

Appendix I – Stage 1 Archaeological Report

*Kennedy Road Environmental Assessment between
Steeles Avenue and Major Mackenzie Drive*





8 November 2017

STAGE 1 ARCHAEOLOGICAL ASSESSMENT

Kennedy Road Class Environmental Assessment from Steeles Avenue to Major Mackenzie Drive, Part of Lots 1-8, 15-20, Concessions 5, and part of Lots 4-20, Concession 6, Geographic Township of Markham, former County of York, now City of Markham, Regional Municipality of York, Ontario

ORIGINAL REPORT

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Executive Summary

A Stage 1 archaeological assessment was conducted on behalf of the Regional Municipality of York through HDR by Golder Associates Ltd. (Golder), on part of Lots 1-8, 15-20, Concessions 5, and part of Lots 4-20, Concession 6, Geographic Township of Markham, former County of York, now City of Markham, Regional Municipality of York, Ontario (Map 1). The Stage 1 archaeological assessment was conducted in support of a Municipal Class Environmental Assessment (Class EA) study for improvements to Kennedy Road from Steeles Avenue to Major Mackenzie Drive.

The objective of the Stage 1 archaeological assessment was to compile available information about the known and potential archaeological resources within the project area and to determine if a field survey (Stage 2 and/or 3) is required, as well as to recommended Stage 2 and/or Stage 3 strategies if required.

The Stage 1 archaeological assessment found the project area exhibited potential for the recovery of pre- and post-contact Indigenous and historical Euro-Canadian archaeological deposits. This finding is supported by the project area's proximity to potable water, soils conducive to Indigenous agriculture, a large number of previously identified archaeological sites within one kilometre and the proximity of the project area to early transportation routes and documented infrastructure. Four cemeteries are located adjacent to the project area: St. Philip's on-the-hill Anglican Church Cemetery, Hagerman East Cemetery, Hagerman West Cemetery and Bethesda Lutheran Cemetery. All four cemeteries were in use through the 19th century. The St. Philip's on-the-hill Anglican Church Cemetery is located at approximate the same elevation of the road surface, while the Hagerman East Cemetery, Hagerman West Cemetery and Bethesda Lutheran Cemetery are located on higher ground, relative to the road surface. All four cemeteries were subject to Ground Penetrating Radar (GPR) surveys as part of the Class EA.

The geophysical survey conducted at the four cemeteries identified numerous ground anomalies in the portions of the cemeteries adjacent to Kennedy Road (Appendix A). Many of the disturbed ground location anomalies have plan outlines consistent with that of a grave. These are also consistent with some of the more recent grave sites within the cemeteries, thus the largest expected GPR anomalies. Older graves, as discussed in Appendix A, provide a lower strength anomaly and are therefore more difficult to identify.

Based on the findings of the Stage 1 assessment the following recommendations are made, as illustrated in Map 5:

- 1) Areas of previous disturbance exhibit low potential for the recovery of archaeological remains. No further assessment is recommended for these areas; and
- 2) The St. Philip's on-the-hill Anglican Church Cemetery, Hagerman East Cemetery, Hagerman West Cemetery and Bethesda Lutheran Cemetery are located adjacent to the project area. Given the GPR survey identified anomalies consistent with grave shafts, and given older graves are difficult to identify through a GPR survey, should impacts be planned beyond the disturbed ROW within 10 metres of the cemeteries' boundaries, a Stage 3 archaeological assessment is recommended. This Stage 3 archaeological assessment should include mechanical topsoil removal within 10 metres of the cemetery's edge, to ensure no unmarked grave shafts are impacted by the Project. This recommendation is consistent with Section 4.3 Standard 1 Table 4 (MTCS 2011).



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Additionally, should ground disturbance be planned within any of the four cemeteries along Kennedy Road, identification and mitigation of grave features will be required, consistent with requirements under the *Ontario Heritage Act* and the *Funeral, Burial and Cremation Services Act*. These requirements may include Stage 3 test trenching to confirm potential grave features and Stage 4 mechanical topsoil removal. Should there be anticipated impacts to any of the cemeteries the Registrar of Cemeteries at the Ministry of Consumer Services will need to be notified and consulted regarding assessment and mitigation strategies will be required.

The MTCS is asked to review the results and recommendations presented herein and accept this report into the Provincial Register of archaeological reports. The MTCS is also asked to provide a letter concurring with the results presented herein.

The Executive Summary highlights key points from the report only; for complete information and findings, as well as the limitations, the reader should examine the complete report.



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Acknowledgments

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APPENDIX A

Geophysical Technical Memorandum



1.0 PROJECT CONTEXT

1.1 Development Context

A Stage 1 archaeological assessment was conducted on behalf of the Regional Municipality of York through HDR by Golder Associates Ltd. (Golder), on part of Lots 1-8, 15-20, Concessions 5, and part of Lots 4-20, Concession 6, Geographic Township of Markham, former County of York, now City of Markham, Regional Municipality of York, Ontario (Map 1). The Stage 1 archaeological assessment was conducted in support of a Municipal Environmental Assessment (Class EA) for improvements to Kennedy Road from Steeles Avenue to Major Mackenzie Drive. The total project area is 30.2 hectares.

Four cemeteries are located adjacent to the project area: St. Philip's on-the-hill Anglican Church Cemetery, Hagerman East Cemetery, Hagerman West Cemetery and Bethesda Lutheran Cemetery. All four cemeteries were subject to Ground Penetrating Radar (GPR) surveys as part of the Class EA in an attempt to determine the extent of grave shafts within the cemetery properties. The results of the GPR surveys are incorporated into the Stage 1 assessment findings in Section 4.0.

The objective of the Stage 1 archaeological assessment was to compile available information about the known and potential archaeological resources within the project area and to determine if a field survey (Stage 2 and/or Stage 3) is required, as well as to recommended Stage 2 and/or Stage 3 strategies if required.

In compliance with the provincial standards and guidelines set out in the Ministry of Tourism, Culture and Sport's *Standards and Guidelines for Consultant Archaeologists* (2011), the objectives of the Stage 1 archaeological assessment were as follows:

- To provide information about the project area's geography, history, previous archaeological fieldwork and current land conditions;
- To evaluate in detail the project area's archaeological potential which will support recommendations for Stage 2 survey for all or parts of the property; and
- To recommend appropriate strategies for Stage 2 survey.

To meet these objectives, Golder archaeologists employed the following research strategies:

- A review of relevant archaeological, historic and environmental literature pertaining to the project area;
- A review of the land use history, including pertinent historic maps;
- An examination of the Ontario Archaeological Sites Database (OASD) to determine the presence of known archaeological sites in and around the project area;
- An inquiry with the Ministry of Tourism, Culture and Sport (MTCS) to determine previous archaeological assessments conducted in close (50 metre) proximity to the project area;
- Ground penetrating radar (GPR) survey of 4 cemeteries adjacent to the project area; and
- A property inspection.

The Stage 1 property inspection of the project area was conducted on June 9, 2017 under archaeological consulting licence P1056, issued to Jamie Lemon of Golder. Permission to enter the private properties for the



purpose of the Stage 1 property inspection was not required, as inspection and photo documentation was completed from the road right-of-way (ROW). Permission to enter the four cemetery properties for the purposes of the GPR survey was coordinated through HDR.

1.2 Historical Context

1.2.1 Post-Contact Indigenous Occupation of Southern Ontario

The post-contact Indigenous occupation of southern Ontario was heavily influenced by the dispersal of various Iroquoian-speaking peoples by the New York State Iroquois and the subsequent arrival of Algonkian-speaking groups from northern Ontario at the end of the 17th century and beginning of the 18th century (Schmalz 1991).

Following the introduction of Europeans to North America, the nature of Indigenous settlement size, population distribution, and material culture shifted as settlers began to colonize the land. Despite this shift in life ways, “written accounts of material life and livelihood, the correlation of historically recorded villages to their archaeological manifestations, and the similarities of those sites to more ancient sites have revealed an antiquity to documented cultural expressions that confirms a deep historical continuity to Iroquoian systems of ideology and thought” (Ferris 2009:114). As a result, Indigenous peoples of southern Ontario have left behind archaeologically significant resources throughout southern Ontario which show continuity with past peoples, even if this connection has not been recorded in historical Euro-Canadian documentation.

The project area is situated within the former Geographic Township of Markham, County of York, Ontario. The project area is within lands that were part of Treaty Number 13, conducted between the Mississaugas and the Crown in 1785. Treaty 13, also known as the Toronto purchase is described as follows:

On the 23rd day of September, 1787, ... Sir John Johnson, representing the King and Wabukanyne, Neace and Paquan, Principal Chief and Warchiefs of the Mississa[auga] Nation at the Carrying Place, did execute an agreement for the purpose of conveying a tract of land to the King, but it has been ascertained that the Instrument was defective and imperfect, and nothing was done about carrying it out until the first day of August, 1805, an Indenture was made, at the River Credit at Lake Ontario, between William Claus, Esquire, Deputy Superintendent General and Deputy Inspector General of Indians and of their Affairs, for and in behalf of Our Sovereign Lord the King and the Principal Chiefs, Warriors and people of the Mississa[uga] Nation of Indians. This purchase ..., is known as the Toronto Purchase and described as follows: “Commencing at the east bank of the south outlet of the River Etobicoke; thence up the same following the several windings and turnings of the said river to a maple tree, blazed on 4 sides at a distance of three quarters in a straight line from the mouth of the said river; thence north twenty-two degrees west twenty-four miles and one quarter; thence north sixty-eight degrees east fourteen miles; thence south twenty-two degrees east twenty-eight miles more or less to Lake Ontario; then westerly along the water’s edge of Lake Ontario, to the eastern bank of the south outlet of the River Etobicoke, being the place of beginning, together with all the woods and waters thereon.” This last described parcel is only a small portion of the parcel, supposed to have been conveyed by the Indians, September 23rd, 1787, and the consideration demanded by the Indians was only ten shillings.

Morris 1943: 21-22



1.2.2 Euro-Canadian Settlement

1.2.2.1 Geographic Township of Markham

The project area is located in the Geographic Township of Markham. The former Township of Markham, named after William Markham, the Archbishop of York, England, was first surveyed in 1793-1794 as part of the larger survey of the County of York and contained 67,578 acres (27,348 ha). The survey organized the territory into ten north-south concessions each 1¼ miles apart, running from Yonge Street and Vaughan Township in the west to Pickering Township in the east. The concessions were divided by six east-west side roads, also 1¼ miles apart. At the time of the survey, these side roads were little more than blazes on trees indicating where the roads would eventually be opened. The township was bounded by the Whitchurch Town Line (Gormley Sideroad) on the north, Yonge Street on the west, the Scarborough Town Line (now Steeles Avenue) on the south and Pickering Township on the east. Concessions were divided into 200 acre lots. In 1791, the Constitutional Act reserved a seventh-part of all lands granted in new townships for the Protestant clergy. In 1792, Simcoe similarly reserved a seventh-part of all lands granted for the Crown. Thus it was that two of every seven lots in Markham Township were Crown and Clergy Reserves, with the exception of lots fronting Yonge Street. The reservation of lots hindered settlement in the township by blocking access to water sources and leaving roads unopened adjacent to the Reserve lots (Champion 1979:9). By the mid-1800s both the Crown and Clergy lots had been released and sold to private owners.

The first major wave of European settlement in Markham Township was led by William Moll Berczy (aka Johann Albrecht Ulrich Moll, aka Wilhelm Albert Ulrich von Mollo, aka Albert-Guillaume Berczy) (b. 1744, d. 1813). Berczy was a German merchant, painter and, eventually, developer who recruited over 200 people from northern Germany to settle in the Genesee area of New York State on behalf of the British based Genesee Association (Stagg 1983). The first group of settlers arrived in America in 1792, and spent the next two years engaged in legal battles to get access to their Promised Land and supplies. Seeking to remedy the situation, Berczy assisted with the formation of the German Company, whose intent was acquiring land in Upper Canada. In 1794, the German Company was granted 64,000 acres (25,900 ha) west of the Grand River with the promise of more when the land was settled. The settlers travelled to Newark (Niagara-on-the-Lake) in June of 1794 and were informed that Simcoe had altered their agreement and they were now to settle in Markham Township due to Lieutenant Governor Simcoe's desire to see development in the vicinity of the newly formed Town of York. The German Company settlers once again packed their belongings and moved en masse to Markham Township. Approximately 190 German Company settlers, including some Pennsylvanians who had joined Berczy's group as they traveled, spent the winter of 1794 camping in the uncleared forests of Markham Township. The next two years were no easier for the settlers and several of them died of starvation in 1795 and 1796 (Champion 1979:13).

Other groups of early settlers in Markham Township included a collection of people known as the French *émigrés*, and the Pennsylvania Dutch. The French *émigrés* included a group of approximately 30 French aristocrats who had fled France to England to escape the French Revolution. By 1799, the *émigrés* had traveled to York and were settled on lots fronting Yonge Street in Markham Township. The settlement of the aristocrats in Markham was a failure and, with the exception of Laurent Quetton St. George who prospered through trade connections with local First Nations and other settlers, all of the *émigrés* had returned to France by 1815 (Champion 1979:26).

The Pennsylvania Dutch, who were in fact Germans or German speaking Swiss, had settled in America as early as the 17th century. The confusion in the name seems to derive from the similarity between the word 'Deutsch' and the word 'Dutch'. Towards the end of the 1700s, many Pennsylvanian Dutch families began migrating into



Upper Canada which offered farmland at a much better price than could be acquired in Pennsylvania at the time. At the turn of the 18th century, numerous Pennsylvanian Dutch families made the eight week journey to Markham Township where they purchased land or occasionally traded their sturdy Conestoga horses for land. Most of the Pennsylvania Dutch settled in the eastern half of Markham Township (Champion 1979:27). The Markham Pennsylvania Dutch were mostly Mennonites, whose communal, self-sufficient lifestyle was well suited to the hardships of settlement in Upper Canada.

The remainder of settlers in early Markham Township tended to be of American or British origin and included English, Irish and Scots all fleeing from European famine and poverty. The first settlers to complete their settlement duties, including clearing land and roads and constructing housing, were Thomas Kinnear, Lot 48, Concession 1, Nicholas Miller, Lot 34, Concession 1 and John Lyons, Lot 33, Concession 1. These men received their land deeds in 1796 (Bruce and Gohn 1950:5). All of these settlers were located on the western border of the township fronting Yonge Street.

The majority of free lots in Markham Township were partially cleared and had buildings erected on them, in accordance with the duties of settlement, by 1809 (Greenwald 1973:46). The Reserve Lots were mostly leased to settlers by the 1820s.

Early roads in Markham Township, as elsewhere, tended to follow the topography of the landscape rather than the straight survey lines. It was not until the early 20th century, with the increase in large engineering works that many of these roads were straightened out through the construction of iron and concrete bridges across the Rouge River and its associated tributaries.

In 1817 the Township of Markham had 14 mills in operation, including both grist mills and saw mills. Twelve of the mills were located on the Rouge River and two of the mills were located on the Don (Champion 1979:116). By 1824, three wool dressing mills were in operation and the number of grist and saw mills had increased to a total of 10 sawmills and 5 grist mills. Two decades later, in 1842, the population of Markham Township had increased to 5,698 and the number of mills in operation had more than doubled to 24 sawmills and 11 grist mills (Robinson 1885 Part II:120).

By 1850 the population of Markham Township had increased slightly to 6,868 and there were also a few more mills in operation: 27 sawmills and 13 grist mills. The farm productivity recorded for the township in 1849 was: 150,000 bushels of wheat, 11,000 bushels of barley, 7,000 bushels of rye, 145,000 bushels of oats, 45,000 bushels of peas, 55,000 bushels of potatoes, 3,000 bushels of turnips and 3,000 tons of hay. (Robinson 1885 Part II:120).

The population of Markham Township continued to increase over the next two decades and by 1871 it was 8,152 (Robinson 1885 Part II:121). By 1881, the population of the township dropped to 6,375, caused by a reduction in land area assigned to the township due to the incorporation of the villages of Markham, Richmond Hill and Stouffville, rather than a reduction in the number of people living in the region. The area of the township was reduced to 66,475 acres (26,901 ha).

The farm productivity recorded for the township in 1881 was: 110,050 bushels of wheat, 199,181 bushels of barley, 271,851 bushels of oats, 55,954 bushels of peas and beans, 10,280 bushels of corn, 89,671 bushels of potatoes, 122,312 bushels of turnips, 118,397 bushels of other root crops and 10,598 tons of hay (Robinson 1885 Part II:120). A little over 10% of the land was in pasture and 2% devoted to orchards while 70% of the land was under tillage and 10% still held forest, mainly beech, maple and basswood with some areas of pine.



1.2.2.2 Project Area History

Prior to its amalgamation into the Town of Markham in 1971, the project area generally followed the early transportation route of 6th Line in the Township of Markham, bordering Lots 4 to 8 and Lots 16 to 20 of Concessions 5 and 6, with the southern portion cutting through the westerly portion of Lots 1 to 3, Concession 5, and the central portion cutting through the easterly portion of Lots 9 to 15, Concession 6. Iredell's 1794 survey map of Markham Township, with later additions, indicates that all of the lots bordering the project area were purchased by the late 18th century to early 19th century, while Tremaine's *Map of the County of York* indicates that by 1860 at least four houses, three churches, two stores, one saw mill, one inn, one school house, and one community (Hagerman's Corners) had been established either within or in close proximity to the project area (Map 2). The structures depicted on the northeast quarter of Lot 5, Concession 5, southwest quarter edge of Lot 6, Concession 6, east-central edge of Lot 17, Concession 5 appear to be located in approximately the same locations as the houses that presently stand at 7710 Kennedy Road, 7779 Kennedy Road, and 9418 Kennedy Road, respectively. The churches shown on the west-central edge of Lot 6, Concession 6, southeast quarter of Lot 17, Concession 5, and southwest quarter of Lot 17, Concession 6 appear to be located in the same locations as the cemeteries presently located at 7791 Kennedy Road, 9400 Kennedy Road, and 9423 Kennedy Road, respectively.

The St. Philip's on-the-hill Anglican Church Cemetery, which is listed on the City of Markham *Register of Properties of Cultural Heritage Value or Interest*, lies immediately south of the St. Philip's on-the-hill Anglican Church Manse at 9400 Kennedy Road. The sign standing at the front of the cemetery indicates that it was established in 1829; however, the earliest grave marker currently standing in the cemetery dates to 1835.

The cemetery located at 7791 Kennedy Road is listed on the City of Markham *Register* as the Hagerman East Cemetery. Although the history of this cemetery remains unclear, it has been suggested from the names represented that it was associated with the Unionville Methodist churches (Champion 1979:244). Grave markers currently standing in the cemetery indicate that it was used from at least 1839 to 1978.

The Bethesda Lutheran Cemetery, which is located at 9423 Kennedy Road and is listed on the City of Markham *Register*, represents the site of the historical hamlet of Unionville's first Lutheran Church. Established in 1820 on a plot of land given by Phillip Eckardt, the first church was a frame structure referred to as St. Philips Lutheran Church. A burying ground was established in association with the original church and many of Berczy's settlers and their descendants are interred there. In 1862, the original frame church was replaced by a brick structure and by 1894, the name had been officially changed to Bethesda Lutheran Church. In 1910, the Lutheran congregation relocated its church to a site within the village of Unionville where building materials from the 1862 church were used in the construction of a new building. The earliest grave marker within the cemetery dates to 1803, before the establishment of the church, while the latest dates to 2013. Two plaques erected by the Ontario Archaeological and Historic Sites Board currently stand within the front entrance of the cemetery. The first of these plaques titled "The Berczy Settlement 1794" reads as follows:

In November, 1794, William von Moll Berczy (1744-1813), colonizer, road builder, architect and painter, brought the first settlers to Markham Township. This group had originally emigrated from Germany to New York State, but moved to Upper Canada in 1794 and acquired extensive lands in this area. In 1795-96 sickness and famine reduced their numbers, but those who remained or returned to their holdings laid the foundation for the rapid development of Markham Township after 1800. Berczy, having exhausting his resources on the settlement, went to Montreal in 1805 where he achieved some success as a portrait painter.



The second plaque titled “Bethesda Church and Burying Ground” reads:

When the first German settlers led by William Berczy arrived in this area in 1794 they were accompanied by the Rev. S. Liebrich who established here one of Upper Canada’s earliest Lutheran congregations. Services were held at first in the house of Phillip Eckardt, but under the guidance of the Rev. Johan D. Peterson who was pastor 1819-29, a church named St. Philip’s was constructed on this site in 1820. Eckardt donated the land for the church and burying ground and this log structure, later renamed Bethesda was used by the congregation until it was replaced by a brick building in 1862. The latter was moved to Unionville in 1910.

The cemetery located at 7782 Kennedy Road is listed on the City of Markham *Register* as the Hagerman West Cemetery. The historical hamlet of Hagerman’s Corners located in the vicinity of Lots 5 and 6 on Concessions 5 and 6 was settled by Nicholas Hagerman in 1803 (Champion 1979:243). A congregation of the Wesleyan Methodist Church was established on Nicholas Hagerman’s property on Lot 6, Concession 5 in 1849, with the surrounding cemetery that was originally used by Hagerman family eventually being made public. Grave markers currently standing in the cemetery indicate that it was used from at least 1832 to 2010.

Miles & Company’s 1878 map of Markham Township in their *Illustrated Historical Atlas of York County* shows the increased residential, agricultural, and industrial development of the area, with at least 23 houses, three churches, one school house, and one hotel depicted near the project area, as well as the mainline of the Toronto and Nipissing Railway (present day GO Transit Stouffville Line) crossing the central portion. Eight of the houses and one of the churches depicted on this map, which were not visible on Tremaine’s 1860 map, correspond to properties that are either designated under Part IV of the *Ontario Heritage Act* or are listed on the City of Markham *Register*, including: 7507 Kennedy Road, 7703 Kennedy Road, 7782 Kennedy Road, 7951 Kennedy Road, 9286 Kennedy Road, 9392 Kennedy Road, 9721 Kennedy Road, 11 Tannis Street, and 10000 Kennedy Road.

Topographical maps produced in 1914 and 1943 show continued residential expansion along either side of Kennedy Road. Aerial photographs from 1954 to 2016 accessible through York Region’s *Interactive Map* and topographical mapping from 1973 and 1974 (Department of Energy, Mines & Resources 1973, 1974) document the expanding residential construction surrounding the project area. In 1978 the project area was predominately rural with houses and farms oriented to Kennedy Road, with the densest area of development at the intersection of Kennedy Road and 16th Avenue. Since then, residential and commercial development has grown from south to north.

1.3 Archaeological Context

1.3.1 The Natural Environment

The south part of the project area, south of Highway 407, is situated within the “South Slope” physiographic region; as described by Chapman and Putnam (1984: 174):

The South Slope is the southern slope of the Oak Ridges Moraine but it includes the strip south of the Peel plain....it rises 300 to 400 feet in an average width of 6 or 7 miles. Extending from the Niagara Escarpment to the Trent River it covers approximately 940 square miles. The central portion is drumlinized...The streams flow directly down the slope; being rapid they have cut sharp valleys in the till...Bare grey slopes, where soil is actively eroding are common in this area.



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The north part of the project area, north of Highway 407, is situated within the “Peel Plain” physiographic region; as described by Chapman and Putnam (1984: 174):

The Peel plain is a level-to-undulating tract of clay soils (Photo 70) covering 300 square miles across the central portions of the Regional Municipalities of York, Peel, and Halton. The general elevation is from 500 to 750 feet a.s.l. and there is a gradual and fairly uniform slope toward Lake Ontario. Across this plain the Credit, Humber, Don, and Rouge Rivers have cut deep valleys, as have other streams such as the Bronte, Oakville, and Etobicoke Creeks.

The soils of the project area consist of various clays, clay loams and sandy loams with variable drainage (Map 3). These types of soils would have been acceptable for pre-contact Indigenous agricultural practices. The closest potable water sources in pre-contact times would have been the Bruce Creek, which bisects the project area just north of Highway 7, as well as several other creek tributaries that cross the project area (Map 1); all of these creeks are tributaries of the Rouge River watershed. The topography of the area is gently undulating with an overarching slope to the south towards Lake Ontario, which is located approximately 13 kilometres southeast of the project area.

The project area is currently comprised of the Kennedy Road ROW which includes the roadway, boulevards and sidewalks. East and west of the ROW are predominately residential subdivisions, as well as commercial plazas and schools.

1.3.2 General Overview of the Pre-Contact Period in Southern Ontario

The culture history of south-central Ontario, based on Ellis and Ferris (1990), is summarised in Table 1.

Table 1: Pre-contact cultural chronology for south-central Ontario

| Period | Characteristics | Time Period | Comments |
|--------------------|--------------------------------|-------------------|------------------------------------|
| Early Paleo-Indian | Fluted Projectiles | 9000 - 8400 BC | spruce parkland/caribou hunters |
| Late Paleo-Indian | Hi-Lo Projectiles | 8400 – 8000 BC | smaller but more numerous sites |
| Early Archaic | Kirk and Bifurcate Base Points | 8000 - 6000 BC | slow population growth |
| Middle Archaic | Brewerton-like points | 6000 - 2500 BC | environment similar to present |
| Late Archaic | Lamoka (narrow points) | 2000 - 1800 BC | increasing site size |
| | Broadpoints | 1800 - 1500 BC | large chipped lithic tools |
| | Small Points | 1500 – 1100 BC | introduction of bow hunting |
| Terminal Archaic | Hind Points | 1100 - 950 BC | emergence of true cemeteries |
| Early Woodland | Meadowood Points | 950 - 400 BC | introduction of pottery |
| Middle Woodland | Dentate/Pseudo-Scallop Pottery | 400 B.C. – AD 500 | increased sedentism |
| | Princess Point | AD 550 - 900 | introduction of corn |
| Late Woodland | Early Ontario Iroquoian | AD 900 - 1300 | emergence of agricultural villages |
| | Middle Ontario Iroquoian | AD 1300 - 1400 | long longhouses (100m +) |
| | Late Ontario Iroquoian | AD 1400 - 1650 | tribal warfare and displacement |
| Contact Indigenous | Various Algonkian Groups | AD 1700 - 1875 | early written records and treaties |
| Late Historic | Euro-Canadian | AD 1796 - present | European settlement |



1.3.3 Pre-contact Indigenous Documentation

Previous archaeological assessments and research surveys have demonstrated that the area now occupied by the City of Markham was intensively occupied by pre-contact Indigenous people.

The following subsections outline the cultural or temporal periods recognized for southern Ontario more generally.

1.3.3.1 *Paleo-Indian Period*

The first human occupation of south-central Ontario begins just after the end of the Wisconsin Glacial Period. Although there were a complex series of ice retreats and advances which played a large role in shaping the local topography, south-central Ontario was finally ice free by 12,500 years ago.

The first human settlement can be traced back 11,000 years, when this area was settled by Native groups that had been living south of the Great Lakes. The period of these early Native inhabitants is known as the Paleo-Indian Period (Ellis and Deller 1990).

Our current understanding of settlement patterns of Early Paleo-Indian peoples suggests that small bands, consisting of probably no more than 25-35 individuals, followed a pattern of seasonal mobility extending over large territories. One of the most thoroughly studied of these groups followed a seasonal round that extended from as far south as Chatham to the Horseshoe Valley north of Barrie. Early Paleo-Indian sites tend to be located in elevated locations on well-drained loamy soils. Many of the known sites were located on former beach ridges associated with glacial lakes. There are a few extremely large Early Paleo-Indian sites, such as one located close to Parkhill, Ontario, which covered as much as six hectares. It appears that these sites were formed when the same general locations were occupied for short periods of time over the course of many years. Given their placement in locations conducive to the interception of migratory mammals such as caribou, it has been suggested that they may represent communal hunting camps. There are also smaller Early Paleo-Indian camps scattered throughout the interior of southwestern and south-central Ontario, usually situated adjacent to wetlands.

The most recent research suggests that population densities were very low during the Early Paleo-Indian Period (Ellis and Deller 1990:54). Archaeological examples of Early Paleo-Indian sites are rare.

The Late Paleo-Indian Period (8400-8000 BC) has been less well researched, and is consequently more poorly understood. By this time the environment of south-central Ontario was coming to be dominated by closed coniferous forests with some minor deciduous elements. It seems that many of the large game species that had been hunted in the early part of the Paleo-Indian Period had either moved further north, or as in the case of the mastodons and mammoths, become extinct.

Like the early Paleo-Indian peoples, late Paleo-Indian peoples covered large territories as they moved about in response to seasonal resource fluctuations. On a province wide basis Late Paleo-Indian projectile points are far more common than Early Paleo-Indian materials, suggesting a relative increase in population.

The end of the Late Paleo-Indian Period was heralded by numerous technological and cultural innovations that appeared throughout the Archaic Period. These innovations may be best explained in relation to the dynamic nature of the post-glacial environment and region-wide population increases.



1.3.3.2 Archaic Period

During the Early Archaic Period (8000-6000 BC), the jack and red pine forests that characterized the Late Paleo-Indian environment were replaced by forests dominated by white pine with some associated deciduous trees (Ellis et al. 1990:68-69). One of the more notable changes in the Early Archaic Period is the appearance of side and corner-notched projectile points. Other significant innovations include the introduction of ground stone tools such as celts and axes, suggesting the beginnings of a simple woodworking industry. The presence of these often large and not easily portable tools suggests there may have been some reduction in the degree of seasonal movement, although it is still suspected that population densities were quite low, and band territories large.

During the Middle Archaic Period (6000-2500 BC) the trend to more diverse toolkits continued, as the presence of netsinkers suggest that fishing was becoming an important aspect of the subsistence economy. It was also at this time that "bannerstones" were first manufactured.

Bannerstones are carefully crafted ground stone devices that served as a counterbalance for *atlatls* or spear-throwers. Another characteristic of the Middle Archaic Period is an increased reliance on local, often poor quality chert resources for the manufacturing of projectile points. It seems that during earlier periods, when groups occupied large territories, it was possible for them to visit a primary outcrop of high quality chert at least once during their seasonal round. However, during the Middle Archaic Period, groups inhabited smaller territories that often did not encompass a source of high quality raw material. In these instances, lower quality materials which had been deposited by the glaciers in the local till and river gravels were utilized.

This reduction in territory size was probably the result of gradual region-wide population growth which led to the infilling of the landscape. This process forced a reorganization of Native subsistence practices, as more people had to be supported from the resources of a smaller area. During the latter part of the Middle Archaic Period, technological innovations such as fish weirs have been documented as well as stone tools especially designed for the preparation of wild plant foods.

It is also during the latter part of the Middle Archaic Period that long distance trade routes began to develop, spanning the northeastern part of the continent. In particular, native copper tools manufactured from a source located northwest of Lake Superior were being widely traded (Ellis et al. 1990). By 3500 BC, the local environment had stabilized in a near modern form (Ellis et al. 1990).

During the Late Archaic Period (2500-950 BC), the trend towards decreased territory size and a broadening subsistence base continued. Late Archaic sites are far more numerous than either Early or Middle Archaic sites, and it seems that the local population had definitely expanded. It is during the Late Archaic Period that the first true cemeteries appear. Before this time individuals were interred close to the location where they died. During the Late Archaic Period, if an individual died while his or her group happened to be at some distance from their group cemetery, the bones would be kept until they could be placed in the cemetery. Consequently, it is not unusual to find disarticulated skeletons, or even skeletons lacking minor elements such as fingers, toes or ribs, in Late Archaic burial pits.

The appearance of cemeteries during the Late Archaic has been interpreted as a response to increased population densities and competition between local groups for access to resources. It is argued that cemeteries would have provided strong symbolic claims over a local territory and its resources. These cemeteries are often located on heights of well-drained sandy/gravel soils adjacent to major watercourses.



This suggestion of increased territoriality is also consistent with the regionalized variation present in Late Archaic projectile point styles. It was during the Late Archaic Period that distinct local styles of projectile points appear. Also during the Late Archaic Period the trade networks which had been established during the Middle Archaic Period continued to flourish. Native copper from northern Ontario and marine shell artifacts from as far away as the Mid-Atlantic coast are frequently encountered as grave goods. Other artifacts such as polished stone pipes and banded slate gorgets also appear on Late Archaic sites. One of the more unusual and interesting of the Late Archaic artifacts is the *birdstone*. Birdstones are small, bird-like effigies usually manufactured from green banded slate.

1.3.3.3 Woodland Period

The Early Woodland Period (950 to 400 BC) is distinguished from the Late Archaic Period primarily by the addition of ceramic technology. While the introduction of pottery provides a useful demarcation point for archaeologists, it may have made less difference in the lives of the Early Woodland peoples. The first pots were very crudely constructed, thick walled, and friable. It has been suggested that they were used in the processing of nut oils by boiling crushed nut fragments in water and skimming off the oil. These vessels were not easily portable, and individual pots must not have enjoyed a long use life. There have also been numerous Early Woodland sites located at which no pottery was found, suggesting that these poorly constructed, undecorated vessels had yet to assume a central position in the day-to-day lives of Early Woodland peoples.

Other than the introduction of this limited ceramic technology, the life-ways of Early Woodland peoples show a great deal of continuity with the preceding Late Archaic Period. For instance, birdstones continue to be manufactured, although the Early Woodland varieties have "pop-eyes" which protrude from the sides of their heads.

Likewise, the thin, well-made projectile points which were produced during the terminal part of the Archaic Period continue in use. However, the Early Woodland variants were side-notched rather than corner-notched, giving them a slightly altered and distinctive appearance.

The trade networks which were established in the Middle and Late Archaic also continued to function, although there does not appear to have been as much traffic in marine shell during the Early Woodland Period. During the last 200 years of the Early Woodland Period, projectile points manufactured from high quality raw materials from the American Midwest begin to appear on sites in southwestern Ontario.

In terms of settlement and subsistence patterns, the Middle Woodland (300 BC to 500 AD) provides a major point of departure from the Archaic and Early Woodland Periods. While Middle Woodland peoples still relied on hunting and gathering to meet their subsistence requirements, fish were becoming an even more important part of the diet.

In addition, Middle Woodland peoples relied much more extensively on ceramic technology. Middle Woodland vessels are often heavily decorated with hastily impressed designs covering the entire exterior surface and upper portion of the vessel interior. Consequently, even very small fragments of Middle Woodland vessels are easily identifiable.

It is also at the beginning of the Middle Woodland Period that rich, densely occupied sites appear along the margins of major rivers and lakes. While these areas had been utilized by earlier peoples, Middle Woodland sites are significantly different in that the same location was occupied off and on for as long as several hundred years and large deposits of artifacts often accumulated. Unlike earlier seasonally utilized locations, these Middle Woodland



sites appear to have functioned as base camps, occupied off and on over the course of the year. There are also numerous small upland Middle Woodland sites, many of which can be interpreted as special purpose camps from which localized resource patches were exploited. This shift towards a greater degree of sedentism continues the trend witnessed from at least Middle Archaic times, and provides a prelude to the developments that follow during the Late Woodland Period.

The Late Woodland Period began with a shift in settlement and subsistence patterns involving an increasing reliance on corn horticulture (Fox 1990; Smith 1990; Williamson 1990:312). Corn may have been introduced into southwestern Ontario from the American Midwest as early as 600 A.D. or a few centuries before. Corn did not become a dietary staple until at least three to four hundred years later, after which the cultivation of corn gradually spread into south-central and southeastern Ontario.

During the early Late Woodland, particularly within the Princess Point Complex (*circa* AD 500-1050), a number of archaeological material changes have been noted: the appearance of triangular projectile point styles, first seen during this period begin with the Levanna form; cord-wrapped stick decorated ceramics using the paddle and anvil forming technique take over from the mainly coil-manufactured and dentate stamped and pseudo-scallop shell impressed ceramics; and if not appearance, increasing use of maize (*Zea mays*) as a food source (e.g., Bursey 1995; Crawford et al. 1997; Ferris and Spence 1995:103; Martin 2004 [2007]; Ritchie 1971:31-32; Spence et al. 1990; Williamson 1990:299).

The Late Woodland Period is widely accepted as the beginning of agricultural life ways in south-central Ontario. Researchers have suggested that a warming trend during this time may have encouraged the spread of maize into southern Ontario, providing a greater number of frost-free days (Stothers and Yarnell 1977). Further, shifts in the location of sites have also been identified with an emphasis on riverine, lacustrine and wetland occupations set against a more diffuse use of the landscape during the Middle Woodland Period (Dieterman 2001).

The first agricultural villages in southern Ontario date to the 10th century AD. Unlike the riverine base camps of the Middle Woodland Period, these sites are located in the uplands, on well-drained sandy soils. Categorized as "Early Ontario Iroquoian" AD (900-1300), many archaeologists believe that it is possible to trace a direct line from the Iroquoian groups, which later inhabited southern Ontario at the time of first European contact, back to these early villagers.

Village sites dating between AD 900 and 1300, share many attributes with the historically reported Iroquoian sites, including the presence of longhouses and sometimes palisades. However, these early longhouses were actually not all that large, averaging only 12.4 metres in length (Dodd et al. 1990:349; Williamson 1990:304-305). It is also quite common to find the outlines of overlapping house structures, suggesting that these villages were occupied long enough to necessitate re-building.

The Jesuits reported that the Huron moved their villages once every 10-15 years, when the nearby soils had been depleted by farming and conveniently collected firewood grew scarce (Pearce 2010). It seems likely that Early Ontario Iroquoians occupied their villages for considerably longer, as they relied less heavily on corn than did later groups. Their villages were also much smaller, placing less demand on nearby resources.

Judging by the presence of carbonized corn kernels and cob fragments recovered from sub-floor storage pits, agriculture was becoming a vital part of the Early Ontario Iroquoian economy. However, it had not reached the level of importance it would in the Middle and Late Ontario Iroquoian Periods. There is ample evidence to suggest that more traditional resources continued to be exploited, and comprised a large part of the subsistence economy.



Seasonally occupied special purpose sites relating to deer procurement, nut collection, and fishing activities have all been identified. While beans are known to have been cultivated later in the Late Woodland Period, they have yet to be identified on Early Ontario Iroquoian sites.

The Middle Ontario Iroquoian Period (AD 1300-1400) witnessed several interesting developments in terms of settlement patterns and artifact assemblages. Changes in ceramic styles have been carefully documented, allowing the placement of sites in the first or second half of this 100-year period. Moreover, villages, which averaged approximately 0.6 hectares in extent during the Early Ontario Iroquoian Period, now consistently range between one and two hectares.

House lengths also change dramatically, more than doubling to an average of 30 metres, while houses of up to 45 metres have been documented. This increase in longhouse length has been variously interpreted. The simplest possibility is that increased house length is the result of a gradual, natural increase in population (Dodd et al. 1990:323, 350, 357; Smith 1990). However, this does not account for the sudden shift in longhouse lengths around AD 1300. Other possible explanations involve changes in economic and socio-political organization (Dodd et al. 1990:357). One suggestion is that during the Middle Ontario Iroquoian Period, small villages were amalgamating to form larger communities for mutual defense (Dodd et al. 1990:357). If this was the case, the more successful military leaders may have been able to absorb some of the smaller family groups into their households, thereby requiring longer structures. This hypothesis draws support from the fact that some sites had up to seven rows of palisades, indicating at least an occasional need for strong defensive measures. There are, however, other Middle Ontario Iroquoian villages which had no palisades present (Dodd et al. 1990). More research is required to evaluate these competing interpretations.

The lay-out of houses within villages also changes dramatically by AD 1300. During the Early Ontario Iroquoian Period villages were haphazardly planned, with houses oriented in various directions. During the Middle Ontario Iroquoian Period villages are organized into two or more discrete groups of tightly spaced, parallel aligned, longhouses. It has been suggested that this change in village organization may indicate the initial development of the clans which were a characteristic of the historically known Iroquoian peoples (Dodd et al. 1990:358).

Initially at least, the Late Ontario Iroquoian Period (AD 1400-1650) continues many of the trends which have been documented for the proceeding century. For instance, between AD 1400 and 1450 house lengths continue to grow, reaching an average length of 62 metres. One longhouse excavated on a site southwest of Kitchener was an incredible 123 metres (Lennox and Fitzgerald 1990:444-445). After AD 1450, house lengths begin to decrease, with houses dating between AD 1500-1580 averaging 30 metres in length.

Why house lengths decrease after AD 1450 is poorly understood, although it is believed that the even shorter houses witnessed on Historical Period sites can be at least partially attributed to the population reductions associated with the introduction of European diseases such as smallpox (Lennox and Fitzgerald 1990:405, 410).

Village size also continues to expand throughout the Late Ontario Iroquoian Period, with many of the larger villages showing signs of periodic expansions. The Late Middle Ontario Iroquoian Period and the first century of the Late Ontario Iroquoian Period was a time of village amalgamation. These large villages were often heavily defended with numerous rows of wooden palisades, suggesting that defence may have been one of the rationales for smaller groups banding together.



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1.3.4 Previously Identified Archaeological Sites and Surveys

Previous archaeological assessments and research surveys have demonstrated that the lands which later became the County of York were utilized by pre-contact Indigenous peoples. A review of the OASD maintained by the MTCS determined that 18 previously registered archaeological sites are located within one kilometre of the project area including eight pre-contact Indigenous sites, nine historical Euro-Canadian sites and one site of unknown cultural affiliation. Nine of the previously identified sites are located within the 300 metres of the study area; no sites are located within the project area.

Table 2: Archaeological sites within 1 km of project area

| Borden # | Site Name | Site Type | Cultural Affinity |
|-----------|--------------------|---------------|------------------------|
| AkGt-53 | Alexandra | Village | Late Woodland |
| AkGt-58 | Rennie | Unknown | Euro-Canadian |
| AkGt-21* | Hood | Unknown | Unknown |
| AlGt-211 | CNR Uxbridge 2 | Homestead | Euro-Canadian |
| AlGt-265 | N/A** | Isolated Find | Pre-contact Indigenous |
| AlGt-266 | N/A** | Isolated Find | Pre-contact Indigenous |
| AlGt-267 | N/A** | Homestead | Euro-Canadian |
| AlGt-602 | Frederick Eckhardt | Homestead | Euro-Canadian |
| AlGt-601* | Eckhardt Log House | Homestead | Euro-Canadian |
| AlGt-625* | Location 3 | Unknown | Euro-Canadian |
| AlGt-626* | Location 2 | Unknown | Pre-contact Indigenous |
| AlGt-627* | Location 4 | Unknown | Pre-contact Indigenous |
| AlGt-508* | Pingle | Homestead | Euro-Canadian |
| AlGt-222 | N/A** | Isolated Find | Pre-contact Indigenous |
| AlGt-223 | N/A** | Isolated Find | Pre-contact Indigenous |
| AlGt-240* | N/A** | Homestead | Euro-Canadian |
| AlGI-591* | Dymond | Isolated Find | Pre-contact Indigenous |
| AlGt-622* | Pingle | Homestead | Euro-Canadian |

*Sites located within 300m of project area

**No site name provided in OASD

A number of archaeological assessments have been undertaken within and adjacent to the project area, mostly related to residential development. In all cases where the previous project areas intersect the current project area, no further assessment was recommended. The following reports document archaeological assessments within and adjacent to the project area (Map 5):

- Dillon. 1997. Canadian Highways International Constructors, Archaeological Assessment of Highway 407 ROW, 1995 and 1996 Field Seasons, Stage 2: Assessment and Stage 3: Testing.
- ASI. 2012. Stage 1 and 2 Archaeological Assessment of Upper Unionville Development, Phase 2B, Part of Draft Plan of Subdivision 19TM-10003, Part of Lot 16 and 17, Concession 6, Geographic Township of Markham, County of York, Now the Town of Markham, Regional Municipality of York, Ontario.



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- ASI. 2014. Stage 1 Archaeological Assessment of the Milliken Secondary Plan, City of Markham, Regional Municipality of York.
- TAI. 2014. Stage 1 & 2 Archaeological Assessment for 9721 Kennedy Road, Part of Lot 19, Concession 6, City of Markham, Regional Municipality of York, Ontario.
- Archeoworks. 2015. Stage 1 Archaeological Assessment for the Steeles Avenue Grade Separation at Stouffville GO Transit Rail Corridor Environmental Assessment Study, Within Part of Lots 26-29, Concession 5, in the Geographical Township of Scarborough, Historical County of York, now in the City of Toronto, and Part of Lot 1, Concession 5 and 6, in the Geographic Township of Markham, Historical County of York, now in the City of Markham, Regional Municipality of York, Ontario.
- Golder. 2016. Stage 2 Archaeological Assessment, Kennedy Manors, Part of Lots 16 & 17, Concession 5 (Part of Lot 1, Registered Plan 3555, Lots 6 and 7, Registered Plan 4113), Geographic Township of Markham, Former County of York, now City of Markham, Regional Municipality of York, Ontario.
- Golder. 2017. Stage 2 Archaeological Assessment, York Downs Golf Club, Phase 1, Parts of Lots 17 and 18, Concession 5, Geographic Township of Markham, County of York, now City of Markham, Ontario.

Information concerning specific site locations is protected by provincial policy, and is not fully subject to the *Freedom of Information Act*. The release of such information in the past has led to looting and or various forms of illegally conducted site destruction. Confidentiality extends to all media capable of conveying location, including maps, drawings, or textual descriptions of a site location. For this reason, maps and data that provide information on archaeological site locations do not form part of this report.

The Draft Archaeological Management Plan for York Region was reviewed in relation to the project area; limited areas of archaeological potential were noted adjacent to the project area, due to the built up nature of the project area (ASI 2013).

The MTCS will provide information concerning site location to the party or an agent of the party holding title to a property or to a licensed archaeologist with relevant cultural resource management interests.



2.0 FIELD METHODS

2.1 Existing Conditions and Land Use

The project area is currently comprised of the Kennedy Road ROW which includes the roadway, boulevards and sidewalks. East and west of the ROW are predominately residential subdivisions, as well as commercial plazas, churches, schools and cemeteries.

The Stage 1 property inspection of the study area was conducted on June 9, 2017 under archaeological consulting licence P1056, issued to Jamie Lemon of Golder; the property inspection was conducted by Chris Lemon of Golder (R289). Mr. Lemon was delegated the responsibility of undertaking the archaeological fieldwork at the study area as per Section 12 of the MTCS 2013 *Terms and Conditions for Archaeological Licences*, issued in accordance with clause 48(4)(d) of the *Ontario Heritage Act*. The weather at the time of the property inspection was sunny and clear with warm temperatures. Lighting conditions during the assessment were excellent and at no time were field conditions found to be detrimental to the completion of the property inspection.

2.2 Property Inspection

The property inspection consisted of a walking assessment of the project area. During the walking assessment, the current conditions of the project area were documented and the entire project area was subjected to extensive photo documentation. Map 4 provides an aerial image of the project area. Map 5 illustrates the Stage 1 assessment results and photographic key. Images 1-18 illustrate the conditions identified along the project area. The project area follows the Kennedy Road ROW and varies in width from 43-45 metres.

The main feature of the project area is the existing ROW associated with Kennedy Road. As illustrated in Map 2, this ROW for the most part follows the historic 19th century road grid, with deviations in the center and southern portions. Development in recent decades, particularly on either side of Kennedy Road, has resulted in the project area being identified as previously disturbed, or previously assessed by archaeological assessments (Map 5). Section 1.3.4 lists the archaeological assessments that have previously been undertaken on lands adjacent to the project area.

The south portion of the project area, from Steeles Avenue to Highway 7, is characterized by mixed-use development on either side of Kennedy Road and is bisected by Highway 407. The north portion of the project area, from Highway 7 to Major Mackenzie Drive, is characterized by predominately residential development, or areas of proposed residential development.

Within the project area, the Kennedy Road roadway, boulevards and sidewalks are consistently present. Within the boulevards along the length of the project area numerous instances of underground services were identified, further highlighting the disturbed nature of the project area.

Four cemeteries are located adjacent to the project area: St. Philip's on-the-hill Anglican Church Cemetery, Hagerman East Cemetery, Hagerman West Cemetery and Bethesda Lutheran Cemetery. All four cemeteries were in use through the 19th century. The St. Philip's on-the-hill Anglican Church Cemetery is located at approximate the same elevation of the road surface, while the Hagerman East Cemetery, Hagerman West Cemetery and Bethesda Lutheran Cemetery are located on higher ground, relative to the road surface (Images 4, 8, 17). All four



cemeteries were subject to Ground Penetrating Radar (GPR) surveys as part of the Class EA. The results of the GPR surveys are included in Appendix A, and summarized below.

2.3 Geophysical Surveys

Below is a summary of the of the geophysical surveys conducted in support of the Class EA, of four cemeteries adjacent to this section of Kennedy Road; below is a summary of the geophysical surveys; for full results please refer to Appendix A.

A GPR system consists of two antennae (transmitter and receiver), a control console/computer for real-time graphic display and data recording, and a wheel odometer to measure travelled distance. In the reflection profiling mode, the antennae (separated by a fixed distance) are moved along a traverse and readings are taken at discrete intervals. At each step, pulses of radio frequency electromagnetic energy (megahertz range) are transmitted and reflections are received from subsurface horizons/objects. The reflecting horizons occur where there is an abrupt change in the subsurface material dielectric permittivity. The amplitude of received radar energy is recorded as a function of time, processed in real-time for display purposes, and the raw data recorded digitally for post-processing and presentation.

GPR signal quality and strength depend on dielectric property contrasts and the amount of clutter or reflections in the data. GPR signal penetration depends primarily on soil type and water content. A water saturated silt or clay layer may completely attenuate the GPR signal resulting in very poor signal penetration. A reinforced concrete pad can also mask any GPR signal from penetrating into the soils. With repeated line-by-line coverage of an area, features will create a pattern which can then be further interpreted.

The geophysical field work was carried out between June 27 and 29, 2017. The Cemeteries were surveyed in the order requested by the client, with the St. Philips on-the-hill Anglican Church Cemetery surveyed first on June 27th, then Bethesda Lutheran Cemetery on June 28th, followed by Hagerman East and West Cemeteries on June 29th.

The background regions (dark blue) on Figures 1, 3, 5, and 7 are areas where no signal property contrasts occur, suggesting no buried features. Red areas indicate higher amplitudes of reflected energy from a potential subsurface object.

Figures 2, 4, 6, and 8 in Appendix A show the interpretation of the GPR depth slice images, showing location of interpreted buried objects for each of the four cemeteries. The data presents two types of anomalies, based on signal strength of the anomaly. These anomalies are classified as interpreted disturbed ground location and interpreted possible disturbed ground locations. In locations where these higher amplitude anomalies are known to be due to surface influence, such as an asphalt driveway, the anomaly was removed from the interpreted results.

Many of the disturbed ground location anomalies have plan outlines consistent with that of a grave. These are also consistent with some of the more recent grave sites within the cemeteries, thus the largest expected GPR anomalies. Older graves, as discussed above, provide a lower strength anomaly and are therefore more difficult to identify.



3.0 RECORD OF FINDS

Table 3 provides an inventory of the documentary record generated in the field.

Table 3: Inventory of documentary record

| Document Type | Current Location of Document | Additional Comments |
|-------------------------|------------------------------|--|
| Field Notes | Golder office in Whitby | 1 page in field notebook and stored digitally on the Golder server |
| Hand Drawn Maps | Golder office in Whitby | 1 map (photo locations and assessment findings) |
| Maps Provided by Client | Golder office in Whitby | 1 map stored digitally in project file |
| Digital Photographs | Golder office in Whitby | 78 photographs stored digitally in project file |



4.0 ANALYSIS AND CONCLUSIONS

4.1 Assessing Archaeological Potential

Archaeological potential is established by determining the likelihood that archaeological resources may be present on a subject property. In accordance with the MTCS's 2011 *Standards and Guidelines for Consultant Archaeologists* the following are features or characteristics that indicate archaeological potential:

- Previously identified archaeological sites;
- Water sources:
 - Primary water sources (lakes, rivers, streams, creeks);
 - Secondary water sources (intermittent streams and creeks; springs; marshes; swamps);
 - Features indicating past water sources (e.g. glacial lake shorelines indicated by the presence of raised gravel, sand, or beach ridges; relic river or stream channels indicated by clear dip or swale in the topography; shorelines of drained lakes or marshes; and cobble beaches);
 - Accessible or inaccessible shoreline (e.g. high bluffs, swamps or marsh fields by the edge of a lake; sandbars stretching into marsh);
- Elevated topography (eskers, drumlins, large knolls, plateaux);
- Pockets of well drained sandy soil, especially near areas of heavy soil or rocky ground; Distinctive land formations that might have been special or spiritual places, such as waterfalls, rock outcrops, caverns, mounds, and promontories and their bases (there may be physical indicators of their use, such as burials, structures, offerings, rock paintings or carvings);
- Resource areas including:
 - Food or medicinal plants;
 - Scarce raw minerals (e.g. quartz, copper, ochre or outcrops of chert);
 - Early Euro-Canadian industry (fur trade, mining, logging);
- Areas of Euro-Canadian settlement; and
- Early historical transportation routes.

In recommending a Stage 2 property survey based on determining archaeological potential for a study area, MTCS stipulates the following:

- No areas within 300 metres of a previously identified site; water sources; areas of early Euro-Canadian Settlement; or locations identified through local knowledge or informants can be recommended for exemption from further assessment;
- No areas within 100 metres of early transportation routes can be recommended for exemption from further assessment; and
- No areas within the property containing an elevated topography; pockets of well-drained sandy soil; distinctive land formations; or resource areas can be recommended for exemption from further assessment.



4.1.1 Potential for Pre- and Post-Contact Indigenous Archaeological Resources

Following the criteria outlined above in Section 4.1 to determine pre- and post-contact Indigenous archaeological potential, several factors can be highlighted. The project area is bisected by the Bruce Creek as well as a creek tributaries of the Rouge River, and the soils of the project area would have been suitable for pre-contact Indigenous agriculture. Additionally, eight pre-contact Indigenous archaeological sites has been previously identified within one kilometre of the project area.

When the above noted archaeological potential criteria are applied to the project area, the project area exhibits archaeological potential for the identification of pre-contact and post-contact Indigenous sites; however, areas of previous disturbance eradicate the potential for the recovery of archaeological resources (Section 4.1.3). Maps 5-1 to 5-7 illustrates areas of archaeological potential and areas of previous disturbance in relation to the project area.

4.1.2 Potential for Historical Euro-Canadian Archaeological Resources

Following the criteria outlined above in Section 4.1 to determine historical Euro-Canadian archaeological potential, a number of factors can be highlighted. The project area is located for the most part on the historic road grid and nine historical Euro-Canadian archaeological sites have been previously identified within one kilometre of the project area. Additionally, a review of the 1860 and 1878 maps of the area illustrate several 19th century structures in close proximity to the project area (Map 2). The geophysical survey conducted at the four cemeteries identified numerous ground anomalies in the portions of the cemeteries adjacent to Kennedy Road (Appendix A). Many of the disturbed ground location anomalies have plan outlines consistent with that of a grave. These are also consistent with some of the more recent grave sites within the cemeteries, thus the largest expected GPR anomalies. Older graves, as discussed in Appendix A, provide a lower strength anomaly and are therefore more difficult to identify.

When the above noted archaeological potential criteria were applied to the project area, the project area exhibits archaeological potential for the identification of historical Euro-Canadian sites; however, areas of previous disturbance eradicate the potential for the recovery of archaeological resources (Section 4.1.3). Maps 5-1 to 5-7 illustrates areas of archaeological potential and areas of previous disturbance in relation to the project area.

4.1.3 Archaeological Integrity

A negative indicator of archaeological potential is extensive land disturbance. This includes widespread earth movement activities that would have eradicated or relocated any cultural material to such a degree that the information potential and cultural heritage value or interest has been lost.

Section 1.3.2 of the MTCS' 2011 Standards and Guidelines for Consultant Archaeologists states that:

Archaeological potential can be determined not to be present for either the entire property or a part(s) of it when the area under consideration has been subject to extensive and deep land alterations that have severely damaged the integrity of any archaeological resources.

MTCS 2011:18



STAGE 1 ARCHAEOLOGICAL ASSESSMENT - KENNEDY ROAD CLASS EA

The types of disturbance referred to above includes, but is not restricted to, quarrying, sewage and infrastructure development, building footprints and major landscaping involving grading below topsoil. Areas identified as being previously disturbed include the Kennedy Road ROW, as well as disturbance related to urban sprawl. In a number of cases, areas disturbed by residential and commercial development have been previously subject to archaeological assessments (Section 1.3.4) (Maps 5-1 to 5-7).



5.0 RECOMMENDATIONS

Based on the findings of the Stage 1 assessment the following recommendations are made, as illustrated in Map 5:

- 1) Areas of previous disturbance exhibit low potential for the recovery of archaeological remains. No further assessment is recommended for these areas.
- 2) The Hagerman East Cemetery is located adjacent to the project area. Given the GPR survey identified anomalies consistent with grave shafts, and given older graves are difficult to identify through a GPR survey, should impacts be planned beyond the disturbed ROW within 10 metres of the cemetery's boundary, a Stage 3 archaeological assessment is recommended. This Stage 3 should include mechanical topsoil removal within 10 metres of the cemetery's edge to ensure no unmarked grave shafts are impacted by the Project. This recommendation is consistent with Section 4.3 Standard 1 Table 4 (MTCS 2011).
- 3) The Hagerman West Cemetery is located adjacent to the project area. Given the GPR survey identified anomalies consistent with grave shafts, and given older graves are difficult to identify through a GPR survey, should impacts be planned beyond the disturbed ROW within 10 metres of the cemetery's boundary, a Stage 3 archaeological assessment is recommended. This Stage 3 should include mechanical topsoil removal within 10 metres of the cemetery's edge to ensure no unmarked grave shafts are impacted by the Project. This recommendation is consistent with Section 4.3 Standard 1 Table 4 (MTCS 2011).
- 4) The Bethesda Lutheran Cemetery is located adjacent to the project area. Given the GPR survey identified anomalies consistent with grave shafts, and given older graves are difficult to identify through a GPR survey, should impacts be planned beyond the disturbed ROW within 10 metres of the cemetery's boundary, a Stage 3 archaeological assessment is recommended. This Stage 3 should include mechanical topsoil removal within 10 metres of the cemetery's edge to ensure no unmarked grave shafts are impacted by the Project. This recommendation is consistent with Section 4.3 Standard 1 Table 4 (MTCS 2011).
- 5) The St. Philip's on-the-hill Anglican Church Cemetery is located adjacent to the project area. Given the GPR survey identified anomalies consistent with grave shafts, and given older graves are difficult to identify through a GPR survey, should impacts be planned beyond the disturbed ROW within 10 metres of the cemetery's boundary, a Stage 3 archaeological assessment is recommended. This Stage 3 should include mechanical topsoil removal within 10 metres of the cemetery's edge to ensure no unmarked grave shafts are impacted by the Project. This recommendation is consistent with Section 4.3 Standard 1 Table 4 (MTCS 2011).

Additionally, should ground disturbance be planned within any of the four cemeteries along Kennedy Road assessment, identification and mitigation of grave features will be required, consistent with requirements under the *Ontario Heritage Act* and the *Funeral, Burial and Cremation Services Act*. These requirements may include Stage 3 test trenching to confirm potential grave features and Stage 4 mechanical topsoil removal. Should there be anticipated impacts to any of the cemeteries the Registrar of Cemeteries at the Ministry of Consumer Services will need to be notified and consulted regarding assessment and mitigation strategies will be required.

The MTCS is asked to review the results and recommendations presented herein and accept this report into the Provincial Register of archaeological reports. The MTCS is also asked to provide a letter concurring with the results presented herein.



6.0 ADVICE ON COMPLIANCE WITH LEGISLATION

This report is submitted to the Minister of Tourism, Culture and Sport as a condition of licensing in accordance with Part VI of the *Ontario Heritage Act*, R.S.O. 1990, c O.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 Tourism, Culture and Sport, a letter will be issued by the ministry stating that there are no further concerns with regards to alterations to archaeological sites by the proposed development.

It is an offence under Sections 48 and 69 of the *Ontario Heritage Act* for any party other than a licenced 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 licenced archaeologist has completed archaeological fieldwork on the site, submitted a report to the Minister stating the site has no further cultural heritage value or interest, and the report has been filed in the Ontario Public Register of Archaeology Reports referred to in Section 65.1 of the *Ontario Heritage Act*.

Should previously undocumented archaeological resources be discovered, they may be representative of a new archaeological site or sites 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*.

The Funeral, Burial and Cremation Services Act, 2002, S.O. 2002, c.33, requires that any person discovering or having knowledge of a burial site shall immediately notify the police or coroner. It is recommended that the Registrar of Cemeteries at the Ministry of Consumer Services is also immediately notified.

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.



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STAGE 1 ARCHAEOLOGICAL ASSESSMENT - KENNEDY ROAD CLASS EA

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8.0 IMAGES



Image 1: Area of previous disturbance adjacent to Kennedy Road, facing south (see Map 5-1)



Image 2: Area of previous disturbance adjacent to Kennedy Road, facing south-southwest (see Map 5-2)



Image 3: Area of previous disturbance adjacent to Kennedy Road, facing north (see Map 5-2)



Image 4: View of Hagerman East Cemetery adjacent to Kennedy Road, facing north (see Map 5-2)



STAGE 1 ARCHAEOLOGICAL ASSESSMENT - KENNEDY ROAD CLASS EA



Image 5: Area of previous disturbance adjacent to Kennedy Road, facing northeast (see Map 5-3)

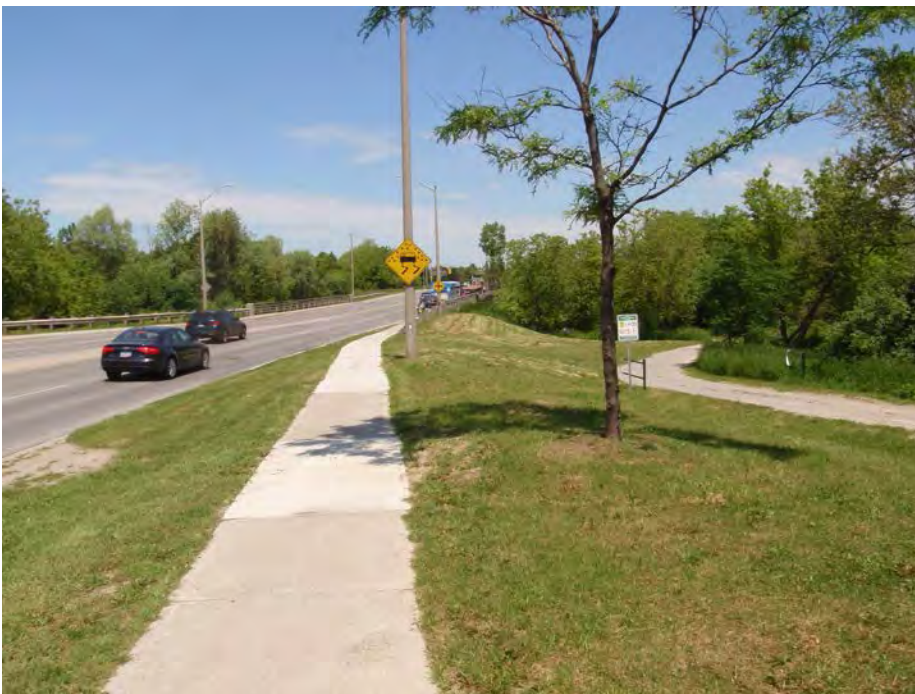


Image 6: Area of previous disturbance adjacent to Kennedy Road and the Rouge River, facing north-northeast (see Map 5-4)



STAGE 1 ARCHAEOLOGICAL ASSESSMENT - KENNEDY ROAD CLASS EA



Image 7: Area of previous disturbance adjacent to Kennedy Road, facing north-northeast (see Map 5-5)



Image 8: View of Bethesda Cemetery adjacent to Kennedy Road, facing north (see Map 5-6)



STAGE 1 ARCHAEOLOGICAL ASSESSMENT - KENNEDY ROAD CLASS EA



Image 9: Area of previous disturbance adjacent to Kennedy Road, facing south (see Map 5-7)



Image 10: Area of previous disturbance adjacent to Kennedy Road, facing south (see Map 5-7)



Image 11: Area of previous disturbance adjacent to Kennedy Road, facing south (see Map 5-6)



Image 12: Area of previous disturbance adjacent to Kennedy Road, facing south-southwest (see Map 5-4)



STAGE 1 ARCHAEOLOGICAL ASSESSMENT - KENNEDY ROAD CLASS EA



Image 13: Area of previous disturbance adjacent to Kennedy Road, facing north-northeast (see Map 5-4)



Image 14: Area of previous disturbance adjacent to Kennedy Road, facing southwest (see Map 5-4)



STAGE 1 ARCHAEOLOGICAL ASSESSMENT - KENNEDY ROAD CLASS EA



Image 15: Area of previous disturbance adjacent to Kennedy Road, facing north-northwest (see Map 5-3)



Image 16: Area of previous disturbance adjacent to Kennedy Road, facing southeast (see Map 5-3)



STAGE 1 ARCHAEOLOGICAL ASSESSMENT - KENNEDY ROAD CLASS EA



Image 17: Hagerman West Cemetery adjacent to Kennedy Road, facing north (see Map 5-2)

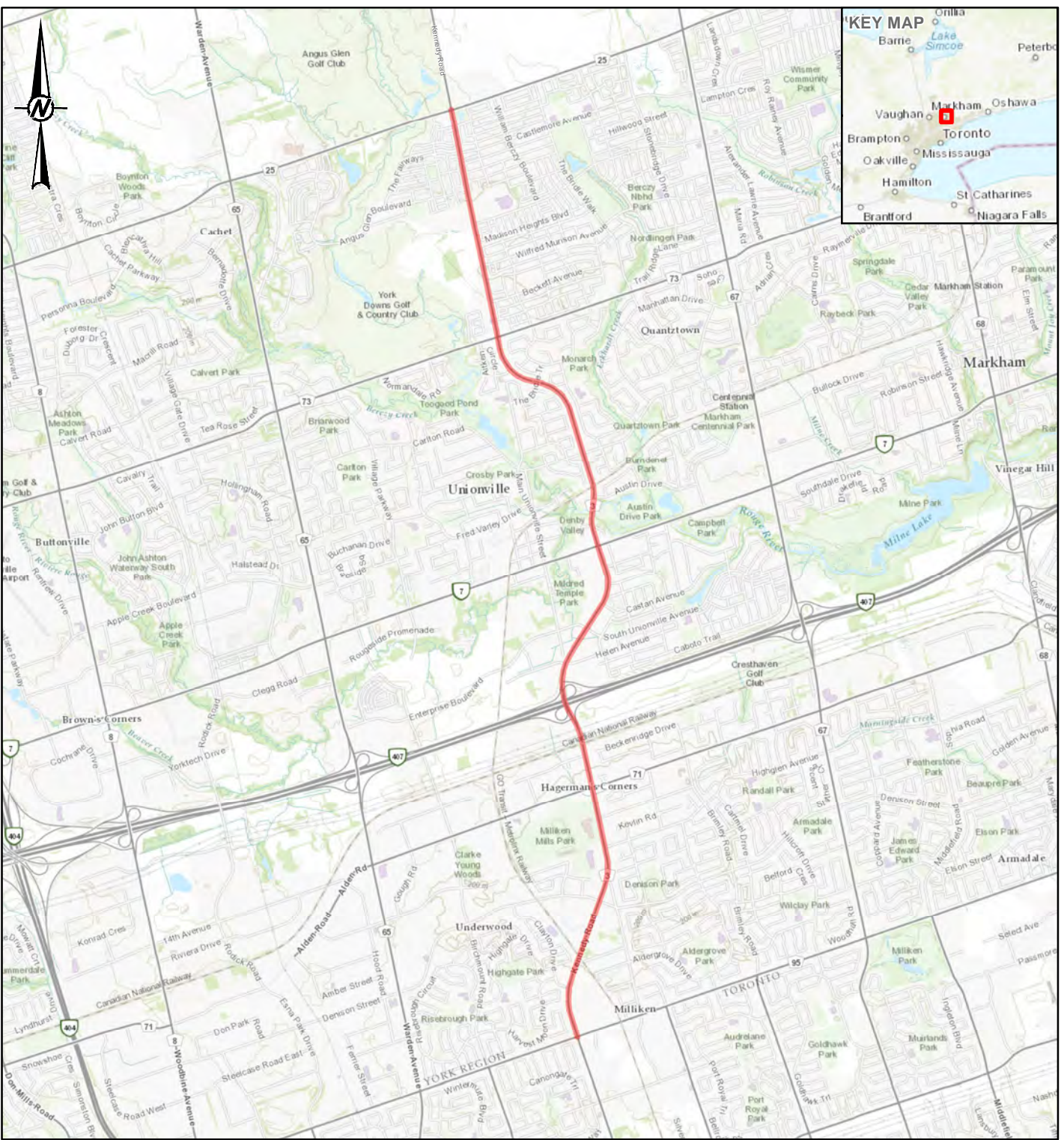


Image 18: Area of previous disturbance adjacent to Kennedy Road, small slope to fallow field outside of project area, facing southeast (see Map 5-1)



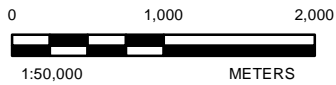
9.0 MAPS

All mapping follows on succeeding pages.



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PROJECT AREA



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2. PROJECTION: TRANSVERSE MERCATOR DATUM: NAD 83 COORDINATE SYSTEM: UTM ZONE 17N

CLIENT
HDR CORPORATION

PROJECT
KENNEDY ROAD (Y.R. 3)
STEELES AVENUE (Y.R. 95) TO MAJOR MACKENZIE DRIVE (Y.R. 25),
CITY OF MARKHAM, REGION OF YORK

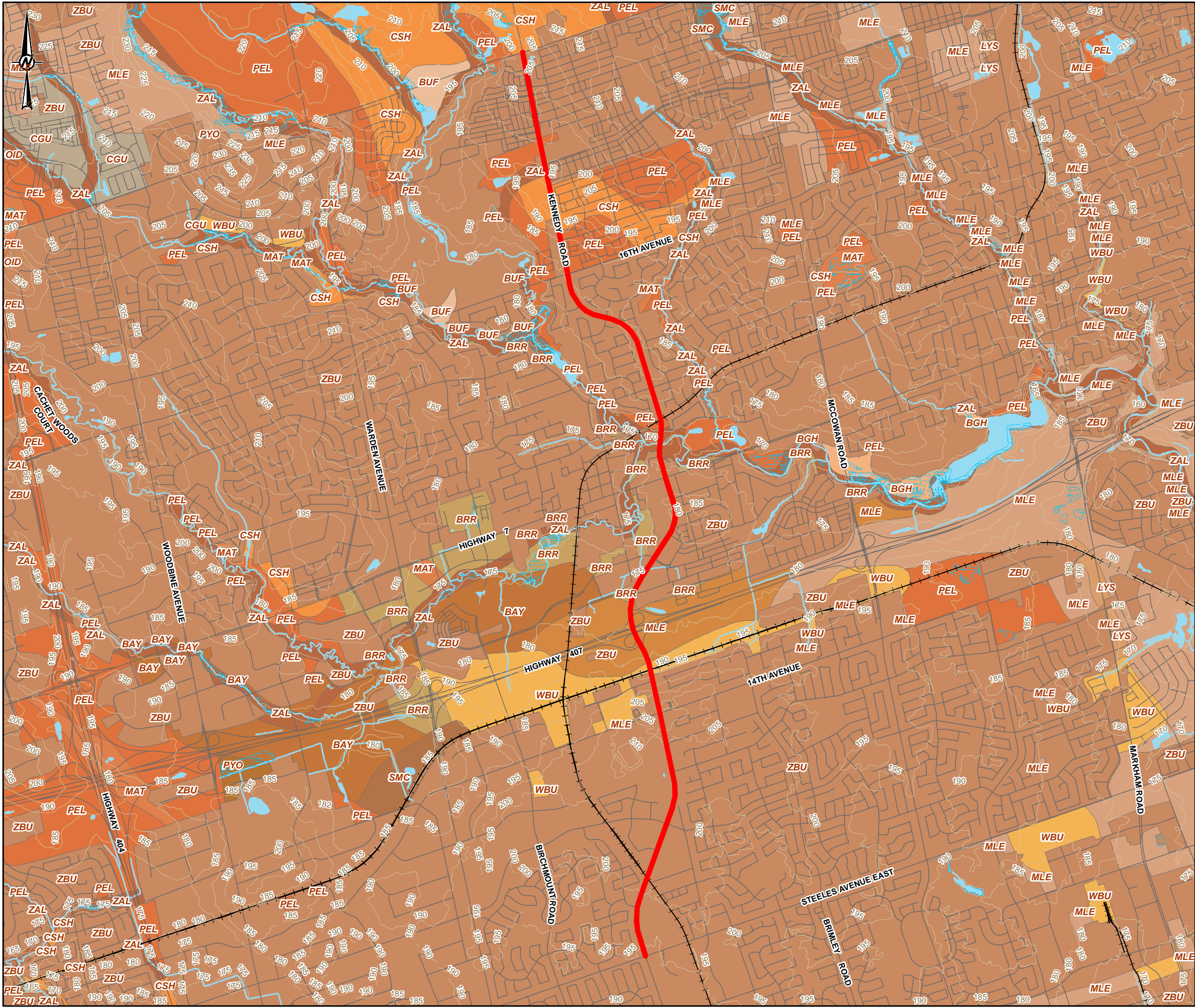
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| | DESIGNED | JR |
| | PREPARED | SFC/LMM |
| | REVIEWED | JL |
| APPROVED | CP | |

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LEGEND

- PROJECT AREA
- ROAD
- RAILWAY
- CONTOUR
- WATERCOURSE
- WATERBODY
- WETLAND

SOIL TYPE

- BERRIEN SANDY LOAM, BRR
- BOTTOM LAND, ZAL
- BRADY SANDY LOAM, BAY
- BRIGHTON SANDY LOAM, BGH
- BUILT UP AREA, ZBU
- BURFORD LOAM, BUF
- CASHEL CLAY, CSH
- CHINGUACOUSY CLAY LOAM, CGU
- LYONS LOAM, LYS
- MALTON CLAY, MAT
- MILLIKEN LOAM, MLE
- MILLIKEN SANDY LOAM, MLE
- ONEIDA CLAY LOAM, OID
- PEEL CLAY, PEL
- PONTYPOOL SANDY LOAM, PYO
- SIMCOE CLAY LOAM, SMC
- WOBURN LOAM, WBU

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2. PROJECTION: TRANSVERSE MERCATOR DATUM: NAD 83
COORDINATE SYSTEM: UTM ZONE 17N

CLIENT
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PROJECT
KENNEDY ROAD (Y.R. 3)
STEELES AVENUE (Y.R. 95) TO MAJOR MACKENZIE DRIVE (Y.R. 25),
CITY OF MARKHAM, REGION OF YORK

TITLE
SOIL AND TOPOGRAPHY

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| PREPARED | JR/SFC | |
| REVIEWED | JL | |
| APPROVED | CP | |

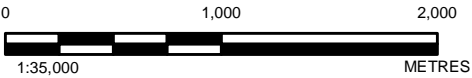


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COORDINATE SYSTEM: UTM ZONE 17N

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PROJECT

KENNEDY ROAD (Y.R. 3)

STEELES AVENUE (Y.R. 95) TO MAJOR MACKENZIE DRIVE (Y.R. 25),

CITY OF MARKHAM, REGION OF YORK

TITLE

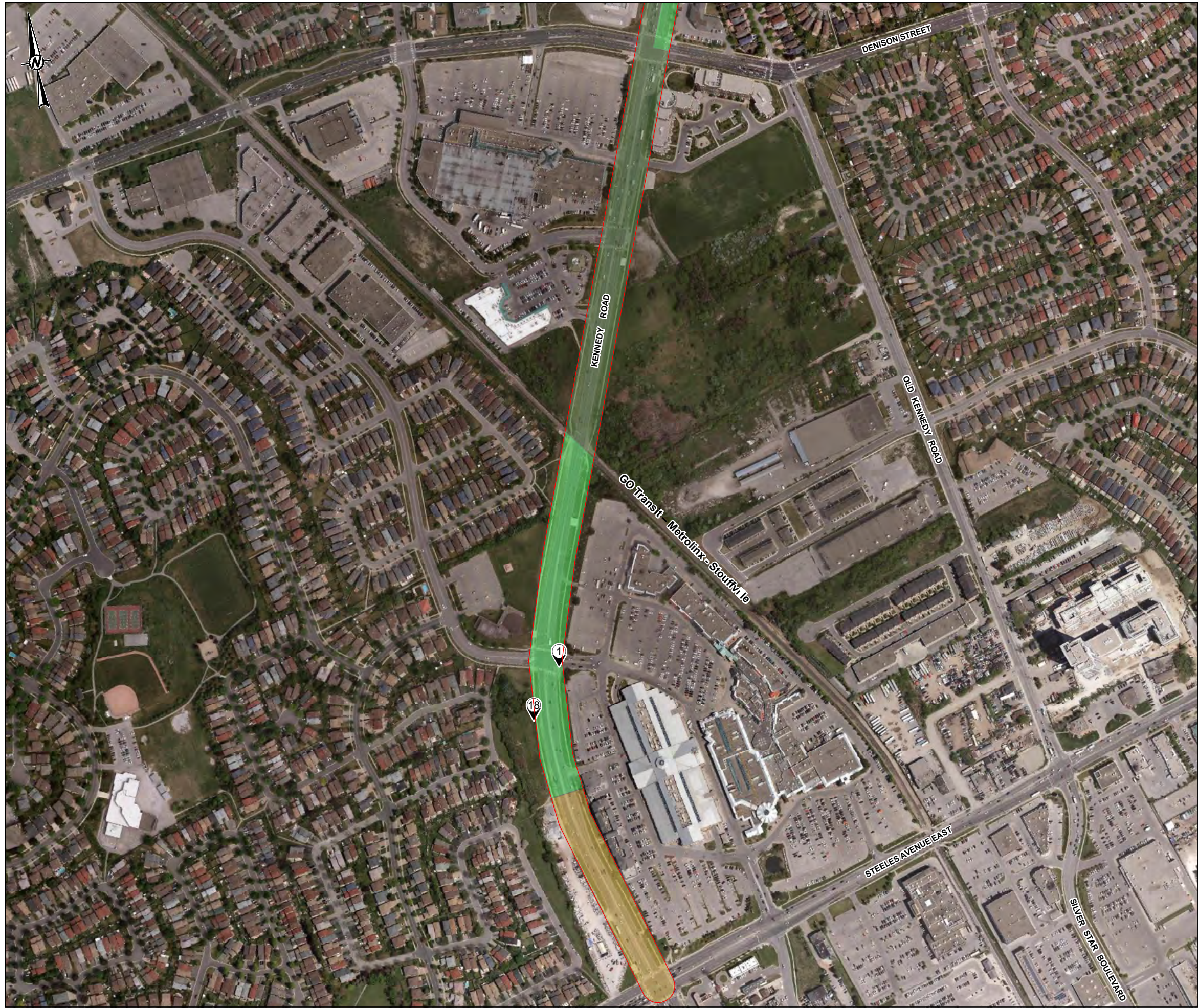
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| PREPARED | JR/SFC | |
| REVIEWED | JL | |
| APPROVED | CP | |



PROJECT NO. 1664178 CONTROL 0003 REV. 0 MAP 4

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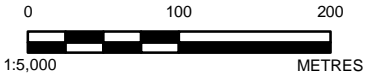
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PREVIOUSLY ASSESSED, NO FURTHER ASSESSMENT RECOMMENDED (ASI)

PREVIOUSLY ASSESSED, NO FURTHER ASSESSMENT RECOMMENDED (ARCHEOWORKS 2015)



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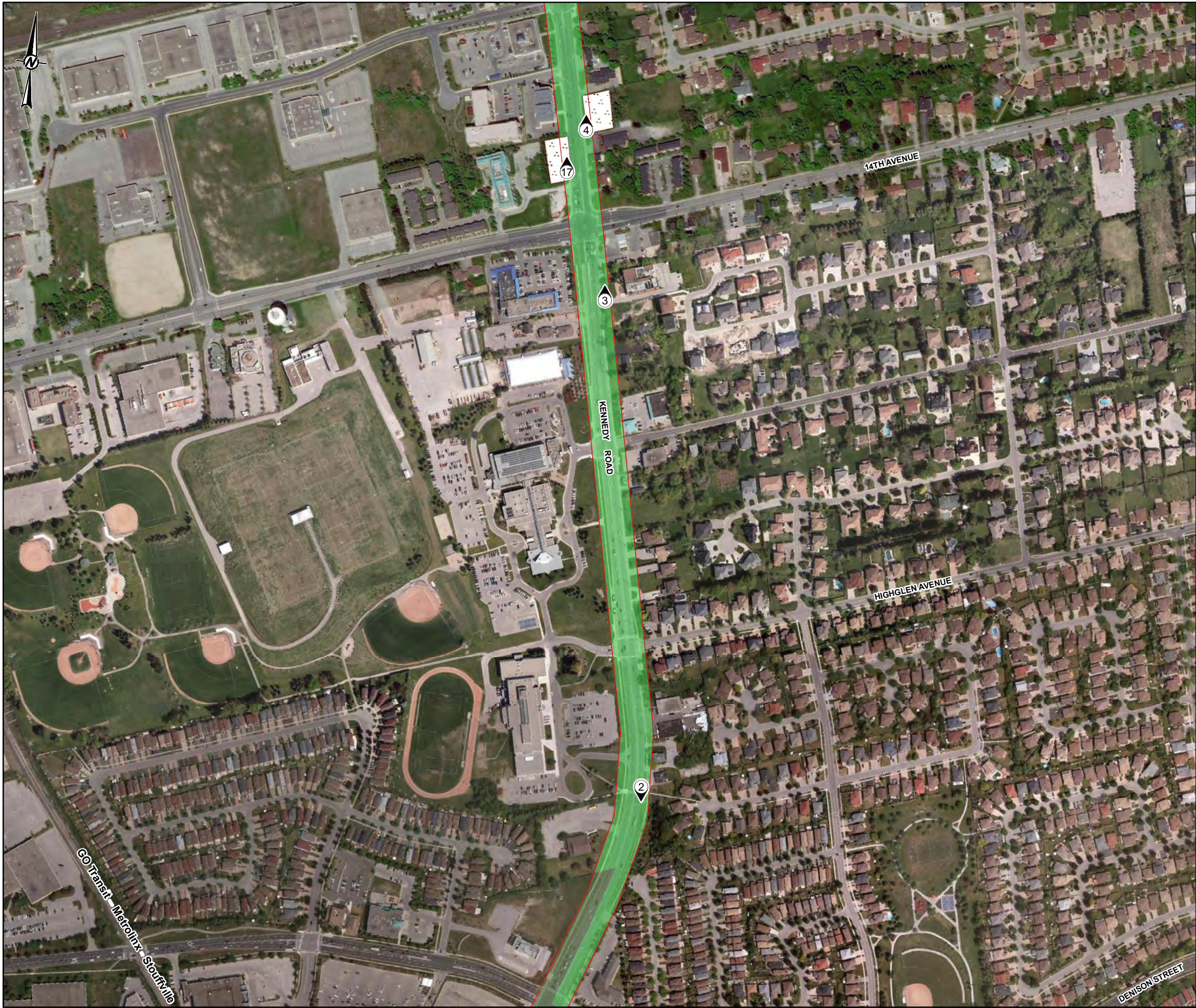
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KENNEDY ROAD (Y.R. 3)
STEELES AVENUE (Y.R. 95) TO MAJOR MACKENZIE DRIVE (Y.R. 25),
CITY OF MARKHAM, REGION OF YORK

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| | PREPARED | SFC/LMM |
| | REVIEWED | JL |
| | APPROVED | CP |

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 - HISTORIC CEMETERY - STAGE 3 TRENCHING WITHIN 10 METRES OF CEMETERY PROPERTY RECOMMENDED IF IMPACTS EXTEND BEYOND DISTURBED ROADWAY



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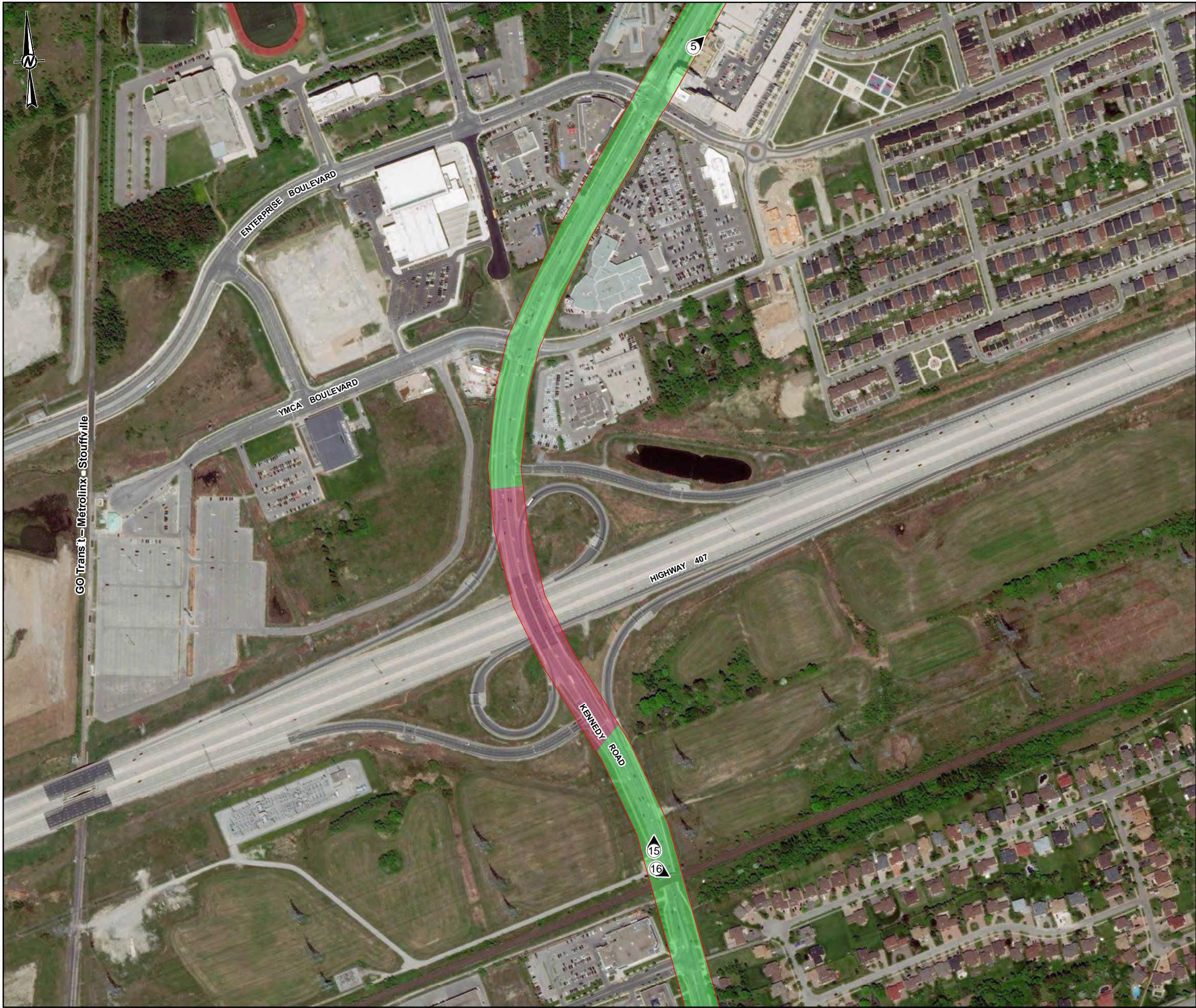
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STEELES AVENUE (Y.R. 95) TO MAJOR MACKENZIE DRIVE (Y.R. 25),
CITY OF MARKHAM, REGION OF YORK

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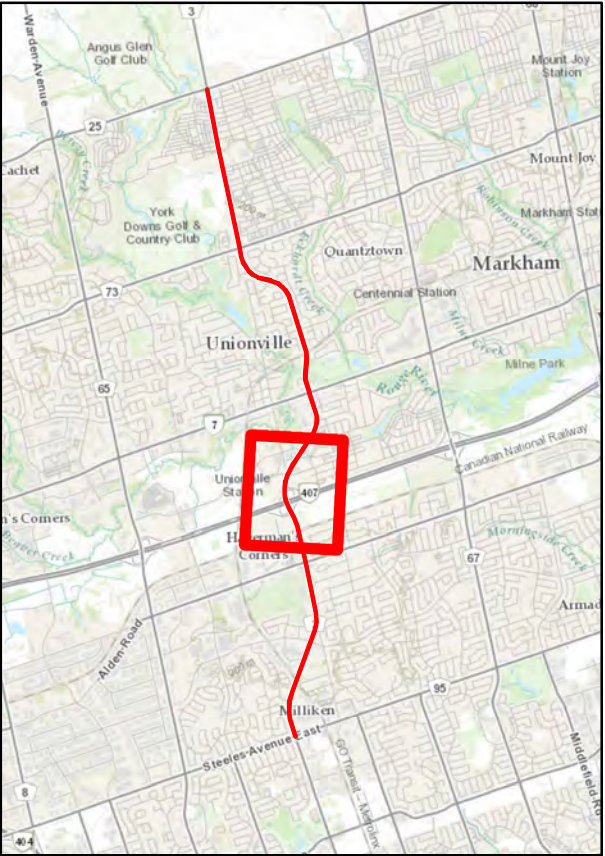
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| | REVIEWED | JL |
| | APPROVED | CP |



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| PROJECT NO. 1664178 | CONTROL 0003 | REV. 0 | MAP 5-2 |
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- LEGEND
- IMAGE NUMBER AND PHOTO DIRECTION (REFER TO SECTION 8.0)
 - PROJECT
 - AREAS OF PREVIOUS DISTURBANCE, NO FURTHER ASSESSMENT RECOMMENDED
 - PREVIOUSLY ASSESSED, NO FURTHER ASSESSMENT RECOMMENDED (DILLON 1997)



REFERENCE(S)
1. BASE DATA: MNR/LIO, OBTAINED 2016; ESRI, HERE, DELOME, INTERMAP, INCREMENT P CORP., GEBCO, USGS, FAO, NPS, NRCAN, GEBCO, IGN, KADASTER NL, ORDNANCE SURVEY, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), SWISSTOPO, MAPMYINDIA, © OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY
2. PROJECTION: TRANSVERSE MERCATOR DATUM: NAD 83
COORDINATE SYSTEM: UTM ZONE 17N

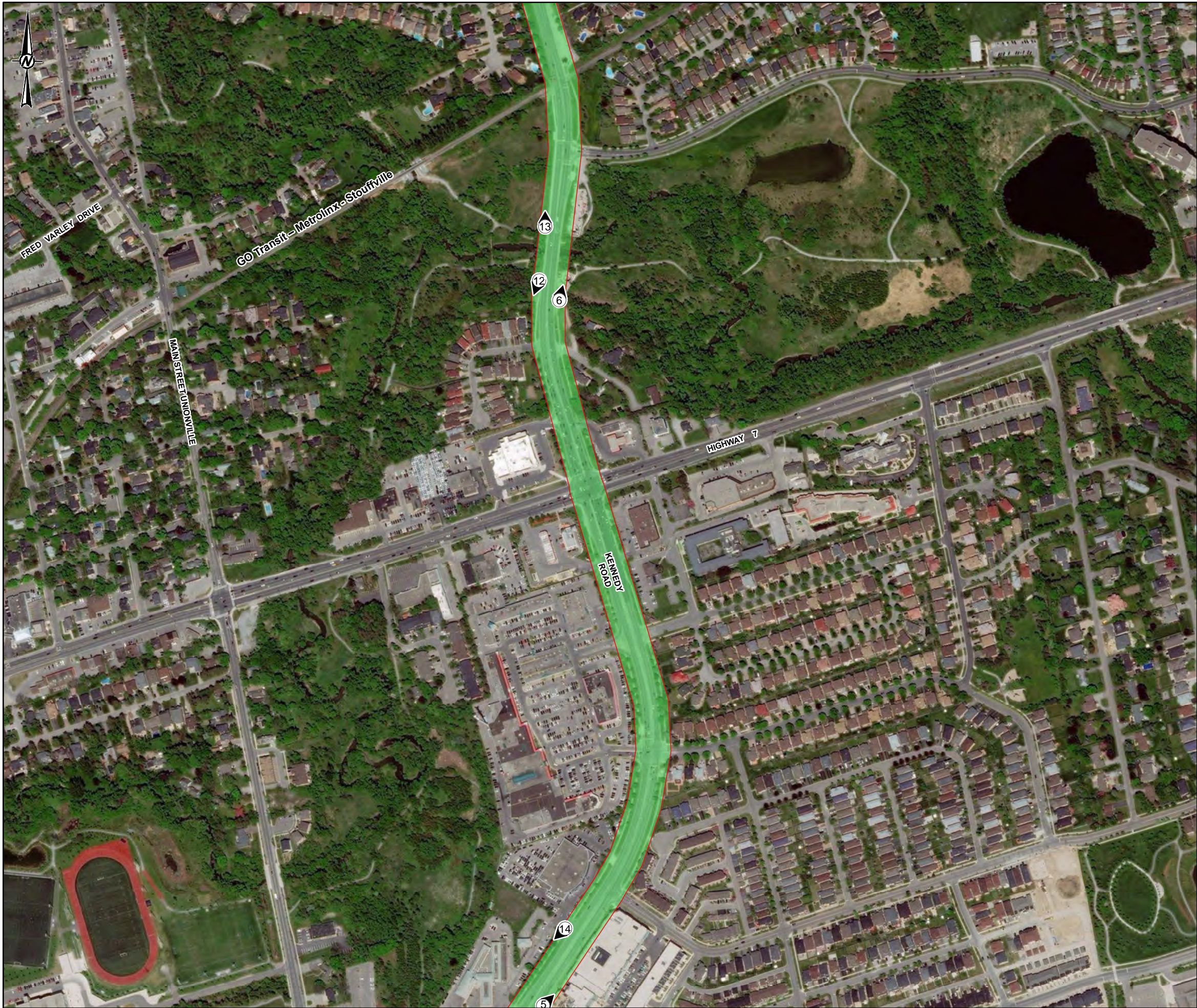
CLIENT
HDR CORPORATION

PROJECT
KENNEDY ROAD (Y.R. 3)
STEELES AVENUE (Y.R. 95) TO MAJOR MACKENZIE DRIVE (Y.R. 25),
CITY OF MARKHAM, REGION OF YORK

TITLE
STAGE 1 ASSESSMENT RESULTS AND PHOTOGRAPHIC KEY

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| CONSULTANT | YYYY-MM-DD | 2017-10-11 |
| | DESIGNED | JR |
| | PREPARED | SFC/LMM |
| | REVIEWED | JL |
| | APPROVED | |

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| PROJECT NO. 1664178 | CONTROL 0003 | REV. 0 | MAP 5-3 |
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LEGEND

IMAGE NUMBER AND PHOTO DIRECTION (REFER TO SECTION 8.0)

PROJECT

AREAS OF PREVIOUS DISTURBANCE, NO FURTHER ASSESSMENT RECOMMENDED



REFERENCE(S)

1. BASE DATA: MNRF LIO, OBTAINED 2016; ESRI, HERE, DELORME, INTERMAP, INCREMENT P CORP., GEBCO, USGS, FAO, NPS, NRCAN, GEOBASE, IGN, KADASTER NL, ORDINANCE SURVEY, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), SWISSTOPO, MAPMYINDIA, © OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY

2. PROJECTION: TRANSVERSE MERCATOR DATUM: NAD 83
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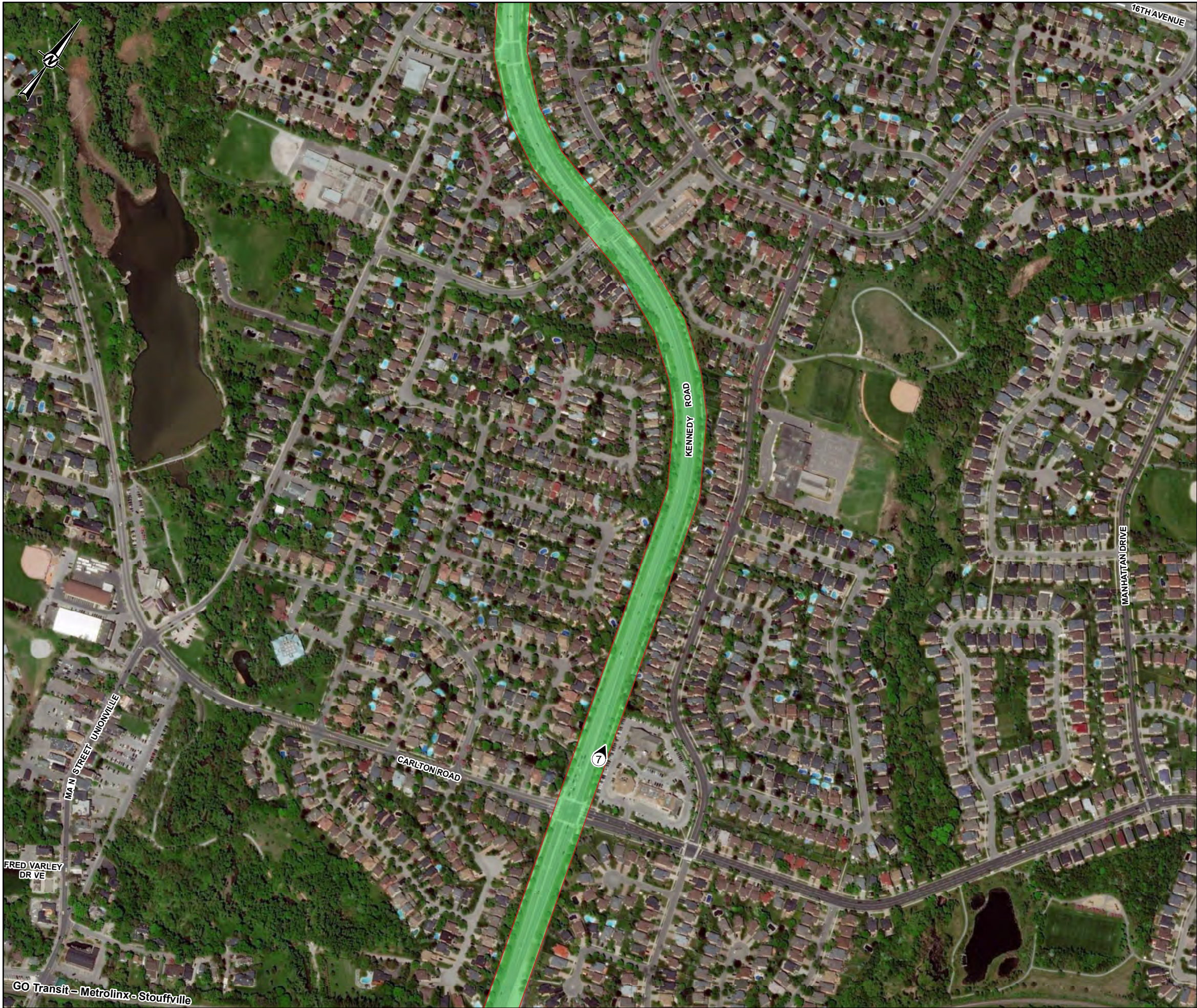
CLIENT
HDR CORPORATION

PROJECT
KENNEDY ROAD (Y.R. 3)
STEELES AVENUE (Y.R. 95) TO MAJOR MACKENZIE DRIVE (Y.R. 25),
CITY OF MARKHAM, REGION OF YORK


TITLE
STAGE 1 ASSESSMENT RESULTS AND PHOTOGRAPHIC KEY


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| CONSULTANT | YYYY-MM-DD | 2017-10-11 |
| | DESIGNED | JR |
| | PREPARED | SFC/LMM |
| | REVIEWED | JL |
| | APPROVED | CP |




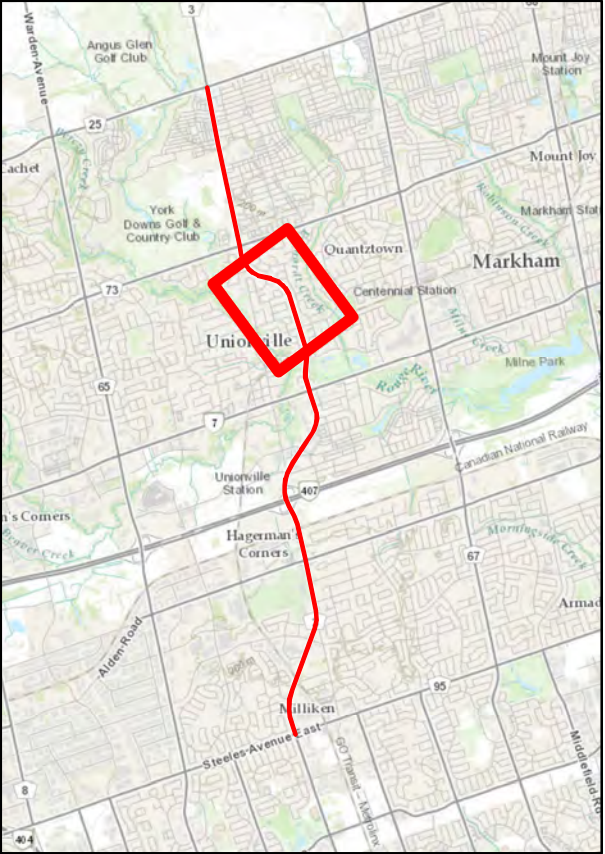


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 IMAGE NUMBER AND PHOTO DIRECTION (REFER TO SECTION 8.0)

 PROJECT

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REFERENCE(S)

1. BASE DATA: MNRF LIO, OBTAINED 2016; ESRI, HERE, DELORME, INTERMAP, INCREMENT P CORP., GEBCO, USGS, FAO, NPS, NRCAN, GEODATA, IGN, KADASTER NL, ORDINANCE SURVEY, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), SWISSTOPO, MAPMYINDIA, © OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY

2. PROJECTION: TRANSVERSE MERCATOR DATUM: NAD 83
COORDINATE SYSTEM: UTM ZONE 17N

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PROJECT
KENNEDY ROAD (Y.R. 3)
STEELES AVENUE (Y.R. 95) TO MAJOR MACKENZIE DRIVE (Y.R. 25),
CITY OF MARKHAM, REGION OF YORK

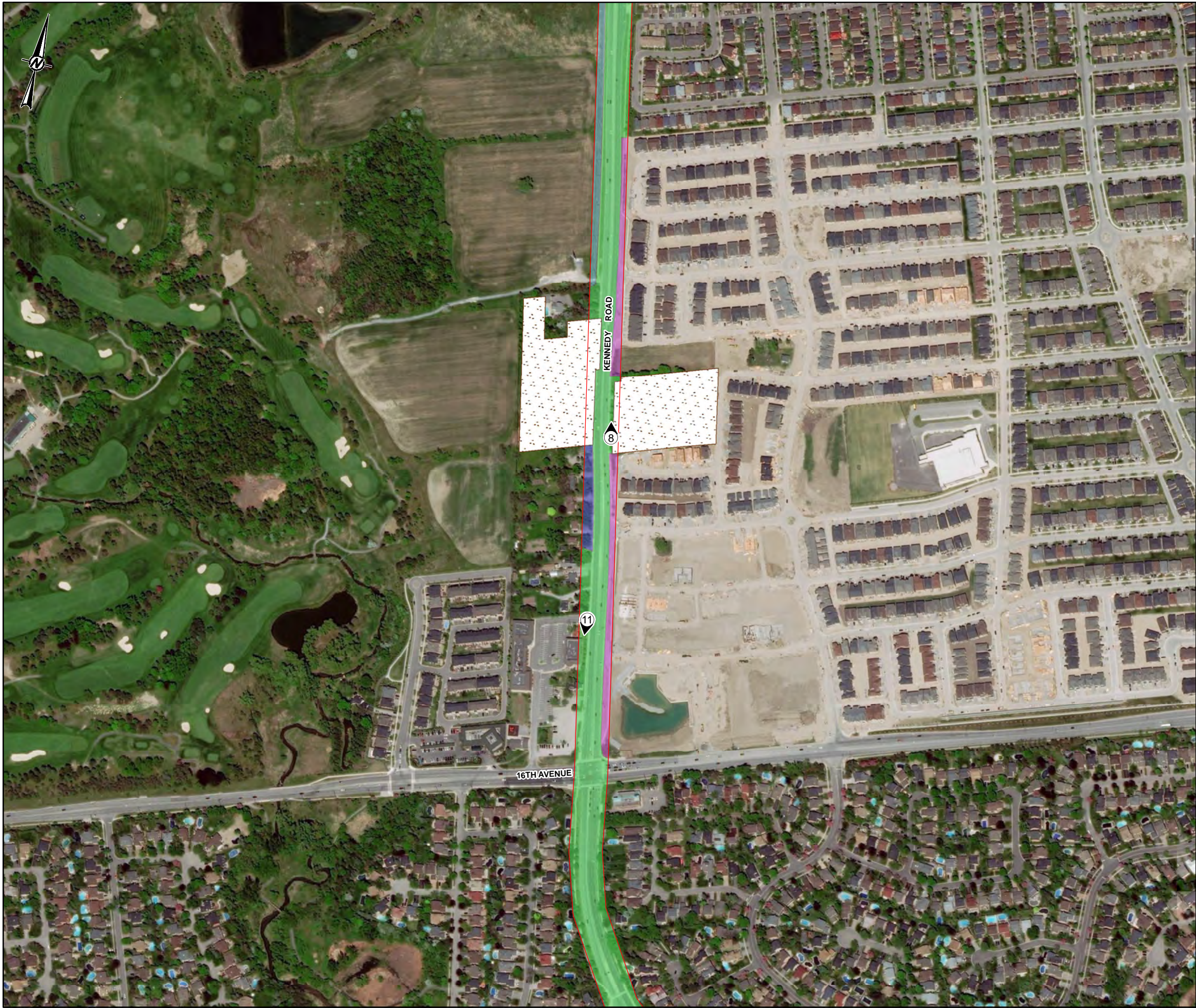
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| CONSULTANT | YYYY-MM-DD | 2017-10-11 |
| | DESIGNED | JR |
| | PREPARED | SFC/LMM |
| | REVIEWED | JL |
| | APPROVED | CP |

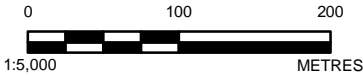


PROJECT NO. 1664178 CONTROL 0003 REV. 0 MAP 5-5

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- LEGEND**
- IMAGE NUMBER AND PHOTO DIRECTION (REFER TO SECTION 8.0)
 - PROJECT
 - AREAS OF PREVIOUS DISTURBANCE, NO FURTHER ASSESSMENT RECOMMENDED
 - PREVIOUSLY ASSESSED, NO FURTHER ASSESSMENT RECOMMENDED (ASI)
 - PREVIOUSLY ASSESSED, NO FURTHER ASSESSMENT RECOMMENDED (GOLDER 2016)
 - PREVIOUSLY ASSESSED, NO FURTHER ASSESSMENT RECOMMENDED (GOLDER 2017)
 - HISTORIC CEMETERY - STAGE 3 TRENCHING WITHIN 10 METRES OF CEMETERY PROPERTY RECOMMENDED IF IMPACTS EXTEND BEYOND DISTURBED ROADWAY



REFERENCE(S)

1. BASE DATA: MNRF LIO, OBTAINED 2016; ESRI, HERE, DELORME, INTERMAP, INCREMENT P CORP., GEBCO, USGS, FAO, NPS, NRCAN, GEOBASE, IGN, KADASTER NL, ORDINANCE SURVEY, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), SWISSTOPO, MAPMYINDIA, © OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY

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COORDINATE SYSTEM: UTM ZONE 17N

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PROJECT
KENNEDY ROAD (Y.R. 3)
STEELES AVENUE (Y.R. 95) TO MAJOR MACKENZIE DRIVE (Y.R. 25),
CITY OF MARKHAM, REGION OF YORK

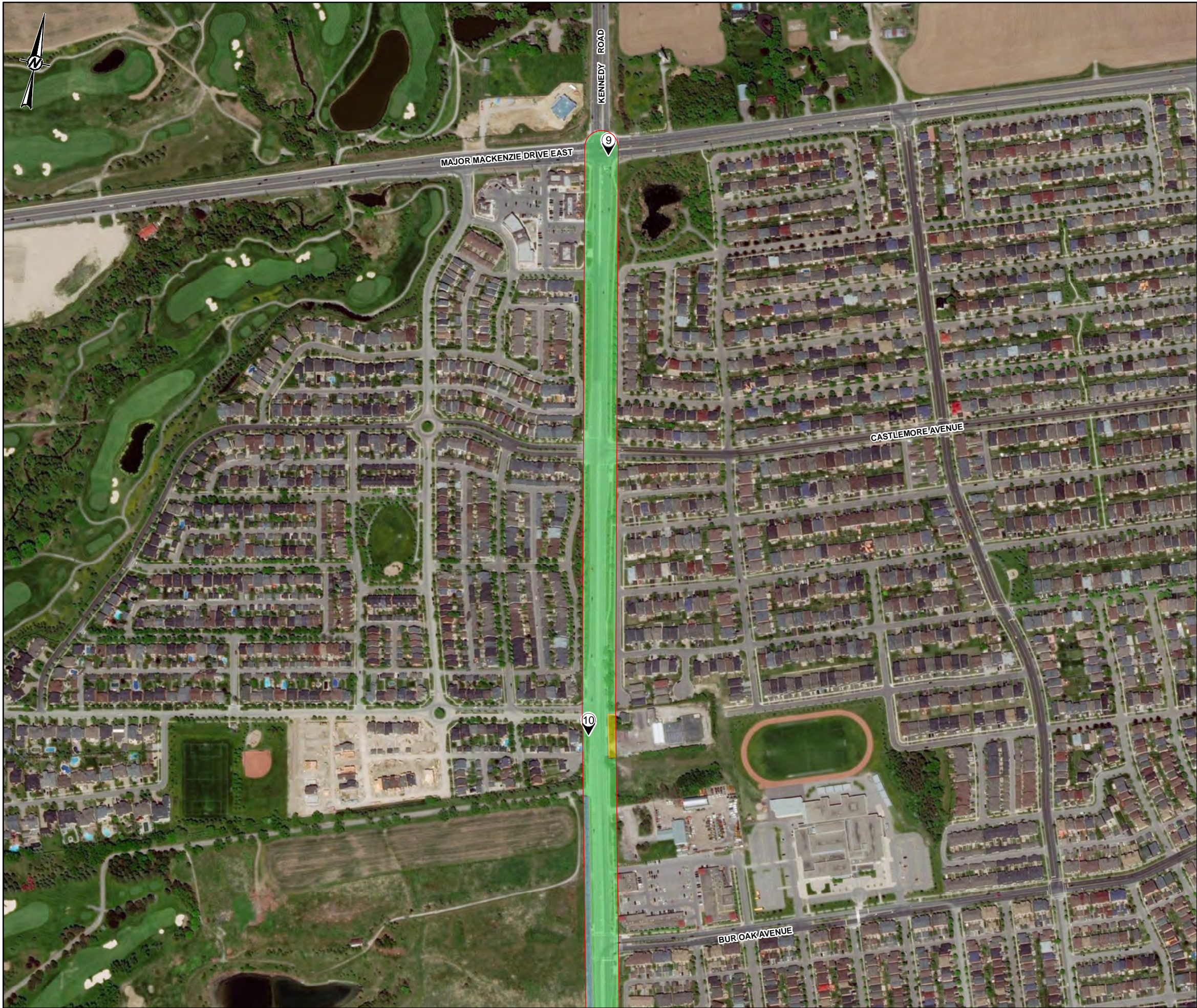
TITLE
STAGE 1 ASSESSMENT RESULTS AND PHOTOGRAPHIC KEY

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| CONSULTANT | YYYY-MM-DD | 2017-10-11 |
| | DESIGNED | JR |
| | PREPARED | SFC/LMM |
| | REVIEWED | JL |
| | APPROVED | CP |



PROJECT NO. 1664178 CONTROL 0003 REV. 0 MAP 5-6

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: 28mm



- LEGEND
- IMAGE NUMBER AND PHOTO DIRECTION (REFER TO SECTION 8.0)
 - PROJECT
 - AREAS OF PREVIOUS DISTURBANCE, NO FURTHER ASSESSMENT RECOMMENDED
 - PREVIOUSLY ASSESSED, NO FURTHER ASSESSMENT RECOMMENDED (GOLDER 2017)
 - PREVIOUSLY ASSESSED, NO FURTHER ASSESSMENT RECOMMENDED (TAI)



REFERENCE(S)
1. BASE DATA: MNRF LIO, OBTAINED 2016; ESRI, HERE, DELORME, INTERMAP, INCREMENT P CORP., GEBCO, USGS, FAO, NPS, NRCAN, GEODATA, IGN, KADASTER NL, ORDINANCE SURVEY, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), SWISSTOPO, MAPMYINDIA, © OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY
2. PROJECTION: TRANSVERSE MERCATOR DATUM: NAD 83
COORDINATE SYSTEM: UTM ZONE 17N

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PROJECT
KENNEDY ROAD (Y.R. 3)
STEELES AVENUE (Y.R. 95) TO MAJOR MACKENZIE DRIVE (Y.R. 25),
CITY OF MARKHAM, REGION OF YORK

TITLE
STAGE 1 ASSESSMENT RESULTS AND PHOTOGRAPHIC KEY

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| CONSULTANT | YYYY-MM-DD | 2017-10-11 |
| | DESIGNED | JR |
| | PREPARED | SFC/LMM |
| | REVIEWED | JL |
| | APPROVED | CP |

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| 1664178 | 0003 | 0 | 5-7 |



10.0 IMPORTANT INFORMATION AND LIMITATIONS OF THIS REPORT

Golder has prepared this report in a manner consistent with that level of care and skill ordinarily exercised by members of the archaeological profession currently practicing under similar conditions in the jurisdiction in which the services are provided, subject to the time limits and physical constraints applicable to this report. No other warranty, expressed or implied is made.

This report has been prepared for the specific site, design objective, developments and purpose described to Golder by HDR (the Client). The factual data, interpretations and recommendations pertain to a specific project as described in this report and are not applicable to any other project or site location.

The information, recommendations and opinions expressed in this report are for the sole benefit of the Client. No other party may use or rely on this report or any portion thereof without Golder's express written consent. If the report was prepared to be included for a specific permit application process, then upon the reasonable request of the Client, Golder may authorize in writing the use of this report by the regulatory agency as an Approved User for the specific and identified purpose of the applicable permit review process. Any other use of this report by others is prohibited and is without responsibility to Golder. The report, all plans, data, drawings and other documents as well as electronic media prepared by Golder are considered its professional work product and shall remain the copyright property of Golder, who authorizes only the Client and Approved Users to make copies of the report, but only in such quantities as are reasonably necessary for the use of the report by those parties. The Client and Approved Users may not give, lend, sell or otherwise make available the report or any portion thereof to any other party without the express written permission of Golder. The Client acknowledges that electronic media is susceptible to unauthorized modification, deterioration and incompatibility and therefore the Client cannot rely upon the electronic media versions of Golder's report or other work products.

Unless otherwise stated, the suggestions, recommendations and opinions given in this report are intended only for the guidance of the Client in the design of the specific project.

Special risks occur whenever archaeological investigations are applied to identify subsurface conditions and even a comprehensive investigation, sampling and testing program may fail to detect all or certain archaeological resources. The sampling strategies incorporated in this study comply with those identified in the Ministry of Tourism, Culture and Sport's 2011 *Standards and Guidelines for Consultant Archaeologists*.

This Report was authored under a Subconsultant Agreement between HDR and Golder for the Regional Municipality of York's ("Owner") projects. The Report is provided to HDR and Regional Municipality of York for their use, utilizing their judgment, in fulfilling a portion of HDR's particular scope of work. No other party may rely upon this report, or any portion thereof, without Golder's express written consent and any reliance of the reports by others will be at that user's sole risk and liability, notwithstanding that they may have received this Report through an appropriate user. In addition, Golder shall not be liable for any use of the Report for any purpose other than that for which the same was originally prepared or provided by Golder, or any improper use of this Report, or to any party other than HDR.



Report Signature Page

GOLDER ASSOCIATES LTD.

Jamie Lemon, M.A.
Archaeologist

Carla Parslow, Ph.D.
Associate, Archaeologist

JL/CP/lb

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APPENDIX A

Geophysical Technical Memorandum

DATE August 2, 2017**PROJECT No.** 1664178**TO** Tyrone Gan
HDR**CC** Jamie Lemon**FROM** Peter Giamou, Christopher Phillips**EMAIL** pgiamou@golder.com;
cphillips@golder.com**KENNEDY ROAD GROUND PENETRATING RADAR GPR INVESTIGATION**

This technical memorandum presents the results of the geophysical investigation carried out at four cemeteries along Kennedy Road, in York Region, Ontario. The cemeteries that were surveyed were the St. Philips on the Hill Cemetery, Bethesda Lutheran Cemetery, Hagermans East Cemetery, and Hagermans West Cemetery. The objective of the geophysical survey was to map the presence of any potential burial graves/interments within 26 metres of the centreline of Kennedy Road on the property of each Cemetery. Golder Associates Ltd. (Golder) used Ground Penetrating Radar (GPR) technology to meet the objective of this investigation.

Methodology

A GPR system consists of two antennae (transmitter and receiver), a control console/computer for real-time graphic display and data recording, and a wheel odometer to measure travelled distance. In the reflection profiling mode, the antennae (separated by a fixed distance) are moved along a traverse and readings are taken at discrete intervals. At each step, pulses of radio frequency electromagnetic energy (megahertz range) are transmitted and reflections are received from subsurface horizons/objects. The reflecting horizons occur where there is an abrupt change in the subsurface material dielectric permittivity. The amplitude of received radar energy is recorded as a function of time, processed in real-time for display purposes, and the raw data recorded digitally for post-processing and presentation.

GPR signal quality and strength depend on dielectric property contrasts and the amount of clutter or reflections in the data. GPR signal penetration depends primarily on soil type and water content. A water saturated silt or clay layer may completely attenuate the GPR signal resulting in very poor signal penetration. A reinforced concrete pad can also mask any GPR signal from penetrating into the soils. With repeated line-by-line coverage of an area, features will create a pattern which can then be further interpreted.

Field Work

The field work was carried out between June 27 and 29, 2017. The Cemeteries were surveyed in the order requested by the client, with the St. Philips on-the-hill Anglican Church Cemetery surveyed first on June 27th, then Bethesda Lutheran Cemetery on June 28th, followed by Hagerman East and West Cemeteries on June 29th.

The GPR survey was completed using a Sensors & Software Noggin GPR system with SmartCart configuration. GPR Data were acquired with 250 MHz antennae and data sampling triggered by a wheel odometer along each

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line at 0.05 metre intervals. GPR data were acquired on a best-effort basis (given some obstructing fences, bushes, trees and tall grass) along lines spaced 0.5 metres apart. The GPR lines were oriented parallel to Kennedy road, which was also generally parallel to the row layout of the gravestones in the cemeteries.

Each Cemetery was surveyed at least 20 metres from the outside edge of the sidewalk on Kennedy Road. This resulted in coverage well beyond the requested 26 metres coverage from the centreline of Kennedy Road.

The GPR survey was collected at walking speed pushing the GPR system. As features such as grave stones, trees, or other obstacles were passed their location was marked in the system to facilitate processing and positioning of the data. A Trimble GeoXH differential GPS was used to survey the locations of the survey grids collected to accurately position the collected grid locations.

Processing and Interpretation

The GPR data were processed and gained for presentation as individual cross-sections using the Ekko_Mapper (Sensors & Software) software package. The GPR data were plotted with a ground wave velocity of 0.08 metres per nanosecond, which was calculated by curve matching features in the data.

Plate 1 below shows the typical GPR signal response from data collected along one line within St. Philips on the Hill Cemetery. From this profile we see the top of the interments ranging between 0.8 and 1.2 metres below ground surface.

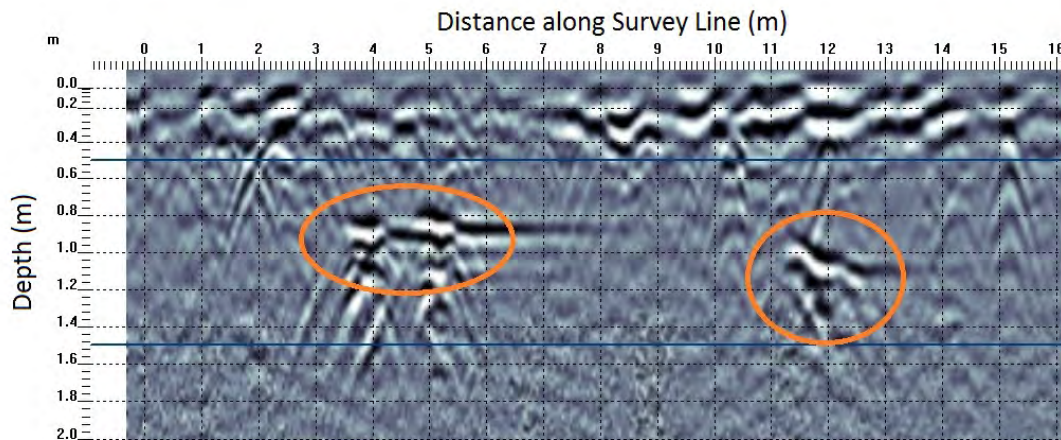


Plate 1: GPR profile collected at St. Philips on the Hill Cemetery showing 'typical' interpreted interment responses consistent with graves.

For cemetery investigations, the older interments generally have a weaker amplitude response making them more difficult to identify. The weaker response is usually a combination of the collapse of coffins without vaults resulting in a less sharp contrast without gap space, and, the assimilation of surrounding soils over time making any excavation diffraction signals disappear.

The GPR data were analysed and interpreted for features representative of a response similar to the test line over known graves as shown in Plate 1. With repeated line-by-line coverage of an area, buried features will create recognizable patterns which can then be further interpreted. The quality and strength of a GPR response will also

determine whether a specific feature can be detected. Signal quality and strength depends on dielectric property contrasts and the amount of clutter or reflections in the data.

The GPR response from an interment is:

- often a little wider compared to something like a pipe or boulder;
- usually within the 1 to 2 m depth range;
- often amongst a grouping of other adjacent interments;
- limited to small footprint and not part of a large or extended linear feature (utility); and
- often displayed in regular rows if part of a cemetery plan.

The GPR data signal quality and strength were excellent with signal penetration up to 2.5 metres below ground surface. The multiple profiles of GPR data acquired at this site were processed for energy reflectance to generate plan map depth-slices. For plan presentation and interpretation of the data a depth window of 0.25 to 1.25 metres was selected to capture the depth range of typical graves to generate a surface map showing the energy response within that depth window within the surveyed area. These plots are presented on Figures 1, 3, 5, and 7, for the individual cemeteries. This data shows a good plan view of anomalies at depth, which can be used to interpret the location of grave locations within the cemeteries.

The background regions (dark blue) on Figures 1, 3, 5, and 7 are areas where no signal property contrasts occur suggesting no buried features. Red areas indicate higher amplitudes of reflected energy from a potential subsurface object.

Figures 2, 4, 6, and 8 show the interpretation of the GPR depth slice images, showing location of interpreted buried objects for each of the four cemeteries. The data presents two types of anomalies based on signal strength of the anomaly. These anomalies are classified as interpreted disturbed ground location and interpreted possible disturbed ground locations. In locations where these higher amplitude anomalies are known to be due to surface influence, such as an asphalt driveway, the anomaly was removed from the interpreted results.

Many of the disturbed ground location anomalies have plan outlines consistent with that of a grave. These are also consistent with some of the more recent grave sites within the cemeteries, thus represent the largest expected GPR anomalies. Older graves, as discussed above, provide a lower strength anomaly and are therefore more difficult to identify.

Although many possible disturbed ground anomalies are identified in this report, it is felt that many do not satisfy the criteria listed above for a grave as several of the responses are features that are too small in relation to what is expected of a grave site. Nonetheless, it would be prudent to further investigate a few of these anomalies intrusively to gain confidence in this interpretation should the project proceed and it is determined that construction needs to be carried out in the vicinity of any of these anomalies. If it is found that interments are discovered, then a more comprehensive investigation should be carried out. Lastly, any subsequent intrusive investigation should use the accompanying figures for reference to position.

The location of the data presented on the figures were determined using a Trimble GeoXH. The airphotos were provided by Google Earth and are considered approximate. In some cases the Google Earth image needed to be shifted slightly from reported location to match the field collected location data.

Limitations and Use of This Memorandum

The geophysical interpretation presented in this Technical Memorandum is based on the use of GPR surveying technique. As with any geophysical method, interpretation presented in this report should be confirmed by intrusive methods (boreholes, test pits, etc.)

Assumptions made in the geophysical interpretation have been stated, where applicable, throughout the memo.

This geophysical survey was carried out in a manner consistent with the level of care and skill normally exercised by other members of the engineering and science professions currently practising under similar conditions, subject to the time limits and financial and physical constraints applicable to the services provided. This technical memorandum provides a professional opinion and therefore no warranty is either expressed, implied, or made as to the conclusions, advice, and recommendations offered in this memo.

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Closure

We trust that this letter meets your current needs. If you have any questions or require further clarification, please contact the undersigned.



Peter Giamou, P.Geo
Senior Geophysicist

PG/CRP/pg/crp

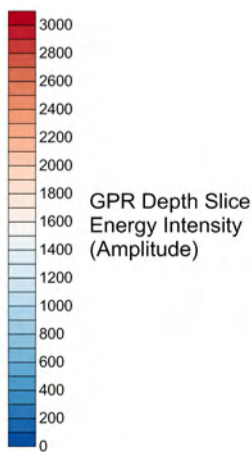


Christopher Phillips, M.Sc., P.Geo
Senior Geophysicist, Principal

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Attachments:

- Figure 1 – St. Philips Cemetery Geophysical Survey Results Depth Slice 0.25 to 1.25 metres
- Figure 2 – St. Philips Cemetery Geophysical Survey Results Interpreted Disturbed Ground Locations
- Figure 3 – Bethesda Cemetery Geophysical Survey Results Depth Slice 0.25 to 1.25 metres
- Figure 4 – Bethesda Cemetery Geophysical Survey Results Interpreted Disturbed Ground Locations
- Figure 5 – Hagermans East Cemetery Geophysical Survey Results Depth Slice 0.25 to 1.25 metres
- Figure 6 – Hagermans East Cemetery Geophysical Survey Results Interpreted Disturbed Ground Locations
- Figure 7 – Hagermans West Cemetery Geophysical Survey Results Depth Slice 0.25 to 1.25 metres
- Figure 8 – Hagermans East Cemetery Geophysical Survey Results Interpreted Disturbed Ground Locations



Notes

1. UTM Coordinates are NAD83, Zone 17N
2. Aerial Photograph copyright Google, 2017.
3. This Figure is to be analyzed in conjunction with the accompanying report.

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| PREPARED | CRP |
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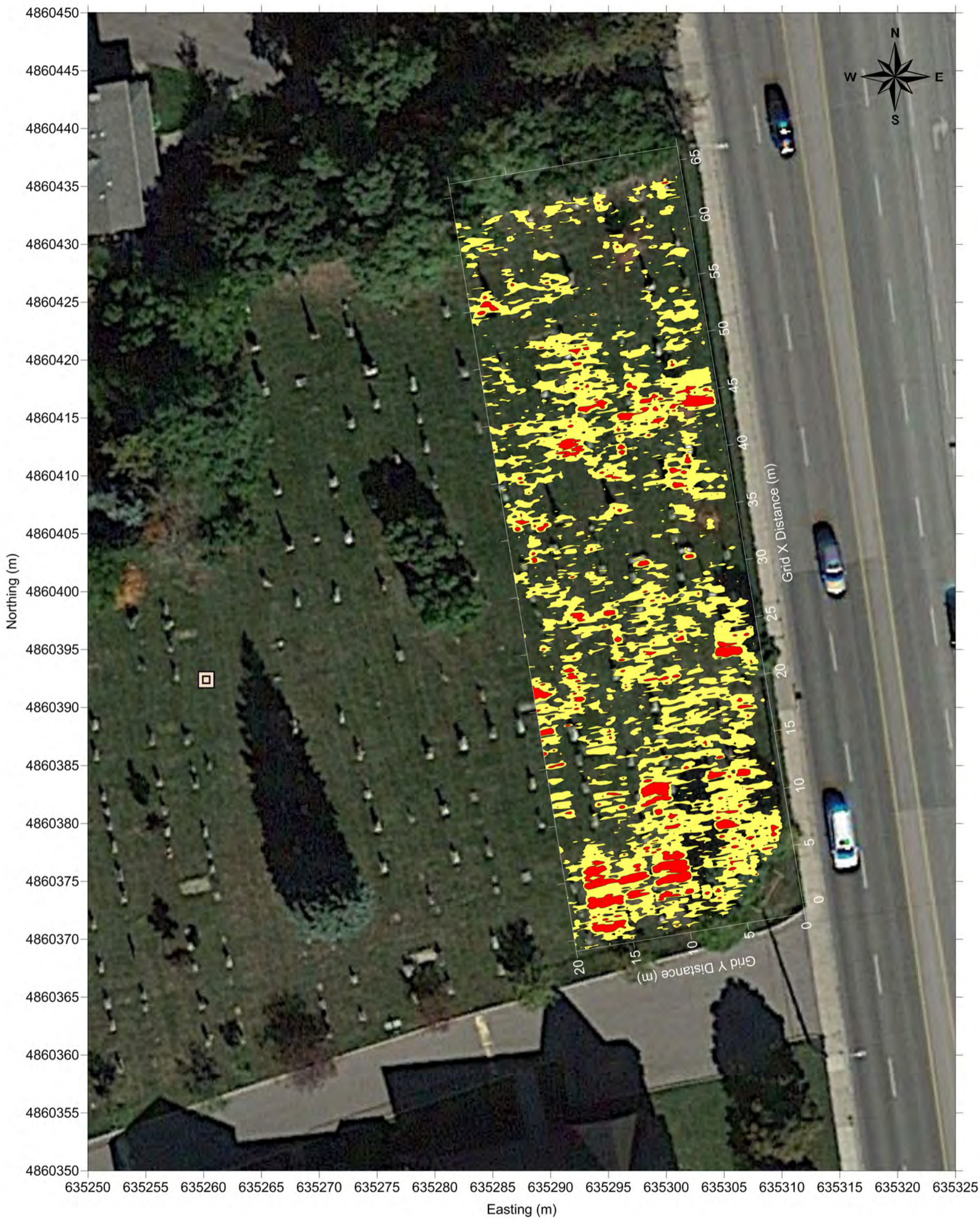
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KENNEDY ROAD (Y.R. 3)
STEELES AVENUE (Y.R. 95) TO MAJOR MACKENZIE DRIVE (Y.R. 25),
CITY OF MARKHAM, REGION OF YORK

TITLE
**ST. PHILIPS CEMETERY
GEOPHYSICAL SURVEY RESULTS
DEPTH SLICE 0.25 TO 1.25 METRES**

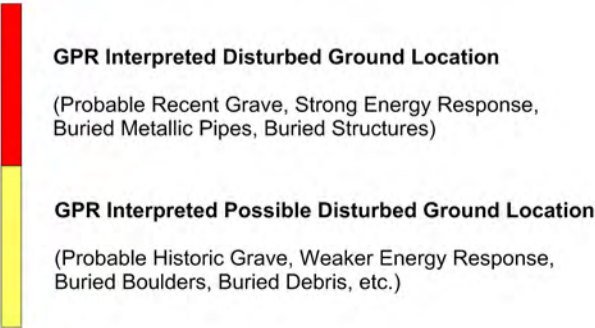
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MAP
1



GPR Interpretation Legend



Notes

1. UTM Coordinates are NAD83, Zone 17N
2. Aerial Photograph copyright Google, 2017.
3. This Figure is to be analyzed in conjunction with the accompanying report.

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STEELES AVENUE (Y.R. 95) TO MAJOR MACKENZIE DRIVE (Y.R. 25),
CITY OF MARKHAM, REGION OF YORK

TITLE
**ST. PHILIPS CEMETERY
GEOPHYSICAL SURVEY RESULTS
INTERPRETED DISTURBED GROUND LOCATIONS**

PROJECT No. 1664178
Rev. A

MAP
2



Notes

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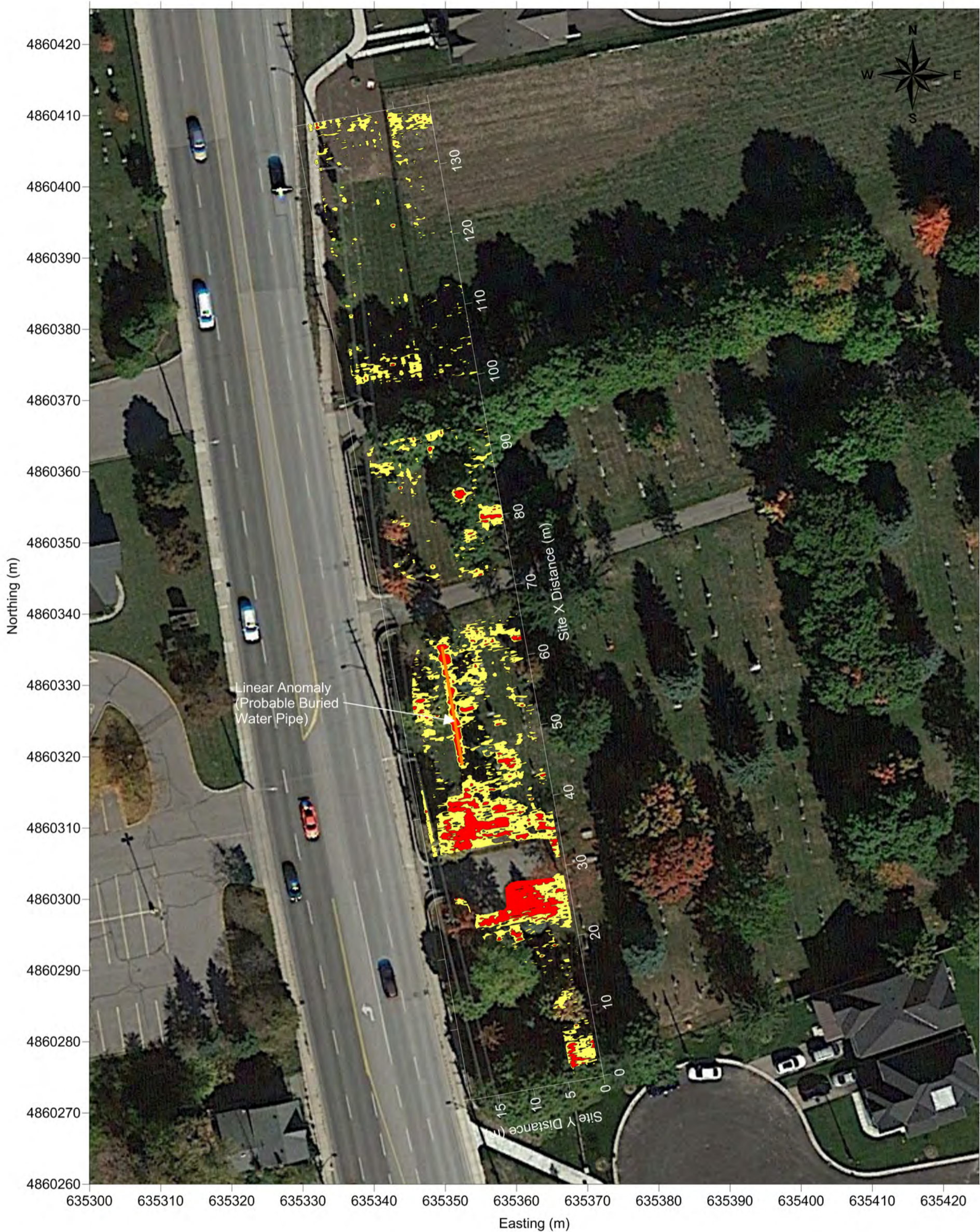
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KENNEDY ROAD (Y.R. 3)
STEELES AVENUE (Y.R. 95) TO MAJOR MACKENZIE DRIVE (Y.R. 25),
CITY OF MARKHAM, REGION OF YORK

TITLE
**BETHESDA CEMETERY
GEOPHYSICAL SURVEY RESULTS
DEPTH SLICE 0.25 TO 1.25 METRES**

PROJECT No.
1664178

Rev.
A

MAP
3



GPR Interpretation Legend

GPR Interpreted Disturbed Ground Location

(Probable Recent Grave, Strong Energy Response, Buried Metallic Pipes, Buried Structures)

GPR Interpreted Possible Disturbed Ground Location

(Probable Historic Grave, Weaker Energy Response, Buried Boulders, Buried Debris, etc.)

Notes

1. UTM Coordinates are NAD83, Zone 17N
2. Aerial Photograph copyright Google, 2017.
3. This Figure is to be analyzed in conjunction with the accompanying report.
4. Note that subsurface anomalies consistent with asphalt and tree roots have been removed from the interpretation.

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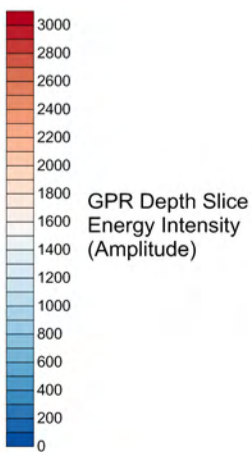
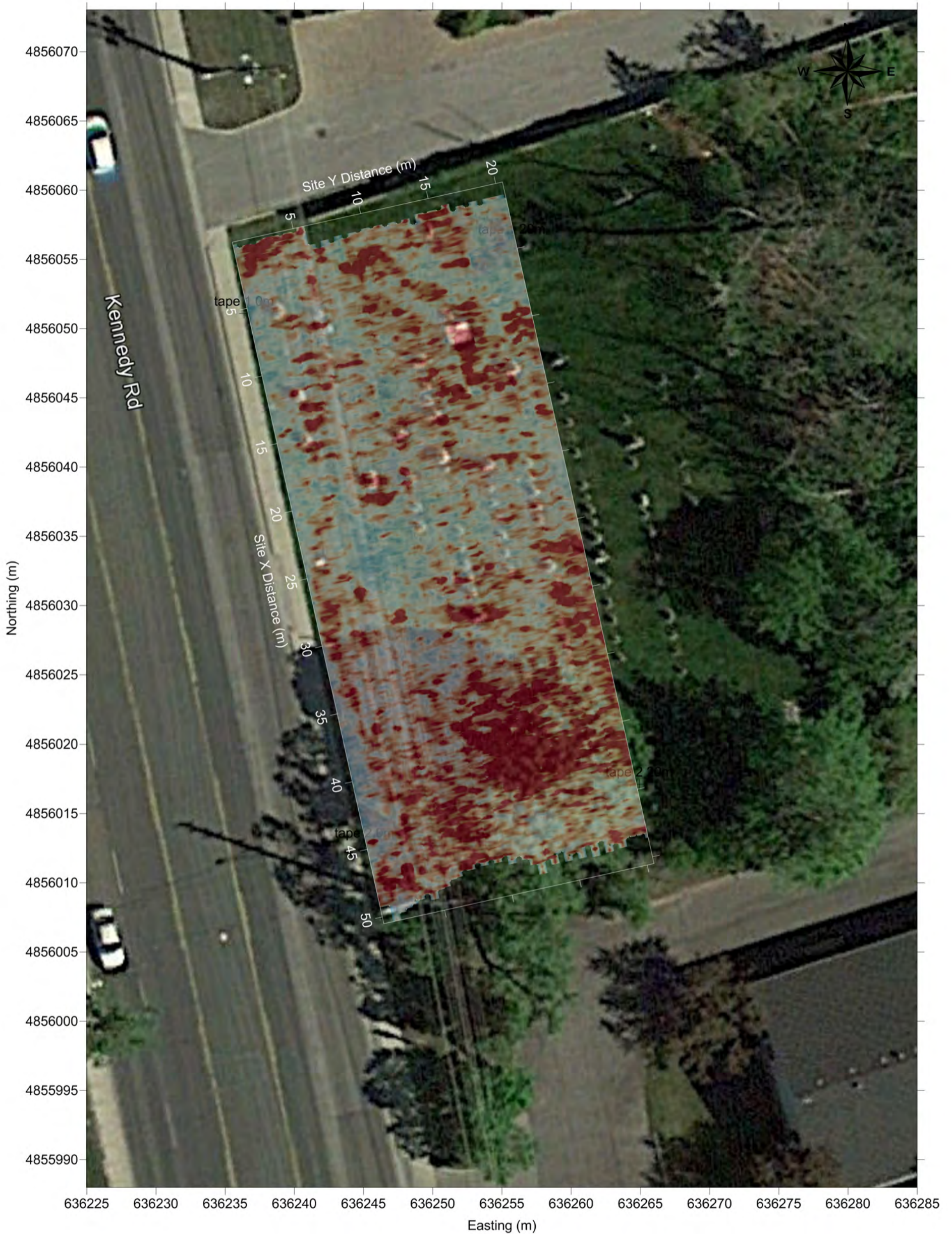

PROJECT
KENNEDY ROAD (Y.R. 3)
STEELES AVENUE (Y.R. 95) TO MAJOR MACKENZIE DRIVE (Y.R. 25),
CITY OF MARKHAM, REGION OF YORK

TITLE
**BETHESDA CEMETERY
GEOPHYSICAL SURVEY RESULTS
INTERPRETED DISTURBED GROUND LOCATIONS**

PROJECT No.
1664178

Rev.
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MAP
4



Notes

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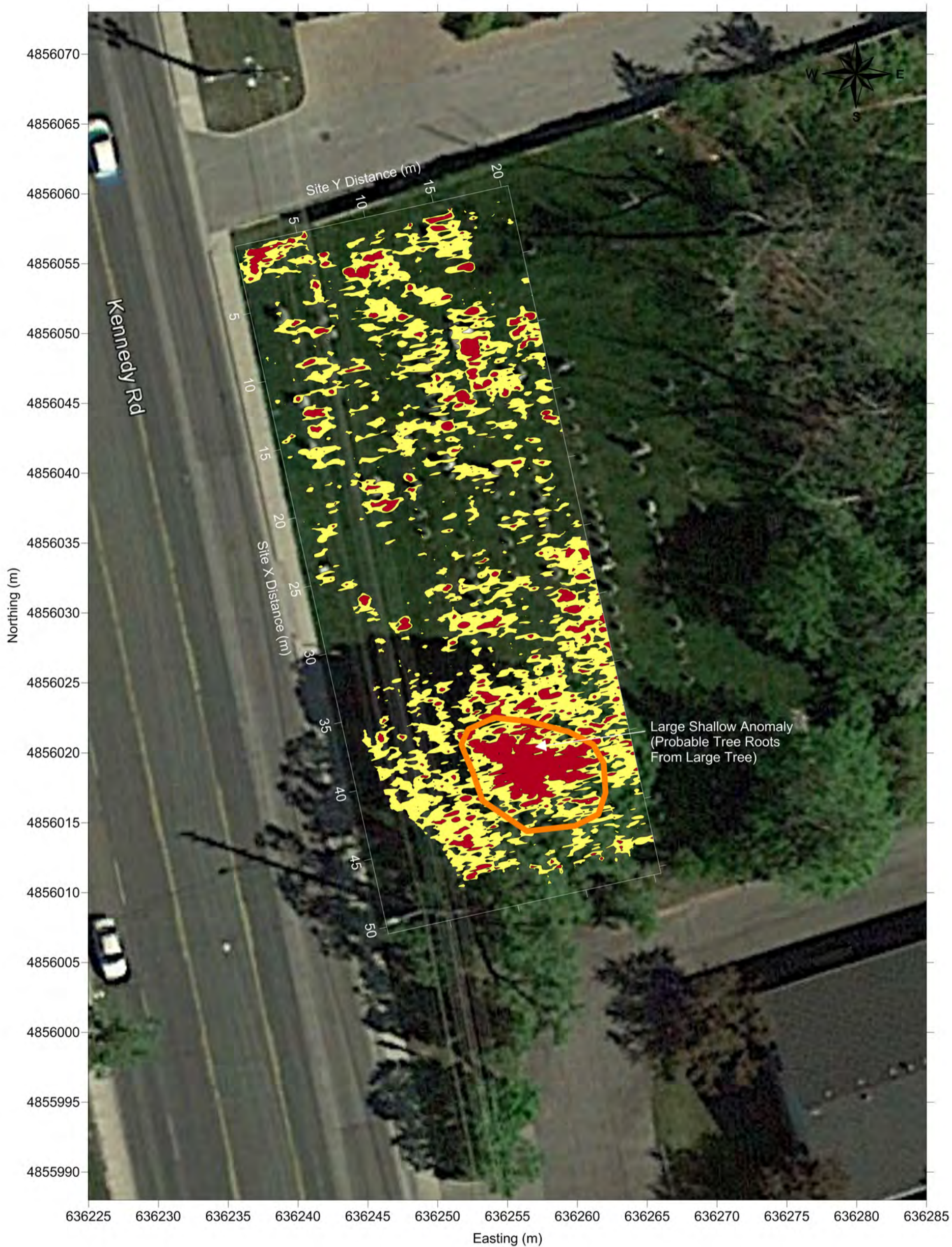
PROJECT
KENNEDY ROAD (Y.R. 3)
STEELES AVENUE (Y.R. 95) TO MAJOR MACKENZIE DRIVE (Y.R. 25),
CITY OF MARKHAM, REGION OF YORK

TITLE
**HAGERMANS EAST CEMETERY
GEOPHYSICAL SURVEY RESULTS
DEPTH SLICE 0.25 TO 1.25 METRES**

PROJECT No.
1664178

Rev.
A

MAP
5



GPR Interpretation Legend

GPR Interpreted Disturbed Ground Location

(Probable Recent Grave, Strong Energy Response, Buried Metallic Pipes, Buried Structures)

GPR Interpreted Possible Disturbed Ground Location

(Probable Historic Grave, Weaker Energy Response, Buried Boulders, Buried Debris, etc.)

Notes

1. UTM Coordinates are NAD83, Zone 17N
2. Aerial Photograph copyright Google, 2017.
3. This Figure is to be analyzed in conjunction with the accompanying report.

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YYYY-MM-DD 2017-07-27

PREPARED CRP

DESIGN CRP

REVIEW

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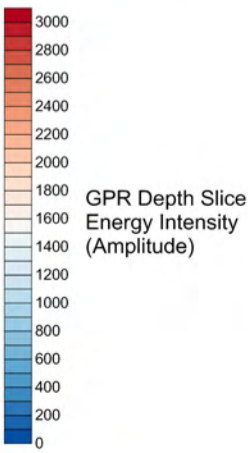
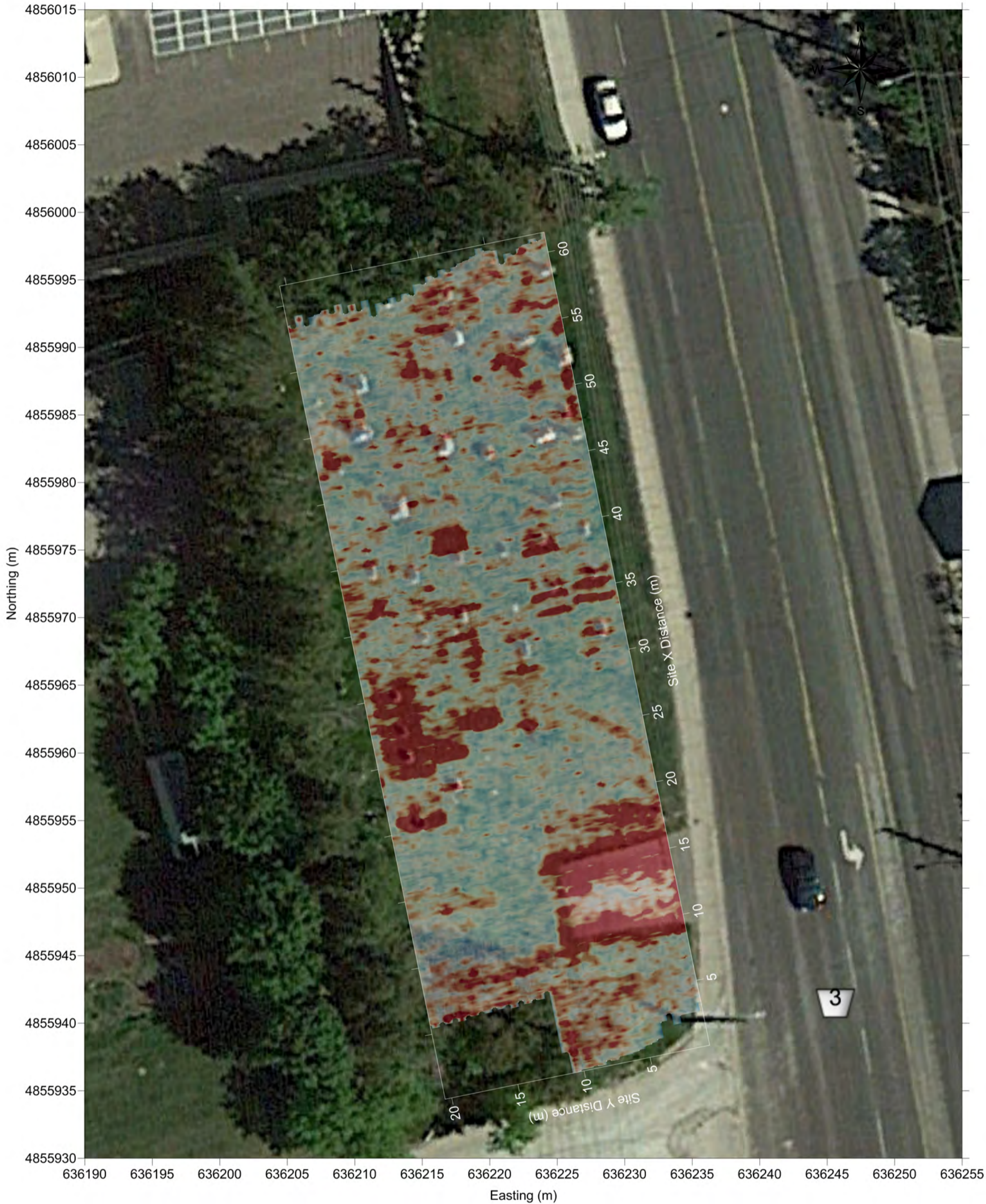
PROJECT
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TITLE
**HAGERMANS EAST CEMETERY
GEOPHYSICAL SURVEY RESULTS
INTERPRETED DISTURBED GROUND LOCATIONS**

PROJECT No.
1664178

Rev.
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MAP
6



- Notes**
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| DESIGN | CRP |
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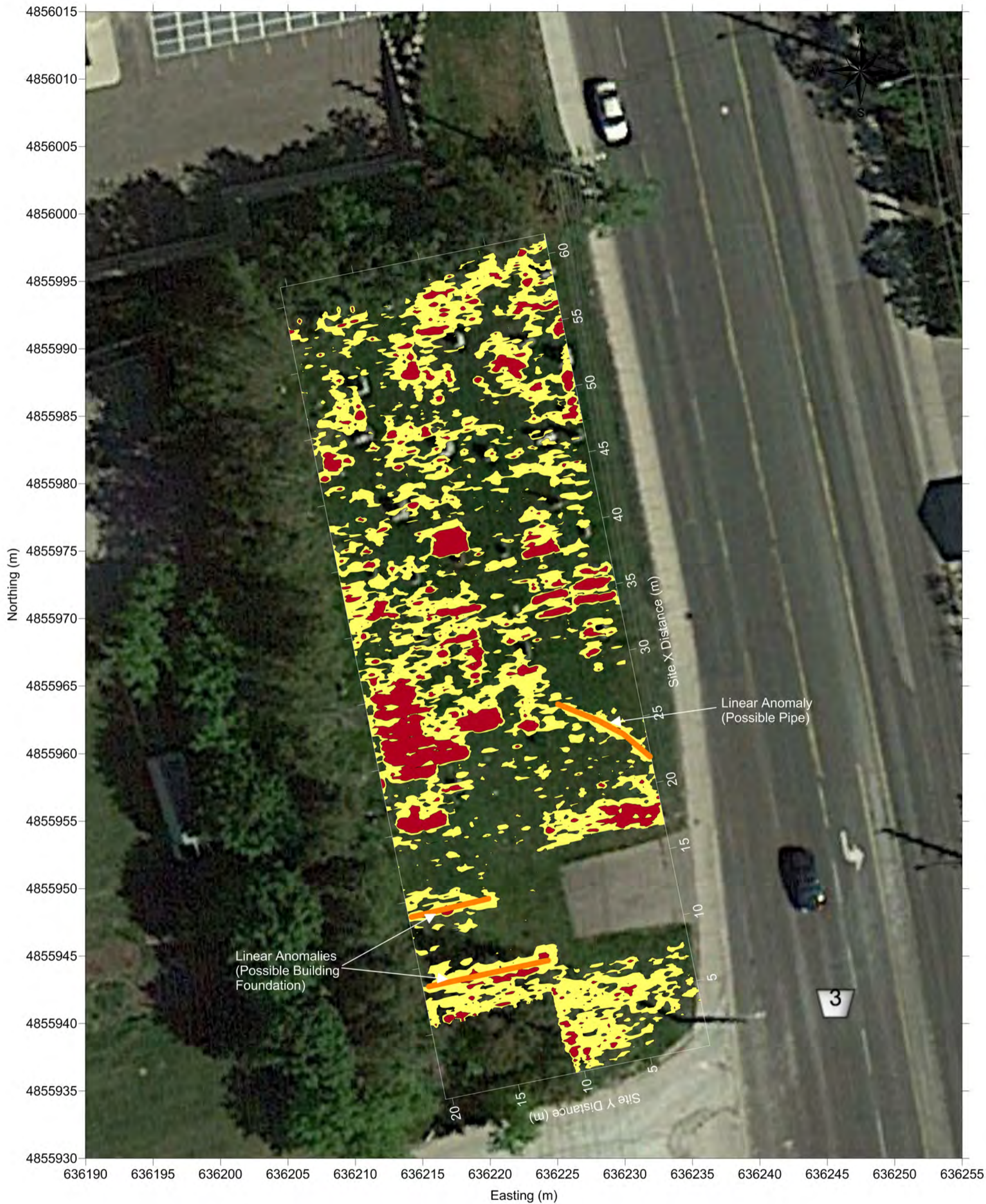
PROJECT
KENNEDY ROAD (Y.R. 3)
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TITLE
**HAGERMANS WEST CEMETERY
GEOPHYSICAL SURVEY RESULTS
DEPTH SLICE 0.25 TO 1.25 METRES**

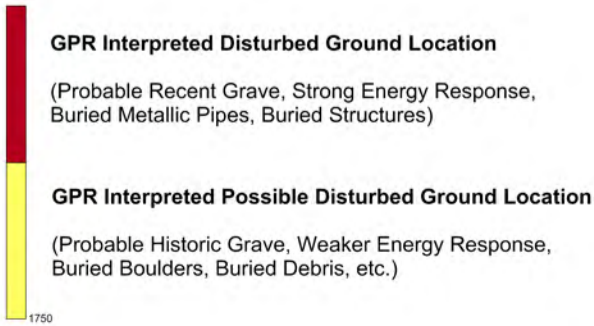
PROJECT No.
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GPR Interpretation Legend



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MAP
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As a global, employee-owned organisation with over 50 years of experience, Golder Associates is driven by our purpose to engineer earth's development while preserving earth's integrity. We deliver solutions that help our clients achieve their sustainable development goals by providing a wide range of independent consulting, design and construction services in our specialist areas of earth, environment and energy.

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