



**ALPHA ENVIRONMENTAL SERVICES INC.**

212 Timpson Drive, Aurora, Ontario, L4G 5M7

905-841-7711 (V), 905-841-6014 (F)

416-722-7545 (Cell), ross@thecampbells.net



April 12, 2011

**RE: Hydrogeological Assessment & Location of Watertable  
Sibthorpe Pit, Cedarhurst Quarries and Crushing Limited  
North ½ Lot 80, Concession 1 WPR, Township of Tiny  
County of Simcoe, AES File 10-04**

To Whom It May Concern,

Alpha Environmental Services Inc. (AES) is pleased to provide you with this letter of opinion as to the location of the watertable at the above noted site shown in Figures 1 and 2. The proposed pit, owned by Cedarhurst Quarries and Crushing Limited (Cedarhurst), is located in the north ½ of Lot 80, Concession 1 WPR, Township of Tiny, County of Simcoe, about 1.6 kilometres northwest of the community of Waverley along Darby Road (Figure 1).

Cedarhurst proposes to develop a Class A, Category 3 sand and gravel pit on the subject property. An active sand and gravel extraction operation, also owned by Cedarhurst, abuts the site along the southern property boundary. The remaining land around the site consists of a mix of residential and agricultural use.

To assist in the understanding of the location of the watertable at the site, one well (MW1-09) was constructed on site in the overburden at the location shown in Figure 3. The locations of wells on the adjacent properties (MW1, MW4, and 16440) are shown in Figure 3. Well 16440 was drilled as a test well and was decommissioned shortly after construction because it was dry. The depths of the wells along with other relevant data are shown in the cross-section in Figure 3. The physiography of the site<sup>1</sup> and surrounding area is shown in Figure 4. The Sand and Gravel Resources Map<sup>2</sup> in Figure 5 identifies

---

<sup>1</sup> Chapman, L.J., and Putnam, D.F., 1972; Physiography of the South Central Portion of Southern Ontario, Map 2226, published by the Ontario Department of Mines and Northern Affairs, 1 inch to 4 miles

<sup>2</sup> Burwasser, G.J., and Boyd, S.T. 1974: Quaternary Geology of the Orr Lake Area (*Western Half*) & Nottawasaga Area (*Eastern Half*), Southern Ontario; Ontario Div. Mines, Prelim. Map P. 975, Geol. Ser., scale 1:50,000. Geology 1974.

the nature of the deposit on site. Figure 6 shows the drift thickness<sup>3</sup> underlying the site and the surrounding area.

A small unnamed pond is shown on the OBM near the north-eastern property boundary of the site (Figure 2). A stream is also shown on the OBM crossing the subject property and flowing into the above unnamed pond. A field investigation by AES concluded that the stream and the pond do not exist. The central portion of the site is relatively flat with elevations rising to about 295 m asl at the central-south-eastern property boundary (Figures 2 and 3). The topography of the site drops sharply about 35 m over the shore cliff of former glacial Lake Algonquin located near the western property boundary (Figures 2 and 3) to an elevation of about 245 m asl at the western end of the property (Figures 2 and 3). The elevation at the eastern extreme of the site along Darby Road is about 259 m asl. (Figure 2)

The site resides primarily on an ice-contact deposit consisting of substratified to stratified gravel and sand including incorporated till (OGS Map P. 975<sup>2</sup>). A steep scarp runs along the western and eastern portions of the site that is composed of beach ridges and near shore bars of previous stages of an ancient glacial lake (Lake Algonquin). At the base of the scarp the deposits have been sifted by subsequent lacustrine action producing a layer of boulders at the surface. Sand and gravel will be extracted from the proposed pit. The material is reported to include gravel <35% with an average thickness of >6 m, having no restrictive quality indicators<sup>2</sup> as shown in Figure 5. The drift thickness on site exceeds 400 feet or 122 metres according to the data<sup>3</sup> in Figure 6.

Based on the location of the watertable in MW1-09, 16440, MW1, and MW4, the watertable is estimated to vary from 236.0 m asl in the west portion of the site to 254.8 m asl in the center to 252.2 m asl in the east portion of the site, as shown in Figure 3. The floor of the pit will then be limited to an extraction depth of 237.5 m asl in the west portion of the site to 256.3 m asl in the center to 253.7 m asl in the east portion of the site, as shown in Figure 3. This will allow up to 41.2 m of material to be extracted from the site. By maintaining the 1.5 m buffer above the watertable, the extraction should have no impact on existing water users near the site. If there is a well interference complaint (water

---

<sup>3</sup> Burwasser, G.J., and Ford, M.J., 1974, Drift Thickness of the Orr Lake Area, Southern Ontario, O.D.M., Prelim. Map P.977

quantity and/or water quality), Cedarhurst should be notified immediately and an investigation should be undertaken to determine the cause of the problem.

It is proposed that the aggregate will be extracted in a series of lifts. It is recommended that following each lift and prior to the commencement of the next lift, a minimum of three test pits should be excavated in the existing pit floor to probe for the watertable to ensure that groundwater is not encountered at an unexpected upper elevation and that the 1.5 metre separation distance is maintained. If water is identified at an unexpected upper elevation, an investigation should be undertaken by qualified personnel to determine if the watertable has been encountered or a perched watertable condition has been identified.

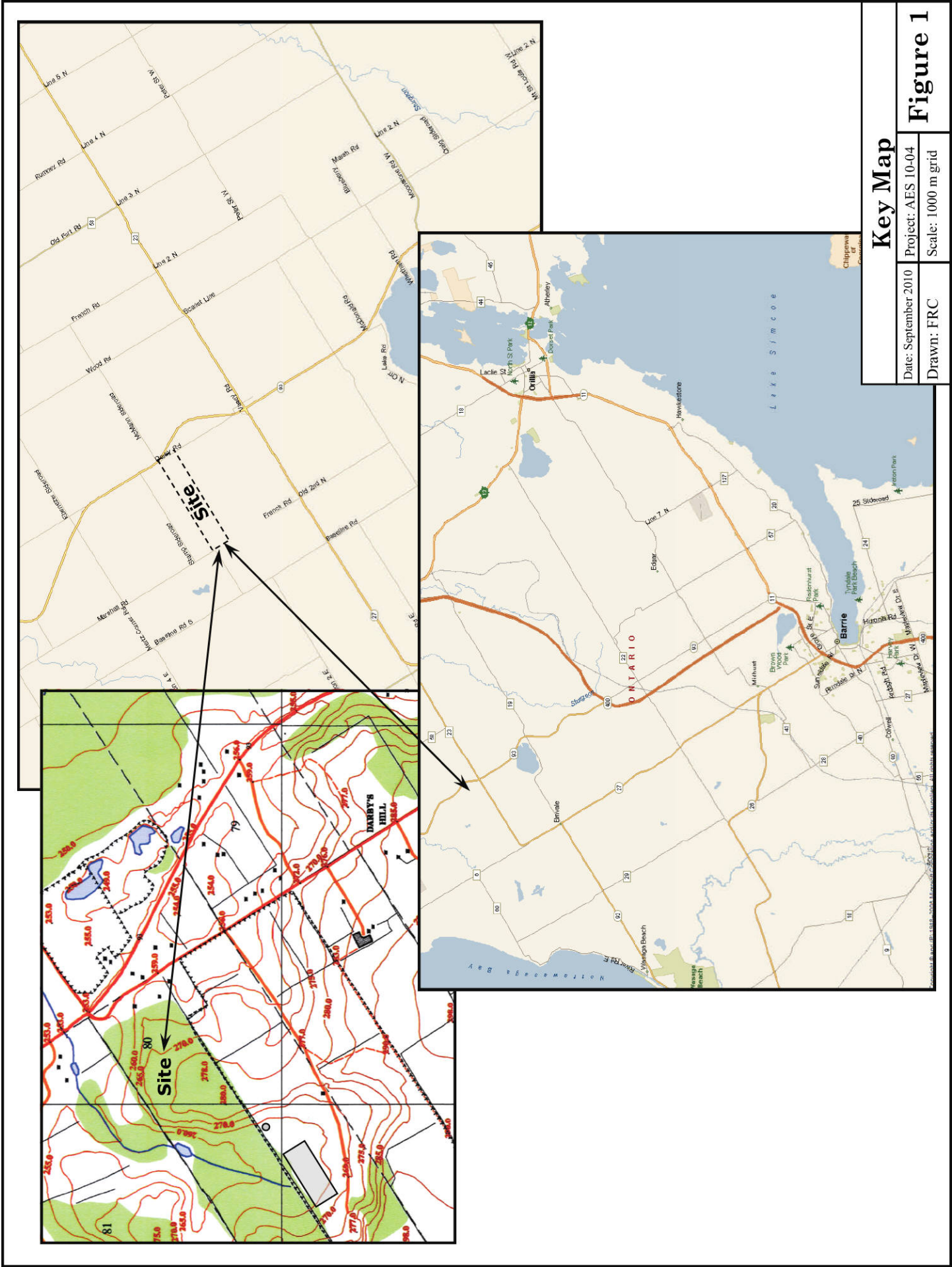
If you have any questions, please contact the undersigned at your convenience.

Yours truly  
Alpha Environmental Services Inc.

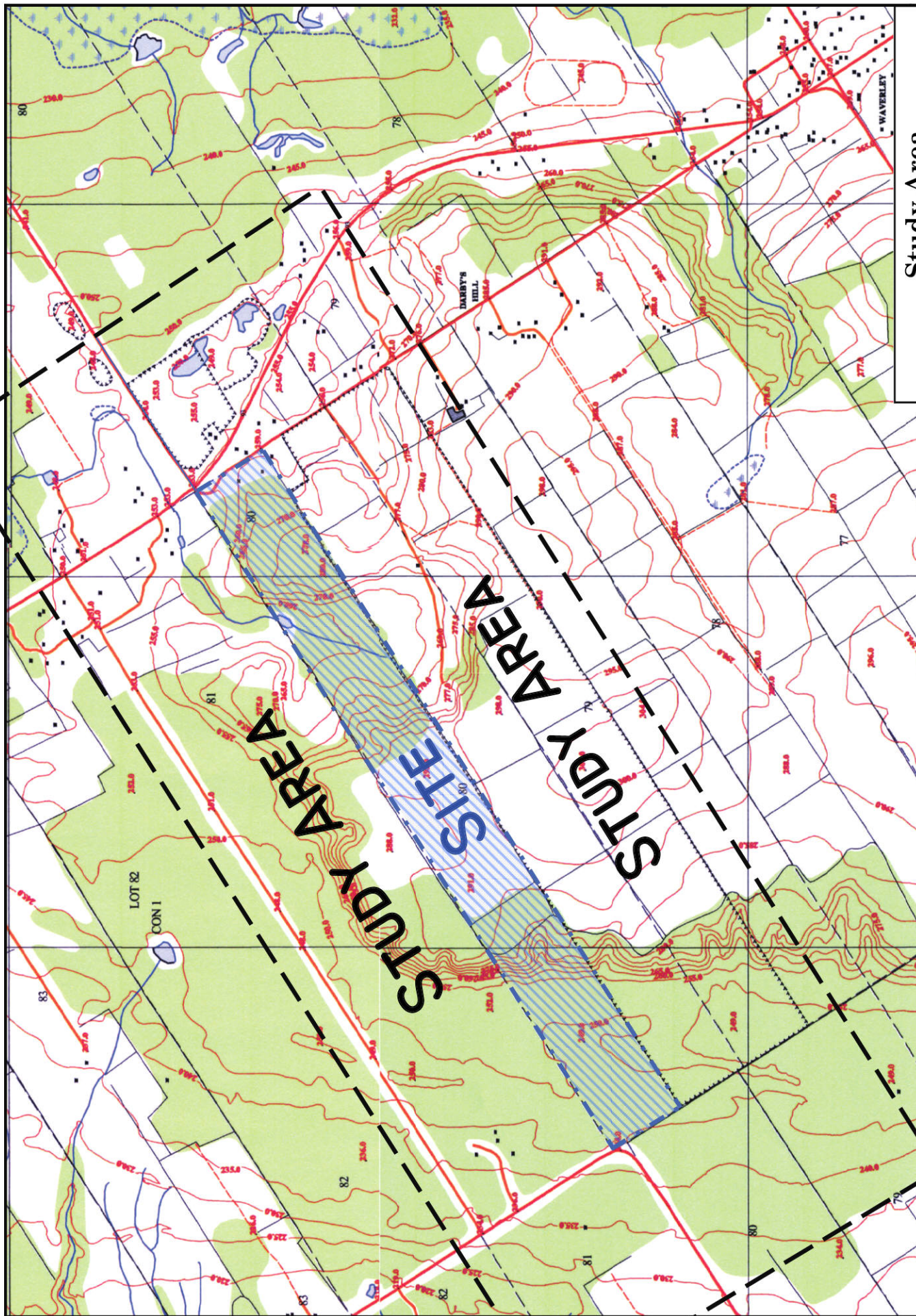
  
Ross Campbell, M.Sc., P.Eng.  
Hydrogeologist



c. Doug Leslie, Rick Geary, Dennis Simmons, Bill Fitzgerald







## Study Area

Date: September 2010

Project: AES 10-04

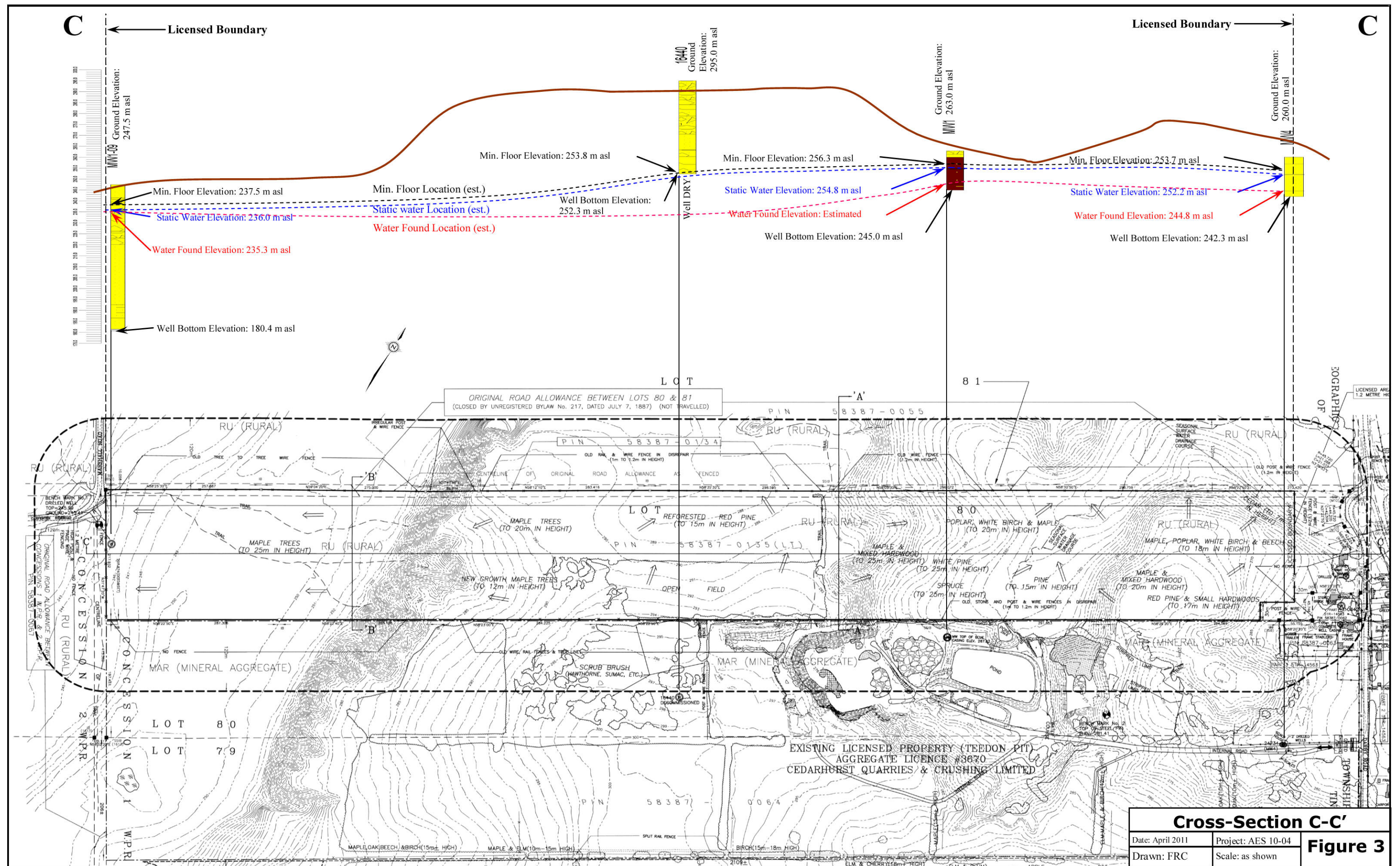
Drawn: FRC

Scale: 1000 m grid

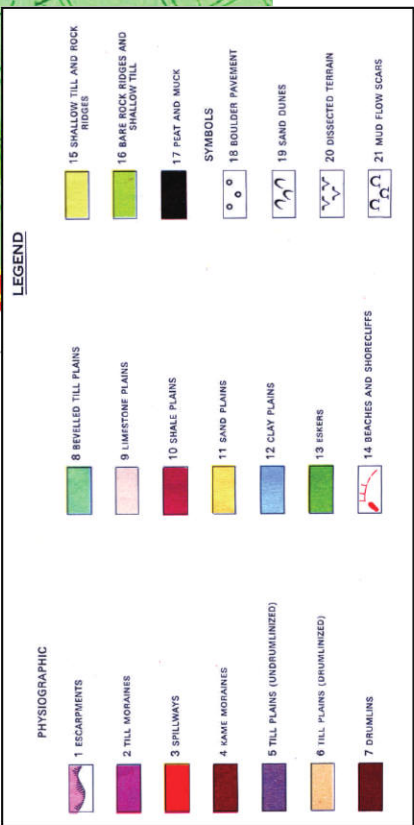
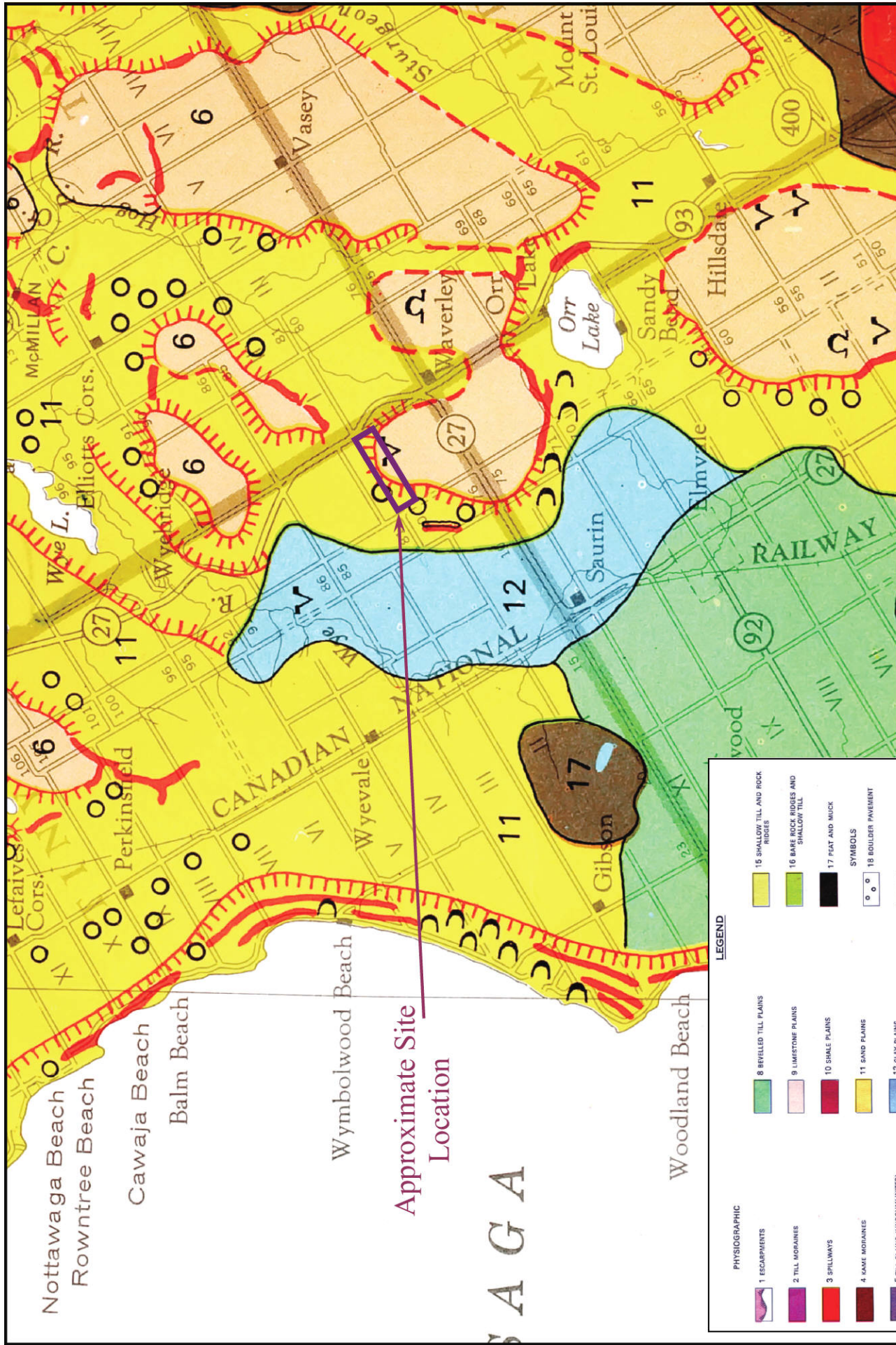
**Figure 2**

Metres 500 0 500 1000 Mètres









# Physiography

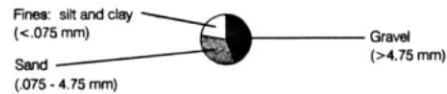
Date: March 2011  
 Project: AES 10-04  
 Drawn: FRC  
 Scale: NTS

Source: Physiography of Southern Ontario  
 by L.J. Chapman and D.F. Putnam, 1984

**Figure 4**

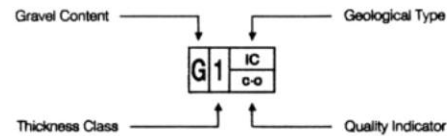


## TEXTURE SYMBOL



The Texture Symbol provides quantitative assessment of the grain size distribution at a sampled location. The relative amounts of gravel, sand, silt and clay in the sampled material are shown graphically by the subdivision of a circle into proportional segments. The above example shows a hypothetical sample consisting of 45% gravel, 35% sand and 20% silt and clay.

## DEPOSIT SYMBOL



Deposits are identified by Gravel Content, Thickness Class, Geological Type and Quality Indicator. Gravel Content is expressed as a percentage of gravel-sized material (i.e., material retained on the 4.75 mm sieve). Thickness Class is based on potential aggregate tonnage per hectare. Geological Type refers to geological origin. Quality indicator describes objectionable grain size and lithology.

### Gravel Content

- G Greater than 35% gravel  
S Less than 35% gravel

### Thickness Class

Class	Average Thickness In Metres	Tonnes per Hectare
1	greater than 6	greater than 106 000
2	3 - 6	53 000 - 106 000
3	1.5 - 3	26 500 - 53 000
4	less than 1.5	less than 26 500

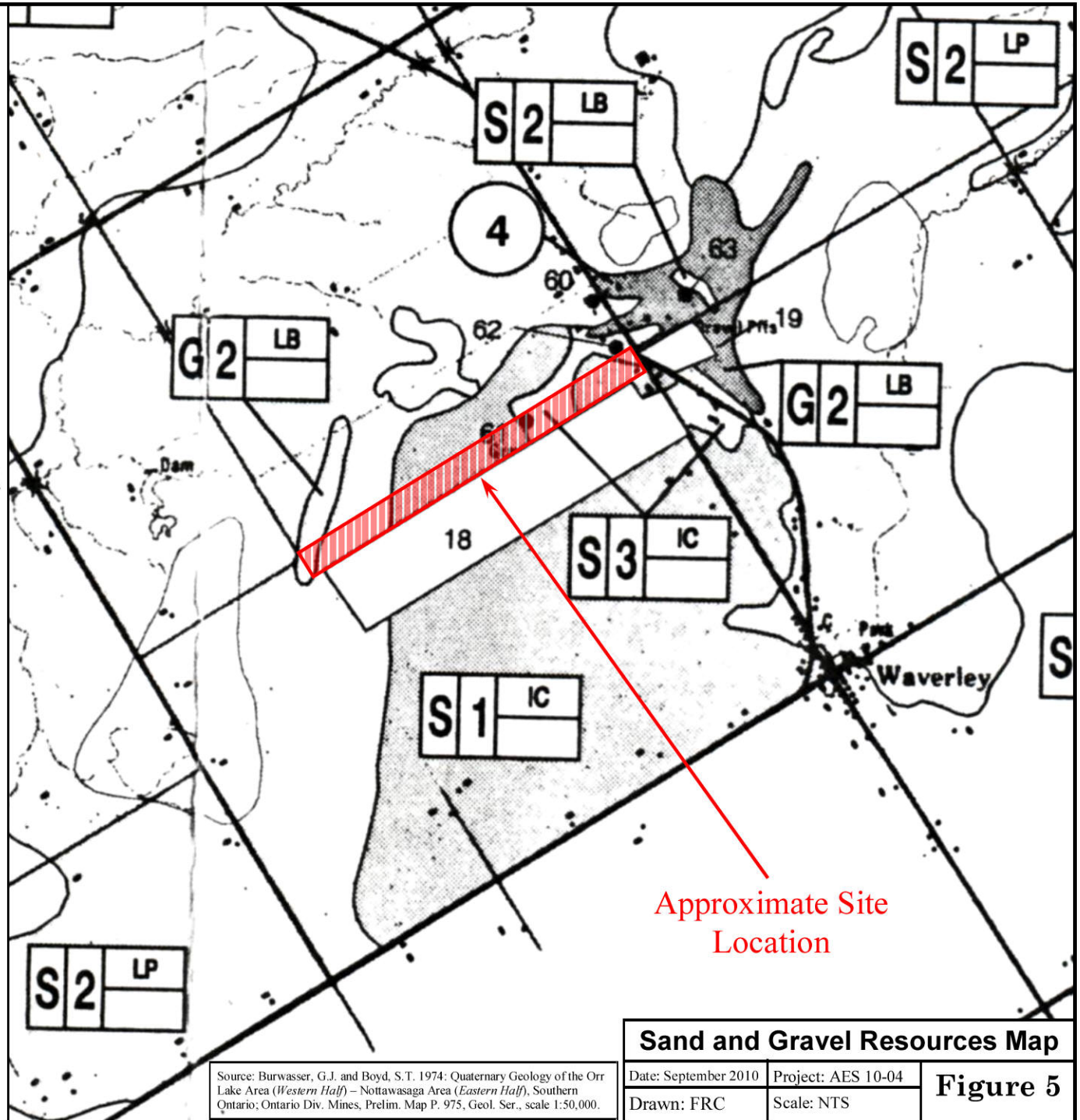
### Geological Type

AL	Older Alluvium	LB	Lacustrine Beach
E	Esker	LD	Lacustrine Delta
M	Moraine	LP	Lacustrine Plain
IC	Undifferentiated Ice-Contact Stratified Drift	OW	Outwash
ICT	Ice-Contact Terrace	SF	Subaqueous Fan
K	Kame	WD	Windblown Forms

(see Appendix C for descriptions of Geological Types.)

### Quality Indicator

- If blank, no known limitations present.
- C Clay and/or silt (fines) present in objectionable quantities.
- L Deleterious lithologies present.
- O Oversize particles or fragments present in objectionable quantities.



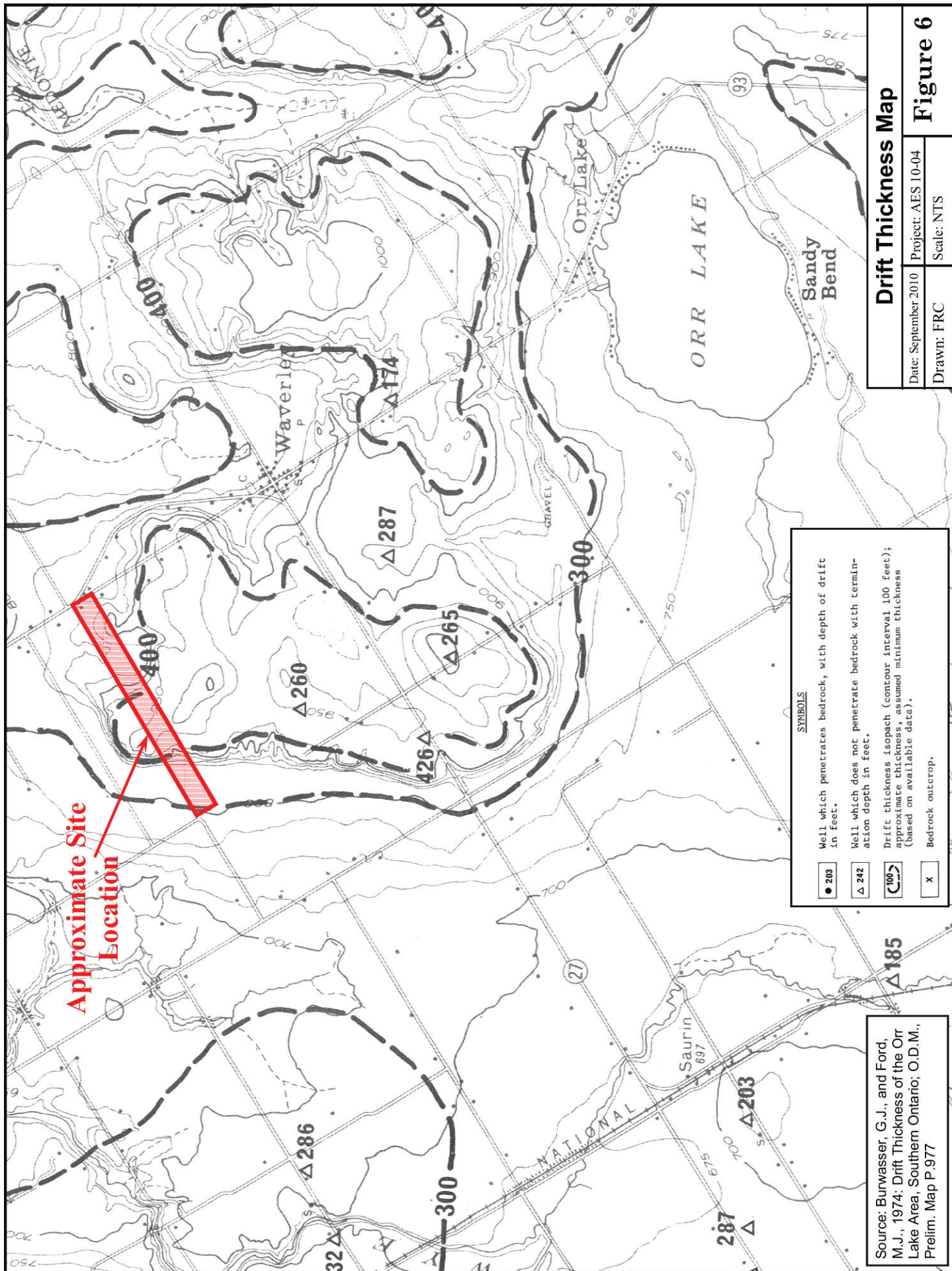
## Sand and Gravel Resources Map

Date: September 2010	Project: AES 10-04
Drawn: FRC	Scale: NTS

Figure 5

Source: Burwasser, G.J. and Boyd, S.T. 1974: Quaternary Geology of the Orr Lake Area (Western Half) - Nottawasaga Area (Eastern Half), Southern Ontario; Ontario Div. Mines, Prelim. Map P. 975, Geol. Ser., scale 1:50,000.





# Drift Thickness Map

Date: September 2010 Project: AES 10-04

Drawn: FRC Scale: NTS

**Figure 6**