIO 3

REFERENCE: THIS DRAWING WAS REPRODUCED FROM THE DRAWING - 689_Design_Alternatives (1).dwg,
PREPARED BY STANTEC CONSULTING LTD., AND DOWNLOADED FROM THEIR FTP SITE
ON APRIL 14, 2009.

STA. 24+000 TO 29+000 (TOWNSHIP OF SOUTH HIMSWORTH)
HIGHWAY 11
ACCESS REVIEW AT THE NORTH ENTRANCE TO POWASSAN
From Highway 534 to Highway 654

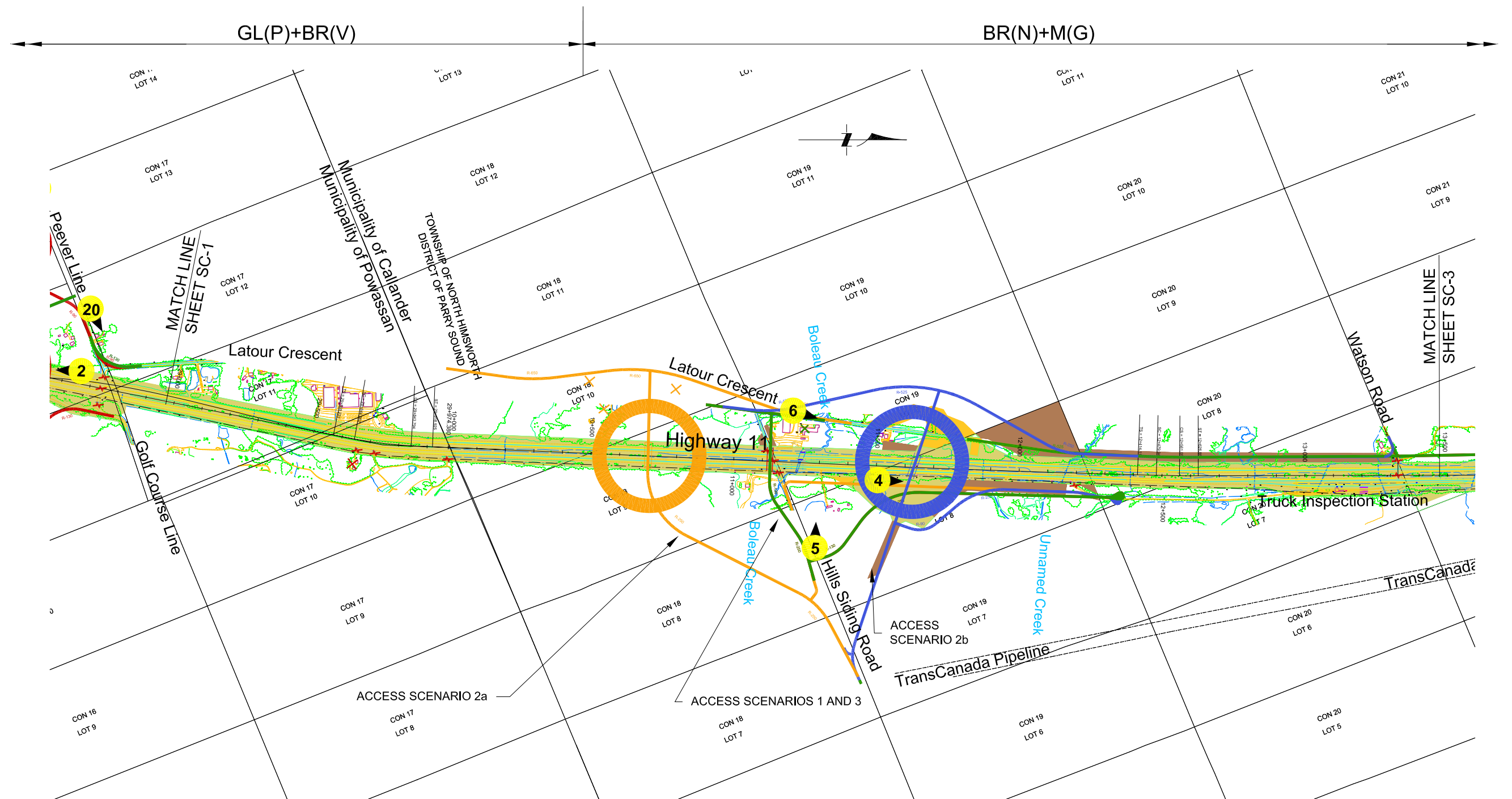
METRIC



HIGHWAY 11
G.W.P. 5379 - 06 - 00



DRAWING
SC-1



GEOCRES No. : 31L-139

LEGEND:

- ACCESS SCENARIO 1
- ACCESS SCENARIO 2a
- ACCESS SCENARIO 2b
- ACCESS SCENARIO 3

REFERENCE: THIS DRAWING WAS REPRODUCED FROM THE DRAWING - 689_Design_Alternatives (1).dwg,
PREPARED BY STANTEC CONSULTING LTD., AND DOWNLOADED FROM THEIR FTP SITE
ON APRIL 14, 2009.

STA. 29+000 to 29+974.380(TOWNSHIP OF SOUTH HIMSWORTH) and
STA. 10+000 to STA. 13+500 (TOWNSHIP OF NORTH HIMSWORTH)
HIGHWAY 11
ACCESS REVIEW AT THE NORTH ENTRANCE TO POWASSAN
From Highway 534 to Highway 654

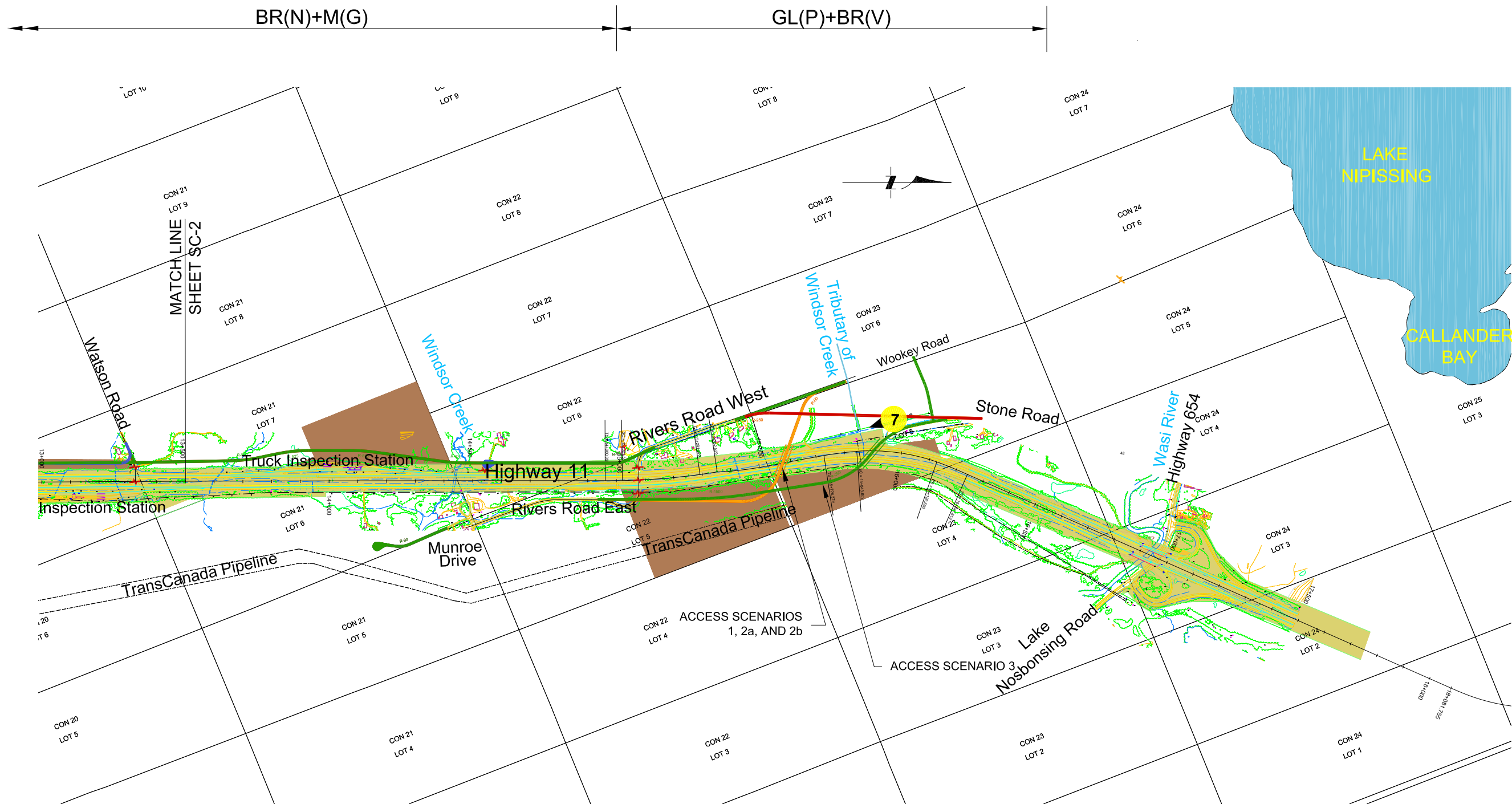
METRIC



HIGHWAY 11
G.W.P. 5379 - 06 - 00



DRAWING
SC-2



GEOCRES No. : 31L-139

LEGEND:

- ACCESS SCENARIO 1
- ACCESS SCENARIO 2a
- ACCESS SCENARIO 2b
- ACCESS SCENARIO 3

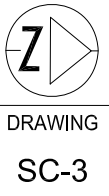
REFERENCE: THIS DRAWING WAS REPRODUCED FROM THE DRAWING - 689_Design_Alternatives (1).dwg,
PREPARED BY STANTEC CONSULTING LTD., AND DOWNLOADED FROM THEIR FTP SITE
ON APRIL 14, 2009.

STA. 13+500 TO STA. 17+500 (TOWNSHIP OF NORTH HIMSWORTH)
HIGHWAY 11
ACCESS REVIEW AT THE NORTH ENTRANCE TO POWASSAN
From Highway 534 to Highway 654

METRIC



HIGHWAY 11
G.W.P. 5379 - 06 - 00





APPENDIX A

List of Reference Documents



APPENDIX A

LIST OF REFERENCE DOCUMENTS

HIGHWAY 11 ACCESS REVIEW FROM HIGHWAY 534
TO HIGHWAY 654
TOWNSHIPS OF SOUTH HIMSWORTH AND NORTH HIMSWORTH
MUNICIPALITIES OF POWASSAN AND CALLANDER, ONTARIO
GWP NO. 5379-06-00

A. Geological Maps

- Quaternary geology of the North Bay – Mattawan Region, MAP–3–1971, from Geological Survey of Canada, issued 1971, Scale: 0.5 inch to 1 mile.
- Ontario Geological Survey 1979, Northern Ontario Engineering Geology Terrain Study, Data Base Map , North Bay, Map 5041, Scale 1 : 100 000

B. Resource Documents

- Parry Sound District, Parry Sound Soil Survey Report No.31, from the Department of Agriculture, published 1962, Scale 1:126,720 or 1 inch to 2 mile.
- Aggregate Resources Inventory Paper 70 and Map 1C and 3C, District of Parry Sound from the Ontario Geological Survey, Ministry of Natural Resources, issued 1984.

C. MTO Reports

- Preliminary Foundation Investigation report for Proposed Interchange At Highway 11 And 534, District 13 (North Bay) Township of North Himsworth, Regional Municipality of North Bay, WP 84-05-0022, Site between 85-03-18 and 85-03-26, Geocres No. 31L 52 (August 1985 noted on Margin).
- Foundation Investigation Report for Culverts along Hwy.11 from 2.0 km North of Hwy. 534, Northerly 9.9 km, District 13, North Bay, W.P 73-74-00 dated August 1991.
- Preliminary Design Report for Highway 11, Powassan to Callander, District 13, North Bay, WP 269-86-00 dated November1990.
- Hydrogeological Conditions and Potential Municipal Well Interference of Highway 11/Highway 534 Overpass Construction, Town of Powassan, South Himsworth Township, W.P. No. 51-75-00, Geocres No. 31L-64 dated April 1993.



D. Well Records (See Appendix B)

- Water Well Records from Ontario Northern Area provided by the Ministry of Environment from 1946 - 1969.

E. Air Photo

- Photo mosaic of oblique colored aerial photographs taken along the study corridor provided by Stantec Consulting Ltd.
- Aerial Photographs 89-4604, 29-56 and 29-58
- Aerial Photographs 89-4605, 16-247 and 16-248
- Aerial Photographs 89-4606, 19-185 and 19-186
- Aerial Photographs 89-4607, 2-173 and 2-174



APPENDIX B

Water Well Records

PARRY SOUND DISTRICT 48

MUNICIPALITY CONCESSION ETC	LGT	WELL NO	UTM EASTING NORTHING	ELEV FEET	DATE	DRILLER	CSG CJA	KIND OF INS	WATER FEET	STAT LVL	PUMP LVL	TEST RATE	TEST TIME	WATER HR/MN	USE	CNMR/L/LOG	DEPTHS IN FEET TO WHICH FORMATIONS EXTEND
SCOTTS BLVD NORTH TOWNSHIP																	
CCN	1	25	772	626592	1041	06/54	3622	6	FR	15	6	6	17	00		ROTS R	CLAY MSND 0004 GREY GRANT 0025
CCN	2	25	773	626605	1025	12/55	2305	2	FR	90	2	6	5	4/00	CO	TEXACO SERVICE STATION	YLLW MSND 0005 GREY QSNQ 0050 GRVL 0051
CCN	2	25	777	626737	1027	12/60	2305	2		ERY						BUSCH J	GREY MSND 0105 GRANT 0161
CCN	2	25	776	627009	1025	06/65	2305	2	FR	106	4	4	5	12/00	CO	BP SERVICE STATION	QSNQ 0102 GRVL 0106
CCN	2	25	775	627050	1027	05/65	2512	5	FR	91	6	60	11	1/00	CO	GERARD E	MSND 0013 CLAY 0040 MSND STNS 0050 GRANT 0054
CCN	2	25	774	627100	1027	07/60	2305	2	FR	86	8	8	7	3/00	DO	SCHNELEFESKE M	RED MSND 0005 GREY QSNQ 0061 GRANT 0064
CCN	2	26	781	626265	1027	08/61	2305	2	FR	153	4	4	2	2/30	DO	STEELE G	YLLW MSND 0004 GREY MSND 0116 GRVL 0117
CCN	2	26	778	626437	1030	07/60	2305	2	FR	75	5	5	2	2/00	DO	GREY ROCK 0161	MAURIDGE N L
CCN	2	26	780	626390	1030	01/61	2305	2		ERY						PUBLIC SCHOOL	GREY QSNQ 0113 GRANT 0205
CCN	2	26	775	626653	1030	01/61	2305	2		ERY						PUBLIC SCHOOL	GREY MSND 0114 GRANT 0361
CCN	2	26	782	626742	1030	01/62	2305	2	FR	107	4	4	3	5/00	PS	PUBLIC SCHOOL	GREY QSNQ 0095 GRANT BLDR GRVL 0106 RED
CCN	2	27	783	626250	1027	10/66	1443	2	FR	110	6	40	4	2/00	DO	GRANT 0113	SMALLWELL D
CCN	3	24	784	627247	1033	04/64	2305	2	FR	96	34	31	3	2/00	DO	MSND CLAY 0070 RED GRANT 0081	WARNER N
CCN	3	25	786	626417	1030	05/67	1443	2	FR	128						PRDG 0038 MSND GRVL 0056 RED GRANT 0141	QUAKOWSKI G
CCN	3	25	565	626770	1023	11/68	2305	2	FR	67	FLW		8	3/00	DO	QSNQ 0085 RED GRANT 0090	LANG L
CCN	3	25	785	626950	1040	04/62	2305	2		ERY						GREY MSND 0057 GRVL 0060 RED GRANT 0071	TOFFLENTRE C
CCN	3	26	787	626594	1030	07/60	2305	2	FR	97	1	8	3	1/00	DO	GREY FMSND 0117 GRANT 0200	GRABOWSKI S
CCN	3	26	788	626665	1030	11/62	2305	2	FR	123	6	12	2	3/30	DO	GREY QSNQ 0054 GRANT 0108	SCHNELEFE G
CCN	4	3	785	624227	1070	05/65	2522	2	FR	106	57		1	24/00	DO	KAUDATZ R	GRVL BDR 0075 MSND BLDR 0100 GREY GRANT 0112
CCN	4	25	752	626687	1110	06/65	2522	2	FR	104	22		1	24/00	DO	BUSCH E	MSND BLDR 0018 GRANT 0085 RED GRANT 0110
CCN	4	27	753	621750	1030	05/56	2905	6	FR	32	15	15	4	1/00	DO	GRANT 0150	GRABOWSKI G
CCN	7	10	754	631050	1100	05/63	2305	2	FR	154	8	46	2	3/00	ST DO	MSND 0015 GREY GRANT 0045	HEADICK C
CCN	7	31	755	623160	1053	08/54	3622	6	FR	80	67		6		ST	GREY MSND 0006 RED GRANT 0177	YOUNG B V
CCN	8	2	1067	633270	930	05/69	1443	2		323	63				DO	WHIT CLAY 0010 MSND 0070 GRVL 0077 BLCK	GRANT 0097
CCN	8	23	756	625489	1250	07/51	1546	2	FR	155	15	15	3	4/00	ST DO	MSND BLDR 0107 GREY GRANT 0323	STOREY D
CCN	9	15	757	626814	550	05/55	2512	5	FR	100	13	131	48/00	DO		GREY CLAY 0025 GRANT 0177	KNLANDSON G
				5101657													CLAY 0024 GREY GRANT 0131

PARRY SOUND DISTRICT 48

MUNICIPALITY CONCESSION ETC	LCT	WELL NO	EASTING NORTHING	ELEV FEET	DATE DRILLER	CSG DIA	KIND OF	WATER FEET	STAT LVL	PUMP LVL	TEST RATE	TEST TIME	WATER GPM	HR/MIN	USE	DEPTHS IN FEET TO WHICH FORMATIONS EXTEND		OWNER/LOG
																FEET	FEET	
SOUTH HINSMORP TOWNSHIP (CONTINUED.....)																		
CCN	5	15	755	626849	650 05/59	2505	6	FR	170	75	170	2	2/00	CO			SOUTER W MSND BLDR 0026 GREY GRNT 0170 RED GRNT 0174	
CCN	5	15	758	627860	550 05/55	2512	5		DRY								ROMANSON G CLAY 0024 GREY GRNT 0061	
CCN	5	16	801	627300	600 12/61	2512	5	FR	95	35	90	4	2/00	PS			SCHOOL CLAY BLDR 0030 BLDR HPAN 0084 RED GRNT 0101	
CCN	5	16	802	627550	501 11/61	2512	5		DRY								SCHOOL FSND 0006 BLUE CLAY 0034 FSND 0040 HPAN 0046	
CCN	5	16	800	627494	525 05/61	2512	5		DRY								BLDR 0046 GREY GRNT 0048	
CCN	5	16	791	627718	537 09/61	2512	5		DRY								SCHOOL BOARD	
CCN	5	16	803	627750	510 04/63	2305	2	FR	122	70		3	1/00	DO			MSND 0004 CLAY 0020 BLDR 0024 GRNT 0256	
CCN	5	16	804	627750	510 04/63	2305	2	FR	144	60		5	14/00	ST DO			SCHOOL	
CCN	5	16	805	627750	510 04/63	2305	2	FR	130	76	12	3	12/00	ST			MSND 0003 HPAN 0023 GRNT 0204	
CCN	5	16	806	627750	510 04/63	2305	2	FR	138	181							BURNS C H PRDG 0003 RED GRNT 0156	
CCN	5	16	807	627750	510 04/63	2305	2	FR	136	181							PRDG 0034 MSND GRVL BLDR 0060	
CCN	5	16	808	627750	510 04/63	2305	2	FR	136	181							ROBERTSON G PRDG 0017 GRVL 0035 BLCK ROCK 0130	
CCN	5	16	809	627750	510 04/63	2305	2	FR	136	181							BENNINGSON D PRDG 0040 GRNT BLDR MSND 0051 RED GRNT 0198	
CCN	5	16	810	627750	510 04/63	2305	2	FR	136	181							MOORE E TPSL MSND BLDR 0022 RED GRNT 0120	
CCN	5	16	811	627750	510 04/63	2305	2	FR	155	10	16	2	5/00	CO			MOORE E L PRDG 0027 GREY GRNT 0163	
CCN	5	16	812	627750	510 04/63	2305	2	FR	30	15	30	2	1/00	CO			ROMANSON S D RED FSND 0023 GREY GRNT 0080	
CCN	5	16	813	627750	510 04/63	2305	2	FR	51	5	51	5	2/00	ST			MOORE G CLAY 0018 GREY GRNT 0049 RED GRNT 0051	
CCN	5	16	814	627750	510 04/63	2305	2	FR	94	16				PS			MAPLE HILL SCHOOL CLAY 0002 GRNT 0095	
CCN	5	16	815	627750	510 04/63	2305	2	FR	40	20	20	6	1/00	DO			HURLBURT F RED MSND 0037 GREY GRNT 0042	
CCN	5	16	816	627750	510 04/63	2305	2	FR	20	26		4	3/00	CC			BUSKEY J BLUE CLAY MUCK 0020 GREY MSND 0030 BLUE	
CCN	5	16	817	627750	510 04/63	2305	2	FR	35	35							MUCK 0035 GRVL 0030 GREY GRNT 0050	
CCN	5	16	818	627750	510 04/63	2305	2	FR	46	24	24	6	1/00	CC			GEDDES J BLUE CLAY MUCK 0020 GREY MSND 0044 GRVL	
CCN	5	16	819	627750	510 04/63	2305	2	FR	20								0045 GREY GRNT 0050	
CCN	5	16	820	627750	510 04/63	2305	2	FR	50								BOWER E BLUE CLAY SILT 0020 GREY MSND 0049 GRVL	
CCN	5	16	821	627750	510 04/63	2305	2	FR	20	15	30	7	6/00	DO			0050 GREY GRNT 0054	
CCN	5	16	822	627750	510 04/63	2305	2	FR	53								HUMPHREY A PRDG 0032 BLDR GRVL 0052 RED GRNT 0115	

PARRY SOUND DISTRICT 48

MUNICIPALITY
CONCESSION
ETC

LTM
WELL EASTING
NORTHING

ELEV
FEET

DATE
DRILLER

CSG KIND
C/A OF
INS

WATER STAT
FOUND LVL
FEET

PUMP TEST
LVL RATE
FEET GPM

WATER
HR/MN USE

OWNER/LOG
DEPTHS IN FEET TO WHICH
FORMATIONS EXTEND

SOUTH HIMSWORDT TOWNSHIP (CONTINUED....)

CCN	11	15	118	627307	880	10/66	3614	2	FR	102	22	60	2	10/00	D0	LAKE J E
CCN	11	16	121	626842	875	05/64	2522	2	FR	55	35		5	15/00	D0	CLAY QSNQ GRVL 0049 RED GRNT 0110
CCN	11	16	119	626980	875	01/60	3014	2	FR	102	12	24	3	2/00	D0	PRDG 0030 QSNQ 0055 GRVL 0070
CCN	11	16	118	626590	880	11/68	1443	2	FR	58	21	40	2	2/00	D0	FARLEY A
CCN	11	16	120	627600	876	11/62	2305	2	FR	141	24		1	1/30	D0	JURON H T
CCN	11	16	122	627100	857	04/66	2522	2	FR	160	34		1	36/00	D0	POLICHUK L
CCN	11	16	123	627176	500	05/66	2305	2	FR	130	62		1	3/30	D0	GRAY MSND BLDR 0028 RED GRNT 0180
CCN	11	16	117	627240	850	04/65	2522	2	FR	280	40	40	1	24/00	D0	BOYCHUK F
CCN	12	4	124	630530	535	05/54	3622	5	FR	125	6	6	8		D0	WARNER G
CCN	12	13	128	627760	925	11/58	3014	2	FR	58	24	26	2	5/00	D0	MSND GRVL BLDR 0060 RED GRNT 0291
CCN	12	14	127	626200	925	08/55	3622	6	FR	19	7	12	2	1/00	D0	PRDG 0040 MSND BLDR 0058 GRNT 0131
CCN	12	14	134	627006	875	06/65	2522	2	FR	100	33		2	24/00	D0	KUNKAL V
CCN	12	14	131	627006	850	08/64	2522	2	FR	50	30		2	55/55	D0	KELLY V
CCN	12	14	122	627065	500	04/65	2512	5	FR	43	16	38	4	5/00	D0	MSND BLDR 0056 GRNT 0058
CCN	12	14	132	627075	870	10/64	2522	2	FR	64	30		1	5/00	D0	TOPHAM E
CCN	12	14	130	627150	857	01/64	2305	2	FR	117	27	27	3	2/30	D0	BLDR CLAY 0018 GRVL 0021
CCN	12	14	129	627175	850	01/64	2305	2	FR	129	28	28	4	4/30	D0	PEEVER M
CCN	12	14	1005	627206	860	08/68	2305	2	FR	127	18	26	2	4/00	D0	BLDR GRVL 0025 FSND 0033 GRNT 0105
CCN	12	15	125	626675	845	07/52	2512	6	FR	24	16	16		1/00	D0	MCCHARLES J
CCN	12	15	127	627065	880	01/65	1443	2	FR	148	16	40	1		D0	GRNT 0057
CCN	12	15	125	627110	870	11/66	2305	2	FR	129	26	26	2		D0	MCDONALD M
CCN	12	16	126	626550	810	09/52	2512	5	FR	30	15	24	1	1/00	D0	MSND STNS 0008 GRVL HPAN STNS 0035 MSND
CCN	12	16	121	626726	871	04/54	3635	6	FR	57	30	57	4	1/00	D0	0042 GRVL 0043
CCN	12	16	120	626760	875	10/52	2512	5	FR	46	20	27	5	2/00	D0	DAVIS M
CCN	12	16	123	626800	875	10/52	2512	5	FR	30	18	18	6		D0	GRVL BLDR 0032 WHIT GRNT 0063
										60						GRVULX R
																BLDR MSND 0045 RED GRNT 0150
																MCORE G
																BLDR GRVL 0114 RED GRNT 0158
																KERR L
																PRDG 0020 BLUE CLAY 0030 GREY QSNQ 0046
																GRVL 0046
																BARTLAN M
																FSND 0056 GRVL 0057
																WHITTAKER L
																BLUE CLAY 0020 HPAN BLDR CSND 0040 BLDR
																GRVL 0048
																WHITE L
																BLUE CLAY 0030 GRVL QSNQ 0036 BLDR HPAN
																QSNQ 0060 GRVL 0061

PARRY SOUND DISTRICT 48

MUNICIPALITY CONCESSION ETC	LGT	BELL NO	EASTING	LTM	ELEV	DATE	DRILLER	CSG	KIND	WATER FOUND FEET	STAT LVL	PUMP LVL	TEST RATE GPM	TEST TIME HR/MN	WATER USE	CMNER/LOG DEPTHS IN FEET TO WHICH FORMATIONS EXTEND
SOUTH HIMSWORDT TOWNSHIP (CONTINUED....)																
CCN	12	25	642	623150	860	05/66	2522	2	FR	66	13		2	12/00	DO	PANTLIN J A GREY CLAY 0003 FSND 0007 GREY GRANT 0045 GRANT 0074 DAGENAIS G CLAY 0013 ROCK 0050 MOORE W TPSL BLDR 0008 RED GRANT 0051 JONES G BLDR GSND 0025 GRVL 0032 MOORE G A BLDR CLAY 0015 GRVL 0019 GREY GRANT 0065 JONES G BLDR GRVL 0017 GRANT 0163 MCCONNELL C MSND STNS 0002 GREY GRANT 0150 WILSON H GRVL BLDR 0029 RED GRANT 0181 MCCONNELL C BLDR GRVL 0004 RED GRANT 0273 KUNKEL G BRWN CLAY 0005 GREY GRANT 0080 RED GRANT 0112 CAMPBELL R CLAY 0012 RED GRANT 0112 DHC CLAY FSND 0006 MPAN 0020 GRVL 0060 ROCK 0070 GREY ROCK 0085 BRWN RCLK 0053 GREY ROCK 0174 RED ROCK 0192 RCLK 0235 HUMMEL J GRVL BLDR 0014 RED GRANT 0114 PIFER R J PRDG 0008 RED GRANT 0025 ALSTON JAMES GREY MSND 0017 RED GRANT 0200 FLOYD S FSND 0055 GRANT 0063 LOXTON HARGOLD YLLW MSND 0004 RED GRANT 0028 WILLIS A YLLW MSND 0023 GREY MSND GRVL BLDR 0043 RED GRANT 0082 CLOSS J RED MSND 0015 GRVL 0024 RED GRANT 0042 BUSCH E YLLW MSND 0032 RED GRANT 0316 BUSCH E GREY MSND 0016 GRVL BLDR 0025 RED GRANT 0081
CCN	13	2	503	621450	935	08/55	3014	2	FR	50	6	6	4	10/00	ST DO	
CCN	13	6	642	630230	950	11/55	3622	6	FR	30	8	10	6	1/00	DO	
CCN	13	8	644	629450	540	05/55	3014	2	FR	32	22	32	2	3/00	DO	
CCN	13	9	645	629150	540	01/57	2905	6	FR	19	19	60	5	1/00	DO	
CCN	13	10	646	628652	505	04/65	2522	2	FR	156	2		2	24/00	DO	
CCN	13	15	646	628358	5105462	910	05/64	2512	5	CRY						
CCN	13	15	647	628360	885	05/64	2512	5	FR	178	22	181	1	1/00	DO	
CCN	13	15	649	628401	875	03/68	2305	2	FR	159	43	59	3	2/45	DO	
CCN	13	22	650	623600	835	01/61	2905	6	FR	60	5	100	1	2/00	DO	
CCN	14	15	573	626200	870	12/68	2305	2	FR	103	18	51	2	3/00	DO	
CCN	14	16	651	626025	880	10/58	2415	7	FR	93	51	175	2	3/00	DO	
CCN	15	6	652	629227	885	06/65	2522	2	FR	91	30	45	1	24/00	ST DO	
CCN	15	12	653	626876	670	07/65	2522		FR	22	6	6	2	24/00	DO	
CCN	15	12	1065	627030	870	05/65	2305	2		176	20	46	2	3/00	DO	
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CCN	15	14	1126	626310	900	10/69	2305	2		98	53	45	2	2/00	DO	
CCN	15	14	657	626340	893	05/64	2305	2	FR	195	21	21	2	6/00	DO	
				510680					FR	66						

PARRY SOUND DISTRICT 48

MUNICIPALITY CONVESSION ETC LGT NO WELL EASTING LTM ELEV NORTHING FEET DATE DRILLER INS WATER FEET PUMP TEST TIME WATER USE

OWNER/LOG DEPTHS IN FEET TO WHICH FORMATIONS EXTEND

SOUTH HINSMWORTH TOWNSHIP (CONTINUED.....)

CCN	15	14	1078	626400	880 07/69	2305	2	FR	80	17	30	5	3/00	DC	MCCMARLES REG
CCN	15	15	658	625765	870 05/66	2522	2	FR	74	25		2	10/00	DC	GREY MSND 0005 RED GRNT 0091
CCN	15	20	659	625637	757 09/64	2522	2	FR	35	12		2	10/00	DC	PILGRIM M GREY CLAY 0009 QSN0 0015 MSND BLDK 0031
CCN	16	2	605	626110	870 04/50	2802		FR	65						RED GRNT 0075
CCN	16	4	604	626240	875 04/50	2802	2	FR	40	40					MOORE E
CCN	17	11	661	626600	520 11/67	2305	2			14	14	8	5/30	DC	RIVERS T
CCN	17	11	660	626605	500 07/61	3014	2	FR	82	14	18	3	5/00	DC	CHIVERS H
CCN	17	12	662	626244	505 08/64	2522	2	FR	59	15		2	12/00	DC	OBON 0020 RGCK 0060
CCN	17	20	663	626225	770 12/63	2305	2	FR	84	13	13	2	2/30	DC	TURCOTTE G
															MSND GRVL 0004 RED GRNT 0219
															GOLF CLUB
															GREY GRNT 0082
															PEEVER P
															GRVL 0002 GRNT 0067
															BRISSON R
															BLDR GRVL 0020 RED GRNT 0095

SOUTH RIVER VILLAGE

CCN	164	625650	1160 11/45	2801	8											PUC SOUTH RIVER
CCN	165	626600	1150 12/45	2801	8											TPSL MSND 0004 RED GRVL MSND BLDK 0024
																MSND GRVL BLDK 0065 MSND SILT 0095 BLUE
																CLAY 0170 BLUE CLAY MSND 0192 BLUE CLAY
																MSND BLDK 0196
																PUC SOUTH RIVER
																TPSL MSND 0005 MSND GRVL BLDK 0060 MSND
																SILT 0114 MSND 0146 MSND CLAY 0214 CLAY
																MSND BLDK 0248 ROCK 0249

SPENCE TOWNSHIP

CCN	5	20	667	601185	960 09/51	2512	5	FR	71	10		2		PS	SCHOOL AREA
CCN	10	27	656	626750	1085 08/68	2305	2	FR	136	FLM		3		D0	BRN MSND 0010 GREY GRNT 0071
CCN	12	30	554	626746	1198 07/68	2512	5	FR	67		63	11	8/30	PS	RUGEAS F
CCN	14	4	665	605850	645 05/60	2512	5	FR	67	3	62	1	1/00	D0	DMG
CCN	14	4	666	605907	550 07/62	2512	5	FR	79	6	50	6	2/00	D0	GRNT 0008 RED GRNT 0070
CCN	A	78	666	606150	925 10/48	2512	5	FR	83	20				D0	CLAY 0014 MSND STNS 0016 GRNT 0062
															LEA E
															MSND 0002 GRNT 0063
															RCSS H
															TPSL 0028 ROCK 0053

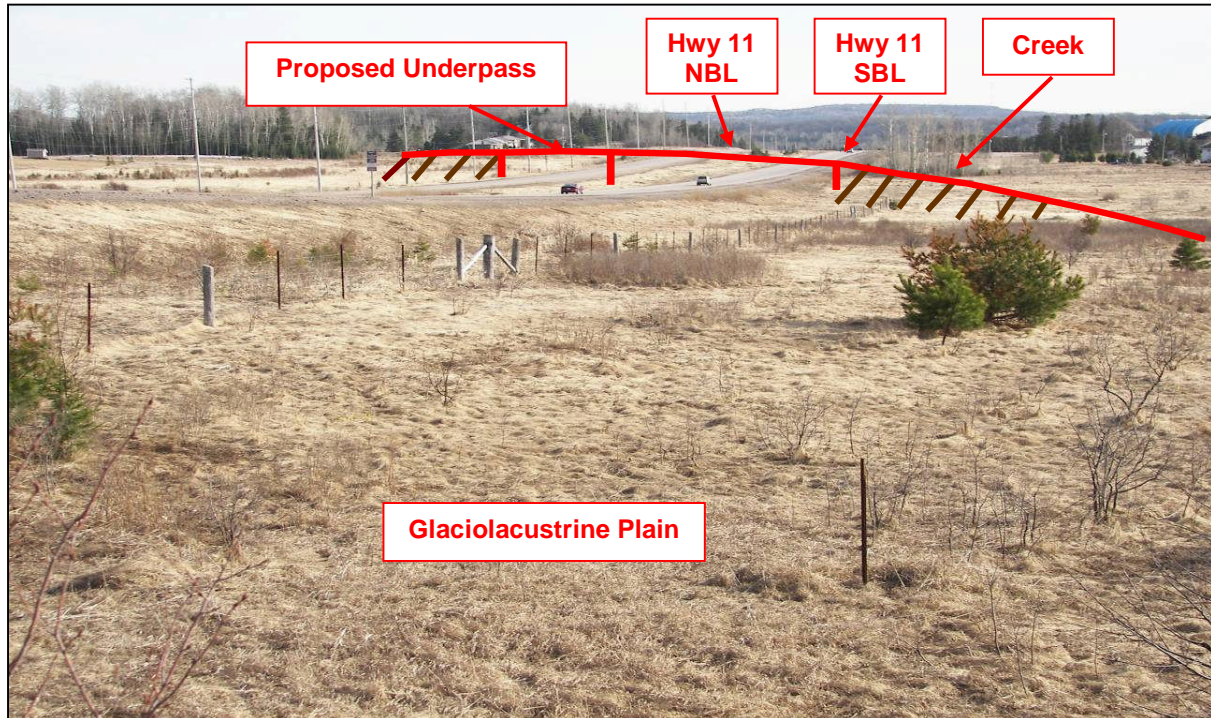
STANAG TOWNSHIP

CCN	2	6	670	621661	1115 12/50	2512	5	FR	106	50		1		D0	TRGLCVE R
CCN	2	18	1058	625900	1100 05/69	2512	5	FR	48	35	46	5	1/00	D0	MSND 0100 CSND GRVL 0106
CCN	3	4	671	624551	1090 07/57	2512	5	FR	22	6	16	3	2/00	D0	RAAFLOUB
CCN	3	15	552	624570	1100 08/67	2305	2	FR	104	6	6	6	3/30	D0	MSND 0003 HPAN 0040 GRVL 0045
															ENESON F
															BLDR HPAN 0018 BLCK GRNT 0022
															EVERARD D E
															MSND GRVL BLDK 0036 RED GRNT 0109

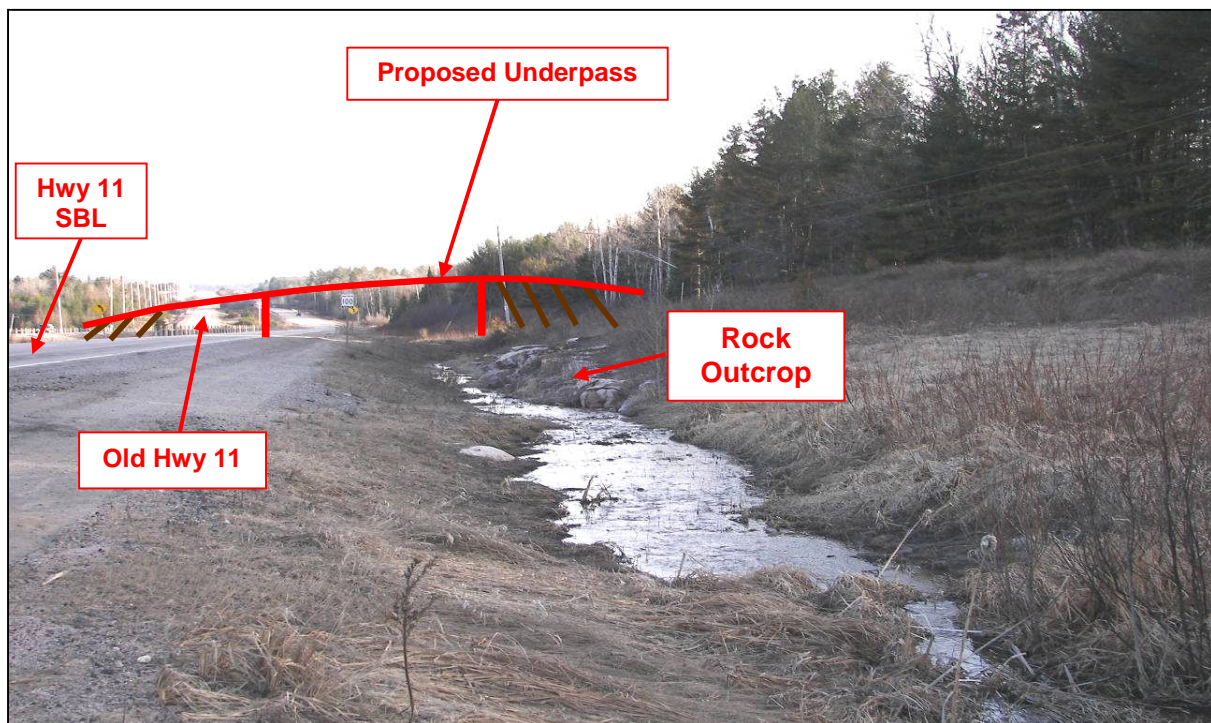


APPENDIX C

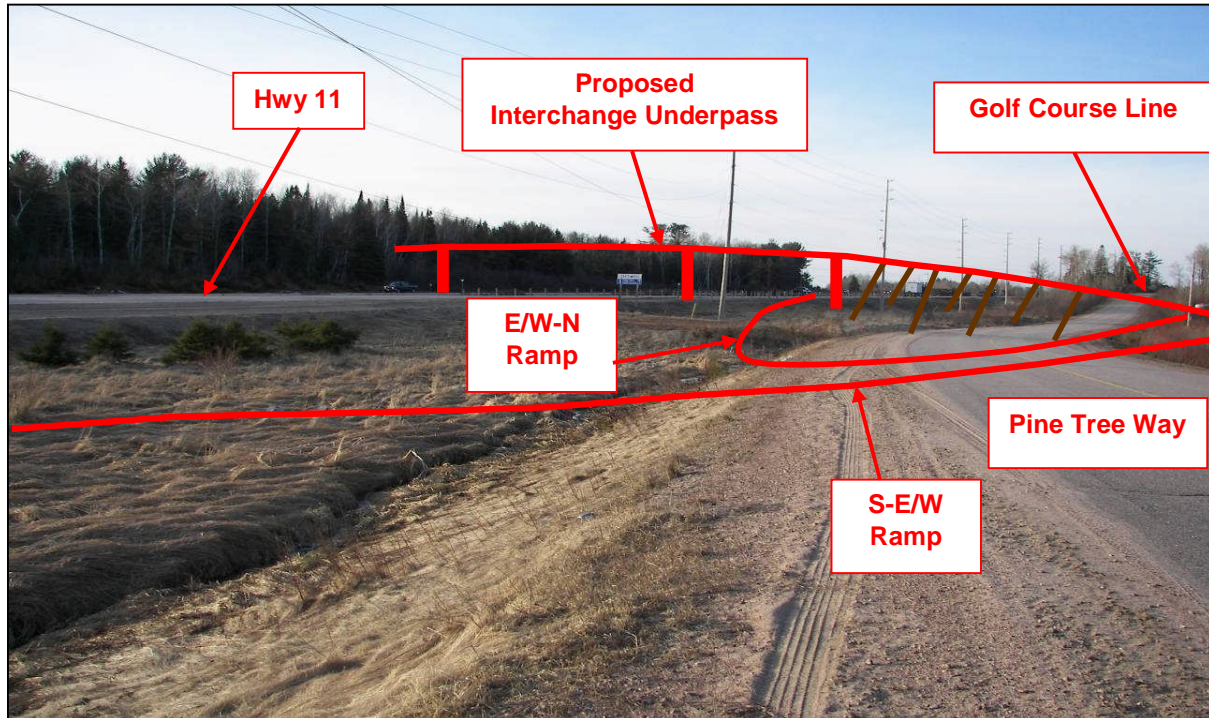
Site Photographs 1 to 20



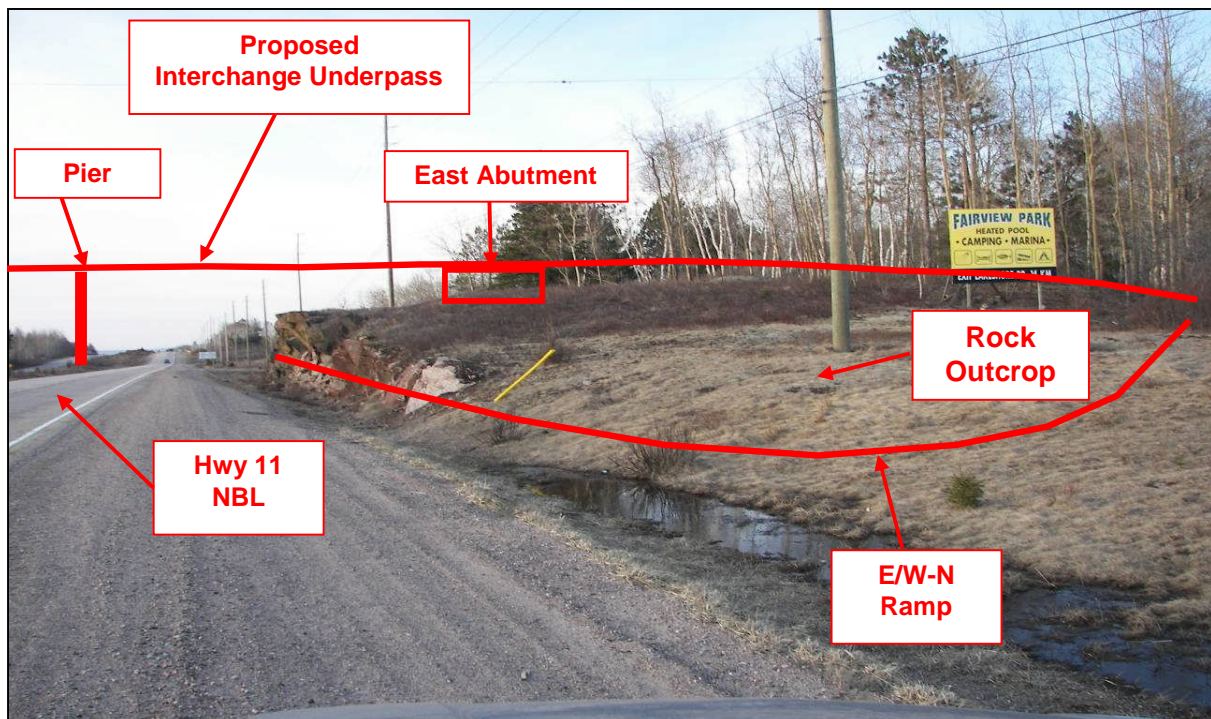
Photograph 1 VIEW: Looking south from south shoulder of McCharles Line. Underpass site is about 100 m north of creek crossing of Highway 11. (April 17, 2008)



Photograph 2 VIEW: Looking south from west ditch of Highway 11 at the Peever Line intersection. Rock exposure noted on west ditch of Highway 11. Proposed interchange underpass will be located south of bedrock exposure. (April 17, 2008)



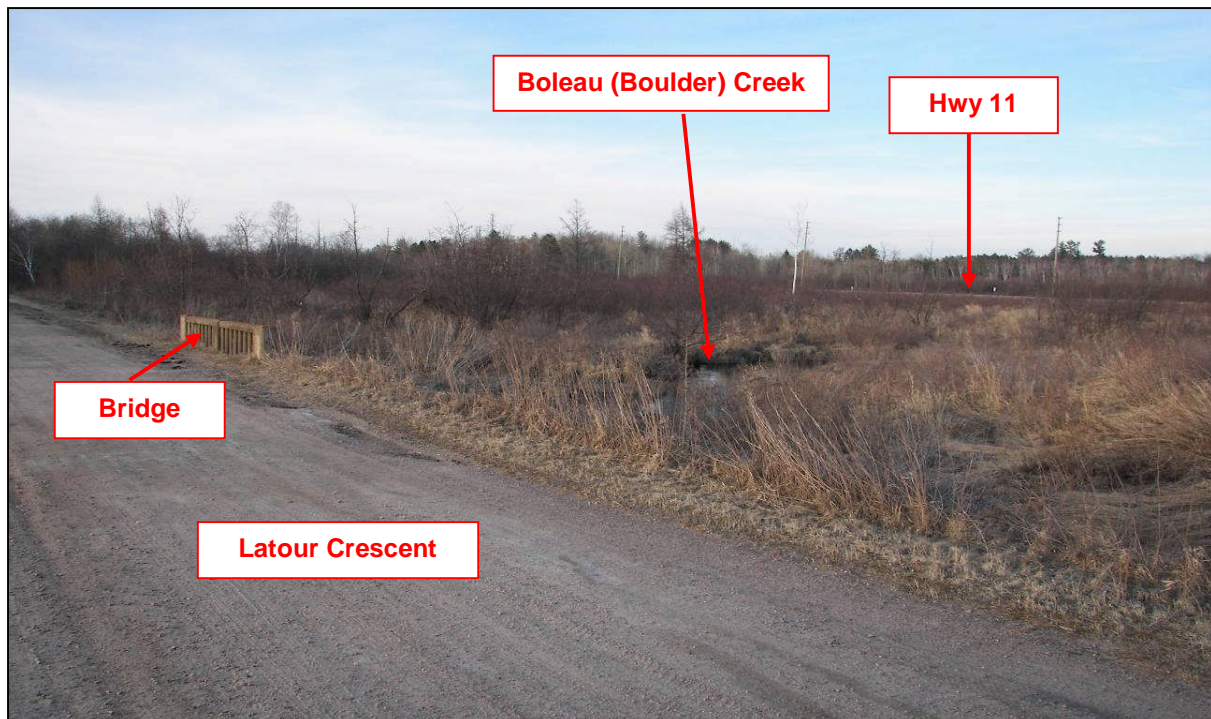
Photograph 3 VIEW: Looking northwest along Pine Tree Way south of Peever Line / Golf Course Line. East ramps and approach embankments are located in glaciolacustrine deposits. (April 17, 2008)



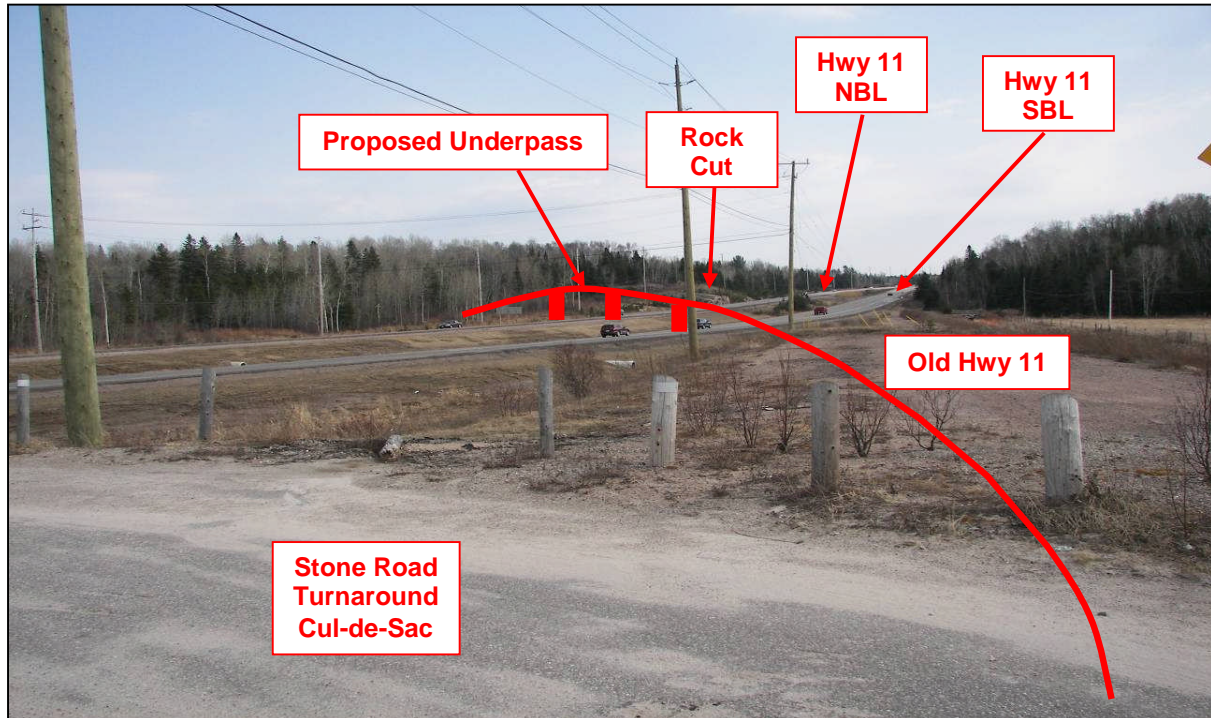
Photograph 4 VIEW: Looking north along east shoulder of Highway 11 NBL about 450 m north of Hills Siding Road. East abutment and E/W-N ramp of proposed interchange are located over a rock outcrop. (April 17, 2008)



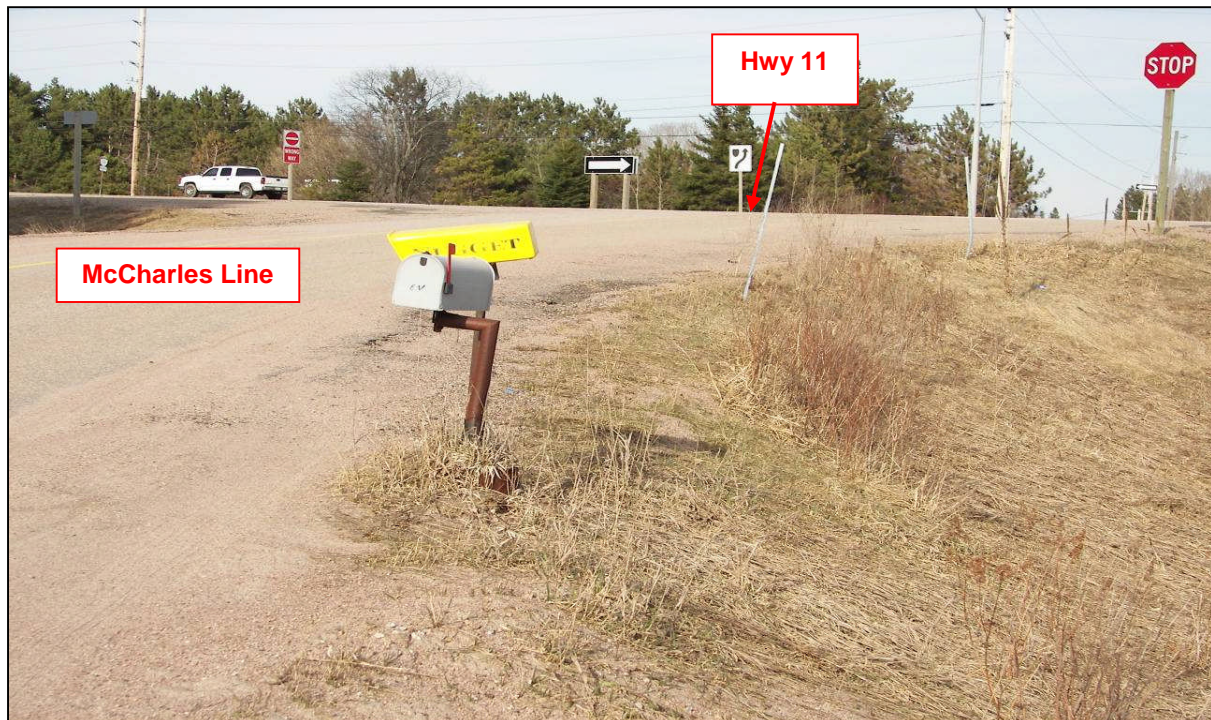
Photograph 5 VIEW: Looking northwesterly from Hills Siding Road across wet swamp/Boleau (Boulder) Creek Floodplain location of underpass (Watson Road/Hills Siding Road). (April 17, 2008)



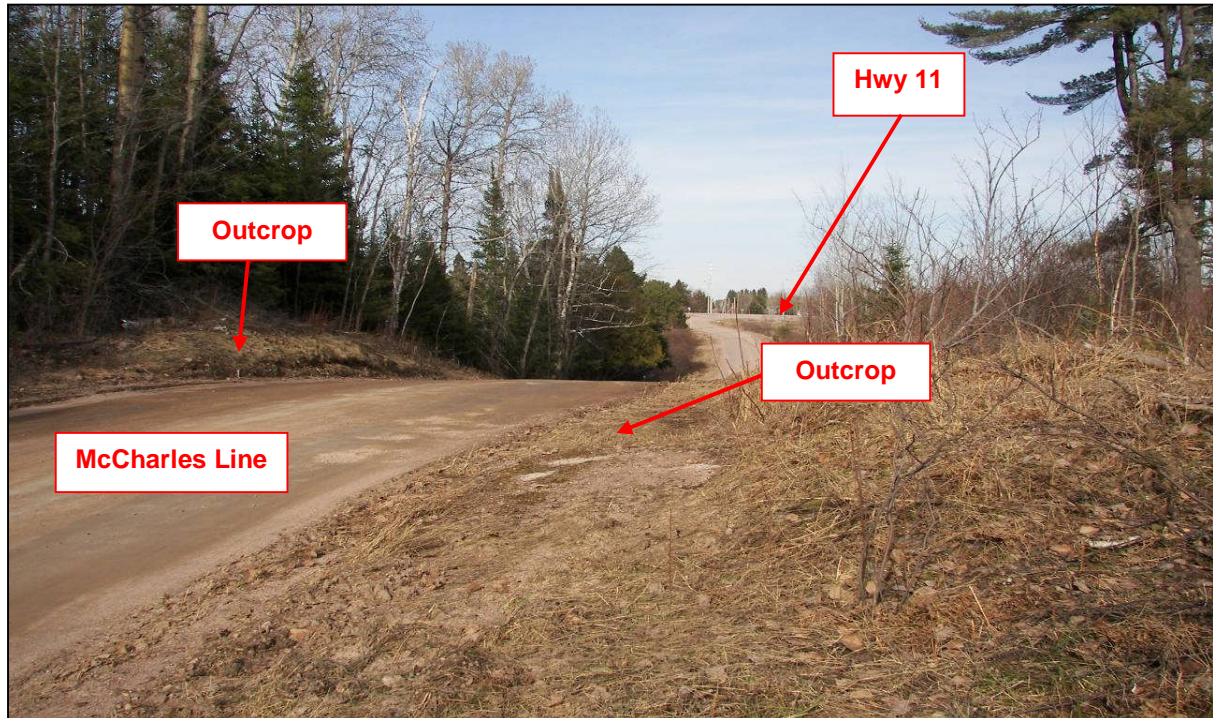
Photograph 6 VIEW: Looking northeast from west shoulder of Latour Crescent at small bridge over Boleau (Boulder) Creek 200 m north of Hills Siding Road proposed interchange to be located to the north of the creek. (April 17, 2008)



Photograph 7 VIEW: Looking south from cul-de-sac at south end of Stone Road (Old Highway 11). Proposed underpass will cross Highway 11 to the north of the rock cut noted on east ditch of Highway 11 NBL. (April 17, 2008)



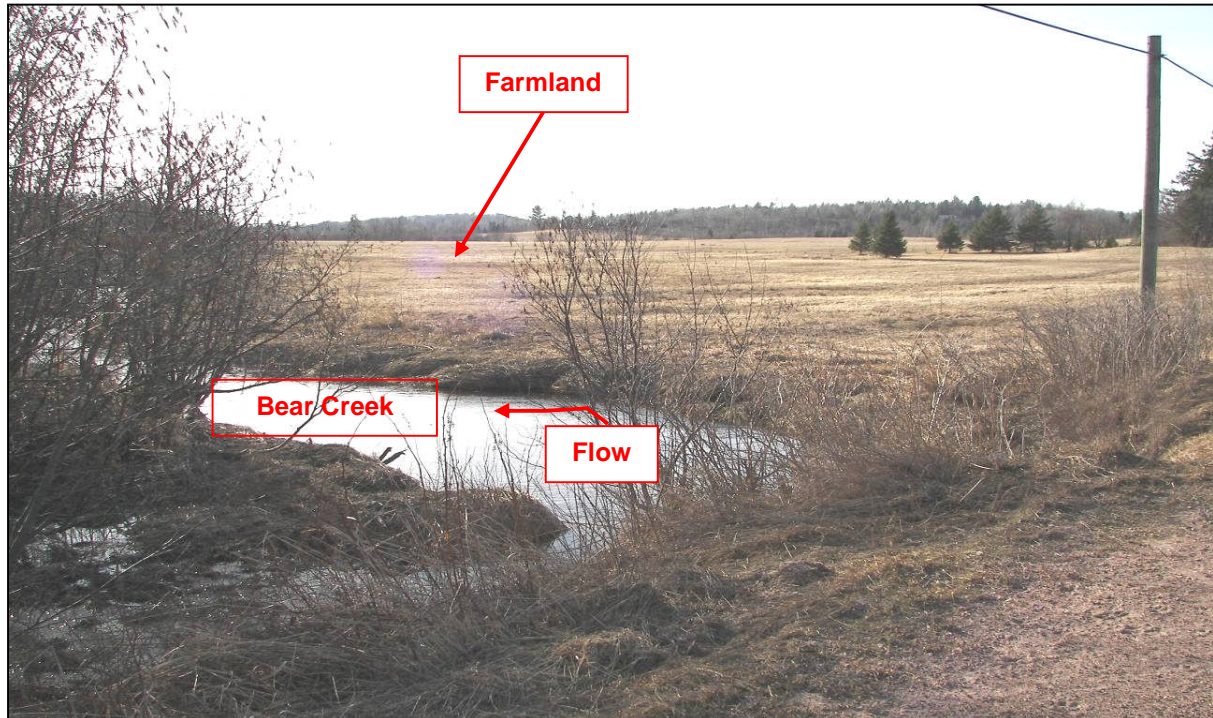
Photograph 8 VIEW: Intersection of McCharles Line and Highway 11 is at a significantly higher grade than the McCharles Line immediately to the west (about 6 m). (April 17, 2008)



Photograph 9 VIEW: Looking east along McCharles Line from about 15 m west of crest. Outcrop visible on north shoulder and on road surface. (April 17, 2008)



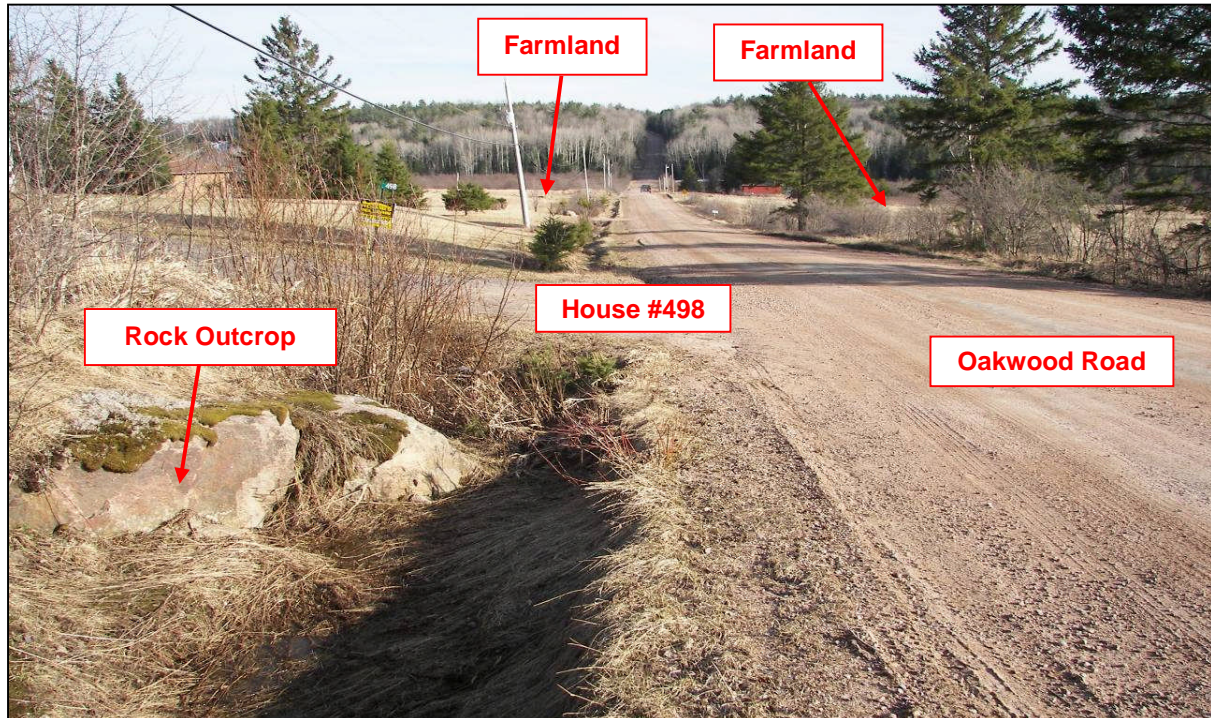
Photograph 10 VIEW: Rock outcrop east of Oakwood Road, 400 m north of McCharles Line. (April 17, 2008)



Photograph 11 VIEW: Looking northwest from Oakwood Road about 1,200 m north of McCharles Line. Farmland established on glaciolacustrine plain beyond road. Bear Creek noted in foreground. (April 17, 2008)



Photograph 12 VIEW: Looking north along Oakwood Road about 1,200 m north of McCharles Line. Road rises in distance to a shallow bedrock ridge. (April 17, 2008)



Photograph 13 VIEW: Looking south from east ditch line of Oakwood Road about 1,630 m north of McCharles Line. View of outcrop in ditch and general view of farmland on both sides of the road. (April 17, 2008)



Photograph 14 VIEW: Looking north along Oakwood Road from about 1,800 m north of McCharles Line. Road grade dips to small creek (at hydro pole) and rises beyond the creek to Peever Line intersection. (April 17, 2008)



Photograph 15 VIEW: Looking east along Peever Line about 50 m east of Oakwood Road. Grade slopes down to crossing of tributary of Bear Creek at mid photo depth. Note gravel road surface in good condition. (April 17, 2008)



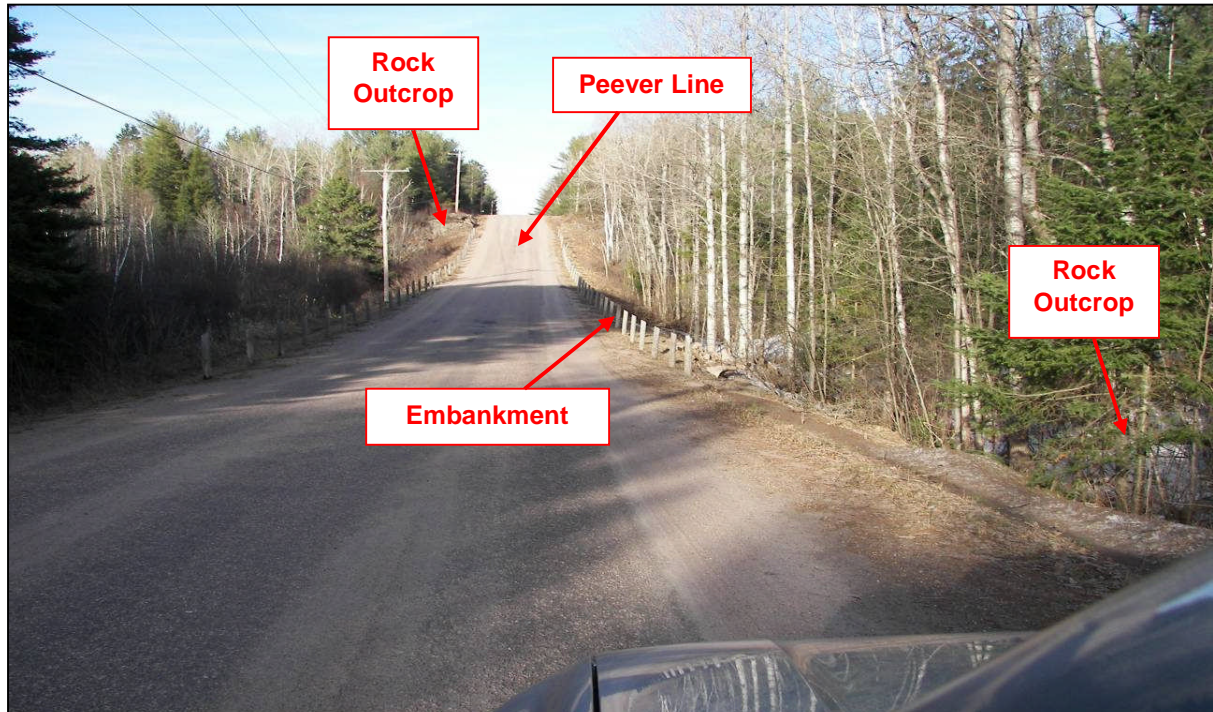
Photograph 16 VIEW: Looking south from north shoulder of Peever Road, 300 m east of Oakwood Road at extensive farmland. (April 17, 2008)



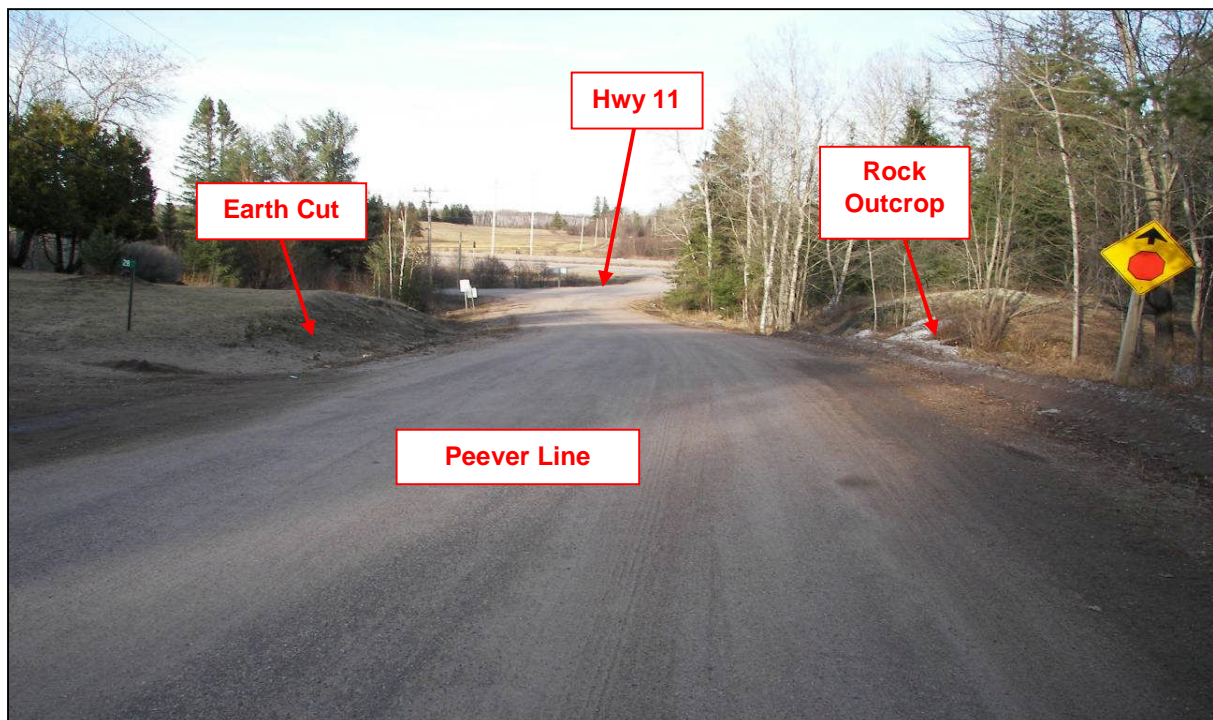
Photograph 17 VIEW: Timber box holding boulders north of Peever Line north shoulder 300 m east of Oakwood Road. Boulders attest to bouldery nature of soil in the area. (April 17, 2008)



Photograph 18 VIEW: Looking east from north ditch line of Peever Line about 600 m east of Oakwood Road near driveway of House #164. Broken rock is from an outcrop extending across roadway. (April 17, 2008)



Photograph 19 VIEW: Looking east along Peever Line at short embankment with wire guide about 850 m east of Oakwood Road. Rock outcrops are visible beyond trees and at crest. Similar crossing noted at 1,100 m east of Oakwood Road. (April 17, 2008)



Photograph 20 VIEW: Looking east along Peever Line about 1,300 m east of Oakwood Road. Note earth cut in north ditch line and outcrop at opposite ditch line. Road is surface treated. (April 17, 2008)