September 12, 2016

Natalie Robinson, Senior Environmental Specialist
Environmental Services
Public Works and Government Services Canada
Suite 1650, 635 – 8 Avenue SW
Calgary, AB T2P 3M3

Project No.: 209.40380.00000

Dear Ms. Robinson,

RE: DATA GAP ASSESSMENT
GARDEN RIVER OLD DUMP SITES, GARDEN RIVER, ALBERTA

1.0 INTRODUCTION AND RELEVANT BACKGROUND

SLR Consulting (Canada) Ltd. (SLR) is pleased to provide Public Works and Government Services Canada's (PWGSC) the following letter summarizing the additional delineation of the Old Dump Site at Garden River. The additional delineation was conducted in support of the overall work plan outlined in the Terms of Reference (ToR) for Professional Services for Design, Tender Support, and Construction Oversight for the Garden River Remediation Project, Wood Buffalo National Park, Alberta (AB).

As part of the 2016 work plan, SLR conducted a site visit on May 31, 2016 with personnel from PWGSC and Parks Canada Agency (PCA) to assess the status of the new Containment Cell A and the Old Dump site. Discussion on-site and subsequent review of the previous consultant reports identified uncertainty regarding the previously estimated volumes of waste requiring disposal at the new cell. In order to refine the volume estimate, it was decided that additional assessment should be conducted as outlined in the following letter. The field work for the assessment took place between July 8 and 26, 2016.

1.1 Objective

The objective of the additional delineation program was to update the volume estimate for the waste that is present at the Old Dump site that would require excavation and placement into the new landfill cell to be constructed at the current Garden River Landfill site.

1.2 Scope of Work

The scope of work conducted as part of the additional delineation program included the following activities:

- Review of historical site reports;
- Preparation of a Health and Safety Plan (HASP);

- Identification of all public underground and above ground utilities in the vicinity of the site by completing an Alberta First Call;

- Clearance of trees in the area of the Old Dump site to allow access to the area requiring assessment;

- Inspection and monitoring of all groundwater monitoring wells remaining at the site to assess the condition of the wells for inclusion in a future groundwater monitoring network;

- Conduct a geophysical survey of the area of the dump site using both electromagnetic (EM) and magnetometer instrumentation to determine the lateral extents of geophysical anomalies indicating the presence of buried waste;

- Conduct a test pitting program to confirm the lateral and vertical extents of the waste identified by the geophysical survey; and

- Preparation of this letter report documenting the results of the assessment and providing an updated estimate of the volume of waste requiring disposal from the Old Dump site.

2.0 ASSESSMENT METHODOLOGY

2.1 Tree Clearing

On July 8, 2016, SLR was on site to observe tree clearing conducted by Little Red River Forestry Company personnel. The area of the suspected former Old Dump that had not been previously cleared was cleared using a Caterpillar D5H dozer.

2.2 Groundwater Monitoring

A groundwater monitoring program was conducted on July 8, 2016 at the same time as the tree clearing. Wells installed by previous consultants were assessed for suitability for inclusion in a long term monitoring program for the dump site. Prior to groundwater monitoring, wells that were found to be in useable condition were monitored for combustible vapour concentrations (CVC) using a RKI Eagle hydrocarbon vapour analyzer. Depth to groundwater, apparent light non-aqueous liquid (LNAPL) presence, and end of monitoring well depth were measured using a Heron Interface Probe.

2.3 Geophysical Survey

A geophysical survey was conducted on July 14, 2016 by AKS Geoscience Inc. (AKS) of Calgary, AB. The geophysical survey was completed using EM31, EM38 and magnetometer methods. The EM methods map out conductivity anomalies in the subsurface caused by leachate, disturbed ground, buried wood debris, etc. relative to background soil conductivity. The EM methods provide conductivity information to depths of approximately 4 m using EM31 and 1.5 m using EM38. The magnetometer detects buried ferrous metal objects in the waste and can also detect small disturbances in the magnetic orientation of native soils adjacent to burnt objects in the dump site. The detection depth of the magnetometer is variable, depending on the mass of the buried metallic objects (i.e. larger objects can be detected at greater depths than smaller objects).

The survey generally encompassed the area of suspected Old Dump Site consisting of a Main Dump and two satellite dumps identified to the north and south of the Main Dump. Additional information on the methodology used in the geophysical survey is included in the AKS result letter appended to this report.

2.4 Test Pit Program

Prior to conducting the test pit program, an Alberta One Call request was made to identify any public utilities in the vicinity of the site. Companies responding to the One Call request included Telus Communications, Atco Electric Ltd., and Alberta Supernet. All three companies indicated that their facilities were located greater than 200 m from the work area. Based on the distance to identified public utilities, the site being public, and the historic land use being a garbage dump, a private utility sweep was not conducted as part of the test pit program.

The test pit program was completed on July 26, 2016 using a Komatsu PC270 LC excavator supplied and operated by the Little Red River Forestry Company. Nineteen test pits were excavated within and surrounding the suspected area of waste. Test pits were advanced to a maximum depth of 4.6 m below ground surface (bgs), which corresponded to the maximum reach of the excavator.

Soil and waste excavated from the test pits was visually logged prior to being placed back into the test pit in the order in which it was removed. No samples of soil or waste were collected. All test pit locations were surveyed in using a global positioning system (GPS) in order to allow for accurate estimation of the location of the waste encountered.

3.0 RESULTS

3.1 Groundwater Monitoring

Groundwater monitoring results are summarized in Table 1. Groundwater monitoring identified that seven of thirteen monitoring wells located at the Old Dump site were suitable for monitoring. Of the seven wells, five (2018-10BH-1M, 2018-10BH-4M, 2018-10BH-5M, 2018-10BH-3M, and 2018-10BH-6M) were in good enough condition to allow for groundwater sampling to be conducted in the future. One well, 08MW06 was dry and should be decommissioned. The seventh well, 2018-10BH-7M, was suitable for groundwater monitoring, but was blocked, limiting its usefulness for groundwater sampling. Monitoring wells suitable for use in a future monitoring program at the site are indicated on Drawing 1.

CVCs measured in the monitoring wells were 0 parts per million (ppm) in six of seven wells monitored, with a CVC of 5 ppm measured in monitoring well 2018-10BH-5M. LNAPL was not encountered in any of the wells monitored.

Depth to groundwater ranged from 8.24 m below top of casing (BTOC) to 9.77 mBTOC. Groundwater elevations were not calculated at this time, as previous consultants used different datums in surveying the wells at the site. Groundwater flow is assumed to be to the south or southeast towards the Peace River.

3.2 Geophysical Survey

Results of the geophysical survey are shown on Drawings 1 to 4 of the AKS report appended to this letter and on Drawing 1.

The geophysical surveys identify three main anomalies corresponding to the previously identified Old Dump Site (referred to as Area 2 by previous consultants), north debris area (Area 1) and south debris area (Area 4). A geophysical anomaly was not identified in the area previously referred to as “scattered surface debris” (Area 3), immediately south of the main Old Dump Site.

3.3 Test Pit Program

Test pits completed as part of the program are summarized in Table 2. The locations of the test pits are shown on Drawing 2. Photographs of the material encountered during the test pit program are provided in Appendix B.

Three areas of waste were delineated by both the geophysical program and test pit program, generally consistent with historical investigations at the site. The areas are referred to as North Dump, Main Dump, and South Dump, corresponding to Areas 1, 2, and 4 from previous assessments. Previous assessments had also identified an area south of the Main Dump referred to as a Scattered Surface Debris (Area 3). Waste was not observed in large quantities in this area, and neither geophysical method indicated that a large volume of waste was present in this area.

South Dump

Test pits TP1 through TP5 and TPA were excavated to delineate the South Dump. Waste was observed in three of the test pits completed, TP1, TP2, and TP3. TP1 at the south end of the southern anomaly was described as being at the southernmost end of the dump area. The southern portion of the test pit encountered a native soil profile, while the northern portion encountered waste to a depth of 1.2 m bgs.

TP3 completed in the centre of the geophysical anomaly encountered waste a depth of 3.7 m bgs followed by native soil consisting of silty sand. The waste included household garbage and evidence of scrapped cars.

TP2 was located to delineate the South Dump area based on the geophysical results; however, the test pit encountered waste to a depth of 2.7 m bgs. Subsequently, an additional test pit, TPA, was completed to the east of TP3 to provide delineation of the waste in this area. TPA did not encounter waste. TP4 on the north side of the anomaly and TP5 on the west side were also completed solely in native soil consisting of silty and clay overlying silty sand, with no waste encountered.

Based on the test pit results it is assumed for estimating purposes that material would need to be excavated to a depth of 4.0 m (waste depth plus immediately adjacent soil) in the South Dump.

Main Dump

Seven test pits (TP6 through TP12) were excavated to delineate the extent and depth of waste in the Main Dump Area. TP6, TP7, and TP12 to the south, west, and north, respectively, of the geophysical anomaly did not encounter any waste. TP10 completed on the east side encountered limited household waste in the western portion of the test pit to a depth of 0.8 m, while the eastern portion was completed in native soil.

TP 8, TP9, and TP11 encountered waste ranging in thickness from 2.4 m in TP9 to greater than 4.6 m (the maximum reach of the excavator) in TP11. The waste consisted of household waste, car parts, re-bar and scrap metal.

Based on TP9 and results of the EM38 survey, for purposes of volume estimating, the Main Dump has been divided into the southern and northern zones as shown on Drawing 2. The depth of material requiring excavation in the north zone is estimated to be 2.7 m (waste depth plus adjacent soil) and in the south zone is estimated to be 5.0 m.

North Dump

The north area was assessed through 6 test pits (TP13 through TP18). TP13, TP14, TP16, and TP18 completed around the anomaly did not encounter any waste. TP15 and TP17 encountered waste that consisted of predominantly scrap metal. The scrap metal appeared consistent with the source of the waste being a former camp (construction trailers). The maximum depth of waste encountered was 2.7 m in TP 17.

Hazardous waste was not observed in large quantities. Items such as oil filters were observed associated with some of the buried car bodies observed in the test pits. Given the likely age and nature of the waste observed in the North Dump (construction camp trailers) there is the potential for hazardous building products (asbestos) to be present.

Based on TP17, the depth of waste and soil requiring disposal from the North Dump is 3.0 m (waste depth plus adjacent soil).

4.0 UPDATED ESTIMATE OF WASTE VOLUME

Based on the results of the additional assessment work conducted, the volume of waste at the site that requires removal has been re-calculated. The estimated volume of waste at the Old Dump site is summarized in Table A.

Table A:
Estimated Waste Volume

Area	Estimated Surface Area (m^2)	Estimated Depth (m)	Estimated Volume (m^3)
South Dump	541	4.0	2,164
Main Dump – North Zone	674	2.7	1,820
Main Dump – South Zone	949	5.0	4,745
North Dump	419	3.0	1,257
Total			**9,986**

5.0 RECOMMENDATIONS

The following recommendations are made as a result of the additional site assessment conducted:

- Monitoring wells located at the Old Dump should be surveyed for elevations to allow for their inclusion into the long term groundwater monitoring well network for the site; and
- Monitoring well 08MW06 was found to be dry during the monitoring program and should be decommissioned.

6.0 STATEMENT OF LIMITATIONS

This report has been prepared and the work referred to in this report has been undertaken by SLR for Public Works and Government Services Canada and completed in compliance with Contract Number EW699-141853-004. Under Contract Number EW699-141853-004, Public Works and Government Services Canada has the exclusive right to copy and redistribute this report.

This report has been prepared for specific application to this site and site conditions existing at the time work for the report was completed. Any conclusions or recommendations made in this report reflect SLR's professional opinion based on limited investigations including: visual observation of the site, surface and subsurface investigation at discrete locations and depths, and laboratory analysis of specific chemical parameters. The results cannot be extended to previous or future site conditions, portions of the site that were unavailable for direct investigation, subsurface locations which were not investigated directly, or chemical parameters and materials that were not addressed. Substances other than those addressed by the investigation may exist within the site; and substances addressed by the investigation may exist in areas of the site not investigated in concentrations that differ from those reported. SLR does not warranty information from third party sources used in the development of investigations and subsequent reporting.

Nothing in this report is intended to constitute or provide a legal opinion. SLR expresses no warranty to the accuracy of laboratory methodologies and analytical results. SLR makes no representation as to the requirements of compliance with environmental laws, rules, regulations or policies established by federal, provincial or local government bodies. Revisions to the regulatory standards referred to in this report may be expected over time. As a result, modifications to the findings, conclusions and recommendations in this report may be necessary.

Public Works and Government Service Canada may submit this report to Alberta Environment and Parks and/or related Alberta environmental regulatory authorities or persons for review and comment purposes.

7.0 CLOSURE

Should you have any questions or require additional information, please do not hesitate to contact the undersigned at (780) 490-7893 at your convenience.

Yours truly,
SLR Consulting (Canada) Ltd.

Prepared by:

Jason Pentland, M.Sc., P.Eng.
Senior Engineer

Reviewed by:

Mark Sungaila, M.A.Sc., P.Eng., PMP
Technical Director

Encl Table 1: Summary of Groundwater Monitoring
Table 2: Test Pit Summary
Drawing 1: Monitoring Well Location Plan
Drawing 2: Test Pit Location Plan
Appendix A: AKS Geoscience Letter Report
Appendix B: Photographs

TABLES

Data Gap Assessment
Garden River Old Dump Sites, Garden River, AB
SLR Project No. 209.40380.00000

Table 1
Summary of Groundwater Monitoring

Monitoring Well	Date Monitored (dd-mmm-yyyy)	TOC Elevation[1] (m)	Standpipe CVC[2] (ppm)	Apparent LNAPL Thickness[3] (mm)	Depth to Groundwater (mBTOC)	Depth to End of Hole (mBTOC)	Groundwater Elevation[4] (m)	Comments
08MW04	8-Jul-2016	240.03	---	---	---	---	---	Destroyed
08MW04B	8-Jul-2016	240.16	---	---	---	---	---	Destroyed
08MW05	8-Jul-2016	240.31	---	---	---	---	---	Destroyed
08MW05B	8-Jul-2016	240.27	---	---	---	---	---	Destroyed
08MW06	8-Jul-2016	240.34	0	0	dry	9.28	dry	
08MW06B	8-Jul-2016	240.29	---	---	---	---	---	Destroyed
2018-10BH-1M	8-Jul-2016	---	0	0	8.24	10.31	---	Waterra tubing in well
2018-10BH-2M	8-Jul-2016	---	---	---	---	---	---	Destroyed
2018-10BH-3M	8-Jul-2016	---	0	0	9.77	11.62	---	Waterra tubing in well
2018-10BH-4M	8-Jul-2016	---	0	0	9.47	11.14	---	Waterra tubing in well
2018-10BH-5M	8-Jul-2016	---	5	0	9.49	12.96	---	
2018-10BH-6M	8-Jul-2016	---	0	0	9.41	11.63	---	Waterra tubing in well
2018-10BH-7M	8-Jul-2016	---	0	0	9.43	10.73	---	Obstruction @ 0.81 m

Notes:

[1] TOC Elevation were obtained from Table 2 of EBA's 2013 Remedial Options Report for EBA well, TOC elevations not available for remainder of wells

[2] CVC- was measured using an EAGLE RKI vapour analyzers calibrated to hexane with methane elimination.

[3] Apparent LNAPL thickness was measured using a Heron interface probe.

[4] Groundwater Elevation is corrected for LNAPL thickness with an assumed specific gravity of 0.8 kg/L.

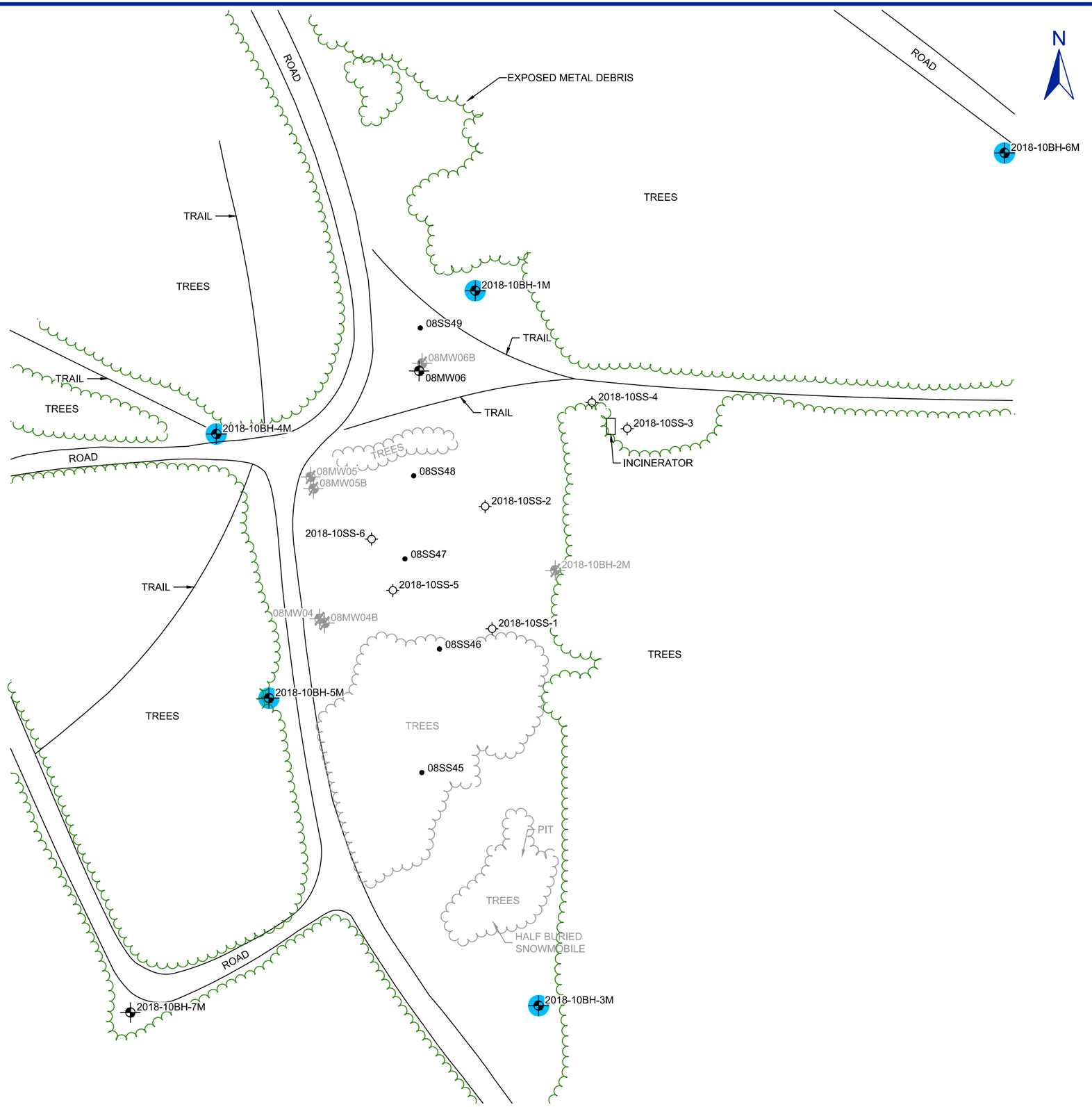
TOC - Top of Casing
m - metres
CVC- Combustible Vapour Concentration
ppm - parts per million
LNAPL - Light Non-Aqueous Phase Liquid
mm- millimetres
mBTOC - metres Below Top of Casing
m bgs - metres below ground surface
nm - not measured

Table 2
Test Pit Summary

Test Pit	Northing (m)	Easting (m)	Depth		Description
			From (m bgs)	To (m bgs)	
TP1	6511152	334088	0	1.2	SILT & CLAY, sandy - Southern portion of test pit; Garbage (chain link fencing, household waste, garbage bags, scrap metal, washing machine) - Northern portion of test pit
			1.2	3.4	SAND, silty, trace clay, fine grained, well sorted, light brown, dry
TP2	6511166	334101	0	2.7	SILTY & CLAY, sandy, brown, moist, garbage - wood waste, scrap metal, household waste, garbage bags.
			2.7	4	dry
TP3	6511167	334089	0	3.7	SILTY & CLAY, sandy, brown, moist, garbage - rebar, scrap metal, car bodies, household waste
			3.7	4.3	dry
TP4	6511180	334088	0	0.5	SILT & CLAY, some sand, moist
			0.5	1.8	SAND, silty, fine grained, light brown, dry
TP5	651167	334077	0	0.6	SILT & CLAY, some sand, brown, moist
			0.6	1.7	SAND, silty, very fine, light brown, dry
TPA	6511167	334105	0	0.3	SILT & CLAY, some sand, brown, moist
			0.3	1.5	SAND, silty, very fine, light brown, dry
TP6	6511207	334083	0	0.5	SILT & CLAY, some sand, brown, moist
			0.5	1.5	SAND, silty, fine grained, light brown, dry
TP7	6511222	334057	0	0.2	SILT & CLAY, Some sand, brown, moist
			0.2	1.5	SAND, silty, fine grained, light brown, dry
TP8	6511222	334070	0	4.3+	SILT & CLAY, sandy, brown, moist, garbage - scrap metal, household waste, ash, clothes, insulation
TP9	6511225	334090	0	2.4	SILT & CLAY, sandy, moist, occasional garbage, rebar, household waste, tires
			2.4	3.4	SAND, silty, fine grained, light brown, dry
TP10	6511237	334098	0	0.8	SILT & CLAY, sandy, some garbage, household waste
			0.8	2.4	SAND, silty, fine grained, light brown, dry
TP11	6511244	334080	0	1.2	SAND, silty, trace metal garbage
			1.2	4.6+	Garbage, household waste, glass, car parts, rebar, scrap
TP12	6511256	334070	0	0.6	SILT & CLAY, some sand, brown
			0.6	2.4	SAND, silty, light brown
TP13	6511317	334071	0	0.6	SILT & CLAY, some sand, brown, moist
			0.6	2.1	SAND, silty, fine grained, light brown, dry
TP14	6511330	334060	0	0.3	SILT & CLAY, some sand, brown, moist
			0.3	2	SAND, silty, light brown, dry
TP15	6511330	334071	0	2.1	SILT & CLAY, light brown, dry, garbage consisting of scrap metal (camp structures)
			2.1	3	SAND, silty, fine grained, light brown, dry
TP16	6511330	334080	0	0.6	SILT & CLAY, some sand, brown, moist
			0.6	2.6	SAND, silty, fine grained, light brown, dry
TP17	6511345	334071	0	2.7	SILT & CLAY, sandy, light brown, dry, scrap metal (former camp?)
			2.7	3.7	SAND, silty, fine grained, light brown, dry
TP18	6511343	334058	0	0.3	SILT & CLAY, sandy, brown, moist
			0.3	2.9	SAND, silty, light brown, dry

DRAWINGS

Data Gap Assessment
Garden River Old Dump Sites, Garden River, AB
SLR Project No. 209.40380.00000



NOTES:
REFERENCED FROM: EBA FIGURE 4A FROM PROJECT NO. E22103088-01 TITLED "OLD LANDFILL SITE PLAN SHOWING SOIL EXCEEDANCES", AKS GEOSCIENCE DRAWING NO. 4 FROM JOB NO. 1877 TITLED "MAGNETIC GRADIENT DATA, 08-07-112-23 W4M, GARDEN RIVER, ALBERTA" AND SITE RECONNAISSANCE INFORMATION.

LEGAL DESCRIPTION:
LSD 05 SEC 08 TWP 112 RGE 23 W4M & LSD 08 SEC 07 TWP 112 RGE 23 W4M
GARDEN RIVER, ALBERTA

LEGEND:

- TREELINE
- FORMER FACILITY / FEATURE
- ID — HAND AUGER BOREHOLE LOCATION (OTHERS)
- ID — BOREHOLE LOCATION COMPLETED AS A MONITORING WELL (OTHERS)
- ID — BOREHOLE LOCATION COMPLETED AS A MONITORING WELL (DESTROYED)
- ID — SOIL SAMPLE LOCATION (OTHERS)
- MONITORING WELL SUITABLE FOR INCLUSION IN FUTURE MONITORING PROGRAM

0 10 20 40 60 m

SCALE 1:1,000
WHEN PLOTTED CORRECTLY ON A 11 x 17 PAGE LAYOUT
NAD 1983 UTM Zone 12N

THIS DRAWING IS FOR CONCEPTUAL PURPOSES ONLY. ACTUAL LOCATIONS MAY VARY AND NOT ALL STRUCTURES ARE SHOWN.

PUBLIC WORKS AND GOVERMENT SERVICES
GARDEN RIVER OLD DUMP SITE
LSD 05 SEC 08 TWP 112 RGE 23 W4M & LSD 08 SEC 07 TWP 112 RGE 23 W4M
GARDEN RIVER, ALBERTA

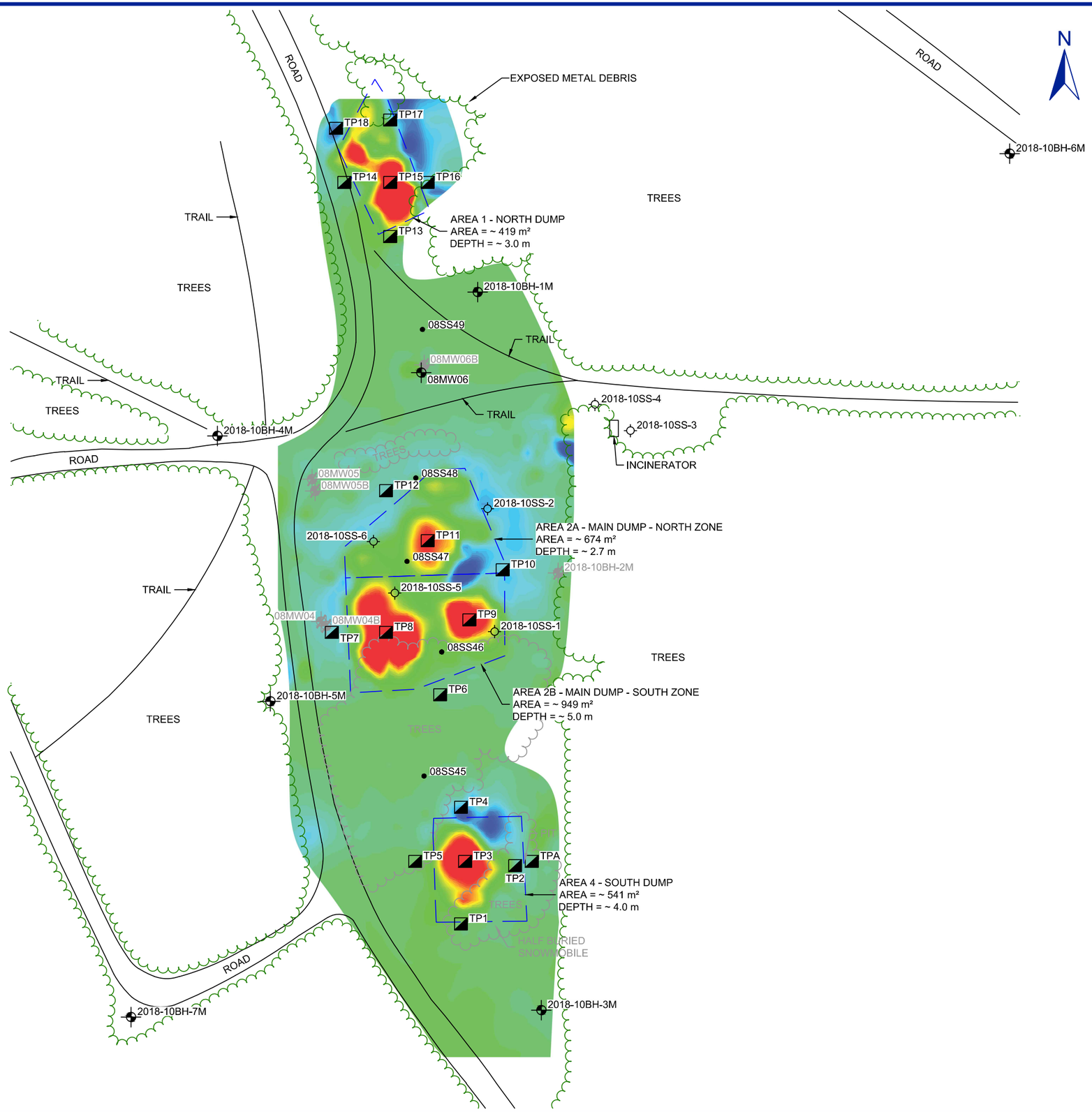
DATA GAP ASSESSMENT REPORT

MONITORING WELL LOCATION PLAN

Date: August 24, 2016
Project No. 209.40380.00000
Drawing No. 1

SLR global environmental solutions

Cadfile name: S_209-40380-00000-A2.dwg



NOTES:
REFERENCED FROM: EBA FIGURE 4A FROM PROJECT NO. E22103088-01 TITLED "OLD LANDFILL SITE PLAN SHOWING SOIL EXCEEDANCES", AKS GEOSCIENCE DRAWING NO. 4 FROM JOB NO. 1877 TITLED "MAGNETIC GRADIENT DATA, 08-07-112-23 W4M, GARDEN RIVER, ALBERTA" AND SITE RECONNAISSANCE INFORMATION.

LEGAL DESCRIPTION:
LSD 05 SEC 08 TWP 112 RGE 23 W4M & LSD 08 SEC 07 TWP 112 RGE 23 W4M
GARDEN RIVER, ALBERTA

LEGEND:

- TREELINE
- FORMER FACILITY / FEATURE
- ID — HAND AUGER BOREHOLE LOCATION (OTHERS)
- ID — BOREHOLE LOCATION COMPLETED AS A MONITORING WELL (OTHERS)
- ID — BOREHOLE LOCATION COMPLETED AS A MONITORING WELL (DESTROYED)
- TP — TEST PIT LOCATION
- ID — SOIL SAMPLE LOCATION (OTHERS)
- ESTIMATED EXTENT OF WASTE

Magnetic Gradient (nT/m)
59880
59760
59640
59520
59400
59280
59160
59040
58920
58800
58680
58560
58440
58320
58200
58080
57960
57840
57720
57600
57480
57360
57240
57120

0 10 20 40 60 m

SCALE 1:1,000
WHEN PLOTTED CORRECTLY ON A 11 x 17 PAGE LAYOUT
NAD 1983 UTM Zone 12N

THIS DRAWING IS FOR CONCEPTUAL PURPOSES ONLY. ACTUAL LOCATIONS MAY VARY AND NOT ALL STRUCTURES ARE SHOWN.

PUBLIC WORKS AND GOVERMENT SERVICES
GARDEN RIVER OLD DUMP SITE
LSD 05 SEC 08 TWP 112 RGE 23 W4M & LSD 08 SEC 07 TWP 112 RGE 23 W4M
GARDEN RIVER, ALBERTA

DATA GAP ASSESSMENT REPORT

TEST PIT LOCATION PLAN

Date: August 24, 2016
Project No. 209.40380.00000
Drawing No. 2

SLR global environmental solutions

Cadfile name: S_209-40380-00000-A2.dwg

APPENDIX A
AKS Geoscience Letter Report

Data Gap Assessment
Garden River Old Dump Sites, Garden River, AB
SLR Project No. 209.40380.00000

AKS Geoscience Inc. #301, 221 - 10 Avenue SE Calgary,
Alberta T2G 0V9
TEL: 1.403.277.4664 FAX: 1.403.451.8767
EMAIL: info@aksgeoscience.com WEB:
www.aksgeoscience.com

July 28, 2016 Project No.: 1877

SLR Consulting (Canada) Ltd.
6940 Roper Road
Edmonton, AB
T6B 3H9

Attention: Jason Pentland, M.Sc., P.Eng
Senior Engineer

RE: GEOPHYSICAL INVESTIGATION AT A FORMER LANDFILL, GARDEN CREEK, ALBERTA.

INTRODUCTION

AKS Geoscience Inc. (AKS) was retained by SLR Consulting to conduct a geophysical investigation at the above mentioned location. The main objectives of the investigation were:

- To delineate regions where surface and subsurface metal objects were suspected to be present.
- To define regions of potential inorganic soil and/or groundwater quality impacts related to landfill operations

To realize the above mentioned objectives geophysical methods such as frequency electro-magnetics (FEM), and magnetics were employed. These methods are highly useful for this type of application as they respond dramatically to buried and/or surface metal objects, and to anomalous concentrations of inorganic constituents in the shallow subsurface. The investigation was completed on July 15, 2016.

METHODOLOGY

Frequency Electro-Magnetics

The Geonics EM31SH (referred to as EM31) and EM38 electromagnetic survey instruments provide terrain (or bulk) conductivity information to depths of approximately 4 m and 1.5 m below ground surface, respectively. All EM instruments operate on the principle of electromagnetic induction. A primary, alternating electromagnetic field is introduced into the subsurface by a transmitting coil. The primary field induces electrical currents to flow in the ground, thus creating a secondary electromagnetic field. Under specific conditions, the ratio of the primary to the quadrature component of the secondary field is equivalent to the ground conductivity, in units of millisiemens per metre (mS/m).

Electrical conductivity of soils and rocks is primarily electrolytic (i.e., electrical current is transmitted via dissolved solids in the pore space). An increase in total dissolved solids in the soil will increase the electrical conductivity of the soil. Sands and sandstones, due to the high quartz content, act as electrical insulators and exhibit low electrical conductivity values. Clays and shales readily release ions into the pore space with the introduction of small amounts of moisture, and thus exhibit relatively high conductivity values. Background conductivity values for common soils range from 10 - 30 mS/m for sands and 80 - 100 mS/m for clays. Inorganic soil and/or groundwater impacts (i.e., salts) can dramatically increase the terrain conductivity, and thus, are readily detected by electromagnetic instruments.

The introduction of metal debris into the subsurface greatly increases the ground conductivity and the instrument response is no longer linear. Thus, in areas of buried metal, conductivity values may appear as a mixture of positive and negative values. This response is diagnostic of buried metal debris or electromagnetic interference.

Magnetics

Total field magnetic intensity is a scalar measurement of the Earth's magnetic field. Anomalies within this field are due to two types of magnetism: induced and remnant. Induced magnetism results in the enhancement of the ambient field due to action of the field on a material that causes it to act as a magnet. Resulting magnetism is directly proportional to the intensity of the ambient field and the ability of the material to enhance the local field (magnetic susceptibility). Remnant magnetism is a permanent magnetism of the material that depends on the metallurgical properties and the thermal, mechanical and magnetic history of the material. It is independent of the field in which it is measured.

In an Overhauser effect magnetometer, the hydrogen-rich fluid in the magnetometer sensor is mixed with an electron-bearing fluid and is subject to a strong radio-frequency current that polarises the protons. Protons are then deflected into their plane of precession by a short duration current pulse. After a brief pause to allow transient currents to subside, the slowly decaying proton precession signal remains. The precession frequency is measured and transformed to magnetic field units, i.e. nanoTesla (nT). For each measurement, the time, position and magnetic field values are digitally stored. The Overhauser effect results in a greater polarization of the proton-rich fluid, translating to stronger signals with less power consumption than proton precession instruments.

DATA ACQUISITION AND PROCESSING

EM and magnetic data were collected one behind the other at 1-second intervals (approximately 1 m linear distance) as the operators walked in a grid like fashion across the areas of interest. Survey lines were nominally spaced 5 - 7 m apart

Gridding and contouring of EM31 and magnetic data was performed using the SURFER processing package, with a geostatistical algorithm. Final presentation and plotting of data was performed using CorelDRAW

RESULTS

Frequency Electro-Magnetics (EM31/38)

EM31 and EM38 conductivity data are displayed in Drawing Nos. 1 and 2, respectively. EM conductivity values ranging from 5 – 30 mS/m are displayed as blue coloured regions on the EM drawings. This range of EM conductivity values typically indicates a coarse to medium grained soil texture (eg., sandy silt till) and is interpreted to represent the dominant background EM31 conductivity response.

EM conductivity values ranging from 40 to 65 mS/m are shown as green coloured regions on the EM drawings. This range of EM conductivity values is termed slightly elevated and is likely attributable to the following sources.

- A variance in soil texture (eg., a decrease in bulk grain size or an increase in soil moisture).
- Potential inorganic soil and/or groundwater impacts related to site activities
- EM interference from surface and/or buried metal objects.

EM conductivity values in excess of 65 mS/m are shown as yellow to red coloured regions on the EM drawings. This level of EM response is termed highly elevated and is likely attributable to the following sources:

- EM interference from surface and/or buried metal objects.
- Potential inorganic soil and/or groundwater impacts related to past industrial activities.

EM31 conductivity data has been overlaid on a recent aerial photograph and is presented as Drawing No. 3. This plot was constructed in order to provide regional context and should be used for conceptual purposes only.

Magnetics

Total field magnetometer data are presented in Drawing No. 4. Green coloured regions on Dwg. No. 4 correspond to total magnetic field values ranging from 58,0806nT to 59,040 nT. This range of values is interpreted to represent natural variations in the total magnetic field, and is representative to the background magnetic field of the earth. Anomalously low total magnetic field values are displayed as blue coloured regions, while anomalously high magnetic field values are represented by yellow-red coloured regions on Dwg. No. 4. An anomalous total magnetic field response suggests the presence of buried and/or surface ferrous metallic objects.

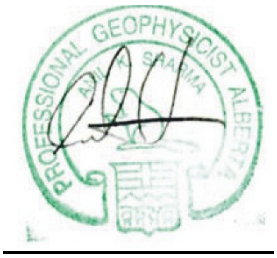
CLOSURE

This report has been prepared with generally accepted geophysical practices for the exclusive use of SLR Consulting (Canada) Ltd. The reported information is believed to provide a reasonable representation of the electrical conductivity of the shallow subsurface and the magnetic field variations at the site, limited to the capabilities of the instrumentation employed. Intrusive investigations (i.e., soil and/or groundwater sampling, test-pitting) are required to confirm the geophysical interpretations.

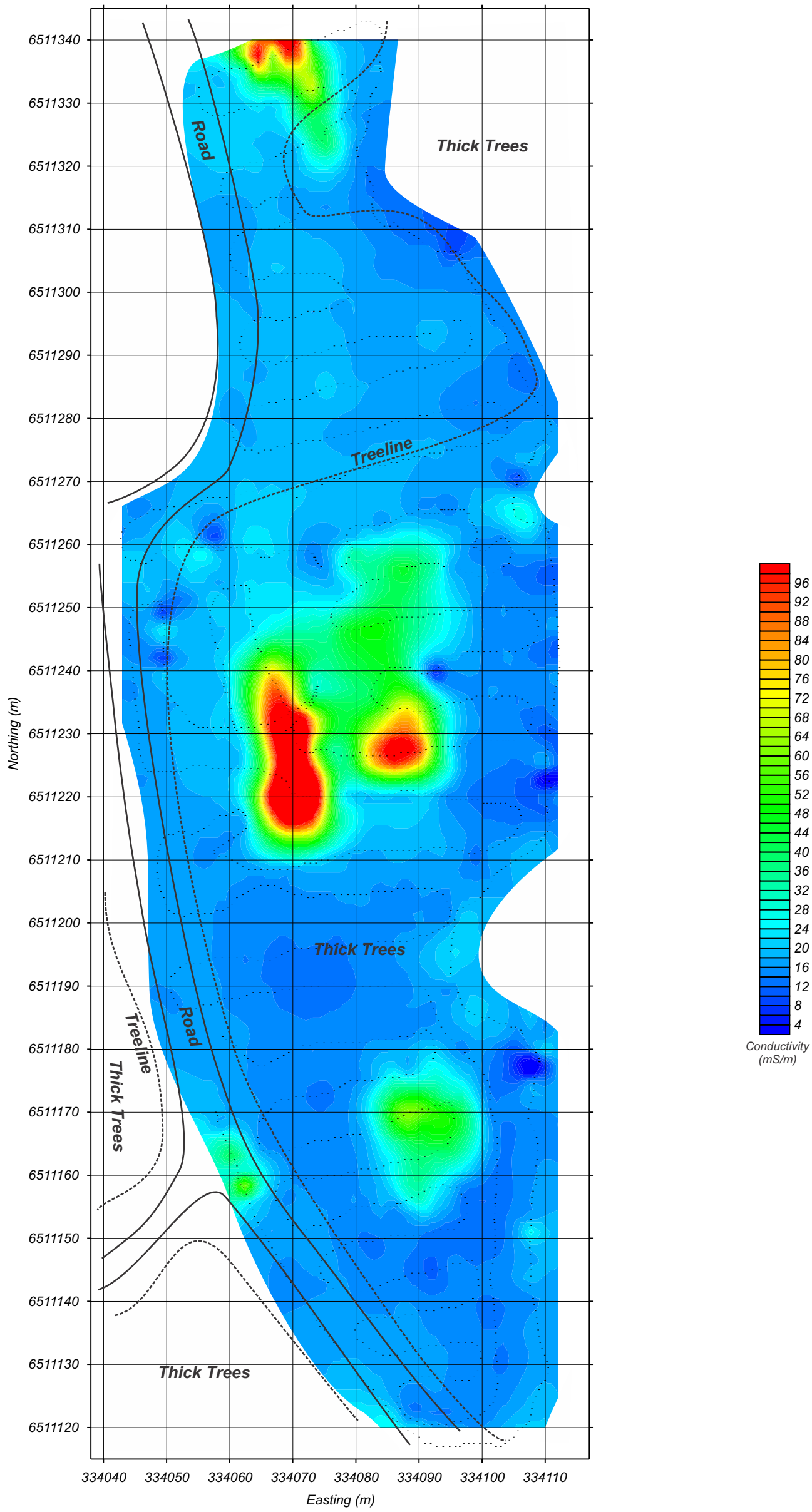
We trust this meets your present requirements. If you should have any further questions please do not hesitate to contact the undersigned. AKS Geoscience Inc. appreciates the opportunity to participate in this project.

Respectfully Submitted,

AKS Geoscience Inc.



Anil K. Sharma, P.Geoph.



Note: Grid Coordinates are in UTM, NAD 83, Zone 12

EM31 CONDUCTIVITY DATA
08-07-112-23 W4M
GARDEN CREEK, ALBERTA

Prepared by: AKS GEOSCIENCE

Client: SLR

Drawn by:

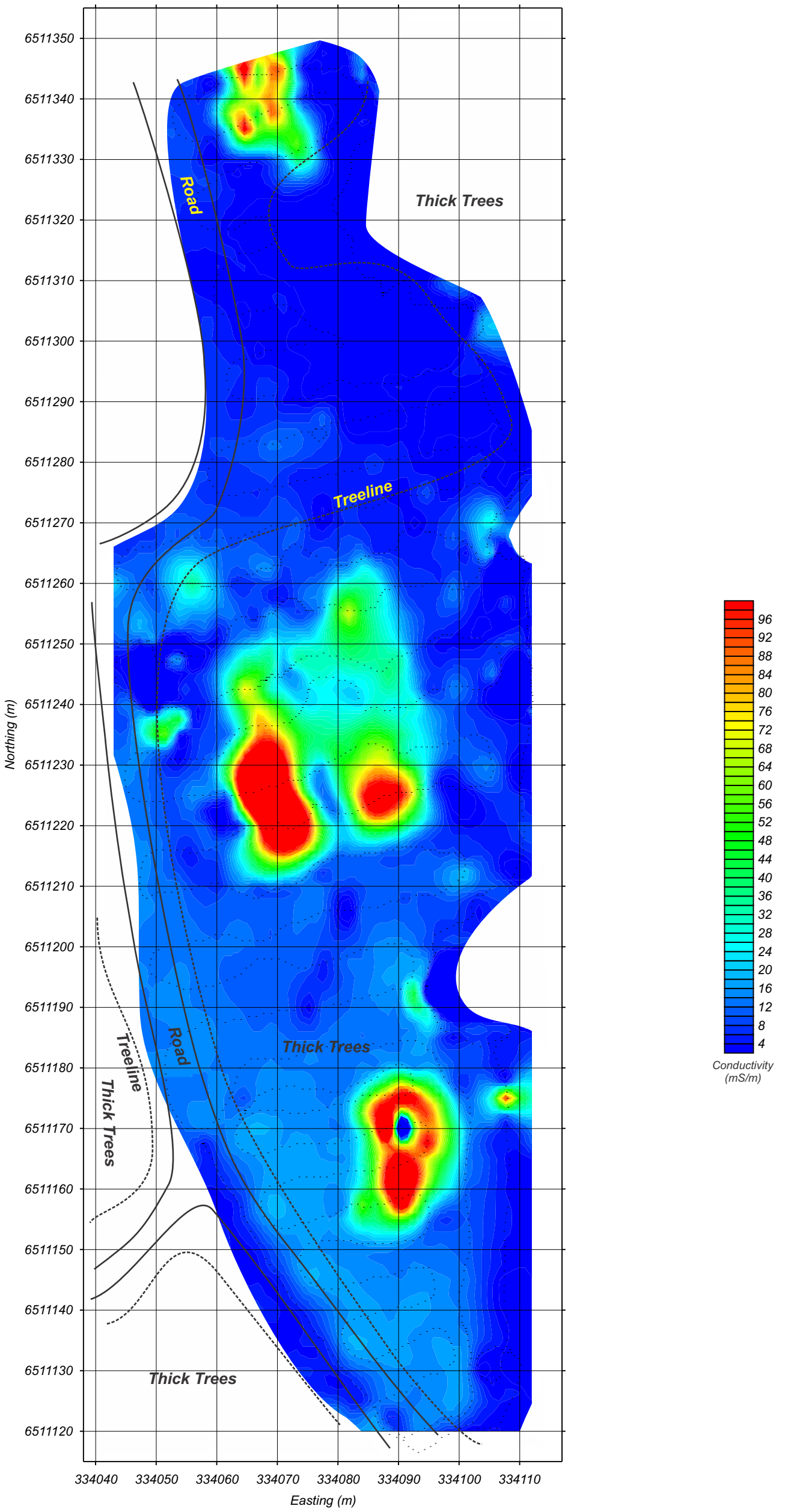
Reviewed by:

Job No. 1877

Scale 1:750

Dwg. No. 1

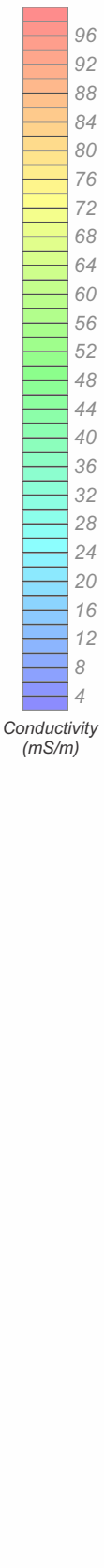
Survey: July 14, 2016



Note: Grid Coordinates are in UTM, NAD 83, Zone 12

EM38 CONDUCTIVITY DATA
08-07-112-23 W4M
GARDEN CREEK, ALBERTA

Prepared by: AKS GEOSCIENCE	Client: SLR	Drawn by:	Reviewed by:
		Job No. 1877	Scale 1:750
		Dwg. No. 2	Survey: July 14, 2016



Scale 1:750

0 20 40 m

EM31 DATA OVERLAID ON AERIAL PHOTO
08-07-112-23 W4M
GARDEN CREEK, ALBERTA

Prepared by: AKS GEOSCIENCE

Client: SLR

Drawn by:

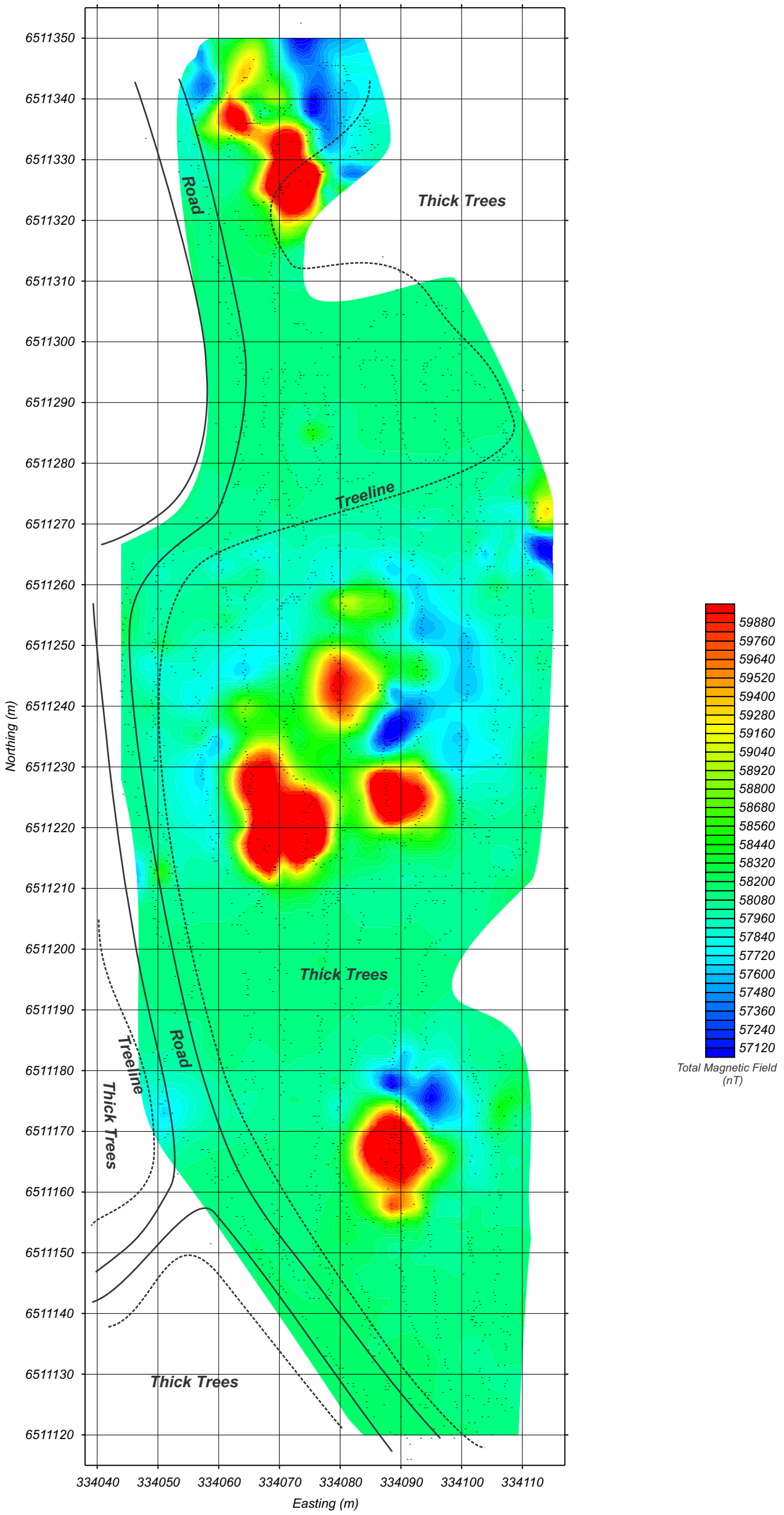
Reviewed by:

Job No. 1877

Scale 1:750

Dwg. No. 3

Survey: July 14, 2016



Note: Grid Coordinates are in UTM, NAD 83, Zone 12

MAGNETIC GRADIENT DATA
08-07-112-23 W4M
GARDEN CREEK, ALBERTA

Prepared by: AKS GEOSCIENCE	Client: SLR	Drawn by:	Reviewed by:
		Job No. 1877	Scale 1:750
		Dwg. No. 4	Survey: July 14, 2016

APPENDIX B
Photographs

Data Gap Assessment
Garden River Old Dump Sites, Garden River, AB
SLR Project No. 209.40380.00000

Photo 1: Panoramic view of site after tree clearing. Mounded soil associated with the south dump area is visible in the background of the photo.

Photo 2: View of destroyed monitoring wells 08-MW04 and 08-MW04B

Photo 3: View of material removed from test pit TP3 completed in south dump area, including re-bar.

Photo 4: View of material in base and side of test pit TP3 showing metals scrap, including car bodies and parts.

Photo 5: View of test pit TP4 showing typical native soil profile encountered in test pits surrounding the dump areas.

Photo 6: View of test pit TP8 showing typical profile of domestic waste encountered in main dump area.

Photo 7: View of test pit TP15 completed in the north debris area. Metal encountered appeared to be a construction camp trailer.

Photo 8: View of test pit TP17 at the edge of the north debris area showing scrap metal encountered in this area.