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Huronia Regional Centre Memorial Cemetery Ground Penetrating Radar Survey and Assessment

Background

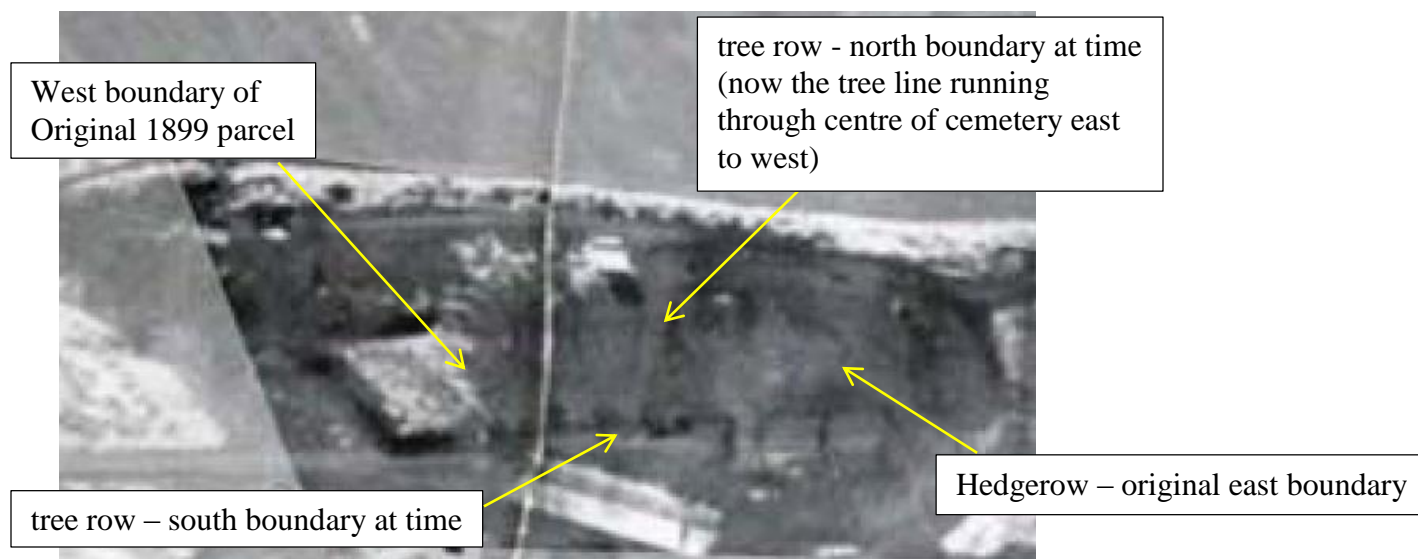
Timmins Martelle Heritage Consultants Inc. (TMHC) was hired by Infrastructure Ontario (IO) to conduct a non-intrusive ground penetrating radar (GPR) survey of the Huronia Regional Centre Memorial Cemetery in Orillia, Ontario. Ground penetrating radar (GPR) is a globally-used and well-accepted technique for investigating cemeteries, employed regularly in Canada, Europe, and the United States. GPR is particularly suitable for cemetery investigations because it is a respectful, non-intrusive survey conducted from the surface of the ground and results in no damage to underlying burials. With good conditions, GPR can provide an accurate understanding of below-ground activities or changes in the soil.

Timmins Martelle Heritage Consultants Inc. (TMHC) is a leader in archaeological cemetery investigations in Ontario and consequently, a forerunner in the use of GPR technology on cemetery and archaeological sites. TMHC has been hired by municipalities, First Nations and private landowners to conduct GPR surveys to assist in the definition of burial areas within and outside of marked cemeteries and to resolve legal issues with modern interments (see Appendix A for a list of TMHC corporate experience in cemetery projects). In Ontario, a range of companies supply GPR services. While many of these companies perform their work primarily in construction and mining-related settings and have limited background in dealing with historic cemeteries, archaeologists are well-suited to conduct cemetery investigations given their training in the identification of human remains and grave shafts, their understanding of historic burial practices and 19th century documentation thereof and their ability to interpret site formation processes. In general, archaeologists are often hired by municipalities, cemetery operators and landowners to assist in the identification of grave shafts, establish cemetery boundaries or assist official cemetery closings.

Summary of Historic Research: events relating to the southwest expansion of the cemetery

The cemetery at the Huronia Regional Centre was opened in or around 1899¹ and underwent two episodes of expansion. The first in 1934-35 to the west of the original cemetery parcel and the second in 1953 to the north of the original cemetery parcel, before its closure to new interments in 1971.

¹ There are two references to burials from 1893, however these references occur in sequence with much later burials, are challenging from a record keeping perspective and cannot be confirmed based on records available.



1935 Aerial Photograph (north at top)

The 1899 cemetery had a main entry gate along the southern fence line that led to a main north-south corridor through the centre of the cemetery. At the western boundary of the 1899 cemetery parcel was a laneway accessed through a large gate which likely provided an access route around the original 1899 cemetery to the farm and maintenance buildings that existed on both the north and south sides of the cemetery.

Burials were initially interred on either side of the main central gate and corridor, gradually continuing outward east and west, and in general, burials were originally separated by gender. Between 1915 and 1919 an area within the west portion of the original cemetery parcel was reserved for individuals from Whitby. Burials continued to be separated by gender until 1931, when the east portion of the cemetery reached the hedgerow boundary. By 1934, the west portion of the original 1899 cemetery area was also running out of space to accommodate new burials, having reached the access laneway boundary. As there was limited area available to the east of the original cemetery parcel, an area to the west was chosen to accommodate the first cemetery expansion in 1935.

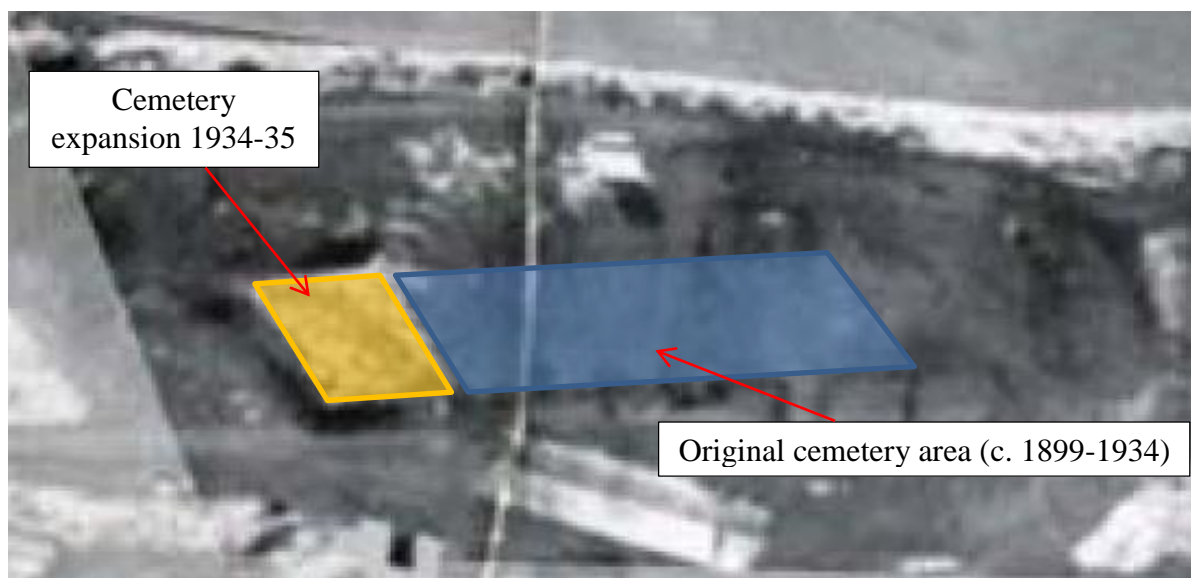
Historic records show several things happen between 1934 and 1935, supporting that there was both an expansion of the cemetery and work to improve record keeping.

- First, by 1934 the 1899 cemetery parcel had no room for new interments, with regularly spaced rows of burials covering the complete 1899 parcel to its easternmost and westernmost limits.
- Second, as stated in a 1936 letter to Dr. Horne, Superintendent of the Ontario Hospital School, in 1935 a “new plan” was made of the Cemetery plots and “all stone markers (head stones) were lifted, the ground was then graded, top dressed and seeded.”
- Third, a number of improvements were made to the farm buildings during this time and in 1934 a new watermain was installed for the institution.

- Fourth, a major tree clearing or ground preparation event occurred (shown in the 1935 aerial photograph), to make room for the first cemetery expansion to the west of the original 1899 cemetery parcel. The gate and laneway at the western edge of the original 1899 cemetery parcel were abandoned, and the laneway was eventually grassed over and no longer visible from the surface. Burials occurred west of the former laneway starting in 1934.

The earliest cemetery plan that is currently available dates to 1935². The letter correspondence confirms that this plan was created in a single moment in time (through comparison with former records) and was not a dynamic record that was added to continuously over time. This fact is also supported by a consistency in hand-writing through the early document.

It may not be coincidental that a number of key events occurred in or around 1935, including when the original 1899 cemetery parcel was ‘graded, top dressed and seeded’ as noted in the letter to Dr. Horne, the cemetery was expanded in 1934–35, and the earliest known cemetery plan was recorded. After this time, all burial rows in the 1934–35 western expansion, whose limits are west of the former laneway (beginning with Row 25 in 1934) received the “new type” flat stones marked with death registration numbers.



1935 Aerial Photograph (north at top)

The 1935 cemetery plan was updated in 1941 to include additional burials in Row 25, all of Row 26 and Row 27, and to show the anticipated addition of Row 28. Although Rows 26 and 27 are shown on the 1935 plan with no additional space and recording of the former laneway and gate, the GPR results indicate that in actuality there is more distance between Rows 25 and 26. The burials of Row 26 were interred on the western edge of the former laneway, rather than directly within. Both surface observations and GPR results confirm the spacing of burial rows shown on

² Cemetery Plots map (RG 29-24-3-94)

the original 1935 sketch plan does not always accurately reflect the spacing of all rows within the actual cemetery, and the plan is known to not be to scale in other areas.

After 1941, burials continued to be made in the 1934-35 western expansion parcel until 1952, although none were recorded on a plan. In 1953 a new section of cemetery was opened, north of the original 1899 cemetery. About 1962, a plot plan was also created for this new section of the cemetery, based on death registration records. This plot plan was updated in 1965 and 1971. In 1971, the cemetery was closed to new interments.

Summary of GPR Results: buried utility in the southern part of the cemetery

The GPR survey was able to clearly identify burial rows and the outline of individual burials (grave shafts) at approximately 1-2 metres below the surface, which is typical for cemetery burials. In some cases, especially in the south half of the cemetery, the size of individual interments can be measured. In other areas, individual burials are more tightly spaced and it is difficult to isolate GPR signatures of the burials.

The GPR survey was also able to detect the former western laneway, identifying it near the ground surface and to a depth of no more than one metre. The location of the former western laneway aligns with the observed utility pipe identified during the utility locates survey (see Appendix B). The precise location and depth of the utility pipe within this area could not be isolated using GPR, but comparison of the utility locates survey and GPR results confirms the utility pipe is located within the signature related to the previous laneway (see Appendix C).

This data shows the utility is located under the former western laneway. This utility may have connected to the blacksmith shop and other buildings further south of the cemetery, which were an active part of the facility farm at the time (and are visible on the 1935 aerial photograph)

The laneway and utility formed the west boundary of the original 1899 cemetery parcel. Prior to 1935, the area west of the laneway and utility was not part of the cemetery footprint. Burials west of the laneway and utility only received interments following the 1934-35 western expansion of the cemetery.

An extensive document and record search was not able to confirm when this utility pipe was installed. One 1951 document outlines an agreement with Orillia for connection to the municipal utility system but this document notes that servicing within the Huronia Regional Centre was already in existence. Surface utility access points, such as manhole covers, were likely updated at this time. There are also records of farm improvements, drainage and watermain installations within the facility around 1934-35 and it is highly possible that the utility pipe also dates to this time of other servicing improvements. Installation of underground utilities within the first part of the 1900s is common within Ontario.

Based on the development events within the Huronia Regional Centre, the cemetery's expansion episodes, and the GPR results, it was determined that the north-south utility pipe installation predated the 1934-35 western expansion. Even though the specific date of the installation is unknown,

it is evident from the GPR results that the existing burials to the east within the original 1899 cemetery were not impacted, and burials to the west post-date the laneway and installation of the utility line. The GPR data indicates continuous and uninterrupted GPR signatures of individual burials. These signatures are detected from the ground surface to roughly two meters deep on either side of the laneway/utility (a depth greater than the signature related to the laneway and utility).

The GPR data also shows complete individual burial shaft signatures extending into the laneway and utility disturbance signatures (i.e. shows continuous, uninterrupted burials). These results show that the burial shafts were dug into the edges of the already existing utility and laneway disturbances, supporting that the utility pre-dates the burials to the west.

The burial rows west of the former laneway, within the 1934-35 western expansion, have minimal space between rows, and east of the laneway the average space between burial rows is between 0.5 and 1 metre.³ However, there is a significantly larger amount of space (approximately 2.5-3 metres) between burial rows 24 and 25, again indicating that burials were intentionally placed on either side of the laneway and utility. Based on this data, the approximate average distance from the utility pipe to the nearest burial rows is 1.5 metres.

Conclusions and Recommendations

Based on the GPR data, which are supported by research and knowledge of the cemetery history and features, it is concluded that:

- The utility was installed under the former laneway and prior to the 1935 western expansion of the cemetery,
- The existing burials to the east within the original 1899 cemetery area were not impacted by the laneway and utility,
- Burial rows to the west were intentionally placed at a greater distance and post-date the laneway and utility installation, and
- Burials were not impacted by existing utilities

The north-south utility line follows the former western boundary laneway. This laneway was located along the western boundary of the original 1899 cemetery parcel, and was closed in 1934-35 when the cemetery required expansion. The comparatively wide spacing of the burial rows immediately east and west of the laneway/utility line makes it apparent that the laneway and utility were intentionally avoided when interring new burials after 1934. This is supported by the GPR detection of continuous, uninterrupted post-1934 grave shaft signatures that overlap into, and are detected at a depth well beyond, the pre-existing laneway/utility-related soil disturbance signatures.

“Ground truthing” or excavation of the buried utility is not recommended due to the potential for heavy disturbance of burials on either side of the laneway/utility line. Previous excavation activities outside the cemetery boundaries revealed the consistent presence of large boulders in the

³ Tightly spaced burials are not unusual for cemeteries dating to a similar time period. TMHC has worked on municipal cemeteries that show similar burial patterns, including the City of Hamilton Cemetery and the City of Timmins Cemetery.

underlying soil throughout the investigation areas along the exterior of the 2014 fence line. The excavation of this type of soil would be very destructive, as the removal of large rocks from the overlying layers would create larger disturbances than normal, potentially disturbing human remains. Further, large rocks could be easily and unintentionally “dragged”, again causing considerably more damage than might be made in areas with less rocky soil.

The GPR results for the cemetery are high quality and provide a clear picture of uninterrupted grave shafts on either side of the former laneway containing the utility line. It is our opinion that the high risk of disturbing burials posed by excavation far outweighs any additional information that such an activity could provide.

Infrastructure Ontario has confirmed that the utilities are no longer in use, and have intentionally been abandoned in place to avoid disturbing burials.

Appendix A:

List of GPR and Cemetery Projects completed by Timmins Martelle Heritage Consultants

GPR Projects

St. John's Dixie Union Cemetery, Mississauga, ON
 Chapelle Notre-Dame-de Bon-Secours (BjFj-96), Old Montreal, QC
 First Baptist Church Early Black Settlement Cemetery, Puce, ON
 Cemetery Boundary Investigation, Huronia Regional Centre Cemetery, Orillia ON
 Trinity Cemetery, Malahide Township, ON
 Saugeen Pioneer Cemetery, Southampton, ON
 City of Hamilton Cemetery, Hamilton, ON
 Brick Street Cemetery, London, ON
 Saugeen Village Cemetery, Southampton, ON
 Tecumseh Park, Chatham, ON
 Edgar Livery, Paris, ON
 Fanshawe Park Road Development, London, ON
 St. Joseph's Roman Catholic Cemetery, Fergus, ON
 Haldimand County Jail, Cayuga, ON
 London Psychiatric Hospital, London, ON
 Birkett Lane Burial (for Haudenosaunee Development Institute)
 St. John's Dixie Union Cemetery, Premier Thomas Laird Kennedy Gravesite
 City of Timmins Cemetery, Timmins, ON
 Clipperton Cemetery, Thorndale, ON
 St. Joseph's Roman Catholic Cemetery, Acton, ON
 Norfolk County Poorhouse Cemetery, Simcoe, ON
 Puce Cemetery, Puce, ON
 Malahide Township Cemetery, Glencolin Line, Aylmer, ON

Cemetery Projects

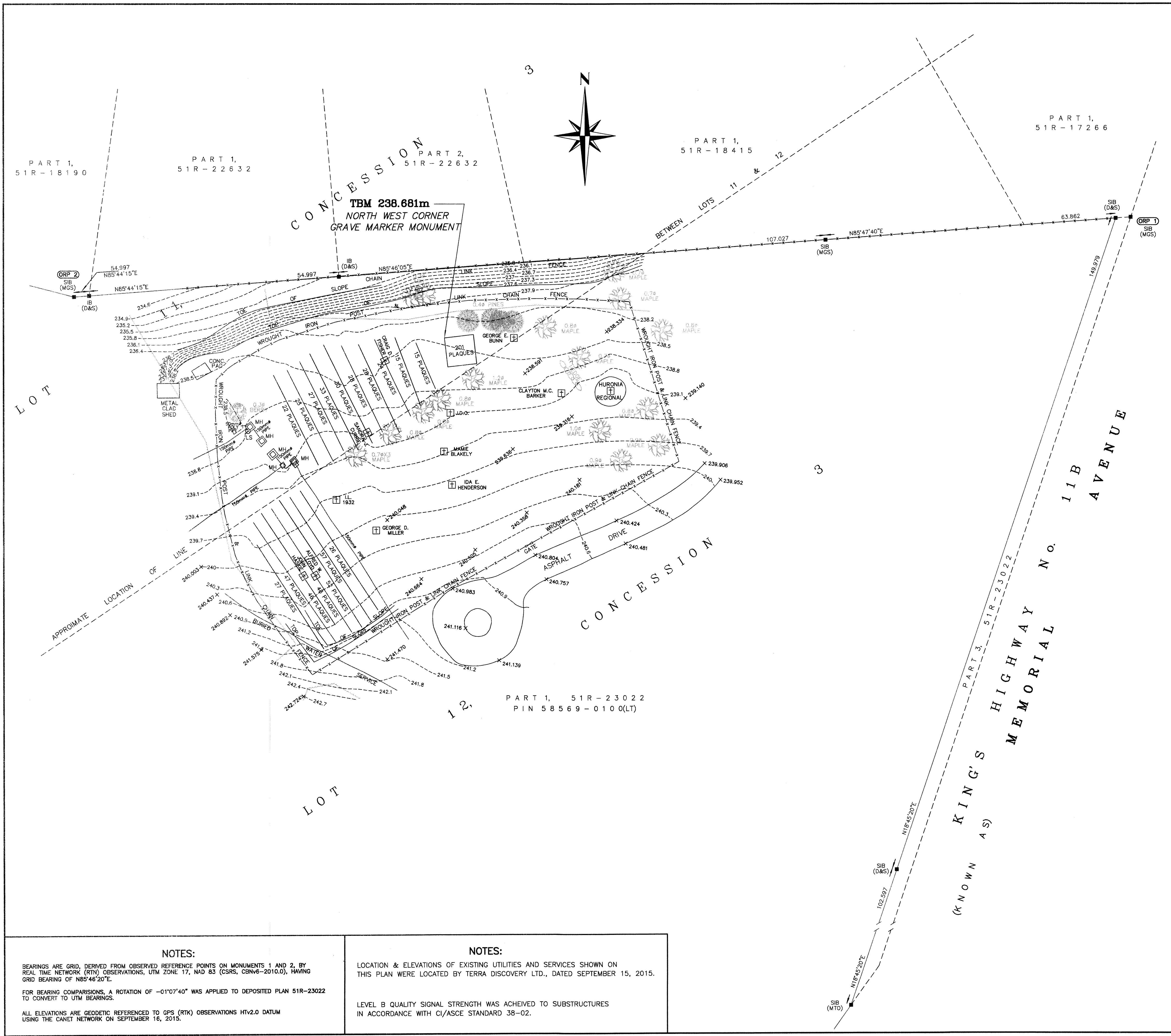
Dresden Municipality Cemetery, Dresden, ON (900+ graves relocated)
 Sharp and Phillips Cemeteries, Ancaster, ON
 Day Family Cemetery, Thamesford, ON

Bluevale Cemetery, Bluevale, ON
 Smith's Knoll, Hamilton, ON
 Birkett St. Brantford Burial, Brantford, ON
 Oxbow Road Burials, Brantford, ON
 Dorchester Village Burials, Dorchester, ON
 St. Jean Baptiste Cemetery, Amherstburg, ON
 St. Peter's Lutheran Cemetery, Rhineland Road, Norfolk County, ON
 Tillsonburg Pioneer Cemetery, Tillsonburg, ON
 Elgin County Jail burials, St. Thomas, ON
 Perth County Jail burials, Stratford, ON
 Essex County Jail burials, Windsor, ON
 Munn's Cemetery, Oakville, ON
 Norfolk County Poorhouse Cemetery, Simcoe, ON
 Clipperton Cemetery, Thorndale, ON
 Saugeen Village Cemetery, Southampton, ON
 St. Joseph's Roman Catholic Cemetery, Acton, ON
 St. Joseph's Roman Catholic Cemetery, Fergus, ON
 Tecumseh Park, Chatham, ON
 City of Timmins Cemetery, Timmins, ON
 Brick Street Cemetery, London, ON
 St. John's Dixie Union Cemetery, Mississauga, ON
 Haldimand County Jail, Cayuga, ON
 London Psychiatric Hospital, London, ON

Projects using other forms of Geophysical Survey

Gradiometer Survey, Camp Ipperwash
 Gradiometer Survey, Bluevale Cemetery, Huron County
 Magnetometer Survey, Norfolk County Poorhouse Cemetery, Simcoe
 Magnetometer Survey, Edgar Livery Historic Site, Paris
 Magnetometer Survey, British Methodist Episcopal Church Site, Chatham
 Electromagnetic Survey, Zebro Lands, London
 Electromagnetic Survey, Tillsonburg Village 2 (AfHe-41) Iroquoian Site

Appendix B:
Utility Locates Survey



ALL COORDINATES ARE IN METRES AND WERE DERIVED FROM GPS OBSERVATIONS USING THE CAN-NET NETWORK, AND ARE REFERRED TO UTM ZONE 17, NAD 83 (CSRS, CBNv6-2010.0)

COORDINATE VALUES ARE TO A URBAN ACCURACY IN ACCORDANCE WITH O.REG.216/10.

POINT ID	NORTHING	EASTING
ORP 1	4938110.371	624988.490
ORP 2	4938093.234	624756.680

CAUTION
COORDINATES CANNOT, IN THEMSELVES, BE USED TO RE-ESTABLISH CORNERS OR BOUNDARIES SHOWN ON THE PLAN.

DISTANCES ON THIS PLAN ARE GROUND DISTANCES AND CAN BE CONVERTED TO GRID DISTANCES BY MULTIPLYING BY THE COMBINED SCALE FACTOR OF 0.999754001.

LEGEND

<ul style="list-style-type: none"> — BENCHMARK ● TSP — TRAVERSE POINT ● GV — EXISTING GAS VALVE ● CS — EXISTING CURB STOP ● WV — EXISTING WATER VALVE ○ FH — EXISTING FIRE HYDRANT ○ AN — EXISTING ANCHOR ○ H — EXISTING HYDRO POLE ○ H&B — EXISTING HYDRO AND BELL ○ LS — EXISTING LIGHT POST ○ W — EXISTING WELL ○ BUCT — EXISTING BELL BOX ⊠ — EXISTING CABLE TV BOX ⊙ — EXISTING STORM MANHOLE ⊙ — EXISTING SANITARY MANHOLE ⊙ — EXISTING TREE — BUSHLINE 	<ul style="list-style-type: none"> ■ — DENOTES MONUMENT FOUND □ — DENOTES MONUMENT PLANTED SIB — DENOTES STANDARD IRON BAR SSIB — DENOTES SHORT STANDARD IRON BAR IB — DENOTES IRON BAR D&S — DENOTES DEARDEN & STANTON LTD., O.L.S. M&S — DENOTES MINISTRY OF GOVERNMENT SERVICE MTO — DENOTES MINISTRY OF TRANSPORTATION OF ONTARIO, GEOMATICS SECTION
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SURVEYOR'S CERTIFICATE

I CERTIFY THAT:
1) THE SURVEY WAS COMPLETED ON SEPTEMBER 16, 2015.

ORILLIA ONTARIO
SEPTEMBER 30, 2015

J. C. STANTON
 ONTARIO LAND SURVEYOR
 CANADA LANDS SURVEYOR

TOPOGRAPHIC PLAN
PART OF LOTS 11 & 12, CONCESSION 3
(GEOGRAPHIC TOWNSHIP OF ORILLIA)
(SOUTHERN DIVISION)
NOW IN THE
CITY OF ORILLIA
COUNTY OF SIMCOE
(PREPARED FOR: INFRASTRUCTURE ONTARIO)

CAD FILE: PT28617_JO.DWG	DEARDEN AND STANTON LTD.	DWS. NO. E-2466
DRAWN: P.M. TOWNES, C.S.T.	ONTARIO LAND SURVEYORS CANADA LANDS SURVEYORS CONSULTING ENGINEERS	 SHEET 1 of 1
CHECKED: J.C. STANTON, O.L.S.	89 COLDWATER STREET E. L1V 1W6 ORILLIA, ONTARIO L4H 1R7	
DATE: SEPTEMBER 30, 2015	PHONE: (705) 325-8521 FAX: (705) 325-0241 WWW.DEARDENANDSTANTON.COM EMAIL: ds@decode.com	
SCALE: HORZ. 1: 400	ORILLIA — ONTARIO	

NOTES:
BEARINGS ARE GRID, DERIVED FROM OBSERVED REFERENCE POINTS ON MONUMENTS 1 AND 2, BY REAL TIME NETWORK (RTN) OBSERVATIONS, UTM ZONE 17, NAD 83 (CSRS, CBNv6-2010.0), HAVING GRID BEARING OF N85°46'20"E.

FOR BEARING COMPARISONS, A ROTATION OF -01°07'40" WAS APPLIED TO DEPOSITED PLAN 51R-23022 TO CONVERT TO UTM BEARINGS.

ALL ELEVATIONS ARE GEODETIC REFERENCED TO GPS (RTK) OBSERVATIONS HTv2.0 DATUM USING THE CANET NETWORK ON SEPTEMBER 16, 2015.

NOTES:
LOCATION & ELEVATIONS OF EXISTING UTILITIES AND SERVICES SHOWN ON THIS PLAN WERE LOCATED BY TERRA DISCOVERY LTD., DATED SEPTEMBER 15, 2015.

LEVEL B QUALITY SIGNAL STRENGTH WAS ACHIEVED TO SUBSTRUCTURES IN ACCORDANCE WITH CI/ASCE STANDARD 38-02.

Appendix C:
Maps and Photos

Map 1: Chronology – Expansion of Cemetery Including Former Lane/Pathways

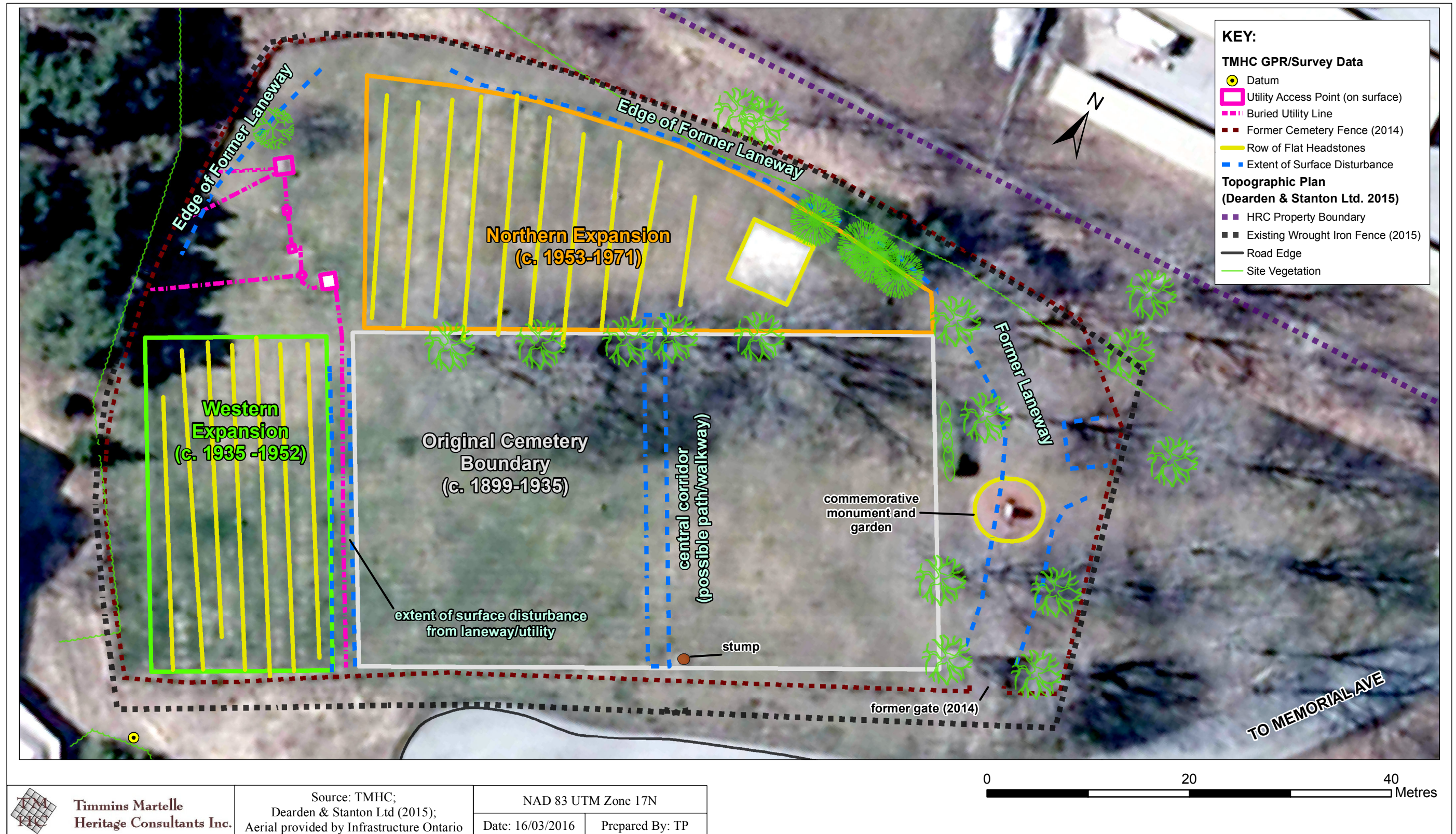
Map 2: GPR Results (roughly 30 cm below surface)

Map 3: Composite GPR Results (roughly 100, 130, 160 and 180 cm below surface)

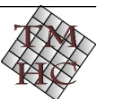
Map 4: Close-Up of GPR Results in Vicinity of Utilities

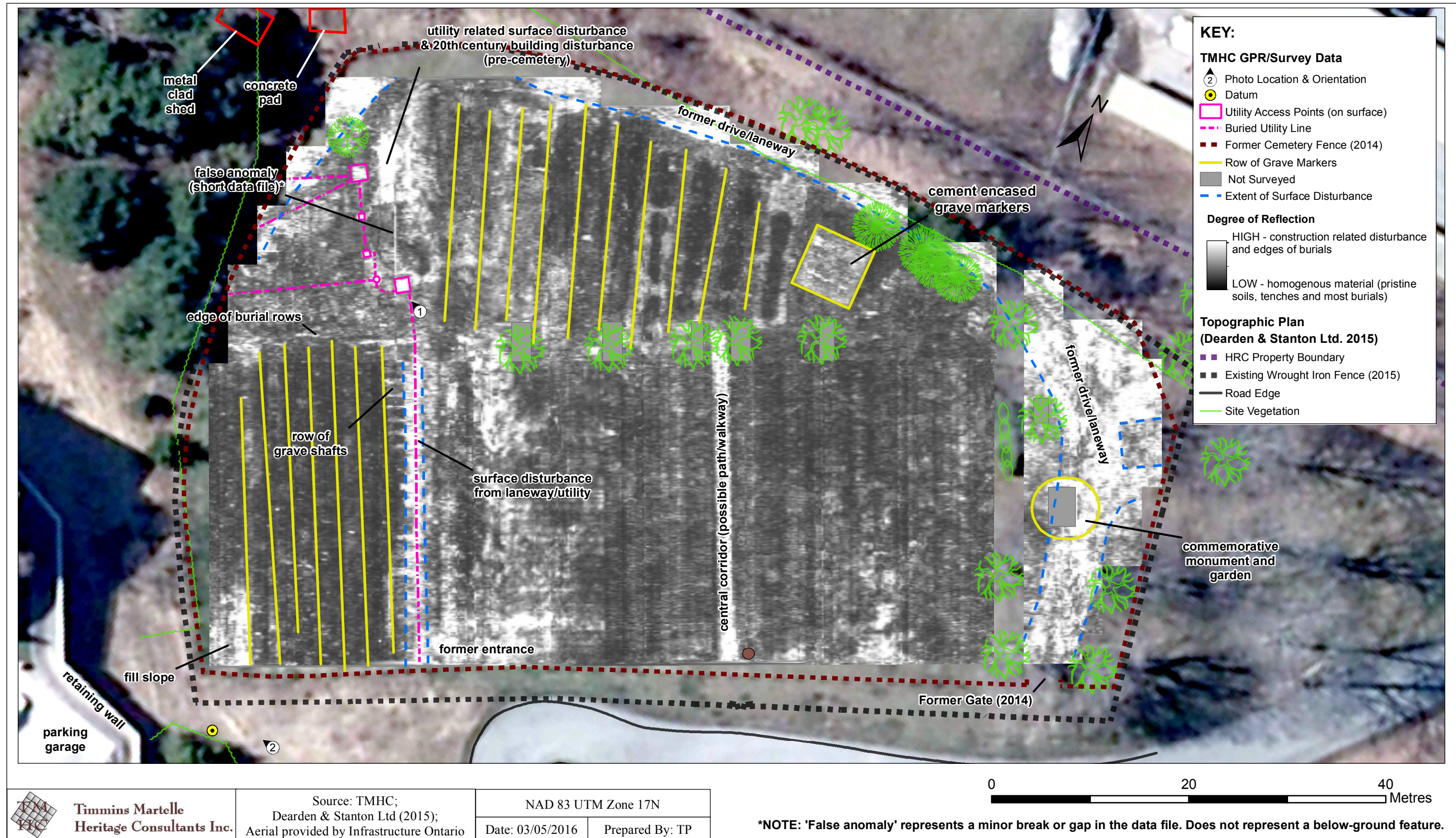
Photo 1: Overview of Utilities Within the Cemetery Fence

Photo 2: Infill Slope from Building and Parking Garage



Map 1: Expansion of Cemetery Including Former Lane/Pathways





Map 2: GPR Results (Grids 1, 7 and 8; roughly 30 cm below surface) Shown on Aerial Photography and 2015 Topographic Plan

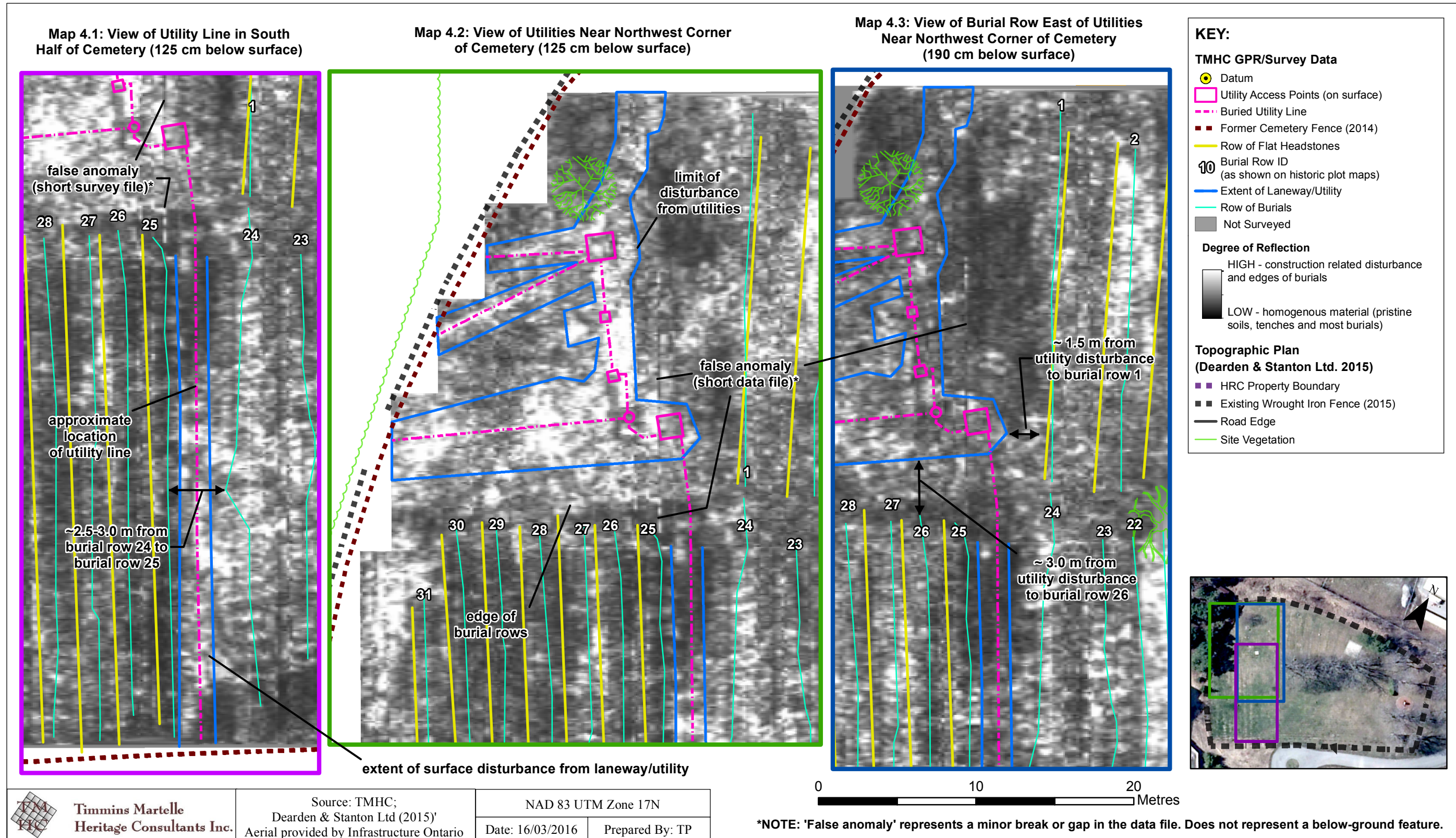
C:\Users\TMHC_Laptop\Desktop\2013-106 IO Huronia Regional Centre Cemetery GPR\Maps\GPR 2015\Final Report\Communications Document\Map_2_GPR_2015_Results_30cm.mxd





Map 3: Composite GPR Results (Grids 1, 7 and 8; roughly 100, 130, 160 and 180 cm below surface) Shown on Aerial Photography and 2015 Topographic Plan





Map 4: Close-Up of GPR Results in Vicinity of Utilities Shown on 2015 Topographic





Photograph 1: Overview of Utilities Within the Cemetery Fence (looking northwest)



Photograph 2: Infill Slope from Building and Parking Garage (looking northwest)

With the construction of neighbouring modern buildings, soils were brought in to create the slope or hill in the landscape that stretches from the building and parking garage to the western edge of the cemetery. Some of this added surface soil can be seen on the GPR results Map 2 as a white area in the southwest corner of the cemetery.