SKETCH OF TOPOGRAPHIC INFORMATION
LANDS KNOWN AS 0 LAURA STREET
CITY OF GREATER SUDBURY
TULLOCH GEOMATICS INC.
2023

SCALE 1:300

0 5 10 15 20 METRES

SHEET 1 OF 2

THE INTENDED PLOT SIZE OF THIS PLAN IS 914mm IN WIDTH BY 1422mm IN HEIGHT WHEN PLOTTED AT A SCALE OF 1:300.

DATE:
TOPOGRAPHIC INFORMATION COLLECTED DURING THE PERIOD OF SEPTEMBER 11th, 2023 TO OCTOBER 24th, 2023.

METRIC:
DISTANCES AND ELEVATIONS SHOWN ON THIS PLAN ARE IN METRES AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048.

ELEVATION NOTE:
ELEVATIONS SHOWN HEREON ARE GEODETIC, ARE REFERRED TO THE CANADIAN GEODETIC VERTICAL DATUM OF 1928 (CGVD28) AND ARE DERIVED FROM THE CITY OF GREATER SUDBURY VERTICAL CONTROL MONUMENT No. 001643124 USING REAL TIME NETWORK (RTN) HAVING AN ELEVATION OF 290.576m.

SITE BENCHMARK NOTE:
SITE BENCHMARK 'A' (BM) IS TOP OF STAINLESS STEEL BOLT AND WASHER (SSBW), CITY OF GREATER SUDBURY VERTICAL CONTROL MONUMENT No. 027960152C, HAVING AN ELEVATION OF 293.998m.

SITE BENCHMARK 'B' IS TOP OF SET ROUND IRON BAR HAVING AN ELEVATION OF 292.49m.

CAUTION:
ANY UNDERGROUND SERVICES AND THEIR POSITIONS ARE NOT CONFIRMED BY THIS PLAN.

LEGEND:

AE	DENOTES ASPHALT EDGE
AN	DENOTES ANCHOR
APPROX	DENOTES APPROXIMATE
BH	DENOTES BOREHOLE
BM	DENOTES BENCHMARK
CL	DENOTES CENTERLINE
CLF	DENOTES CHAIN LINK FENCE
GF	DENOTES GARAGE FLOOR
NTS	DENOTES NOT TO SCALE
PIN	DENOTES PROPERTY IDENTIFICATION NUMBER
RW	DENOTES RETAINING WALL
SSBW	DENOTES STAINLESS STEEL BOLT AND WASHER
S/T	DENOTES SUBJECT TO
TS	DENOTES TOE OF SLOPE
UP	DENOTES UTILITY POLE
-----	DENOTES EDGE OF GRAVEL
——x——	DENOTES FENCE LINE
——OW——	DENOTES OVERHEAD WIRE
~~	DENOTES HEDGE OUTLINE

CARMEN STREET
REGISTERED PLAN M-490

CARMEN STREET
REGISTERED PLAN M-520
PIN 73508-0040

BLOCK "A" (0.305 RESERVE) (NTS)
REGISTERED PLAN M-520

ROGER STREET
REGISTERED PLAN M-490

ROGER STREET
REGISTERED PLAN 53M-1146

LAURA STREET
REGISTERED PLAN 53M-1146

GLADU CRESCENT
REGISTERED PLAN 53M-1146

JAMES STREET
PIN 73508-1133

BLOCK "B" (0.305 RESERVE) (NTS)
REGISTERED PLAN M-490
PIN 73508-1178
SUBJECT TO EASEMENT AS IN LT117325

BLOCK 67 (0.305 RESERVE) (NTS)
REGISTERED PLAN 53M-1146
PIN 73508-1141
SUBJECT TO EASEMENT AS IN LT117304

BLOCK 68 (0.305 RESERVE) (NTS)
REGISTERED PLAN 53M-1146
PIN 73508-1140
SUBJECT TO EASEMENT AS IN LT117304

BLOCK 69
REGISTERED PLAN 53M-1146
PIN 73508-1139
SUBJECT TO EASEMENT AS IN LT117304

BLOCK 70
REGISTERED PLAN 53M-1146
PIN 73508-1138
SUBJECT TO EASEMENT AS IN LT117304

BLOCK 71
REGISTERED PLAN 53M-1146
PIN 73508-1137
SUBJECT TO EASEMENT AS IN LT117304

SITE BM 'A': SSBW 027960152C
ELEVATION=293.998

SITE BM 'B': ELEVATION=292.49

PART 12, PLAN 53R-6491
SUBJECT TO EASEMENT AS IN LT421457

PART 10
PLAN 53R-
6491
SUBJECT TO EASEMENT AS IN LT117304

PART 11
PLAN 53R-
6491

PART 1 PART 2 PART 3 PART 4 PART 5 PART 6 PART 7 PART 8 PART 9
PLAN 53R-6491

PART 17 S/T LT421458
PART 18 S/T LT421458
PART 19 S/T LT421458
PART 20 S/T LT421458
PART 21 S/T LT421458
PART 22 S/T LT421458
PART 23 S/T LT421458
PART 24 S/T LT421458

PART 14 S/T LT421458
PART 15 S/T LT421458
PART 16 S/T LT421458

LOT 1 LOT 2 LOT 3 LOT 4 LOT 5 LOT 6 LOT 7 LOT 8 LOT 9 LOT 10 LOT 11 LOT 12 LOT 13 LOT 14

LOT 95 LOT 96 LOT 97 LOT 98 LOT 99 LOT 100 LOT 101 LOT 102 LOT 103 LOT 104 LOT 105

LOT 41 PIN 73508-1144
LOT 42 LOT 43 LOT 44 LOT 45 LOT 46 LOT 47 PIN 73508-1143
LOT 48 PIN 73508-1142
LOT 49 LOT 50 LOT 51 LOT 52 LOT 53 LOT 54
LOT 55 LOT 56 LOT 57 LOT 58 LOT 59 LOT 60 LOT 61 LOT 62 LOT 63 LOT 64 LOT 65 LOT 66
LOT 34 LOT 35 LOT 36 LOT 37 LOT 38 LOT 39 LOT 40 PIN 73508-1145
LOT 15 LOT 16 LOT 17 LOT 18 LOT 19 LOT 20 LOT 21 LOT 22 LOT 23 LOT 24
LOT 25 LOT 26 LOT 27 LOT 28 LOT 29 LOT 30 LOT 31 LOT 32 LOT 33

PIN 73508-1135 SUBJECT TO EASEMENT AS IN LT117304
PIN 73508-1136 SUBJECT TO EASEMENT AS IN LT117304
PIN 73508-1134
PIN 73508-1099

LOT 11 CONCESSION 2 GEOGRAPHIC TOWNSHIP OF CAPREOL

MATCHLINE: SEE SHEET 2

TULLOCH

TULLOCH GEOMATICS INC.
1942 REGENT ST.
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Woodland Heritage Northeast
Archaeological and Heritage Consulting Services

Stage 1 Archaeological Resource Assessment (original)

Proposed Subdivision in Part of Lot 11, Concession 2, Township of Capreol, City of Greater Sudbury, District of Sudbury, Ontario

Prepared for: **Hanmer Dreamhomes**
Unit 404, 50 Thorncliffe Park Dr, Toronto, Ontario
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Telephone: 416 543 0007

Submitted by: **Woodland Heritage Northeast Limited**
50 Whitewood Avenue, New Liskeard, Ontario
P0J 1P0
Telephone: 705 676 7458

Province of Ontario Archaeological Licence # P208
MCM PIF # P208-0310-2023
Our Project # R2023-42

September 29, 2023

Woodland Heritage Northeast
Archaeological and Heritage Consulting Services

Executive Summary

Woodland Heritage Northeast Ltd. was retained by Hanmer Dreamhomes to conduct a Stage 1 archaeological resource assessment of a proposed subdivision in part of Lot 11, Concession 2, Township of Capreol, City of Greater Sudbury, District of Sudbury, Ontario. All of the work detailed in this report conforms to the 2011 Ministry of Citizenship and Multiculturalism's *Standards and Guidelines for Consultant Archaeologists*. Additionally, this work has been undertaken and described without prejudice, and in conformance to the ethical principles of the Society for American Archaeology, the Canadian Archaeological Association, and the Ontario Archaeological Society.

The purpose of this Stage 1 archaeological assessment was to determine if any areas of archaeological potential were present in the proposed subdivision study area. Both a background study and a property inspection were carried out to determine whether features of archaeological potential were present on the subject property. One feature of archaeological potential was identified during both the background study and property inspection, namely the unnamed creek south of the property, which is a tributary of the Whitson River. At the conclusion of the property inspection, it was determined that the entire study area had low archaeological potential due to the presence of saturated terrain flanking the creek extending over 100 metres inland. The remainder of the study area was sufficiently distant from the Whitson River tributary, the sole feature of archaeological potential identified in association with the subject property, to be considered to have archaeological potential.

Recommendation from sub-section 4.3.3:

As a result of the Stage 1 assessment of the study area, the recommendations are as follows:

1. No additional archaeological work is recommended in advance of the proposed subdivision located in part Lot 11, Concession 2, Township of Capreol, City of Greater Sudbury, District of Sudbury, Ontario (Map 4).

Woodland Heritage Northeast
Archaeological and Heritage Consulting Services

Corporate Information

Woodland Heritage Northeast Ltd.
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New Liskeard, ON
P0J 1P0
705-676-7458

Project Personnel

Ryan Primrose, M.A. B.Ed., P208, CAHP – Principal, Lead Archaeologist
David Gadzala, M.A., P1040 – Senior Archaeologist
Josée Boulanger, B.A., R1344 – Junior Archaeologist

Designated Field Director

David Gadzala (P1040)

Acknowledgements

Woodland Heritage Northeast would like to acknowledge the assistance of Hanmer Dreamhomes for providing maps, background information and overall project support throughout the development of this report.

We acknowledge multiple complimentary ways of understanding the past; two of which are: Indigenous-based knowledge, and archaeologically-based knowledge. The archaeological-based knowledge of the past is informed largely by the material culture where sufficient deposits are detectable through archaeological methods. This report does not attempt to replace or minimise Indigenous knowledge of the study area, but instead focusses on the archaeological knowledge of the past.

Whenever archaeological work is initiated by Woodland Heritage Northeast, it begins with an understanding that Indigenous people have occupied the landscape since time immemorial; this is, the human settlement of the uncovered and emergent lands beginning soon after the recession of the Laurentide Ice Sheet. The history of the area begins with the ancestors of modern First Nations people.

Disclaimer on Word Usage from Outside Texts

Woodland Heritage Northeast Limited recognises that some historical sources, which may have been excerpted and presented in this report, may contain terms and descriptions of Indigenous individuals or groups which are influenced by the original author's temporal context and potential biases, and / or society's view on Indigenous people. Woodland does not excuse or condone the use of hurtful terms or descriptions in these historical texts, or the opinions they may represent. This disclaimer is intended to notify the reader that the quotations and excerpts used in this text are included as they may offer beneficial descriptions of the study area or provide important historical context, and although Woodland does not censor the original text, it recognises that it may be incorrect, offensive, or potentially harmful.

List of Terms and Abbreviations

CHVI – Cultural Heritage Value or Interest

MCM – Ministry of Citizenship and Multiculturalism

OASD – Ontario Archaeological Sites Database

OGS – Ontario Geological Survey

S&Gs – 2011 MCM Standards and Guidelines for Consultant Archaeologists

WHNE – Woodland Heritage Northeast Ltd.

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1.0 Project Context

This report is intended to provide the reader with an overview of the project area, the requirement for undertaking the work, and the context of the project under the Ontario Heritage Act.

1.1 Location of Project

1.1.1 Geographic Description of the Location

The study area is located in part of Lot 11, Concession 2, Township of Capreol, City of Greater Sudbury, District of Sudbury, Ontario (Map 1). The study area is situated in the southeastern part of Hanmer, east of Roy Avenue and South of Carmen Street, Ontario. Generally, the limits of this assessment can be bounded by a polygon with the following corners:

Table 1. Approximate coordinates of the bounding box for the study area.

Corner	UTM Coordinate (NAD 83 UTM17N)
NW	504984 m E, 5165689 m N
SW	504984 m E, 5165035 m N
SE	505178 m E, 5165035 m N
NE	505178 m E, 5165689 m N

1.2 Development Information

Woodland Heritage Northeast Limited (WHNE) was retained by Hanmer Dreamhomes to complete a Stage 1 archaeological resource assessment of a proposed land subdivision of a property located in Capreol, City of Greater Sudbury, District of Sudbury (Map 2).

1.2.1 Proposed Development

The proposed development includes the division of the existing land parcel into several lots. The southern portion of the existing land parcel will consist of one large lot, spanning south of Roger Street to the unnamed creek. The northern portion of the existing property will be subdivided into several smaller lots, with a new proposed road to accommodate the land subdivision. Please see Map 2 for reference.

1.2.2 Legislative Prompt

This archaeological work was required by the City of Greater Sudbury as a condition of the proposed subdivision application, and was administered under the authority of the Ministry of Municipal Affairs and Housing and its associated legislation.

1.2.3 Heritage Act Requirements

Under the Ontario Heritage Act, (R.S.O. 1990) anyone wishing to carry out archaeological fieldwork in Ontario must have a licence from the Ministry of Citizenship and Multiculturalism (MCM), file a report with the MCM containing details of the fieldwork that has been done for each project, and file information with the MCM about any archaeological sites documented for each project.

Under Ontario Regulation 8/06 of the Ontario Heritage Act, "consultant archaeologist" means "an archaeologist who enters into an agreement with a client to carry out or supervise archaeological fieldwork on behalf of the client, produce reports for or on behalf of the client and provide technical advice to the client".

Refer to the section entitled "Legal Considerations" for more description of the limitations of this report, and additional information on the legal requirements once this report has been accepted by MCM.

1.2.4 Stages of Archaeological Assessments (MCM 2011 S&Gs)

The following text describes the four stages of archaeological assessments in the Province of Ontario as administered by MCM. This section has been provided to the reader for information purposes, and it should be recognised that not all stages of archaeological assessment described here apply to this report. Additional technical information concerning all four stages of assessment are available in Sections 1-4 of the 2011 MCM S&Gs.

Four stages of archaeological assessment exist in Ontario. They are regulated by the MCM by way of the *2011 Standards and Guidelines for Consultant Archaeologists* (S&Gs), under the authority of the Ontario Heritage Act (R.S.O. 1990). Generally, the assessments begin with the Stage 1 assessment of potential, proceeding onto the Stage 2 survey to identify any archaeological resources, through to the mitigation of those sites through Stage 3 and 4 work. Below are brief descriptions of the four stages of archaeological assessments in the province.

1.2.4.1 Stage 1 Assessment Background

A Stage 1 archaeological resource assessment is a comprehensive review of the geographic and historical characteristics of a property in order to determine how they contribute to the subject property's past suitability for human use. This review and analysis serve to form the basis for an evaluation of archaeological potential on and around the property, with greater detail and accuracy than a determination of archaeological potential done by a non-specialist, or by way of the MCM Checklist for Archaeological Potential. The results of the Stage 1 may be used in place of a determination of archaeological potential by provincial or municipal approval

authorities, and to determine whether the property requires a Stage 2 property survey, and to recommend legally compliant assessment strategies.

1.2.4.2 Stage 2 Assessment Background

A Stage 2 archaeological property survey tests the areas of archaeological potential identified during the Stage 1 assessment. This survey generally is comprised of the systematic sub-surface excavation of test pits along a five-metre grid, with all soils screened and the contents examined for any artifacts, or a pedestrian survey which surveys former agricultural areas through examining recently prepared and weathered ground. When archaeological resources have been identified, both forms of survey are intensified in order to both gain insight into the depth and complexity of the potential archaeological site, as well as to determine initial estimates of the site boundary.

A secondary goal of the Stage 2 when artifacts are found, is to determine the relative cultural heritage value or interest (CHVI) of the deposit. If it is determined through intensification of testing that the archeological resource has limited CHVI, the survey is terminated and the assessment process ends. However, if the CHVI is considered to be unknown or high, recommendations will be made to carry out a Stage 3 site-specific assessment.

1.2.4.3 Stage 3 Assessment Background

The goal of the Stage 3 site-specific assessment is to determine the maximal extent of the archaeological site, as well as to evaluate the cultural heritage value or interest (CHVI) of the archaeological site. This is generally accomplished through the excavation of 1x1 metre units at 5 or 10 metre intervals across and beyond the limits of the archaeological site as determined by the Stage 2 survey.

Depending on the results of the test excavation and the corresponding level of CHVI, recommendations will be made to either terminate the assessment process or to proceed with Stage 4 assessment work.

1.2.4.4 Stage 4 Assessment Background

The Stage 4 mitigation of development impacts generally involves either the protection of the identified archaeological site, or its excavation. The MCM holds the position that avoidance and protection is the preferred approach and, when feasible, often presents the most cost-effective option. When the Stage 4 avoidance and protection of an archaeological site is not possible, the complete or partial excavation of the site may be required.

When excavation is required, the archaeologists are responsible for the careful stratigraphic excavation of the site, recording the locations of all artifacts and features to be analysed in the lab, as well as collecting samples. The reporting requirements for Stage 4 work are sufficient to document all significant aspects of the archaeological site excavated, and generally are more stringent than the reporting requirements for Stage 1 to 3 assessments.

2.0 Pre-Contact Historical Environment

As a result of the archaeological work undertaken during the 1900s and recent times, it has become clearly understood that in pre-contact times Indigenous People were active in the study area, although the depth and complexity of this activity remains poorly understood. As archaeological work continues to be undertaken in northern Ontario, certain elements of pre-contact culture and settlement are becoming better understood.

2.1.0 Archaeological Overview

Archaeologists generally divide the historic sequence in Ontario into pre-European contact and post-European contact. The pre-contact historical sequence is further subdivided into temporal/cultural periods based on material culture traits and settlement patterns derived from archaeological data, and historical records. The pre-contact sequence is divided as follows:

- Terminal Pleistocene and Initial Holocene Cultural Periods (before 8,500 B.P.[1])
- Mid-Holocene Cultural Periods (circa 8,500–2,500 B.P.)
- Early and Middle Ceramic Periods (circa 2,500–800 B.P.)
- Late Ceramic Period (circa 800–350 B.P.)

2.1.0.1 Terminal Pleistocene and Initial Holocene Cultural Periods

As a result of recent archaeological work in northeastern Ontario, it is suspected that there is an Initial Holocene Cultural (>8,500 B.P.) component of human occupation in this part of Ontario. This contrasts with earlier interpretations, which seemed to suggest that it was not until the mid-Holocene which recorded the first peopling of the area. At this time, very little is known about the details of the Initial Holocene Cultural Period of Northeastern Ontario, although if similar to those reports outside of the region, the period may be characterised by finely worked projectile point forms (*e.g.* Agate Basin), and the predation of large game such as Barren Land Caribou (*Rangifer tarandus groenlandicus*). Elsewhere, Initial Holocene people predated the ancient Bison (*Bison antiquus*), though its presence in Northeastern Ontario has yet to be confirmed.

Initial Holocene peoples may have also supplemented their diets with locally-available boreal subsistence resources such as woodland caribou, moose, beaver, hare, fish, and waterfowl. Faunal data from archaeological sites in the upper Great Lakes region suggests that Late Paleo-

[1] *Before Present (B.P.) refers to the years before A.D. 1950.*

Indian and Early Archaic populations had already developed a generalized foraging strategy, employing a broad variety of faunal resources from a range of ecological settings, including large and small mammals, waterfowl, and fish (Kuehn 1988, Jackson and Hinshelwood 2004, Fidel 2007).

2.1.0.2 Mid-Holocene Cultural Periods

Formerly believed to be the earliest known inhabitants of Northeastern Ontario some 2,500–8,500 years ago were the Shield Archaic Peoples. Up until recently, Paleo-Indian materials were seen to be "largely restricted to the northwest, suggest[ing] that the major penetration into Ontario and eastward took place after the transition from an Agate Basin culture to a Shield Archaic culture," (Wright 1981:88).

In northern Ontario, this period represents about 6,000 years of occupation in an area stretching from Manitoba to Quebec. The mid-Holocene cultural expressions may have evolved directly out of the preceding initial Holocene cultural period, although there are several key differences in material culture. Mid-Holocene quarry/workshop and habitation sites demonstrate a shift from higher quality toolstone toward the exploitation of greater percentages of metasediments such as greywacke. Additionally, it is considered that during the mid-Holocene Cultural Period the first groundstone tools were produced. During this time, the flaking of the tools appears to drop in quality as the period progresses, a change that can be seen from the highly-refined corner notched points through to the smaller side notched points of the later part of the Period. That said, this changing projectile point technology yielded a wider variety of projectile point styles in contrast to the terminal Pleistocene and initial Holocene, including various forms of stemmed and notched points. Of interest in northern Ontario is the rise in the use of native copper in the production of tools and decorative items (Wright 1972a; Pollock 1975, 1976, 1984).

Similar to the earlier cultural expressions, the mid-Holocene groups appear to have been wide ranging big game hunters. As the environment stabilised following the glacial retreat, these people shifted to an economy of smaller game and fishing which required smaller tools and a more local, territorial seasonal round to exploit resources at different times of the year. This trend from big game to more diverse, local resources appears to have continued through the Shield Archaic period to about 2,000 years ago.

Depending on the location, some mid-Holocene sites may be more closely associated with post glacial landscape features such as relict shorelines. As the environment stabilised, sites became

more widely distributed, and associated with suitable occupation locations on modern lakes and rivers.

2.1.0.3 Early Ceramic Period

Earlier interpretations of archaeology in the northeast suggested that a true early Ceramic period was absent, with the exception of some artifacts located sporadically and seldom featured at archaeological sites in the northeast. Recent excavations in northeastern Ontario and northwestern Quebec challenge this earlier interpretation and suggest that northern cultures formed part of the Meadowood Interaction Sphere (WHS 2011; WHS 2017; Taché 2008). It is now believed that an early Ceramic Period presence persisted in the north as evidenced by a number of Meadowood artifacts and habitation sites, one of the markers of this period. Vinette 1 ceramics are strongly associated with this period, but not all sites with Meadowood points or cache blades feature ceramics. Generally, ceramics are less commonly found on areas of the Canadian Shield than in more southerly areas.

2.1.0.4 Middle Ceramic (Laurel) Period

In terms of material culture, the Middle Ceramic Period was similar to the preceding Shield Archaic, but with the addition of fired clay pottery. As clay is a more plastic and malleable material than stone, distinct surface variations in decoration and structural variations in vessel construction allow archaeologists to develop refined distinctions between different ceramic types. Middle Ceramic vessels are characteristically thin-walled, with straight sided rims and pointed bases and decorations made using plain tool impressions (Wright 1967).

The Middle Ceramic Period economy appears to have been similar to the preceding period, with seasonal exploitation of a variety of subsistence resources the norm. Based on the distribution of sites, it is understood that extended family groups traversed hunting, fishing or gathering territories in pursuit of large and small game, and fish for subsistence during most of the year. In the summer, these groups may have come together into larger bands on larger lakes or rivers. The presence of a series of large ceremonial mounds containing burials, centred on the Rainy River in northwestern Ontario, also suggests that during some years, larger ceremony based gatherings also occurred (Arthurs 1986; Reid and Rajnovich 1991).

Other than the summer group campsites, Laurel sites are generally small, possibly reflecting the establishment of a seasonal round which saw the Laurel people break up into individual families during the fall, winter and spring periods of the year to more effectively exploit available resources. Laurel site distribution and settlement patterns differ from the inland site pattern noted for the mid-Holocene cultural period and set the pattern for settlement in the following

late ceramic period. Laurel peoples showed a preference for large lakes and rivers with preferred campsites on sandy bays, portage ends, points, peninsulas, and locations near waterfalls, below rapids and at river mouths. These locations served for the establishment of small, seasonal hunting and fishing camps.

2.1.0.5 Late Ceramic Period (Blackduck and Selkirk) Period

The Middle Ceramic (Laurel) material culture appears to have gradually evolved into the late Ceramic. This transition is not as evident in the lithic and copper artifacts, but the pottery makes a notable change to thin walled, globular pots with constricted necks and widened lips decorated using a combination of plain and 'cord-wrapped' object impressions. Two main pottery types are noted by archaeologists who have speculated that a more southerly type (Blackduck) represents early Ojibwe culture, while the more northerly type (Selkirk) represents a Cree culture (Wright 1972b; MacNeish 1958).

Data from northern Ontario suggests a trend toward a growth in population during the late Ceramic period reflected in an increased frequency of sites recovered during archaeological surveys. Archaeological evidence suggests that a seasonal cycle of travelling to resource exploitation areas may have been well established during this era. Site locations follow an established pattern with preference given to level places on islands, peninsulas, narrow parts of lakes, sandy beaches and portage ends, as well as rapids and waterfalls on rivers. These people were the ancestors of present day regional cultural/social groups.

2.1 Post-Contact Historical Environment

Archaeologists' understanding of the post-European contact period is based in both archaeological and documentary research. The post-contact historical sequence can be described in terms of significant themes relating to the consecutive waves of influence from, primarily, eastern Canada. The post-contact historic sequence is generally subdivided according to the main Euro-Canadian economic or political trends. The major post-contact periods in northeastern Ontario are divided as follows:

- Early post-contact (circa 350–85 B.P.)
- Survey and Development (circa 85–10 B.P.)

2.1.1 Indigenous Land Use

It should be noted that one or more First Nation or Métis populations live and use the land in, and around the study area. It is not within the scope of a technical archaeological report to comment on the various First Nations and their respective involvement, land-use, and traditional territories. Recent and modern First Nation histories are best addressed by the First Nations themselves.

Traditional knowledge regarding the historical use of the land by Indigenous people is often curated and passed down by Indigenous Elders and Knowledge Keepers. Areas of cultural and historical importance to Indigenous communities are best identified by the communities and members themselves. We encourage communities' participation in the archaeological process as several Native Values have overlap with archaeological values, but Native Values can also include ephemeral values which elude archaeologists (*e.g.* spiritual sites etc.).

2.1.1.1 The Effect of Early Post-Contact Period on Indigenous People

European contact in northern Ontario was disruptive to the natural evolution of material culture, traditional land use, and subsistence practice among indigenous populations. It is understood that traditional material cultural items were supplanted quite rapidly by corresponding trade items imported from Europe. As the pursuit of furs became increasingly important to the purchase and replacement of trade items, subsistence practices became displaced by exploitation of fur resources. Gradually, settlement patterns also changed, trading trips to fur trade posts were introduced, and in some cases settlement occurred at or near fur trade posts or, later, near the railways.

Historical documents also begin to name the indigenous occupants of the region. The northern interior shield areas were inhabited by *Anishinaabeg* (Ojibwe, Odawa, Mississaugas, Nipissing, and Algonquin), while farther north in Ontario was the traditional territory of the *Néhinaw/Ililiw/Ininiw* (Cree). Further south, the traditional Indigenous groups settled near Georgian Bay include the *Wendat* (Huron) and the *Tionontati* (Petun/Tobacco). The first contact between Europeans and Indigenous people in the area was with the Recollects and Jesuit missionaries and other French explorers and traders during the early and middle part of the 17th century (Lytwyn 2002).

2.1.1.2 Indigenous Land Use Specific to the Study Area

No specific Indigenous land use information was sought out prior to the development of this report. For information on Indigenous land use, local First Nation and Métis communities should be contacted.

2.1.1.3 Existing Treaties

It is not within the scope of a technical archaeological report to comment on the social implications, intent, or fulfillment of the conditions of the various treaties which have been established in the province. First Nations should be consulted directly should additional information be sought on the following commentary on the Treaties.

The study area is located within an area covered by the 1850 Robinson-Huron Treaty.

3.0 Archaeological Assessment

3.0.1 Registered Archaeological Sites

Before the initiation of fieldwork, WHNE undertook a review of the Ontario Archaeological Sites Database (OASD) through the MCM's PastPortal to determine the number and nature of archaeological sites registered on or in the immediate vicinity of the subject property. The site files and catalogued reports at the WHNE office were also checked to confirm the database results and include updates which have not yet been entered into the database.

No archaeological sites have been registered within three kilometres of the study area.

3.0.2 Previous Archaeological Fieldwork

In 1981, an archaeological and cultural heritage assessment was undertaken by Settlement Surveys Ltd., entitled "Ontario Hydro Archaeological Resources Overview Report; Hanmer TS to Mississagi TS Transmission Line". At the conclusion of the report, it was determined that areas with archaeological potential were present in the study area and numerous previously identified sites were also situated within the large study area boundary. As this report served as an overview of the broader archaeological context of the area, they released an addendum in 1982 reviewing alternative routes and station connections to Ontario Hydro that would be subjected to further archaeological assessments (Settlement Surveys Ltd. 1982).

In 1981, an archaeological and cultural heritage assessment was undertaken by Settlement Surveys Ltd., entitled "Ontario Hydro Archaeological and Heritage Resources Overview Report; Little Jackfish Transmission Study Area". At the conclusion of the report, it was determined that 20 area featuring archaeological potential were identified along the proposed transmission line path. They recommended that an archaeological survey (Stage 2 sub-surface survey) of the identified areas of potential be conducted prior to the development of the proposed transmission line (Settlement Surveys Ltd. 1982).

In 1991, an archaeological and cultural heritage assessment was undertaken by Settlement Surveys Ltd., entitled "Preliminary Assessment (Overview) of Prehistoric Archaeological Resources Hanmer T.S. to Pinard T.S.". At the conclusion of the report, it was determined that fifty-seven areas featuring archaeological potential were identified in relation to the proposed transmission line development. They recommended that an archaeological survey be required for these identified areas of potential. In addition to this, they recommended that the other areas, such as access roads and staging areas that had not been mapped out or planned previous this assessment, be reassessed for their archaeological potential prior to any impacts.

Lastly, it was recommended that communications with local Indigenous communities and archival work be required prior to construction taking place (Settlement Surveys Ltd. 1982).

3.1 Assignment of Archaeological Potential

The initial determination of archaeological potential for this project was assigned by the City of Greater Sudbury under the authority of the Ministry of Municipal Affairs and Housing by way of the MCM checklist for archaeological potential. This initial determination was refined during the fieldwork and detailed in Section 4.0 of this report.

4.0 Archaeological Fieldwork

This property inspection was undertaken to locate features of potential identified during the background research. The inspection also documented any landscape characteristics that would affect assessment strategies such as saturated soils, steep slopes, and exposed bedrock. Efforts were also made to identify and document additional features not visible on available mapping such as ridges or berms associated with relict shorelines, pockets of well-drained soil in otherwise saturated environments, pockets of level ground along steep slopes, pit features or conspicuous historical remains, as well as former clearings which may have hosted historical settlement.

4.1 Fieldwork Overview

4.1.1 Permission to Enter, Access, and Timing

The Stage 1 on-ground property inspection was undertaken on August 31, 2023 with David Gadzala (P1040) as the designated field director.

The study area was accessed by way of Roger Street.

Prior to the fieldwork, WHNE received permission to enter onto the property to carry out all activities related to archaeological assessments.

4.1.2 Technical and Safety Equipment Used

When working in the study area, the archaeological field crew used standard safety equipment and PPE including hi-visibility vests and CSA-certified work boots. Additionally, maps depicting the study area were produced in advance of field activities and used for both navigation purposes and to record field observations.

Additional navigation devices used were Suunto magnetic compasses and Garmin 64s GPS receivers with WAAS and GLONASS enabled.

A first aid kit was available, and light first aid supplies were carried on person during field activities. Sunscreen and insect repellant was available should they be needed.

4.1.3 Spatial Control

For the purposes of ensuring spatial control through data collection, GPS coordinates were collected to document property assessment and particular landscape features, photographs, or areas of archaeological potential. GPS coordinates were taken using one Garmin GPSmap 64 GPS and GLONASS receiver with an error rated (with WAAS) to ± five metres on average. All coordinates are in UTM17N using NAD 83.

4.2 Archaeological Assessment (Stage 1)

4.2.1 Current Land Use

The study area is largely forested and has been previously used for forestry and recreational purposes.

4.2.2 Weather and Lighting Conditions During Assessment

The archaeological fieldwork was undertaken under appropriate weather and lighting conditions. Weather conditions were sunny with good visibility, temperatures between 10 and 20 degrees Celsius, and no precipitation. Fieldwork would have been suspended when weather and lighting conditions reduced the ability to identify and document any part of the subject lands, although no adverse weather conditions impeded the fieldwork activities.

4.2.3 Property Inspection

The entirety of the study area was assessed systematically. The assessment began on the west side of the study area following an existing network of trails found on the property. The property inspection then involved the examination of potential clearings north of the wetland along the creek, identified from a 1946 air photograph of the study area (Map 3). Next, the saturated lands along the north side of the creek were traversed and assessed, followed by an examination of the inland areas further north, terminating near the residential structures north of the northern property boundary. A DJI Mini 2 drone was then used to capture high-resolution, near-ground imagery of the entire study area, resulting in a thorough assessment of the entire subject property (Images 1 to 3).

4.2.4 Disturbances Observed

Minor ground disturbances were observed along modern trails and in areas which have previously undergone timber harvesting activities, typically consisting of linear ruts caused by tracked machinery, small borrow pits, as well as small mounds of displaced soil (Images 4 to 9).

4.2.5 Inventory of Field Documentation

Field maps were drawn on-site and subsequently digitised. Field notes were collected to record the assessment process, to document the archaeological potential of the area, and to record photographic information.

Representative photographs were taken of the areas of potential, of the study area landforms and vegetation, of the areas to be impacted, and the field conditions encountered at the time of the assessment (Map 5 and Images 1 to 15). Additionally, photographs in the report are referenced by site or locale, but also carry the photographic record number that is embedded in

the digital file. Thus, an Image in this report may be indicated as “Image 1”, and include a reference to “Photograph 389”, indicating both the position of the photograph in the report and the number designating the photograph (assigned by the camera), and maintained within the documentation generated during fieldwork and analysis.

The project record documentation includes photographs, maps, field notes, GPS location data, and this report (Table 2).

Table 2. Documentary records for this project.

Documentation	*N*	*Description*	*Location*
Photographs	258	Digital images	Digital storage
GPS readings (Tracks and Waypoints)	416	Context, property assessment	Digital storage
Field notes	1	Pages of notes	Digital storage
Report	1	Copy (.pdf)	Digital storage

The digital records relating to this project are stored at the WHNE office in New Liskeard and are backed up periodically from the source drive to ensure long term stability. Digital records will be maintained in contemporary software formats, updated as WHNE updates software or storage media.

4.3 Analysis and Conclusions

4.3.1 Analysis and Conclusions

The Stage 1 assessment confirmed that the primary feature of potential within the study area was the unnamed creek that is situated along the southernmost boundary of the property. The area bordering the creek consisted of wetlands rising to a low, saturated forest consisting of spruce, tamarack, alder, Labrador tea, tufts of marsh grass, and other water-tolerant vegetation. This saturated area persists between 80 to 125 metres north of the creek (Images 3, 10 to 15) and is clearly visible as unimpacted, unharvested land in the 1946 aerial photograph of the study area (Map 3), likely due to its poor drainage.

While the terrain alongside the creek was considered to have low archaeological potential due to the poorly drained ground conditions, the areas further inland are considered to have low archaeological potential based on their excessive distance from water. In areas of northern Ontario, defined by the S&Gs as being from the Districts of Muskoka and Parry Sound north, and in areas underlain by pre-Cambrian rock (Canadian Shield), a modified approach to testing is available and described in Section 2.1.5 of the S&Gs. Based on statistical analyses and over 50 years of archaeological prospecting, this modified approach serves to restrict the Stage 2 survey work to areas within 50 metres of modern water sources, 150 metres of relict water features, and 150 metres of structures (if nothing is found). If archaeological resources are located, the survey must continue. These areas are generally referred to as "Areas beyond the limit of northern testing," on the associated archaeological potential mapping.

As the field assessment did not identify any area as having confirmed archaeological potential within the study area boundary, or its periphery, it was determined that the entire study area was considered to have low archaeological potential.

4.3.2 Support of Recommendations

As stated in Section 7.7.4, Standard 1.b of the 2011 MCM *Standards and Guidelines for Consultant Archaeologists*, if no features of archaeological potential are identified within the study area, the licensee may recommend that the property does not require additional archaeological assessments. At which point, the assessment is deemed completed and the proposed project may proceed.

4.3.3 Recommendations

As a result of the Stage 1 assessment of the study area, the recommendations are as follows:

1. No additional archaeological work is recommended in advance of the proposed subdivision located in part Lot 11, Concession 2, Township of Capreol, City of Greater Sudbury, District of Sudbury, Ontario (Map 4).

5.0 Legal Considerations

The following sections are designed to describe the limit of information and representation available in the archaeological assessment report, and to inform the reader of the ongoing legal obligations, as required by MCM.

5.1 Limitations of this Report

Some information in this report may be confidential, including any photos, maps, texts of narrative information concerning First Nation communities and / or private informants. The Freedom of Information and Protection of Privacy Act requires that this information be kept secure and not be distributed to unauthorized parties. Further, the MCM 2011 Standards and Guidelines for Consultant Archaeologists, Section 7.3.3 requires that such information is not contained in reports which may be entered into the Ontario Public Register of Archaeology Reports. As such, this information, although available to the report author, may not be transmitted as part of the report package except as required for MCM review.

Some information in this report may be sensitive, including the location of registered archaeological sites. Policy developed under the Ontario Heritage Act requires that this information be kept secure and not be distributed to unauthorized parties. Further, the MCM 2011 Standards and Guidelines for Consultant Archaeologists, Section 7.6.1, standard 1 requires that any information that identifies the location of an archaeological site be presented only in the supplementary documentation to the report. The supplementary documentation is excluded from the Ontario Public Register of Archaeology Reports. As such, this information, although available to the report author, may not be transmitted as part of the report package except as required for MCM review.

This report has been generated for the proponent named on the cover page of this report for their exclusive use, and for the explicit purposes defined in the Executive Summary. Further distribution, modification or publication of this report is not permitted without prior written agreement from Woodland Heritage Northeast Limited. While this document is believed to contain correct information, neither Woodland Heritage Northeast Limited, nor its affiliates makes any warranty, either expressed or implied, or assumes any legal responsibility for the completeness or usefulness of any results or any information disclosed. The interpretation of this and any other data related to this report is solely the responsibility of the client.

As set out in the Ontario Heritage Act and associated Regulations, archaeological assessment has as its focus only material remains of past human use and occupation of landscapes.

Archaeological assessments completed under the terms and conditions of a licence issued under the authority of the Ontario Heritage Act do not directly involve documenting Native values, traditional land use, traditional ecological knowledge or traditional territories. While this information is at times valuable in evaluating archaeological potential or interpreting archaeological sites, the use of such information does not render it part of the archaeological record. Control over the recording and use of this information rests solely with the individuals and communities wherein the knowledge resides.

5.2 Advice on Compliance with Legislation

1. Advice on compliance with legislation is not part of the archaeological record. However, for the benefit of the proponent and approval authority in the land use planning and development process, the report must include the following standard statements:

a. This report is submitted to the Minister of Citizenship and Multiculturalism as a condition of licensing in accordance with Part VI of the Ontario Heritage Act, R.S.O. 1990, c 0.18. The report is reviewed to ensure that it complies with the standards and guidelines that are issued by the Minister, and that the archaeological fieldwork and report recommendations ensure the conservation, protection and preservation of the cultural heritage of Ontario. When all matters relating to archaeological sites within the project area of a development proposal have been addressed to the satisfaction of the Ministry of Citizenship and Multiculturalism, a letter will be issued by the ministry stating that there are no further concerns with regard to alterations to archaeological sites by the proposed development.

b. It is an offence under Sections 48 and 69 of the Ontario Heritage Act for any party other than a licensed archaeologist to make any alteration to a known archaeological site or to remove any artifact or other physical evidence of past human use or activity from the site, until such time as a licensed archaeologist has completed archaeological fieldwork on the site, submitted a report to the Minister stating that the site has no further cultural heritage value or interest , and the report has been filed in the Ontario Public Register of Archaeological Reports referred to in Section 65.1 of the Ontario Heritage Act.

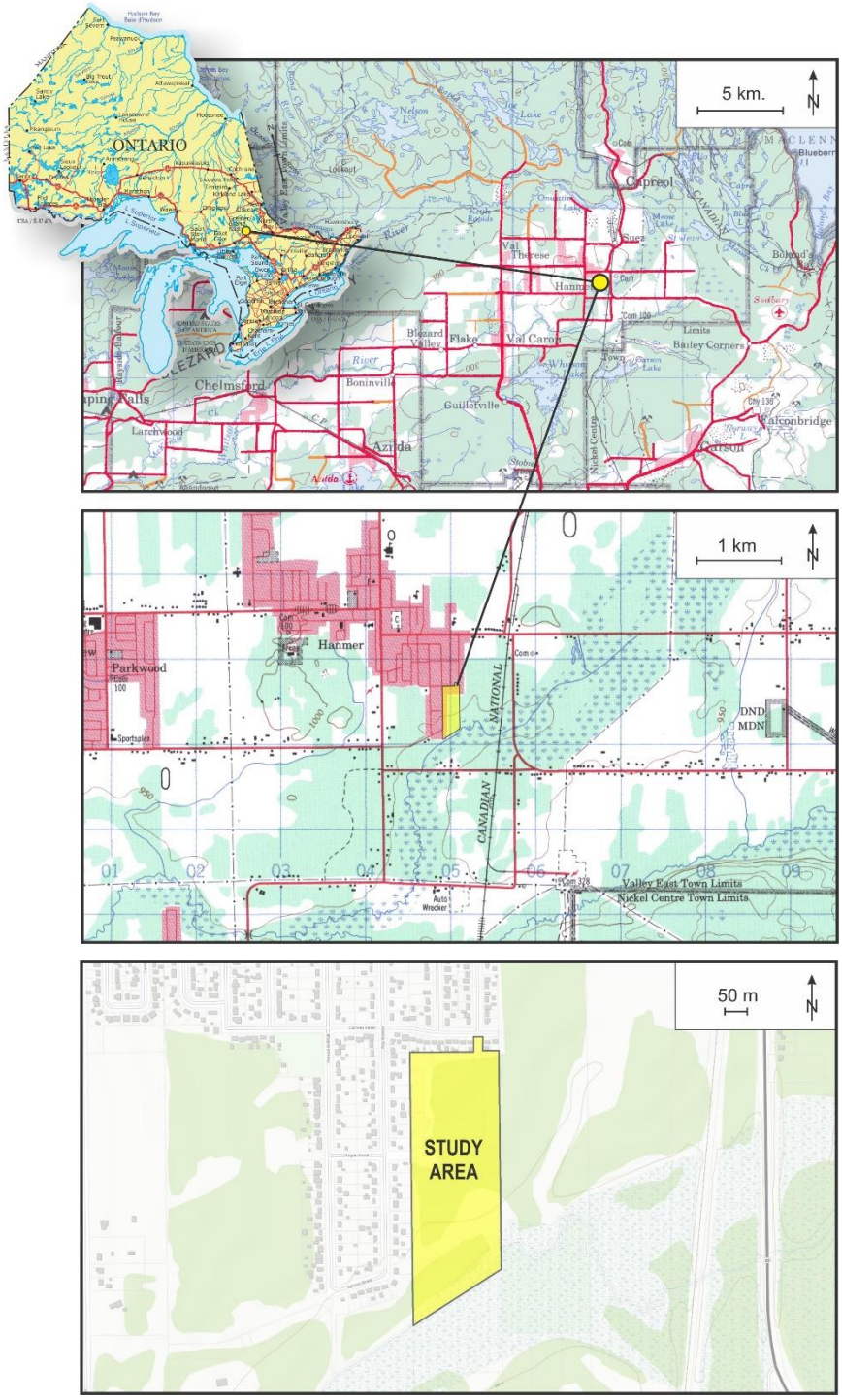
c. Should previously undocumented archaeological resources be discovered, they may be a new archaeological site and therefore subject to Section 48 (1) of the Ontario Heritage Act. The proponent or person discovering the archaeological resources must cease alteration of the site

immediately and engage a licensed consultant archaeologist to carry out archaeological fieldwork, in compliance with Section 48 (1) of the Ontario Heritage Act.

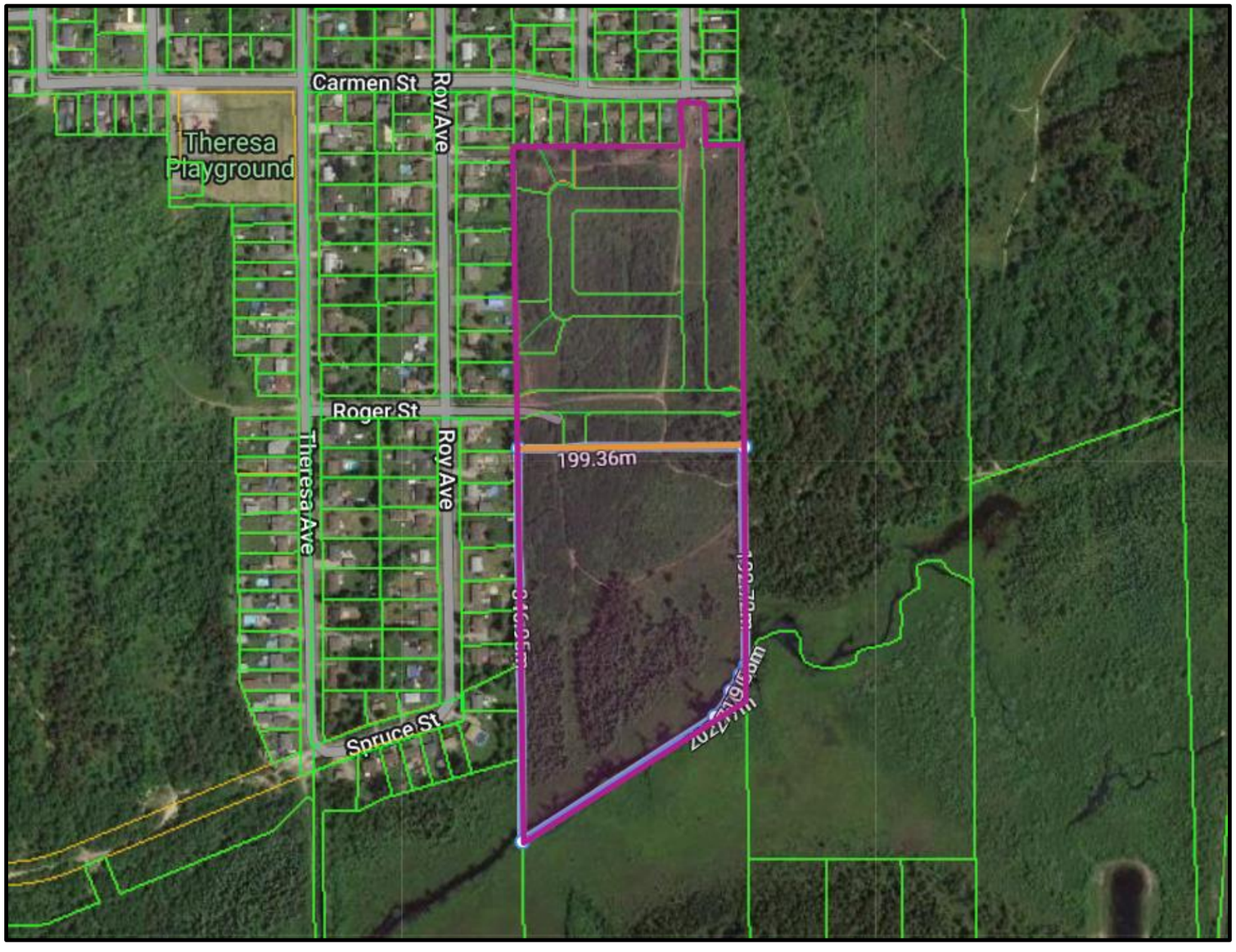
d. The Cemeteries Act, R.S.O. 1990 c. C.4 and the Funeral, Burial and Cremation Services Act, 2002, S.O. 2002, c.33 (when proclaimed in force) require that any person discovering human remains must notify the police or coroner and the Registrar of Cemeteries at the Ministry of Consumer Services.

2. Reports recommending further archaeological fieldwork or protection for one or more archaeological sites must include the following standard statement: “Archaeological sites recommended for further archaeological fieldwork or protection remain subject to Section 48 (1) of the Ontario Heritage Act and may not be altered, or have artifacts removed from them, except by a person holding an archaeological licence.”

6.0 Maps

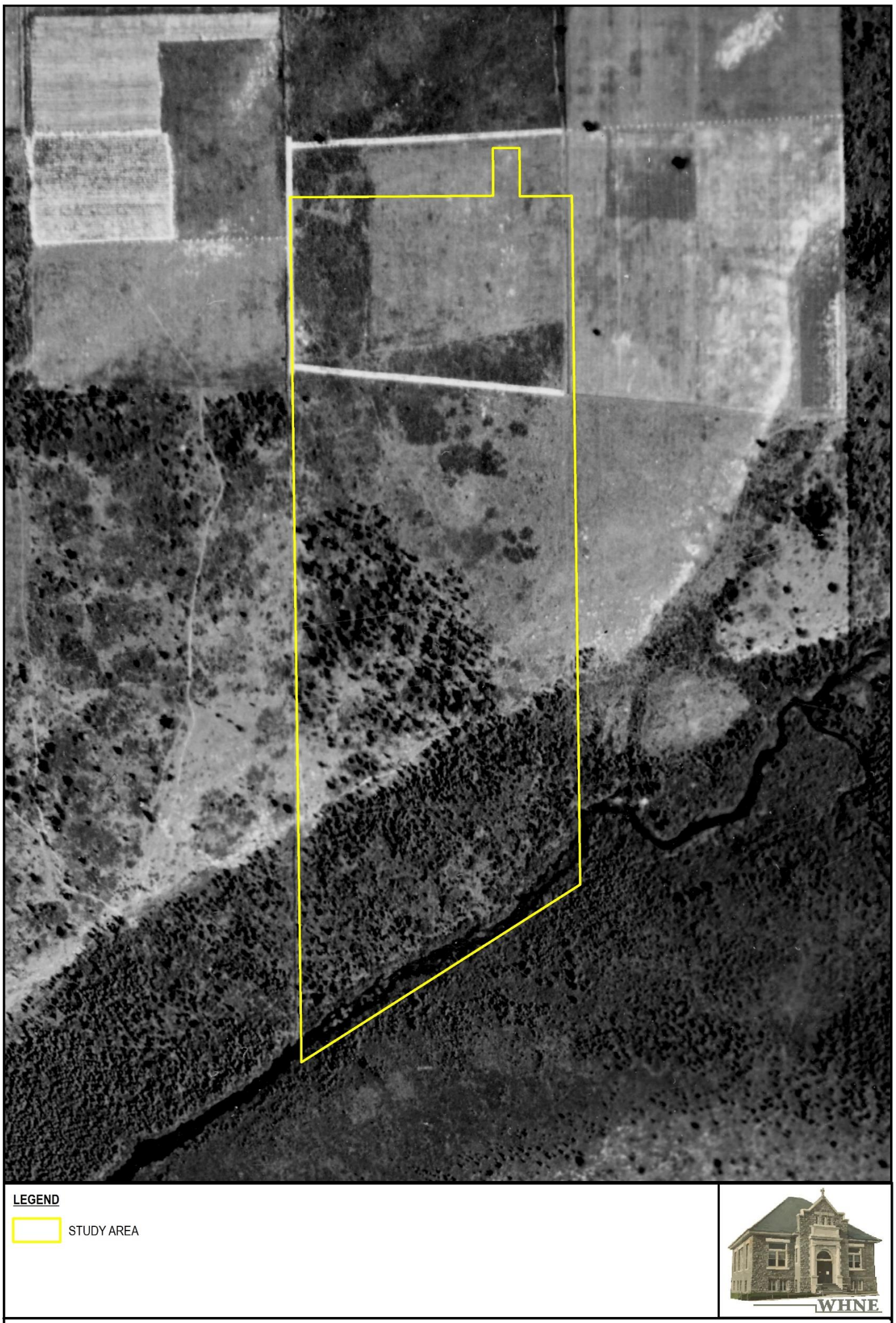


Map 1. Project location map.

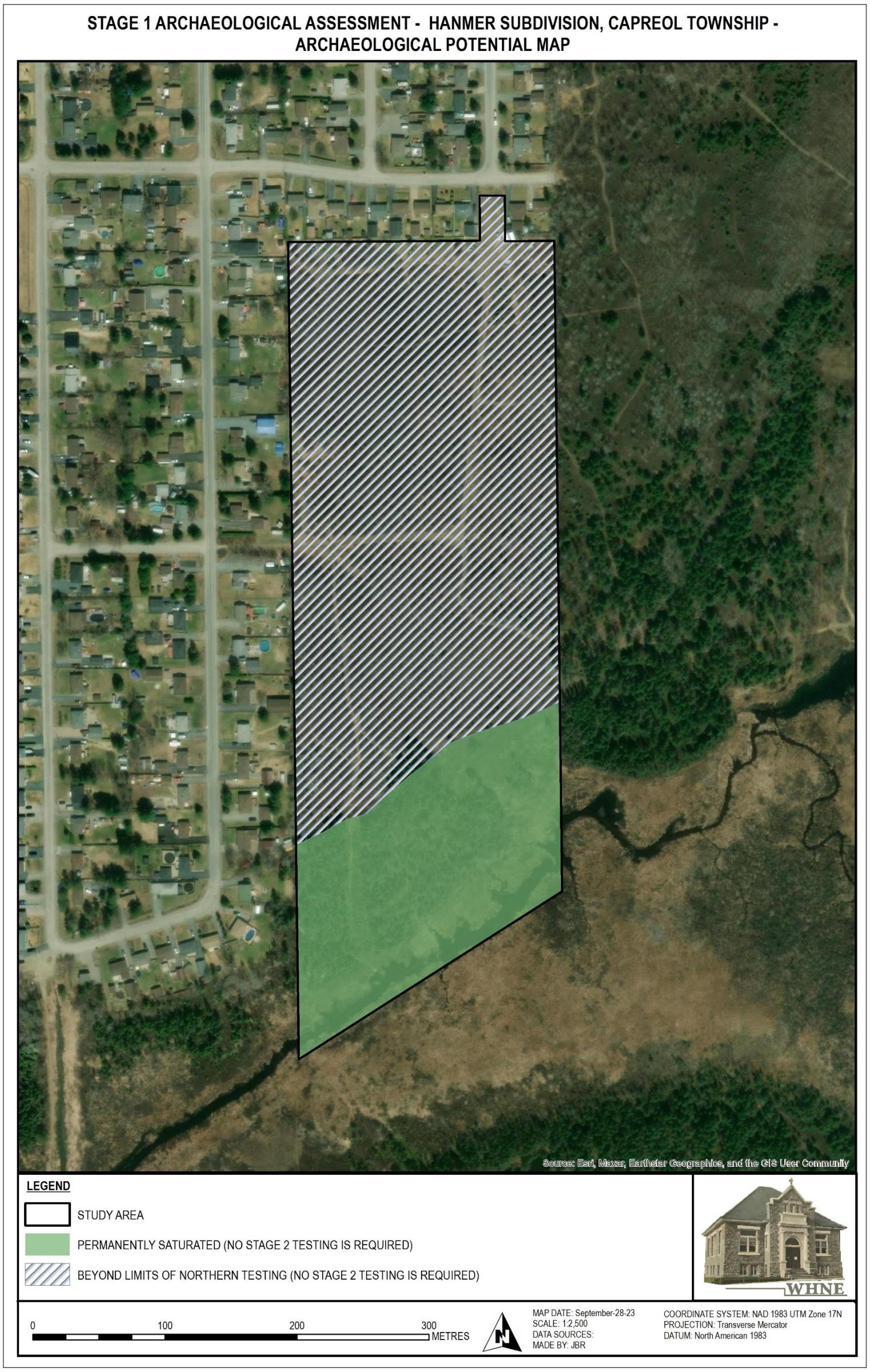


Map 2. Unmodified development map provided by the proponent.

STAGE 1 ARCHAEOLOGICAL ASSESSMENT - HANMER SUBDIVISION, CAPREOL TOWNSHIP - HISTORICAL 1946 AIR PHOTOGRAPH MAP



Map 3. 1946 historical aerial photograph overlain with the study area.



Map 4. Map showing the results of this archaeological assessment.

STAGE 1 ARCHAEOLOGICAL ASSESSMENT - HANMER SUBDIVISION, CAPREOL TOWNSHIP - IMAGE LOCATION MAP

Map 5. Map showing the locations and directions of the photographs used in this report.

7.0 Images

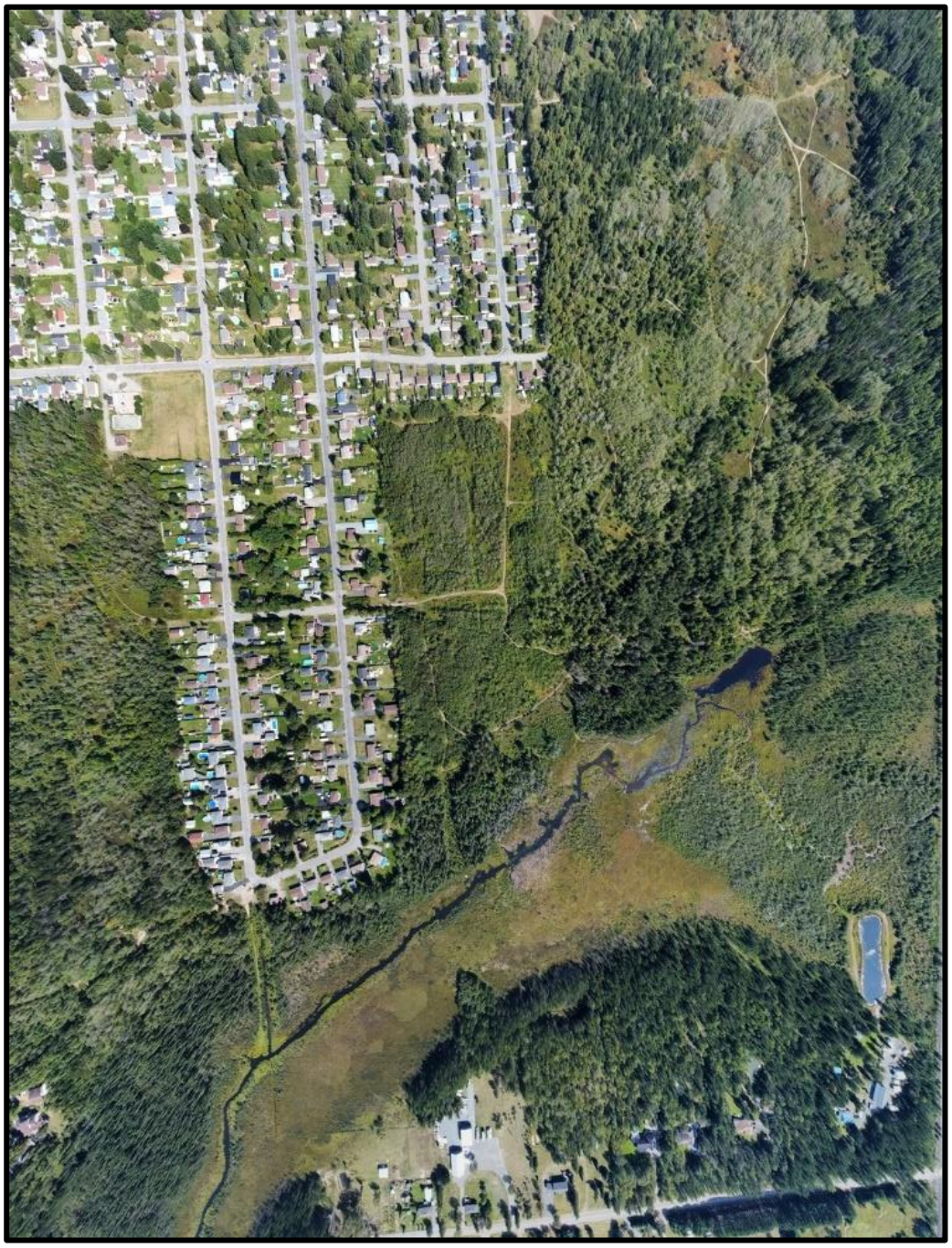


Image 1. Photograph 949 overlooking the study area.

Image 2. Photograph 263 overlooking the southern portion of the property, highlighting the creek and surrounding terrain.

Image 3. Photograph 777 overlooking the southern portion of the property, highlighting the creek and surrounding vegetation.

Image 4. Photograph 730 of an existing trail found throughout the north and central portion of this property.

Image 5. Photograph 24 showing some of the established trails found throughout the north and central portion of this property.

Image 6. Photograph 673 showing some of the minor wheel ruts in the trail on the eastern line of the subject property, facing south toward the wetlands.

Image 7. Photograph 804 of the lands along the northern property boundary.

Image 8. Photograph 217 of the lands along the northern property boundary.

Image 9. Photograph 41 facing a material borrow pit located near one of the trails in the central portion of the study area. Note the shovel in the centre of the photograph.

Image 10. Photograph 652 showing the unnamed creek on the southern portion of the study area.

Image 11. Photograph 239 showing the unnamed creek and adjacent wetland on the southern portion of the study area.

Image 12. Photograph 637 showing the wetland adjacent to the unnamed creek and the transition into a spruce dominated forest on the southern portion of the study area.

Image 13. Photograph 432 showing the wetland and the transition into a spruce and tamarack dominated forest situated along the southeastern portion of the study area.

Image 14. Photograph 932 of the wetland on the south side of the study area.

Image 15. Photograph 560 showing the saturated forest identified throughout the southern portion of the subject property.

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THE CASE FOR LESSER FRONTAGES

Greater Sudbury's Low-Density Residential Framework

PREPARED BY
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REAL ESTATE BROKERAGE

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Low-Density Residential Standards

- Greater Sudbury's current zoning framework encourages developers to build large homes on big lots for a traditional market of wealthy homebuyers.
- The City created the R1-6 and R1-7 zones to respond to the need for smaller homes, increase flexibility, and meet the demand of older adults looking to downsize and young couples looking for starter homes.
- Despite being available for years, there have been no rezonings to R1-6 or R1-7. Rezoning is a burdensome process, and changing the common R1-5 standard to permit smaller lot frontages as of right would give greater flexibility to builders and developers.

Greater Sudbury R1 Overview

Current Zoning Framework

Low-Density Residential Zonings	# of lots with this Zoning	% of all R1 Lots	Current Minimum Lot Frontage	Current Minimum Lot Area
R1-1	130	6.1%	45m	4000m2
R1-2	166	7.8%	36m	1300m2
R1-3	27	1.3%	30m	1000m2
R1-4	28	1.3%	18m	665m2
R1-5	1766	83.4%	15m	465m2
R1-6	0	0%	12m	400m2
R1-7	0	0%	9m	279m2
Balanced small lot size	0	0%	11m	352m2

What are other cities doing? Comparables

Municipality	Zoning	Permits Semi-Ds	Minimum Lot Frontage	Minimum Lot Area
Thunder Bay	UL - Urban Low-rise	Yes	9m / 6m per townhouse	270m2 / 180m2 per townhouse
Guelph	R1.D	No	9m	275m2
Hamilton	R1	Yes	12m / 9m per semi	360m2 / 270m2 per semi
Vancouver	RS-1	No	7.3m	334m2 min 511m2 max
Toronto	R	Yes	3.5m/6m	180m2
Kingston	UR - Urban Residential	Yes	10m/9m per semi	N/A
Kitchener	RES-5	Yes	9m/7.5m per semi	235m2 / 210m2 per semi

The cost of low density

Servicing, Taxation and Sustainability

- Less metres of linear infrastructure per home reduces the cost of new houses and the ongoing maintenance costs for municipalities.
- Lower minimums allow for subdivisions to have a range of lot sizes, to create neighbourhoods that cater to multi-generational needs and a wider range of incomes.
- The current R1-5 zoning is fundamentally unsustainable. Houses will not generate enough tax revenue to cover their operational costs as well as their infrastructure renewal needs. More homes per meter of linear infrastructure = more sustainable.

Residential Zone Minimum Frontage	Homes per serviced KM	Cost per Home ($5900/m)	Renewal Cost @50yrs (2% inf)
R1-7: 9m	111	$53,100	$142,923
R1-6: 12m	83	$70,800	$190,564
R1-5: 15m	66	$88,500	$238,206
R1-2: 36m	27	$212,400	$571,693

Value per acre

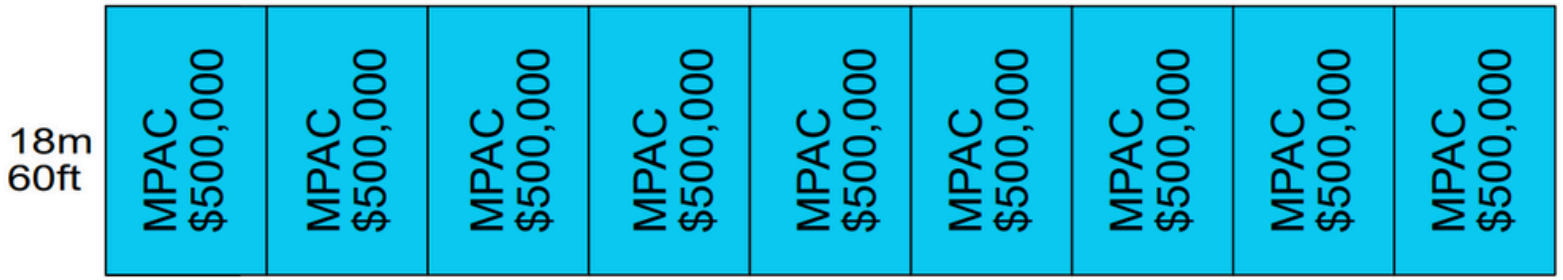
Value per acre calculations are an ideal way for municipalities to determine the value of specific development patterns.

A simple and effective ratio of the the area that a development requires to the assessment value of that development provides a method for municipalities to gauge the sustainability of different development patterns.

Subdivision Value per acre

Comparing different development patterns at a high level.

Lesser frontages will yield more homes, provide greater assessment growth and increase sustainability.



60ft Frontages
Premium New Build

Homes per km of frontage = 55.6 (-11.1) MPAC Assessment per km = $27.8M

50ft Frontages
(R1-5 standard)

Homes per km of frontage = 66.7 MPAC Assessment per km = $30.02M

Homes per km of frontage = 90.9 (+24.2) MPAC Assessment per km = $35.45M

36ft (11m) Frontages - Affordable and Sustainable Housing

Mallette-Goring Inc.
REAL ESTATE BROKERAGE

LAURA SUBDIVISION

SUDBURY, ONTARIO

Servicing Brief

July 3, 2024

N.A.J.M ENGINEERING LTD

Prepared for:

Hanmer Dreamhomes.

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APPENDIX

1.0 INTRODUCTION

The client is proposing the development of the lands along the Southwest region of Hanmer in Greater Sudbury, Ontario. The proposed development will span from Laura St in the North to the wetlands along the Whitson River tributary in the south.

N.A.J.M. Engineering Ltd. (NAJM) has been retained by Client of Laura Subdivision to investigate the site servicing and stormwater management that will be associated with the proposed redevelopment and to prepare a servicing brief in support of a draft plan application for the proposed development.

2.0 PROJECT BACKGROUND

2.1 Existing Site Description

The subject site, referred to as Laura Subdivision, is a 7.72-hectare (19.08 acres) property extending from Laura St in the north to the wetlands along the Whitson River tributary in the south, in Hanmer, Sudbury, ON. The site currently comprises of natural grassed areas, bushy to dense shrubs, grass and mud trails and tree vegetation. The site is bounded by Carmen St to the north, residential properties along Roy Ave to the west and east, grassed areas, woodlands to the east and wetlands along Whitson River tributary to the south. The existing soil for the development is mostly sand with trace silt and trace gravel (Refer Geotechnical Investigation and Design report by exp), this soil type comes under Hydrological Soil Group A (Refer to Appendix). Refer to Figure 2.1 for an aerial view of the site.

Figure 2.1 – Site Location

2.2 Proposed development

The development area is 7.72 hectares (19.08 acres) and consists of 125 single-family residential units, along with a stormwater management pond, which will be constructed as a part of the development. Refer to Figure 2.2 for a view of the proposed site layout.

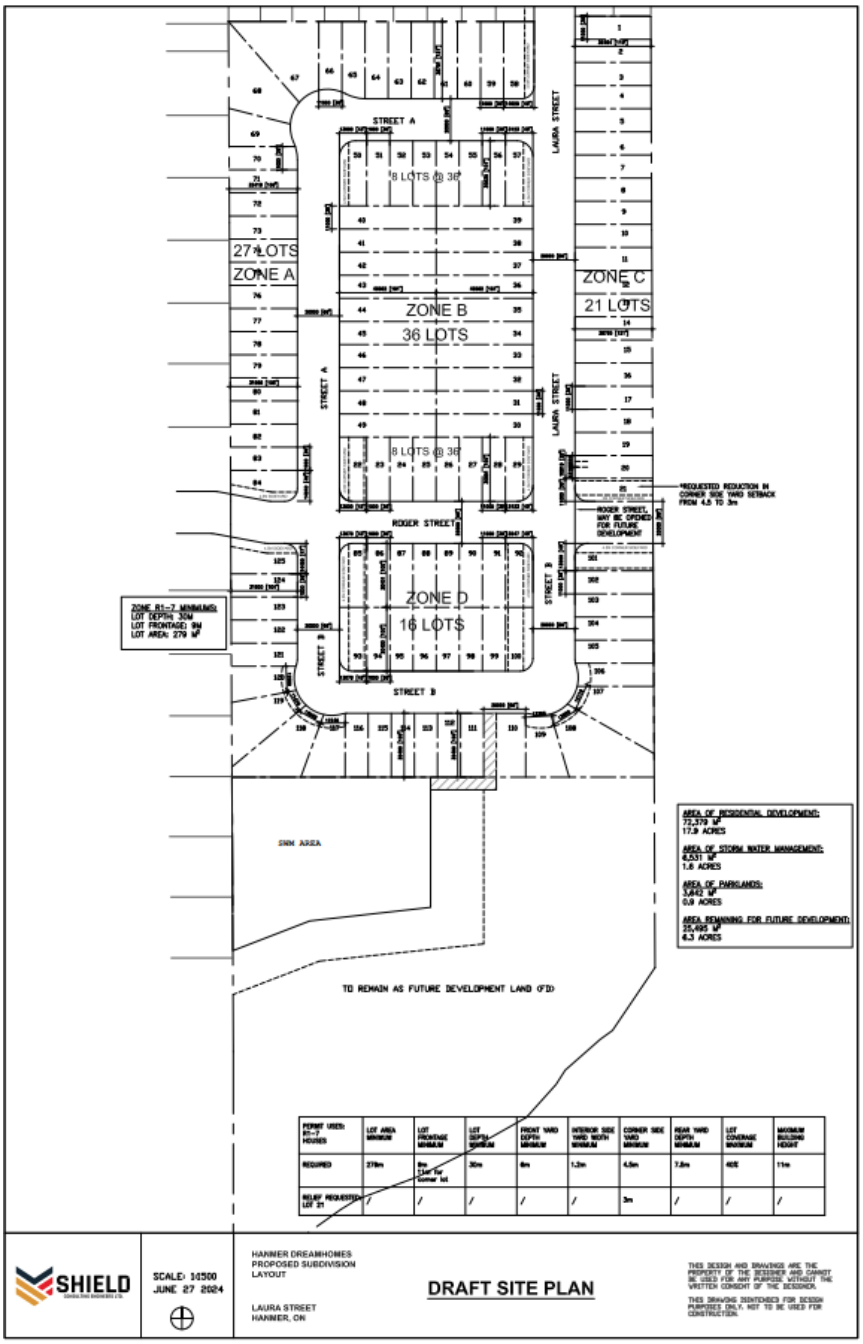


Figure 2.2 – Proposed Site Layout

2.3 Background and Resource Information

In preparing for this report, the following information was obtained and reviewed:

- City of Greater Sudbury (C.G.S) - Engineering Record drawings
- Ontario Soil Survey complex for soil types
- City of Greater Sudbury GIS Mapping
- Proposed site plan by Studio Kimiis Inc.
- City of Greater Sudbury Engineering Design Manual
- City of Greater Sudbury Stormwater Management Guide
- City of Greater Sudbury – Supplemental Design Criteria for Sanitary sewers, Storm sewers and Force mains.
- Ministry of Environment (MOE) SWM Planning Manual, Sewer Design, and Drinking Water System Guidelines.
- Sketch of Topographic Information Lands known as 0 Laura Street City of Greater Sudbury Tulloch Geomatics Inc. 2023.

3.0 SERVICING INVESTIGATION

Information with respect to existing municipal services and utilities was determined from the City of Greater Sudbury record drawings.

3.1 Water Servicing Criteria

The City of Greater Sudbury Engineering Design Manual was utilized. The criteria are generally summarized as follows:

- Water supply systems should be designed to satisfy the greater of peak hour demand or maximum day demand plus fire flow.
- Average domestic water demand of 360 liters per capita per day for residential.
- Maximum day and peak hour factors for residential are 1.8 and 2.7 times the average flow requirement.
- Fire flow requirements for the site based on the Engineering Design Manual.
- The minimum pressure requirement during fire flow demand should be no lower than 20 PSI.

- The required pressure should be no lower than 40 PSI and 50 PSI during maximum hour and maximum day demand.
- The maximum pressure in the system should not exceed 100 PSI during maximum hour and maximum day demand.

3.1.1 Existing Water Servicing

Based on Municipal records, there is an existing 150mm water main along Carmen Street. There is an existing 150mm watermain located along Roy Avenue. There is an existing 150mm watermain along Roger Street and Laura Street.

A WaterCAD analysis was performed by the Development Engineering Section of C.G.S at the 150mm junction at Laura/Carment and at Roy/Roger. Results of the model are provided below:

Table 3.1 – WaterCAD analysis – Model results

Location	Max Hour	Max Day	Fire Flow
Laura/Carmen	79 psi	79 psi	104 l/s
Roy/Roger	81 psi	81 psi	87 l/s

3.1.2 Proposed Water Servicing

Domestic Water Demand Analysis

The development with total of 125 units requires a maximum day demand of **2.81 L/s** and peak hour demand of **4.22 L/s**.

Fire Flow Demand

Based on the City of Greater Sudbury Engineering Design Manual guidelines, the fire flow requirement for Subdivisions of zones R1 and R2 is **75 L/s**, which applies to the proposed development.

Governing Water Demand

As discussed under subsection 3.1, Water supply systems should be designed to satisfy the greater of peak hour demand or maximum day demand plus fire flow. In this criterion it is **4.22 L/s** of peak hour demand plus the fire flow of **75 L/s** for the duration of 2 hrs will be the governing water demand.

Based on the results from the WaterCAD analysis provided by C.G.S, sufficient water capacity and pressure is available in the existing watermains to accommodate the water demands of the proposed development.

3.2 Sanitary Servicing

3.2.1 Sanitary Servicing Criteria

The City of Greater Sudbury Engineering Design Manual and City of Greater Sudbury – Supplemental Design Criteria for Sanitary Sewers, Storm Sewers and Force mains was utilized. The criteria are generally summarized as follows:

- Average domestic residential sewage flows of 360 litres per capita per day.
- The peak domestic sewage flow is to be calculated by utilizing a calculated Harmon Peaking Factor of [$M = 1 + 14 / (4+P^{0.5)}$]
- A peak extraneous flow of 0.39 L/s/ha is required for all sewers.
- The total peak sanitary flow will be established based on a peaking factor multiplied by the average domestic residential flow and the addition of peak extraneous flow to account for groundwater seepage and cracks in the sanitary sewer system.
- The population will be calculated based on 3.0 Person Per Unit (PPU) for detached homes (single family).

3.2.2 Existing Sanitary Sewers and Servicing

A review of the City of Greater Sudbury, record drawings indicates that the site is in an area predominantly serviced by sanitary sewers. Based on these records and City of Greater Sudbury as-built plan and profile drawings, the sanitary sewers in the area are as follows:

- There is an existing 250mm sanitary sewer along Laura Street flowing south towards Carmen Street.
- There is an existing 250mm sanitary sewer along Carmen Street flowing West and further upsizing to 300mm sanitary sewer after the Carmen Street and Roy Avenue Intersection.
- There is an existing 200mm sanitary sewer starting just south of Carmen Street and Roy Avenue Intersection and continues to flow south along Roy Avenue. This 200mm sewer is then upsized to 250mm after Roy Avenue and Roger Street Intersection and continues to flow south.

3.2.3 Proposed Sanitary Servicing

Proposed Sanitary Flows

The development will have a total of 125 units and generates a peak sanitary sewage flow of **9.32 L/s.**

A review performed by the Development Engineering Section of C.G.S on the existing sewage mains downstream from the proposed connection at MH 17295 East of Carmen/Laura and MH 9-054 Roger and Roy indicated that the mains could convey the additional 9.32 L/s of flow expected from the proposed development.

The downstream Spruce Street Lift station does not have sufficient capacity at this time of the report and must be upgraded to support the proposed development.

3.3 Storm Servicing

3.3.1 Existing Storm Servicing

A review of the City of Greater Sudbury, record drawings indicates that the site is in an area serviced by municipal storm sewer. The subject site is assessed to the Whitson River Watershed and a tributary of the Whitson River flows to the South of the proposed development. The proposed development will outlet directly to the Whitson River tributary through a storm outlet pipe from the proposed Stormwater management pond.

3.3.2 Proposed Storm Servicing

The background IDF and Regional Storm (Timmins) information are mentioned in section 4.2 of this report. The minor system pipes for the proposed development will be sized based on the rational method using the 2-year storm IDF. As mentioned in section 3.3.1, the storm water outlet from the pond will connect to the Whitson River Tributary crossing the wetlands between the proposed development and Whitson River Tributary. Design of the outlet will be provided during the detailed design stages of the project.

4.0 STORMWATER MANAGEMENT PLAN

4.1 Storm Drainage Criteria

The following target stormwater management (SWM) requirements apply to the site and are based on Ministry of Environment stormwater management planning and design guidelines and City of Greater Sudbury Stormwater Management Guide. follows:

- Water Quantity:
    - The permissible minor storm discharge from the subject development must be limited to the existing pre-development site runoff resulting from a 2-year design storm.
    - The permissible major storm discharge from the subject development must be limited to the existing pre-development site runoff resulting from a 100-year design storm or regional storm event, whichever is greater.
- Water Quality: apply appropriate measures to ensure stormwater discharging from the site achieves enhanced level of 80% Total Suspended Solids (TSS) removal on an annual basis.
- Maintain existing drainage patterns, ensuring adjacent properties are not adversely affected.

4.2 Post-Development Allowable Storm Discharge

Based on the City of Greater Sudbury guidelines, the allowable peak discharge from the site is to be based on controlling the discharge rate to the existing condition. The runoff coefficient of C=0.20 for the 2-year pre-development condition was based on the existing condition of the site. As mentioned in section 2.2 of this report, the exiting site consists of natural grassed areas, bushy to dense shrubs, grass and mud trails and tree vegetation. A composite run off coefficient of C=0.20 was used in pre-development 2-year calculations. To determine the pre-development release rate during the 100-year storm event, the runoff coefficient was increased by a factor of 25% per City of Greater Sudbury Stormwater Management Guide. Hence, a runoff coefficient of 0.25 was used to determine the release rate during the 100-year and Regional Storm event (Timmins storm). The greater of these two storm events will be the allowable discharge during the major storm event (100-year and Timmins storm). The allowable peak discharge rate from the Drainage Area can be calculated using the rational method:

$$Q_{allowable} = 2.78\ x\ CiA$$

Table 4.1 – IDF Parameters

Storm Event	A	B	C
2-year	429.375	4.25	0.7325
100-year	1093	3.656	0.735

Table 4.2 – Timmins Storm

Time (h)	1	2	3	4	5	6	7	8	9	10	11	12	Total
Incremental Precipitation (mm)	15	20	10	3	5	20	43	20	23	13	13	8	**193**

2-year allowable release rate = 78 L/s.

100-year allowable release rate = 256 L/s.

Timmins storm release rate = 231 L/s.

Based on the above results, the **2-year** storm event will be restricted to the allowable release rate of **78 L/s** and the **100-year and Timmins** storm event will be restricted to the allowable release rate of **256 L/s** during the post-development conditions of the development.

4.3 Proposed Stormwater Management

4.3.1 SWM Plan Description and Summary

The configuration of the proposed development will increase the discharge from the existing conditions. However, to mitigate this scenario, stormwater management pond is proposed to the southwest of the development. The SWM pond will store the 100-year and Timmins storm post development flows from the proposed development. The pond is sized with 1: 3 side slopes with 1.8m active storage volume depth for Water Quantity and 1.2m for permanent pool and sediment forebay for Water Quality purposes. The SWM pond parameters are designed based on MOE SWM planning and design manual Table 3-2 for wet ponds.

4.3.2 Water Quantity

For the purpose of calculating the proposed discharge rates and required detention volumes for each Phase, rational method (excel sheet) was created to simulate the storage and discharge characteristics of the site, based on the peak flows and storage requirements within the drainage areas of the site.

Based on City of Greater Sudbury Stormwater Management Guide, the runoff coefficient for the post development catchments areas were assigned 0.55 for single family for 2-year storm. For 100-year and Timmins storm events, 25% increase was added to the run-off coefficient values based on the SWM Criteria of CGS. The post development detailed calculation is attached in Appendix of this submission for 2 years, 100-year and Timmins storm for the development.

Table 4.3 – Active Storage Requirement and Release Rate

Storm Event	Storage Required (m^3)	Storage Provided (m^3)	Allowable Release Rate (m^3/s)
2-year	584	5500	0.078
100-year	1795	5500	0.256
Timmins Storm	1883	5500	0.256

As discussed in subsection 4.2, the peak discharge up to 100-year storm event and Timmins storm event will be maintained to the allowable discharge rate with orifice plate installed at the outlet of the regional pond. The detailed calculation of orifice and outlet details will be provided during the detailed design. Both the 100-year and Timmins storm events are stored within the pond. To mitigate the impact of storm events greater than the 100-year event, an emergency spillway will be provided along the southern side of the pond.

4.3.3 Water Quality

The pond will be sized with permanent pool storage and sediment for forebay for settling purposes. Based on MOE table 3.2, for normal 80% long term Suspended Solids removal for the impervious level of **55%,** the storage volume required is **190m^3/ha**, out of which **40m^3/ha** is for extended detention. The required storage volume for **permanent pool** is **1158m^3** and the required **extended detention** volume is **309m^3** which can be incorporated within the pond active storage control volume.

Table 4.4 – Permanent Pool Storage Volume –Pond

Stage m	Pond Elevation m	Surface Area m^2	Total Volume m^3
0	288.200	1631	0
1.2	289.400	2402	2406

The sediment forebay will be designed in the permanent pool area using the design peak flow, settling distance, dispersion length and forebay berm. The above details will be discussed during the detailed design stages of the project. The sediment forebay will be designed based on the water Quality storm.

5.0 EROSION AND SEDIMENT CONTROL

Measures are to be taken during construction to ensure that erosion and/or transportation of sediments off and on-site are controlled. Erosion plans are to be developed during site plan approval for each phase separately. Mitigation measures include:

- Erection of sediment control fence prior to construction, and maintenance throughout construction activities.

- Construction of a clear-stone “mud-mat” at construction site exists to control the tracking of sediments off-site from the tires of vehicles.
- Installation of sediment control measures on catch basins and maintenance throughout construction activities.
- Use of watering for dust control.
- Periodic cleaning of catch basin sumps throughout the construction activities.
- Application to the City for a permit to discharge construction water, including the testing and sediment removal pre-pumping measures.

6.0 CONCLUSION

With respect to the proposed Laura Subdivision development, the proposed site servicing and stormwater management system will address the requirements of the City of Greater Sudbury, as follows:

Water

A peak water demand of 79.22 L/s has been estimated for the proposed development.

The existing watermains impacted by the proposed development have sufficient water capacity and pressure to support the water demands of the proposed development.

Sanitary

The total proposed peak sanitary flow from the development is 9.32 L/s.

The existing sewage mains along Carmen St, Roger St and Roy Ave have sufficient capacity to convey the sanitary flows from the proposed development.

The existing sanitary lift station at Spruce St must be upgraded to accommodate the sanitary flows from the proposed development.

Storm

All storm runoff leaving the site from the 2-year post development condition will be controlled to the 2-year pre-development flow rate and the 100-year and Timmins storm post development condition will be controlled to the 100-year pre-development flow rate.

All captured runoffs will be treated by wet pond with permanent pool and sediment forebay for settling. This quality treatment will be sized to achieve ‘enhanced’ levels of 80% TSS removal for the overall development.

Updated and detailed calculations and sizing of all storms, sanitary, and water services and appurtenances will be provided at the time of detailed design.

We trust that this report satisfies the requirements of the City of Greater Sudbury with respect to the subject development. Should you have any questions, please do not hesitate to contact the undersigned.

NADIM MRAD, P.ENG

N.A.J.M ENGINEERING LTD

APPENDIX

STORM, SANITARY AND WATER DEMAND CALCULATIONS AND BACKGROUND INFORMATION

WATERMAIN DESIGN CRITERIA (Chapter 3 CGS - Engineering Design Manual)

Population Density	3	PPU
Average Day Flow	360	L/Cap/day
Maximum Day Peak Factor	1.8	x AVG FLOW
Peak Hour Factor	2.7	x AVG FLOW

DOMESTIC WATER DEMAND CALCULATION

Total Units	125	
Population	375	
Average Day Flow (L/s)	1.56	L/s
Maximum Day Demand	2.81	L/s
Peak Hour Demand	4.22	L/s

FIRE FLOW DEMAND

Based on Section 3.1.1 Design Water Demands - Fire Flows

Fire Flow Demand	75 L/s	(R1 and R2 Zone Subdivisions)

RESIDENTIAL PEAKING FACTORS			
System	**Min. Hour**	**Max. Hour**	**Max. Day**
Capreol	0.5	3.0	2.0
Coniston	0.45	3.38	2.25
Copper Cliff	0.45	3.38	2.25
Dowling	0.45	3.75	2.5
Falconbridge	0.4	4.13	2.75
Garson	0.5	3.0	2.0
Levack	0.45	3.75	2.5
Lively	0.5	3.0	2.0
Onaping	0.4	4.13	3.75
Sudbury	0.7	2.48	1.65
Wahnapitae	4.5	3.75	2.50
Walden (including Mikkola, Naughton, Whitefish)	0.5	3.0	2.0
Valley (including Hanmer, Val Therese, Val Caron, McCrea Hts., Blezard, Azilda, Chelmsford)	0.65	2.7	1.8

Table 3.1

PEAK SANITARY DESIGN FLOWS

ROW HOUSING (UNITS) (2.1PPU)	0	
SINGLE FAMILY (UNITS) (3.0 PPU)	125	
POPULATION	375	
q = Average Daily Domestic flow per capita (L/cap/day)	360	(Valley East Location)
Harmon Peaking Factor	4.04	
I = Extraneous Flow (L/s/ha)	0.39	
A = Tributary Area (ha)	7.72	
Qp = Peak residential sanitary sewage flow	**9.32**	**L/s**

2.0. Design Of Sanitary Sewers

2.1. Design Flows

2.1.1. Residential Flows

Delete the following:

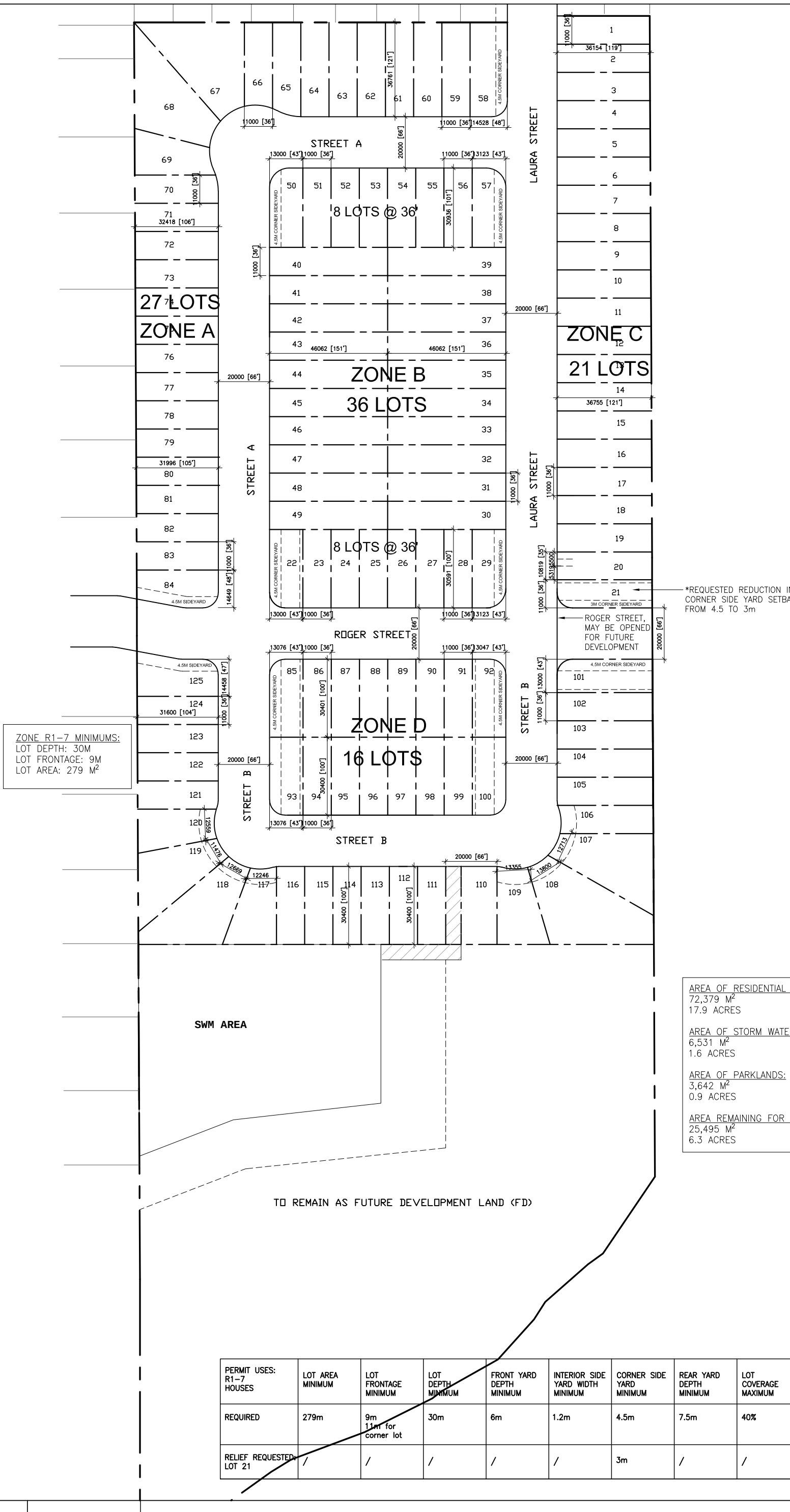
1. The average daily residential flows of 225 to 450 L/cap/day shall be used in the design for sizing the pipe.

Add in the following:

1. The average daily residential flows used for sizing the pipe are to follow the community flows from the below table for the community the system will be connected to.

RECOMMENDED DESIGN FLOWS BY LOCATION

LOCATION	PER CAPITA FLOW RATE	UNITS OF PEAK EXTRANEOUS FLOW				
	ℓ/cap/day	ℓ/ha/s			ℓ/ha/day	ℓ/ha/day
		Existing		New	Existing	New
Azilda	360	0.26		0.26	22450	22450
Capreol	500	0.39		0.39	33700	33700
Chelmsford	360	0.39		0.39	33700	33700
Coniston	410	0.39		0.39	33700	33700
Copper Cliff	500	0.26		0.39	22450	33700
Dowling	360	0.39		0.39	33700	33700
Falconbridge	410	0.39		0.39	33700	33700
Garson	360	0.13		0.13	11250	11250
Levack	410	0.26		0.26	22450	22450
Lively	410	0.39		0.39	33700	33700
Mikkola	360	0.39		0.39	33700	33700
Onaping	410	0.39		0.39	33700	33700
Sudbury	410	0.39 Over 40 ha	0.52 under 40 ha	0.20	33700 over 40 ha	44900 under 40 ha	17280
Valley East	360	0.39		0.39	33700	33700
Walden	450	0.21		0.21	18050	18050



ZONE R1–7 MINIMUMS:
LOT DEPTH: 30M
LOT FRONTAGE: 9M
LOT AREA: 279 M^2

AREA OF RESIDENTIAL DEVELOPMENT:
72,379 M^2
17.9 ACRES

AREA OF STORM WATER MANAGEMENT:
6,531 M^2
1.6 ACRES

AREA OF PARKLANDS:
3,642 M^2
0.9 ACRES

AREA REMAINING FOR FUTURE DEVELOPMENT:
25,495 M^2
6.3 ACRES

PERMIT USES: R1–7 HOUSES	LOT AREA MINIMUM	LOT FRONTAGE MINIMUM	LOT DEPTH MINIMUM	FRONT YARD DEPTH MINIMUM	INTERIOR SIDE YARD WIDTH MINIMUM	CORNER SIDE YARD MINIMUM	REAR YARD DEPTH MINIMUM	LOT COVERAGE MAXIMUM	MAXIMUM BUILDING HEIGHT
REQUIRED	279m	9m 11m for corner lot	30m	6m	1.2m	4.5m	7.5m	40%	11m
RELIEF REQUESTED: LOT 21	/	/	/	/	/	3m	/	/	/

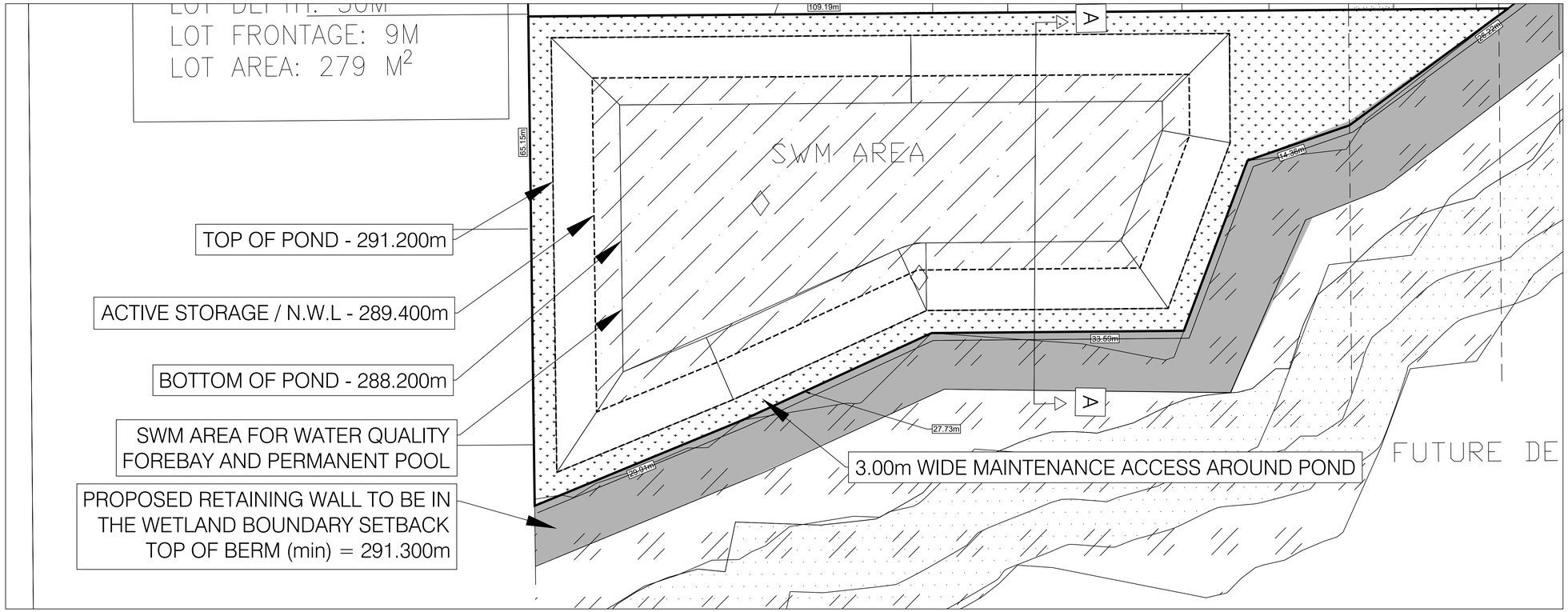
SHIELD CONSULTING ENGINEERS LTD.

SCALE: 1:1500
JUNE 27 2024

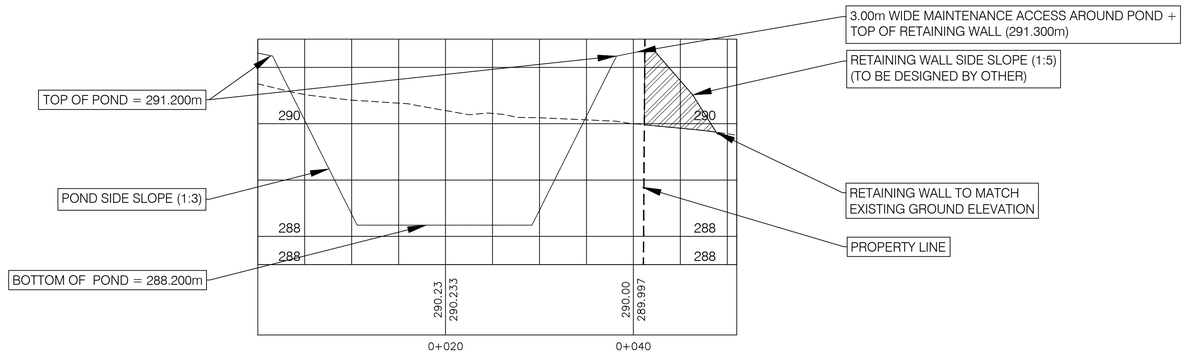
HANMER DREAMHOMES
PROPOSED SUBDIVISION LAYOUT

LAURA STREET
HANMER, ON

DRAFT SITE PLAN



POND AND RETAINING WALL PROFILE



KEY PLAN:

SCALE= N.T.S

LEGEND:

NOTES:

REVISIONS

No.	DATE	DESCRIPTION
01	----------	ISSUED FOR DISCUSSION

STAMP:

ENGINEER:

N.A.J.M. ENGINEERING LTD.
5590 OUTER DRIVE, UNIT 4
OLDCASTLE, ON N9G 0C3 +1(519)300-1705

CLIENT:

SHEET TITLE:

SWM POND

ADDRESS:

LAURA St, SUDBURY, ON

DRAWN BY:	R.S./G.S.	SCALE:	1:300
DESIGNED BY:	R.S./G.S.	DATE:	
CHECKED BY:	N.M.	JOB #:	24108
APPROVED BY:	N.M.	DRAWING #:	-

PLOT DATE: July 3, 2024 12:01:43 PM

N.A.J.M ENGINEERING LTD

PROJECT NAME:	**LAURA SUBDIVISION**
PROJECT NO	**24108**
DATE	**3/4/2024**

0.7325

Return Period (Year)	A	B	C
2	429.4	4.25	0.7325
5	600.9	4	0.7325
10	726.6	3.94	0.74
25	847	3.94	0.74
50	986.3	3.75	0.7375
100	1093	3.66	0.7375

I =	**A /((T+B)^C)**
I=	**Intensity**
T=	**Duration of Rainfall**
A,B.C =	**Coeffıcients**

PRE-DEVELOPMENT FLOW CALCULATIONS

Storm event =	**2 year**
A =	429.4
B =	4.25
C=	0.7325

Intensity I =	A/(T+B)^C	mm/hr
Discharge / Flow Q =	2.78*A*C	L/s

SITE / CATCHMENT PARAMETERS		
CATCHMENT ID =	**EXISTING**	
Runoff Coefficient 'C' =	0.20	
Area A =	7.72	ha

Time of Concentration Calculation		
Flow Length L	420	m
Runoff Coefficient C =	0.20	
Slope S =	0.6	%
Time of Concentration T =	71	min.

Time (t)	**INTENSITY (I)**	**A x C**	**Q (pre)**
(min.)	**(mm/hr)**	**(ha)**	**(L/s)**
5	84	1.5440	*361*
10	61	1.5440	*263*
71	18	**1.5440**	***78***
80	17	1.5440	*72*

Pre-development Release Rate = **78** **L/s**

PRE-DEVELOPMENT FLOW CALCULATIONS

Storm event =	**100 year**
A =	1093
B =	3.656
C=	0.735

Intensity I =	A/(T+B)^C	mm/hr
Discharge / Flow Q =	2.78*A*C	L/s

SITE / CATCHMENT PARAMETERS		
CATCHMENT ID =	**EXISTING**	
Runoff Coefficient 'C' =	0.21	
Area A =	7.72	ha

Time of Concentration Calculation		
Flow Length L	420	m
Runoff Coefficient C =	0.25	(25% increased)
Slope S =	0.6	%
Time of Concentration T =	67	min.

Time (t)	**INTENSITY (I)**	**A x C**	**Q (pre)**
(min.)	**(mm/hr)**	**(ha)**	**(L/s)**
5	224	1.9300	*1200*
10	160	1.9300	*859*
67	48	**1.9300**	***256***
80	42	1.9300	*227*

Pre-development Release Rate = **256** **L/s**

TIMMINS STORM (PRE-DEVELOPMENT)

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Time (minutes)	Intensity(mm/hr)	C Value	Area (km2)	Q(Total)
0	15	0.25	0.0772	0.080
60	15	0.25	0.0772	0.080
120	20	0.25	0.0772	0.107
180	10	0.25	0.0772	0.054
240	3	0.25	0.0772	0.016
300	5	0.25	0.0772	0.027
360	20	0.25	0.0772	0.107
420	43	0.25	0.0772	0.231
480	20	0.25	0.0772	0.107
540	23	0.25	0.0772	0.123
600	13	0.25	0.0772	0.070
660	13	0.25	0.0772	0.070
720	8	0.25	0.0772	0.043

POST-DEVELOPMENT FLOW CALCULATIONS

Storm event =	**2 year**
A =	429.375
B =	4.25
C=	0.7325

Intensity I =	A/(T+B)^C	mm/hr
Discharge / Flow Q =	2.78*A*C	L/s

SITE / CATCHMENT PARAMETERS		
CATCHMENT ID =	**A1**	
Runoff Coefficient 'C' =	0.55	
Area A =	7.72	ha

Time (t) (min.)	INTENSITY (I) (mm/hr)	A x C (ha)	Q (post) (L/s)	STORM VOL. (L)	RELEASE RATE (L/s)	RELEASE VOL. (L)	REQUIRED STORAGE (L)	REQUIRED STORAGE m^3
5	84	4.246	*993*	*298046.5*	78.00	23400	274646.5	274.6
10	61	4.246	*724*	*434353.6*	78.00	46800	387553.6	387.6
20	42	4.246	*490*	*588493.2*	78.00	93600	494893.2	494.9
30	32	4.246	*381*	*685480.6*	78.00	140400	545080.6	545.1
40	*27*	*4.246*	*316*	*757602.3*	78.00	*187200*	*570402.3*	570.4
50	23	4.246	*272*	*815708.5*	78.00	234000	581708.5	581.7
60	***20***	***4.246***	***240***	***864762.7***	***78.00***	***280800***	***583962.7***	***584.0***
70	18	4.246	*216*	*907456.2*	78.00	327600	579856.2	579.9
80	17	4.246	*197*	*945415.7*	78.00	374400	571015.7	571.0
85	16	4.246	*189*	*962966.5*	78.00	397800	565166.5	565.2
90	15	4.246	*181*	*979702.5*	78.00	421200	558502.5	558.5
95	15	4.246	*175*	*995706.4*	78.00	444600	551106.4	551.1
100	14	4.246	*169*	*1011048.7*	78.00	468000	543048.7	543.0
105	14	4.246	*163*	*1025789.8*	78.00	491400	534389.8	534.4
110	13	4.246	*158*	*1039982.0*	78.00	514800	525182.0	525.2
115	13	4.246	*153*	*1053670.6*	78.00	538200	515470.6	515.5
120	13	4.246	*148*	*1066895.6*	78.00	561600	505295.6	505.3
125	12	4.246	*144*	*1079692.1*	78.00	585000	494692.1	494.7
130	12	4.246	*140*	*1092091.2*	78.00	608400	483691.2	483.7
135	12	4.246	*136*	*1104120.8*	78.00	631800	472320.8	472.3
140	11	4.246	*133*	*1115805.5*	78.00	655200	460605.5	460.6
145	11	4.246	*130*	*1127167.7*	78.00	678600	448567.7	448.6
150	11	4.246	*126*	*1138227.6*	78.00	702000	436227.6	436.2
155	10	4.246	*124*	*1149003.4*	78.00	725400	423603.4	423.6
160	10	4.246	*121*	*1159511.6*	78.00	748800	410711.6	410.7
165	10	4.246	*118*	*1169767.3*	78.00	772200	397567.3	397.6
170	10	4.246	*116*	*1179784.4*	78.00	795600	384184.4	384.2
175	10	4.246	*113*	*1189575.5*	78.00	819000	370575.5	370.6

TOTAL ALLOWABLE RELEASE RATE ***78 L/s***

TOTAL STORAGE REQUIRED - 2YR ***584.0 cu.m***

POST-DEVELOPMENT FLOW CALCULATIONS

Storm event =	**100 year**
A =	1093
B =	3.656
C=	0.7325

Intensity I =	A/(T+B)^C	mm/hr
Discharge / Flow Q =	2.78*A*C	L/s

SITE / CATCHMENT PARAMETERS		
CATCHMENT ID =	**A1**	
Runoff Coefficient 'C' =	0.68	(Increased by 25%)
Area A =	7.72	ha

Time (t) (min.)	INTENSITY (I) (mm/hr)	A x C (ha)	Q (post) (L/s)	STORM VOL. (L)	RELEASE RATE (L/s)	RELEASE VOL. (L)	REQUIRED STORAGE (L)	REQUIRED STORAGE m^3
5	225	5.250	*3283*	*984753.5*	256.00	76800	907953.5	908.0
10	161	5.250	*2351*	*1410320.9*	256.00	153600	1256720.9	1256.7
20	108	5.250	*1572*	*1886081.3*	256.00	307200	1578881.3	1578.9
30	83	5.250	*1214*	*2185196.0*	256.00	460800	1724396.0	1724.4
40	*69*	*5.250*	*1003*	*2408076.2*	256.00	*614400*	*1793676.2*	*1793.7*
50	**59**	**5.250**	***863***	***2588016.4***	**256.00**	**768000**	**1820016.4**	**1820.0**
60	52	5.250	*761*	*2740194.3*	256.00	921600	1818594.3	1818.6
70	47	5.250	*684*	*2872833.8*	256.00	1075200	1797633.8	1797.6
80	43	5.250	*623*	*2990909.6*	256.00	1228800	1762109.6	1762.1
85	41	5.250	*597*	*3045545.8*	256.00	1305600	1739945.8	1739.9
90	39	5.250	*574*	*3097669.6*	256.00	1382400	1715269.6	1715.3
95	38	5.250	*552*	*3147534.9*	256.00	1459200	1688334.9	1688.3
100	36	5.250	*533*	*3195357.8*	256.00	1536000	1659357.8	1659.4
105	35	5.250	*514*	*3241323.5*	256.00	1612800	1628523.5	1628.5
110	34	5.250	*498*	*3285592.5*	256.00	1689600	1595992.5	1596.0
115	33	5.250	*482*	*3328304.5*	256.00	1766400	1561904.5	1561.9
120	32	5.250	*468*	*3369582.1*	256.00	1843200	1526382.1	1526.4
125	31	5.250	*455*	*3409533.2*	256.00	1920000	1489533.2	1489.5
130	30	5.250	*442*	*3448253.8*	256.00	1996800	1451453.8	1451.5
135	29	5.250	*430*	*3485829.3*	256.00	2073600	1412229.3	1412.2
140	29	5.250	*419*	*3522336.1*	256.00	2150400	1371936.1	1371.9
145	28	5.250	*409*	*3557843.0*	256.00	2227200	1330643.0	1330.6
150	27	5.250	*399*	*3592412.1*	256.00	2304000	1288412.1	1288.4
155	27	5.250	*390*	*3626099.6*	256.00	2380800	1245299.6	1245.3
160	26	5.250	*381*	*3658956.6*	256.00	2457600	1201356.6	1201.4
165	26	5.250	*373*	*3691029.8*	256.00	2534400	1156629.8	1156.6
170	25	5.250	*365*	*3722361.7*	256.00	2611200	1111161.7	*1111.2*
175	24	5.250	*357*	*3752991.4*	256.00	2688000	1064991.4	1065.0

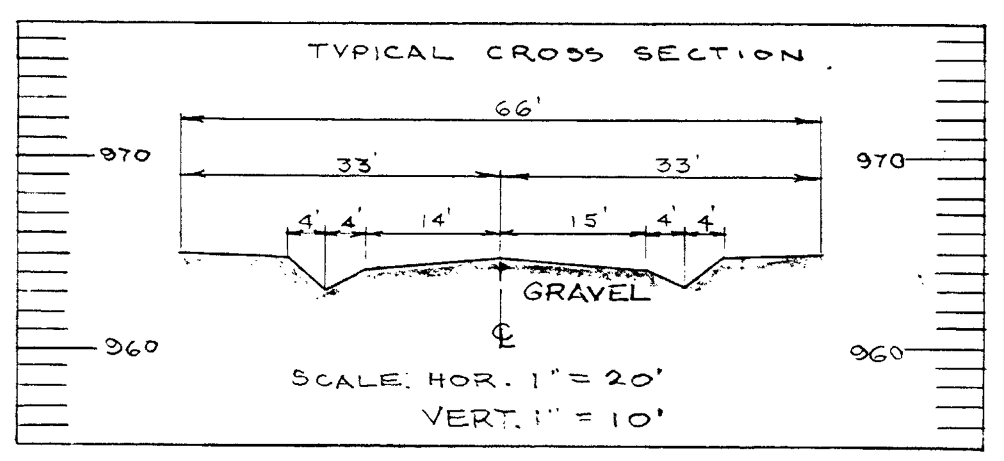
TOTAL ALLOWABLE RELEASE RATE ***256 L/s***

TOTAL STORAGE REQUIRED - 2YR ***1820.0 cu.m***

Time (minutes)	Intensity(mm/hr)	C Value	Area (km2)	Q(Total) (m3/s)	Q(Allowable) (m3/s)	Qdelta	Volume (Qdelta*60(minutes)*5=m3	Consecutive Volume Required (m3)
0	15	0.68	0.0772	0.219	0.256	-0.03709168	-11.127504	0
5	15	0.68	0.0772	0.219	0.256	-0.03709168	-11.127504	0
10	15	0.68	0.0772	0.219	0.256	-0.03709168	-11.127504	0
15	15	0.68	0.0772	0.219	0.256	-0.03709168	-11.127504	0
20	15	0.68	0.0772	0.219	0.256	-0.03709168	-11.127504	0
25	15	0.68	0.0772	0.219	0.256	-0.03709168	-11.127504	0
30	15	0.68	0.0772	0.219	0.256	-0.03709168	-11.127504	0
35	15	0.68	0.0772	0.219	0.256	-0.03709168	-11.127504	0
40	15	0.68	0.0772	0.219	0.256	-0.03709168	-11.127504	0
45	15	0.68	0.0772	0.219	0.256	-0.03709168	-11.127504	0
50	15	0.68	0.0772	0.219	0.256	-0.03709168	-11.127504	0
55	15	0.68	0.0772	0.219	0.256	-0.03709168	-11.127504	0
60	15	0.68	0.0772	0.219	0.256	-0.03709168	-11.127504	0
65	20	0.68	0.0772	0.292	0.256	0.03587776	10.763328	11
70	20	0.68	0.0772	0.292	0.256	0.03587776	10.763328	22
75	20	0.68	0.0772	0.292	0.256	0.03587776	10.763328	32
80	20	0.68	0.0772	0.292	0.256	0.03587776	10.763328	43
85	20	0.68	0.0772	0.292	0.256	0.03587776	10.763328	54
90	20	0.68	0.0772	0.292	0.256	0.03587776	10.763328	65
95	20	0.68	0.0772	0.292	0.256	0.03587776	10.763328	75
100	20	0.68	0.0772	0.292	0.256	0.03587776	10.763328	86
105	20	0.68	0.0772	0.292	0.256	0.03587776	10.763328	97
110	20	0.68	0.0772	0.292	0.256	0.03587776	10.763328	108
115	20	0.68	0.0772	0.292	0.256	0.03587776	10.763328	118
120	20	0.68	0.0772	0.292	0.256	0.03587776	10.763328	129
125	10	0.68	0.0772	0.146	0.256	-0.11006112	-33.018336	96
130	10	0.68	0.0772	0.146	0.256	-0.11006112	-33.018336	63
135	10	0.68	0.0772	0.146	0.256	-0.11006112	-33.018336	30
140	10	0.68	0.0772	0.146	0.256	-0.11006112	-33.018336	0
145	10	0.68	0.0772	0.146	0.256	-0.11006112	-33.018336	0
150	10	0.68	0.0772	0.146	0.256	-0.11006112	-33.018336	0
155	10	0.68	0.0772	0.146	0.256	-0.11006112	-33.018336	0
160	10	0.68	0.0772	0.146	0.256	-0.11006112	-33.018336	0
165	10	0.68	0.0772	0.146	0.256	-0.11006112	-33.018336	0
170	10	0.68	0.0772	0.146	0.256	-0.11006112	-33.018336	0
175	10	0.68	0.0772	0.146	0.256	-0.11006112	-33.018336	0
180	10	0.68	0.0772	0.146	0.256	-0.11006112	-33.018336	0
185	3	0.68	0.0772	0.044	0.256	-0.212218336	-63.6655008	0
190	3	0.68	0.0772	0.044	0.256	-0.212218336	-63.6655008	0
195	3	0.68	0.0772	0.044	0.256	-0.212218336	-63.6655008	0
200	3	0.68	0.0772	0.044	0.256	-0.212218336	-63.6655008	0
205	3	0.68	0.0772	0.044	0.256	-0.212218336	-63.6655008	0
210	3	0.68	0.0772	0.044	0.256	-0.212218336	-63.6655008	0
215	3	0.68	0.0772	0.044	0.256	-0.212218336	-63.6655008	0

Time (minutes)	Intensity(mm/hr)	C Value	Area (km2)	Q(Total) (m3/s)	Q(Allowable) (m3/s)	Qdelta	Volume (Qdelta*60(minutes)*5=m3	Consecutive Volume Required (m3)
220	3	0.68	0.0772	0.044	0.256	-0.212218336	-63.6655008	0
225	3	0.68	0.0772	0.044	0.256	-0.212218336	-63.6655008	0
230	3	0.68	0.0772	0.044	0.256	-0.212218336	-63.6655008	0
235	3	0.68	0.0772	0.044	0.256	-0.212218336	-63.6655008	0
240	3	0.68	0.0772	0.044	0.256	-0.212218336	-63.6655008	0
245	5	0.68	0.0772	0.073	0.256	-0.18303056	-54.909168	0
250	5	0.68	0.0772	0.073	0.256	-0.18303056	-54.909168	0
255	5	0.68	0.0772	0.073	0.256	-0.18303056	-54.909168	0
260	5	0.68	0.0772	0.073	0.256	-0.18303056	-54.909168	0
265	5	0.68	0.0772	0.073	0.256	-0.18303056	-54.909168	0
270	5	0.68	0.0772	0.073	0.256	-0.18303056	-54.909168	0
275	5	0.68	0.0772	0.073	0.256	-0.18303056	-54.909168	0
280	5	0.68	0.0772	0.073	0.256	-0.18303056	-54.909168	0
285	5	0.68	0.0772	0.073	0.256	-0.18303056	-54.909168	0
290	5	0.68	0.0772	0.073	0.256	-0.18303056	-54.909168	0
295	5	0.68	0.0772	0.073	0.256	-0.18303056	-54.909168	0
300	5	0.68	0.0772	0.073	0.256	-0.18303056	-54.909168	0
305	20	0.68	0.0772	0.292	0.256	0.03587776	10.763328	11
310	20	0.68	0.0772	0.292	0.256	0.03587776	10.763328	22
315	20	0.68	0.0772	0.292	0.256	0.03587776	10.763328	32
320	20	0.68	0.0772	0.292	0.256	0.03587776	10.763328	43
325	20	0.68	0.0772	0.292	0.256	0.03587776	10.763328	54
330	20	0.68	0.0772	0.292	0.256	0.03587776	10.763328	65
335	20	0.68	0.0772	0.292	0.256	0.03587776	10.763328	75
340	20	0.68	0.0772	0.292	0.256	0.03587776	10.763328	86
345	20	0.68	0.0772	0.292	0.256	0.03587776	10.763328	97
350	20	0.68	0.0772	0.292	0.256	0.03587776	10.763328	108
355	20	0.68	0.0772	0.292	0.256	0.03587776	10.763328	118
360	20	0.68	0.0772	0.292	0.256	0.03587776	10.763328	129
365	43	0.68	0.0772	0.628	0.256	0.371537184	111.4611552	241
370	43	0.68	0.0772	0.628	0.256	0.371537184	111.4611552	352
375	43	0.68	0.0772	0.628	0.256	0.371537184	111.4611552	464
380	43	0.68	0.0772	0.628	0.256	0.371537184	111.4611552	575
385	43	0.68	0.0772	0.628	0.256	0.371537184	111.4611552	686
390	43	0.68	0.0772	0.628	0.256	0.371537184	111.4611552	798
395	43	0.68	0.0772	0.628	0.256	0.371537184	111.4611552	909
400	43	0.68	0.0772	0.628	0.256	0.371537184	111.4611552	1021
405	43	0.68	0.0772	0.628	0.256	0.371537184	111.4611552	1132
410	43	0.68	0.0772	0.628	0.256	0.371537184	111.4611552	1244
415	43	0.68	0.0772	0.628	0.256	0.371537184	111.4611552	1355
420	43	0.68	0.0772	0.628	0.256	0.371537184	111.4611552	1467
425	20	0.68	0.0772	0.292	0.256	0.03587776	10.763328	1477
430	20	0.68	0.0772	0.292	0.256	0.03587776	10.763328	1488
435	20	0.68	0.0772	0.292	0.256	0.03587776	10.763328	1499
440	20	0.68	0.0772	0.292	0.256	0.03587776	10.763328	1510
445	20	0.68	0.0772	0.292	0.256	0.03587776	10.763328	1521
450	20	0.68	0.0772	0.292	0.256	0.03587776	10.763328	1531

Time (minutes)	Intensity(mm/hr)	C Value	Area (km2)	Q(Total) (m3/s)	Q(Allowable) (m3/s)	Qdelta	Volume (Qdelta*60(minutes)*5=m3	Consecutive Volume Required (m3)
455	20	0.68	0.0772	0.292	0.256	0.03587776	10.763328	1542
460	20	0.68	0.0772	0.292	0.256	0.03587776	10.763328	1553
465	20	0.68	0.0772	0.292	0.256	0.03587776	10.763328	1564
470	20	0.68	0.0772	0.292	0.256	0.03587776	10.763328	1574
475	20	0.68	0.0772	0.292	0.256	0.03587776	10.763328	1585
480	20	0.68	0.0772	0.292	0.256	0.03587776	10.763328	1596
485	23	0.68	0.0772	0.336	0.256	0.079659424	23.8978272	1620
490	23	0.68	0.0772	0.336	0.256	0.079659424	23.8978272	1644
495	23	0.68	0.0772	0.336	0.256	0.079659424	23.8978272	1668
500	23	0.68	0.0772	0.336	0.256	0.079659424	23.8978272	1691
505	23	0.68	0.0772	0.336	0.256	0.079659424	23.8978272	1715
510	23	0.68	0.0772	0.336	0.256	0.079659424	23.8978272	1739
515	23	0.68	0.0772	0.336	0.256	0.079659424	23.8978272	1763
520	23	0.68	0.0772	0.336	0.256	0.079659424	23.8978272	1787
525	23	0.68	0.0772	0.336	0.256	0.079659424	23.8978272	1811
530	23	0.68	0.0772	0.336	0.256	0.079659424	23.8978272	1835
535	23	0.68	0.0772	0.336	0.256	0.079659424	23.8978272	1859
540	23	0.68	0.0772	0.336	0.256	0.079659424	23.8978272	1883
545	13	0.68	0.0772	0.190	0.256	-0.066279456	-19.8838368	1863
550	13	0.68	0.0772	0.190	0.256	-0.066279456	-19.8838368	1843
555	13	0.68	0.0772	0.190	0.256	-0.066279456	-19.8838368	1823
560	13	0.68	0.0772	0.190	0.256	-0.066279456	-19.8838368	1803
565	13	0.68	0.0772	0.190	0.256	-0.066279456	-19.8838368	1783
570	13	0.68	0.0772	0.190	0.256	-0.066279456	-19.8838368	1763
575	13	0.68	0.0772	0.190	0.256	-0.066279456	-19.8838368	1743
580	13	0.68	0.0772	0.190	0.256	-0.066279456	-19.8838368	1724
585	13	0.68	0.0772	0.190	0.256	-0.066279456	-19.8838368	1704
590	13	0.68	0.0772	0.190	0.256	-0.066279456	-19.8838368	1684
595	13	0.68	0.0772	0.190	0.256	-0.066279456	-19.8838368	1664
600	13	0.68	0.0772	0.190	0.256	-0.066279456	-19.8838368	1644
605	13	0.68	0.0772	0.190	0.256	-0.066279456	-19.8838368	1624
610	13	0.68	0.0772	0.190	0.256	-0.066279456	-19.8838368	1604
615	13	0.68	0.0772	0.190	0.256	-0.066279456	-19.8838368	1584
620	13	0.68	0.0772	0.190	0.256	-0.066279456	-19.8838368	1564
625	13	0.68	0.0772	0.190	0.256	-0.066279456	-19.8838368	1545
630	13	0.68	0.0772	0.190	0.256	-0.066279456	-19.8838368	1525
635	13	0.68	0.0772	0.190	0.256	-0.066279456	-19.8838368	1505
640	13	0.68	0.0772	0.190	0.256	-0.066279456	-19.8838368	1485
645	13	0.68	0.0772	0.190	0.256	-0.066279456	-19.8838368	1465
650	13	0.68	0.0772	0.190	0.256	-0.066279456	-19.8838368	1445
655	13	0.68	0.0772	0.190	0.256	-0.066279456	-19.8838368	1425
660	13	0.68	0.0772	0.190	0.256	-0.066279456	-19.8838368	1405
665	8	0.68	0.0772	0.117	0.256	-0.139248896	-41.7746688	1364
670	8	0.68	0.0772	0.117	0.256	-0.139248896	-41.7746688	1322
675	8	0.68	0.0772	0.117	0.256	-0.139248896	-41.7746688	1280
680	8	0.68	0.0772	0.117	0.256	-0.139248896	-41.7746688	1238
685	8	0.68	0.0772	0.117	0.256	-0.139248896	-41.7746688	1197
690	8	0.68	0.0772	0.117	0.256	-0.139248896	-41.7746688	1155
695	8	0.68	0.0772	0.117	0.256	-0.139248896	-41.7746688	1113
700	8	0.68	0.0772	0.117	0.256	-0.139248896	-41.7746688	1071
705	8	0.68	0.0772	0.117	0.256	-0.139248896	-41.7746688	1029
710	8	0.68	0.0772	0.117	0.256	-0.139248896	-41.7746688	988
715	8	0.68	0.0772	0.117	0.256	-0.139248896	-41.7746688	946
720	8	0.68	0.0772	0.117	0.256	-0.139248896	-41.7746688	904
							Peak Storage Requirement =	1883 cu.m



MK.	BY	REVISIONS	APP.	DATE
	R.M.	AS CONSTRUCTED		FEB. 6/73
	K.B.	PLOTTED HSE. #4360		JULY / 75
	AGS	SERVICE BOX TIE - INS		JAN 12/77
D	M.J.C.	PLOTTED HOUSES 4289, 4329, & 53R-7140, 53R-6721		OCT. 17/77.
	L.M.	PLOTTED HSE # 4282, 53R-7670, 53R-5678, 53R-6164, 53R-6707, 53R-7473		1979-09-11
	R.B.	GASMAIN PLOTTED		1985-08-27
	D.V.	PLOTTED INFO FILE DATA		1986-07-17
		MICROFILMED 1986		
	D.W.L.	REPLOTTED HSE # 4289		1988-09-02

DWN. BY
CHKD. BY R. Grover
DATE APRIL 1971
SCALE HOR. 1" = 40' VERT. 1" = 10'

ONTARIO WATER RESOURCES COMMISSION

TOWNSHIP OF VALLEY EAST
PROVINCIAL SEWAGE WORKS PROJECT Nº 1-0039-66
PROVINCIAL WATER WORKS PROJECT N 5-0050-67
CONTRACT '22'

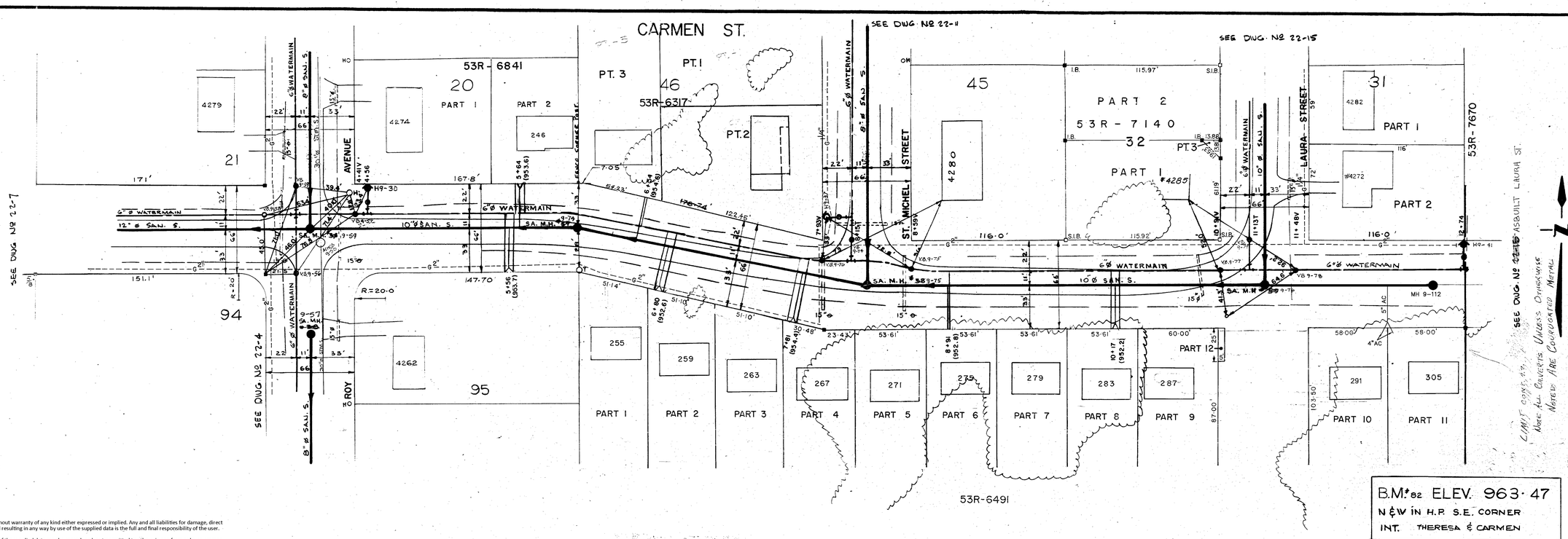
LAURA STREET
CARMEN ST. — EVA ST.

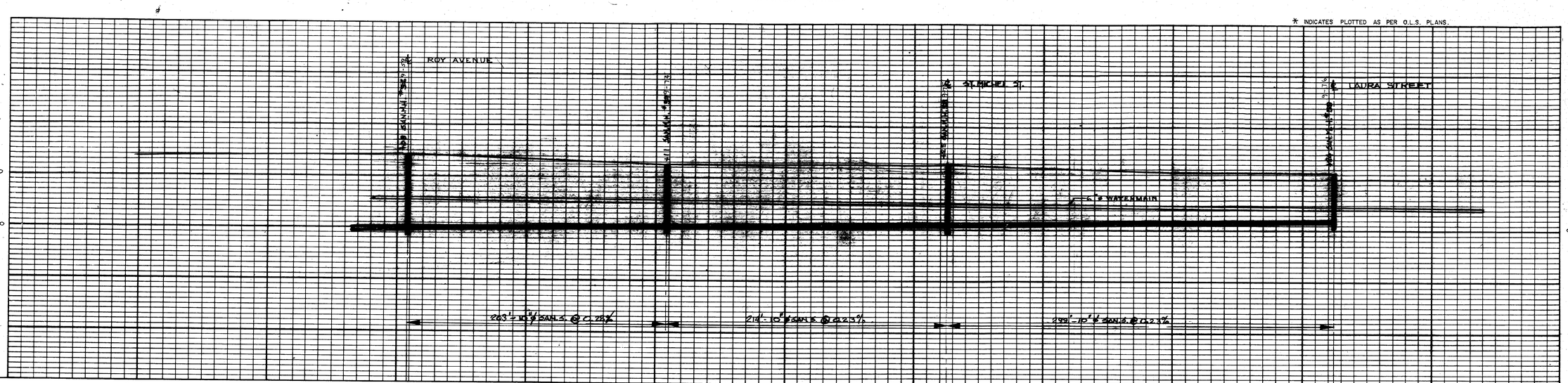
Northland Engineering
CONSULTING CIVIL ENGINEERS
NORTH BAY - SUDBURY - ONTARIO

No. SU-172

22-15

V.E. HANMER CARMEN ST. 4 OF 4





CHAINAGE	2+00	3+00	4+08	5+00	6+08.8	7+00	7+92.67 8+25.70	9+00	10+00	11+23.70	12+00
℄ ELEV.	963.7		964.3	963.2	962.4		962.5 962.7		961.1	961.1	
TOP SAN. M.H.EL.			968.92							960.70	
SAN. INV. EL			949.32 949.52		949.96		950.55			951.24	
TOP ST. M.H. EL											
ST. INV. E.L.											

NOTE: TYPICAL CROSS SECTION SEE 22-7

MK.	BY	REVISIONS	APP.	DATE
	R.M.	AS CONSTRUCTED		JAN.31/73
	M.J.C.	HOUSES PLOTTED (53R-6491 PARTS I THRU II)		OCT. 5/77.
C	R.H.	PLOTTED HOUSE 246 (PART 2 : 53R-6841)		NOV. 7/ 77
	J.W.	53R-7140		DEC. 20,1977
	L.M.	PLOTTED HSE № 4282 & 53R-7670		1979-09-11
	R.B.	GASMAIN PLOTTED		1985-08-28
		MICROFILMED 1996		
	D.C.L.	PAGE NUMBER REVISED		34-09-30
	SAG	ADDED MH 9-112 & SAN SERV TO BLDG 291 & 305		2017-09-25

REGISTERED PROFESSIONAL ENGINEER — CIVIL — LYLE M. KOETT — PROVINCE OF ONTARIO

DWN. BY AA
CHKD. BY WWK.
DATE APRIL 1971
SCALE HOR. 1"=40' VERT. 1"=10'

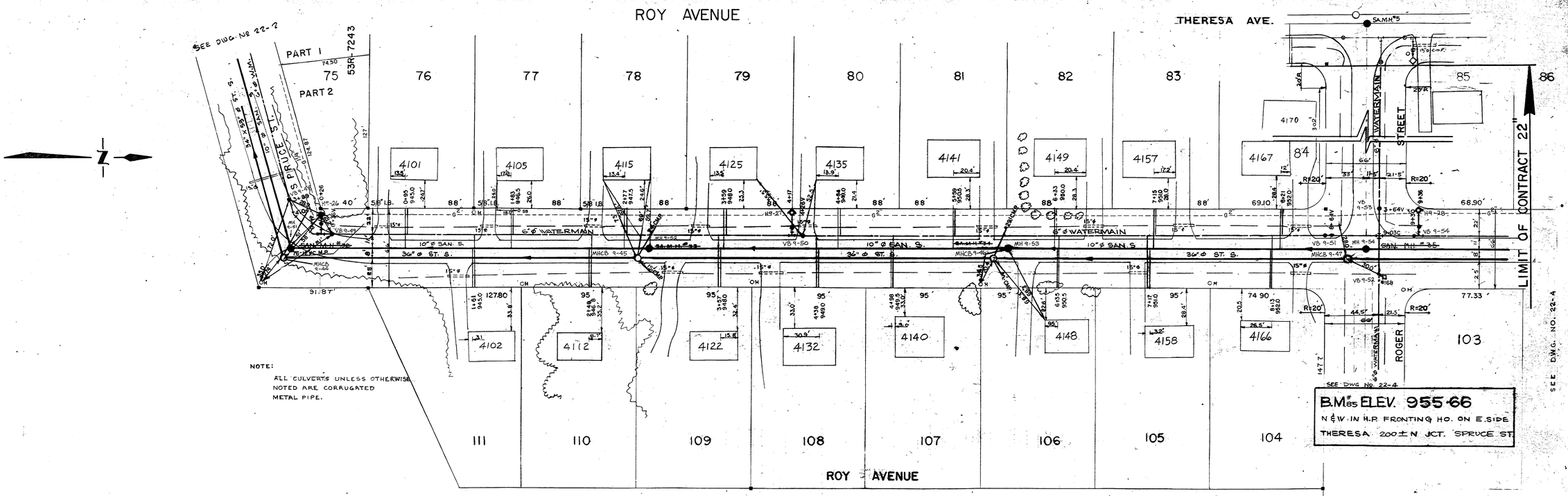
ONTARIO WATER RESOURCES COMMISSION
TOWNSHIP OF VALLEY EAST
PROVINCIAL SEWAGE WORKS PROJECT № 1-0039-66
PROVINCIAL WATER WORKS PROJECT № 5-0050-67
CONTRACT '22'
CARMEN STREET
ROY AVE. — LAURA ST.

Northland Engineering
CONSULTING CIVIL ENGINEERS
NORTH BAY - SUDBURY - ONTARIO

No. SU-172
22-10

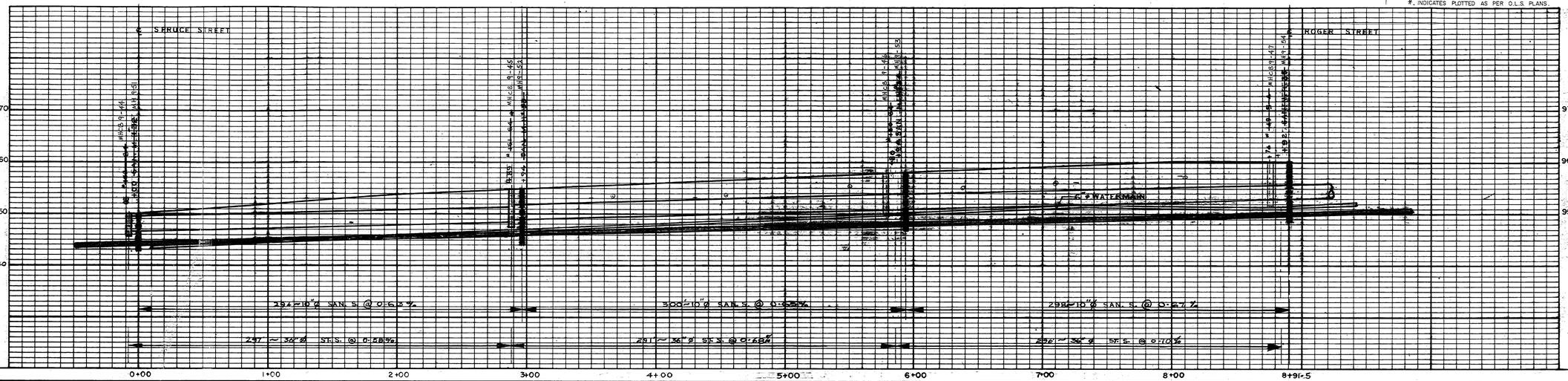
TRANSTEX 13 909-1-68

THERESA AVENUE
ROY AVENUE
LIMIT OF CONTRACT "22"
STREET
ROGER
CARMEN
MATCH LINE 20+56
SEE DWG. NO. 22-3
SEE DWG. NO. 22-7
SEE DWG. NO. 22-10
SEE DWG. NO. 22-5
PLAN 53R-5879
PART 1
PART 2
PART 3
PART 4
8" ⌀ SAN. S.
36" ⌀ ST. S.
6" ⌀ WATERMAIN
B.M. 85 EL. 955.66
N. 4 W. IN W. FACE H.P. 200'± NORTH ON E. SIDE
THERESA AVE. INTER. SPRUCE STREET
NOTE:
ALL CULVERTS UNLESS OTHERWISE
NOTED ARE CORRUGATED METAL PIPE
* INDICATES PLOTTED AS PER O.L.S. PLANS.
ROGER STREET
CARMEN STREET
6" ⌀ WATERMAIN
292'~8" ⌀ SAN. S. @ 0.25%
281'~8" ⌀ SAN. S. @ 0.24%
288'~8" ⌀ SAN. S. @ 0.26%
279'~8" ⌀ SAN. S. @ 0.28%
318'~36" ⌀ ST. S. @ 0.42%
318'~36" ⌀ ST. S. @ 0.26%
319'~36" ⌀ ST. S. @ 0.18%
317'~30" ⌀ ST. S. @ 0.29%
CHAINAGE
℄ ELEV.
TOP SAN. M.H. EL
SAN. INV. EL
TOP ST. M.H. EL
ST. INV. EL
NOTE: TYPICAL CROSS SECTION SEE 22-3
R.M. AS CONSTRUCTED JAN. 29-73
AS CONSTRUCTED APR. 10-73
R.B. GASMAIN PLOTTED 1985-08-26
MICROFILMED 1986
J.T. PLOTTED HSE. #4204 & HSE. ON LOT 94, PT. 1 1991-07-03
MK. BY REVISIONS APP. DATE
REGISTERED PROFESSIONAL ENGINEER
CIVIL
LYLE M. KOETT
PROVINCE OF ONTARIO
DWN. BY
CHKD. BY
DATE APR. 1971
SCALE HOR. 1"=40' VERT. 1"=10'
ONTARIO WATER RESOURCES COMMISSION
TOWNSHIP OF VALLEY EAST
PROVINCIAL SEWAGE WORKS PROJECT NO 1-0039-66
PROVINCIAL WATER WORKS PROJECT NO 5-0050-67
CONTRACT '22'
ROY AVENUE
ROGER ST. — CARMEN ST.
Northland Engineering
CONSULTING CIVIL ENGINEERS
NORTH BAY, SUDBURY, ONTARIO
No. SU-172
22-4
(2 OF 4)

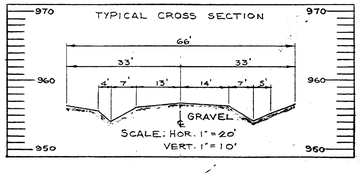


NOTE:
ALL CULVERTS UNLESS OTHERWISE NOTED ARE CORRUGATED METAL PIPE.

*. INDICATES PLOTTED AS PER O.L.S. PLANS.



CHAINAGE	0+00	1+00	2+00	3+00	4+00	5+00	6+00	7+00	8+00	8+91.5
℄ ELEV.	950.02		953.92		956.8		958.22		960.4	960.8
TOP SAN. M.H. EL	952.12			956.09			958.47			960.76
SAN. INV. EL	948.81			945.66			947.62			949.62 | 949.79
TOP ST. M.H. EL.	951.95			955.79			958.05			960.33
ST. INV. EL.	946.61			948.33 | 948.71			950.69			952.77



MK.	BY	REVISIONS	APP.	DATE
	R.M.	AS CONSTRUCTED		JAN 31-1973
	A.G.S.	SERVICE BOX TIE-INS FOR HSE NO. 4105		JAN 12/77
	R.B.	GASMAIN PLOTTED		1985-08-26
		MICROFILMED 1986		

REGISTERED PROFESSIONAL ENGINEER — CIVIL — LYLE M. KEETT — PROVINCE OF ONTARIO

DWN. BY A.A.
CHKD. BY [illegible]
DATE APRIL 1971
SCALE HOR. 1" = 50' VERT. 1" = 5'

ONTARIO WATER RESOURCES COMMISSION
TOWNSHIP OF VALLEY EAST
PROVINCIAL SEWAGE WORKS PROJECT Nº 1-0039-66
PROVINCIAL WATER WORKS PROJECT Nº 5-0050-67
CONTRACT 22
ROY AVENUE
SPRUCE ST. — ROGER ST.

Northland Engineering
CONSULTING CIVIL ENGINEERS
NORTH BAY - SUDBURY - ONTARIO

No. SU-172
22-3

Geotechnical Investigation and Design Report

Hanmer Dreamhomes

Type of Document:
Report

Project Name:
Proposed Laura Street Subdivision
Hanmer, Ontario

Project Number:
SUD-23012932-A0

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Date Submitted:
2024-01-10

Table of Contents

Further to our Proposal No. 23/148/GP dated September 27, 2023, EXP Services Inc. (EXP) has completed the updated geotechnical engineering evaluation for the proposed Phil Street Subdivision. Our comments and recommendations, based on the results of the field investigation and our understanding of the project scope, are provided in this report.

1. Introduction

It is understood that a proposed subdivision is to be developed south of Laura Street in Hanmer, ON. The current subdivision layout consists of 114 lots and associated roads. A geotechnical investigation was requested for the road construction and subdivision development.

To assist with the engineering design of the roads and subdivision, EXP has completed the requested geotechnical engineering studies with the findings contained herein.

2. Field Investigation

Between November 23 and 24, a geotechnical technician from EXP supervised the drilling of six (6) boreholes, which were located in accessible locations across the subdivision, which were free of underground locates. All boreholes were advanced to 5.2 m ± depth. The boreholes were located in the field by EXP's geotechnical technician. The borehole locations are shown on Dwg. A-1 in Appendix A.

The boreholes were advanced using 200 mm Hollow Stem Augers (HAS), followed by a Dynamic Cone Penetration Tests (DCPT) at selected borehole locations. Soil samples were obtained using a 51 mm (2 inch) outside diameter split spoon sampler in conjunction with Standard Penetration Tests (ASTM D1586) at depths noted on the attached, previously completed, borehole logs provided in Appendix B. Soil samples were generally obtained at 0.75 m intervals in the upper 3 m. The Standard Penetration Test (SPT) 'N' values were recorded and used to provide an assessment of the in-situ relative density of the overburden soils. In all boreholes a DCPT was then advanced adjacent to the borehole termination depth and DCPT 'N' values were recorded. All boreholes were backfilled with auger cuttings and bentonite pellets upon completion of drilling.

The locations and elevations of the boreholes were determined using a hand held GPS. The locations and elevations are accurate to the degree and methodology used in the field. It should be noted that the location and elevations noted herein should not be used for detailed design purposes.

The retained samples were logged in the field and then carefully packaged and transported to our Sudbury laboratory for detailed examination and testing. All borehole drilling was supervised on a full-time basis by EXP Services Inc.

3. Laboratory Testing

A laboratory testing program was performed on representative soil samples and consisted of moisture content determinations and grain size analysis. The laboratory test results are summarized on the attached borehole logs in Appendix B with individual test results provided in Appendix C.

4. Subsurface Conditions

Details of the soils encountered during the field investigation are summarized on the attached borehole logs in Appendix B pertaining to Phase 1 of the subdivision. The logs include textural descriptions of the subsoil along with results of the field and laboratory testing program in accordance with the Unified Soil Classification System. The explanatory notes and definitions provided in Figures 1A and 1B in Appendix B should be referenced when reading this report.

The subsurface conditions within the site generally consisted of topsoil overlying native cohesionless soils.

The upper topsoil layer ranged from 25 mm to 75 mm in thickness. Topsoil thicknesses could further vary across the subdivision between the widely spaced boreholes.

Underlying the topsoil at the borehole locations, was a cohesionless soil. The cohesionless deposit consisted of a sand with trace silt and trace gravel. The cohesionless soils were brown in colour and moist to wet. Uncorrected SPT 'N' values within the silt ranged from 1 to 14 blows per 300 mm classifying the material as very loose to compact. The cohesionless soils were noted to have a moisture content ranging from 3% to 23%.

A DCPT was advanced adjacent to each borehole to depths noted on the attached logs in Appendix B. The DCPT 'N' values within the boreholes were generally similar or slightly higher that the SPT 'N' values suggesting the cohesionless soils are in more of a compact state.

4.1 Groundwater

Groundwater was measured within the boreholes prior to backfilling or installation of a groundwater monitoring well. Groundwater and or cave conditions were noted at the borehole locations. Groundwater observations are noted as follows:

Borehole No.	Time observed	Depth to Groundwater Below Existing Grade (m)	Depth to Cave Below Existing Grade (m)	Geodetic Elevation of Groundwater Observation (m)
BH-1	December 1, 2023	3.2	--	288.8
BH-2	Upon Completion	--	2.4	--
BH-3	December 1, 2023	3.6	--	287.4
BH-4	Upon Completion	--	2.7	--
BH-5	December 1, 2023	1.3	--	288.7
BH-6	Upon Completion	--	3.7	--

Groundwater can be expected to be at or near elevation 289.0. However, due to the slightly higher water content laboratory test results above this level, it is recommended that additional groundwater readings be taken within the installed groundwater monitoring wells, during wetter periods of the year and during drying periods of the year. However, at this time, the groundwater table at the site can be expected to be encountered bellow elevation 289.0 m.

Seasonal variations in the water table should be anticipated, with higher levels occurring during wet weather conditions (such as spring thaw and late fall) and lower levels occurring during dry weather conditions.

5. Foundation Recommendations

Based on the soil conditions encountered, the proposed residential structures can be founded on conventional strip or spread footings or on a thickened edge slab on grade bearing on an engineered fill pad overlying the native soils.

5.1 Site Preparation

It is assumed that some cut and fill operations on site will be completed. At this time, it unknown how much cut and fill will be completed to accommodate the site development. Once final subdivision design drawings are made available, EXP should be contracted to review the drawing and ensure the recommendations contained herein are being met.

The encountered soil conditions at the site generally consisted of loose to compact cohesionless native soils with a relatively high groundwater level, estimated to be at elevation 289.0.

Based on the encountered soil and groundwater conditions, development of this site may be challenging. Excavations that approach the groundwater table will likely require significant dewatering and shoring during excavation.

Upfill within the road should be completed with select subgrade material meeting OPSS that are placed in lifts not exceeding 200 mm and be compacted to 98% SPMDD. As it is anticipated that the residential structures will be constructed with basements it has been assumed that foundations will be placed directly on shallow native subsoils and therefore engineered fill throughout the building pads will not be required, therefore in-filling of the lots may be completed with fill soils, free of organic and debris, with appropriate moisture content that can be compacted to a minimum of 98% SPMDD.

It is recommended and of best practice, that all grade raises, and site infill be completed prior to building construction when working on sites of this nature, in order to ensure that any potential settlements, from the additional soil weight, dissipate before the building foundations and or site services are constructed. In the cohesionless sand soils encountered, settlements should occur relatively quickly.

5.2 Conventional Foundations and Thickened Edge Slab-on-Grade Foundation

Foundations founded on the native subsoils or on engineered fill overlying the native subsoils, can be designed with a factored geotechnical resistance at Ultimate Limit States (ULS) of 112 kPa. This value was calculated using a geotechnical resistance factor of 0.5. A bearing pressure at Serviceability Limit States (SLS) of 75 kPa may be used. Footings designed with the recommendations contained herein are expected to settle less than 25 mm total and 20 mm differential. Additional upfill, across the lots for grading purposes, of up to 3.0 m has been accounted for, in providing the above noted bearing capacity.

Prior to the placement of the foundation concrete the exposed subgrade is to be visually inspected by a qualified geotechnical engineer from this office to verify the founding soil conditions and construction procedures.

Any soft areas encountered during review from this Office, should be excavated and replaced with a Granular “A” or Granular “B” Type II in accordance with OPSS.MUNI 1010. Once the native ground surface is prepared, if any engineered fill is required below the foundations, the material should consist of a Granular “B” Type I or Type II (OPSS 1010). If wet soil conditions are present, a non-woven geotextile separator (Terrafix 270R or equivalent) is to be used between the subgrade soils and the engineered fill materials to stabilize the native soils.

Where engineered fill is placed below the foundations, it is to extend horizontally a minimum of 0.3 m beyond the edges of the foundation and slope down at 1H:1V to ensure the foundation loads are properly transferred to the underlying subgrade. All engineered fill is to be placed in maximum 150 mm thick lifts and be compacted to 100% Standard Proctor Maximum Dry Density (SPMDD) within 1.5% of optimum moisture content. Engineered fill placement and compaction below foundations is to be continuously monitored on a full-time basis by a qualified geotechnical representative from this office.

It is recommended that engineered fill be placed in strips or along the row of the house footprints. Due to the relatively short distances from foundation to foundation of the residential lots, EXP discourages placing engineered fill on a lot by lot basis. Placing engineered fill in strips or along the rows of house footprints eliminates the risk of undermining adjacent already constructed foundations.

Foundations, which are to be placed at different elevations in soils or near service trenches, should be located such that the footings are set below a line drawn up at 10 horizontal to 7 vertical from the near edge of a lower foundation or bottom of a service trench, as indicated on Figure 5-1 below.

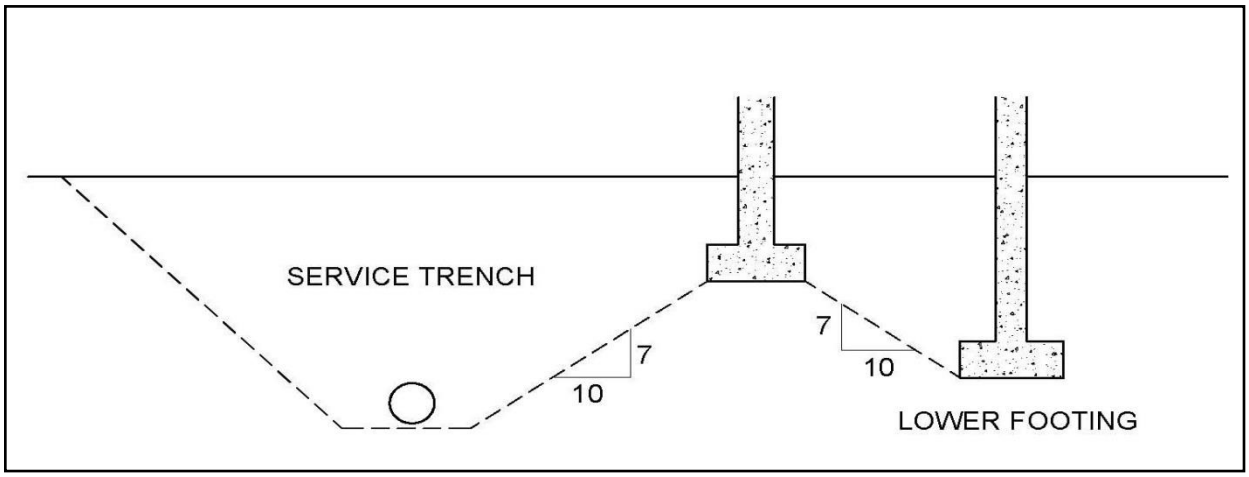


Figure 5-1: Footings near Service Trenches or at Different Elevations

These foundation recommendations assume the structures are lightly loaded. Strip and spread footing widths must comply with minimum Code requirements.

5.3 Floor Slab-on-Grade

For a floor slab-on-grade where standard foundations are used, construction will be possible at this site provided that all topsoil, fill, organics and other deleterious materials are removed down to competent native soils. The subgrade soils should be proof-roll compacted in the presence of EXP prior to placing any engineered fill. Any soft areas encountered during proof-rolling should be excavated and replaced with Granular "B" Type II (OPSS 1010) material. Once the native ground surface is prepared, all required up-fill material is to consist of Granular "B" Type I or II (OPSS 1010). If wet soil conditions are present during construction, a non-woven geotextile separator (Terrafix 270R or equivalent) should be placed between the subgrade soils and any upfill material to stabilize the native soils. A final 300 mm thick layer of 19 mm minus clearstone (OPSS 1004) or Granular "A" (OPSS 1010) should be placed directly below the floor slab-on-grade combined with an appropriate moisture barrier such as a polyethylene membrane. All fill material below the floor slab-on-grade should be placed in maximum 150 mm thick lifts and be compacted to 100% of the SPMDD within 1.5% of the optimum moisture content.

Due to the anticipated high groundwater conditions noted at the site, the finish floor elevation of the lowest floor slab-on-grade should be designed to be a minimum of 600 mm above the groundwater elevation (i.e. 600 mm above elevation 289.0). Pending additional groundwater level monitoring during wetter and drying seasons, the above noted depth below grade may require adjustment.

5.4 Backfill Recommendations

All imported backfill material used to backfill foundations should consist of Granular "B" Type I or Granular "B" Type II (OPSS 1010) material. Any Granular "B" used against or below foundations should have a maximum aggregate size of 120 mm and must be placed in lifts no greater than 150 mm in thickness and must be compacted to 100% SPMDD. Care must be taken to ensure over compaction and damage to the foundation does not occur.

5.5 Frost Considerations

The freezing index in the Greater Sudbury area is approximately 1,330 C degree-days. There is potential for up to 2.1 m of frost penetration to occur over the winter months in unprotected, unheated areas and 1.7 m for heated structures. A structure is considered heated if the temperature within the structure is maintained continuously no lower than 18° C.

As such, foundations for unheated structures should be provided with the a minimum of 2.1 m of earth cover frost protection and foundations for heated structures should be provided with a minimum of 1.7 m of earth cover frost protection. Since it is likely that sufficient earth cover frost protection will not be available, insulation will be required. Insulation should consist of rigid extruded polystyrene, have a minimum compressive strength of 275 kPa, and an R-Value of 5 for every 25.4 mm of thickness, (i.e. Styrofoam High Load 40). Any exposed insulation is to be protected against sunlight and physical damage. A rough estimate for cost evaluation purposes can be made by assuming that 25.4 mm of rigid insulation designed for below grade installation is equivalent to 300 mm of soil cover. Note that insulation for unheated structures must extend below the entire foundation. Higher compressive strength insulation (i.e. Styrofoam High Load 60 or 100, etc.) may be required if insulation extends below foundations, depending on foundation loading conditions.

Detailed insulation recommendations can be provided by EXP, if necessary, once the final foundation designs have been determined.

5.6 Re-Use of Excavated Material

The in-situ materials are too silty to be re-used as free draining engineered fill. The native soils can be re-used for general fill away from structures and pavement structures provided it is environmentally safe to do so.

5.7 Lateral Earth Pressure

Any foundations or retaining structures should be designed to resist lateral earth pressure. The expression for calculating lateral earth pressure "p" at any depth "h" is given by the following:

$$\mathbf{p = K(\gamma h + q) + \gamma_w h_w}$$

where

p	=	Lateral earth pressure (kPa)
K	=	Coefficient of earth pressure
γ	=	Unit weight of backfill (kN/m^3)
γ_w	=	Unit weight of water (kN/m^3)
h	=	Depth to point of interest (m)
h_w	=	Depth of water above point of interest (m)
q	=	Surcharge load acting adjacent to the wall at the ground surface (kPa)

The below tables list various earth pressure properties for given materials.

Material	Friction Angle ø´ (unfactored)	Coefficient of Active Earth Pressure (k_a)	Coefficient of Passive Earth Pressure (k_p)	Coefficient of Earth Pressure at Rest (k_o)	Unit Weight γ (kN/m^3)
Granular "A"	38°	0.24	4.2	0.38	22
Granular "B" Type I	35°	0.27	3.7	0.43	21
Granular "B" Type II	38°	0.24	4.2	0.38	21

Note: Values given for horizontal earth pressures are for horizontal backfill. For sloping backfill, the design requirements outlined in the Canadian Foundation Engineering Manual should be used.

The mobilization of full active or passive resistance requires a measurable and perhaps significant wall movement or rotation. Therefore, unless the structural element can tolerate these deflections, the at-rest earth pressure should be used in design.

The effects of compaction surcharge should be taken into account in the calculations of active and at rest earth pressures. The lateral pressure due to compaction should be taken as at least 12 kPa at the surface, and its magnitude should be assumed to diminish linearly with depth to zero at the depth where the active (or at rest) pressure is equal to 12 kPa. This pressure distribution should be added to the calculated active (or at rest) pressure. Notwithstanding, lighter compaction equipment and smaller lifts should be used adjacent to walls to prevent overstressing.

5.8 Drainage

The exterior grade around the buildings should be sloped away from the walls to prevent surface runoff from entering the building. Permanent perimeter weeping tile should be installed where any floor is less than 150 mm above final grade and is required to be dry. The drainage tile should have a minimum diameter of 100 mm and be surrounded by well-draining filter material (i.e. 20 mm clearstone gravel). The filter material should be surrounded with a non-woven geotextile. The perforated drainage tile should drain to a suitable drainage area or interior sump. Any subsurface walls should be adequately damp-proofed above the water table and waterproofed below the water table. The roof drains should discharge away from the building to appropriate drainage areas.

5.9 Site Classification for Seismic Response

The Ontario Building Code (OBC) has adopted the National Building Code of Canada requirements for seismic design considerations. The Site Classification for Seismic Response has been estimated based on the boreholes advanced at the site. As the Site Classification for Seismic Response is based on soil conditions in the upper 30 m, assumptions were made by EXP for the soil conditions below the borehole termination depths.

Based on EXP's assumptions, the site is classified as Site Class E as per the OBC clause 4.1.8.4, Site Properties and Table 4.1.8.4 A, Site Classification for Seismic Response.

These earthquake/seismic design parameters should be reviewed in detail by the structural engineer and incorporated into the design as required. As this site class is based on an assumption of the soil conditions, the site class may not be sufficient, and it may result in an overdesign of the structure.

If a precise Site Classification is required, EXP can provide a quote to perform the necessary testing.

6. Excavations

The in-situ native soils may be classified as Type 3 soils for excavations terminating above the groundwater level and Type 4 soils for excavations terminating below the groundwater level in conformance with the Ontario Occupational Health and Safety Act (OHSA). Excavation side slopes in Type 3 soils should remain stable at a slope of 1H:1V. Excavation side slopes in Type 4 soils should remain stable at a slope of 3H:1V. The need to excavate flatter side slopes if excessively wet or soft/loose materials, or concentrated seepage zone are encountered, should not be overlooked.

Extreme caution should be utilized when excavating near the existing building foundations so as not to undermine the existing structures.

Water (i.e. surface water runoff) should not be permitted to enter and/or pond within the construction area.

All excavations must be completed in accordance with the most recent regulations in the Ontario Occupational Health and Safety Act. The contractor should be aware that slope height, slope inclination, or excavation depths, should in no case, exceed those specified in local, provincial or federal safety regulations. Such regulations are strictly enforced and, if not followed, the owner, the contractor or earthwork or utility subcontractor could be liable for substantial penalties.

It is important to note that soils encountered in the construction excavations may vary significantly across the site. Our preliminary soil classifications are based solely on the materials encountered in widely spaced explorations. The contractor should verify that similar conditions exist throughout the proposed area of excavation. If different subsurface conditions are encountered at the time of construction, we recommend that EXP be contacted immediately to evaluate the conditions encountered.

7. Dewatering

Groundwater is anticipated within the area at an approximate elevation of 289.0 or slightly higher. As such, should excavations extend to or below this depth, dewatering will likely be required. Above the groundwater table, any perched water should be possible to remove using conventional construction pumps.

The estimated hydraulic conductivity, "K" of the native sand, based on empirical information, is 10^{-2} to 10^{-3} cm/s.

Dewatering requirements will be governed by the time of the year the construction is performed. It is the responsibility of the Contractor to propose a suitable dewatering system based on the time of construction and groundwater levels. The method used should not undermine any adjacent structures or buried services. The dewatering method is the responsibility of the Contractor and the Contractor should submit his proposal to the Prime Consultant for review and approval prior to construction.

8. Asphalt Pavement Recommendations

Pavement structure analysis was undertaken using The Routine (Empirical) Design Method following the guidelines provided in the MTO "Pavement Design and Rehabilitation Manual (PDRM)". The Routine (Empirical) Design Method is based on the concept of a Granular Base Equivalency (GBE), which relates the structural contribution of various pavement materials to an equivalent Granular "A" thickness. A target GBE value is selected based upon the anticipated AADT (Average Annual Daily Traffic) and the in-situ native soils conditions. The contribution of various pavement materials is shown below on the table below.

Material	Equivalency Factor
New or Recycled Asphalt	2.0
New Base (Granular "A")	1.0
New Subbase (Granular "B")	0.67

8.1 Recommended Pavement Structure

The AADT for the new subdivision has been assumed by EXP to be less than 1,000, with truck traffic assumed to account for less than 10% of the AADT. As such, in order to comply with the City of Greater Sudbury Standards, and with a sand subgrade with < 40% material between 5 and 75 µm, a target GBE of 405 is considered appropriate.

The following pavement structure is recommended for the proposed roadway based on Table 3.3.2 and 3.3.3 of the PDRM. As recommended in the PDRM, modifications must be made to account for deep frost penetration and marginal soil conditions in Northern Ontario. As such, granular depths should be no less than those for 3000-4000 AADT. CGS pavement standards have also been considered in the design. The recommended pavement structure is outlined on the table below.

Material	Thickness	Equivalency Factor	GBE
Asphalt	40 mm Surface (HL3) 50 mm Binder (HL8)	2.0	180
Base	150 mm	1.0	150
Subbase	600 mm	0.67	402
TOTAL	**840 mm**	**--**	**732**

As noted, the resulting GBE of 732 far exceeds the target GBE of 405 and as such, the recommended pavement structure is considered adequate.

A conventional asphalt pavement structure as noted above will typically have a functional service life of 12 years provided adequate subgrade support and proper drainage is available. This represents the number of years to the first rehabilitation (via overlay or resurfacing), assuming that regular maintenance and crack sealing is completed. Subsequent resurfacing is typically expected to last at least 10 years.

8.2 Subgrade Preparation

The long-term performance of pavement is highly dependent upon the subgrade support conditions. Stringent construction control procedures should be maintained to ensure that uniform subgrade moisture and density conditions are achieved.

All topsoil, organics, or other deleterious materials are to be removed below the proposed roadways. Prior to the placement of any engineered fill, the subgrade must be properly shaped, crowned (a minimum of 3%), and proof-rolled in the presence of a qualified geotechnical engineer to ensure uniform conditions. Should soft or spongy areas be encountered, these areas should be sub-excavated and the material replaced with Granular “A” or Granular “B” Type II.

General upfill below the proposed pavement structure should consist of Granular “B” or Select Subgrade Material (SSM) in accordance with OPSS 1010.

The most severe loading conditions on the pavement subgrade usually occur during construction. Consequently, special provisions, such as additional granular subbase, may be required, especially if construction is completed during unfavourable weather conditions.

Where the subgrade soils are wet or loose, it may be necessary to place a geotextile over the exposed subgrade/subgrade fill.

8.3 Drainage

To ensure pavement structure performance and maximum life expectancy, the need for adequate drainage cannot be overemphasized. The finished pavement surface and underlying subgrade must be sloped to provide effective drainage towards the proposed drainage system (i.e., curb, catchbasins, ditching, and/or subdrains). Surface water should not be allowed to pond adjacent to the outside edges of pavement areas.

Subdrains are to be placed along the full length of the roadway to provide additional drainage. The subdrains should consist of 150 mm diameter rigid slotted plastic pipes and should be completely surrounded with a minimum of 50 mm of 19 mm minus Clear Stone gravel (OPSS 1004). The Clear Stone gravel is to be completely wrapped with a non-woven geotextile (Terrafix 270R or equivalent) to prevent any materials from migrating into the Clear Stone.

8.4 Material Requirements

Asphalt

The surface asphalt placed as part of this project should consist of HL3 and binder asphalt should consist of HL8. The surface asphalt should be placed in a single compacted 40 mm thick lift and binder asphalt should be placed in a single compacted 50 mm thick lift. All asphalt shall be in accordance with OPSS 1150 (HL mixes). Placement and compaction of the asphalt shall be in accordance with OPSS 310.

Granular Materials

The granular base material should consist of Granular "A" in accordance with OPSS.MUNI 1010. Although a 60% crushed Granular "A" material may be used as specified in OPSS 1010, EXP recommends the Granular "A" material be 100% crushed, as this material will enhance drainage and offer better structural support.

Subbase material should consist of Granular "B" Type II in accordance with OPSS.MUNI 1010. Granular "B" Type II is recommended as it offers increased stability, easier placement and compaction, and is readily available in the area.

All roadway granular material should be placed full width in maximum 200 mm thick lifts and compacted to 98% of the Standard Proctor Maximum Dry Density (SPMDD) within 1.5% of optimum moisture content.

9. Buried Service Recommendations

Recommendations for proposed buried services are included in the following sections.

9.1 Frost Protection

Protection against freezing is an integral part of a sewer and water system design. The standard solution calls for burying the top of the utility lines in the ground below the anticipated frost penetration depth (2.1 m in the Sudbury Area). Where this cannot be achieved, an alternate solution involves incorporating rigid polystyrene insulation (i.e. Styrofoam HIGHLOAD-40), which can be used to reduce the depth of trench required. The two design configurations frequently used are horizontal placement, and the inverted "U". Both of these methods require suitable design, as well as correct construction procedures. Installing insulation does not alter conventional utility line construction practice to an appreciable extent. However, in some cases, a wider trench may be required to accommodate the horizontal layer of insulation. Another option is to use pre-insulated pipe.

A rough estimate for cost evaluation can be made by assuming that 25 mm of rigid insulation designed for below grade installation is equivalent to 300 mm of soil cover. This and any other design values should, however, be confirmed with the insulation manufacturer.

Maintaining compatibility with adjacent subgrade conditions should minimize annual differential frost heaving. This is usually accomplished by backfilling the service trenches with materials matching the surrounding soils. Another approach to minimizing the annual differential heaving of subgrade soil is to construct frost tapers in conformance with OPSD 803.030 and/or 803.031. The same amount of heaving will occur whether a frost taper is installed, or the trench is backfilled with excavated material. However, the heaving of a frost taper is spread across the length of the taper causing the differential heaving to be less abrupt.

9.2 Pipe Embedment and Bedding

All fill materials, organics, and deleterious material are to be removed down to competent native soils prior to placement of the bedding material. Pipe bedding requirements as outlined in the OPSD 802.010 for flexible pipes and OPSD 802.031 and 802.032 for rigid pipes will be sufficient for sanitary, storm and watermain pipes. The pipe bedding should consist of a Clear Stone gravel (OPSS 1004) or Granular "A" material (OPSS.MUNI 1010) with a minimum thickness of 150 mm beneath the pipe and raised to the pipe springline. The granular bedding should be placed in lifts not exceeding 150 mm and compacted to 98% of the material's SPMDD. Particular care should be taken when compacting beneath the pipe haunches. The cover material should consist of a compacted sand material with no sizes greater than 25 mm or a Granular "A" material.

Bedding thicknesses may be increased in areas where the native soil base supporting the bedding is wet, or subject to disturbance. Where soft or loose base conditions are encountered below the water table, base stabilization may be required. This may include the placement of crushed stone sub-bedding, wrapped in a non-woven geotextile, to prevent base disturbance and to allow the removal of water through standard filtered sump and pump methods.

If construction proceeds during the winter months, the base and sides of the trench, as well as all fill materials, should not be allowed to freeze.

9.3 Excavated Soil and Trench Backfill

It is typical practice in Northern Ontario to re-use a portion of the in-situ excavated native material as fill within exterior (outside) trench utility services, especially where these trenches interrupt traveled sections of a roadway. This is to ensure compatibility with adjacent subgrade soils to minimize annual differential frost heaving.

Non-organic material from the service trench excavation may be re-used as random fill above the top of the pipe cover material to the underside of the pavement structure subbase materials. All re-used materials must be placed in lifts not exceeding 150 mm and be compacted to 98% of the SPMDD within 2% of the optimum moisture content. EXP cautions that any native material below the groundwater level may not meet the above compaction requirements without significant reworking and drying prior to placement. If stockpiling of trench excavated material for re-use is required, it is recommended that it be covered to prevent exposure to rain and it cannot be allowed to freeze. All unsuitable materials from the trench excavation not reused must be disposed of off-site.

Any excavated material contaminated with organics must not be re-used as backfill material. This material may be re-used for general landscaping purposes, provided it is environmentally safe to do so. It is also recommended that any blast rock fill material not be used as trench backfill.

10. Re-Use of Excavated Material

The in-situ soils could be considered free draining and used as engineered fill on site, however it is recommended that any material to be reused be stockpiled and testing to confirm that it is free draining prior to re-use. Excavated soils can be re-used for general fill away from structures or pavement structures provided it is environmentally safe to do so. Excavated soils to be removed off site are considered to be Excess Soils and disposal of such soils should follow O.Reg. 406/19. Once the final site plan has been determined, and the known volume of soils to be excavated and removed off site is known, additional excess soil field studies can be completed. EXP would be pleased to complete the additional studies and provide all recommendations required.

11. Construction Constraints Under Cold Weather Conditions

For all construction activities at this site, the following applies:

- During excavations, all subgrade soils must be maintained at a minimum temperature of 5° C.
- No granular material may be placed under frozen conditions, with all fill material maintained at a minimum temperature of 5° C prior to and during installation. If granular fill is to be placed in freezing conditions, the granular fill must be restricted to Granular "B" Type II material. Since Granular "B" Type II has a larger aggregate size, care should be taken to prevent point loading on the underside of the concrete.
- Soils and granular fill material that are in direct contact with fresh concrete must be at a minimum temperature of 5° C prior to pouring the concrete and must be free of snow and ice fragments.
- All granular fill, prior to placement of concrete, must be reviewed by this office to ensure that it is free of frost, buried ice and snow.
- All reinforcing steel in the concrete forms must be free of ice and snow, and must be maintained at a minimum temperature of 5° C.
- During the placement of concrete in cold weather conditions, a field cured cylinder should be placed beside the heated form for a period of 6 days. The field cured cylinder should be returned to a designated laboratory on the sixth day for 7-day compressive strength testing.
- All heated and tarped areas should be monitored for temperature using a max/min thermometer.
- All concrete is to have a minimum of 6% to 8% air entrainment to prevent cracking and shall be maintained at a minimum temperature of 10° C for a period of 4 to 7 days.

The 6% to 8% air entrained concrete during cold weather placement is to prevent significant strength loss of concrete as a result of freezing and thawing. The air entrainment will provide the capacity to absorb stresses during freeze/thaw action.

12. Construction Quality Control

Construction quality control of the "earthworks" should be provided throughout the project by a representative of EXP to verify all design assumptions, recommendations and confirmation of the subsurface soil conditions. This includes inspection of the excavation and subgrade prior to the placement of any structural fill and foundations, to ensure that any and all deleterious materials have been removed and to ensure that the actual conditions are not markedly different than those on which the recommendations made herein are based. Compaction control of structural fill is also recommended as standard practice, as is sampling and testing of aggregates and concrete.

13. Design Review

The recommendations made in this report are considered preliminary and in accordance with our present understanding of the project and are provided solely for the design team responsible for the project. If there are any changes, such as relocation of any structures or other features which may affect our analysis, the information obtained during this investigation may be inadequate and additional field work and reporting may be required.

EXP Services Inc. should be retained to review the final design and specifications to confirm that we are in general agreement with the assumptions on which our recommendations are based. If not accorded the privilege of making this review, EXP will assume no responsibility for interpretation of the recommendations in this report.

14. Limitations

A subsurface investigation is a limited sampling of a site. Should any conditions at the site be encountered that differ from those reported at the test locations, we require that we be notified immediately in order to allow reassessment of our recommendations.

Whereas this investigation has estimated the groundwater level at the time of the fieldwork, and commented on general construction problems, the presence of conditions, which would be difficult to establish from our test holes, may affect the type and nature of dewatering procedures which should be used in practice. These conditions include local and seasonal fluctuations in the groundwater table, erratic changes in the soil profile between the tests, and thin layers of soil with large or small permeabilities compared with the general soil mass, etc.

The comments given in this report are intended only for the guidance of the design team responsible for the project. The number of test holes required to determine the localized underground conditions between test holes affecting construction costs, techniques, sequencing, equipment, scheduling, etc. could be greater than has been carried out for preliminary design purposes. Contractors bidding on or undertaking the works should, in this light, decide on their own investigations, as well as their own interpretations of the factual test hole results, so that they may draw their own conclusions as to how the subsurface conditions may affect them.

The investigation and comments are necessarily ongoing as new information of underground conditions becomes available. For example, more specific information is available with respect to in-situ subsurface conditions between test locations once construction is underway. Subsurface soil interpretation between test holes, as well as the recommendations of this report, should be verified through field inspections provided by EXP to validate the current information for use during the construction stage.

Virtually no scope of work, no matter how exhaustive, can identify all contaminants or all conditions above or below ground. For example, conditions elsewhere on the property may differ from those encountered, and conditions may change with time. Therefore, no warranty is provided that the entire site condition is represented by those identified at specific borehole locations.

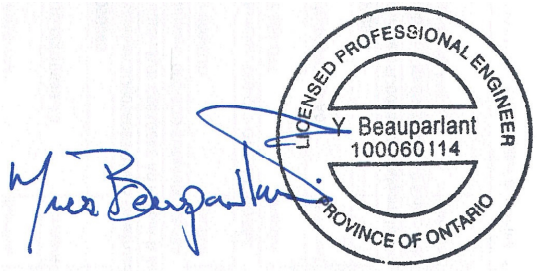
This report in no way reflects any on-site environmental considerations.

15. Closure

We trust that these comments provide you with sufficient information to proceed with design. Should you have any questions, please do not hesitate to contact this office.

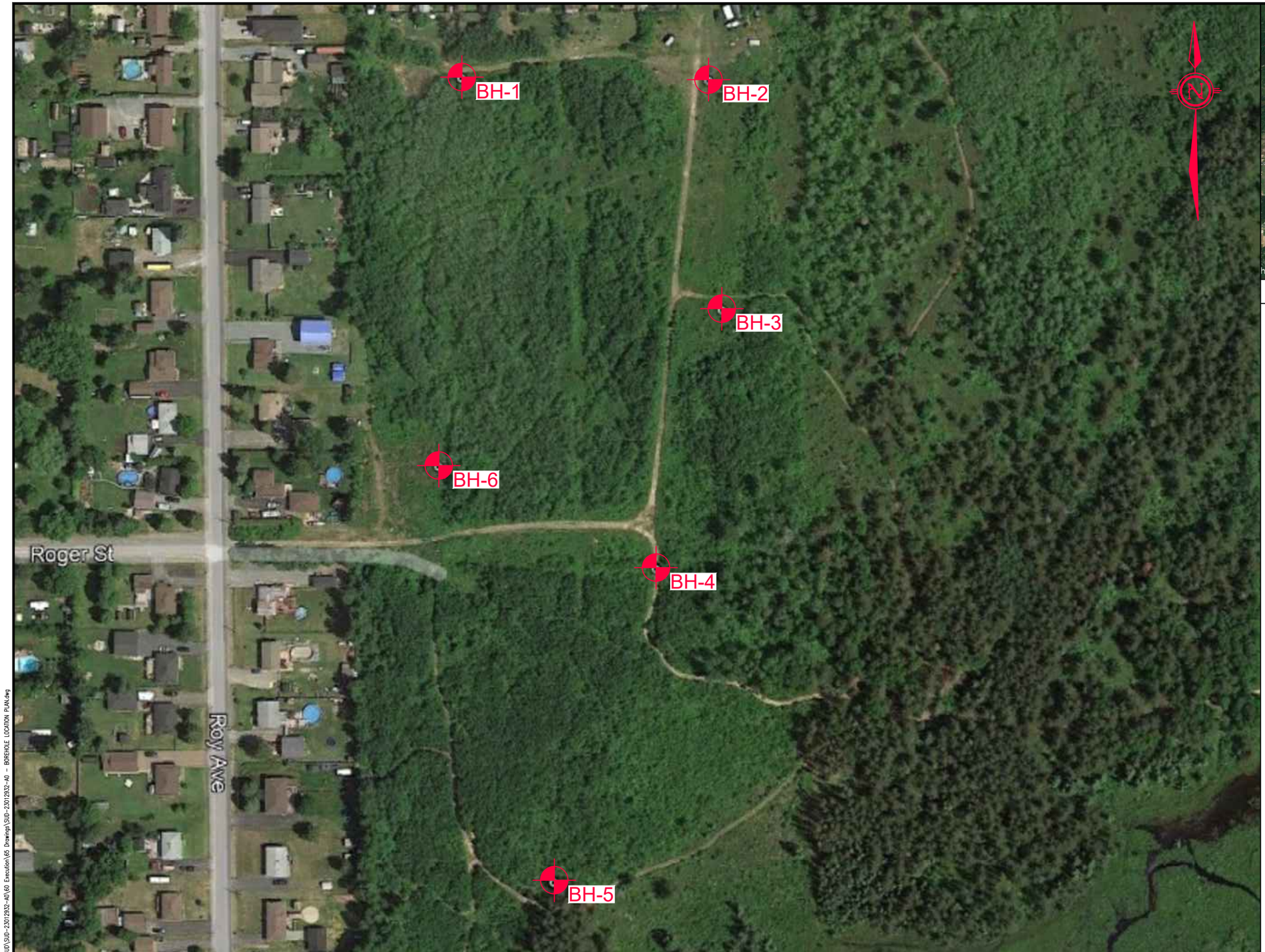
Yours truly,

EXP Services Inc.



Yves Beauparlant, P.Eng.
Manger, Earth & Environmental Services
Northeastern Ontario

Appendix A - Drawing



KEYPLAN - N.T.S.

LEGEND

EXP BOREHOLE

— NOTES —

1) The boundaries and soil types have been established only at Test Hole locations. Between Test Holes, they are assumed and may be subject to considerable error.
2) Do not use Test Hole elevations for design purposes.
3) Soil samples will be retained in storage for 3 month and then destroyed unless client advises that an extended time period is required.
4) Quantities should not be established from the information provided at the Test Hole locations.
5) This drawing forms part of the report, project number as referenced, and should be used only in conjunction with this report.

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Canada
www.exp.com

REVISIONS

No.	DESCRIPTION	DATE

CLIENT: COLIN'S HAULAGE INC.

PROJECT: PROPOSED SUBDIVISION HANMER, ON

PROJECT NO.: SUD-23012932-A0

TITLE: BOREHOLE LOCATION PLAN

DATE: DECEMBER 2023 | SCALE: NTS | DWG NO.: A-1

Appendix B – Borehole Logs

Notes on Sample Descriptions

1. All sample descriptions included in this report follow the International Society for Soil Mechanics and Foundation Engineering (ISSMFE), as outlined in the Canadian Foundation Engineering Manual. Note, however, that behavioral properties (i.e. plasticity, permeability) take precedence over particle gradation when classifying soil. Please note that, with the exception of those samples where a grain size analysis has been made, all samples are classified visually. Visual classification is not sufficiently accurate to provide exact grain sizing or precise differentiation between size classification systems.

UNIFIED SOIL CLASSIFICATION

CLAY (PLASTIC) TO	FINE	MEDIUM	CRS.	FINE	COARSE
SILT (NONPLASTIC)	SAND			GRAVEL	

EQUIVALENT GRAIN DIAMETER IN MILLIMETRES

ISSMFE SOIL CLASSIFICATION

CLAY	SILT			SAND			GRAVEL			COBBLES	BOULDERS
	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE		

2. Fill: Where fill is designated on the borehole log it is defined as indicated by the sample recovered during the boring process. The reader is cautioned that fills are heterogeneous in nature and variable in density or degree of compaction. The borehole description may therefore not be applicable as a general description of site fill materials. All fills should be expected to contain obstruction such as wood, large concrete pieces or subsurface basements, floors, tanks, etc., none of these may have been encountered in the boreholes. Since boreholes cannot accurately define the contents of the fill, test pits are recommended to provide supplementary information. Despite the use of test pits, the heterogeneous nature of fill will leave some ambiguity as to the exact composition of the fill. Most fills contain pockets, seams, or layers of organically contaminated soil. This organic material can result in the generation of methane gas and/or significant ongoing and future settlements. Fill at this site may have been monitored for the presence of methane gas and, if so, the results are given on the borehole logs. The monitoring process does not indicate the volume of gas that can be potentially generated nor does it pinpoint the source of the gas. These readings are to advise of the presence of gas only, and a detailed study is recommended for sites where any explosive gas/methane is detected. Some fill material may be contaminated by toxic/hazardous waste that renders it unacceptable for deposition in any but designated land fill sites; unless specifically stated the fill on this site has not been tested for contaminants that may be considered toxic or hazardous. This testing and a potential hazard study can be undertaken if requested. In most residential/commercial areas undergoing reconstruction, buried oil tanks are common and are generally not detected in a conventional geotechnical site investigation.

3. Till: The term till on the borehole logs indicates that the material originates from a geological process associated with glaciation. Because of this geological process the till must be considered heterogeneous in composition and as such may contain pockets and/or seams of material such as sand, gravel, silt or clay. Till often contains cobbles (75 to 200 mm) or boulders (over 200 mm). Contractors may therefore encounter cobbles and boulders during excavation, even if they are not indicated by the borings. It should be appreciated that normal sampling equipment cannot differentiate the size or type of any obstruction. Because of the horizontal and vertical variability of till, the sample description may be applicable to a very limited zone; caution is therefore essential when dealing with sensitive excavations or dewatering programs in till materials.

Notes On Soil Descriptions

4. The following table gives a description of the soil based on particle sizes. With the exception of those samples where grain size analyses have been performed, all samples are classified visually. The accuracy of visual examination is not sufficient to differentiate between this classification system or exact grain size.

Soil Classification		Terminology	Proportion
Clay and Silt	<0.060 mm	"trace" (e.g. Trace sand)	1% to 10%
Sand	0.060 to 2.0 mm	"some" (e.g. Some sand)	10% to 20%
Gravel	2.0 to 75 mm	adjective (e.g. sandy, silty)	20% to 35%
Cobbles	75 to 200 mm	"and" (e.g. and sand)	35% to 50%
Boulders	>200 mm		

The compactness of Cohesionless soils and the consistency of the cohesive soils are defined by the following:

Cohesionless Soil		Cohesive Soil		
Compactness	**Standard Penetration Resistance "N" Blows / 0.3 m**	**Consistency**	**Undrained Shear Strength (kPa)**	**Standard Penetration Resistance "N" Blows / 0.3 m**
Very Loose	0 to 4	Very soft	<12	<2
Loose	4 to 10	Soft	12 to 25	2 to 4
Compact	10 to 30	Firm	25 to 50	4 to 8
Dense	30 to 50	Stiff	50 to 100	8 to 15
Very Dense	Over 50	Very Stiff	100 to 200	15 to 30
		Hard	>200	>30

5. **ROCK CORING**

Where rock drilling was carried out, the term RQD (Rock Quality Designation) is used. The RQD is an indirect measure of the number of fractures and soundless of the rock mass. It is obtained from the rock cores by summing the length of the core covered, counting only those pieces of sound core that are 100 mm or more length. The RQD value is expressed as a percentage and is the ratio of the summed core lengths to the total length of core run. The classification based on the RQD value is given below.

RQD Classification	RQD (%)
Very Poor Quality	<25
Poor Quality	25 to 50
Fair Quality	50 to 75
Good Quality	75 to 90
Excellent Quality	90 to 100

$$\text{Recovery Designation \% Recovery} = \frac{\text{Length of Core Per Run}}{\text{Total Length of Run}} \times 100$$

Log of Borehole BH-1

Project No. SUD-23012932-A0 | Figure No. B-2

Project: Proposed Subdivision | Sheet No. 1 of 1

Location: Laura Street, Hanmer, ON

505025E; 5165627N

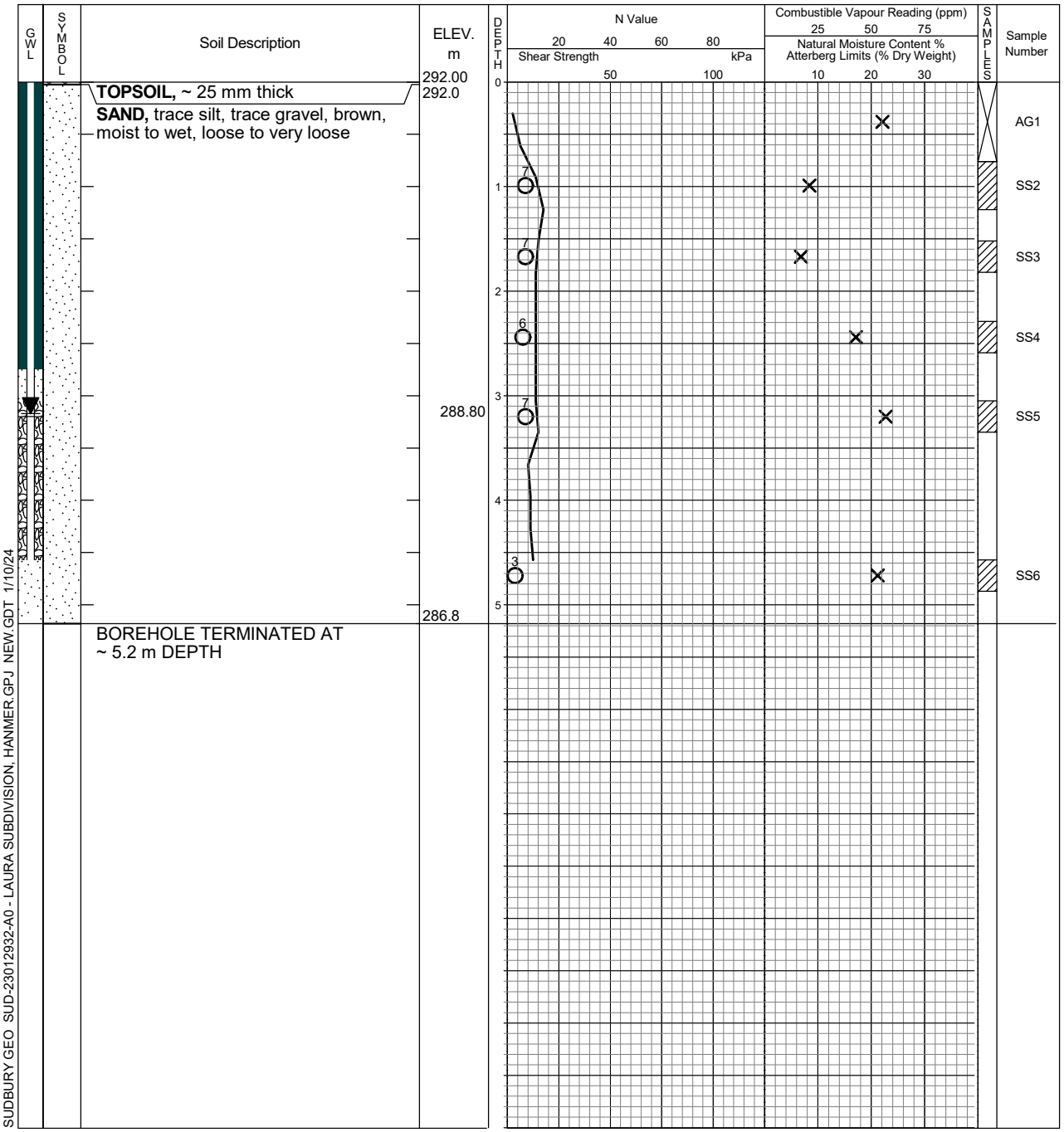
Date Drilled: November 23, 2023

Drill Type: CME55 TRUCK MOUNT

Datum: Geodetic (Hand-Held)

Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Field Vane Test (S)

Combustible Vapour Reading
Natural Moisture
Plastic and Liquid Limit
Undrained Triaxial at % Strain at Failure
Penetrometer



SUDBURY GEO SUD-23012932-A0 - LAURA SUBDIVISION, HANMER.GPJ NEW.GDT 1/10/24

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f: +1.705.674.5583

Borehole data requires interpretation assistance from EXP before use by others.

See Figures B-1A and B-1B for Notes on Sample Description

Time	Water Level (m)	Depth to Cave (m)
Upon Completion	3.1	N/A
November 24, 2023	3.1	N/A
Decmber 1, 2023	3.2	N/A

Log of Borehole BH-2

Project No. SUD-23012932-A0 | Figure No. B-3

Project: Proposed Subdivision | Sheet No. 1 of 1

Location: Laura Street, Hanmer, ON

505134E; 5165626N

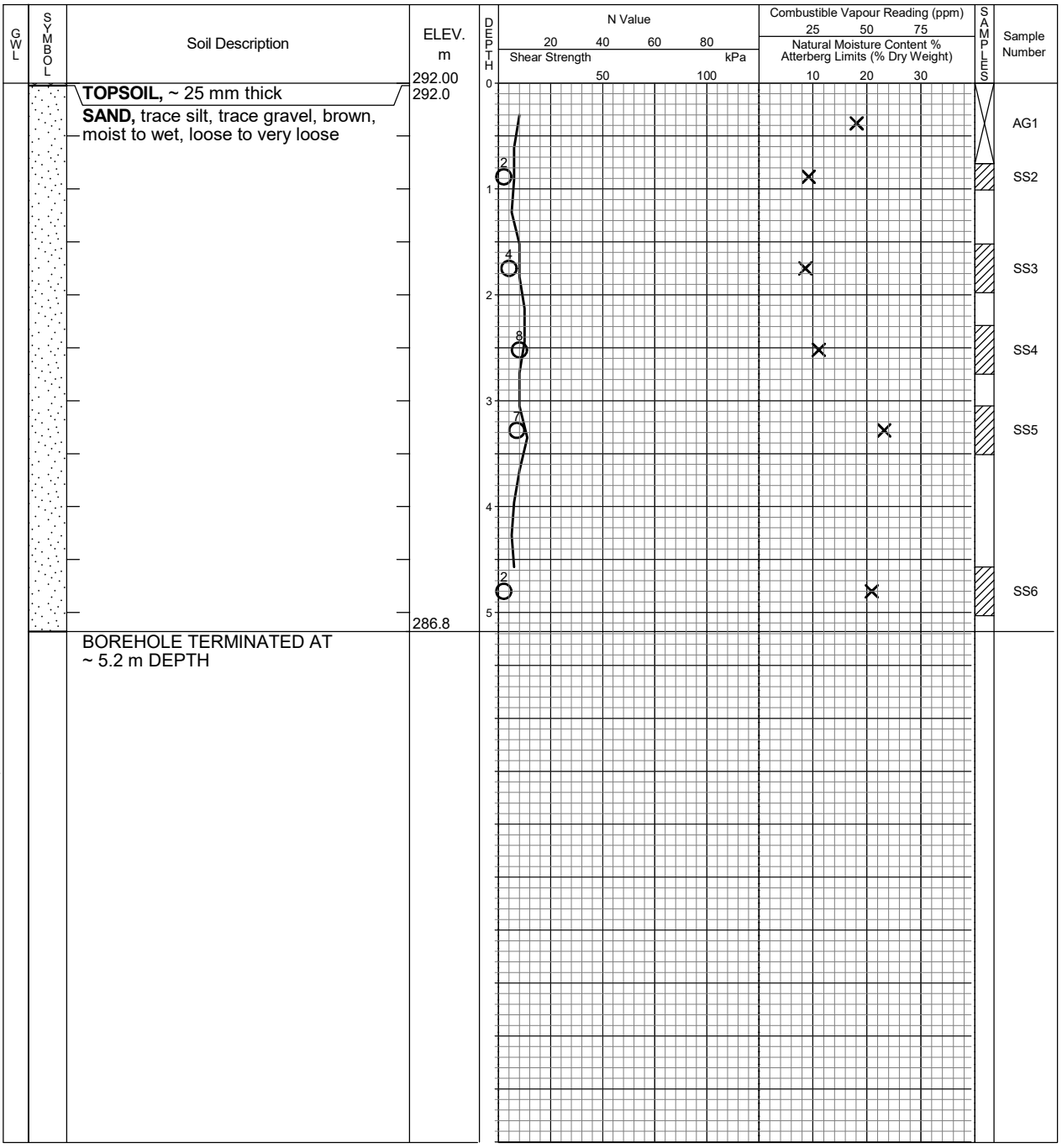
Date Drilled: November 23, 2023

Drill Type: CME55 TRUCK MOUNT

Datum: Geodetic (Hand-Held)

Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Field Vane Test (S)

Combustible Vapour Reading
Natural Moisture
Plastic and Liquid Limit
Undrained Triaxial at % Strain at Failure
Penetrometer



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Borehole data requires interpretation assistance from EXP before use by others.

See Figures B-1A and B-1B for Notes on Sample Description

Time	Water Level (m)	Depth to Cave (m)
Upon Completion	Dry	2.4

Log of Borehole BH-3

Project No. SUD-23012932-A0 | Figure No. B-4

Project: Proposed Subdivision | Sheet No. 1 of 1

Location: Laura Street, Hanmer, ON

505140E; 5165525N

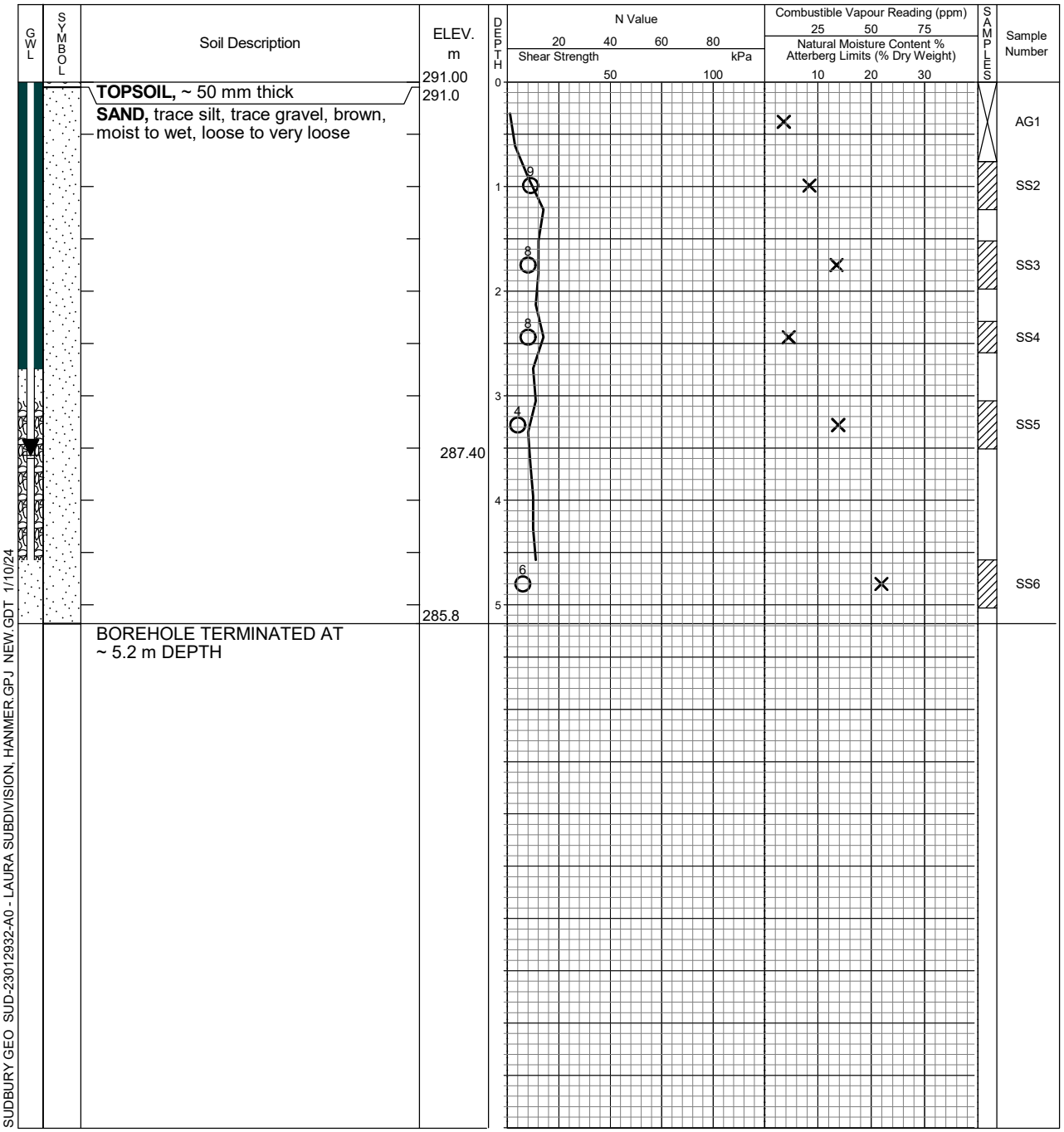
Date Drilled: November 23, 2023

Drill Type: CME55 TRUCK MOUNT

Datum: Geodetic (Hand-Held)

Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Field Vane Test

Combustible Vapour Reading
Natural Moisture
Plastic and Liquid Limit
Undrained Triaxial at % Strain at Failure
Penetrometer



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Borehole data requires interpretation assistance from EXP before use by others.

See Figures B-1A and B-1B for Notes on Sample Description

Time	Water Level (m)	Depth to Cave (m)
Upon Completion	3.6	N/A
November 24, 2023	3.5	N/A
Decmber 1, 2023	3.6	N/A

Log of Borehole BH-4

Project No. SUD-23012932-A0 | Figure No. B-5

Project: Proposed Subdivision | Sheet No. 1 of 1

Location: Laura Street, Hanmer, ON

505111E; 5165411N

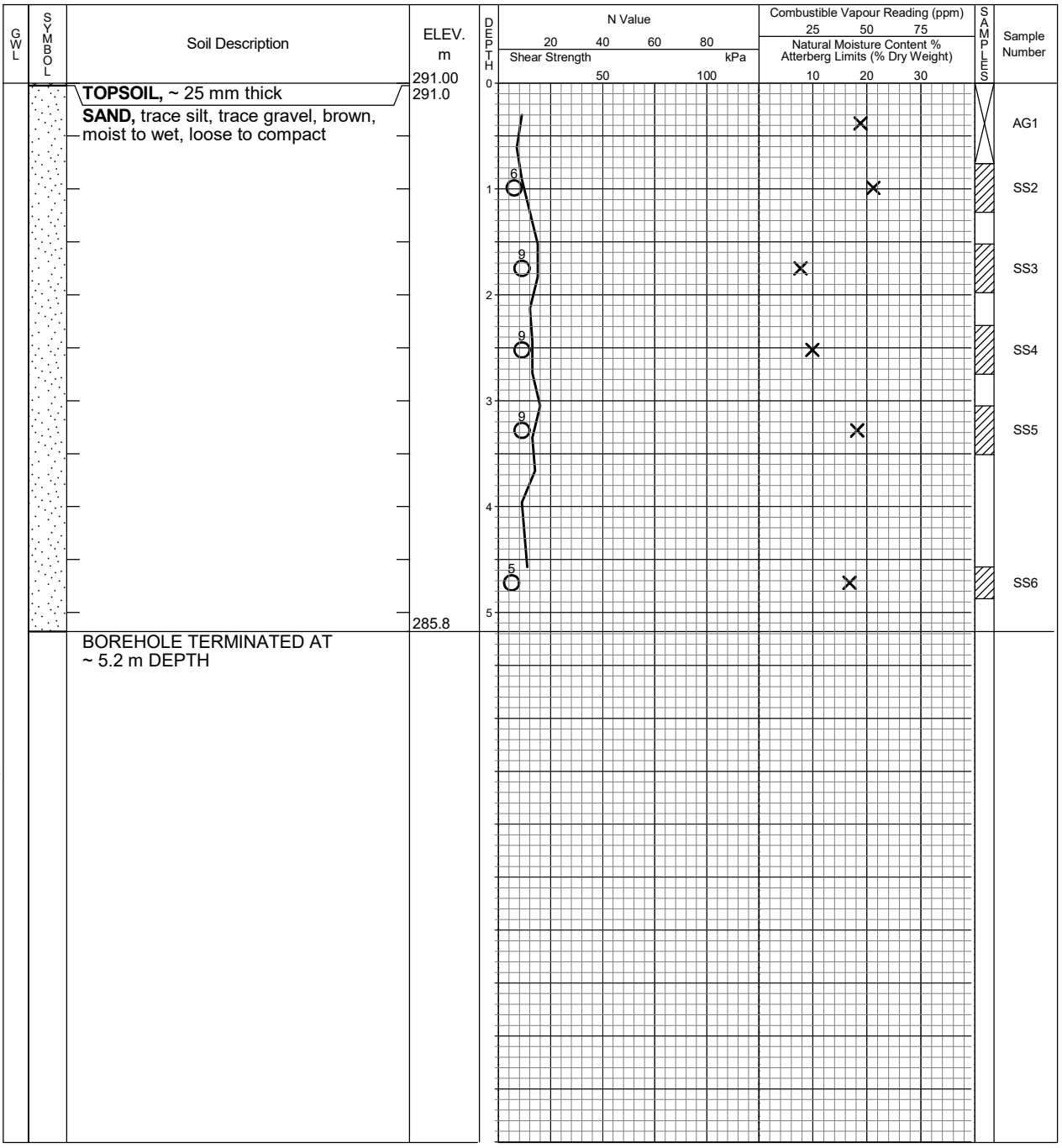
Date Drilled: November 23, 2023

Drill Type: CME55 TRUCK MOUNT

Datum: Geodetic (Hand-Held)

Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Field Vane Test (S)

Combustible Vapour Reading
Natural Moisture
Plastic and Liquid Limit
Undrained Triaxial at % Strain at Failure
Penetrometer



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Borehole data requires interpretation assistance from EXP before use by others.

See Figures B-1A and B-1B for Notes on Sample Description

Time	Water Level (m)	Depth to Cave (m)
Upon Completion	Dry	2.7

Log of Borehole BH-5

Project No. SUD-23012932-A0 | Figure No. B-6

Project: Proposed Subdivision | Sheet No. 1 of 1

Location: Laura Street, Hanmer, ON

505066E; 5165273N

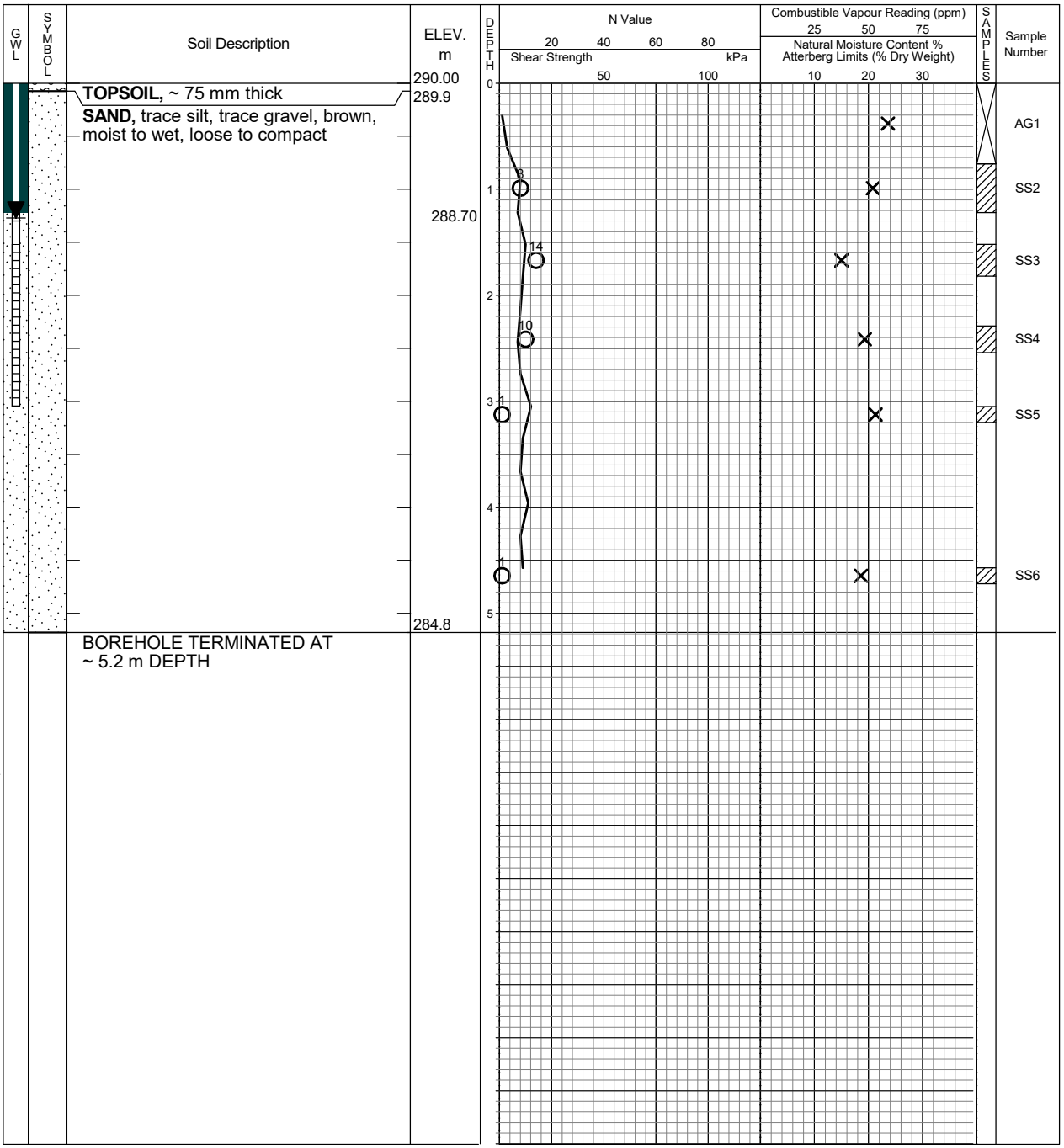
Date Drilled: November 24, 2023

Drill Type: CME55 TRUCK MOUNT

Datum: Geodetic (Hand-Held)

Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Field Vane Test (S)

Combustible Vapour Reading
Natural Moisture
Plastic and Liquid Limit
Undrained Triaxial at % Strain at Failure
Penetrometer



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Borehole data requires interpretation assistance from EXP before use by others.

See Figures B-1A and B-1B for Notes on Sample Description

Time	Water Level (m)	Depth to Cave (m)
Upon Completion	1.3	N/A
Decmber 1, 2023	1.3	N/A

Log of Borehole BH-6

Project No. SUD-23012932-A0 | Figure No. B-7

Project: Proposed Subdivision | Sheet No. 1 of 1

Location: Laura Street, Hanmer, ON

505015E; 5165456N

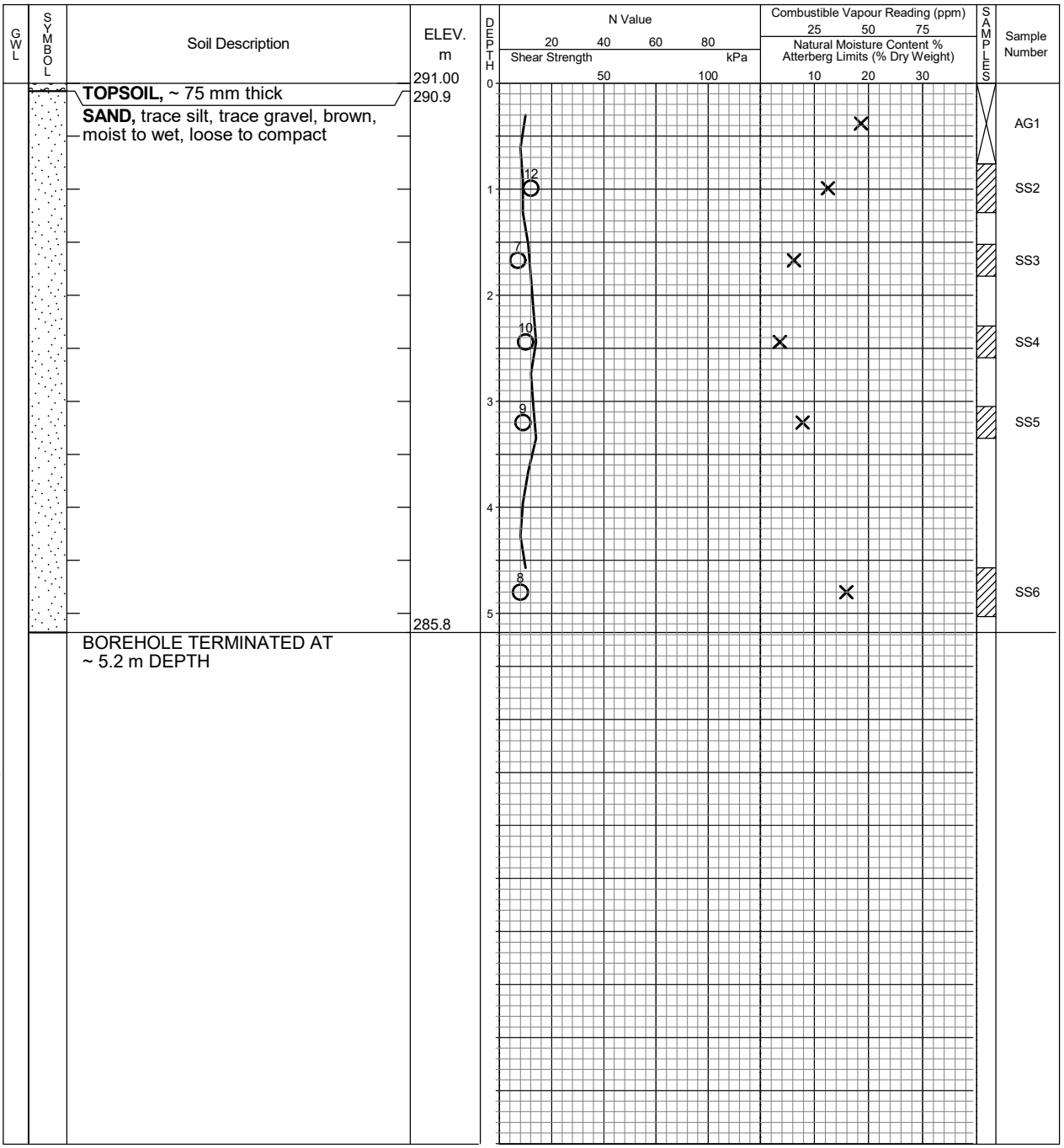
Date Drilled: November 24, 2023

Drill Type: CME55 TRUCK MOUNT

Datum: Geodetic (Hand-Held)

Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Field Vane Test (S)

Combustible Vapour Reading
Natural Moisture
Plastic and Liquid Limit
Undrained Triaxial at % Strain at Failure
Penetrometer



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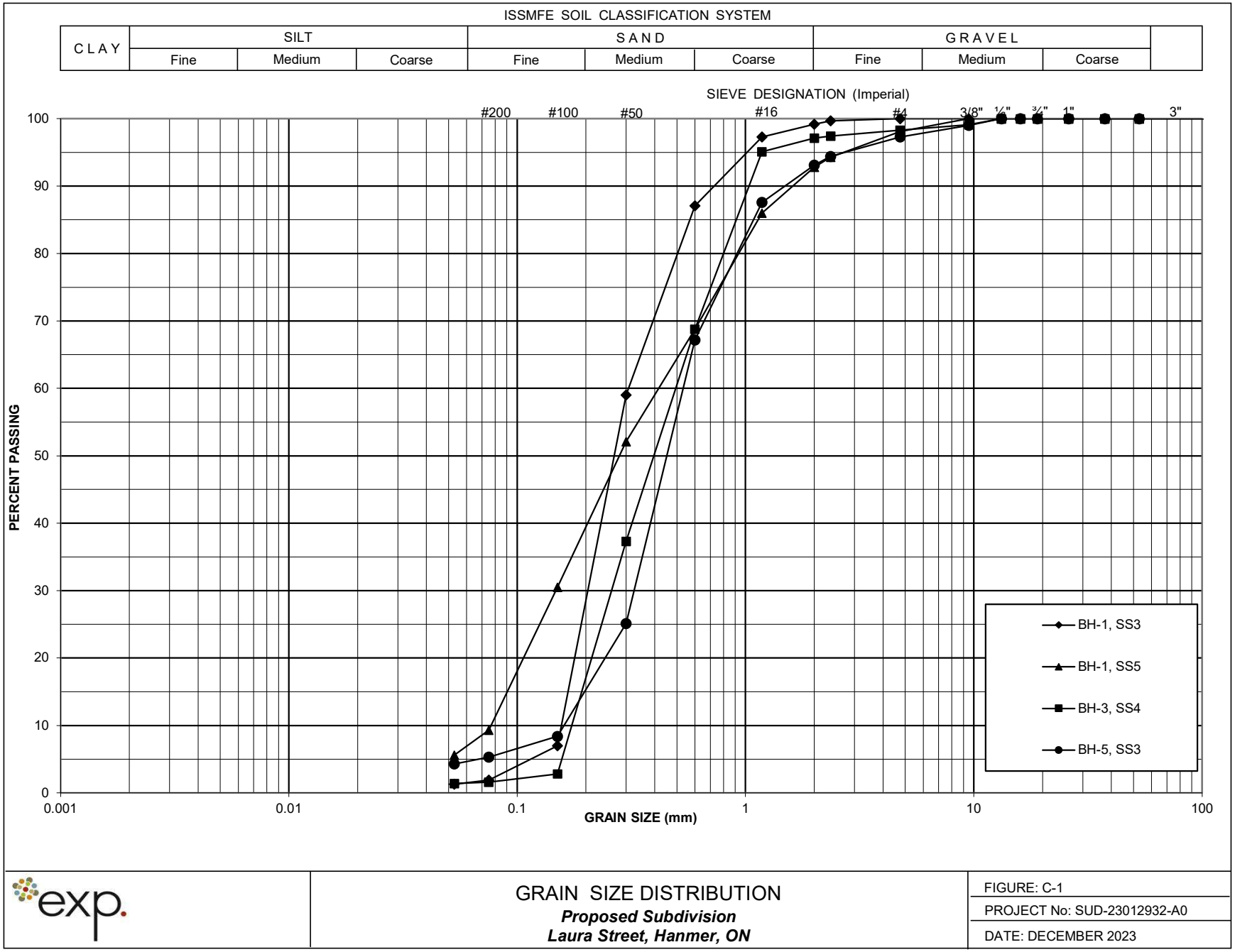
f: +1.705.674.5583

Borehole data requires interpretation assistance from EXP before use by others.

See Figures B-1A and B-1B for Notes on Sample Description

Time	Water Level (m)	Depth to Cave (m)
Upon Completion	Dry	3.7

Appendix C – Laboratory Test Results



GRAIN SIZE DISTRIBUTION

Proposed Subdivision

Laura Street, Hanmer, ON

FIGURE: C-1

PROJECT No: SUD-23012932-A0

DATE: DECEMBER 2023

September 16, 2024
File No. 45-23

Environmental Ecosystems Inc

SCOPED ENVIRONMENTAL IMPACT STUDY

For Part 1, Lot 11 Concession 2, Township of Capreol

0 Laura Street, City of Greater Sudbury

PREPARED FOR

Mallette-Goring Inc.

128 Pine Street, Suite 300,

Sudbury, ON P3C 1X3

F-887 Notre Dame Avenue
Sudbury, ON P3A 2T2

Table of Contents

APPENDICES

1.0 EXECUTIVE SUMMARY

The subject property, known as 0 Laura Street, requires an Environmental Impact Study (EIS) to fulfill requirements prior to beginning an application for the development of the Hanmer Dream Homes. The EIS is scoped to determine if the development of lots will have a negative impact to fish habitat, turtle habitat, hydrology, and potential increase in sediment and erosion to the adjacent wetland. The Study will also include appropriate mitigations and/or compensations if necessary. Field studies conducted determined the property contained various wetland types including conifer swamp, grassy marsh, and a permanent tributary. Blanding's turtles are confirmed to be present within a two (2) kilometre radius from the site and accommodations will need to be made to avoid contraventions to Section 9 (kill, harm, harass) or Section 10 (damage or destroy species at risk (SAR) habitat) of the *Endangered Species Act, 2007* (ESA). The watercourse and wetlands host fish habitat which will require consideration to ensure it is not degraded through the proposed development. The land use change from undisturbed upland and wetland vegetation to residential dwellings will cause an increase in impervious surfaces that can greatly impact peak flows and peak pollutant levels in the area. Appropriate stormwater modelling will be required to create a stormwater management system that can offset these impacts. Erosion and sediment control is essential during construction, particularly since the proposed development is going to be within 15 m of the wetland boundary. Based on the nature of the development, in conjunction with the provided mitigation strategies, the outlined Valued Components (VC's) are not anticipated to experience detrimental negative ecological or hydrological impacts such that the functions of the VC's are significantly reduced or impaired.

2.0 INTRODUCTION

Environmental Ecosystems Inc. (Enviro-Eco) was retained by Mallette-Goring Inc. to complete an Environmental Impact Study (EIS) to support an application for residential land development of Part 1, Lot 11, Concession 2 in the Township of Capreol. The property is known as 0 Laura Street located in Hanmer, Ontario. A map of the study area location is provided in Appendix A.

The subject property is currently undeveloped. The north portion of the subject property is the location of the Gladu Park Plan of subdivision registered as Plan 53M-1146, currently undeveloped. The southern portion of the subject property is a single undeveloped parcel currently zoned as Future Development.

The proposed development is located adjacent to Tributary X to the Whitson River. This watercourse has an associated flood and erosion hazard. The Regulatory flood elevation throughout the property is 288.89 m.

The site is zoned as "Low Density Residential" (R1-5) and "Future Development" (FD) according to the City of Greater Sudbury Zoning By-law. The R1-5 Zone requires a minimum lot area of 465.0 square metres and a minimum lot frontage of 15.0 metres on an open, publicly maintained road. The FD Zone requires a minimum lot area of 4.0 hectares with no minimum lot frontage. Once the lots are developed, they are to be re-zoned as "Low Density Residential One" (R1-7), which requires a minimum lot area of 279.0 square metres and a minimum frontage of 9.0 metres

on an open, publicly maintained road. As per the comments from the City's Strategic & Environmental Planning Department in October 2023, a scoped EIS report is required by the City of Greater Sudbury to ensure that ecological functions of the land have been evaluated and that there will be no negative impacts to the natural features or ecological functions of the identified Valued Components (VC). Impacts include changes to hydrological functions, impacts from sediment and erosion, fish and fish habitat, and species at risk (SAR) - the Blanding's turtle.

3.0 DEVELOPMENT DESCRIPTION

The development application anticipates the creation of 125 new lots on currently undeveloped residential land. The residential area will form a rectangle that runs the length of lots 96 through 107 along Roy Avenue and the width of parts 1 through 11 along Carmen Street. A stormwater management block and parkland will be developed past the southern border of proposed lots 118 to 108 and extend up to fifteen (15) m from the wetland boundary identified by Environmental Ecosystems Inc. and shown in Appendix D. The lot severances, boundaries, and subdivision plan were completed by Sheild Consulting Engineers and Architecture and is provided in Appendix B.

Total development area is proposed to be 10.79 hectares – 7.2 hectares for residential, 0.65 hectares for stormwater management, 0.49 hectares for parklands, and 2.41 for potential future development. Roger Street and Laura Street will be extended into the development, as well as two more streets (Street A and Street B) to complete access for all proposed lots. Development is to occur in the forested area up to 15 m from the edge of the established wetland boundary. The lots will hold residential dwellings, garages, and municipal water lines. At the time of this report, installations of municipal wastewater lines are not confirmed as it hinged on the planned upgrades to the Spruce Street lift station that are anticipated to be completed in 2024. The lots fall within the Whitson Lake watershed and stormwater management is included in the current residential development plan. Hydro infrastructure is established in the area and the anticipated lots are located within Municipal Road maintenance boundaries.

ENVIRONMENTAL IMPACT STUDY (EIS) BOUNDARIES

3.1 Spatial Boundaries

The purpose of the scoped EIS is to determine if the development of lots will have a negative impact to the valued components (VC) to the adjacent wetland surrounding the Tributary X of the Whiston River; specifically, the hydrology, impacts from sediment and erosion, fish and fish habitat and the Blanding's Turtle. In a letter dated October 25, 2023, Conservation Sudbury indicates in their assessment and determined the hydrology of the wetland is primarily driven by flows within the adjacent watercourse. As such development up to 15 m from the edge of the wetland is considered to have a negligible impact to the hydrology of the wetland and shall be permitted without further study. Development within 15 m of the wetland will require the support of an Environmental Impact Study (EIS) as per Conservation Sudbury's Wetland Guidelines (June 2021). The development shall be restricted to a fifteen (15) metre buffer outside of the wetland areas to be defined within the EIS. Access and development of housing within the lots will require the installation culverts, infrastructure, and utilities that may adversely impact the functions of the

VC's. A regional study area has been defined to include all wetland habitats and watercourses within the same watershed that may be indirectly and/or cumulatively impacted by the development. A map illustrating the delineated EIS study area and future development zones is provided in Appendix C.

3.2 Temporal Boundaries

The majority of the anticipated impacts from development of the property are permanent alterations and will occur over a short time period. Long-term or chronic impacts to the local and regional study area are anticipated to be minimal based on typical residential use. Type, duration and severity of anticipated impacts were evaluated to determine the EIS temporal boundary. Based on the primary acute impacts to the site, temporal boundaries were satisfied within a single site investigation.

4.0 EXISTING ENVIRONMENT

4.1 General

The site was assessed on September 11th, 2023, by Renee Levasseur and Manon Giroux, both certified Ontario Wetland Evaluator (OWES). The site will be located at 0 Laura Street; however, it does not currently have any frontage onto municipal roads. The proposed development area includes a grassy marsh wetland and conifer swamp area associated with Tributary X to the Whitson River to the south, and an area dominated by a tall shrub and mixed forest to the north. The edge of the property on the north and east sides are lined with residential dwellings. The property itself is vacant of any buildings at this time.

A local study area delineated within the southern portion of the lot has been identified as a wetland on the Ministry of Natural Resources Make a Natural Heritage Map (Ministry of Natural Resources and Forestry, n.d.).

The field team identified and delineated the wetland boundary following the MNRF Ontario Wetland Evaluation System. A copy of the wetland boundary identification report is provided in Appendix D. The wetlands surface area remains fairly uniform on the site property. The remaining area of the property consists of low-lying shrubs with thick brush along the fence lines and perimeter. Representative site photographs are provided in Appendix F.

4.2 Biophysical

4.2.1 Topography and Soils

The proposed development is situated in a vegetated area behind residential dwellings in the community settlement of Hanmer. It contains both tall shrub and mixed forests to the north then transitions to a wetland area as the ground begins to slope to the south. The wetland does not appear to have any historical disturbance and hosts a variety of wetland types including conifer swamp, grassy marsh, and permanent tributary to the Whitson River.

The average elevation of the wetland area to the south is 289 metres (Google, n.d.). Roy avenue is at an average of 291 metres, and the northern tall shrub and mixed forest area is 293 metres (Google, n.d.). Soils in the study area are split between the north and south. The northern portion which hosts the tall shrub and mixed forest consists of very fine sandy loam orthic humo-ferric podzols characterized as noncalcareous very fine sandy outwash of Precambrian materials with good drainage and gently sloping topography (Agriculture and Agri-Food Canada, 2013). The southern wetland portion of the site contains clay gleyed gray luvisol characterized as noncalcareous clay lacustrine deposits of Precambrian materials with imperfect drainage and gently to moderately rolling topography (Agriculture and Agri-Food Canada, 2013). Soils within the wetland ranged from damp to over-saturated.

4.2.2 Flora

The study area at present is vacant and hosts a diversity of upland and wetland vegetation species. The wetland areas contain mature wetland vegetation communities. A non-exhaustive vegetation list for the wetland is appended in Appendix D, Attachment 3. No invasive or rare species were observed within the study area.

Available data sources do not identify the presence of rare plant communities, invasive species, significant wetlands, significant habitats, Areas of Natural and Scientific Interest (ANSI) or candidate ANSI (*iNaturalist*, n.d.; Land Information Ontario, n.d.-a; Ministry of Natural Resources and Forestry, n.d.).

4.2.3 Fauna

A desktop review of all available sources was completed for the project area for occurrences of fauna. No Wildlife Values Areas are identified on site (Land Information Ontario, n.d.-b); the nearest Wildlife Values Site is approximately 8 kilometres north west where a Broad-winged Hawk nesting site was identified in January of 2003 (Land Information Ontario, 2024). Three (3) species listed on SARO were identified in or around the project area (*iNaturalist*, n.d.; Ministry of Natural Resources and Forestry, n.d.; Ontario Nature, n.d.; The Cornell Lab of Ornithology, n.d.; Toronto Entomologists' Association, n.d.; Xerces and Partners, n.d.); the species are the Blanding's turtle (*Emydoidea blandingii*), Canada warbler (*Cardellina canadensis*), and Monarch butterfly (*Danaus Plexippus*). Tributary X to the Whitson River is known as Blanding's Turtle habitat.

During the field investigation, common bird species were observed within the wetland. No other wildlife or signs of wildlife were observed on-site or within the southern wetland habitat. The site visit did not occur during the critical nesting period; however, it is likely that birds may utilize the area for nesting. Fish and fish habitat are supported within the Whitson Lake tributary. The wetland area and tributary may be utilized by fauna, such as amphibians, as a movement corridor.

4.2.4 Ground Water

Well records in the area show the overburden to be sand and silt of varying depths ranging from approximately 5 feet to over 45 feet with water found in the bedrock at depths ranging from approximately 100 feet to 200 feet. Static groundwater levels were generally less than 20 feet below ground surface.

Soils of Sudbury Area Ontario Soil Survey Report No. 49 shows the soil to be Naiden – a poorly drained very fine sandy loam and fine sand and Chartrand – an imperfectly drained loam, sandy loam, silt loam, clay loam, clay.

The bedrock geology is 28c -Lapilli tuff, breccia, felsic flows and intrusions, minor carbonate and cherty Whitewater Group; Onaping Formation (Geology Ontario, n.d.)

The development is not expected to pose any significant problems for groundwater in the area. Incorporating a groundwater component into the stormwater modelling would enhance the certainty of this statement.

Non-interference with groundwater recharge, discharge, quality and quantity can be achieved with proper design.

5.0 VALUED COMPONENT SELECTION

The assessment of development impacts on the biophysical environment has been scoped to selected Valued Components (VCs) identified within the study area. VCs are identified based on ecological importance, societal value or sensitivity of the environmental component to proposed development effects.

The VCs adjacent to the wetland surrounding the Tributary X of the Whiston River selection within the study area as part of the application for severance includes: hydrology, impacts from sediment and erosion, fish and fish habitat, and the Blanding's Turtle. A total of four (4) VCs were identified for this site.

5.1 Hydrology

The site drainage flows to a tributary that joins other tributaries before entering the Whitson River approximately 5.5 km to the southwest. The Ontario Watershed Information Tool (OWIT) identified that the point where this tributary crosses between Lot 11 into Lot 12 of Concession 2 Capreol, the catchment area is approximately eleven (11) square kilometres (km^2), with a main channel slope of 5.7 m/km and elevations ranging from 301 m to 377 m (Ministry of Natural Resources, 2023).

Altering the site from an area with natural vegetation and soil to an area with many impervious surfaces such as roof tops and paved areas often results in increased peak flows and increased peak pollutant levels. The potential to negatively impact surface water through surface alteration affecting the ratio of infiltration to runoff is high, but is also easily mitigated through proper stormwater management, including proper storm water drainage and ponds to limit the resulting peak flows and pollutant loadings to acceptable limits. Green infrastructure, such as infiltration wells, swales, etc. should be incorporated. Stormwater modelling capable of modelling flows and pollutant loadings for various extreme flows (e.g. .x-year floods, Timmins Storm, etc.) ensures the protection of the existing wetland hydrological functions. It is assumed that such storm water management and proper design of storm water ponds, etc. is included in the design process.

It should be demonstrated by the stormwater modelling that the final design incorporates sufficient controls to limit impacts to both flows and pollutant loadings that no negative impacts to the surface water will result. Erosion and sediment control, particularly during construction is also essential.

In Enviro-Eco's opinion, no interference to the wetland functioning will occur provided the above conditions are followed.

5.2 Sediment and Erosion Control

Erosion and sediment control is essential during construction, particularly since the proposed development going to be within 15 m of the wetland boundary. The average elevation ranges from 289 m in the south to 293 in the north over an extend area. The change in elevation is observed to be gradual allowing for sustainable management through a site-specific sediment and erosion control plan.

In a letter dated October 25, 2023, Conservation Sudbury indicates in their assessment and determined the hydrology of the wetland is primarily driven by flows within the adjacent watercourse.

5.3 Fish and Fish Habitat

The proposed development is located adjacent to Tributary X to the Whitson River and part of the Whitson Creek watershed. Whitson Creek is a warm water body and the Lake is know to host warm water fish species such as the Brown Bullhead (*Ameiurus nebulosus*), Yellow Perch *(Perca flavescens),* Walleye *(Sander vitreus)*, Northern Pike *(Esox lucius),* Smallmouth Bass *(Micropterus dolomieu),* Pumpkinseed *(Lepomis gibbosus),* White Sucker *(Catostomus commersonii)* and Central Mudminnow *(Umbra limi).*

Being the wetland is primarily driven by the flows with the adjacent watercourse known as Tributary X and the wetland consist of a grass marsh and conifer swamp with very low canopy cover, it is highly unlikely the proposed development up to 15 m of the wetland boundary is going to have an adverse effect of fish and fish habitat.

5.4 Species at Risk (SAR)

The site and surrounding areas have three (3) identified species that are currently listed under SARO: Blanding's turtle (*Emydoidea blandingii*), Canada warbler (*Cardellina canadensis*), and Monarch butterfly (*Danaus Plexippus*) (Ministry of Natural Resources and Forestry, n.d.; Toronto Entomologists' Association, n.d.). The Blanding's turtle is currently listed as threatened whereas the monarch and the Canadian warbler are species of special concern. The wetland area has also been assessed and the City of Sudbury Strategic and Environmental Planning Department has confirmed it to be Category 2 habitat for the Blanding's turtle.

During the field investigation, common bird species were observed within the wetland. No other wildlife or signs of wildlife were observed on-site or within the southern wetland habitat.

During a pre-consultation meeting in May 2024 with Mr. Monet of the CGS, it was noted that the wetland within the study area is considered Blanding's Turtle habitat by the MNRF. The purpose of the wetland boundary delineation was also to determine the extent of the Category 2 and 3 Habitat for the Blanding's Turtle, as outlined within the MNRF document entitled: "*Blanding's Turtle General Habitat Description*" (MNRF 2018) and to categorize areas with lowest to highest toleration to alteration.

Category 1 are Nest sites and overwintering sites are essential features and along with the 30 m area surrounding them are considered to have the lowest tolerance to alteration. Blanding's Turtles depend on these areas for sensitive life processes including egg-laying, incubation, hatching of young, and hibernation. A 30 m radius (average tree height) buffer around nesting and overwintering sites is important to maintain the microclimate conditions (e.g., thermal, vegetative and lighting features). These areas are habitually used and may support concentrations of individuals.

Based on the results of the file review and wetland boundary delineation, it was determined that a Category 2 should be applied to the site. A copy of the General Habitat Description for Blanding's Turtle can be found in Appendix E.

According to the habitat description document, Category 2 habitat includes the wetland complex (i.e., all suitable wetlands or waterbodies within 500 m of each other) that extends up to 2 km from an occurrence, and the area within 30 m around those suitable wetlands or waterbodies.

Category 2 habitat is considered to have a medium tolerance level to site alteration/development. A wetland complex will contain overwintering sites, springtime pools, and rehydration pools in vicinity of nesting habitat. The surface water connections within the wetland complex allow the Blanding's turtle to migrate to other surface water bodies within the complex. These connections are required for the turtle to carry out critical life processes such as overwintering hibernation, mating, reproduction, foraging, thermoregulation, and to provide access to nesting and refuge habitat or other surface water bodies during summer dry periods and low water levels. (Kiviat E., 1997). Significant draining, infilling, dredging, or other significant alteration of wetlands or other suitable waterbodies would impair and restrict the ecological functions that this habitat provides for the Blanding's turtle.

The Category 2 habitat also incorporates a 30 m buffer surrounding wetlands. This 30 m buffer in uplands is extremely important to the Blanding's turtle as they are known to use uplands not only for nesting during late spring early summer, but also for dormant periods in late summer. Blanding's turtle will dig out shallow depressions in the ground and cover themselves with leaf litter or vegetation, remaining inactive for days. This behaviour may be due to environmental temperature, moisture, photoperiod, and food supply (Joyal, 2001). Buffers of 30 m are widely recognized as providing a range of functional benefits to aquatic features and wetlands such as maintaining water quality by filtering sediment and nutrients, input of woody debris, and cooling water temperatures by shading and infiltrating surface runoff (MNRF, 2013). As reptiles are cold-blooded, their body temperature depends on its environment. Turtles that bask on land are gaining heat from the substrate they are in contact with, such as a log or the sand, through a process known as conduction. The Blanding's turtle is known to bask within 30 m of wetlands.

Therefore, the ecological functions of the Category 2 habitat encompassing the 30 m upland buffer is extremely significant to the life processes of the Blanding's turtle.

The Category 3 habitat has the highest tolerance to alteration. It is used as movement corridors between wetlands which are essential for carrying our life processes associated with Category 1.

The area of the proposed development is located in Category 2 and 3 Blanding's Turtle Habitat.

Since the Category 2 Blanding's Turtle wetland boundary setback is 30 m and the proposed development is being proposed up to 15 m of the wetland, consultation with the Ministry of Environmental, Conservation and Parks (MECP) is on-going to determine if an Overall Benefit Permit would be required that would authorize a person, company or organization to perform the activities of encroachment of the development with the 30 m buffer of the wetland.

6.0 IMPACT ASSESSMENT

Table 1 below provides a summary of typical development tasks that will have potential impacts on all identified VCs.

Table 1. Development Tasks, Potential Impacts, and Proposed Mitigations to All Identified Valued Components Within the Study Area Located on Laura Street.

Task	Potential Impacts	Level of Impact	Proposed Mitigations
Vegetation Removal	Disturbance, displacement, or mortality of wildlife	Moderate to high	Removal of vegetation within the migratory bird nesting window (May 1 to August 31) must be surveyed by a biologist prior to brushing, as required by the *Migratory Birds Convention Act*. As the vegetation removal will occur 15m from the wetland boundary, the area should be surveyed for presence of amphibians or reptiles prior to the removal.
	Increased Predation	Low	Risk of predation is low as a protective 15m buffer will be implemented surrounding the wetland. Furthermore, only a small portion of the development will be done in that proximity to the wetland to accommodate the stormwater management block which has been approved by Conservation Sudbury. No vegetation will be removed from within the 15m wetland boundary.
	Habitat loss	Low	Loss of wetland habitat is low and a 15 m buffer will be implemented as a protective measure. All vegetation removed prior to the 15m wetland buffer should be reduced to the smallest extent to limit losses.
	Damage to adjacent habitats and communities as a result.	Low	The area of vegetation removal is small and not anticipated to damage adjacent communities significantly. Priority of preservation should be given to tall woody shrubs and trees during vegetation removal.
	Potential for the establishment of invasive species	Moderate	Care must be made to ensure invasive species are not transported on-site via equipment, materials or vehicles. Equipment and vehicles should be washed prior to entering the site. Native vegetation should be conserved to the greatest extent possible to ensure long-term preservation of vegetation communities. If invasive plants begin to establish in the wetland area, plants should be removed as quickly as possible to prevent the spread.
	Increased erosion and sedimentation.	Low	Overall wetland vegetation to be removed from the site is low and a 15 m buffer will remain in place. Priority should be given to preserve the mature woody shrubs and trees surrounding the stormwater management block whenever possible.

Task	Potential Impacts	Level of Impact	Proposed Mitigations
	Increased light resulting in increased exposure, desiccation, temperature, and algae blooms.	Low	No vegetation is being removed from within the wetland boundary. The level of vegetation to be removed at the 15m buffer zones is minimal to accommodate the construction of the stormwater treatment block. Priority should be given to preserve canopy and super-canopy woody vegetation (i.e.: tall shrubs and trees). There will not be any opportunity for re-vegetation as all cleared areas will be used for the development. Should there be any cleared areas that are not is use post-development, re-vegetating with native wetland specific species identified in Appendix D, Attachment 3 of this report is encouraged.
Site Excavation and Grading	Risk of sediment erosion into wetland and surface water features.	Moderate	Ontario Provincial Standard Specification 805 (Construction Specification for Temporary Sediment Control), 804 (Construction Specification for Temporary Erosion Control), and 219 (Specs) shall be incorporated and implemented during the development of these lots. The site must establish sufficient filter/buffer strips with the proper width (based on slope and roughness factor) to prevent sedimentation from occurring in the wetland and tributary. Installation of permanent erosion fencing is recommended if impacts to the surrounding vegetation and wetland are determined too high. The project site should be fenced off to ensure no machinery enters the habitat that is to be retained. All excess materials must be collected, contained and properly disposed of off-site in an approved manner.
	Habitat loss.	Low	Disturbance to wetland area will be limited to the smallest extent possible. Only the creation of the stormwater management block shall be permitted to disturb the wetland area.
	Changes to wetland and stream hydrology.	Low	Impacts to the wetland and tributary hydrology pose a low risk. In a letter dated October 25, 2023, Conservation Sudbury indicates their assessment determined the hydrology of the wetland is primarily driven by flows within the adjacent watercourse. As such development up to 15 m from the edge of the wetland is considered to have a negligible impact to the hydrology of the wetland. It is integral to ensure water quality is not impacted by short-term lot development and long-term residential lot use. Excavation of the wetlands should be reduced to the smallest extent possible and limited to the construction footprint. Appropriate

Task	Potential Impacts	Level of Impact	Proposed Mitigations
			stormwater management will be required to ensure that water quality is not impaired. These might include additional storage in stormwater management ponds and installation of baffles or other energy dissipation techniques. Stormwater modelling must occur to anticipate any changes and plan accordingly.
	Importation of invasive species.	Low	All equipment and vehicles should be cleaned prior to arriving on site.
	Displacement of soils resulting in ground movement, settlement and/or instability.	Low	The area of the site near the wetland that is to be excavated and grated is a small area only to accommodate the storm water management block. The area is outside of the 15m wetland buffer. The site is relatively flat, and the risk of soil instability is low.
	Disturbance, displacement, or mortality of wildlife.	Moderate	Reptile exclusionary fencing, specifically for the Blanding's Turtle will be implemented as an assurance to prevent reptiles and amphibians from entering the Site. The area should be surveyed for presence of amphibians or reptiles prior to the beginning of construction to examine the integrity of the fencing and ensure none have entered the area. Daily records are to be logged. If a species at risk, such as the Blanding's turtle, is stranded within the isolated work area, work should cease and it should be allowed to leave the area by its own accord if possible. If needed, the turtle can be encouraged to leave the work area by slowly following the turtle out of the work area. If a turtle is in imminent danger or harm and cannot be encouraged to leave on its own, the turtle should be relocated outside of the work area by a qualified environmental professional an individual trained by a qualified environmental professional (EP), referencing the Ontario Species at Risk Handling Manual: For Endangered Species Act Authorization Holders as required. Qualified environmental professionals should be contacted in the event species at risk are discovered on site.
Filling	Importation of invasive species.	Moderate	Only clean fill material should be used for filling and preference is given to fill obtained locally and from a location absent of invasive species wherever reasonable.

Task	Potential Impacts	Level of Impact	Proposed Mitigations
	Sediment erosion into wetland and surface water features.	Low to moderate	Sediment and erosion control measures will be implemented in accordance with Ontario Provincial Policy Standards Section B, Part 4. Fill materials should be of a type that will not produce significant sediment erosion into the wetland and waterbodies. The site must establish sufficient filter/buffer strips with the proper width (based on slope and roughness factor) to prevent sedimentation from occurring in the wetland and tributary. Installation of permanent erosion fencing is recommended if impacts to the surrounding vegetation and wetland are determined too high.
	Risk of vegetation community mortality due to increased sediment load.	Moderate	Fill materials should be of a type and quality that will not produce significant sediment erosion into the wetland and waterbodies. Installation of permanent erosion fencing is recommended to the surrounding vegetation and wetland area.
	Introduction of acid generating fill materials.	Low	Fill materials are to be tested to ensure acid-generating materials are not used for filling within the wetland or within 50 m of the wetland.
	Injury or death to wildlife due to sharp, coarse materials.	Low	The use of round stones and other safe fill materials are recommended. The perimeter of the development can be revegetated with native plants to reduce harm to wildlife using the area.
Material Storage	Stockpiles of overburden soil, gravel, or sand may erode into nearby wetland and/or surface water features.	Moderate	Management of excess materials shall follow Ontario Provincial Policy Standard 180 (General Specification for the Management of Excess Materials), 805 (Construction Specification for Temporary Sediment Control), and 804 (Construction Specification for Temporary Erosion Control). Stockpiles of materials should be a minimum of 30m away from the wetland and not left longer than 48 hours or during heavy rainfall events.
	Indirect contamination of downstream surface water.	Low	Management of excess materials shall follow Ontario Provincial Policy Standard 180 (General Specification for the Management of Excess Materials), 805 (Construction Specification for Temporary Sediment Control), and 804 (Construction Specification for Temporary Erosion Control). Stockpiles of materials

Task	Potential Impacts	Level of Impact	Proposed Mitigations
			should be a minimum of 30m away from the wetland and not left longer than 48 hours or during heavy rainfall events.
	Risk of nesting in stockpiled materials by reptiles.	Low	Stockpiles of sand or gravel are to be kept outside of the wetland. A visual inspection of the stockpile may be required daily when working in the active nesting season (early May to mid-July) to assess for signs of nesting. Turtle exclusionary fencing can be installed surrounding the development area to prevent reptiles from entering the work area. Fencing should be inspected daily to confirm its integrity as an effective barrier.
Site Water Management	Potential for flood impacts.	Moderate to high	A storm water management block will be built on the southern portion of the subdivision. The specifications of this storm water management block have not been disclosed at the present date. The change in terrain permeation has the potential to impact the natural hydro-period. Site water management will require design by a qualified professional engineer. All site water management infrastructure should be designed in consideration of various extreme flows (i.e., x-year floods, Timmins Storm).
	Change in stormwater quality and quantity including: erosion of exposed soil, increase sediment loading and increased surface/stormwater runoff.	Moderate to high	A Sediment and Erosion control plan will be developed to include storm water management. Practices to be considered and implemented as required include: reduce clearing and amount of exposed soil; install key sediment control before grading/land alterations begin; sequence construction activities so that the soil is not exposed for long periods of time; protect storm drain inlets to filter out debris; stabilize all exposed soil areas as soon as land alterations have been completed.
	Local contamination of groundwater or surface water.	Low	Handling of contaminated materials shall be included within a Sediment and Erosion Control Plan. This includes disposal of excess materials or contaminated materials, spills procedures, preventative protocols and best management practices.
Road Construction	Disturbance, displacement, or mortality to wildlife.	Low	Road construction will not be occurring near the wetland area. Turtle exclusionary fencing is recommended and visual surveys for amphibians and reptiles will prior to the commencement of each day should any roadwork occur within the 15m wetland buffer.

Task	Potential Impacts	Level of Impact	Proposed Mitigations
	Noise disturbance to nesting birds.	Moderate	Migratory bird nest surveys are required for the removal of vegetation and disturbance to nests in the area of the construction per the *Migratory Birds Convention Act*.
	Loss of habitat linkages and increased movement obstacles.	Low	The maintenance of native vegetation is encouraged as much as possible.
	Increased risk of predation to wildlife.	Low	Road construction is not occurring near the 15m wetland buffer. If construction were to require removal of vegetation within the 15m wetland buffer, priority should be given to tall woody vegetation.
	Risk of hazardous material entering the wetland and/or surface water features	Moderate	A Sediment and Erosion Control Plan will be implemented to reduce risk of infiltration of hazardous materials or erosion of sediment into the wetland and/or surface water features. No cutting of wood or cement shall be done over the wetland.
Infrastructure and Building Construction, Installation of Utilities	Disturbance, displacement, or mortality to wildlife	Moderate	Visual surveys are recommended for wildlife, specifically reptiles and amphibians, during infrastructure and building construction.
	Noise disturbance to nesting birds	Moderate	Migratory breeding bird surveys are required for the removal of vegetation and impact of disturbance on nesting birds in the area, as per the *Migratory Birds Convention Act*.
	Risk of sediment erosion and hazardous materials entering wetland and/or surface water features	Moderate	A Sediment and Erosion Control Plan will be implemented to reduce risk of infiltration of hazardous materials or erosion of sediment into the wetland and/or surface water features. No cutting of wood or cement shall be done over the wetland/watercourse.
Fencing	Loss of habitat connectivity and movement corridor barriers.	Low	The use of fences is not permitted in the wetland or surrounding surface water features.

Task	Potential Impacts	Level of Impact	Proposed Mitigations
	Disturbance, displacement, or mortality to wildlife.	Low	Caution is recommended for wildlife in upland areas during the installation of fences. Bird nest surveys are required when the removal of vegetation is needed as per the *Migratory Birds Convention Act*.
Operation – Long-term			
Water Management	Excessive collection of rain water in barrels could alter hydrology of wetland.	High	Collection of rainwater is prohibited within the wetland.
	Risk of contamination to wetland by wastewater systems.	Low	Wastewater systems are to be installed by professionals and using appropriate standard methods.
Storage, Handling, and Transport of Hazardous Material.	Spills of hazardous materials (i.e., gasoline, oil, paint, cement, etc.) directly contaminate wetland and surface water features.	Low	Storage of materials is prohibited within 15m of the wetland. Safe storage and handling of toxic materials is recommended at all times.
	Spills of hazardous materials (i.e., gasoline, oil, paint, cement, etc.) indirectly affect linked surface water and groundwater features.	Low	Storage of materials is prohibited within 15m of the wetland. Safe storage and handling of toxic materials is recommended at all times.
Vegetation Removal and Maintenance	Disturbance, displacement or mortality to wildlife.	Moderate	A visual survey for nesting birds is required prior to the removal of vegetation, as per the *Migratory Birds Convention Act*. A visual inspection for other wildlife is recommended prior to commencing construction activities.
	Improper use of herbicides and	Moderate	Herbicide use shall be administered in accordance to the *Pesticides Act*. Spraying herbicides within 15m of a wetland is prohibited.

Task	Potential Impacts	Level of Impact	Proposed Mitigations
	pesticides risks contaminating wetland and linked surface water features.		
	Improper use of pesticides risks harm and death of wildlife and threats to local ecosystems, and an increased risk of pesticide resistance.	Moderate	Pesticide use shall be administered in accordance to the *Pesticides Act*. Spraying pesticides within 15m of a wetland is prohibited.
	Improper or excessive use of fertilizers poses risk of nutrient overload and contamination in wetland and linked surface water features.	Moderate	Use of fertilizers should be a minimum of 15m away from any wetland or waterbody and used in accordance to best management practices.
Filling and Site Grading	Import of unsuitable, contaminated or acid-generating materials pose risk to wetland and linked surface water features.	Moderate	Fill materials are recommended to be tested for acid-generating materials prior to use. Filling inside of the wetland is not permitted. Filling within 15m of the wetland is recommended to incorporate sediment and erosion control measures.
	Filling of wetland poses risk of contamination, loss of habitat, danger to wildlife and changes to the hydrology and water quality.	Low	Filling inside of the wetland is not permitted.

Task	Potential Impacts	Level of Impact	Proposed Mitigations
Fencing	Disturbance, displacement or mortality to wildlife.	Low	Fencing is not permitted within the wetland area. Visual surveys for wildlife are recommended prior to the construction of new fencing upland.
	Loss of habitat connectivity and movement corridor barrier.	Low	Upland habitat connectivity and movement corridors are not anticipated to be significantly impacted by the creation of fencing.

7.0 CONCLUSION AND RECOMMENDATIONS

The lot severances and proposed development within the property located on Laura Street is not anticipated to have a significant impact on the identified valued component's functions and features, should all mitigation recommendations provided in the above table be complied. Any site alteration must remain 15 m from the established wetland boundary which has been approved by Conservation Sudbury. A qualified professional engineer will be required to complete a stormwater management model to determine how the changes in terrain will impact the natural hydro-period. Mitigation measures such as stormwater management ponds or installation of baffles or other energy dissipation techniques should be explored if site development leads to an increase in flow velocities. Maintaining water quality is also crucial to the health and wellness of the valued components. Water must be treated prior to entering the wetland area should the quality of the runoff be negatively impacted by the residential development and long-term operations on site. The creation and implementation of a Sediment and Erosion Control is required. Additional studies are required for any future work within the 15m of the wetland boundary. Reptile and amphibian surveys must be conducted to ensure none have entered the site and may be harmed by the development. As the wetland in considered to be Category 2 habitat for the Blanding's turtle, special consideration must be taken to ensure the development does not cause any impacts that are listed under Section 9 (kill, harm, harass) or Section 10 (damage or destroy species at risk (SAR) habitat) of the *Endangered Species Act, 2007*. Sediment and erosion mitigation tactics shall include turtle exclusion fencing around the staging area and exposed dirt piles to prevent the turtle's potentially accessing the project site. The project will be subject to daily sweeps to prior to the beginning of construction to examine the integrity of the fencing and ensure no turtles have entered the area. If a turtle is stranded in the work area, a qualified environmental professional must be contacted and follow the protocol listed in the Ontario Species at Risk Handling Manual: For endangered Species Act Authorization Holders as required.

Discussions are on-going with MECP Species at Risk Division. A Blanding's Turtle Category 2 buffer is 30 m from the wetland boundary identification. Conservation Sudbury has assessed the area and determined that a 15 m setback of the wetland was considered to have negligible impact to the hydrology therefore it doesn't support the 30 m setback. An overall Benefit Permit may be required that authorizes a person, company or organization to perform the activities, as long a s there is an overall benefit to the species. Recommendations provided by MECP will be submitted as an addendum to this report once received and will form an integrated part of the setback from the wetland boundary.

8.0 LIMITATIONS AND CLOSURE

This report has been prepared by Environmental Ecosystems Inc. The study represents the conditions at the Site only at the time of the study and is based on the information referenced and contained in the report. The conclusions presented herein respecting current conditions represents the best judgment of the assessor based on current environmental standards. Environmental Ecosystems Inc. attests that to the best of our knowledge, the information presented in this report is accurate.

We trust that the information is sufficient to meet your requirements. Should you have any questions or require further information, please do not hesitate to contact the undersigned at your convenience.

Sincerely,
For Environmental Ecosystems Inc.

Alannah Day, *BES*
Env. Scientist/Author
alannah.day@gmail.com

Manon Giroux, *C.E.T., E.P.*
Sr. Env. Scientist/President
mgiroux@enviro-eco.ca

9.0 REFERENCES

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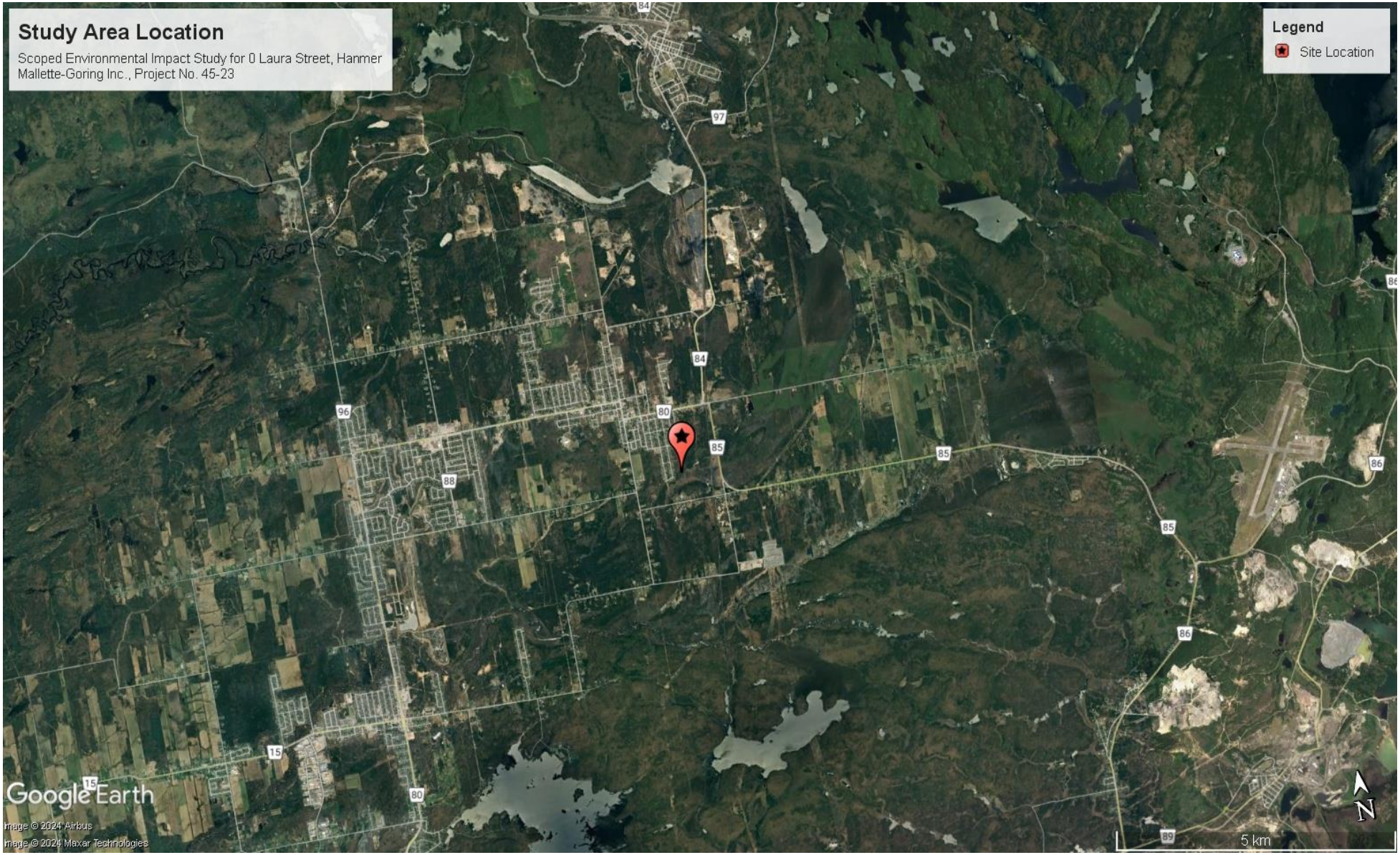
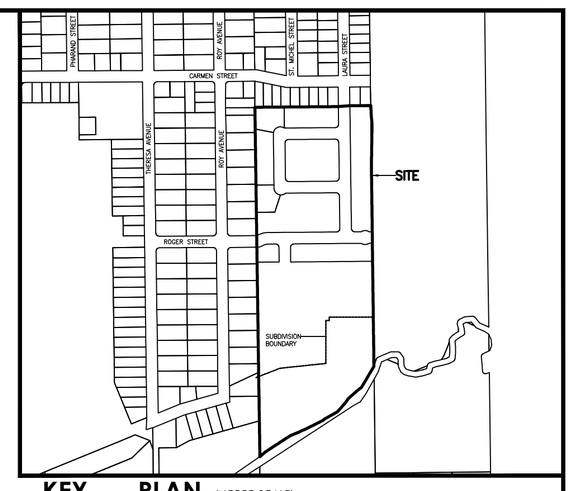
APPENDIX A

Study Area Location


Study Area Location
Scoped Environmental Impact Study for 0 Laura Street, Hanmer
Mallette-Goring Inc., Project No. 45-23
Legend
Site Location
Google Earth
Image © 2024 Airbus
Image © 2024 Maxar Technologies
5 km
N

APPENDIX B

Draft Site Plan



KEY PLAN *(NOT TO SCALE)*

DRAFT PLAN OF SUBDIVISION LOTS 1 TO 66 REGISTERED PLAN 53M-1146 AND PART OF LOT 11 CONCESSION 2

(GEOGRAPHIC TOWNSHIP OF CAPREOL)

CITY OF GREATER SUDBURY

DISTRIC OF SUDBURY

Scale 1:750

20 0 20 40 METRES

Avant Garde Geomatics Ltd.

METRIC CONVERSION

DISTANCES AND COORDINATES SHOWN ON THIS PLAN ARE IN METRES AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048

LAND USE

AREA OF LOTS = 5.25 (12.97)	Hectares (Acres)
AREA OF ROADS = 2.03 (5.01)	Hectares (Acres)
AREA OF BLOCKS = 1.17 (2.89)	Hectares (Acres)
TOTAL AREA OF SUBDIVISION = 8.45	Hectares

NOTES

1. THE BOUNDARY INFORMATION IS COMPILED FROM SKETCH BY TULLOCH GEOMATICS INC. AND ARE VERIFIED BY FIELD MEASUREMENTS
2. THE PROPOSED LOT FABRIC IS CONTINGENT ON THE TRANSFER TO THE OWNER OF THE PROPERTIES DEDICATED IN 1981 FOR ROADS AND PARK PURPOSES FOR THE DEEMED PLAN OF SUBDIVISION 53M-1146. AS THE CURRENT OWNER OF THE LANDS SEEKS TO REVISE, EXPAND AND MODERNIZE THE LOT FABRIC ON THE LANDS, RESOLUTION PL2024-99 WAS RATIFIED BY CITY OF GREATER SUDBURY COUNCIL ON JUNE 25TH 2024, APPROVING THE ROAD CLOSURE AND DECLARATION OF SURPLUS LAND FOR THE ROADS FOR SALE TO THE OWNER, AND OFFER OF THE PARK PURPOSES LOTS FOR SALE TO THE OWNER.

ADDITIONAL INFORMATION REQUIRED UNDER SECTION 51 OF THE PLANNING ACT.

(A)-AS SHOWN ON DRAFT PLAN
(B)-AS SHOWN ON DRAFT PLAN
(C)-AS SHOWN ON DRAFT AND KEY PLANS
(D)-LOTS 1-125: R1-7 "LOW-DENSITY RESIDENTIAL ONE" SINGLE-FAMILY DETACHED HOUSES
BLOCK 126: OSC "OPEN SPACE CONSERVATION" FOR STORMWATER MANAGEMENT
BLOCK 127: OSC "OPEN SPACE CONSERVATION" FOR LINEAR TRAILS AND PARK
BLOCK 128: OSC "OPEN SPACE CONSERVATION" ACCESS TO SWM AND LINEAR TRAILS
(E)-AS SHOWN ON DRAFT PLAN
(F)-NORTH – LOW DENSITY RESIDENTIAL ONE (R1-5)
SOUTH – FUTURE DEVELOPMENT (FD)
EAST – FUTURE DEVELOPMENT (FD)
WEST – LOW DENSITY RESIDENTIAL ONE (R1-5)
(G)-AS SHOWN ON DRAFT PLAN
(H)-MUNICIPAL WATER SUPPLY CAPACITY AVAILABILITY FOR THE PROPOSED DEVELOPMENT WAS CONFIRMED WITH THE CITY OF GREATER SUDBURY ON MAY 10TH 2024. WASTEWATER SUPPLY CAPACITY FOR THE PROPOSED DEVELOPMENT IS EXPECTED TO BECOME AVAILABLE PENDING MUNICIPAL SPRUCE STREET LIFT STATION UPGRADES PLANNED FOR 2024.
(I)-THE SUBSURFACE CONDITIONS WITHIN THE SITE GENERALLY CONSISTED OF TOPSOIL OVERLYING NATIVE COHESIONLESS SOILS, CONSISTING OF A SAND WITH TRACE SILT AND TRACE GRAVEL.
(J)-TOPOGRAPHY IS NOT SHOWN.
(K)-ALL MUNICIPAL SERVICES AVAILABLE
(L)-AS SHOWN ON DRAFT PLAN

PREPARED BY:

SHIELD CONSULTING ENGINEERS & ARCHITECTURE
130 PARIS STREET
SUDBURY, ON P3E 3E1

ONTARIO LAND SURVEYOR:

AVANT GARDE GEOMATICS INC.
600 PINE CONE ROAD,
SKEAD, ON, P0M 2Y0

OWNER'S CERTIFICATE

I HEREBY AUTHORIZE AVANT GARDE GEOMATICS LTD. TO SUBMIT THIS DRAFT PLAN OF SUBDIVISION ON MY BEHALF

DATE

SHARIFUL ISLAM,PRESIDENT
1000564075 ONTARIO CORPORATION
I HAVE THE AUTHORITY TO BIND THE CORPORATION

SURVEYOR'S CERTIFICATE

I HEREBY CERTIFY THAT THE BOUNDARIES OF THE SUBJECT LANDS AND THEIR RELATIONSHIP TO ADJOINING LANDS HAVE BEEN ACCURATELY AND CORRECTLY SHOWN.

JULY 10, 2024
DATE

JUZER NOMAN
ONTARIO LAND SURVEYOR

SHIELD
130 PARIS STREET, SUDBURY, ON P3E 3E1
WWW.SHIELDENG.CA
TEL: 705-885-1080

Avant Garde Geomatics Inc.
ONTARIO LAND SURVEYORS
aggeo.ca

DRAWN: JN	CHECKED: JN	DATE: 07/10/2024	PROJECT No.: SS24013

10 July 2024 11:42 AM

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APPENDIX C

Wetland Boundary Map

SKETCH OF TOPOGRAPHIC INFORMATION
LANDS KNOWN AS 0 LAURA STREET
CITY OF GREATER SUDBURY
TULLOCH GEOMATICS INC.
2023

SCALE 1:300

0 5 10 15 20 METRES

SHEET 1 OF 2

THE INTENDED PLOT SIZE OF THIS PLAN IS 914mm IN WIDTH BY 1422mm IN HEIGHT WHEN PLOTTED AT A SCALE OF 1:300.

DATE:
TOPOGRAPHIC INFORMATION COLLECTED DURING THE PERIOD OF SEPTEMBER 11th, 2023 TO OCTOBER 24th, 2023.

METRIC:
DISTANCES AND ELEVATIONS SHOWN ON THIS PLAN ARE IN METRES AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048.

ELEVATION NOTE:
ELEVATIONS SHOWN HEREON ARE GEODETIC, ARE REFERRED TO THE CANADIAN GEODETIC VERTICAL DATUM OF 1928 (CGVD28) AND ARE DERIVED FROM THE CITY OF GREATER SUDBURY VERTICAL CONTROL MONUMENT No. 001643124 USING REAL TIME NETWORK (RTN) HAVING AN ELEVATION OF 290.576m.

SITE BENCHMARK NOTE:
SITE BENCHMARK 'A' (BM) IS TOP OF STAINLESS STEEL BOLT AND WASHER (SSBW), CITY OF GREATER SUDBURY VERTICAL CONTROL MONUMENT No. 027960152C, HAVING AN ELEVATION OF 293.998m.

SITE BENCHMARK 'B' IS TOP OF SET ROUND IRON BAR HAVING AN ELEVATION OF 292.49m.

CAUTION:
ANY UNDERGROUND SERVICES AND THEIR POSITIONS ARE NOT CONFIRMED BY THIS PLAN.

LEGEND:

AE	DENOTES ASPHALT EDGE
AN	DENOTES ANCHOR
APPROX	DENOTES APPROXIMATE
BH	DENOTES BOREHOLE
BM	DENOTES BENCHMARK
CL	DENOTES CENTERLINE
CLF	DENOTES CHAIN LINK FENCE
GF	DENOTES GARAGE FLOOR
NTS	DENOTES NOT TO SCALE
PIN	DENOTES PROPERTY IDENTIFICATION NUMBER
RW	DENOTES RETAINING WALL
SSBW	DENOTES STAINLESS STEEL BOLT AND WASHER
S/T	DENOTES SUBJECT TO
TS	DENOTES TOE OF SLOPE
UP	DENOTES UTILITY POLE
-----	DENOTES EDGE OF GRAVEL
——x——	DENOTES FENCE LINE
——OW——	DENOTES OVERHEAD WIRE
~~	DENOTES HEDGE OUTLINE

CARMEN STREET
REGISTERED PLAN M-490

CARMEN STREET
REGISTERED PLAN M-520
PIN 73508-0040

BLOCK "A" (0.305 RESERVE) (NTS)
REGISTERED PLAN M-520

ROGER STREET
REGISTERED PLAN M-490

ROGER STREET
REGISTERED PLAN 53M-1146

LAURA STREET
REGISTERED PLAN 53M-1146

GLADU CRESCENT
REGISTERED PLAN 53M-1146

JAMES STREET
PIN 73508-1133

BLOCK "B" (0.305 RESERVE) (NTS)
REGISTERED PLAN M-490
PIN 73508-1178
SUBJECT TO EASEMENT AS IN LT117325

BLOCK 67 (0.305 RESERVE) (NTS)
REGISTERED PLAN 53M-1146
PIN 73508-1141
SUBJECT TO EASEMENT AS IN LT117304

BLOCK 68 (0.305 RESERVE) (NTS)
REGISTERED PLAN 53M-1146
PIN 73508-1140
SUBJECT TO EASEMENT AS IN LT117304

BLOCK 69
REGISTERED PLAN 53M-1146
PIN 73508-1139
SUBJECT TO EASEMENT AS IN LT117304

BLOCK 70
REGISTERED PLAN 53M-1146
PIN 73508-1138
SUBJECT TO EASEMENT AS IN LT117304

BLOCK 71
REGISTERED PLAN 53M-1146
PIN 73508-1137
SUBJECT TO EASEMENT AS IN LT117304

SITE BM 'A': SSBW 027960152C
ELEVATION=293.998

SITE BM 'B': ELEVATION=292.49

PART 12, PLAN 53R-6491
SUBJECT TO EASEMENT AS IN LT421457

PART 10
PLAN 53R-
6491
SUBJECT TO EASEMENT AS IN LT117304

PART 11
PLAN 53R-
6491

PART 1 PART 2 PART 3 PART 4 PART 5 PART 6 PART 7 PART 8 PART 9
PLAN 53R-6491

PART 17 S/T LT421458
PART 18 S/T LT421458
PART 19 S/T LT421458
PART 20 S/T LT421458
PART 21 S/T LT421458
PART 22 S/T LT421458
PART 23 S/T LT421458
PART 24 S/T LT421458

PART 14 S/T LT421458
PART 15 S/T LT421458
PART 16 S/T LT421458

LOT 1 LOT 2 LOT 3 LOT 4 LOT 5 LOT 6 LOT 7 LOT 8 LOT 9 LOT 10 LOT 11 LOT 12 LOT 13 LOT 14

LOT 95 LOT 96 LOT 97 LOT 98 LOT 99 LOT 100 LOT 101 LOT 102 LOT 103 LOT 104 LOT 105

LOT 41 PIN 73508-1144
LOT 42 LOT 43 LOT 44 LOT 45 LOT 46 LOT 47 PIN 73508-1143
LOT 48 PIN 73508-1142
LOT 49 LOT 50 LOT 51 LOT 52 LOT 53 LOT 54
LOT 55 LOT 56 LOT 57 LOT 58 LOT 59 LOT 60 LOT 61 LOT 62 LOT 63 LOT 64 LOT 65 LOT 66
LOT 34 LOT 35 LOT 36 LOT 37 LOT 38 LOT 39 LOT 40 PIN 73508-1145
LOT 15 LOT 16 LOT 17 LOT 18 LOT 19 LOT 20 LOT 21 LOT 22 LOT 23 LOT 24
LOT 25 LOT 26 LOT 27 LOT 28 LOT 29 LOT 30 LOT 31 LOT 32 LOT 33

PIN 73508-1135 SUBJECT TO EASEMENT AS IN LT117304
PIN 73508-1136 SUBJECT TO EASEMENT AS IN LT117304
PIN 73508-1134
PIN 73508-1099

LOT 11 CONCESSION 2 GEOGRAPHIC TOWNSHIP OF CAPREOL

MATCHLINE: SEE SHEET 2

TULLOCH

TULLOCH GEOMATICS INC.
1942 REGENT ST.
UNIT L
SUDBURY, ON
P3E 5V5
T. 705 671.2295
F. 705 671.9477
TF. 800 810.1937
sudbury@tulloch.ca

DRAWN BY: EM | FILE: 232937 – SHEET 1

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SKETCH OF TOPOGRAPHIC INFORMATION
LANDS KNOWN AS 0 LAURA STREET
CITY OF GREATER SUDBURY
TULLOCH GEOMATICS INC.
2023

SCALE 1:300

0 5 10 15 20 METRES

SHEET 2 OF 2

THE INTENDED PLOT SIZE OF THIS PLAN IS 914mm IN WIDTH BY 1422mm IN HEIGHT WHEN PLOTTED AT A SCALE OF 1:300.

DATE:
TOPOGRAPHIC INFORMATION COLLECTED DURING THE PERIOD OF SEPTEMBER 11th, 2023 TO OCTOBER 24th, 2023.

METRIC:
DISTANCES AND ELEVATIONS SHOWN ON THIS PLAN ARE IN METRES AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048.

ELEVATION NOTE:
ELEVATIONS SHOWN HEREON ARE GEODETIC, ARE REFERRED TO THE CANADIAN GEODETIC VERTICAL DATUM OF 1928 (CGVD28) AND ARE DERIVED FROM THE CITY OF GREATER SUDBURY VERTICAL CONTRÔL MONUMENT No. 001643124 USING REAL TIME NETWORK (RTN) HAVING AN ELEVATION OF 290.576m.

SITE BENCHMARK NOTE:
SITE BENCHMARK 'A' (BM) IS TOP OF STAINLESS STEEL BOLT AND WASHER (SSBW), CITY OF GREATER SUDBURY VERTICAL CONTROL MONUMENT No. 027960152C, HAVING AN ELEVATION OF 293.998m.

SITE BENCHMARK 'B' IS TOP OF SET ROUND IRON BAR HAVING AN ELEVATION OF 292.49m.

CAUTION:
ANY UNDERGROUND SERVICES AND THEIR POSITIONS ARE NOT CONFIRMED BY THIS PLAN.

WETLAND NOTE:
LIMIT OF WETLANDS WERE MAPPED BY MANON GIROUX, CERTIFIED NORTHERN ONTARIO WETLAND EVALUATOR, ENVIRONMENTAL ECOSYSTEMS INC. ON SEPTEMBER 11, 2023.

EROSION HAZARD NOTE:
THE EROSION HAZARD LIMIT OF THE UNCONFINED RIVER SYSTEM WAS DETERMINED BY MALLETTE-GORING INC. AS THE FLOOD HAZARD LIMIT PLUS A 6M EROSION ACCESS ALLOWANCE, AS PER SECTION 3.3 OF THE ONTARIO MINISTRY OF NATURAL RESOURCES TECHNICAL GUIDE "RIVER AND STREAM SYSTEMS EROSION HAZARD LIMIT".

LEGEND:

AE	DENOTES ASPHALT EDGE
AN	DENOTES ANCHOR
APPROX	DENOTES APPROXIMATE
BH	DENOTES BOREHOLE
BM	DENOTES BENCHMARK
CL	DENOTES CENTERLINE
CLF	DENOTES CHAIN LINK FENCE
GF	DENOTES GARAGE FLOOR
NTS	DENOTES NOT TO SCALE
PIN	DENOTES PROPERTY IDENTIFICATION NUMBER
RW	DENOTES RETAINING WALL
SSBW	DENOTES STAINLESS STEEL BOLT AND WASHER
S/T	DENOTES SUBJECT TO
TS	DENOTES TOE OF SLOPE
UP	DENOTES UTILITY POLE
- - - - - - - -	DENOTES EDGE OF GRAVEL
——x——	DENOTES FENCE LINE
——OH——	DENOTES OVERHEAD WIRE
~~	DENOTES HEDGE OUTLINE

MATCHLINE: SEE SHEET 1

LOT 105 PIN 73508-0567 REGISTERED PLAN M-490

LOT 106 PIN 73508-0490

LOT 107 PIN 73508-0546

LOT 108 PIN 73508-0493

LOT 109 PIN 73508-0488

LOT 110 PIN 73508-0556

LOT 111 PIN 73508-0723 REGISTERED PLAN 8456

PART 7 PIN 73508-0395

PART 6 PIN 73508-0396

LOT 12 CONCESSION 2 GEOGRAPHIC TOWNSHIP OF CAPREOL

PIN 73508-0253
SUBJECT TO EASEMENT AS IN LT117304

LOT 11
CONCESSION 2
GEOGRAPHIC TOWNSHIP OF CAPREOL

PART 1
PLAN 53R-8456

PIN 73508-1099

LINE BETWEEN THE EAST HALF AND WEST HALF OF THE WEST HALF OF LOT 11, CONCESSION 12

SOUTH LIMIT OF PART 1, PLAN 53R-8456

PIN 73508-1049

PIN 73508-1069

CLF 0.27± W
WOOD FENCE 0.19± W
WOOD FENCE 0.12± E
CLF ON-LINE±
CLF 0.19± E
CLF ON-LINE±
CLF 0.05± W
CLF 0.13± E
CLF 0.10± E
CLF 0.08± E
UP (0.22± W)
CLF 0.19± E
CHICKEN WIRE ENCLOSURE
1.56±
331.79±
180.43±
0.71±
1.03±
TRAIL
15m FLOOD HAZARD SETBACK
FLOOD HAZARD LIMIT=288.89m
EROSION HAZARD LIMIT
30m WETLAND BOUNDARY SETBACK
15m WETLAND BOUNDARY SETBACK
WETLAND BOUNDARY DELINEATED BY ENVIRONMENTAL ECOSYSTEMS INC.
BH 3
CLF 1.13± E
CLF 0.20± E
CLF 1.22± E
CLF 0.69± E
UP (0.49± E)
WIRE FENCE 0.15± E
WIRE FENCE 1.00± E
UP (1.19± E)
WIRE FENCE 0.77± E

TULLOCH

TULLOCH GEOMATICS INC.
1942 REGENT ST.
UNIT L
SUDBURY, ON
P3E 5V5
T. 705 671.2295
F. 705 671.9477
TF. 800 810.1937
sudbury@tulloch.ca

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APPENDIX D

Wetland Boundary Report

Tel: 705.699.1111
Fax: 705.885.3391

Environmental Ecosystems Inc

February 20, 2024

Enviro-Eco File No.: 45-23

Mallette-Goring Inc.
128 Pine Street, Suite 300,
Sudbury, ON P3C 1X3

RE: Wetland Boundary Identification
Part 1 of Lot 11, Concession 2, Geographic Township of Capreol

---

Environmental Ecosystems Inc. (Enviro-Eco) was retained by Malette-Goring Inc. to determine the extend of the wetland boundaries on a property known as 0 Laura Drive, in Hanmer, Township of Capreol, Ontario. The scope of work included a file review, determination of the extent of the wetland boundaries within the project area defined by the Client and provide a letter report.

The project area, Part 1 of Lot 11, Concession 2, is approximately 5.5 hectares in lot area and currently does not have frontage onto municipal roads. The property is located within the community settlement of Hanmer. The site is dominated by a tall shrub meadow and contains areas of mixed forest and a large wetland at the southern property border. Applying the Ontario Wetland Evaluation System (OWES), the field work was carried out on September 11th, 2023 by Ms. Levasseur, a qualified professional (OWES-Certified). The extent of all wetland boundaries were determined on-site and surveyed at the same time by Tulloch Engineering Inc. Mapping of the wetland boundaries follows this report in Attachment 1.

As per the Conservation Sudbury's Wetland Guidelines, the creation of new lots, where development of those lots would require interference with a wetland, is not supported. In order for Conservation Sudbury to approve the proposed severance, wetlands must be mapped out to ensure access to building envelopes of any lot does not interfere with the wetlands. Additional requirements for the mapping are as follows:

- Demonstrate a 12 metre and a 30 metre buffer around all wetlands;
- Demonstrate the flood contour elevation and a corresponding 15 metre buffer;

- Demonstrate all waterways with a 15 metre buffer; and,

- Outline steep slopes that are associated with a stream, valley or lake with a slope steeper than 3H:1V and the projected stable slope, which is drawn at the projected 3H:1V slope.

The Site was assessed for cover, wetland vegetation, saturation and substrate. Wetland boundaries are defined where greater than 50% of the plant species can be found in both uplands and wetlands – thus characterised as wetland plant species.

The wetland boundary identification and survey determined there is one large wetland located within the property boundaries and contains various wetland types including a conifer swamp, grassy marsh and a permanent river. Soil samples were taken to confirm the presence of wetland soils and determine substrate types and moisture regimes. The wetland contains mineral soils overlain by thin layers of organic material and moisture ranged from damp to over-saturated. All soil samples collected inside the wetland boundaries contained small amounts of mottling. Soil samples were taken in the wetland and upland areas to corroborate the wetland boundary delineation and borehole logs are provided in Attachment 2. The wetland held characteristic wetland vegetation structures and species that distinguished it from the upland mixed forest and shrublands. A comprehensive list of wetland vegetation species follows this report as Attachment 3.

Conservation Sudbury regulates the development within and adjacent to hazards and features under Ontario Regulation 156/06: Regulation of Development, Interference with Wetlands and Alterations to Shorelines and Watercourses, made pursuant to Section 28 of the Conservation Authorities Act (R.S.O. 1990, c C.27, S.25) defines development as:

(a) the construction, reconstruction, erection or placing of a building or structure of any kind,

(b) any change to a building or structure that would have the effect of altering the use or potential use of the building or structure, increasing the size of the building or structure or increasing the number of dwelling units in the building or structure,

(c) site grading, or

(d) the temporary or permanent placing, dumping or removal or any material, originating on the site or elsewhere.

Generally, development should be directed to locations that are greater than 30 metres from a wetland. In some cases, development may be permitted within 30 metres of a wetland if the proponent can demonstrate that there is no alternative, and that the development will not impact the hydrology of the wetland. A Section 28 Application would need to be completed and submitted to Conservation Sudbury. Development within 12 metres of the wetland is generally not permitted. It is recommended to request review with Conservation Sudbury prior to finalizing development plans.

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

Sincerely,

For **Environmental Ecosystems Inc**.

Renée Levasseur, *B.Sc*., *PGCert*
Ecologist/OWES Evaluator
rlevasseur@enviro-eco.ca

Manon Giroux, *C.E.T., EP, President*
Sr. Env. Scientist/OWES Evaluator
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ATTACHMENT 1

Wetland Boundary Map

SKETCH OF TOPOGRAPHIC INFORMATION
LANDS KNOWN AS 0 LAURA STREET
CITY OF GREATER SUDBURY
TULLOCH GEOMATICS INC.
2023

SCALE 1:300

0 5 10 15 20 METRES

SHEET 1 OF 2

THE INTENDED PLOT SIZE OF THIS PLAN IS 914mm IN WIDTH BY 1422mm IN HEIGHT WHEN PLOTTED AT A SCALE OF 1:300.

DATE:
TOPOGRAPHIC INFORMATION COLLECTED DURING THE PERIOD OF SEPTEMBER 11th, 2023 TO OCTOBER 24th, 2023.

METRIC:
DISTANCES AND ELEVATIONS SHOWN ON THIS PLAN ARE IN METRES AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048.

ELEVATION NOTE:
ELEVATIONS SHOWN HEREON ARE GEODETIC, ARE REFERRED TO THE CANADIAN GEODETIC VERTICAL DATUM OF 1928 (CGVD28) AND ARE DERIVED FROM THE CITY OF GREATER SUDBURY VERTICAL CONTROL MONUMENT No. 001643124 USING REAL TIME NETWORK (RTN) HAVING AN ELEVATION OF 290.576m.

SITE BENCHMARK NOTE:
SITE BENCHMARK 'A' (BM) IS TOP OF STAINLESS STEEL BOLT AND WASHER (SSBW), CITY OF GREATER SUDBURY VERTICAL CONTROL MONUMENT No. 027960152C, HAVING AN ELEVATION OF 293.998m.

SITE BENCHMARK 'B' IS TOP OF SET ROUND IRON BAR HAVING AN ELEVATION OF 292.49m.

CAUTION:
ANY UNDERGROUND SERVICES AND THEIR POSITIONS ARE NOT CONFIRMED BY THIS PLAN.

LEGEND:

AE	DENOTES ASPHALT EDGE
AN	DENOTES ANCHOR
APPROX	DENOTES APPROXIMATE
BH	DENOTES BOREHOLE
BM	DENOTES BENCHMARK
CL	DENOTES CENTERLINE
CLF	DENOTES CHAIN LINK FENCE
GF	DENOTES GARAGE FLOOR
NTS	DENOTES NOT TO SCALE
PIN	DENOTES PROPERTY IDENTIFICATION NUMBER
RW	DENOTES RETAINING WALL
SSBW	DENOTES STAINLESS STEEL BOLT AND WASHER
S/T	DENOTES SUBJECT TO
TS	DENOTES TOE OF SLOPE
UP	DENOTES UTILITY POLE
-----	DENOTES EDGE OF GRAVEL
——x——	DENOTES FENCE LINE
——OW——	DENOTES OVERHEAD WIRE
~~	DENOTES HEDGE OUTLINE

CARMEN STREET
REGISTERED PLAN M-490

CARMEN STREET
REGISTERED PLAN M-520
PIN 73508-0040

BLOCK "A" (0.305 RESERVE) (NTS)
REGISTERED PLAN M-520

ROGER STREET
REGISTERED PLAN M-490

ROGER STREET
REGISTERED PLAN 53M-1146

LAURA STREET
REGISTERED PLAN 53M-1146

GLADU CRESCENT
REGISTERED PLAN 53M-1146

JAMES STREET
PIN 73508-1133

BLOCK "B" (0.305 RESERVE) (NTS)
REGISTERED PLAN M-490
PIN 73508-1178
SUBJECT TO EASEMENT AS IN LT117325

BLOCK 67 (0.305 RESERVE) (NTS)
REGISTERED PLAN 53M-1146
PIN 73508-1141
SUBJECT TO EASEMENT AS IN LT117304

BLOCK 68 (0.305 RESERVE) (NTS)
REGISTERED PLAN 53M-1146
PIN 73508-1140
SUBJECT TO EASEMENT AS IN LT117304

BLOCK 69
REGISTERED PLAN 53M-1146
PIN 73508-1139
SUBJECT TO EASEMENT AS IN LT117304

BLOCK 70
REGISTERED PLAN 53M-1146
PIN 73508-1138
SUBJECT TO EASEMENT AS IN LT117304

BLOCK 71
REGISTERED PLAN 53M-1146
PIN 73508-1137
SUBJECT TO EASEMENT AS IN LT117304

SITE BM 'A': SSBW 027960152C
ELEVATION=293.998

SITE BM 'B': ELEVATION=292.49

PART 12, PLAN 53R-6491
SUBJECT TO EASEMENT AS IN LT421457

PART 10
PLAN 53R-
6491
SUBJECT TO EASEMENT AS IN LT117304

PART 11
PLAN 53R-
6491

PART 1 PART 2 PART 3 PART 4 PART 5 PART 6 PART 7 PART 8 PART 9
PLAN 53R-6491

PART 17 S/T LT421458
PART 18 S/T LT421458
PART 19 S/T LT421458
PART 20 S/T LT421458
PART 21 S/T LT421458
PART 22 S/T LT421458
PART 23 S/T LT421458
PART 24 S/T LT421458

PART 14 S/T LT421458
PART 15 S/T LT421458
PART 16 S/T LT421458

LOT 1 LOT 2 LOT 3 LOT 4 LOT 5 LOT 6 LOT 7 LOT 8 LOT 9 LOT 10 LOT 11 LOT 12 LOT 13 LOT 14

LOT 95 LOT 96 LOT 97 LOT 98 LOT 99 LOT 100 LOT 101 LOT 102 LOT 103 LOT 104 LOT 105

LOT 41 PIN 73508-1144
LOT 42 LOT 43 LOT 44 LOT 45 LOT 46 LOT 47 PIN 73508-1143
LOT 48 PIN 73508-1142
LOT 49 LOT 50 LOT 51 LOT 52 LOT 53 LOT 54
LOT 55 LOT 56 LOT 57 LOT 58 LOT 59 LOT 60 LOT 61 LOT 62 LOT 63 LOT 64 LOT 65 LOT 66
LOT 34 LOT 35 LOT 36 LOT 37 LOT 38 LOT 39 LOT 40 PIN 73508-1145
LOT 15 LOT 16 LOT 17 LOT 18 LOT 19 LOT 20 LOT 21 LOT 22 LOT 23 LOT 24
LOT 25 LOT 26 LOT 27 LOT 28 LOT 29 LOT 30 LOT 31 LOT 32 LOT 33

PIN 73508-1135 SUBJECT TO EASEMENT AS IN LT117304
PIN 73508-1136 SUBJECT TO EASEMENT AS IN LT117304
PIN 73508-1134
PIN 73508-1099

LOT 11 CONCESSION 2 GEOGRAPHIC TOWNSHIP OF CAPREOL

MATCHLINE: SEE SHEET 2

TULLOCH

TULLOCH GEOMATICS INC.
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DRAWN BY: EM | FILE: 232937 – SHEET 1

ACAD FILE: P:\2023\232937 0 Laura Development\Geomatics\06 Production\TOPO\232937 Topo Sketch.dwg

SKETCH OF TOPOGRAPHIC INFORMATION
LANDS KNOWN AS 0 LAURA STREET
CITY OF GREATER SUDBURY
TULLOCH GEOMATICS INC.
2023

SCALE 1:300

0 5 10 15 20 METRES

SHEET 2 OF 2

THE INTENDED PLOT SIZE OF THIS PLAN IS 914mm IN WIDTH BY 1422mm IN HEIGHT WHEN PLOTTED AT A SCALE OF 1:300.

DATE:
TOPOGRAPHIC INFORMATION COLLECTED DURING THE PERIOD OF SEPTEMBER 11th, 2023 TO OCTOBER 24th, 2023.

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SITE BENCHMARK 'B' IS TOP OF SET ROUND IRON BAR HAVING AN ELEVATION OF 292.49m.

CAUTION:
ANY UNDERGROUND SERVICES AND THEIR POSITIONS ARE NOT CONFIRMED BY THIS PLAN.

WETLAND NOTE:
LIMIT OF WETLANDS WERE MAPPED BY MANON GIROUX, CERTIFIED NORTHERN ONTARIO WETLAND EVALUATOR, ENVIRONMENTAL ECOSYSTEMS INC. ON SEPTEMBER 11, 2023.

EROSION HAZARD NOTE:
THE EROSION HAZARD LIMIT OF THE UNCONFINED RIVER SYSTEM WAS DETERMINED BY MALLETTE-GORING INC. AS THE FLOOD HAZARD LIMIT PLUS A 6M EROSION ACCESS ALLOWANCE, AS PER SECTION 3.3 OF THE ONTARIO MINISTRY OF NATURAL RESOURCES TECHNICAL GUIDE "RIVER AND STREAM SYSTEMS EROSION HAZARD LIMIT".

LEGEND:

AE	DENOTES ASPHALT EDGE
AN	DENOTES ANCHOR
APPROX	DENOTES APPROXIMATE
BH	DENOTES BOREHOLE
BM	DENOTES BENCHMARK
CL	DENOTES CENTERLINE
CLF	DENOTES CHAIN LINK FENCE
GF	DENOTES GARAGE FLOOR
NTS	DENOTES NOT TO SCALE
PIN	DENOTES PROPERTY IDENTIFICATION NUMBER
RW	DENOTES RETAINING WALL
SSBW	DENOTES STAINLESS STEEL BOLT AND WASHER
S/T	DENOTES SUBJECT TO
TS	DENOTES TOE OF SLOPE
UP	DENOTES UTILITY POLE
- - - - - - - -	DENOTES EDGE OF GRAVEL
——x——	DENOTES FENCE LINE
——OH——	DENOTES OVERHEAD WIRE
~~	DENOTES HEDGE OUTLINE

MATCHLINE: SEE SHEET 1

LOT 105 PIN 73508-0567 REGISTERED PLAN M-490

LOT 106 PIN 73508-0490

LOT 107 PIN 73508-0546

LOT 108 PIN 73508-0493

LOT 109 PIN 73508-0488

LOT 110 PIN 73508-0556

LOT 111 PIN 73508-0723 REGISTERED PLAN 8456

PART 7 PIN 73508-0395

PART 6 PIN 73508-0396

LOT 12 CONCESSION 2 GEOGRAPHIC TOWNSHIP OF CAPREOL

PIN 73508-0253
SUBJECT TO EASEMENT AS IN LT117304

LOT 11
CONCESSION 2
GEOGRAPHIC TOWNSHIP OF CAPREOL

PART 1
PLAN 53R-8456

PIN 73508-1099

LINE BETWEEN THE EAST HALF AND WEST HALF OF THE WEST HALF OF LOT 11, CONCESSION 12

SOUTH LIMIT OF PART 1, PLAN 53R-8456

PIN 73508-1049

PIN 73508-1069

CLF 0.27± W
WOOD FENCE 0.19± W
WOOD FENCE 0.12± E
CLF ON-LINE±
CLF 0.19± E
CLF ON-LINE±
CLF 0.05± W
CLF 0.13± E
CLF 0.10± E
CLF 0.08± E
UP (0.22± W)
CLF 0.19± E
CHICKEN WIRE ENCLOSURE
1.56±
331.79±
180.43±
0.71±
1.03±
TRAIL
15m FLOOD HAZARD SETBACK
FLOOD HAZARD LIMIT=288.89m
EROSION HAZARD LIMIT
30m WETLAND BOUNDARY SETBACK
15m WETLAND BOUNDARY SETBACK
WETLAND BOUNDARY DELINEATED BY ENVIRONMENTAL ECOSYSTEMS INC.
BH 3
CLF 1.13± E
CLF 0.20± E
CLF 1.22± E
CLF 0.69± E
UP (0.49± E)
WIRE FENCE 0.15± E
WIRE FENCE 1.00± E
UP (1.19± E)
WIRE FENCE 0.77± E

TULLOCH

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DRAWN BY: EM | FILE: 232937 – SHEET 2

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ATTACHMENT 2

Borehole Log

Sample ID	Coordinates (UTM) & Location	Depth (inches)		Soil Description				Comments
		From	To	Colour	Odour	Soil Type	Moisture	
BH1	5165252.248, 505264.979	0"	6"	Brown	Fresh	Fibric	Saturated	Mottling
		6”	9”	Brown	Fresh	Mesic	Saturated	
	Inside of wetland	9”	9”+	Brown	None	Loamy Sand	Saturated	
BH2	5165265.032, 505266.587	0”	1”	Brown	Fresh	Fibric	Damp	No mottling visible
		1”	2”	Light Brown	None	Loam	Damp	
	Outside of wetland	2”	2”+	Orange	None	Sandy Loam	Wet	
BH3	5165219.766, 505089.985	0”	1”	Brown	Fresh	Fibric	Wet	Mottling
		1”	6”	Light Brown	None	Sandy Loam	Saturated	
	Inside of wetland	6”	6”+	Beige	None	Loamy Sand	Saturated	
BH4	5165050.473, 5165050.473	0”	2”	Brown	Fresh	Fibric	Wet	Mottling
		2”	5”	Light Brown	None	Loam	Wet	
	Inside of wetland	5”	5”+	Light Brown	None	Sandy Loam	Over-saturated	

ATTACHMENT 3

Wetland Vegetation Species List

Common Name	Scientific Name
Balsam Fir	*Abies balsamea*
Balsam Willow	*Salix pyrifolia*
Black Spruce	*Picea mariana*
Bog Rosemary	*Andromeda polifolia* spp. g*laucophylla*
Broadleaf Cattail	*Typha latifolia*
Common Reed	*Phragmites australis*
Eastern White Cedar	*Thuja occidentalis*
Fowl Meadow Grass	*Poa palustris*
Ground Raspberry	*Rubus pubescens*
Interrupted Fern	*Osmunda claytoniana*
Labrador Tea	*Rhododendron groenlandicum*
Lance-leaved Aster	*Aster lanceolatus*
Large-leaved Lupine	*Lupinus polyphyllus*
Lesser Panicled Sedge	*Carex diandra*
Low-bush Blueberries	*Vaccinium angustifolium*
Meadow Horsetail	*Equisetum pratense*
Peat Mosses	*Sphagnum* spp.
Purple-stemmed Aster	*Aster puniceus*
Rattlesnake Manna Grass	*Glyceria canadensis*
Red Pine	*Pinus resinosa*
Red-osier Dogwood	*Cornus stolonifera*
Rough-stemmed Goldenrod	*Solidago rugosa*
Sensitive Fern	*Oncolea sensibilis*
Sheep Laurel	*Kalmia angustifolia*
Small Cranberry	*Vaccinium oxycoccos*
Soft-leaved Sedge	*Carex disperma*
Speckled Alder	*Alnus incana*
Starflower	*Trientalis borealis*
Sweet Gale	*Myrica gale*
Tamarack	*Larix laricina*
Three-fruited Sedge	*Carex trisperma*

Common Name	Scientific Name
Tussock Cottongrass	*Eriophorum vaginatum*
Twinflower	*Linnaea borealis*
Wild Raisin	*Viburnum nudum*
Woolgrass	*Scirpus cyperinus*

APPENDIX E

Blanding's Turtle Categorization

General Habitat Description for the Blanding's Turtle (*Emydoidea blandingii*)

A general habitat description is a technical document that provides greater clarity on the area of habitat protected for a species based on the general habitat definition found in the Endangered Species Act, 2007. General habitat protection does not include an area where the species formerly occurred or has the potential to be reintroduced unless existing members of the species depend on that area to carry out their life processes. A general habitat description also indicates how the species' habitat has been categorized, as per the policy "Categorizing and Protecting Habitat Under the Endangered Species Act", and is based on the best scientific information available.

HABITAT CATEGORIZATION

1	Nest and the area within 30 m or Overwintering sites and the area within 30 m
2	The wetland complex (i.e. all suitable wetlands or waterbodies within 500 m of each other) that extends up to 2 km from an occurrence, and the area within 30 m around those suitable wetlands or waterbodies
3	Area between 30 m and 250 m around suitable wetlands/waterbodies identified in Category 2, within 2 km of an occurrence

Category 1

Nest sites and overwintering sites are essential features and along with the 30 m area surrounding them are considered to have the lowest tolerance to alteration. Blanding's Turtles depend on these areas for sensitive life processes including egg-laying, incubation, hatching of young, and hibernation. A 30 m radius (average tree height) buffer around nesting and overwintering sites is important to maintain the microclimate conditions (e.g., thermal, vegetative and lighting features). These areas are habitually used and may support concentrations of individuals.

Nesting Sites

Blanding's Turtle nests are created in open habitats with low vegetation cover and high sun exposure such as in forest clearings, meadows, shorelines, beaches, rock outcrops, cornfields, gravel roads, road shoulders, ploughed fields, gardens, powerline rights-of-ways, yards and abandoned railroad beds (Linck *et al.* 1989, Ross and Anderson 1990, Kiviat 1997, Standing *et al.* 1999, Joyal *et al.* 2001, Congdon *et al.* 2008, Downing *et al.* 2010, Refsnider and Linck 2012). Females often show high fidelity to the same general nesting areas (Congdon *et al.* 1983, McNeil 2002, Congdon *et al.* 2011).

Overwintering Sites

Overwintering sites are typically occupied for at least six months during the overwintering period in Ontario (Edge *et al*. 2009, Edge *et al*. 2010, Davy 2011 unpublished data, Paterson unpublished data 2013, NHIC 2013). Blanding's Turtles display overwintering site fidelity, using some sites year after year (Power 1989, McNeil 2002, Caverhill 2006 in Newton and Herman 2009, Edge *et al*. 2009). Many individuals may aggregate at one site while overwintering (Anderson 1990, St-Hilaire 2003 in COSEWIC 2005, Ross and, Congdon *et al*. 2008, Edge *et al*. 2009).

Suitable Blanding's Turtle overwintering habitat typically includes permanent bogs, fens, marshes, ponds, channels or other habitats with free (unfrozen) shallow water (Joyal *et al*. 2001, Edge 2010, Seburn 2010). Blanding's Turtles studied in Algonquin Provincial park overwintered in wetlands with free water depths of 7 cm - 50 cm (Edge *et al*. 2009).This species may also hibernate within graminoid shallow marsh areas of larger marsh complexes by burying into substrates in areas of pooled water (Gillingwater unpublished data 2013). Blanding's Turtle's may also overwinter in seasonal pools or small excavated areas with standing water (Joyal *et al*. 2001, Rouse unpublished data 2012).

Category 2

The wetland complex that extends up to 2 km from an occurrence and 30 m around these suitable wetlands/waterbodies (Category 2) will be considered to have a moderate level of tolerance to alteration before their function is compromised. For the purpose of general habitat protection for Blanding's Turtle, a wetland complex is defined as all wetlands that are within 500 m of each other. This definition is based on the biology of the species and its documents movement patterns between adjacent suitable wetlands/waterbodies. In cases where an occurrence is not within suitable aquatic habitat, the nearest wetland should be considered the starting point for delineating the wetland complex.

Blanding's Turtles depend on these wetlands and the surrounding habitat throughout their home range for life processes including feeding, mating, thermoregulation, movement, and protection from predators.

Blanding's Turtle home range sizes and lengths in Ontario vary significantly between individuals within the same population and between different populations. In Algonquin Provincial Park, the average range length of radio-tracked Blanding's Turtles was 1.8 km (1.2 standard deviation), with a maximum of 4.3 km (Edge 2013 unpublished data). Recent Ontario studies documented a 90th percentile home range length of radio-tracked Blanding's Turtles in Parry Sound District and Bancroft District of 2.0 and 2.3 km, respectively (Rouse unpublished data 2013, Cameron unpublished data 2013). Average range length of a population on Grenadier Island, Ontario, was 813 m, with a maximum range length just over 2 km. In a Minnesota population, average range length was just over 1.6 km, with a maximum range length just over 5 km (Pappas *et al*. 2000).

Blanding's Turtles regularly move between wetlands or other aquatic areas in order to access mates, overwintering sites, nesting sites, other seasonally required resources and thermoregulation sites (Congdon *et al*. 2008, Edge *et al*. 2010). In a study from Algonquin Provincial Park, Blanding's Turtles made an average of four movements between wetlands each year with an average movement distance of 231 m for males and 497 m for females (Edge *et al*. 2010). Average interwetland movement distances of a population in Maine was 680 ± 550 m (Joyal *et al*. 2001). Rouse and Cameron (unpublished data 2013) found that Blanding's Turtles primarily moved through wetlands and other water and were rarely located more than 200 m from water. Since interwetland movements tend to average about 500 m, wetlands that are separated by more than 500 m from other suitable wetlands have a lower likelihood of being occupied.

A 30 m radius (average tree height) buffer around suitable wetlands helps to maintain microclimate conditions. Buffers of 30 m are widely recognized as providing a range of functional benefits to aquatic features and wetlands such as maintaining water quality by filtering sediment and nutrients, input of woody debris, and cooling water temperatures by shading and infiltrating surface runoff (OMNR 2010). Blanding's Turtles have also been shown to generally bask within 30 m of wetlands (Joyal *et al*. 2001).

Suitable habitat for Blanding's Turtles during the active season includes a variety of wetlands such as marsh, swamps, ponds, fens, bogs, slow-flowing streams, shallow bays of lakes or rivers, as well as graminoid shallow marsh and slough forest habitats that are adjacent to larger marsh complexes (Joyal *et al*. 2001, Gillingwater 2001, Gillingwater and Piraino 2004, 2007, Congdon *et al*. 2008, Edge *et al*. 2010; Seburn 2010). Suitable wetlands used during the active season are typically eutrophic (mineral or organic nutrient-rich), shallow with a soft substrate composed of decomposing materials, and often have emergent vegetation, such as water lilies and cattails (COSEWIC 2005, Congdon *et al*. 2008).

Category 3

The area between 30 m and 250 m around suitable Category 2 wetlands/waterbodies will be considered to have the highest tolerance to alteration. Blanding's Turtles depend on these areas as movement corridors between wetlands, which are essential for carrying out life processes associated with Category 1 and 2 habitats.

Blanding's Turtle nests are typically close to permanent wetlands and reported average distances between nests and the nearest wetland range from 99.5 to 242 m, with maximum distances of 256 m to just over 400 m (Joyal *et al*. 2001, Beaudry *et al*. 2010, Congdon *et al*. 2011, Paterson *et al*. 2012, Refsnider and Linck 2012). Consequently, the area within 250 m of suitable aquatic habitat provides critical movement corridors through with hatchling Blanding's Turtles access wetlands after hatching. This habitat is also used by some hatchlings as overwintering habitat in their first year (Paterson *et al*. 2012).

Although Blanding's Turtles nest close to water, they often travel considerable distances from their wetland of origin during nesting migrations, with movements of 6 km being documented in some Ontario populations (Edge *et al*. 2010). Although wetlands and ponds are used as movement corridors when available, females make extensive movements through upland habitat to access nesting sites (Congdon *et al*. 2008). As mentioned in the previous section (see Category 2), Blanding's Turtles also make regular overland movements between wetlands throughout the active season in order to access Category 1 and 2 habitats within their home range. Category 3 habitat provides essential movement corridors of up to 500 m between wetlands, which will encompass the areas that are most likely to be used for overland movement.

Activities in Blanding's Turtle habitat

Activities in general habitat can continue as long as the *function of these areas for the species is maintained and individuals of the species are not killed, harmed, or harassed.*

Generally compatible:

- Recreational use of the water such as swimming, boating, and fishing.
- Small-scale alterations to land cover that do not impede overland movements or impair nesting sites.

Generally not compatible:*

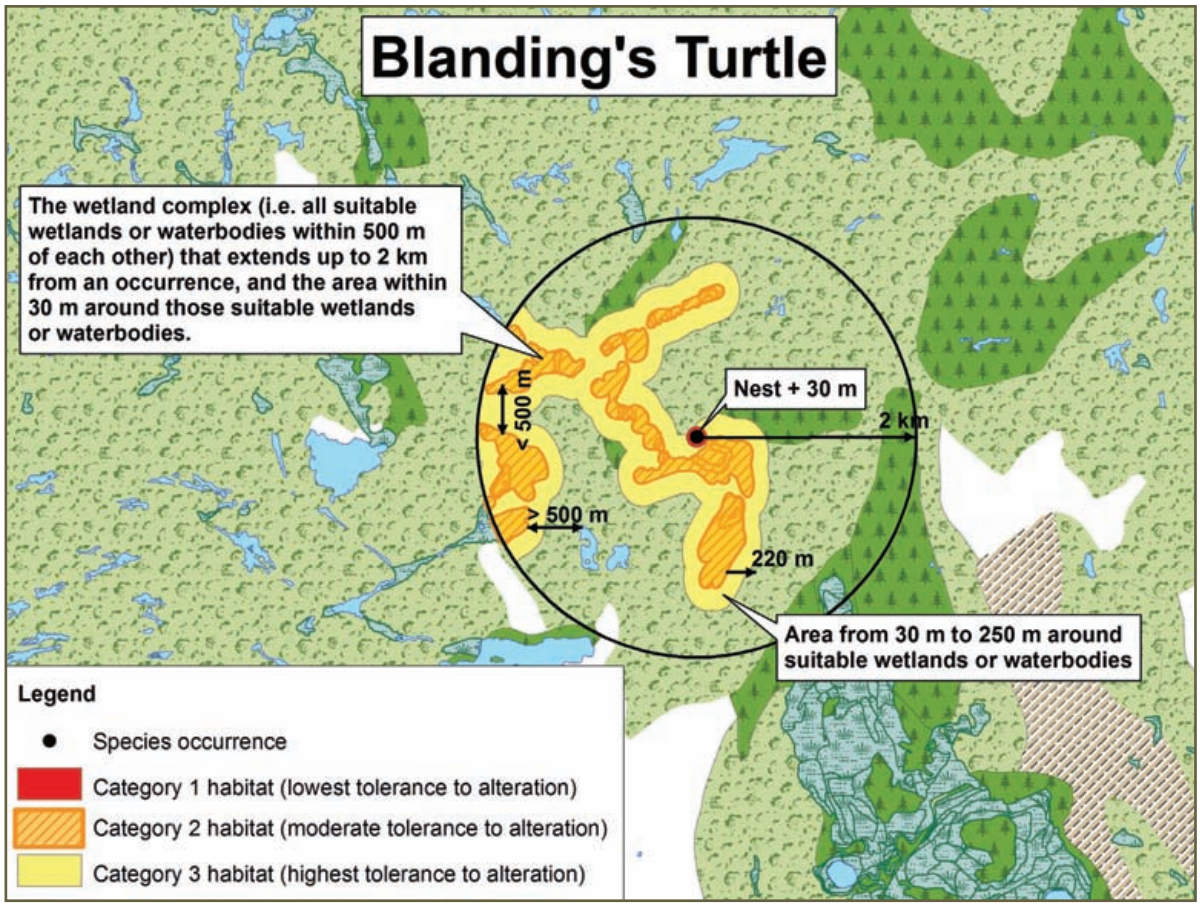
- Significant draining, infilling, dredging, or other significant alteration of wetlands or other suitable waterbodies.
- Significant alteration of shorelines, especially hardening (e.g. the use of gabion baskets, rip-rap, and rock armour).

* If you are considering an activity that may not be compatible with general habitat, please contact your local MNR office for more information.

Key terms:

- **Thermoregulation:** Some animals, such as turtles, use thermoregulation to alter their internal body temperature through behavioural patterns, such as basking in the sun to increase body temperature or seeking out cool areas to lower body temperature.

Sample application of the general habitat protection for Blanding's Turtle



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APPENDIX F

Site Photographs

Site Photographs
Page 1 of 2

Photo 1: Northern part of the proposed development depicting the upland vegetation.

Photo 2: Common upland vegetation.

Site Photographs
Page 2 of 2

Photo 3: Southern part of the proposed development looking at the wetland and Tributary X of the Whitson River.

Photo 4: Grass marsh wetland located south adjacent to the Tributary X.

SKETCH OF TOPOGRAPHIC INFORMATION
LANDS KNOWN AS 0 LAURA STREET
CITY OF GREATER SUDBURY
TULLOCH GEOMATICS INC.
2023

SCALE 1:300

0 5 10 15 20 METRES

SHEET 2 OF 2

THE INTENDED PLOT SIZE OF THIS PLAN IS 914mm IN WIDTH BY 1422mm IN HEIGHT WHEN PLOTTED AT A SCALE OF 1:300.

DATE:
TOPOGRAPHIC INFORMATION COLLECTED DURING THE PERIOD OF SEPTEMBER 11th, 2023 TO OCTOBER 24th, 2023.

METRIC:
DISTANCES AND ELEVATIONS SHOWN ON THIS PLAN ARE IN METRES AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048.

ELEVATION NOTE:
ELEVATIONS SHOWN HEREON ARE GEODETIC, ARE REFERRED TO THE CANADIAN GEODETIC VERTICAL DATUM OF 1928 (CGVD28) AND ARE DERIVED FROM THE CITY OF GREATER SUDBURY VERTICAL CONTROL MONUMENT No. 001643124 USING REAL TIME NETWORK (RTN) HAVING AN ELEVATION OF 290.576m.

SITE BENCHMARK NOTE:
SITE BENCHMARK 'A' (BM) IS TOP OF STAINLESS STEEL BOLT AND WASHER (SSBW), CITY OF GREATER SUDBURY VERTICAL CONTROL MONUMENT No. 027960152C, HAVING AN ELEVATION OF 293.998m.

SITE BENCHMARK 'B' IS TOP OF SET ROUND IRON BAR HAVING AN ELEVATION OF 292.49m.

CAUTION:
ANY UNDERGROUND SERVICES AND THEIR POSITIONS ARE NOT CONFIRMED BY THIS PLAN.

WETLAND NOTE:
LIMIT OF WETLANDS WERE MAPPED BY MANON GIROUX, CERTIFIED NORTHERN ONTARIO WETLAND EVALUATOR, ENVIRONMENTAL ECOSYSTEMS INC. ON SEPTEMBER 11, 2023.

EROSION HAZARD NOTE:
THE EROSION HAZARD LIMIT OF THE UNCONFINED RIVER SYSTEM WAS DETERMINED BY MALLETTE-GORING INC. AS THE FLOOD HAZARD LIMIT PLUS A 6M EROSION ACCESS ALLOWANCE, AS PER SECTION 3.3 OF THE ONTARIO MINISTRY OF NATURAL RESOURCES TECHNICAL GUIDE "RIVER AND STREAM SYSTEMS EROSION HAZARD LIMIT".

LEGEND:

AE	DENOTES ASPHALT EDGE
AN	DENOTES ANCHOR
APPROX	DENOTES APPROXIMATE
BH	DENOTES BOREHOLE
BM	DENOTES BENCHMARK
CL	DENOTES CENTERLINE
CLF	DENOTES CHAIN LINK FENCE
GF	DENOTES GARAGE FLOOR
NTS	DENOTES NOT TO SCALE
PIN	DENOTES PROPERTY IDENTIFICATION NUMBER
RW	DENOTES RETAINING WALL
SSBW	DENOTES STAINLESS STEEL BOLT AND WASHER
S/T	DENOTES SUBJECT TO
TS	DENOTES TOE OF SLOPE
UP	DENOTES UTILITY POLE
- - - - - - - - - -	DENOTES EDGE OF GRAVEL
——x——	DENOTES FENCE LINE
——OH——	DENOTES OVERHEAD WIRE
. . . . .	DENOTES HEDGE OUTLINE

MATCHLINE: SEE SHEET 1

LOT 105 PIN 73508-0567 REGISTERED PLAN M-490

LOT 106 PIN 73508-0490

LOT 107 PIN 73508-0546

LOT 108 PIN 73508-0493

LOT 109 PIN 73508-0488

LOT 110 PIN 73508-0556

LOT 111 PIN 73508-0723 REGISTERED PLAN 53R-8456

LOT 12 CONCESSION 2 GEOGRAPHIC TOWNSHIP OF CAPREOL PART 6 PIN 73508-0396

PART 7 PIN 73508-0395

PIN 73508-1069

PIN 73508-0253
SUBJECT TO EASEMENT AS IN LT117304

LOT 11
CONCESSION 2
GEOGRAPHIC TOWNSHIP OF CAPREOL

PART 1
PLAN 53R-8456

PIN 73508-1099

LOT 11 CONCESSION 2 GEOGRAPHIC TOWNSHIP OF CAPREOL

PIN 73508-1049

CLF 0.27± W
WOOD FENCE 0.19± W
WOOD FENCE 0.12± E
CLF ON-LINE±
CLF 0.19± E
CLF ON-LINE±
CLF 0.05± W
CLF 0.13± E
CLF 0.10± E
CLF 0.08± E
UP (0.22± W)
CLF 0.19± E
CHICKEN WIRE ENCLOSURE
1.56±
331.79±
15m FLOOD HAZARD SETBACK
FLOOD HAZARD LIMIT=288.89m
WETLAND BOUNDARY DELINEATED BY ENVIRONMENTAL ECOSYSTEMS INC.
EROSION HAZARD LIMIT
15m WETLAND BOUNDARY SETBACK
CLF 1.13± E
CLF 0.20± E
CLF 1.22± E
CLF 0.69± E
UP (0.49± E)
WIRE FENCE 0.15± E
WIRE FENCE 1.00± E
UP (1.19± E)
WIRE FENCE 0.77± E
TRAIL
BH 3
186.43±
0.71±
1.03±
LINE BETWEEN THE EAST HALF AND WEST HALF OF THE WEST HALF OF LOT 11, CONCESSION 12
SOUTH LIMIT OF PART 1, PLAN 53R-8456

TULLOCH

TULLOCH GEOMATICS INC.
1942 REGENT ST.
UNIT L
SUDBURY, ON
P3E 5V5
T. 705 671.2295
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DRAWN BY: EM | FILE: 232937 - SHEET 2

ACAD FILE: P:\2023\232937 0 Laura Development\Geomatics\06 Production\TOPO\232937 Topo Sketch.dwg

Geotechnical Investigation and Design Report

Hanmer Dreamhomes

Type of Document:
Report

Project Name:
Proposed Laura Street Subdivision
Hanmer, Ontario

Project Number:
SUD-23012932-A0

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Date Submitted:
2024-01-10

Table of Contents

Further to our Proposal No. 23/148/GP dated September 27, 2023, EXP Services Inc. (EXP) has completed the updated geotechnical engineering evaluation for the proposed Phil Street Subdivision. Our comments and recommendations, based on the results of the field investigation and our understanding of the project scope, are provided in this report.

1. Introduction

It is understood that a proposed subdivision is to be developed south of Laura Street in Hanmer, ON. The current subdivision layout consists of 114 lots and associated roads. A geotechnical investigation was requested for the road construction and subdivision development.

To assist with the engineering design of the roads and subdivision, EXP has completed the requested geotechnical engineering studies with the findings contained herein.

2. Field Investigation

Between November 23 and 24, a geotechnical technician from EXP supervised the drilling of six (6) boreholes, which were located in accessible locations across the subdivision, which were free of underground locates. All boreholes were advanced to 5.2 m ± depth. The boreholes were located in the field by EXP's geotechnical technician. The borehole locations are shown on Dwg. A-1 in Appendix A.

The boreholes were advanced using 200 mm Hollow Stem Augers (HAS), followed by a Dynamic Cone Penetration Tests (DCPT) at selected borehole locations. Soil samples were obtained using a 51 mm (2 inch) outside diameter split spoon sampler in conjunction with Standard Penetration Tests (ASTM D1586) at depths noted on the attached, previously completed, borehole logs provided in Appendix B. Soil samples were generally obtained at 0.75 m intervals in the upper 3 m. The Standard Penetration Test (SPT) 'N' values were recorded and used to provide an assessment of the in-situ relative density of the overburden soils. In all boreholes a DCPT was then advanced adjacent to the borehole termination depth and DCPT 'N' values were recorded. All boreholes were backfilled with auger cuttings and bentonite pellets upon completion of drilling.

The locations and elevations of the boreholes were determined using a hand held GPS. The locations and elevations are accurate to the degree and methodology used in the field. It should be noted that the location and elevations noted herein should not be used for detailed design purposes.

The retained samples were logged in the field and then carefully packaged and transported to our Sudbury laboratory for detailed examination and testing. All borehole drilling was supervised on a full-time basis by EXP Services Inc.

3. Laboratory Testing

A laboratory testing program was performed on representative soil samples and consisted of moisture content determinations and grain size analysis. The laboratory test results are summarized on the attached borehole logs in Appendix B with individual test results provided in Appendix C.

4. Subsurface Conditions

Details of the soils encountered during the field investigation are summarized on the attached borehole logs in Appendix B pertaining to Phase 1 of the subdivision. The logs include textural descriptions of the subsoil along with results of the field and laboratory testing program in accordance with the Unified Soil Classification System. The explanatory notes and definitions provided in Figures 1A and 1B in Appendix B should be referenced when reading this report.

The subsurface conditions within the site generally consisted of topsoil overlying native cohesionless soils.

The upper topsoil layer ranged from 25 mm to 75 mm in thickness. Topsoil thicknesses could further vary across the subdivision between the widely spaced boreholes.

Underlying the topsoil at the borehole locations, was a cohesionless soil. The cohesionless deposit consisted of a sand with trace silt and trace gravel. The cohesionless soils were brown in colour and moist to wet. Uncorrected SPT 'N' values within the silt ranged from 1 to 14 blows per 300 mm classifying the material as very loose to compact. The cohesionless soils were noted to have a moisture content ranging from 3% to 23%.

A DCPT was advanced adjacent to each borehole to depths noted on the attached logs in Appendix B. The DCPT 'N' values within the boreholes were generally similar or slightly higher that the SPT 'N' values suggesting the cohesionless soils are in more of a compact state.

4.1 Groundwater

Groundwater was measured within the boreholes prior to backfilling or installation of a groundwater monitoring well. Groundwater and or cave conditions were noted at the borehole locations. Groundwater observations are noted as follows:

Borehole No.	Time observed	Depth to Groundwater Below Existing Grade (m)	Depth to Cave Below Existing Grade (m)	Geodetic Elevation of Groundwater Observation (m)
BH-1	December 1, 2023	3.2	--	288.8
BH-2	Upon Completion	--	2.4	--
BH-3	December 1, 2023	3.6	--	287.4
BH-4	Upon Completion	--	2.7	--
BH-5	December 1, 2023	1.3	--	288.7
BH-6	Upon Completion	--	3.7	--

Groundwater can be expected to be at or near elevation 289.0. However, due to the slightly higher water content laboratory test results above this level, it is recommended that additional groundwater readings be taken within the installed groundwater monitoring wells, during wetter periods of the year and during drying periods of the year. However, at this time, the groundwater table at the site can be expected to be encountered bellow elevation 289.0 m.

Seasonal variations in the water table should be anticipated, with higher levels occurring during wet weather conditions (such as spring thaw and late fall) and lower levels occurring during dry weather conditions.

5. Foundation Recommendations

Based on the soil conditions encountered, the proposed residential structures can be founded on conventional strip or spread footings or on a thickened edge slab on grade bearing on an engineered fill pad overlying the native soils.

5.1 Site Preparation

It is assumed that some cut and fill operations on site will be completed. At this time, it unknown how much cut and fill will be completed to accommodate the site development. Once final subdivision design drawings are made available, EXP should be contracted to review the drawing and ensure the recommendations contained herein are being met.

The encountered soil conditions at the site generally consisted of loose to compact cohesionless native soils with a relatively high groundwater level, estimated to be at elevation 289.0.

Based on the encountered soil and groundwater conditions, development of this site may be challenging. Excavations that approach the groundwater table will likely require significant dewatering and shoring during excavation.

Upfill within the road should be completed with select subgrade material meeting OPSS that are placed in lifts not exceeding 200 mm and be compacted to 98% SPMDD. As it is anticipated that the residential structures will be constructed with basements it has been assumed that foundations will be placed directly on shallow native subsoils and therefore engineered fill throughout the building pads will not be required, therefore in-filling of the lots may be completed with fill soils, free of organic and debris, with appropriate moisture content that can be compacted to a minimum of 98% SPMDD.

It is recommended and of best practice, that all grade raises, and site infill be completed prior to building construction when working on sites of this nature, in order to ensure that any potential settlements, from the additional soil weight, dissipate before the building foundations and or site services are constructed. In the cohesionless sand soils encountered, settlements should occur relatively quickly.

5.2 Conventional Foundations and Thickened Edge Slab-on-Grade Foundation

Foundations founded on the native subsoils or on engineered fill overlying the native subsoils, can be designed with a factored geotechnical resistance at Ultimate Limit States (ULS) of 112 kPa. This value was calculated using a geotechnical resistance factor of 0.5. A bearing pressure at Serviceability Limit States (SLS) of 75 kPa may be used. Footings designed with the recommendations contained herein are expected to settle less than 25 mm total and 20 mm differential. Additional upfill, across the lots for grading purposes, of up to 3.0 m has been accounted for, in providing the above noted bearing capacity.

Prior to the placement of the foundation concrete the exposed subgrade is to be visually inspected by a qualified geotechnical engineer from this office to verify the founding soil conditions and construction procedures.

Any soft areas encountered during review from this Office, should be excavated and replaced with a Granular “A” or Granular “B” Type II in accordance with OPSS.MUNI 1010. Once the native ground surface is prepared, if any engineered fill is required below the foundations, the material should consist of a Granular “B” Type I or Type II (OPSS 1010). If wet soil conditions are present, a non-woven geotextile separator (Terrafix 270R or equivalent) is to be used between the subgrade soils and the engineered fill materials to stabilize the native soils.

Where engineered fill is placed below the foundations, it is to extend horizontally a minimum of 0.3 m beyond the edges of the foundation and slope down at 1H:1V to ensure the foundation loads are properly transferred to the underlying subgrade. All engineered fill is to be placed in maximum 150 mm thick lifts and be compacted to 100% Standard Proctor Maximum Dry Density (SPMDD) within 1.5% of optimum moisture content. Engineered fill placement and compaction below foundations is to be continuously monitored on a full-time basis by a qualified geotechnical representative from this office.

It is recommended that engineered fill be placed in strips or along the row of the house footprints. Due to the relatively short distances from foundation to foundation of the residential lots, EXP discourages placing engineered fill on a lot by lot basis. Placing engineered fill in strips or along the rows of house footprints eliminates the risk of undermining adjacent already constructed foundations.

Foundations, which are to be placed at different elevations in soils or near service trenches, should be located such that the footings are set below a line drawn up at 10 horizontal to 7 vertical from the near edge of a lower foundation or bottom of a service trench, as indicated on Figure 5-1 below.

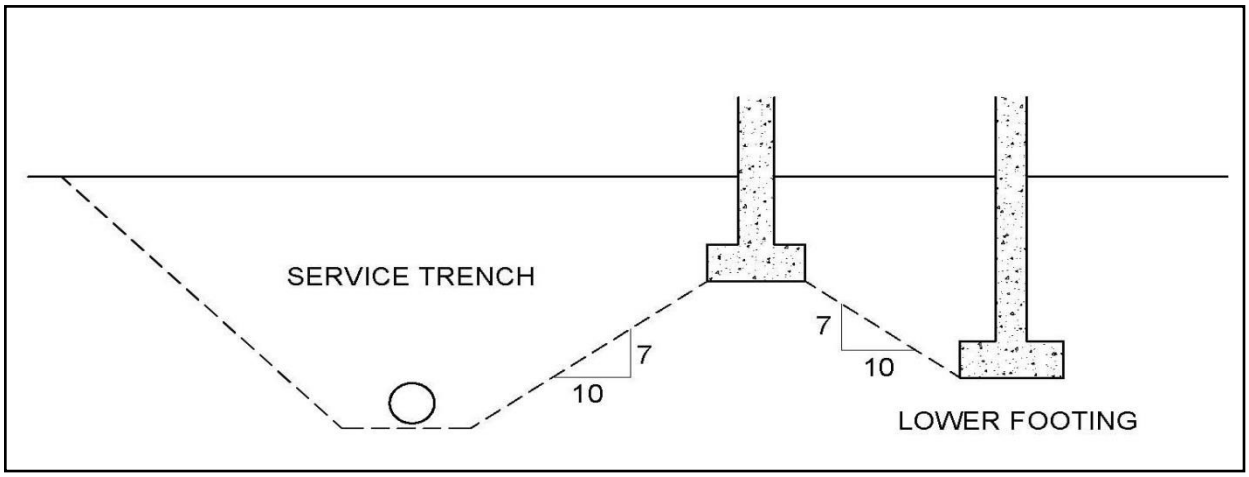


Figure 5-1: Footings near Service Trenches or at Different Elevations

These foundation recommendations assume the structures are lightly loaded. Strip and spread footing widths must comply with minimum Code requirements.

5.3 Floor Slab-on-Grade

For a floor slab-on-grade where standard foundations are used, construction will be possible at this site provided that all topsoil, fill, organics and other deleterious materials are removed down to competent native soils. The subgrade soils should be proof-roll compacted in the presence of EXP prior to placing any engineered fill. Any soft areas encountered during proof-rolling should be excavated and replaced with Granular "B" Type II (OPSS 1010) material. Once the native ground surface is prepared, all required up-fill material is to consist of Granular "B" Type I or II (OPSS 1010). If wet soil conditions are present during construction, a non-woven geotextile separator (Terrafix 270R or equivalent) should be placed between the subgrade soils and any upfill material to stabilize the native soils. A final 300 mm thick layer of 19 mm minus clearstone (OPSS 1004) or Granular "A" (OPSS 1010) should be placed directly below the floor slab-on-grade combined with an appropriate moisture barrier such as a polyethylene membrane. All fill material below the floor slab-on-grade should be placed in maximum 150 mm thick lifts and be compacted to 100% of the SPMDD within 1.5% of the optimum moisture content.

Due to the anticipated high groundwater conditions noted at the site, the finish floor elevation of the lowest floor slab-on-grade should be designed to be a minimum of 600 mm above the groundwater elevation (i.e. 600 mm above elevation 289.0). Pending additional groundwater level monitoring during wetter and drying seasons, the above noted depth below grade may require adjustment.

5.4 Backfill Recommendations

All imported backfill material used to backfill foundations should consist of Granular "B" Type I or Granular "B" Type II (OPSS 1010) material. Any Granular "B" used against or below foundations should have a maximum aggregate size of 120 mm and must be placed in lifts no greater than 150 mm in thickness and must be compacted to 100% SPMDD. Care must be taken to ensure over compaction and damage to the foundation does not occur.

5.5 Frost Considerations

The freezing index in the Greater Sudbury area is approximately 1,330 C degree-days. There is potential for up to 2.1 m of frost penetration to occur over the winter months in unprotected, unheated areas and 1.7 m for heated structures. A structure is considered heated if the temperature within the structure is maintained continuously no lower than 18° C.

As such, foundations for unheated structures should be provided with the a minimum of 2.1 m of earth cover frost protection and foundations for heated structures should be provided with a minimum of 1.7 m of earth cover frost protection. Since it is likely that sufficient earth cover frost protection will not be available, insulation will be required. Insulation should consist of rigid extruded polystyrene, have a minimum compressive strength of 275 kPa, and an R-Value of 5 for every 25.4 mm of thickness, (i.e. Styrofoam High Load 40). Any exposed insulation is to be protected against sunlight and physical damage. A rough estimate for cost evaluation purposes can be made by assuming that 25.4 mm of rigid insulation designed for below grade installation is equivalent to 300 mm of soil cover. Note that insulation for unheated structures must extend below the entire foundation. Higher compressive strength insulation (i.e. Styrofoam High Load 60 or 100, etc.) may be required if insulation extends below foundations, depending on foundation loading conditions.

Detailed insulation recommendations can be provided by EXP, if necessary, once the final foundation designs have been determined.

5.6 Re-Use of Excavated Material

The in-situ materials are too silty to be re-used as free draining engineered fill. The native soils can be re-used for general fill away from structures and pavement structures provided it is environmentally safe to do so.

5.7 Lateral Earth Pressure

Any foundations or retaining structures should be designed to resist lateral earth pressure. The expression for calculating lateral earth pressure "p" at any depth "h" is given by the following:

$$\mathbf{p = K(\gamma h + q) + \gamma_w h_w}$$

where

p	=	Lateral earth pressure (kPa)
K	=	Coefficient of earth pressure
γ	=	Unit weight of backfill (kN/m^3)
γ_w	=	Unit weight of water (kN/m^3)
h	=	Depth to point of interest (m)
h_w	=	Depth of water above point of interest (m)
q	=	Surcharge load acting adjacent to the wall at the ground surface (kPa)

The below tables list various earth pressure properties for given materials.

Material	Friction Angle ø´ (unfactored)	Coefficient of Active Earth Pressure (k_a)	Coefficient of Passive Earth Pressure (k_p)	Coefficient of Earth Pressure at Rest (k_o)	Unit Weight γ (kN/m^3)
Granular "A"	38°	0.24	4.2	0.38	22
Granular "B" Type I	35°	0.27	3.7	0.43	21
Granular "B" Type II	38°	0.24	4.2	0.38	21

Note: Values given for horizontal earth pressures are for horizontal backfill. For sloping backfill, the design requirements outlined in the Canadian Foundation Engineering Manual should be used.

The mobilization of full active or passive resistance requires a measurable and perhaps significant wall movement or rotation. Therefore, unless the structural element can tolerate these deflections, the at-rest earth pressure should be used in design.

The effects of compaction surcharge should be taken into account in the calculations of active and at rest earth pressures. The lateral pressure due to compaction should be taken as at least 12 kPa at the surface, and its magnitude should be assumed to diminish linearly with depth to zero at the depth where the active (or at rest) pressure is equal to 12 kPa. This pressure distribution should be added to the calculated active (or at rest) pressure. Notwithstanding, lighter compaction equipment and smaller lifts should be used adjacent to walls to prevent overstressing.

5.8 Drainage

The exterior grade around the buildings should be sloped away from the walls to prevent surface runoff from entering the building. Permanent perimeter weeping tile should be installed where any floor is less than 150 mm above final grade and is required to be dry. The drainage tile should have a minimum diameter of 100 mm and be surrounded by well-draining filter material (i.e. 20 mm clearstone gravel). The filter material should be surrounded with a non-woven geotextile. The perforated drainage tile should drain to a suitable drainage area or interior sump. Any subsurface walls should be adequately damp-proofed above the water table and waterproofed below the water table. The roof drains should discharge away from the building to appropriate drainage areas.

5.9 Site Classification for Seismic Response

The Ontario Building Code (OBC) has adopted the National Building Code of Canada requirements for seismic design considerations. The Site Classification for Seismic Response has been estimated based on the boreholes advanced at the site. As the Site Classification for Seismic Response is based on soil conditions in the upper 30 m, assumptions were made by EXP for the soil conditions below the borehole termination depths.

Based on EXP's assumptions, the site is classified as Site Class E as per the OBC clause 4.1.8.4, Site Properties and Table 4.1.8.4 A, Site Classification for Seismic Response.

These earthquake/seismic design parameters should be reviewed in detail by the structural engineer and incorporated into the design as required. As this site class is based on an assumption of the soil conditions, the site class may not be sufficient, and it may result in an overdesign of the structure.

If a precise Site Classification is required, EXP can provide a quote to perform the necessary testing.

6. Excavations

The in-situ native soils may be classified as Type 3 soils for excavations terminating above the groundwater level and Type 4 soils for excavations terminating below the groundwater level in conformance with the Ontario Occupational Health and Safety Act (OHSA). Excavation side slopes in Type 3 soils should remain stable at a slope of 1H:1V. Excavation side slopes in Type 4 soils should remain stable at a slope of 3H:1V. The need to excavate flatter side slopes if excessively wet or soft/loose materials, or concentrated seepage zone are encountered, should not be overlooked.

Extreme caution should be utilized when excavating near the existing building foundations so as not to undermine the existing structures.

Water (i.e. surface water runoff) should not be permitted to enter and/or pond within the construction area.

All excavations must be completed in accordance with the most recent regulations in the Ontario Occupational Health and Safety Act. The contractor should be aware that slope height, slope inclination, or excavation depths, should in no case, exceed those specified in local, provincial or federal safety regulations. Such regulations are strictly enforced and, if not followed, the owner, the contractor or earthwork or utility subcontractor could be liable for substantial penalties.

It is important to note that soils encountered in the construction excavations may vary significantly across the site. Our preliminary soil classifications are based solely on the materials encountered in widely spaced explorations. The contractor should verify that similar conditions exist throughout the proposed area of excavation. If different subsurface conditions are encountered at the time of construction, we recommend that EXP be contacted immediately to evaluate the conditions encountered.

7. Dewatering

Groundwater is anticipated within the area at an approximate elevation of 289.0 or slightly higher. As such, should excavations extend to or below this depth, dewatering will likely be required. Above the groundwater table, any perched water should be possible to remove using conventional construction pumps.

The estimated hydraulic conductivity, "K" of the native sand, based on empirical information, is 10^{-2} to 10^{-3} cm/s.

Dewatering requirements will be governed by the time of the year the construction is performed. It is the responsibility of the Contractor to propose a suitable dewatering system based on the time of construction and groundwater levels. The method used should not undermine any adjacent structures or buried services. The dewatering method is the responsibility of the Contractor and the Contractor should submit his proposal to the Prime Consultant for review and approval prior to construction.

8. Asphalt Pavement Recommendations

Pavement structure analysis was undertaken using The Routine (Empirical) Design Method following the guidelines provided in the MTO "Pavement Design and Rehabilitation Manual (PDRM)". The Routine (Empirical) Design Method is based on the concept of a Granular Base Equivalency (GBE), which relates the structural contribution of various pavement materials to an equivalent Granular "A" thickness. A target GBE value is selected based upon the anticipated AADT (Average Annual Daily Traffic) and the in-situ native soils conditions. The contribution of various pavement materials is shown below on the table below.

Material	Equivalency Factor
New or Recycled Asphalt	2.0
New Base (Granular "A")	1.0
New Subbase (Granular "B")	0.67

8.1 Recommended Pavement Structure

The AADT for the new subdivision has been assumed by EXP to be less than 1,000, with truck traffic assumed to account for less than 10% of the AADT. As such, in order to comply with the City of Greater Sudbury Standards, and with a sand subgrade with < 40% material between 5 and 75 µm, a target GBE of 405 is considered appropriate.

The following pavement structure is recommended for the proposed roadway based on Table 3.3.2 and 3.3.3 of the PDRM. As recommended in the PDRM, modifications must be made to account for deep frost penetration and marginal soil conditions in Northern Ontario. As such, granular depths should be no less than those for 3000-4000 AADT. CGS pavement standards have also been considered in the design. The recommended pavement structure is outlined on the table below.

Material	Thickness	Equivalency Factor	GBE
Asphalt	40 mm Surface (HL3) 50 mm Binder (HL8)	2.0	180
Base	150 mm	1.0	150
Subbase	600 mm	0.67	402
TOTAL	**840 mm**	**--**	**732**

As noted, the resulting GBE of 732 far exceeds the target GBE of 405 and as such, the recommended pavement structure is considered adequate.

A conventional asphalt pavement structure as noted above will typically have a functional service life of 12 years provided adequate subgrade support and proper drainage is available. This represents the number of years to the first rehabilitation (via overlay or resurfacing), assuming that regular maintenance and crack sealing is completed. Subsequent resurfacing is typically expected to last at least 10 years.

8.2 Subgrade Preparation

The long-term performance of pavement is highly dependent upon the subgrade support conditions. Stringent construction control procedures should be maintained to ensure that uniform subgrade moisture and density conditions are achieved.

All topsoil, organics, or other deleterious materials are to be removed below the proposed roadways. Prior to the placement of any engineered fill, the subgrade must be properly shaped, crowned (a minimum of 3%), and proof-rolled in the presence of a qualified geotechnical engineer to ensure uniform conditions. Should soft or spongy areas be encountered, these areas should be sub-excavated and the material replaced with Granular “A” or Granular “B” Type II.

General upfill below the proposed pavement structure should consist of Granular “B” or Select Subgrade Material (SSM) in accordance with OPSS 1010.

The most severe loading conditions on the pavement subgrade usually occur during construction. Consequently, special provisions, such as additional granular subbase, may be required, especially if construction is completed during unfavourable weather conditions.

Where the subgrade soils are wet or loose, it may be necessary to place a geotextile over the exposed subgrade/subgrade fill.

8.3 Drainage

To ensure pavement structure performance and maximum life expectancy, the need for adequate drainage cannot be overemphasized. The finished pavement surface and underlying subgrade must be sloped to provide effective drainage towards the proposed drainage system (i.e., curb, catchbasins, ditching, and/or subdrains). Surface water should not be allowed to pond adjacent to the outside edges of pavement areas.

Subdrains are to be placed along the full length of the roadway to provide additional drainage. The subdrains should consist of 150 mm diameter rigid slotted plastic pipes and should be completely surrounded with a minimum of 50 mm of 19 mm minus Clear Stone gravel (OPSS 1004). The Clear Stone gravel is to be completely wrapped with a non-woven geotextile (Terrafix 270R or equivalent) to prevent any materials from migrating into the Clear Stone.

8.4 Material Requirements

Asphalt

The surface asphalt placed as part of this project should consist of HL3 and binder asphalt should consist of HL8. The surface asphalt should be placed in a single compacted 40 mm thick lift and binder asphalt should be placed in a single compacted 50 mm thick lift. All asphalt shall be in accordance with OPSS 1150 (HL mixes). Placement and compaction of the asphalt shall be in accordance with OPSS 310.

Granular Materials

The granular base material should consist of Granular "A" in accordance with OPSS.MUNI 1010. Although a 60% crushed Granular "A" material may be used as specified in OPSS 1010, EXP recommends the Granular "A" material be 100% crushed, as this material will enhance drainage and offer better structural support.

Subbase material should consist of Granular "B" Type II in accordance with OPSS.MUNI 1010. Granular "B" Type II is recommended as it offers increased stability, easier placement and compaction, and is readily available in the area.

All roadway granular material should be placed full width in maximum 200 mm thick lifts and compacted to 98% of the Standard Proctor Maximum Dry Density (SPMDD) within 1.5% of optimum moisture content.

9. Buried Service Recommendations

Recommendations for proposed buried services are included in the following sections.

9.1 Frost Protection

Protection against freezing is an integral part of a sewer and water system design. The standard solution calls for burying the top of the utility lines in the ground below the anticipated frost penetration depth (2.1 m in the Sudbury Area). Where this cannot be achieved, an alternate solution involves incorporating rigid polystyrene insulation (i.e. Styrofoam HIGHLOAD-40), which can be used to reduce the depth of trench required. The two design configurations frequently used are horizontal placement, and the inverted "U". Both of these methods require suitable design, as well as correct construction procedures. Installing insulation does not alter conventional utility line construction practice to an appreciable extent. However, in some cases, a wider trench may be required to accommodate the horizontal layer of insulation. Another option is to use pre-insulated pipe.

A rough estimate for cost evaluation can be made by assuming that 25 mm of rigid insulation designed for below grade installation is equivalent to 300 mm of soil cover. This and any other design values should, however, be confirmed with the insulation manufacturer.

Maintaining compatibility with adjacent subgrade conditions should minimize annual differential frost heaving. This is usually accomplished by backfilling the service trenches with materials matching the surrounding soils. Another approach to minimizing the annual differential heaving of subgrade soil is to construct frost tapers in conformance with OPSD 803.030 and/or 803.031. The same amount of heaving will occur whether a frost taper is installed, or the trench is backfilled with excavated material. However, the heaving of a frost taper is spread across the length of the taper causing the differential heaving to be less abrupt.

9.2 Pipe Embedment and Bedding

All fill materials, organics, and deleterious material are to be removed down to competent native soils prior to placement of the bedding material. Pipe bedding requirements as outlined in the OPSD 802.010 for flexible pipes and OPSD 802.031 and 802.032 for rigid pipes will be sufficient for sanitary, storm and watermain pipes. The pipe bedding should consist of a Clear Stone gravel (OPSS 1004) or Granular "A" material (OPSS.MUNI 1010) with a minimum thickness of 150 mm beneath the pipe and raised to the pipe springline. The granular bedding should be placed in lifts not exceeding 150 mm and compacted to 98% of the material's SPMDD. Particular care should be taken when compacting beneath the pipe haunches. The cover material should consist of a compacted sand material with no sizes greater than 25 mm or a Granular "A" material.

Bedding thicknesses may be increased in areas where the native soil base supporting the bedding is wet, or subject to disturbance. Where soft or loose base conditions are encountered below the water table, base stabilization may be required. This may include the placement of crushed stone sub-bedding, wrapped in a non-woven geotextile, to prevent base disturbance and to allow the removal of water through standard filtered sump and pump methods.

If construction proceeds during the winter months, the base and sides of the trench, as well as all fill materials, should not be allowed to freeze.

9.3 Excavated Soil and Trench Backfill

It is typical practice in Northern Ontario to re-use a portion of the in-situ excavated native material as fill within exterior (outside) trench utility services, especially where these trenches interrupt traveled sections of a roadway. This is to ensure compatibility with adjacent subgrade soils to minimize annual differential frost heaving.

Non-organic material from the service trench excavation may be re-used as random fill above the top of the pipe cover material to the underside of the pavement structure subbase materials. All re-used materials must be placed in lifts not exceeding 150 mm and be compacted to 98% of the SPMDD within 2% of the optimum moisture content. EXP cautions that any native material below the groundwater level may not meet the above compaction requirements without significant reworking and drying prior to placement. If stockpiling of trench excavated material for re-use is required, it is recommended that it be covered to prevent exposure to rain and it cannot be allowed to freeze. All unsuitable materials from the trench excavation not reused must be disposed of off-site.

Any excavated material contaminated with organics must not be re-used as backfill material. This material may be re-used for general landscaping purposes, provided it is environmentally safe to do so. It is also recommended that any blast rock fill material not be used as trench backfill.

10. Re-Use of Excavated Material

The in-situ soils could be considered free draining and used as engineered fill on site, however it is recommended that any material to be reused be stockpiled and testing to confirm that it is free draining prior to re-use. Excavated soils can be re-used for general fill away from structures or pavement structures provided it is environmentally safe to do so. Excavated soils to be removed off site are considered to be Excess Soils and disposal of such soils should follow O.Reg. 406/19. Once the final site plan has been determined, and the known volume of soils to be excavated and removed off site is known, additional excess soil field studies can be completed. EXP would be pleased to complete the additional studies and provide all recommendations required.

11. Construction Constraints Under Cold Weather Conditions

For all construction activities at this site, the following applies:

- During excavations, all subgrade soils must be maintained at a minimum temperature of 5° C.
- No granular material may be placed under frozen conditions, with all fill material maintained at a minimum temperature of 5° C prior to and during installation. If granular fill is to be placed in freezing conditions, the granular fill must be restricted to Granular "B" Type II material. Since Granular "B" Type II has a larger aggregate size, care should be taken to prevent point loading on the underside of the concrete.
- Soils and granular fill material that are in direct contact with fresh concrete must be at a minimum temperature of 5° C prior to pouring the concrete and must be free of snow and ice fragments.
- All granular fill, prior to placement of concrete, must be reviewed by this office to ensure that it is free of frost, buried ice and snow.
- All reinforcing steel in the concrete forms must be free of ice and snow, and must be maintained at a minimum temperature of 5° C.
- During the placement of concrete in cold weather conditions, a field cured cylinder should be placed beside the heated form for a period of 6 days. The field cured cylinder should be returned to a designated laboratory on the sixth day for 7-day compressive strength testing.
- All heated and tarped areas should be monitored for temperature using a max/min thermometer.
- All concrete is to have a minimum of 6% to 8% air entrainment to prevent cracking and shall be maintained at a minimum temperature of 10° C for a period of 4 to 7 days.

The 6% to 8% air entrained concrete during cold weather placement is to prevent significant strength loss of concrete as a result of freezing and thawing. The air entrainment will provide the capacity to absorb stresses during freeze/thaw action.

12. Construction Quality Control

Construction quality control of the "earthworks" should be provided throughout the project by a representative of EXP to verify all design assumptions, recommendations and confirmation of the subsurface soil conditions. This includes inspection of the excavation and subgrade prior to the placement of any structural fill and foundations, to ensure that any and all deleterious materials have been removed and to ensure that the actual conditions are not markedly different than those on which the recommendations made herein are based. Compaction control of structural fill is also recommended as standard practice, as is sampling and testing of aggregates and concrete.

13. Design Review

The recommendations made in this report are considered preliminary and in accordance with our present understanding of the project and are provided solely for the design team responsible for the project. If there are any changes, such as relocation of any structures or other features which may affect our analysis, the information obtained during this investigation may be inadequate and additional field work and reporting may be required.

EXP Services Inc. should be retained to review the final design and specifications to confirm that we are in general agreement with the assumptions on which our recommendations are based. If not accorded the privilege of making this review, EXP will assume no responsibility for interpretation of the recommendations in this report.

14. Limitations

A subsurface investigation is a limited sampling of a site. Should any conditions at the site be encountered that differ from those reported at the test locations, we require that we be notified immediately in order to allow reassessment of our recommendations.

Whereas this investigation has estimated the groundwater level at the time of the fieldwork, and commented on general construction problems, the presence of conditions, which would be difficult to establish from our test holes, may affect the type and nature of dewatering procedures which should be used in practice. These conditions include local and seasonal fluctuations in the groundwater table, erratic changes in the soil profile between the tests, and thin layers of soil with large or small permeabilities compared with the general soil mass, etc.

The comments given in this report are intended only for the guidance of the design team responsible for the project. The number of test holes required to determine the localized underground conditions between test holes affecting construction costs, techniques, sequencing, equipment, scheduling, etc. could be greater than has been carried out for preliminary design purposes. Contractors bidding on or undertaking the works should, in this light, decide on their own investigations, as well as their own interpretations of the factual test hole results, so that they may draw their own conclusions as to how the subsurface conditions may affect them.

The investigation and comments are necessarily ongoing as new information of underground conditions becomes available. For example, more specific information is available with respect to in-situ subsurface conditions between test locations once construction is underway. Subsurface soil interpretation between test holes, as well as the recommendations of this report, should be verified through field inspections provided by EXP to validate the current information for use during the construction stage.

Virtually no scope of work, no matter how exhaustive, can identify all contaminants or all conditions above or below ground. For example, conditions elsewhere on the property may differ from those encountered, and conditions may change with time. Therefore, no warranty is provided that the entire site condition is represented by those identified at specific borehole locations.

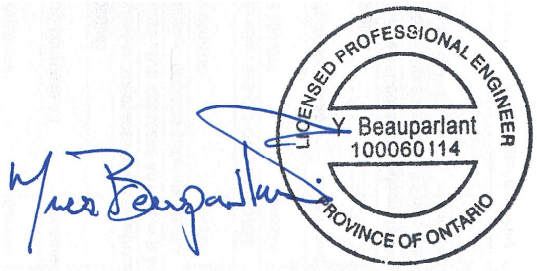
This report in no way reflects any on-site environmental considerations.

15. Closure

We trust that these comments provide you with sufficient information to proceed with design. Should you have any questions, please do not hesitate to contact this office.

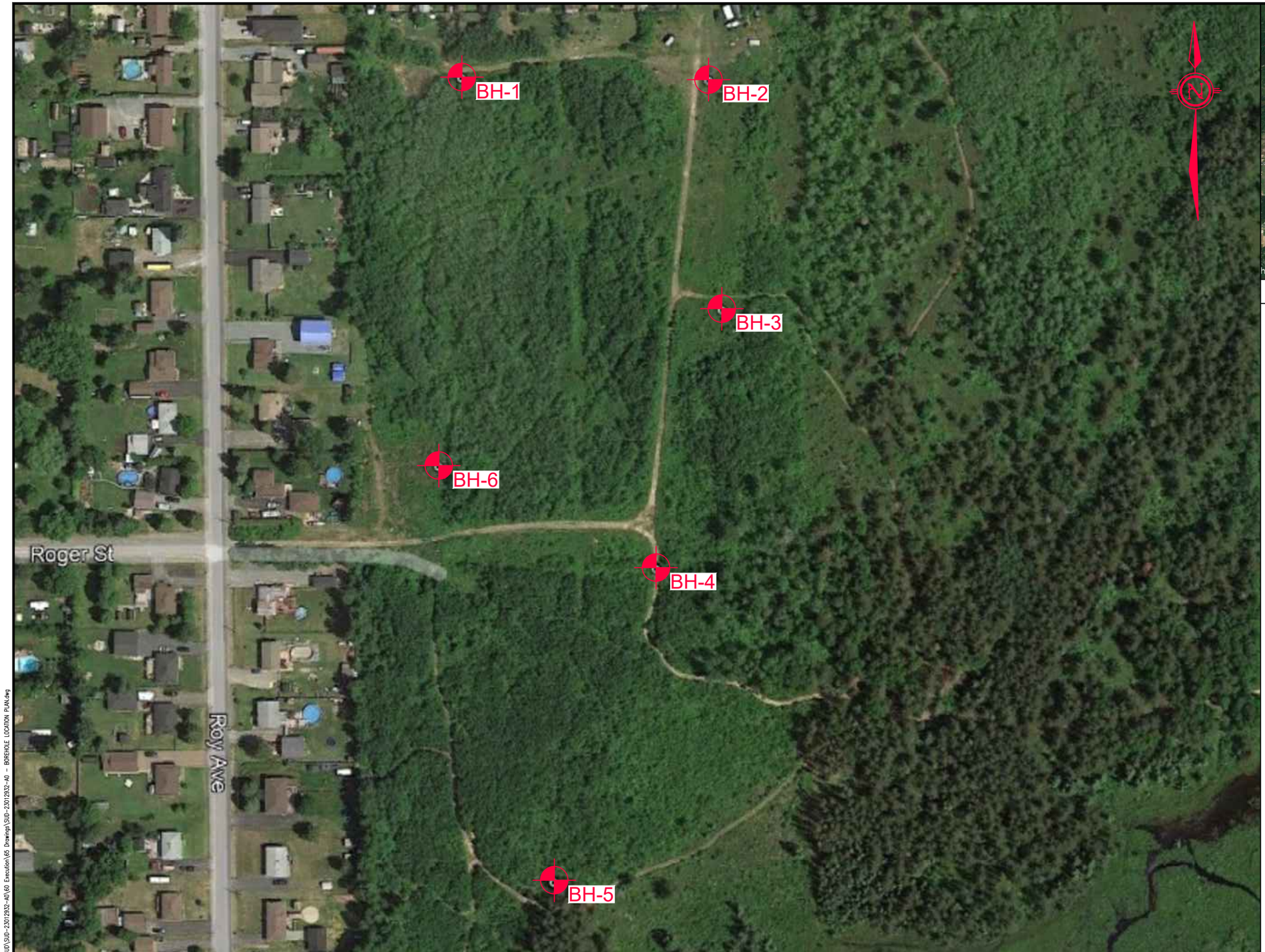
Yours truly,

EXP Services Inc.



Yves Beauparlant, P.Eng.
Manger, Earth & Environmental Services
Northeastern Ontario

Appendix A - Drawing



KEYPLAN - N.T.S.

LEGEND

EXP BOREHOLE

— NOTES —

1) The boundaries and soil types have been established only at Test Hole locations. Between Test Holes, they are assumed and may be subject to considerable error.
2) Do not use Test Hole elevations for design purposes.
3) Soil samples will be retained in storage for 3 month and then destroyed unless client advises that an extended time period is required.
4) Quantities should not be established from the information provided at the Test Hole locations.
5) This drawing forms part of the report, project number as referenced, and should be used only in conjunction with this report.

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REVISIONS

No.	DESCRIPTION	DATE

CLIENT: COLIN'S HAULAGE INC.

PROJECT: PROPOSED SUBDIVISION HANMER, ON

PROJECT NO.: SUD-23012932-A0

TITLE: BOREHOLE LOCATION PLAN

DATE: DECEMBER 2023 | SCALE: NTS | DWG NO.: A-1

Appendix B – Borehole Logs

Notes on Sample Descriptions

1. All sample descriptions included in this report follow the International Society for Soil Mechanics and Foundation Engineering (ISSMFE), as outlined in the Canadian Foundation Engineering Manual. Note, however, that behavioral properties (i.e. plasticity, permeability) take precedence over particle gradation when classifying soil. Please note that, with the exception of those samples where a grain size analysis has been made, all samples are classified visually. Visual classification is not sufficiently accurate to provide exact grain sizing or precise differentiation between size classification systems.

UNIFIED SOIL CLASSIFICATION

CLAY (PLASTIC) TO	FINE	MEDIUM	CRS.	FINE	COARSE
SILT (NONPLASTIC)	SAND			GRAVEL	

EQUIVALENT GRAIN DIAMETER IN MILLIMETRES

ISSMFE SOIL CLASSIFICATION

CLAY	SILT			SAND			GRAVEL			COBBLES	BOULDERS
	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE		

2. Fill: Where fill is designated on the borehole log it is defined as indicated by the sample recovered during the boring process. The reader is cautioned that fills are heterogeneous in nature and variable in density or degree of compaction. The borehole description may therefore not be applicable as a general description of site fill materials. All fills should be expected to contain obstruction such as wood, large concrete pieces or subsurface basements, floors, tanks, etc., none of these may have been encountered in the boreholes. Since boreholes cannot accurately define the contents of the fill, test pits are recommended to provide supplementary information. Despite the use of test pits, the heterogeneous nature of fill will leave some ambiguity as to the exact composition of the fill. Most fills contain pockets, seams, or layers of organically contaminated soil. This organic material can result in the generation of methane gas and/or significant ongoing and future settlements. Fill at this site may have been monitored for the presence of methane gas and, if so, the results are given on the borehole logs. The monitoring process does not indicate the volume of gas that can be potentially generated nor does it pinpoint the source of the gas. These readings are to advise of the presence of gas only, and a detailed study is recommended for sites where any explosive gas/methane is detected. Some fill material may be contaminated by toxic/hazardous waste that renders it unacceptable for deposition in any but designated land fill sites; unless specifically stated the fill on this site has not been tested for contaminants that may be considered toxic or hazardous. This testing and a potential hazard study can be undertaken if requested. In most residential/commercial areas undergoing reconstruction, buried oil tanks are common and are generally not detected in a conventional geotechnical site investigation.

3. Till: The term till on the borehole logs indicates that the material originates from a geological process associated with glaciation. Because of this geological process the till must be considered heterogeneous in composition and as such may contain pockets and/or seams of material such as sand, gravel, silt or clay. Till often contains cobbles (75 to 200 mm) or boulders (over 200 mm). Contractors may therefore encounter cobbles and boulders during excavation, even if they are not indicated by the borings. It should be appreciated that normal sampling equipment cannot differentiate the size or type of any obstruction. Because of the horizontal and vertical variability of till, the sample description may be applicable to a very limited zone; caution is therefore essential when dealing with sensitive excavations or dewatering programs in till materials.

Notes On Soil Descriptions

4. The following table gives a description of the soil based on particle sizes. With the exception of those samples where grain size analyses have been performed, all samples are classified visually. The accuracy of visual examination is not sufficient to differentiate between this classification system or exact grain size.

Soil Classification		Terminology	Proportion
Clay and Silt	<0.060 mm	"trace" (e.g. Trace sand)	1% to 10%
Sand	0.060 to 2.0 mm	"some" (e.g. Some sand)	10% to 20%
Gravel	2.0 to 75 mm	adjective (e.g. sandy, silty)	20% to 35%
Cobbles	75 to 200 mm	"and" (e.g. and sand)	35% to 50%
Boulders	>200 mm		

The compactness of Cohesionless soils and the consistency of the cohesive soils are defined by the following:

Cohesionless Soil		Cohesive Soil		
Compactness	**Standard Penetration Resistance "N" Blows / 0.3 m**	**Consistency**	**Undrained Shear Strength (kPa)**	**Standard Penetration Resistance "N" Blows / 0.3 m**
Very Loose	0 to 4	Very soft	<12	<2
Loose	4 to 10	Soft	12 to 25	2 to 4
Compact	10 to 30	Firm	25 to 50	4 to 8
Dense	30 to 50	Stiff	50 to 100	8 to 15
Very Dense	Over 50	Very Stiff	100 to 200	15 to 30
		Hard	>200	>30

5. **ROCK CORING**

Where rock drilling was carried out, the term RQD (Rock Quality Designation) is used. The RQD is an indirect measure of the number of fractures and soundless of the rock mass. It is obtained from the rock cores by summing the length of the core covered, counting only those pieces of sound core that are 100 mm or more length. The RQD value is expressed as a percentage and is the ratio of the summed core lengths to the total length of core run. The classification based on the RQD value is given below.

RQD Classification	RQD (%)
Very Poor Quality	<25
Poor Quality	25 to 50
Fair Quality	50 to 75
Good Quality	75 to 90
Excellent Quality	90 to 100

$$\text{Recovery Designation \% Recovery} = \frac{\text{Length of Core Per Run}}{\text{Total Length of Run}} \times 100$$

Log of Borehole BH-1

Project No. SUD-23012932-A0 | Figure No. B-2

Project: Proposed Subdivision | Sheet No. 1 of 1

Location: Laura Street, Hanmer, ON

505025E; 5165627N

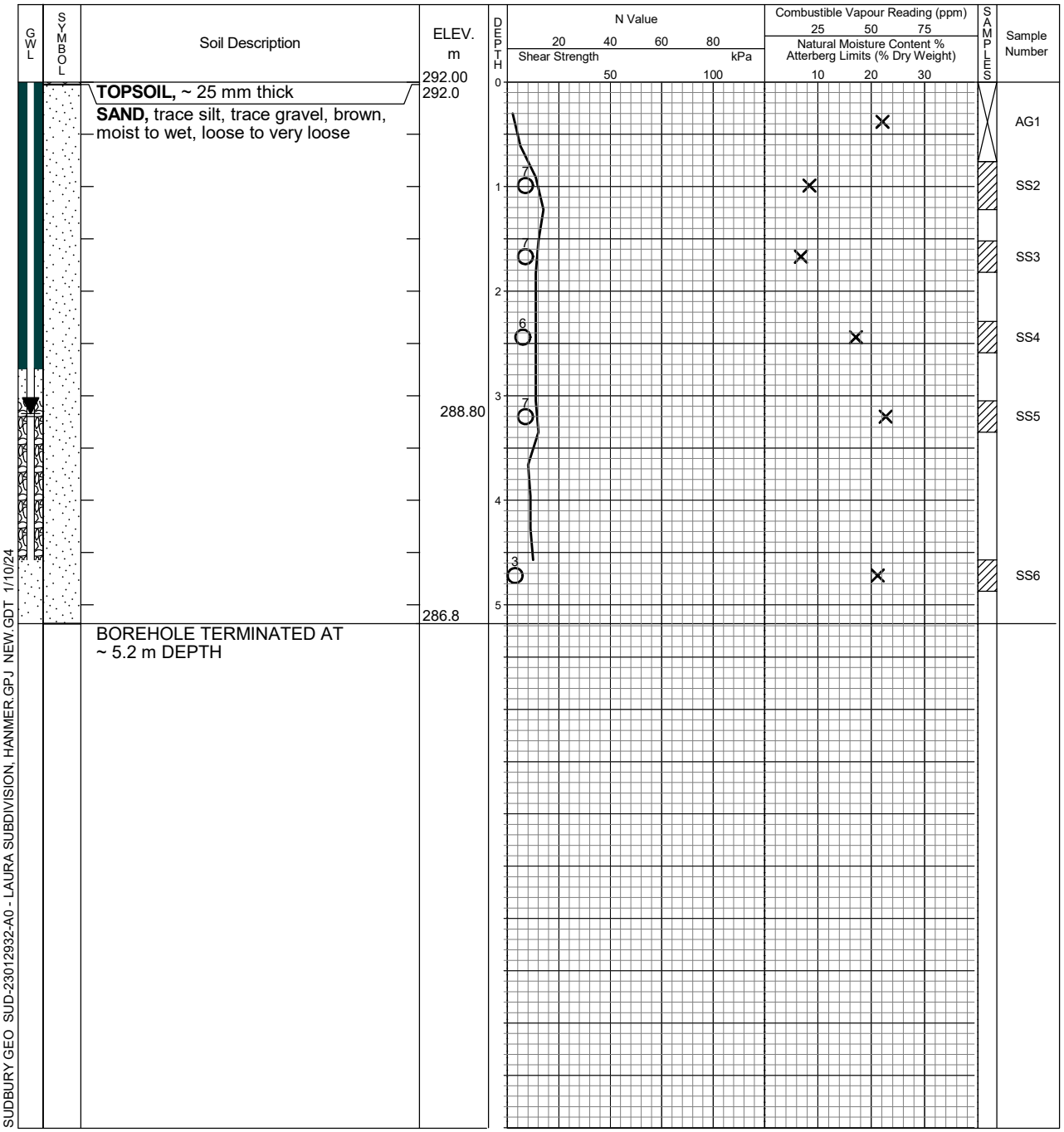
Date Drilled: November 23, 2023

Drill Type: CME55 TRUCK MOUNT

Datum: Geodetic (Hand-Held)

Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Field Vane Test (S)

Combustible Vapour Reading
Natural Moisture
Plastic and Liquid Limit
Undrained Triaxial at % Strain at Failure
Penetrometer



SUDBURY GEO SUD-23012932-A0 - LAURA SUBDIVISION, HANMER.GPJ NEW.GDT 1/10/24

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Borehole data requires interpretation assistance from EXP before use by others.

See Figures B-1A and B-1B for Notes on Sample Description

Time	Water Level (m)	Depth to Cave (m)
Upon Completion	3.1	N/A
November 24, 2023	3.1	N/A
Decmber 1, 2023	3.2	N/A

Log of Borehole BH-2

Project No. SUD-23012932-A0 | Figure No. B-3

Project: Proposed Subdivision | Sheet No. 1 of 1

Location: Laura Street, Hanmer, ON

505134E; 5165626N

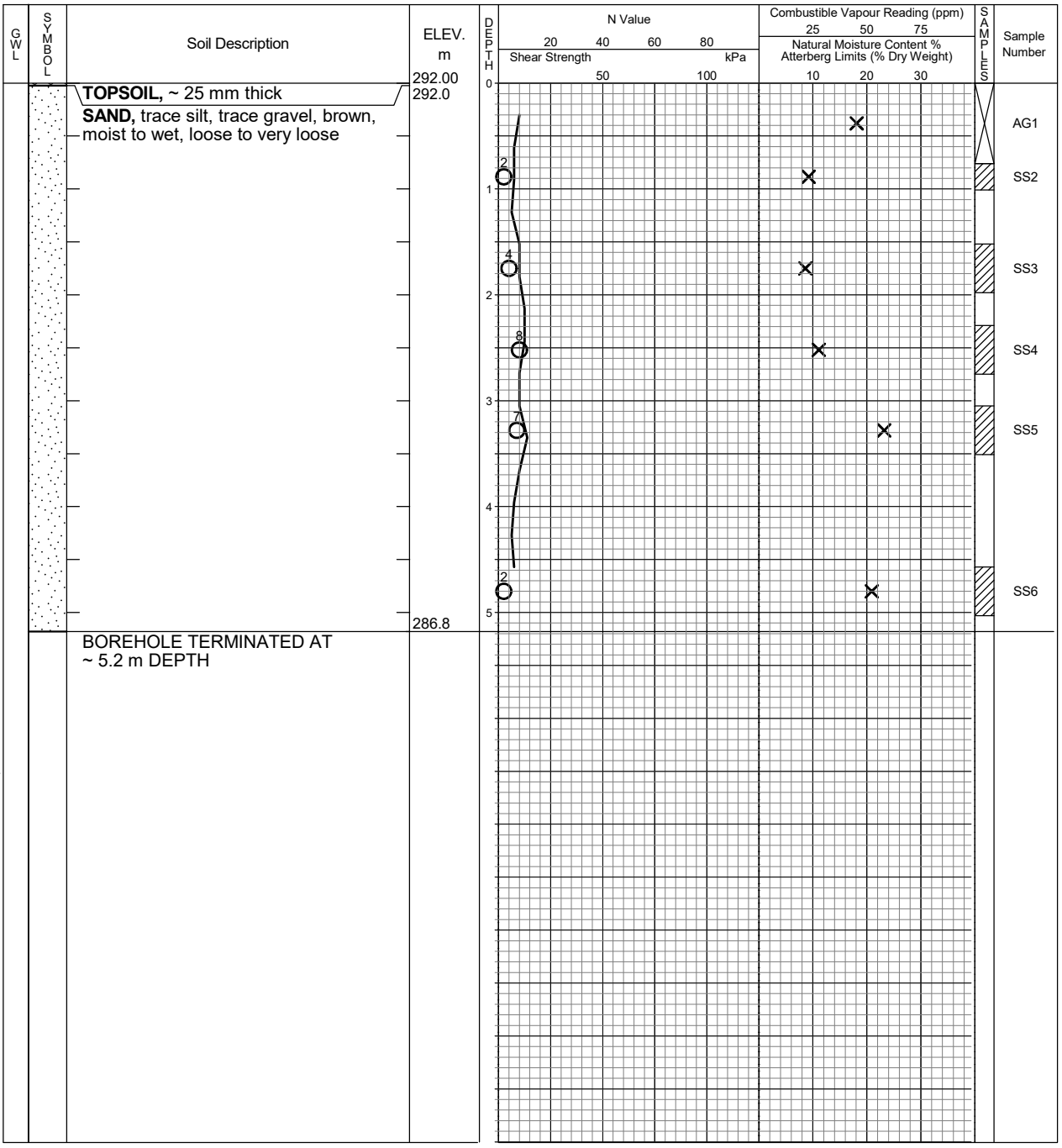
Date Drilled: November 23, 2023

Drill Type: CME55 TRUCK MOUNT

Datum: Geodetic (Hand-Held)

Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Field Vane Test (S)

Combustible Vapour Reading
Natural Moisture
Plastic and Liquid Limit
Undrained Triaxial at % Strain at Failure
Penetrometer



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See Figures B-1A and B-1B for Notes on Sample Description

Time	Water Level (m)	Depth to Cave (m)
Upon Completion	Dry	2.4

Log of Borehole BH-3

Project No. SUD-23012932-A0 | Figure No. B-4

Project: Proposed Subdivision | Sheet No. 1 of 1

Location: Laura Street, Hanmer, ON

505140E; 5165525N

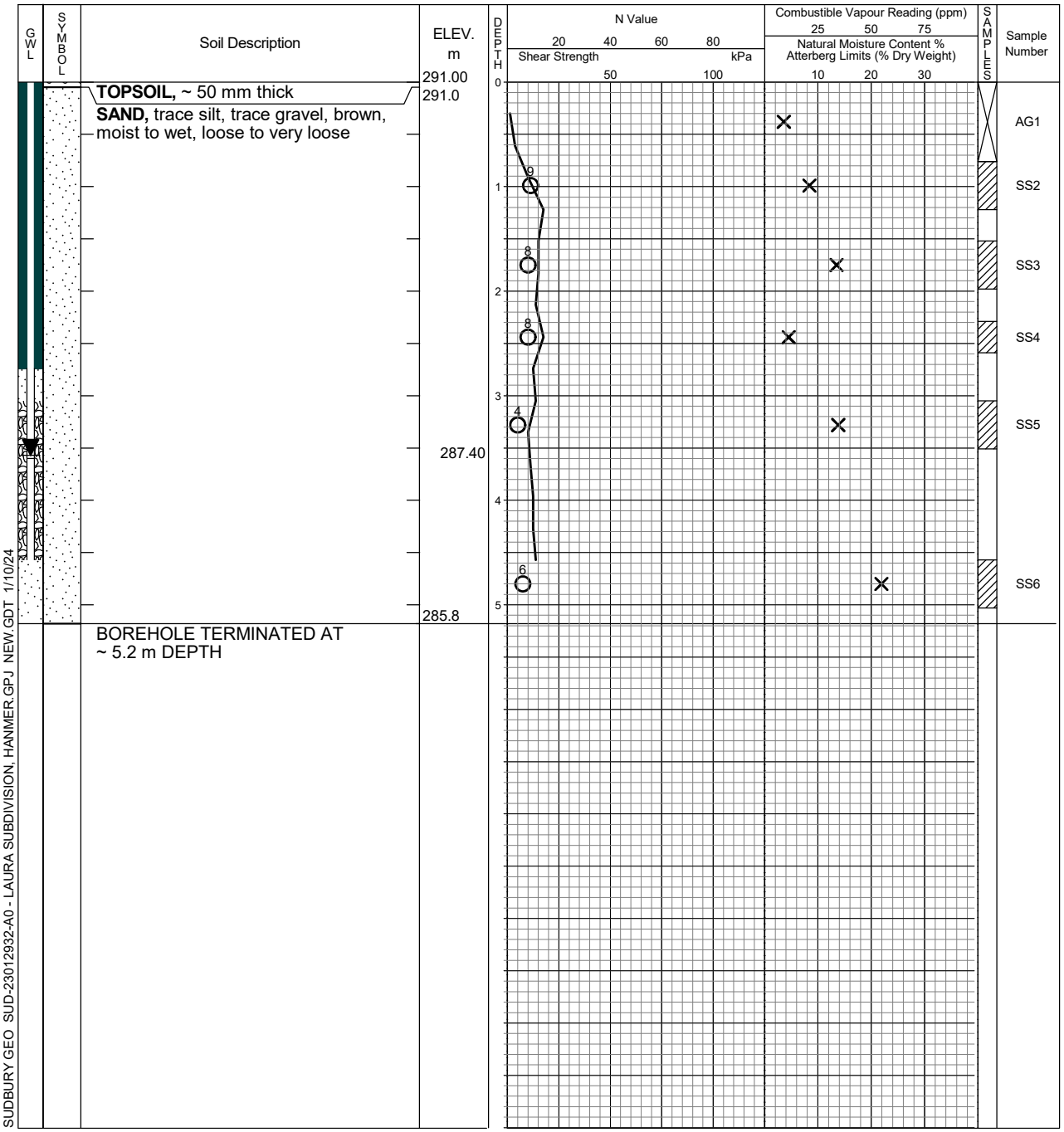
Date Drilled: November 23, 2023

Drill Type: CME55 TRUCK MOUNT

Datum: Geodetic (Hand-Held)

Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Field Vane Test

Combustible Vapour Reading
Natural Moisture
Plastic and Liquid Limit
Undrained Triaxial at % Strain at Failure
Penetrometer



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See Figures B-1A and B-1B for Notes on Sample Description

Time	Water Level (m)	Depth to Cave (m)
Upon Completion	3.6	N/A
November 24, 2023	3.5	N/A
Decmber 1, 2023	3.6	N/A

Log of Borehole BH-4

Project No. SUD-23012932-A0 | Figure No. B-5

Project: Proposed Subdivision | Sheet No. 1 of 1

Location: Laura Street, Hanmer, ON

505111E; 5165411N

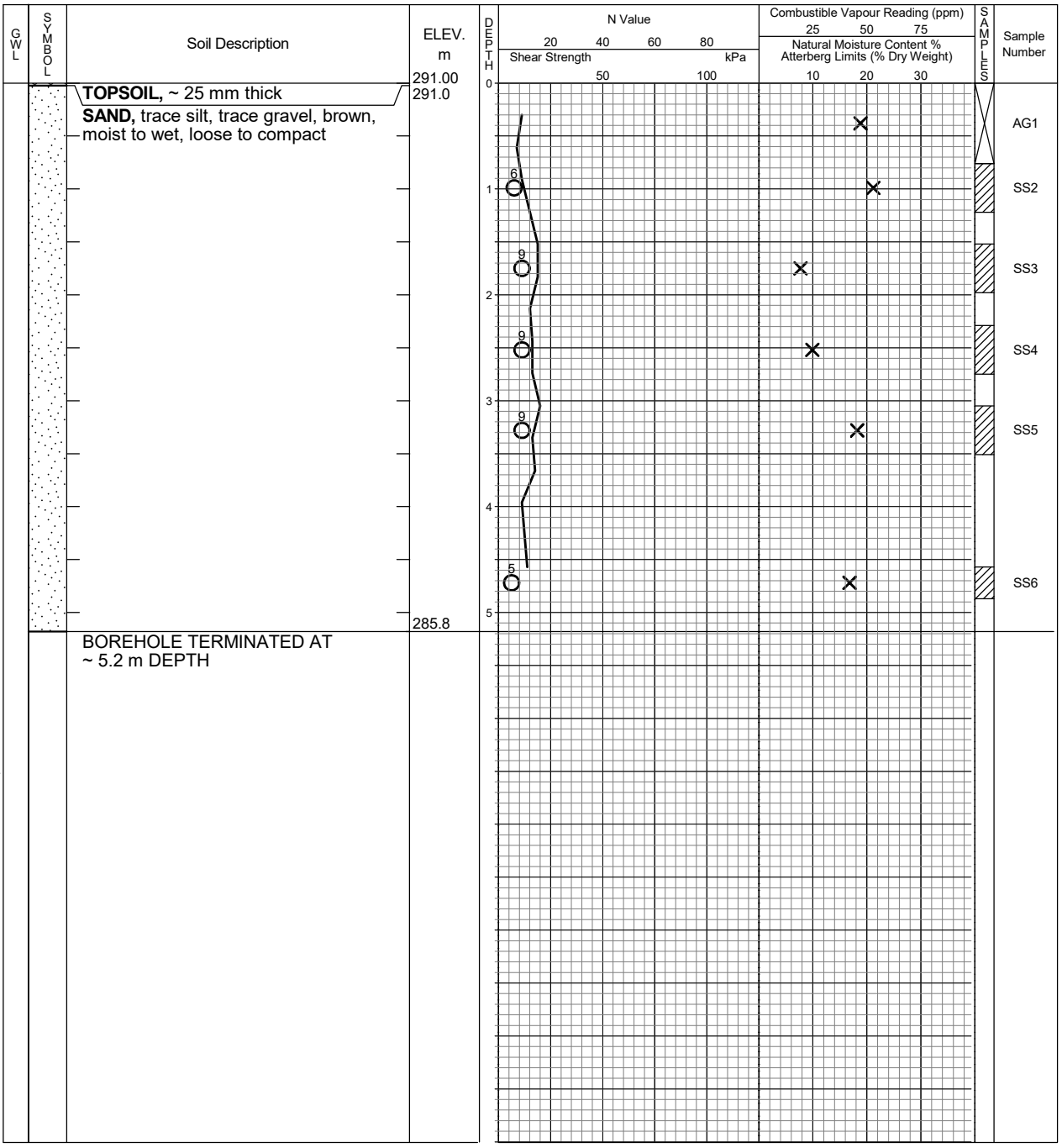
Date Drilled: November 23, 2023

Drill Type: CME55 TRUCK MOUNT

Datum: Geodetic (Hand-Held)

Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Field Vane Test (S)

Combustible Vapour Reading
Natural Moisture
Plastic and Liquid Limit
Undrained Triaxial at % Strain at Failure
Penetrometer



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Borehole data requires interpretation assistance from EXP before use by others.

See Figures B-1A and B-1B for Notes on Sample Description

Time	Water Level (m)	Depth to Cave (m)
Upon Completion	Dry	2.7

Log of Borehole BH-5

Project No. SUD-23012932-A0 | Figure No. B-6

Project: Proposed Subdivision | Sheet No. 1 of 1

Location: Laura Street, Hanmer, ON

505066E; 5165273N

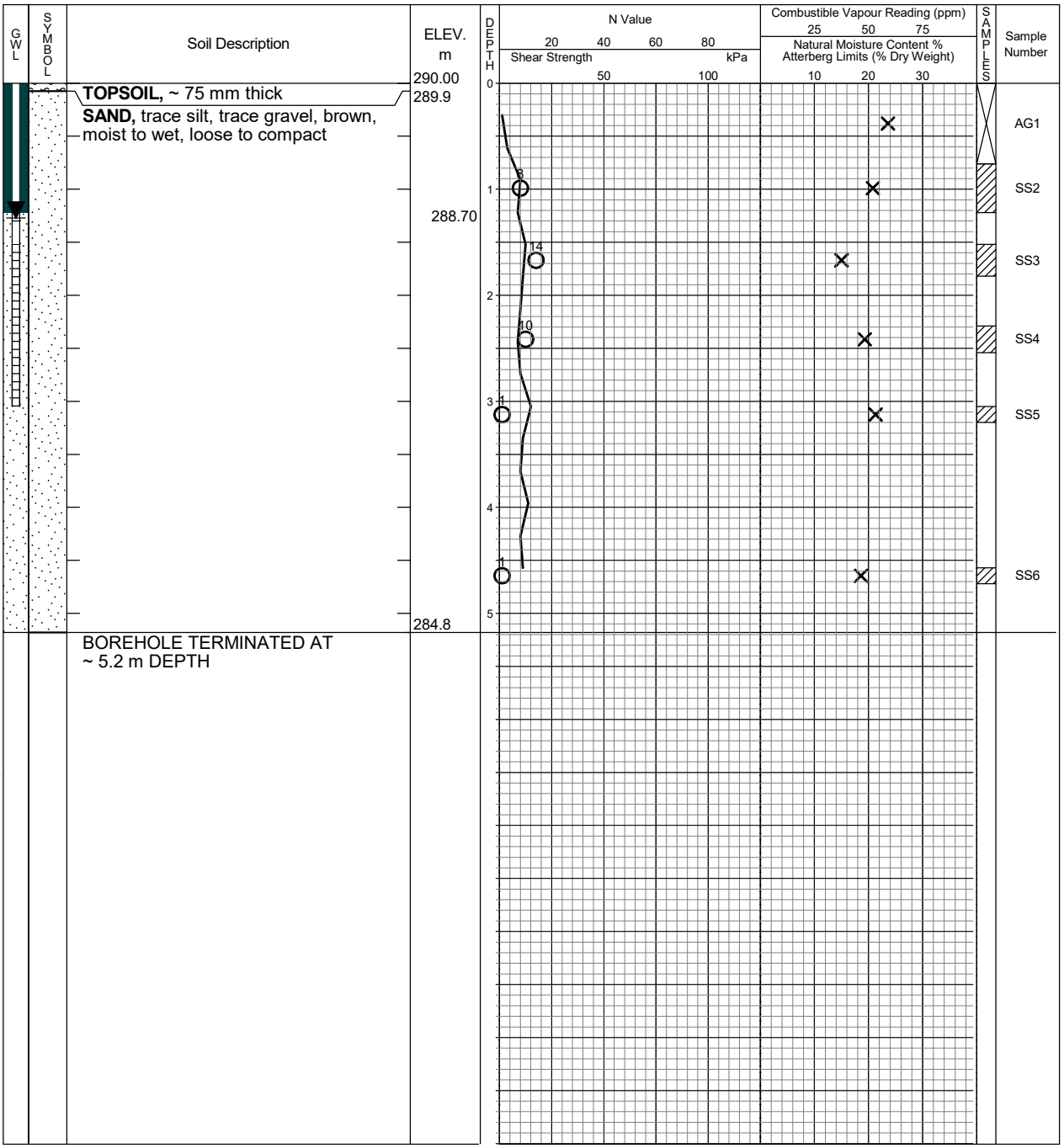
Date Drilled: November 24, 2023

Drill Type: CME55 TRUCK MOUNT

Datum: Geodetic (Hand-Held)

Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Field Vane Test (S)

Combustible Vapour Reading
Natural Moisture
Plastic and Liquid Limit
Undrained Triaxial at % Strain at Failure
Penetrometer



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Borehole data requires interpretation assistance from EXP before use by others.

See Figures B-1A and B-1B for Notes on Sample Description

Time	Water Level (m)	Depth to Cave (m)
Upon Completion	1.3	N/A
Decmber 1, 2023	1.3	N/A

Log of Borehole BH-6

Project No. SUD-23012932-A0 | Figure No. B-7

Project: Proposed Subdivision | Sheet No. 1 of 1

Location: Laura Street, Hanmer, ON

505015E; 5165456N

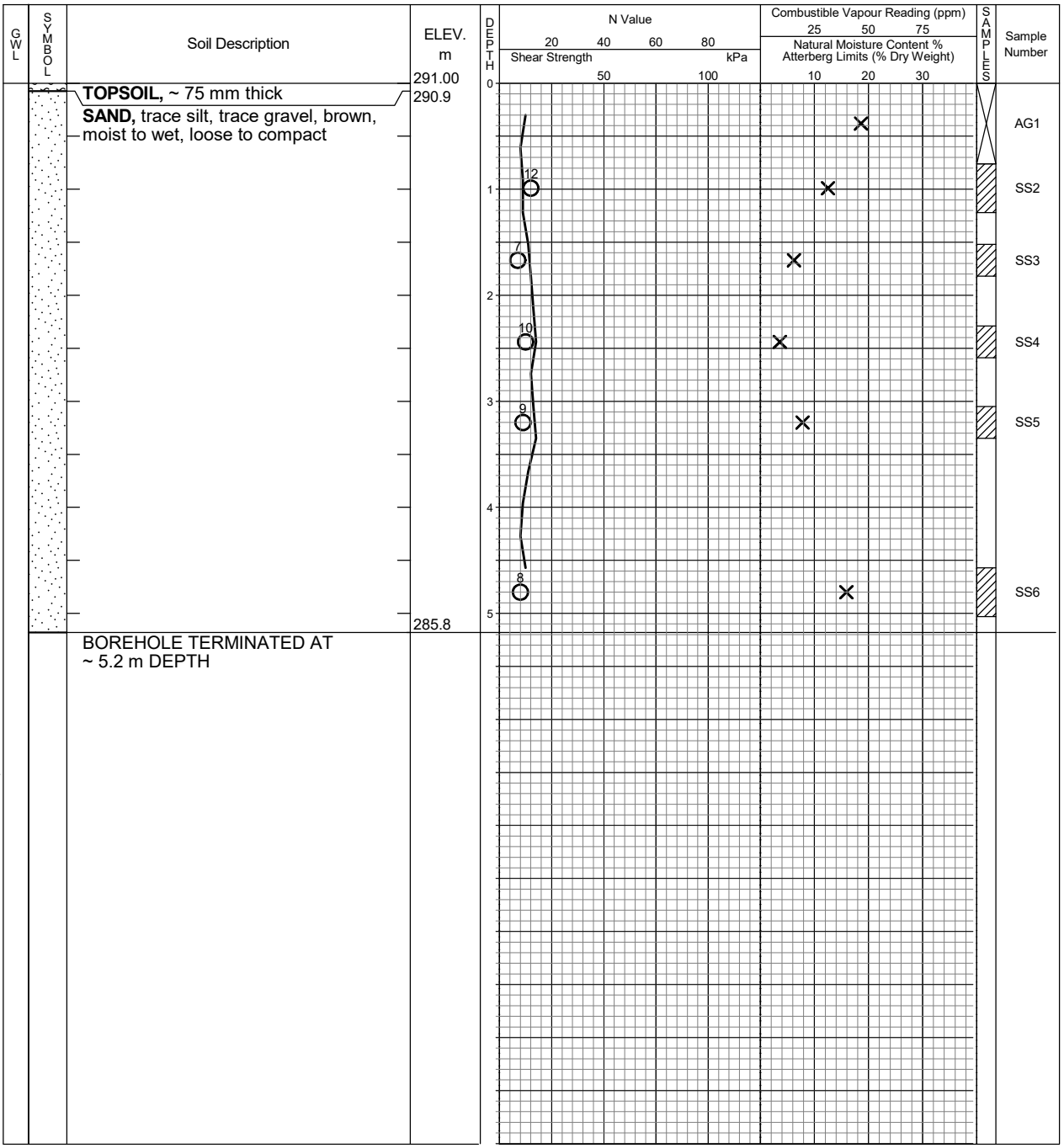
Date Drilled: November 24, 2023

Drill Type: CME55 TRUCK MOUNT

Datum: Geodetic (Hand-Held)

Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Field Vane Test (S)

Combustible Vapour Reading
Natural Moisture
Plastic and Liquid Limit
Undrained Triaxial at % Strain at Failure
Penetrometer



SUDBURY GEO SUD-23012932-A0 - LAURA SUBDIVISION, HANMER.GPJ NEW.GDT 1/10/24

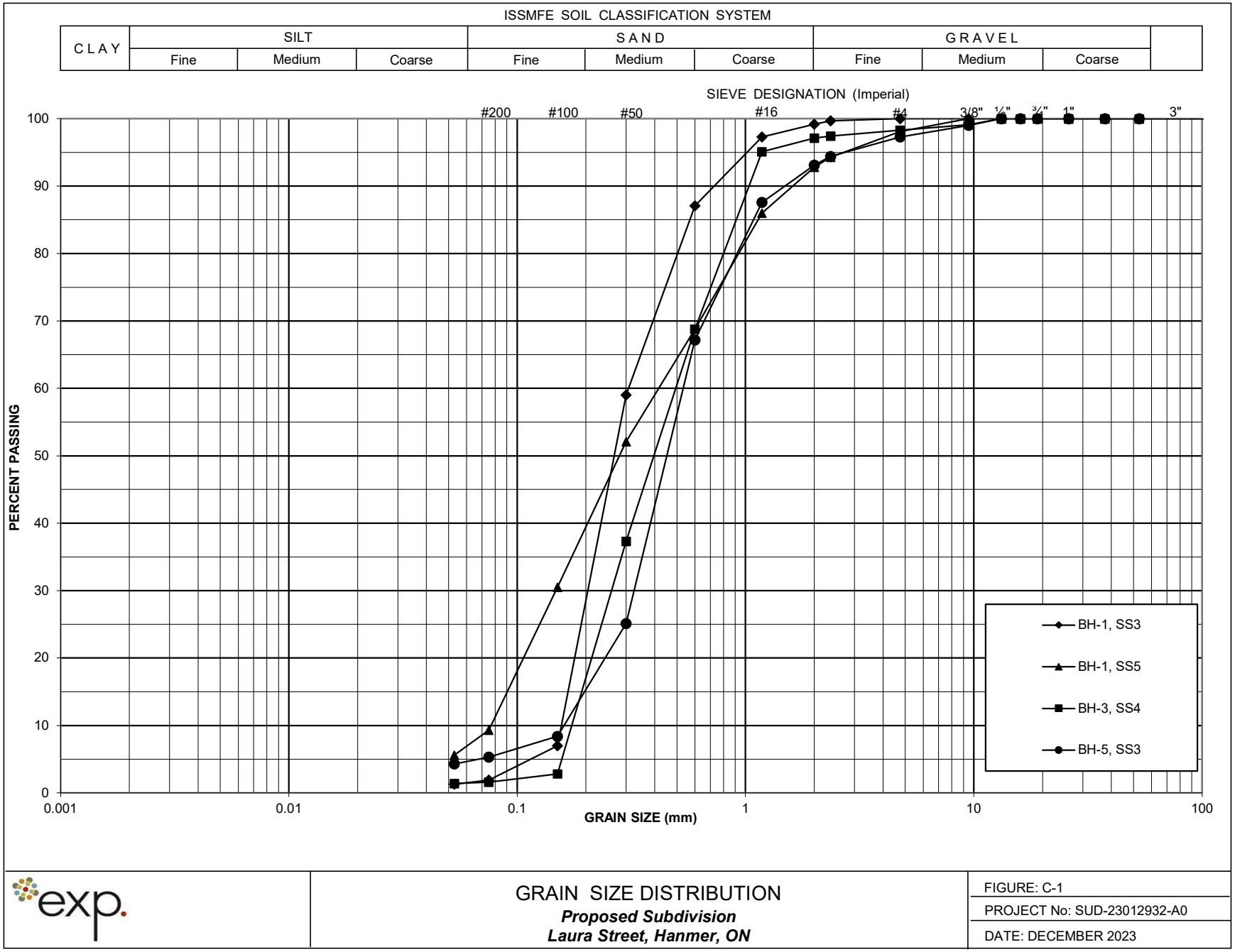
EXP Services Inc.
885 Regent Street
Sudbury, ON P3E 5M4
CANADA
t: +1.705.674.9681
f: +1.705.674.5583

Borehole data requires interpretation assistance from EXP before use by others.

See Figures B-1A and B-1B for Notes on Sample Description

Time	Water Level (m)	Depth to Cave (m)
Upon Completion	Dry	3.7

Appendix C – Laboratory Test Results



GRAIN SIZE DISTRIBUTION

Proposed Subdivision

Laura Street, Hanmer, ON

FIGURE: C-1

PROJECT No: SUD-23012932-A0

DATE: DECEMBER 2023

NEOM Homes' Proposed "Hanmer Dreamhomes" Subdivision Planning Brief

Plan of Subdivision for 125 Single-Family Homes in Greater Sudbury, Ontario
Submitted July 10th, 2024

1. Introduction

This planning brief is written in support of the proposed "Hanmer Dreamhomes" plan of subdivision for 125 single-family homes in the Hanmer community of Greater Sudbury, Ontario. The subdivision has been designed to align with the City of Greater Sudbury's current Official Plan, the Growth Plan for Northern Ontario and the Provincial Policy Statement (PPS), while espousing sustainable development practices that will also minimize impacts on existing infrastructure and community services.

2. Context and Site Description

The proposed subdivision is located in the Hanmer Neighbourhood within Greater Sudbury, Ontario. This is a neighbourhood primarily consisting of single-family detached residential homes that were developed throughout the mid-20th century. The overall site is approximately 10.8 hectares, with the Plan of Subdivision occupying approximately 8.45 hectares of that space. 5.25 hectares of the subdivision area is intended for residential development, 2.03 hectares will be dedicated for roads, an 0.65 hectare block will be dedicated for stormwater management as per the submitted servicing brief, and 0.5 hectares will be dedicated as Open Space Conservation parkland for linear trails. The majority of the lands are designated R1-5 "Low-Density Residential One", and the balance of the lands are zoned FD "Future Development". The proposal is to rezone the residential development lands to R1-7 "Low-Density Residential One", a 2.4 hectare portion of the lands will remain FD "Future Development", and a 1.17 hectare section of the lands will be rezoned to OSC "Open Space Conservation" which are expected to host the stormwater management facility and walking trails.

The proposed residential development area meets the typical setback requirements from the wetland and those specified by Conservation Sudbury, and a geotechnical report was completed to confirm the soils are suitable for residential development. A boundary and detailed topographical survey was completed to support Draft Plan creation and servicing/stormwater management design. A Stage 1 Archaeological Resource Assessment was completed to confirm that there were no areas of archaeological potential within the proposed subdivision area. A water/wastewater capacity evaluation has been completed which indicates that there is adequate water supply to service the proposed subdivision, and while there is no available wastewater supply at present, upgrades to the Spruce Street Lift Station are already underway which is anticipated to create more than adequate supply for the proposed subdivision. It is understood that the lift station upgrades will be complete in the coming months, and that subdivision registration will be contingent on adequate wastewater supply being available for the

development.

Official Plan: All of the area of the proposed residential development is currently designated as Living Area 1 in Greater Sudbury's Official Plan. The limits of the settlement area on the site follow the extent of the wetland and hazards associated with the Whitson River. The remainder of the properties within the wetland area are designated Parks & Open Space. A qualified Ontario Wetland Evaluator and a registered Ontario land surveyor were engaged to identify and delineate the extent of the wetlands on the site and confirm the limits of both the Living Area and the residential development.

Zoning: A large portion of the proposed subdivision is currently zoned R1-5 "Low-Density Residential One" and was previously host to an existing plan of subdivision known formerly as the "Gladu Park" subdivision, originally registered in 1981. The newly proposed Plan of Subdivision incorporates both the prior subdivision and a section of the lands immediately to the south of the prior subdivision that are currently zoned FD "Future Development". The proposed subdivision incorporates all of the developable Living Area 1 property and seeks to rezone both the R1-5 and the FD zoned areas of the proposed residential development to R1-7 "Low-Density Residential One". The primary reason for rezoning to R1-7 is to permit 11m lot frontages to accommodate approximately 36% more single-family detached houses, resulting in a more walkable and sustainable development pattern. As this yields more homes and more taxable assessment per metre of linear infrastructure, this approach is more sustainable from a municipal perspective. This approach will also allow houses to be more affordable with the reduced cost of linear infrastructure per house. The lot fabric features primarily 11m frontages because with widths of 11m this will allow homes to accommodate a 5.5m double-wide driveway (2.75m required width per parking space under section 5.2.3.1 of the City's zoning bylaw) while maintaining the 50% front yard maximum driveway width under Section 5.4.2 and minimum landscaped open space requirement of Section 4.15.2 of the City's zoning bylaw.

Zoning Bylaw Relief: A single minor relief request is being made for Lot 21, to permit a 3m corner sideyard setback where 4.5m is typically required.

Surrounding land uses: Surrounding land uses include single-family homes zoned R1-5 and designated Living Area 1 to the north and west of the site, FD Future Development-zoned land designated Living Area 1 to the east, and Rural-zoned land designated Parks & Open Space to the south.

Net Density and Units per Hectare: With approximately 5.25 hectares intended for 125 single-family detached homes, this yields a net density of approximately 23.8 units per hectare. The Official Plan permits Low Density development up to a maximum net density of 36 units per hectare, which would permit up to 189 residential units on 5.25 hectares. The proposed development is well within the Official Plan density limits.

Road Cross Section: While the City of Greater Sudbury's practice for decades has been to require all new subdivisions to provide an "Urbanized Road Cross Section" with curb and gutters and a storm sewer system, this development proposes a Rural Local Cross-Section, as per one of the nine typologies originally provided in the City's Complete Streets Design Guidelines consultation. Road cross sections with ditches and paved shoulders or separated walking paths are permitted in towns and cities from Inisfill to Nanaimo, and are common in Quebec. The development proposes to continue the practice in the area of using ditches as the primary vessel for stormwater conveyance and to provide either paved shoulders or a separated multiuse path for active transportation purposes.

Ditches reduce stormwater impacts on our lakes and waterways by providing excellent infiltration and filtration of stormwater, they reduce the land requirement for stormwater management facilities, reduce long-term municipal liabilities, and result in greener, more resilient, and more sustainable neighbourhoods. Paved shoulders require the least ongoing operational maintenance cost, and also result in the lowest long-term capital liability.

Less excavation, less concrete, and less land requirement allows for greener neighbourhoods and reduces the up-front cost of residential developments – increasing housing affordability and the viability of building new subdivisions. The more expensive infrastructure costs associated with an urban cross section would otherwise either be passed on to homebuyers or render some subdivision developments unfeasible.

3. Alignment with Provincial Policies

3.1 Growth Plan for Northern Ontario

The Growth Plan for Northern Ontario aims to support economic development, promote healthy communities, and protect the environment. The proposed subdivision contributes to these objectives by providing housing options that meet the needs of current and future residents while respecting natural heritage features and promoting efficient land use. The proposed subdivision aligns with the Growth Plan for Northern Ontario in various ways:

- **Population and Economic Growth**: The Growth Plan for Northern Ontario aims to support population growth, economic development, and improved quality of life. A single-family detached house subdivision in Sudbury contributes to accommodating population growth by providing housing options that meet the needs of residents.
- **Infrastructure Investment**: The Growth Plan "emphasizes infrastructure investment to support growth in Northern Ontario. Municipalities, including Greater Sudbury, are encouraged to plan for housing developments that are supported by infrastructure investments, ensuring that new subdivisions have access to necessary transportation networks and services". The upgrading of Spruce Street Lift Station to accommodate growth as per the proposed subdivision is an example of municipal investments and the proposed development aligning to meet the desired outcomes of the Growth Plan.
- **Sustainability and Conservation**: The Growth Plan promotes sustainable land use practices and conservation of natural resources and outlines that planning for a

subdivision should consider these principles, including promoting energy-efficient housing designs and protecting natural features and landscapes. The houses are intended to be energy-efficient “Smart Homes”, and by rezoning and reducing frontages the proposed subdivision will protect natural features and landscapes of the area by accommodating more residential units within this zoned, serviced land than would be possible under the City’s existing R1-5 zoning framework. A Rural Local road cross section featuring ditches and either paved shoulders or a separated multi use path for active transportation would further increase the sustainability of the development and conserve land.

- Section 3.4.3 of the Growth Plan reads “Municipalities are encouraged to support and promote healthy living by providing for communities with a diverse mix of land uses, a range and mix of employment and housing types, high-quality public open spaces, and easy access to local stores and services”. The proposed natural trails around and beside the proposed stormwater management facility provide an opportunity to create a high-quality public open space. The smaller frontages will provide smaller and more affordable homes than are found on the estate lots with 15-18m of frontage found in more traditional subdivision developments of Greater Sudbury, expanding the range of housing types available locally.
- The development aligns with the City’s community design falling within the Living Area 1 and built boundary, and so therefore aligns with Section 4.1 of the Growth Plan which reads “Well-planned and thoughtfully designed communities will attract investment and support economic development, attract and retain skilled workers, strengthen cultural identity and heritage, and maintain a clean and healthy environment”.
- This investment in the former Town of Valley East will allow both Greater Sudbury and Valley East to continue to grow as “Economic and service Hubs”, as defined in section 4.3 of the Plan. Specifically, the increased residential density of this subdivision will support increased commercial investment in the traditional town center hub of Hanmer. While not next to a “Strategic Core Area” as defined by the City’s Community Improvement Plan, the proposed subdivision is approximately 1km southeast of the Hanmer Development Charge exempt traditional town centre, as defined in Schedule E-5 of Bylaw 2019-100. This will contribute towards “providing easy access to stores, services and recreational opportunities” for area residents.

3.2 Provincial Policy Statement (PPS)

The Provincial Policy Statement provides policy direction on land use planning in Ontario. Key policies relevant to this subdivision include promoting efficient development patterns, protecting natural resources, and ensuring transportation systems are efficient and support economic prosperity. The proposed subdivision aligns with the latest PPS in various ways:

- **Land Use Planning**: The PPS emphasizes efficient land use and development that supports economic prosperity, environmental sustainability, and social well-being. By reducing frontages and providing more residential units per hectare than permitted in the existing R1-5 zone, the proposed single-family detached house subdivision will

contribute to efficient land use by accommodating residential growth in a manner that minimizes urban sprawl and promotes compact complete communities.

- **Infrastructure and Servicing**: The PPS encourages development that is supported by infrastructure and services (such as roads, water, sewer, and utilities). This area is fully serviced by all municipal utilities, with the only capacity constraint being wastewater, and new capacity coming online to support the development in the coming months.
- **Natural Heritage and Resources**: This subdivision has carefully considered protection of natural heritage features and areas, including significant woodlands, wetlands, and watercourses, as outlined in the PPS. Multiple environmental assessments have been completed and mitigation measures have been planned in both the subdivision design as well as for construction activities to minimize impacts on these features. A Rural Local road cross section featuring ditches and either paved shoulders or a separated multi use path for active transportation would mitigate stormwater impacts on the nearby wetland and waterway and reduce the stormwater management facility size with a parallel increase in the area available for open-space conservation.

4. Planning Rationale

4.1 Housing and Community Context

The proposed subdivision will consist of 125 single-family homes, which will contribute to meeting the housing needs identified in the Greater Sudbury Official Plan, the City's strategic plan, and the Community Energy and Emissions Plan (CEEP).

- The direction given in the current Official Plan (OP) is strong in its support of infill development and compact land-use planning. The design of the houses has been carefully considered to create a cohesive and attractive community that integrates seamlessly with existing neighbourhoods.
- Rezoning to R1-7 to permit lesser frontages aligns well with the CEEP Goal 1 of "Achieve energy efficiency and emissions reductions by creating compact, complete communities through infill developments, decreasing dwelling size through an increase in multi-family buildings, and increasing building type mix".
- The reduced frontages will also reduce the capital cost of linear infrastructure required for each house, which aligns with the City's Strategic Plan goal "5.1 Expand Affordable and Attainable Housing Options".
- New residential development supports the City's Strategic Plan goal 2.1 "Work with existing employers to grow businesses by attracting new employees and supporting existing businesses", as new employees will not consider a move to Greater Sudbury without suitable housing.
- A Rural Local road cross section featuring ditches and either paved shoulders or a separated multi use path will yield infrastructure that is more resilient to flooding and stormwater impacts, and aligns with the City's Strategic Plan goal 3.2 to develop a "corporate-wide Climate Change Adaptation Strategy that will guide preparations for and dealing with challenges resulting from severe weather-related events, ranging from drought, floods, ice storms and heavy winds".

- A Rural Local road cross section featuring ditches and either paved shoulders or a separated multi use path will yield infrastructure that has a lesser carbon footprint than traditional urban cross sections, aligning with the CEEP and the City's Strategic Plan goal 1.2 "Incorporate environmental performance considerations such as total carbon footprint calculations when making choices about asset renewal".

4.2 Transportation and Traffic Considerations

During the City of Greater Sudbury's SPART Pre-Consultation process, staff reviewed the proposed development and determined that a Traffic Impact Study would not be required, as the limited traffic impact of the proposed development is not anticipated to provide any major detrimental impacts to existing traffic infrastructure and capacities or provide issues for local multimodal transportation. Staff did however determine that traffic calming will be required as a condition of draft plan approval.

Traffic Calming: The developer has indicated their support of Staff's recommendation that traffic speed humps or other traffic calming measures in the area be considered a condition prior to this development moving forward. The development seeks to incorporate best practices in traffic engineering and planning to ensure minimal impact on existing infrastructure and traffic flows, while potentially contributing to reducing the average speed of vehicles on neighbouring local roads. The developer supports the goal of keeping local streets operating efficiently, while ensuring they are safe for active transportation and vehicles alike. The Hanmer Dreamhomes Plan of Subdivision will therefore include implementing traffic calming techniques such as speed humps or street trees within the subdivision to manage traffic speeds and enhance safety. The specific techniques utilized will be determined in consultation with staff, public consultation and the local Ward Councillor.

Transit: The nearest transit stops are available on Coté Boulevard, approximately 700m from the entrance to the subdivision. The subdivision layout will result in homes that are approximately 750m-1150m away from these transit stops, or about a 9-15 minute walk. Due to the distance and the level of transit service in the area, it is concluded that a minority of residents will utilize transit as their primary source of transportation.

4.3 Environmental Considerations

Wetland Evaluation and Delineation: The wetland was evaluated and delineated by an Ontario Wetland Evaluation System (OWES) trained evaluator. This is done to protect the residential development from wetland hazards such as poor soils and flooding, and to protect the wetland flora and fauna from residential development impacts.

Environmental Impact Study (EIS): A scoped environmental impact study has been conducted by Environmental Ecosystems to identify and mitigate potential environmental impacts associated with the subdivision development. The EIS addresses concerns related to natural heritage features, stormwater management, and tree preservation, ensuring compliance with environmental regulations and best practices.

Blanding's Turtle Habitat: As per the Ministry of Environment, Conservation and Parks' "General Habitat Description for Blanding's Turtle", much of the site is considered confirmed Blanding's Turtle habitat. The site wetlands are part of a wetland complex extending 2km from a turtle sighting in the area, and are therefore automatically considered Category 2 Blanding's Turtle habitat. The area 30m to 250m around the wetlands of the property are also considered Category 3 Blanding's Turtle habitat. By default, a portion of the stormwater management facility will be located in Category 2 habitat and a number of the houses will be located in Category 3 habitat. A scoped environmental impact study was undertaken in June 2024 by Environmental Ecosystems which included an investigation into potential turtle habitat on the site, potential mitigation efforts, and conclusions. An overall benefitting permit is being sought with the Ministry of Environment, Conservation and Parks to ensure that the Blanding's Turtle will not be negatively impacted by any proposed development.

5. Conclusion

The proposed plan of subdivision for 125 single-family homes in Greater Sudbury, Ontario, aligns with the Growth Plan for Northern Ontario and the Provincial Policy Statement by promoting efficient land use, supporting economic growth, and protecting natural resources. The subdivision is not anticipated to have any major detrimental impacts on existing intersections or traffic flows, with mitigation measures implemented as necessary to ensure efficient and safe transportation systems.

This planning justification report concludes that the proposed subdivision is consistent with municipal and provincial policies and priorities, and will contribute positively to the community by providing housing options and supporting sustainable development in Greater Sudbury, Ontario.

6. Recommendations

Based on the findings of this report, it is recommended that the plan of subdivision for 125 single-family homes be approved by the relevant municipal authorities, subject to any conditions or requirements identified through the review process.

Thank you for your consideration of this matter.

Geoff McCausland

Development & Project Manager
Mallette-Goring Inc., Brokerage

Tel: 705.699.1111
Fax: 705.885.3391

Environmental Ecosystems Inc

February 20, 2024

Enviro-Eco File No.: 45-23

Mallette-Goring Inc.
128 Pine Street, Suite 300,
Sudbury, ON P3C 1X3

RE: Wetland Boundary Identification
Part 1 of Lot 11, Concession 2, Geographic Township of Capreol

---

Environmental Ecosystems Inc. (Enviro-Eco) was retained by Malette-Goring Inc. to determine the extend of the wetland boundaries on a property known as 0 Laura Drive, in Hanmer, Township of Capreol, Ontario. The scope of work included a file review, determination of the extent of the wetland boundaries within the project area defined by the Client and provide a letter report.

The project area, Part 1 of Lot 11, Concession 2, is approximately 5.5 hectares in lot area and currently does not have frontage onto municipal roads. The property is located within the community settlement of Hanmer. The site is dominated by a tall shrub meadow and contains areas of mixed forest and a large wetland at the southern property border. Applying the Ontario Wetland Evaluation System (OWES), the field work was carried out on September 11th, 2023 by Ms. Levasseur, a qualified professional (OWES-Certified). The extent of all wetland boundaries were determined on-site and surveyed at the same time by Tulloch Engineering Inc. Mapping of the wetland boundaries follows this report in Attachment 1.

As per the Conservation Sudbury's Wetland Guidelines, the creation of new lots, where development of those lots would require interference with a wetland, is not supported. In order for Conservation Sudbury to approve the proposed severance, wetlands must be mapped out to ensure access to building envelopes of any lot does not interfere with the wetlands. Additional requirements for the mapping are as follows:

- Demonstrate a 12 metre and a 30 metre buffer around all wetlands;
- Demonstrate the flood contour elevation and a corresponding 15 metre buffer;

- Demonstrate all waterways with a 15 metre buffer; and,

- Outline steep slopes that are associated with a stream, valley or lake with a slope steeper than 3H:1V and the projected stable slope, which is drawn at the projected 3H:1V slope.

The Site was assessed for cover, wetland vegetation, saturation and substrate. Wetland boundaries are defined where greater than 50% of the plant species can be found in both uplands and wetlands – thus characterised as wetland plant species.

The wetland boundary identification and survey determined there is one large wetland located within the property boundaries and contains various wetland types including a conifer swamp, grassy marsh and a permanent river. Soil samples were taken to confirm the presence of wetland soils and determine substrate types and moisture regimes. The wetland contains mineral soils overlain by thin layers of organic material and moisture ranged from damp to over-saturated. All soil samples collected inside the wetland boundaries contained small amounts of mottling. Soil samples were taken in the wetland and upland areas to corroborate the wetland boundary delineation and borehole logs are provided in Attachment 2. The wetland held characteristic wetland vegetation structures and species that distinguished it from the upland mixed forest and shrublands. A comprehensive list of wetland vegetation species follows this report as Attachment 3.

Conservation Sudbury regulates the development within and adjacent to hazards and features under Ontario Regulation 156/06: Regulation of Development, Interference with Wetlands and Alterations to Shorelines and Watercourses, made pursuant to Section 28 of the Conservation Authorities Act (R.S.O. 1990, c C.27, S.25) defines development as:

(a) the construction, reconstruction, erection or placing of a building or structure of any kind,

(b) any change to a building or structure that would have the effect of altering the use or potential use of the building or structure, increasing the size of the building or structure or increasing the number of dwelling units in the building or structure,

(c) site grading, or

(d) the temporary or permanent placing, dumping or removal or any material, originating on the site or elsewhere.

Generally, development should be directed to locations that are greater than 30 metres from a wetland. In some cases, development may be permitted within 30 metres of a wetland if the proponent can demonstrate that there is no alternative, and that the development will not impact the hydrology of the wetland. A Section 28 Application would need to be completed and submitted to Conservation Sudbury. Development within 12 metres of the wetland is generally not permitted. It is recommended to request review with Conservation Sudbury prior to finalizing development plans.

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

Sincerely,

For **Environmental Ecosystems Inc**.

Renée Levasseur, *B.Sc*., *PGCert*
Ecologist/OWES Evaluator
rlevasseur@enviro-eco.ca

Manon Giroux, *C.E.T., EP, President*
Sr. Env. Scientist/OWES Evaluator
mgiroux@enviro-eco.ca

ATTACHMENT 1

Wetland Boundary Map

SKETCH OF TOPOGRAPHIC INFORMATION
LANDS KNOWN AS 0 LAURA STREET
CITY OF GREATER SUDBURY
TULLOCH GEOMATICS INC.
2023

SCALE 1:300

0 5 10 15 20 METRES

SHEET 1 OF 2

THE INTENDED PLOT SIZE OF THIS PLAN IS 914mm IN WIDTH BY 1422mm IN HEIGHT WHEN PLOTTED AT A SCALE OF 1:300.

DATE:
TOPOGRAPHIC INFORMATION COLLECTED DURING THE PERIOD OF SEPTEMBER 11th, 2023 TO OCTOBER 24th, 2023.

METRIC:
DISTANCES AND ELEVATIONS SHOWN ON THIS PLAN ARE IN METRES AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048.

ELEVATION NOTE:
ELEVATIONS SHOWN HEREON ARE GEODETIC, ARE REFERRED TO THE CANADIAN GEODETIC VERTICAL DATUM OF 1928 (CGVD28) AND ARE DERIVED FROM THE CITY OF GREATER SUDBURY VERTICAL CONTROL MONUMENT No. 001643124 USING REAL TIME NETWORK (RTN) HAVING AN ELEVATION OF 290.576m.

SITE BENCHMARK NOTE:
SITE BENCHMARK 'A' (BM) IS TOP OF STAINLESS STEEL BOLT AND WASHER (SSBW), CITY OF GREATER SUDBURY VERTICAL CONTROL MONUMENT No. 027960152C, HAVING AN ELEVATION OF 293.998m.

SITE BENCHMARK 'B' IS TOP OF SET ROUND IRON BAR HAVING AN ELEVATION OF 292.49m.

CAUTION:
ANY UNDERGROUND SERVICES AND THEIR POSITIONS ARE NOT CONFIRMED BY THIS PLAN.

LEGEND:

AE	DENOTES ASPHALT EDGE
AN	DENOTES ANCHOR
APPROX	DENOTES APPROXIMATE
BH	DENOTES BOREHOLE
BM	DENOTES BENCHMARK
CL	DENOTES CENTERLINE
CLF	DENOTES CHAIN LINK FENCE
GF	DENOTES GARAGE FLOOR
NTS	DENOTES NOT TO SCALE
PIN	DENOTES PROPERTY IDENTIFICATION NUMBER
RW	DENOTES RETAINING WALL
SSBW	DENOTES STAINLESS STEEL BOLT AND WASHER
S/T	DENOTES SUBJECT TO
TS	DENOTES TOE OF SLOPE
UP	DENOTES UTILITY POLE
-----	DENOTES EDGE OF GRAVEL
——x——	DENOTES FENCE LINE
——OW——	DENOTES OVERHEAD WIRE
~~	DENOTES HEDGE OUTLINE

CARMEN STREET
REGISTERED PLAN M-490

CARMEN STREET
REGISTERED PLAN M-520
PIN 73508-0040

BLOCK "A" (0.305 RESERVE) (NTS)
REGISTERED PLAN M-520

ROGER STREET
REGISTERED PLAN M-490

ROGER STREET
REGISTERED PLAN 53M-1146

LAURA STREET
REGISTERED PLAN 53M-1146

GLADU CRESCENT
REGISTERED PLAN 53M-1146

JAMES STREET
PIN 73508-1133

BLOCK "B" (0.305 RESERVE) (NTS)
REGISTERED PLAN M-490
PIN 73508-1178
SUBJECT TO EASEMENT AS IN LT117325

BLOCK 67 (0.305 RESERVE) (NTS)
REGISTERED PLAN 53M-1146
PIN 73508-1141
SUBJECT TO EASEMENT AS IN LT117304

BLOCK 68 (0.305 RESERVE) (NTS)
REGISTERED PLAN 53M-1146
PIN 73508-1140
SUBJECT TO EASEMENT AS IN LT117304

BLOCK 69
REGISTERED PLAN 53M-1146
PIN 73508-1139
SUBJECT TO EASEMENT AS IN LT117304

BLOCK 70
REGISTERED PLAN 53M-1146
PIN 73508-1138
SUBJECT TO EASEMENT AS IN LT117304

BLOCK 71
REGISTERED PLAN 53M-1146
PIN 73508-1137
SUBJECT TO EASEMENT AS IN LT117304

SITE BM 'A': SSBW 027960152C
ELEVATION=293.998

SITE BM 'B': ELEVATION=292.49

PART 12, PLAN 53R-6491
SUBJECT TO EASEMENT AS IN LT421457

PART 10
PLAN 53R-
6491
SUBJECT TO EASEMENT AS IN LT117304

PART 11
PLAN 53R-
6491

PART 1 PART 2 PART 3 PART 4 PART 5 PART 6 PART 7 PART 8 PART 9
PLAN 53R-6491

PART 17 S/T LT421458
PART 18 S/T LT421458
PART 19 S/T LT421458
PART 20 S/T LT421458
PART 21 S/T LT421458
PART 22 S/T LT421458
PART 23 S/T LT421458
PART 24 S/T LT421458

PART 14 S/T LT421458
PART 15 S/T LT421458
PART 16 S/T LT421458

LOT 1 LOT 2 LOT 3 LOT 4 LOT 5 LOT 6 LOT 7 LOT 8 LOT 9 LOT 10 LOT 11 LOT 12 LOT 13 LOT 14

LOT 95 LOT 96 LOT 97 LOT 98 LOT 99 LOT 100 LOT 101 LOT 102 LOT 103 LOT 104 LOT 105

LOT 41 PIN 73508-1144
LOT 42 LOT 43 LOT 44 LOT 45 LOT 46 LOT 47 PIN 73508-1143
LOT 48 PIN 73508-1142
LOT 49 LOT 50 LOT 51 LOT 52 LOT 53 LOT 54
LOT 55 LOT 56 LOT 57 LOT 58 LOT 59 LOT 60 LOT 61 LOT 62 LOT 63 LOT 64 LOT 65 LOT 66
LOT 34 LOT 35 LOT 36 LOT 37 LOT 38 LOT 39 LOT 40 PIN 73508-1145
LOT 15 LOT 16 LOT 17 LOT 18 LOT 19 LOT 20 LOT 21 LOT 22 LOT 23 LOT 24
LOT 25 LOT 26 LOT 27 LOT 28 LOT 29 LOT 30 LOT 31 LOT 32 LOT 33

PIN 73508-1135 SUBJECT TO EASEMENT AS IN LT117304
PIN 73508-1136 SUBJECT TO EASEMENT AS IN LT117304
PIN 73508-1134
PIN 73508-1099

LOT 11 CONCESSION 2 GEOGRAPHIC TOWNSHIP OF CAPREOL

MATCHLINE: SEE SHEET 2

TULLOCH

TULLOCH GEOMATICS INC.
1942 REGENT ST.
UNIT L
SUDBURY, ON
P3E 5V5
T. 705 671.2295
F. 705 671.9477
TF. 800 810.1937
sudbury@tulloch.ca

DRAWN BY: EM | FILE: 232937 – SHEET 1

ACAD FILE: P:\2023\232937 0 Laura Development\Geomatics\06 Production\TOPO\232937 Topo Sketch.dwg

SKETCH OF TOPOGRAPHIC INFORMATION
LANDS KNOWN AS 0 LAURA STREET
CITY OF GREATER SUDBURY
TULLOCH GEOMATICS INC.
2023

SCALE 1:300

0 5 10 15 20 METRES

SHEET 2 OF 2

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WETLAND NOTE:
LIMIT OF WETLANDS WERE MAPPED BY MANON GIROUX, CERTIFIED NORTHERN ONTARIO WETLAND EVALUATOR, ENVIRONMENTAL ECOSYSTEMS INC. ON SEPTEMBER 11, 2023.

EROSION HAZARD NOTE:
THE EROSION HAZARD LIMIT OF THE UNCONFINED RIVER SYSTEM WAS DETERMINED BY MALLETTE-GORING INC. AS THE FLOOD HAZARD LIMIT PLUS A 6M EROSION ACCESS ALLOWANCE, AS PER SECTION 3.3 OF THE ONTARIO MINISTRY OF NATURAL RESOURCES TECHNICAL GUIDE "RIVER AND STREAM SYSTEMS EROSION HAZARD LIMIT".

LEGEND:

AE	DENOTES ASPHALT EDGE
AN	DENOTES ANCHOR
APPROX	DENOTES APPROXIMATE
BH	DENOTES BOREHOLE
BM	DENOTES BENCHMARK
CL	DENOTES CENTERLINE
CLF	DENOTES CHAIN LINK FENCE
GF	DENOTES GARAGE FLOOR
NTS	DENOTES NOT TO SCALE
PIN	DENOTES PROPERTY IDENTIFICATION NUMBER
RW	DENOTES RETAINING WALL
SSBW	DENOTES STAINLESS STEEL BOLT AND WASHER
S/T	DENOTES SUBJECT TO
TS	DENOTES TOE OF SLOPE
UP	DENOTES UTILITY POLE
- - - - - - - -	DENOTES EDGE OF GRAVEL
——x——	DENOTES FENCE LINE
——OH——	DENOTES OVERHEAD WIRE
~~	DENOTES HEDGE OUTLINE

MATCHLINE: SEE SHEET 1

LOT 105 PIN 73508-0567 REGISTERED PLAN M-490

LOT 106 PIN 73508-0490

LOT 107 PIN 73508-0546

LOT 108 PIN 73508-0493

LOT 109 PIN 73508-0488

LOT 110 PIN 73508-0556

LOT 111 PIN 73508-0723 REGISTERED PLAN 8456

PART 7 PIN 73508-0395

PART 6 PIN 73508-0396

LOT 12 CONCESSION 2 GEOGRAPHIC TOWNSHIP OF CAPREOL

PIN 73508-0253
SUBJECT TO EASEMENT AS IN LT117304

LOT 11
CONCESSION 2
GEOGRAPHIC TOWNSHIP OF CAPREOL

PART 1
PLAN 53R-8456

PIN 73508-1099

LINE BETWEEN THE EAST HALF AND WEST HALF OF THE WEST HALF OF LOT 11, CONCESSION 12

SOUTH LIMIT OF PART 1, PLAN 53R-8456

PIN 73508-1049

PIN 73508-1069

CLF 0.27± W
WOOD FENCE 0.19± W
WOOD FENCE 0.12± E
CLF ON-LINE±
CLF 0.19± E
CLF ON-LINE±
CLF 0.05± W
CLF 0.13± E
CLF 0.10± E
CLF 0.08± E
UP (0.22± W)
CLF 0.19± E
CHICKEN WIRE ENCLOSURE
1.56±
331.79±
180.43±
0.71±
1.03±
TRAIL
15m FLOOD HAZARD SETBACK
FLOOD HAZARD LIMIT=288.89m
EROSION HAZARD LIMIT
30m WETLAND BOUNDARY SETBACK
15m WETLAND BOUNDARY SETBACK
WETLAND BOUNDARY DELINEATED BY ENVIRONMENTAL ECOSYSTEMS INC.
BH 3
CLF 1.13± E
CLF 0.20± E
CLF 1.22± E
CLF 0.69± E
UP (0.49± E)
WIRE FENCE 0.15± E
WIRE FENCE 1.00± E
UP (1.19± E)
WIRE FENCE 0.77± E

TULLOCH

TULLOCH GEOMATICS INC.
1942 REGENT ST.
UNIT L
SUDBURY, ON
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sudbury@tulloch.ca

DRAWN BY: EM | FILE: 232937 – SHEET 2

ACAD FILE: P:\2023\232937 0 Laura Development\Geomatics\06 Production\TOPO\232937 Topo Sketch.dwg

ATTACHMENT 2

Borehole Log

Sample ID	Coordinates (UTM) & Location	Depth (inches)		Soil Description				Comments
		From	To	Colour	Odour	Soil Type	Moisture	
BH1	5165252.248, 505264.979	0"	6"	Brown	Fresh	Fibric	Saturated	Mottling
		6”	9”	Brown	Fresh	Mesic	Saturated	
	Inside of wetland	9”	9”+	Brown	None	Loamy Sand	Saturated	
BH2	5165265.032, 505266.587	0”	1”	Brown	Fresh	Fibric	Damp	No mottling visible
		1”	2”	Light Brown	None	Loam	Damp	
	Outside of wetland	2”	2”+	Orange	None	Sandy Loam	Wet	
BH3	5165219.766, 505089.985	0”	1”	Brown	Fresh	Fibric	Wet	Mottling
		1”	6”	Light Brown	None	Sandy Loam	Saturated	
	Inside of wetland	6”	6”+	Beige	None	Loamy Sand	Saturated	
BH4	5165050.473, 5165050.473	0”	2”	Brown	Fresh	Fibric	Wet	Mottling
		2”	5”	Light Brown	None	Loam	Wet	
	Inside of wetland	5”	5”+	Light Brown	None	Sandy Loam	Over-saturated	

ATTACHMENT 3

Wetland Vegetation Species List

Common Name	Scientific Name
Balsam Fir	*Abies balsamea*
Balsam Willow	*Salix pyrifolia*
Black Spruce	*Picea mariana*
Bog Rosemary	*Andromeda polifolia* spp. g*laucophylla*
Broadleaf Cattail	*Typha latifolia*
Common Reed	*Phragmites australis*
Eastern White Cedar	*Thuja occidentalis*
Fowl Meadow Grass	*Poa palustris*
Ground Raspberry	*Rubus pubescens*
Interrupted Fern	*Osmunda claytoniana*
Labrador Tea	*Rhododendron groenlandicum*
Lance-leaved Aster	*Aster lanceolatus*
Large-leaved Lupine	*Lupinus polyphyllus*
Lesser Panicled Sedge	*Carex diandra*
Low-bush Blueberries	*Vaccinium angustifolium*
Meadow Horsetail	*Equisetum pratense*
Peat Mosses	*Sphagnum* spp.
Purple-stemmed Aster	*Aster puniceus*
Rattlesnake Manna Grass	*Glyceria canadensis*
Red Pine	*Pinus resinosa*
Red-osier Dogwood	*Cornus stolonifera*
Rough-stemmed Goldenrod	*Solidago rugosa*
Sensitive Fern	*Oncolea sensibilis*
Sheep Laurel	*Kalmia angustifolia*
Small Cranberry	*Vaccinium oxycoccos*
Soft-leaved Sedge	*Carex disperma*
Speckled Alder	*Alnus incana*
Starflower	*Trientalis borealis*
Sweet Gale	*Myrica gale*
Tamarack	*Larix laricina*
Three-fruited Sedge	*Carex trisperma*

Common Name	Scientific Name
Tussock Cottongrass	*Eriophorum vaginatum*
Twinflower	*Linnaea borealis*
Wild Raisin	*Viburnum nudum*
Woolgrass	*Scirpus cyperinus*