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G-M PEARSON ENVIRONMENTAL INC.

Canadian Environmental Assessment Act Project Description

Ryley Biomedical Waste Incinerator

307074-01969-300 – EN-REP-0001

23 January 2015

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PROJECT 307074-01969-300 - CANADIAN ENVIRONMENTAL ASSESSMENT ACT PROJECT DESCRIPTION

REV	DESCRIPTION	ORIG	REVIEW	WORLEY – PARSONS APPROVAL	DATE	CLIENT APPROVAL	DATE
0	Issued as final	C. Petch	T. Jacklin	T. Jacklin	06-Jan-15		
1	Re-issued as final	C. Petch	T. Jacklin/ G. Ramesh	T. Jacklin	23-Jan-15		

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1. GENERAL INFORMATION AND CONTACTS

1.1 Nature of the Project and Location

On behalf of G-M Pearson Environmental Inc. (the Proponent), WorleyParsons Canada Services Ltd. (WorleyParsons) has prepared this Project Description for the purpose of determining whether a federal environmental assessment is required for a potentially designated project pursuant to the Canadian Environmental Assessment Act (CEAA) (Government of Canada 2012).

The Proponent is an Alberta-owned company that has operated a biomedical waste incinerator in Wainwright, Alberta under the Alberta Environmental Protection and Enhancement Act (EPEA, Government of Alberta 2014) Approval 9846-01-00 (under Approval holder Wainwright Regional Waste to Energy Authority [WtE]), which expires in January 31, 2015.

G-M Pearson anticipates that the Wainwright Facility will be decommissioned during 2016 and plans a new Biomedical Waste Incinerator Facility (the Project) in the Equity Industrial Park in Beaver County adjacent to the Village of Ryley Alberta (refer to Figure 1). The Project will use the latest, proven technology and will be located closer to Alberta's population corridor (Edmonton – Red Deer – Calgary and outlying towns).

1.2 Proponent Contact Information

The name of the Project is the "Ryley Biomedical Waste Incinerator Project".

The Proponent for the Project is G-M Pearson Environmental Inc.

2333 - 119 Avenue NE

Edmonton, Alberta, T6S 1A9

Website: http://www.gmpearson.ca/

The Chief Executive Officer and the principal contact for the Project Description is:

Mr. Joe Kress

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Edmonton, Alberta, T6S 1A9

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Office phone: (780) 473-6633

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1.3 Summary of Parties Consulted to Date

The Project Description has been prepared following consultation with Ms. Susan Tiege and Ms. Tawanis Testart of the Canadian Environmental Assessment Agency. No other public or aboriginal stakeholders or regulatory agencies under provincial or municipal jurisdictions have been consulted with respect to the preparation of the Project Description.

1.4 Other Relevant Information

1.4.1 Municipal Jurisdictions

The project site lies with the Equity Industrial Park Area Structure Plan. Although the Project lies outside of the municipal boundaries for the Village of Ryley, the Project footprint is located within the Ryley Intermunicipal Development Plan Area and is designated for “general industrial” future land use. A development permit must be obtained for proposed activities occurring within lands designated to be for “general industrial” land use. A development permit has been applied for and is under review by local municipality.

1.4.2 Provincial Jurisdictions

Pursuant to Schedule 1 of the Alberta Environmental Protection and Enhancement Act (EPEA) Environmental Assessment (Mandatory and Exempted Activities) Regulation (Government of Alberta 1993), the development of a “biomedical waste incinerator” is not considered an activity for which an environmental impact assessment (EIA) must be conducted prior to receiving approval from Alberta Environment and Sustainable Resource Development (ESRD).

ESRD is responsible for approvals for specific facilities such as Biomedical wastes. Subject to the requirements for notification of the Project to ESRD, G-M Pearson prepared a Project Summary Table that was submitted for review by ESRD. On February 27, 2014, ESRD confirmed that the completion of an EIA in accordance with the EPEA is not required for the Project (Appendix 1).

Pursuant to Schedule 1, Division 1, Clause (A) of the EPEA Activities Designation Regulation (Government of Alberta 2003), the Ryley Facility is considered to be an activity for which an approval must be obtained.

In accordance with the Historical Resources Act a Historical Resources Act Clearance will be sort through Alberta Culture and Tourism’s online permitting and clearance system with the submission of a historic resources application. During this process, G-M Pearson will engage with Alberta Culture and Tourism as needed.

Although Alberta Health Services (AHS) do not have a direct regulatory permitting function for the Project, they are interested in the Project.

1.5 Regional Environmental Studies

There are no Regional Environmental Studies as defined under the CEAA, 2012 that apply to the region in which the Project is located.

The Project is located within the North Saskatchewan Planning Region designated under the provincial Land Use Framework (ESRD 2013). The North Saskatchewan Regional Plan (NSRP) has not yet been developed; however completion of the NSRP is anticipated prior to application for Approval under the EPEA. In the event that the NSRP is completed in advance of the application for Approval under the EPEA, G-M Pearson will ensure that the Project is constructed and operated in accordance with applicable constraints, conditions, targets or thresholds established within the NSRP, as required according to the conditions of Approval for the Project, to be issued by ESRD.

2. PROJECT INFORMATION

2.1 Project Purpose and Rationale

In the Province of Alberta opportunities for the safe handling and disposal of biomedical waste are severely limited. According to ESRD the recommended management option for the disposal of biomedical waste is by incineration at approved facilities. Incineration has traditionally been the principal method to destroy anatomical and non-anatomical biomedical wastes. There is one facility in Alberta licensed to accept biomedical waste (the Wainwright WtE facility which the Proponent operates Proponent proposes to construct a new state of the art facility to replace the Wainwright facility when it closes in January 2016. It is proposed that the incinerator be approved to process ~ 1, 400 Kg per hour of waste.

2.2 Regulation Designating Physical Activities

Canadian Environmental Assessment Act, 2012 defines the regulations designating physical activities (Government of Canada 2012). Pursuant to Paragraph 29 of the Canadian Environmental Assessment Act, 2012 (Government of Canada 2012) Regulations:

> 29. The construction, operation, decommissioning and abandonment of a new facility used exclusively for the treatment, incineration, disposal or recycling of hazardous waste.

The Agency does not define “hazardous waste” but uses the definition from Environment Canada:

> Biomedical waste is defined in Schedule 3 of the Export and Import of Hazardous Waste and Hazardous Recyclable Material Regulations SOR/2005-149 issued under the Canadian Environmental Protection Act (Government of Canada 2005).

Consequently, the proposed Facility is considered to be a Designated Project.

2.3 Components and Activities

2.3.1 Physical Works

The proposed Facility will be located in the NW quarter of Section 3, Township 050, Range 17, West of the 4th Meridian (14-03-050-17 W4M) (Figure 2).

The physical works will include the construction of an enclosed building containing a rotary kiln incinerator office space, three water tanks for cooling water, air pollution control equipment (baghouse, lime storage silo, activated carbon silo), stormwater management facilities and site grading (see Figure 2). Further details on equipment and layout are shown on Appendix 2.

2.3.2 Anticipated Size and Production Capacity

The Project is being designed to incinerate approximately 1,400 kg/hour of waste. The Project site is approximately 1.42 hectares (3.51 acres) and the proposed building will occupy approximately 975 m^2

(10,500 ft^2). There will also be an on site office that will be approximately 147 m^2 (1,600 ft^2). Figure 1 illustrates the size and location of the Project's parcel within the industrial park.

2.3.3 Percentage Increase in Capacity

Not applicable to the Project. This will be a new Project as opposed to an expansion.

2.3.4 Description of Activities Incidental to the Project

The proposed Project will use treated wastewater from the Village of Ryley for use as industrial cooling water in the Facility. In support of the Project, a 500 m long water supply line will be constructed to transfer treated wastewater from the Village of Ryley wastewater lagoons to the project site.

2.4 Emissions, Discharges and Waste

2.4.1 Atmospheric Emissions

The Project will have one main exhaust stack, a building heat vent stack, tank vents, and an emergency generator stack. G-M Pearson is committed to using state of the art technologies to ensure that emissions are minimized and regulations are met. The incinerator selected will provide for cleaner and consistent incineration of the waste, particularly due to the rotary design of the chamber. The exhaust gases from the rotary kiln incinerator will be directed to the afterburner to ensure the destruction of any residual organic material entrained in the exhaust fumes. The afterburner combustion exhaust gases flow to the combustion off-gas treatment system for cooling, acid gas scrubbing and filtration. The combustion exhaust gases from the afterburner will be cooled down to a temperature suitable for the baghouse. Cooling will be done in the quench tower. In the baghouse, activated carbon and acid gas sorbents (lime) will be injected into the cooled combustion exhaust gases to remove the volatile metals and trace organic materials. The acid gas sorbent will react with the acid gases to form salt products that are then removed by the fabric filters. Fine particulates will also be removed by the fabric filters.

In addition, a continuous emission monitoring system (CEMS) system will be in place in accordance with CEMS Code to provide continuous emission monitoring and compliance capability. A manual stack survey for emissions will also be undertaken once per year. An air quality assessment was completed to evaluate possible changes in potential air quality effects, which are attributed to the proposed Facility. A standard dispersion modelling approach, employing AERMOD model, was used to predict maximum oxides of nitrogen (NO_x) which include nitrogen dioxide (NO_2), sulphur dioxide (SO_2), total particulate matter (TPM) and particulate matter less than 2.5 microns (PM2.5) concentrations due to emissions from the site. Predictions were made for maximum ground-level concentrations of SO_2, NO_x as nitrogen dioxide (NO_2), and TPM. The modeling scenarios considered are as follows:

- Scenario 1: Normal Operations where biomedical waste is continuously incinerated at a rate of 1,400 kg/hr;

- Scenario 2: Emergency Power Generation where a diesel generator is used to produce power in case of a power cut, and the waste incineration is expected to continue for one hour after the power cut; and
- Scenario 3: Emergency Operation (Shutdown conditions).

Air dispersion-modelling was performed to assess the suitability and capacity of the proposed treatment and release control systems. Dispersion modeling has predicted that the air emission treatment and release control systems are acceptable and that emissions will comply with the Alberta Ambient Air Quality Guidelines (WorleyParsons 2014b).

Greenhouse Gas Atmospheric Emissions

Potential sources of greenhouse gases include the incinerator exhaust stack and the emergency generator. Since the emergency generator will be used only in emergency situations, greenhouse gas emissions from it will be minimal.

Preliminary engineering data provided by the rotary kiln vendor indicates an operational carbon dioxide equivalent (CO2e) mass flow rate of 2.2 tons per hour or approximately 19,272 tons per year (T/Y) assuming a constant rotary kiln operating rate of 24-hours per day, 365 days per year. 19,272 T/Y would represent only 0.04% of the 2012 total Canadian national annual CO2e emissions from the “waste and others” sector. Therefore, the Project will be an insignificant source of greenhouse gas emissions and because it will only emit 19,272T/Y of CO2e, it does not meet the trigger level of 50,000 T of CO2e under Alberta’s Specified Gas Emitters Regulation (Government of Alberta 2007) that requires facilities to report their greenhouse gas emissions under the program.

2.4.2 Liquid Discharges

The biomedical waste incineration system will use Ryley’s wastewater and water from the Wash Water Tank to cool the incinerator and the incinerators off gas. The wastewater from the Ryley wastewater plants effluent and filtered prior to use in the incinerator system. The water will be used to cool the rotary kiln and to cool the off gas from the afterburner prior to the gas entering the off gas treatment system.

The rotary kiln operates at 860^{o}C to approximately 1093^{o}C, the water sprays are used intermittently to maintain the rotary kiln at approximately 1000^{o}C. The heat content of the biomedical waste varies such that at times the burner will add heat to maintain temperature or alternatively the water sprays will activate to remove excess temperature. Additionally, water is used to reduce the afterburner outlet gas temperature from 1093^{o}C to approximately 150^{o}C prior to entering the off gas treatment system.

Only the required amount of water is injected into the system. Therefore, there is no waste water from the system as all the water (approximately 108 litres per minute) is evaporated and exits the stack as vapor.

There will be a two compartment sump for water used to wash down of the Project buildings and equipment. The water will be directed to the Wash Water Tank for re-use as cooling water.

Drainage and surface water runoff will be controlled by a system of graded slopes, pipes and ditches. Surface runoff at the Project site will be diverted to an on site stormwater pond. Water collected will be stored for use in the incinerator quench tower. The pond will be lined with a compacted clay liner and will be sized for a 1:25 year stormwater event. The stormwater pond is shown on Figure 2.

Wash water generated during equipment and vehicle cleaning events will be captured in a two compartment sump and directed to the Wash Water Tank for process use. There will be no other process wastewater generated.

Domestic sewage generated from on site washrooms and kitchen facilities will be separated into solids and liquids. Liquids will be piped to the municipal sewage disposal system via the Equity Industrial Park wastewater collection system (EPEA Approval 264283-00-00). Solids will be contained on site in a sump (the Sewage Tank) and a hydra vac truck will be commissioned to remove the solids for disposal at the municipal sewage treatment plant.

2.4.3 Wastes

The project will generate waste streams as follows:

- bottom ash from the rotary kiln;
- ash from the baghouse; and
- incidental, non-hazardous solid wastes from operations.

Ash will be disposed of to the adjacent approved licensed landfill site. Any incidental nonhazardous waste generated during operations will be incinerated on site.

All biomedical waste will arrive at the Facility in labelled and sealed boxes and containers and will be loaded directly into the Facility for incineration. No biomedical waste will be stored at the Facility.

2.5 Project Phases and Scheduling

The Project duration including timelines and associated milestones is provided in Table A.

Table A Project Timelines

Milestone	Timeline
Public Consultation & Engagement	December, 2013 to present. Stakeholder updates are ongoing Next Public Meeting January 13, 2015
ESRD Application Submitted	October 31, 2014
Construction Start Date	April 1, 2015

Milestone	Timeline
Incinerator Start-up	December 1, 2015
Cessation of Operations	anticipated to be >30 years

All construction activities will take place within the property boundary as shown on Figures 1 and 2, on industrial zoned land. As determined during construction, a perimeter ditch will be constructed and silt fencing will be used to manage surface runoff. A construction plan will be prepared by the selected contractor prior to construction commencing. The plan will show the construction area, and access, parking, waste storage and laydown provisions.

Topsoil within areas that will be required for construction will be salvaged and stockpiled on site. Once topsoil salvage and stockpiling has been completed as-built records of the salvage will be generated and kept on company record. The stockpile will be stabilized as soon as practicable with grass seed. The stockpile will be clearly labelled with its intended use for site reclamation purposes. Salvaged topsoil will be used on site for landscaping where possible.

The estimated Project construction schedule is shown below in Table B Schedule for Construction:

Table B Approximate Schedule for Construction

Activity	Schedule
Approval granted by ESRD	Q1 2015
Site clearing and grading	Q2 2015
Foundations	Q2 2015
Building structures	Q2 - Q3 2015
Incinerator installation	Q3 – Q4 2015
Electrical installation	Q4 2015
Facility Operational	Q4 2015

The design life of the Project will exceed 30 years. There are no anticipated land reclamation requirements for this Site. The property is industrial zoned and is expected to continue to have industrial use. If operations were suspended, the equipment would be purged of any product, all tanks and vessels emptied and contents disposed appropriately, equipment and facilities removed, any contamination issues resolved, and the Site sold for future industrial use. The existing building would be re-purposed for future industrial use. In the event of decommissioning a Decommissioning and Land Reclamation Plan will be prepared in advance of the end of design life and will be submitted to ESRD for approval.

3. PROJECT LOCATION

3.1 Designated Project Location

The Project site is situated in the Equity Industrial Park immediately east of the Municipal Limits of the Village of Ryley, Alberta. Edmonton, the nearest city, is located approximately 86 km away. A location plan is provided in Figure 1 and the Equity Industrial Park Structure Plan is shown in Figure 3.

The street address is: 31 - 50025 Range Road 173, Equity Industrial Park, Ryley, Alberta, T0B 4A0.

The Project site is owned by G-M Pearson.

3.1.1 Project Coordinates

The latitude and longitude of the Project site are 53°17’33N 112°24’19”W respectively.

3.1.2 Site Plans and Map

A site plan is provided in Figures 1 and 2.

3.1.3 Photographs of Work Locations

Photographs of the Project site are provided in Figure 1 and Appendix 3.

3.1.4 Proximity to Other Land Uses and Other Aspects

Permanent, seasonal or temporary residents

Figure 1 illustrates the location of the nearest residential area, Village of Ryley, which is approximately 1.5 km west of the Project site.

Reserves, traditional territories, settlement land and lands and resources currently used for traditional purposes by Aboriginal peoples

Figure 4 illustrates the nearest reserves. The Project is not located in close proximity to any known traditional territories, settlement land or lands and resources currently used for traditional purposes by aboriginal peoples. Nearest aboriginal lands have the following proximities to the Project:

- Kikino Métis Settlement: 116 km north;
- Buffalo Lake Métis Settlement: 125 km north;
- Saddle Lake Cree First Nation: 79 km northeast;
- Louis Bull First Nation: 85 km southwest;
- Ermineskin First Nation: 78 km southwest;
- Samson First Nation: 77 km southwest; and

- Montana First Nation: 90 km southwest.

The Project is located approximately 35 km southeast from Elk Island National Park. There is no current aboriginal use at the site for traditional purposes.

Figure 5 illustrates the nearest crown land to the Project site while Figure 6 shows the Project site in relation to environmental sensitive, protected, or designated areas.

Federal Lands

The project is not located on federal land and there is no federal land within approximately 10 km of the Project site. Figure 5 illustrates the nearest crown land to the Project site. Crown land included provincial and federal land.

3.2 Land and Water Use

3.2.1 Zoning Designations

The proposed Project will be situated on approximately 1.4 ha (3.51 acres) within an industrial park situated on previously vacant agricultural land (Beaver County 2009). The industrial park is within the Equity Industrial Park Area Structure Plan.

The site is within the area covered by the Beaver County Municipal Development Plan (Beaver County 2013a) and the Beaver County Land Use Bylaw (Beaver County 2013b). The land is designated as Rural Industrial District according to the Land Use District Map 10.4, Beaver County (2010a) and as General Industrial in Map 1C of the Beaver County Municipal Development Plan (Beaver County 2010b).

The proposed project lies within the 450 m buffer from the Beaver Regional Waste Management Services Landfill and the proposed development is a conforming land use consistent with the Subdivision and Development Regulation 43/2002 - s13(4).

3.2.2 Legal Description of Land to be Used

The legal description of the land is: Plan: 042 7065, Block: 1, Lot: 2.

It will be located in the NW quarter of Section 3, Township 050, Range 17, West of the 4th Meridian (LSD 14-03-050-17W4M).

3.2.3 Resource Management and Conservation Plans

Other Land Uses

Surrounding land-use includes agriculture, and the Village of Ryley including municipal and rural industrial facilities. Nearby industrial development includes the Beaver Regional Waste Management Services Landfill, located 550 m north. This is a Class II landfill facility and is 160 ha in size and accepts municipal waste, contaminated soils, waste sludge, construction and demolition debris, and asbestos waste.

Additional industrial and commercial ventures include a tank manufacturing company, ATCO Electric, a humalite processing facility (Black Earth - a soil processing/mixing company) and warehousing.

Areas adjacent to the Industrial Park are either already developed as industrial, or will be used by the Beaver Regional Waste Management Services Commission for landfill expansion. An area of environmental reserve and a municipal reserve are located South of the roadway in the NW ¼ 3-50-17W4, which contains a wetland (Beaver County 2009), refer to Figure 3.

The Project is located approximately 12 km south-southeast from lands administered according to the Beaverhill Lake Land Use Plan (Alberta Energy and Natural Resources 1981). The Beaverhill Lake Land Use Plan provides guidance on the integration of agricultural, recreational and wildlife land use planning in the areas immediately surrounding Beaverhill Lake. There are no regionally applicable recommendations associated with the Beaverhill Lake Land Use Plan.

Resource Plans

The Project site falls within the boundary of the North Saskatchewan Region (NSR) integrated resource planning area. The NSR Plan is currently under development. Previously, the area was within the boundaries of the Rocky-North Saskatchewan integrated resource planning areas (ESRD 2013) and so was included in the Rocky North Saskatchewan Sub-Regional - Integrated Resource Plan.

There is no current or planned oil and gas activity on site. Because the development at the site is wholly within an existing industrial park, conflicts with the management of resources in the region are not anticipated.

Water Management Plans

The Project is located within the Beaverhill Region of the North Saskatchewan Watershed, for which the North Saskatchewan Watershed Alliance (NSWA) has developed an Integrated Watershed Management Plan (NSWA 2012).

Throughout Project design the Proponent has looked for the most appropriate way to source water for the Project. Non-potable water for Project operations will be sourced from the on site stormwater pond and the municipal treated wastewater lagoon and the neighbouring landfill facility thereby minimizing the potential impact of the Project on regional water sources. There is no process discharge and stormwater will be re-used for cooling water. Therefore there is no process or effluent discharge into area watercourses.

3.2.4 Aboriginal Lands/Resource Involvement

The Project will not require access to, use or occupation of, or the exploration, development and production of lands and resources currently used for traditional purposes by Aboriginal peoples. The Project will be constructed and operated on an existing industrial zoned site within an existing industrial park. The nearest Aboriginal land area is approximately 80 km from the Project site (Figure 4).

The Project is located within the asserted traditional territory of Treaty 6 First Nations, however, the lands are on Freehold (private) land in an area designated for industrial development. The area has not been accessed by First Nations for traditional land use since settlement. There are no Aboriginal reserves in close proximity and no trap lines or traditional harvesting on the land. Therefore, the Project will not require access to, use or occupation of, or the exploration, development and production of lands and resources currently used for traditional purposes by Aboriginal peoples.

4. FEDERAL INVOLVEMENT – FINANCIAL SUPPORT, LANDS AND LEGISLATIVE REQUIREMENTS

4.1 Federal Financial Support

No federal authority will be providing any financial support for the Project.

4.2 Federal Lands

No federal lands will be required for the Project.

4.3 Federal Legislative or Regulatory Requirements

There are no federal legislative or regulatory requirements (including any federal license or permit) that are applicable to the Project. The only purported Federal Regulatory Requirement is in relation to the CEAA 2012 reporting requirements herein.

The Proponent will comply with all legislative requirements for the auxiliary activity of the transportation of the biomedical waste.

5. ENVIRONMENTAL EFFECTS

5.1 Site Conditions

A reconnaissance site inspection was conducted to view biophysical conditions on July 28, 2014.

5.1.1 Local and Regional Vegetation Types

Vegetation in the Central Parkland Natural Subregion contains a mixture of grasslands, mixed deciduous and mature aspen forests, saline wetlands, shrublands and sparse communities stabilizing sand dune slopes (Natural Regions Committee [NRC] 2006). The Project site is dominated by herbaceous and graminoid vegetation communities, consisting primarily of grasses and herbs. Only two trees occur within the Project site, both are cottonwood poplar (*Populus deltoides*), and both are less than 2 m tall. There are no shrubs within the Project site.

A search of the Alberta Conservation Information Management System (ACIMS) revealed that there are no element occurrences within Township 37, Range 9, West of the 5th Meridian (ESRD 2014b). This includes both rare and non-rare plants and ecological communities.

Two noxious weed species, as defined by the Alberta Weed Control Act (Government of Alberta 2010a) and the Weed Control Regulation (Government of Alberta 2010b), were observed on site: Canada thistle (*Cirsium arvense*) and scentless chamomile (*Tripleurospermum perforatum*). In addition, two weeds, as defined by Royer and Dickinson (2006), are present: foxtail barley (*Hordeum jubatum*) and common dandelion (*Taraxacum officinale*).

5.1.2 Wildlife

Limited wildlife and signs of wildlife were seen during a July 2014 site reconnaissance. Two songbirds were flushed from the herbaceous vegetation community, several species of butterflies, mosquitoes, several gopher burrows, the bed of an ungulate along the west side of the Project site, as well as a wildlife trail in the northeastern part of the Project site.

A report was generated using ESRD's Fish and Wildlife Internet Mapping Tool (FWIMT) using a 5 km buffer radius. The results of the mapping are shown below in Table C (ESRD 2014a):

Table C Species Summary Report

Fish Inventory	Wildlife Inventory	Sensitive Species
Fathead minnow	Barn swallow	Yes
	Green-winged teal	No
	Least flycatcher	Yes
	Northern pintail	No
	Sora	No
	Swainson's hawk	Yes

Note: * As categorized by the general status assessment process of ESRD - Wildlife Management

The Project site does not fall within an Important Bird Area (IBA Canada 2014).

5.1.3 Soils

The land capability class and rating displayed on the Canada Land Inventory Soil Capability for Agriculture map (Edmonton, 83H). NW 3-50-17W4 is categorized as Class 2, indicating moderate limitations that restrict the range of crops or require moderate conservation practices. The area is deemed as subclass S, signifying soil limitations, whether by undesirable structure, low permeability, a restricted rooting zone, low natural fertility, low moisture holding capacity or salinity.

According to a previous soil survey report (Alberta Research Council 1988), the parent material of the local area, consists of mostly fine loamy brown till of variable thickness with some gray till at the surface deposited within an undulating to slightly hummocky terrain characterized by numerous scattered depressions. Soils consist of mostly well-drained, Black Solonetzic (Solodized Solonetz and Solod) soils with poorly-drained Humic Gleysols in scattered depressions in addition to some Chernozemic soils and Gleyed subgroups (Alberta Research Council 1988).

Prior to development of the Equity Industrial Park, a Phase 1 Environmental Site Assessment (ESA) was undertaken in 2004 and updated in 2009 for the NW 1/2 of Section 03-050-17W4. Stains or unusual odours were not noted at the site during the investigation (Sabatini Earth Technologies Inc. [SETI] 2009).

5.1.4 Surface Watercourses and Drainage

The Project site is situated in the Beaverhill Watershed and the major drainage feature in the region is the North Saskatchewan River, which is located approximately 78 km north of the site. The Vermilion River, a tributary of the North Saskatchewan River, is located about 14 km northeast of the site. Beaverhill Lake, located about 15 km northwest of the site, is a lake that was designated a Wetland of International Importance by the Ramsar Convention in 1987. The Beaverhill Natural Area, including Beaverhill Lake,

was also established in 1987 and is significant habitat for migrating birds. This area is also protected under the Alberta Provincial Government's Wilderness Areas, Ecological Reserves and Natural Areas Act (1981), now known as the Wilderness Areas, Ecological Reserves, Natural Areas and Heritage Rangelands Act (Government of Alberta 2013a).

Regional surface drainage generally moves north-north-east as shown on Figure 2.

There are no aquatic habitats, e.g. water bodies or watercourses, in the Project site. A seasonal low lying drainage area present approximately 360 m east of the Project site, and a dugout is present about 50 m southeast. There are no wetlands in the Project site; however, several low lying wet areas occurred within 250 m east and northwest of the Project site that were tentatively classified as Class II, Temporary Wetlands, under the Stewart and Kantrud (1971) wetland classification system.

5.1.5 Groundwater

There are no aquifers of note documented to be beneath the Project site. Saturated sand and gravels are reported of limited areal extent in the study area. Total dissolved solids concentrations for wells completed in the surficial deposits for the County of Beaver were <1,500 mg/L (Hydrogeological Consultants Ltd. 1999) (WorleyParsons 2014a).

The bedrock aquifers beneath the site include the Bearpaw Formation, Oldman Formation, and the Foremost Formation (Continental) (Hydrogeological Consultants Ltd. 1999) (WorleyParsons 2014a). Underlying the Foremost Formation is the Lea Park Formation, consisting of very low permeability shales (aquitard) and with thickness in the range of 100 to 200 m (WorleyParsons 2014a). The depth to the top of the Bearpaw Formation within the study area is in the order of 30 metres below ground surface (mbgs). The Bearpaw Formation is characterized by expected yields of <15 imperial gallons per minute (igpm). Total dissolved solids concentrations in this formation range from 500 to 2,000 mg/L. The depth to the top of the Oldman Formation within the study area within the Project site is in the order of 60 mbgs. Yields in this formation are expected yields are <1.5 igpm while total dissolved solids concentrations range from 500 to 3,000 mg/L. Deeper, the depth to the Foremost Formation (Continental): is 120 mbgs. Expected yields are within the Foremost Formation are <1.5 igpm. Total dissolved solids concentrations here range from 1,000 to 3,000 mg/L.

5.1.6 Air Quality

Ambient or background air quality is defined as ambient concentrations that occur in the absence of the Project. Other potential sources could include other facilities, communities and traffic. Ambient air quality data for NO_2, SO_2, and particulate matter up to 2.5 micrometres (PM2.5) were obtained from the Edmonton East monitoring station. Its elevated background level due to being an urban setting provides a conservative estimate of the ambient air quality for the Project site. Table D presents the ambient air quality data relevant to the Project site.

Table D Background NO_2, SO_2 and $PM_{2.5}$ Concentrations based on 2013 Measurements at the Alberta Capital Airshed Alliance (ACAA)

Contaminant	Molecular Weight (g/mole)	Time Average[3]	90th Percentile (ppm)	90th Percentile (µg/m3)	Average (µg/m3)
NO_2[1]	46	1-hour	0.033	61.3	
		Annual	-	-	11.8
SO_2[1]	64	1-hour	0.002[3]	5.2	
		24-Hour	-	-	5.2[2]
		Monthly	-	-	5.2[2]
		Annual[2]	-	-	5.2[2]
TPM[4]	-	1-Hour	-	49.0	-
		24-Hour			49.0[2]
		Annual			49.0[2]
PM_{10}[5]	-	1-Hour	-	29.0	-
		24-Hour			
	-	Annual	-	-	29.0[2]
$PM_{2.5}$[1]	-	1-Hour	-	20.0	
		24-Hour	-	-	20.0[2]

Notes:

[1] NO_2, SO_2 and $PM_{2.5}$ background concentrations are from Edmonton East air monitoring station obtained from Clean Air Strategic Alliance (CASA), Alberta Ambient Air Data Management System.

[2] 24-Hour, monthly, and annual background concentrations are conservatively assumed to be equivalent to the 1-hour 90th percentile background concentration.

[3] Data has been verified and validated by CASA.

[4] Representative background TPM concentrations are not available hence assumed to be equivalent to the total of $PM_{2.5}$ and PM_{10} background concentrations

[5] PM_{10} background concentrations are from Edmonton South air monitoring station obtained from Clean Air Strategic Alliance (CASA), Alberta Ambient Air Data Management System.

5.2 Potential Environmental Effects

Overall, due to the location of the Project site and the nature of the area (pasture), environmental impacts as a result of the project are considered to be minimal.

The Project site is within an existing industrial park adjacent to a land reserved for landfill purposes and the Project site is not identified as providing significant wildlife habitat. Therefore environmental wildlife impacts from the Project are considered to be unlikely. Furthermore, to avoid construction impacts on birds, a wildlife sweep will be conducted prior to any works which is planned to take place mid-April to August 31. This sweep will identify if there are nesting birds present at the site. Should any evidence of migratory birds on the site be found, ESRD will be contacted to determine a suitable management approach.

No significant issues with terrain or soil were noted for the proposed Project location. Operational soil impacts from the Project are considered to be unlikely as Project activities will take place indoors on a concrete floor; the concrete floor is constructed in such a way to collect facility wash water and recycle it as cooling water. There are three water tanks for use as cooling water at the Facility. These water tanks do not contain compounds which may cause soil or groundwater contamination. Outdoors, the small fuel tank for fuelling the loader will be portable and made using double walled steel construction with spill containment. The lime storage silo and activated carbon storage will be constructed on concrete pads which collect and drain any accumulated stormwater back into the Facility for use as cooling water thereby avoiding potential contact with soil.

There are no watercourses or wetlands present within the Project site, no process effluent will be generated from the facility, and no off site discharges of liquid wastes such as stormwater and sewage to watercourses. Therefore impacts on watercourses as a result of the Project are unlikely. Liquid sewage will be transported by pipe to the municipal wastewater treatment plant while solid sewage will be transported by a truck. Stormwater will be conveyed to the on site stormwater pond.

It is considered unlikely that the project will have any impacts on groundwater as Project activities will take place indoors on a concrete floor and bunded building and there will be no process effluent generated or disposed of as part of the process. Furthermore, there will be no waste disposal on site and the inert (decontaminated) ash produced from the incinerator process will be disposed of at the adjacent landfill site. The ash will be directly loaded from the kiln/baghouse into sealable waste containers and trucked to the landfill for disposal.

An air quality assessment was completed (WorleyParsons 2014b) to evaluate possible changes in potential air quality effects, which are attributed to the Project. A standard dispersion modelling approach was used to predict maximum oxides of nitrogen (NO_x) which includes NO_2, SO_2, TPM and particulate matter less than 2.5 microns ($PM_{2.5}$) concentrations due to emissions from the Project. The modeling scenarios considered are as follows:

- Scenario 1: Normal Operations where biomedical waste is continuous incinerated at a rate of 1,400 kg/hr;

- Scenario 2: Emergency Power Generation where a diesel generator is used to produce power in case of a power cut, and the waste incineration is expected to continue for one hour after the power cut; and
- Scenario 3: Emergency Operation (Shutdown conditions).

Concentrations of NO_x, SO_2, TPM, and $PM_{2.5}$ under maximum design operation and also in the case of emergency power generation were evaluated. In all cases, the maximum ground level NO_2, SO_2, TPM, and $PM_{2.5}$ concentrations were predicted to be less than their respective Alberta Ambient Air Quality Objectives (AAAQOs, Government of Alberta 2013b). A copy of the air quality assessment is provided in Appendix 4, including emergency scenarios.

In terms of greenhouse gas emissions, preliminary engineering data provided by the rotary kiln vendor indicates an operational carbon dioxide equivalent (CO2e) mass flow rate of 2.2 tons per hour or approximately 19,272 tons per year (T/Y). This assumes a constant rotary kiln operating rate of 24-hours per day, 365 days per year. 19,272 T/Y would represent only 0.04% of the 2012 total Canadian national annual CO2e emissions from the “waste and others” sector. Therefore, the Project will be an insignificant source of greenhouse gas emissions and because it will only emit 19,272T/Y of CO2e, it does not meet the trigger level of 50,000 T of CO2e under Alberta’s Specified Gas Emitters Regulation that requires facilities to report their greenhouse gas emissions under the program (Government of Alberta 2007).

5.3 Potential Effects Related to Federal Legislation

5.3.1 Effects on Fish and Fish Habitat

No changes are expected to off site fish and fish habitats as defined in the Fisheries Act as there will be no discharges of liquid wastes to the natural environment directly from the site in accordance with an EPEA Approval issued by ESRD (refer to Section 2.4.2).

The Project footprint does not contain any aquatic environments, nor are there any potential effects that extend beyond the Project footprint (e.g. off site deposition of fugitive dust) likely to interact with aquatic environments. Consequently, there are no anticipated effects on aquatic species as defined in the federal Species at Risk Act.

5.3.2 Effects on Marine Plants

There is no marine component to the project therefore there will be no impact on Marine Plants as a result of this Project.

5.3.3 Effects on Migratory Birds

Wildlife habitat is limited in the Project site and restricted to the herbaceous and graminoid vegetation communities, as there were only two trees and no shrub communities within, or near, the Project site. Construction of the Ryley Facility will result in transformation of the pasture areas with minimal impact on wildlife and migratory birds.

Project-specific impacts to migratory birds and their habitat are anticipated to be limited in the construction, operation and closure phases of the Project. Given the distance from Beaverhill Lake, current land use within the Project footprint and implementation of applicable operational and closure measures, impacts to migratory birds are anticipated to be limited in extent and severity and are considered to be reversible during the period following closure and reclamation of the Project footprint.

No vegetation clearing, other than pasture, will be needed for the Project. Regardless, as construction activity required to complete the Project will need to occur during the primary nesting period (mid-April to August 31) as a precaution a certified biologist will be engaged to conduct a nest sweep prior to onset of construction activities to avoid potential impacts on migratory birds. Should any evidence of migratory birds on the site be found, ESRD will be contacted to determine a suitable approach.

5.4 Potential Effects Related to Interprovincial/Federal/International Lands

It is anticipated that there will be no environmental effects of the Project on federal lands or on other provinces or countries. The Project is not located on federal land and there is no federal land within approximately 10 km of the Project site. Nor is the Project site located near a provincial or international border.

5.5 Potential Effects on Aboriginal Peoples from Changes to the Environment

Given the distance between the Project and the nearest aboriginal land (Section 3.1.5), and since the detailed environmental analysis of air quality and ecology impacts predicted that there would be no significant change to the environmental beyond the property line, the potential for construction and operation of the Project to affect the health, rights and socio-economic conditions of aboriginal peoples is considered to be unlikely. Furthermore, the lands on which the Project is located have been under freehold title and have not been accessed for the purposes of traditional use and/or resource harvesting following settlement in the region. Consequently, impacts to the environment associated with the Project footprint are not anticipated to have an effect on the physical and cultural heritage of, or traditional use by, aboriginal peoples.

6. PROPONENT ENGAGEMENT AND CONSULTATION WITH ABORIGINAL GROUPS

6.1 Potentially Interested or Affected Groups

G-M Pearson has reviewed the location of aboriginal communities with nearest proximity to, and therefore most likely to be affected by, the Project. The aboriginal groups identified as having the greatest potential to be affected by the Project include:

- Kikino Métis Settlement;
- Buffalo Lake Métis Settlement;
- Saddle Lake Cree First Nation;
- Louis Bull First Nation;
- Ermineskin First Nation;
- Samson First Nation; and
- Montana First Nation.

6.2 Consultation Undertaken

Engagement and consultation with aboriginal groups has not yet been initiated however initial contact was made with Mr. Darcy Evanochoko (ESRD North Saskatchewan Regional Lead, Regulatory Consultation) regarding Aboriginal consultation for the project. Mr. Evanochoko advised that consultation with aboriginal groups is not likely to be required however this will be reviewed again upon the submission of the EPEA approval application.

G-M Pearson is committed to identifying and addressing aboriginal concerns regarding the Project, including those concerns related to aboriginal rights, health, safety and the environment. At this time G-M Pearson has reached out to aboriginal groups and the public through notification for the open house mail out (February 2014, public advertising in January and February 2014 and open house in January 2015).

6.3 Comments and Concerns

To date no comments of concerns have been expressed by aboriginal groups in relation to this project.

6.4 Consultation and Information Gathering Plan

As stated in 6.1 and 6.2, no specific aboriginal group consultation has been undertaken. Aboriginal groups will be provided with information regarding the project through the Alberta EPEA approval application process once the application and will have opportunity to raise any comments or concerns pertaining to the project.

7. CONSULTATION WITH THE PUBLIC AND OTHER PARTIES

7.1 Comments and Concerns

The Proponent is committed to engaging and consulting with community stakeholders with regard to potential impacts of the Project. The Proponent is working collaboratively with the local community, stakeholders and local and provincial governments to ensure that the Project is understood by those affected and incorporates their input.

Below is a summary of the key stakeholders and groups that have been consulted with at the time of submission.

Government Bodies and Regulatory Agencies

- Alberta Environment and Sustainable Resource Development (ESRD);
- Federal Member of Parliament (MP);
- Provincial Member of the Legislative Assembly (MLA);
- Beaver County Council;
- Village of Ryley Mayor and Council; and
- Canadian Wildlife Services, Environmental Stewardship Branch of Environment Canada, Beaverhill Lake.

Direct Neighbours

- Equity Development Park: Neighboring businesses and industries;
- Village of Ryley: Residents, especially those in close proximity to the industrial park; and
- Farmers and landowners: within 800 m of the proposed Project site.

Community Group

- Ryley Public Advisory Committee;
- Communities in the Immediate Vicinity;
- Holden: Located past Poe about 15 km east of Ryley - population in 2006 was 398 people;
- Town of Tofield: Located about 18 km northeast of Ryley - population in 2006 was 1,876 people; and
- Haight: Located approximately 10 km north east of Ryley - unincorporated area.

Special Interest Groups

- Nature Canada http://www.naturecanada.ca/;
- Beaver Hill Birds Observatory http://beaverhillbirds.com/#;
- The Beaver Hills Initiative www.beaverhills.ab.ca;
- Beaver River Watershed Alliance www.beaverriverwatershed.ca; and
- Other special interest groups to be identified during the Consultation process.

Consultation and Engagement commenced late 2013. A Project Information Package was mailed out February 4, 2014 to all stakeholders groups including:

- residents and businesses within the Village of Ryley;
- rural landowners within Beaver County;
- those with liens, encumbrances and interests on the proposed Project site; and
- “other interested stakeholders”.

Informational meetings were also held with the Village of Ryley Council on February 4, 2014, the Beaver County Council on February 19, 2014 and ESRD on May 20, 2014.

Additionally, a forum by way of an Open House in the Village of Ryley was held on February 18, 2014. It was advertised in the local weekly newspaper, the Tofield Mercury, on January 18, February 4 and February 11, 2014. An ad was also run in the February edition of the monthly newsletter, the Ryley Village Voice, on January 30, 2014. In addition, an invitation to the Open House was included in the Project Information Package which was sent to all identified stakeholders. The invitation was also posted at the Village Office and in local businesses in Ryley. A variety of communication materials were distributed, including a plain language description of the Project, related maps and management strategies for safe and compliant operation. During the open house, a team of technical experts were on hand to answer questions. In addition, representatives from Alberta Health Services (AHS) attended to discuss public health concerns and the need for the Biomedical Waste Incinerator.

The Open House attracted a large turn-out with approximately 72 people.

Specific environmental concerns raised during the course of the public consultation process to date were:

- Concern: air emissions/risks of cancers and bio-accumulation in food and the environment:
  - Response: air modelling has been performed in order to ensure compliance with the Alberta Ambient Air Quality Guidelines.
  - Response: an afterburner burns any residual organic particles in the exhaust gas at 1,000°C. Only filtered exhaust gasses will be emitted. Activated carbon will remove volatile metals, semi-volatile metals and trace amounts of organic materials. Chemicals injected into the gas ducting react with any acid gases to form solid salts.

- Concern: biomedical waste and public health:
  - Response: the design of the incinerator is to operate at temperatures ranging from 860°C to 1,093°C, destroying any pathogens present in the waste.
- Concern: transport and handling of biomedical waste:
  - Response: the Proponent has an Emergency Response Plan in place in case of an accident. The waste is transported in approved, labelled boxes following applicable regulations.

7.2 Planned On-Going Consultation

Ongoing communications with individual stakeholders as follow-up to the information package mail-out, the Open House and the meeting with Beaver County Council are underway to address any outstanding questions and concerns. An updated open house is scheduled for January 2015.

In addition to the above, the general public will be formally notified of the application through advertisement of the application in local weekly newspapers per the EPEA approval process. Public notification requires that the Project Description to be advertised in two local newspapers. Advertisements will run for a minimum of 30 days in order to receive public inputs, statements of concern, and information requests for at least an additional 30 days following the last advertisement. Advertising will be conducted once the application has been deemed complete by ESRD.

The Proponent intends to continue to utilize the above discussed forums throughout the regulatory approval process to ensure the community and stakeholders are kept informed and to foster strong positive community relationships by maintaining open and transparent communications.

7.3 Consultation with Other Jurisdictions

The Proponent and their consultant, WorleyParsons, have engaged with several representatives from relevant regulatory bodies. These include:

- Village of Ryley's Mayor, Council, and Chief Administrative Officer;
- Beaver County Administration/Council;
- Beaver County Water Commission;
- ESRD; and
- Alberta Health Services.

Specific consultation with these regulatory bodies includes:

a) Village of Ryley: The Proponent has been in contact with Village of Ryley representatives to discuss the Project and various aspects including sewage and water. An informational meeting was also held with the Village of Ryley Council on February 4, 2014.

b) Beaver County Council: The Proponent attended the Beaver County Council Meeting at 10:30 am on Wednesday, February 19, 2014, following the Open House event. A short project summary was provided to the Beaver County Council followed by a brief question and answer period. The Proponent remains in contact with Beaver County representatives and a development permit application for the Project will submitted shortly.

c) ESRD: The Proponent and WorleyParsons have been in touch with several ESRD representatives throughout the preparation of the approval that is being sought under the Alberta Environmental Protection and Enhancement Act. These include the following:

   i) A meeting was held on May 20th in Edmonton with Mohammad Habib (Acting Manager Industrial Approvals), Mohammad Shoaib (Engineer), Carol Nelson (Waste Policy Advisor), and David Lyder (Air Dispersion Modeller) to discuss the proposal and approval application.

   ii) On February 21st Corrine Kristensen (Acting Environmental Assessment Team Leader) was emailed requesting confirmation to whether a provincial EIA was required for the project. On February 27th Ms. Kristensen responded via letter to confirm that an EIA was not required.

   iii) On December 19th Darcy Evanochoko (North Saskatchewan Regional Lead, Regulatory Consultation) was called and emailed regarding Aboriginal consultation for the project.

d) Alberta Health Services: The Proponent is in regular contact with Alberta Health Services regarding the proposal as they will be the main user of the incinerator. Representatives of Alberta Health Services attended the open house to discuss public health concerns and the need for the Biomedical Waste Incinerator. Alberta Health Services representatives present where Brown (Central Zone Manager, Environmental Public Health) and Tony Mak (Provincial Advisor - Health Impact Assessment).

A development permit must be obtained for proposed activities occurring within lands designated to be for “general industrial” land use.

G-M Pearson prepared a Project Summary Table that was submitted for review by ESRD on March 17, 2014. On April 10, 2014, ESRD confirmed that the completion of an EIA in accordance with the EPEA shall not be required for the Project (Appendix 1).

Pursuant to Section 37(2) of the Alberta Historical Resources Act (HRA, Government of Alberta 2013c), ground disturbance activities with potential to cause alteration, damage or destruction of historical resources may require an assessment to determine the effect of the proposed activity on historic resources in the area where the activity is carried out. Alberta Culture (AC) issues Clearance under the HRA where impacts to historical resources are determined to be unlikely. G-M Pearson will submit an application for Clearance under the HRA and, if required, will conduct a Historical Resources Impact Assessment (HRIA) and meet any conditions as required by AC.

8. SUMMARY OF THE PROJECT DESCRIPTION

A summary of this Project Description has been provided as a separate document. In accordance with the Officials Language Act, the summary has been prepared and provided in both English and French. The summary will be posted on the Agency website.

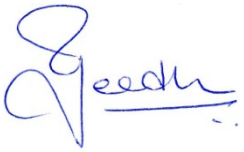
9. CLOSURE

We trust that this report satisfies your current requirements and provides suitable documentation for your records. If you have any questions or require further details, please contact the undersigned at any time.

Report Prepared by

Cleo Petch, B.Sc.
Staff Environmental Approvals Specialist

Senior Review by



Tom Jacklin, M.Eng., P.Eng.
Principal Remediation Engineer

Geetha Ramesh, Ph.D., P.Biol.
Principal Toxicologist
Technical Director, Contaminated Sites

APEGA Permit to Practice No. P00725

Prairie Business Unit
Infrastructure & Environment
WorleyParsons Canada Services Ltd.

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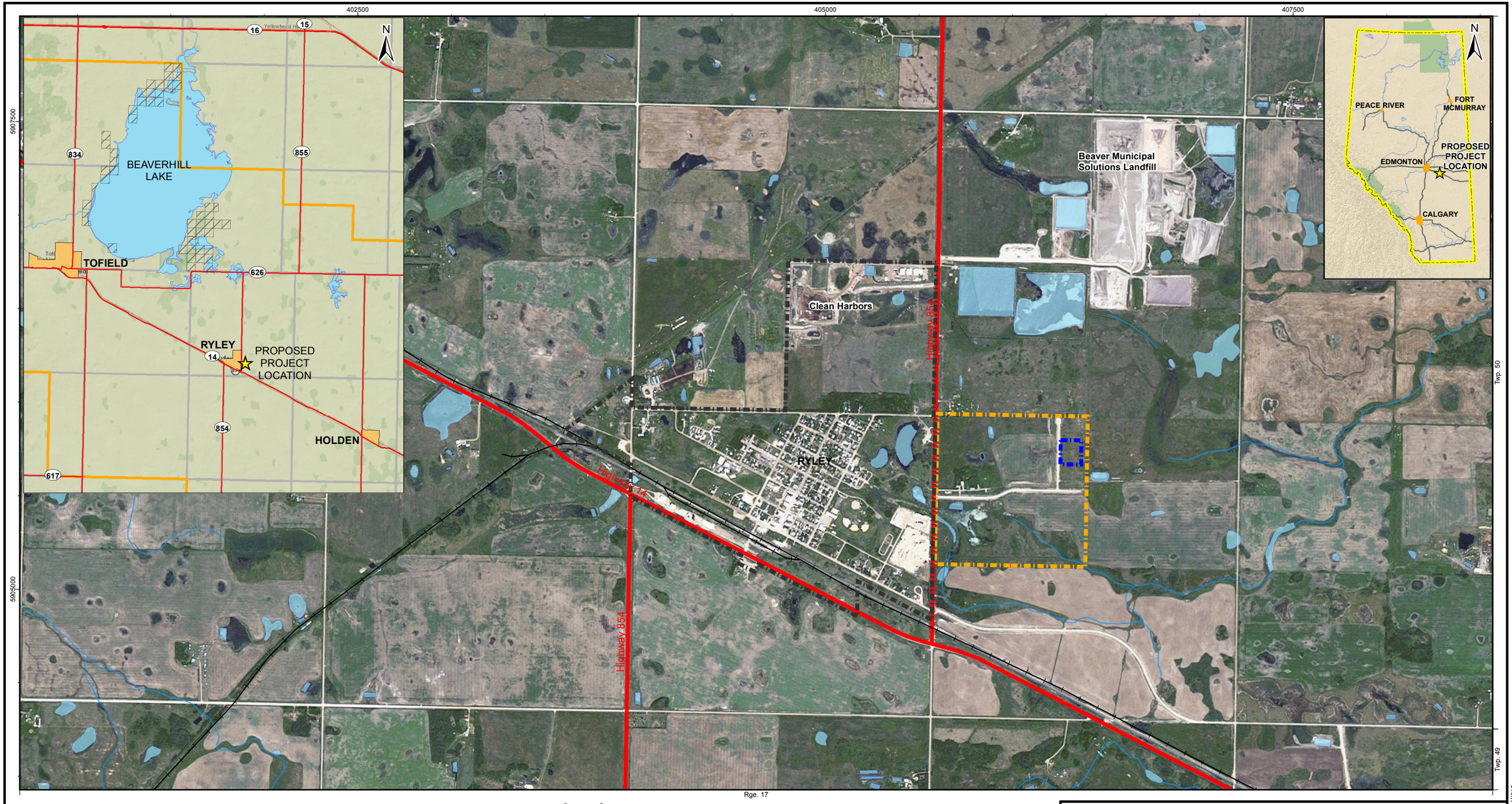
Figures



Legend

- Project Location
- Village of Ryley Municipal Limits
- Equity Industrial Park
- Waterbodies/Lagoons
- Watercourse
- Provincial Highway
- Railway

Basemap Sources:
Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community National Geographic, Esri, DeLorme, HERE, UNEP-WCMC, USGS, NASA, ESA, METI, NRCAN, GEBCO, NOAA, increment P Corp.

0 0.5 1
Kilometres
1:20,000
NAD 1983 UTM Zone 12N

G-M PEARSON
RYLEY BIOMEDICAL WASTE INCINERATOR
CEAA PROJECT DESCRIPTION

SITE LOCATION

OneWay™ to zero harm

Date:	Drawn by:	Edited by:	App'd by:
27-OCT-14	T.G.	E.H.	TJ

WorleyParsons resources & energy

WorleyParsons Project No.: 307074-01969-300

FIG No: 1 | REV: A

"This drawing is prepared solely for the use of our customers as specified in the accompanying report. WorleyParsons Canada Services Ltd. assumes no liability to any other party for any representations contained in this drawing."

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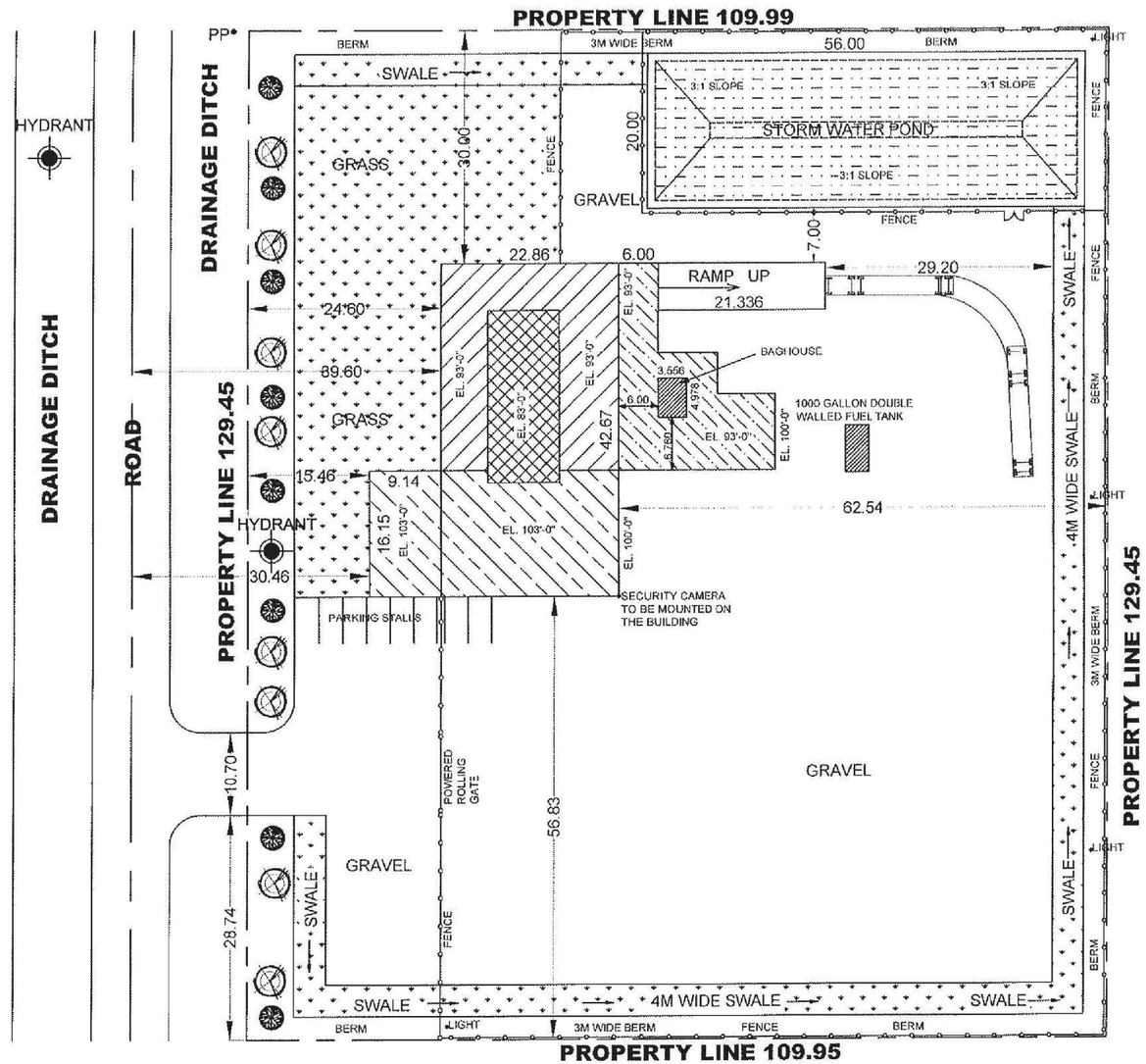

LEGAL DESCRIPTION

PLAN: 042 7065
BLOCK:1
LOT: 2
LSD:

MUNICIPAL ADDRESS

BEAVER COUNTY

BUILDING CLASSIFICATION

-ALBERTA BUILDING CODE: 2006
-GROUP F - DIVISION 1 (INDUSTRIAL BUILDING)
-CLAUSE - 3.2.2.66
-SINGLE STOREY, FACING ONE STREET
-NON-SPRINKLERED
-COMBUSTIBLE AND/OR NON-COMBUSTIBLE CONSTRUCTION PERMIT PERMITTED

LOT COVERAGE

LOT AREA: 1.42 ha = 14,245 m^2
BUILDING AREA = 1,123 m^2
LOT COVERAGE = 7.88 %

OCCUPANCY & USE

TYPE OF BUSINESS

1. MEDICAL WASTE DISPOSAL
2. HOURS OF OPERATION WILL BE 24/7
3. THIS LOT IS FAIRLY LEVEL THEREFORE NO EXTRA SOIL WILL VE BROUGHT IN OR CARTED AWAY

EXTERIOR LIGHTS ON BUILDING

HIGH PRESSURE SODIUM (SHOWN ON BUILDING ELEVATIONS)
a. 400W MOUNTED AT HIGH ELEVATION ON BUILDING
b. 250W MOUNTED AT LOW ELEVATION ON BUILDING

SIGNAGE ON THE BUILDING

THERE WILL BE 8FT. X 4FT. SIGN BOARD ATTACHED TO WEST WALL NOT SHOWN ON ELEVATION

SOURCE:
OLYMPIA ENGINEERING (1982) INC.; PROJECT No.: 14012; SITE PLAN DATED: JULY/28/2014, REV.B

m 0 10 20 30 40 m

1:750

G-M PEARSON
RYLEY BIOMEDICAL WASTE INCINERATOR
CEAA PROJECT DESCRIPTION

SITE PLAN

Date: 03-NOV-14	Drawn by: OTHERS	Edited by: KMS	App'd by: TJ

WorleyParsons Project No. 307074-01969-300
FIG No 2
REV B

OneWay to zero harm
WorleyParsons resources & energy

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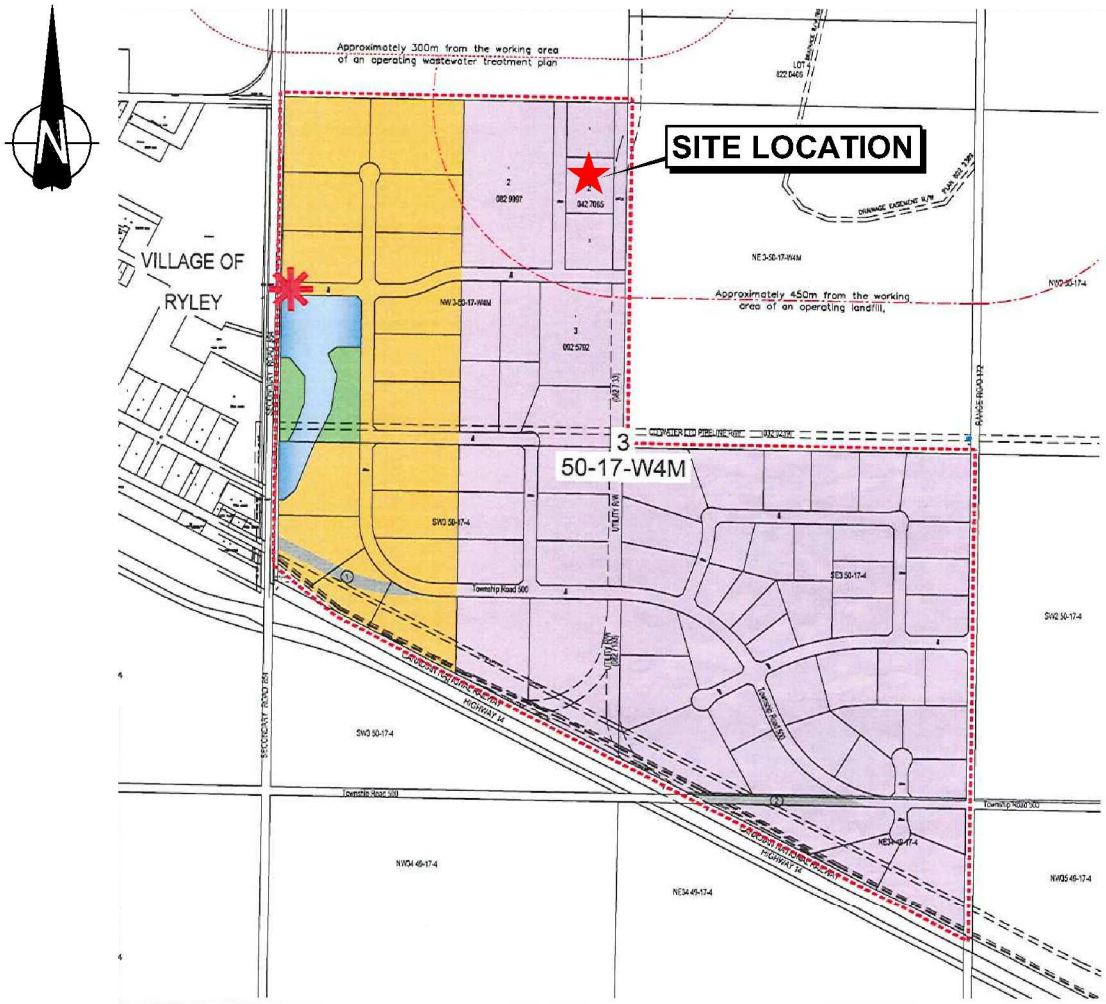

Commercial/Light Industrial

Industrial

Environmental Reserve

Municipal Reserve

Proposed Road Closures:
1. Portion of Road Plan 082 3216;
2. Portion of Township Road 500 R/W

Type IVb Intersection Treatment (To be confirmed by Traffic Impact Assessment)

450m Setback to Landfill

300m Setback to Wastewater Treatment Plant

Area Structure Plan Boundary

SOURCE:
EQUITY INDUSTRIAL PARK ARE STRUCTURE PLAN
DECEMBER 2009; FIGURE 4.0

m 0 250 500 750 m

1:17500

G-M PEARSON
RYLEY BIOMEDICAL WASTE INCINERATOR
CEAA PROJECT DESCRIPTION

EQUITY INDUSTRIAL PARK AREA STRUCTURE PLAN

Date: 24-OCT-14	Drawn by: OTHERS	Edited by: KMS	App'd by: TJ

OneWay to zero harm

WorleyParsons resources & energy

WorleyParsons Project No. 307074-01969-300

FIG No 3 | REV A

"This drawing is prepared for the use of our customer as specified in the accompanying report. WorleyParsons Canada Services Ltd. assumes no liability to any other party for any representations contained in this drawing."

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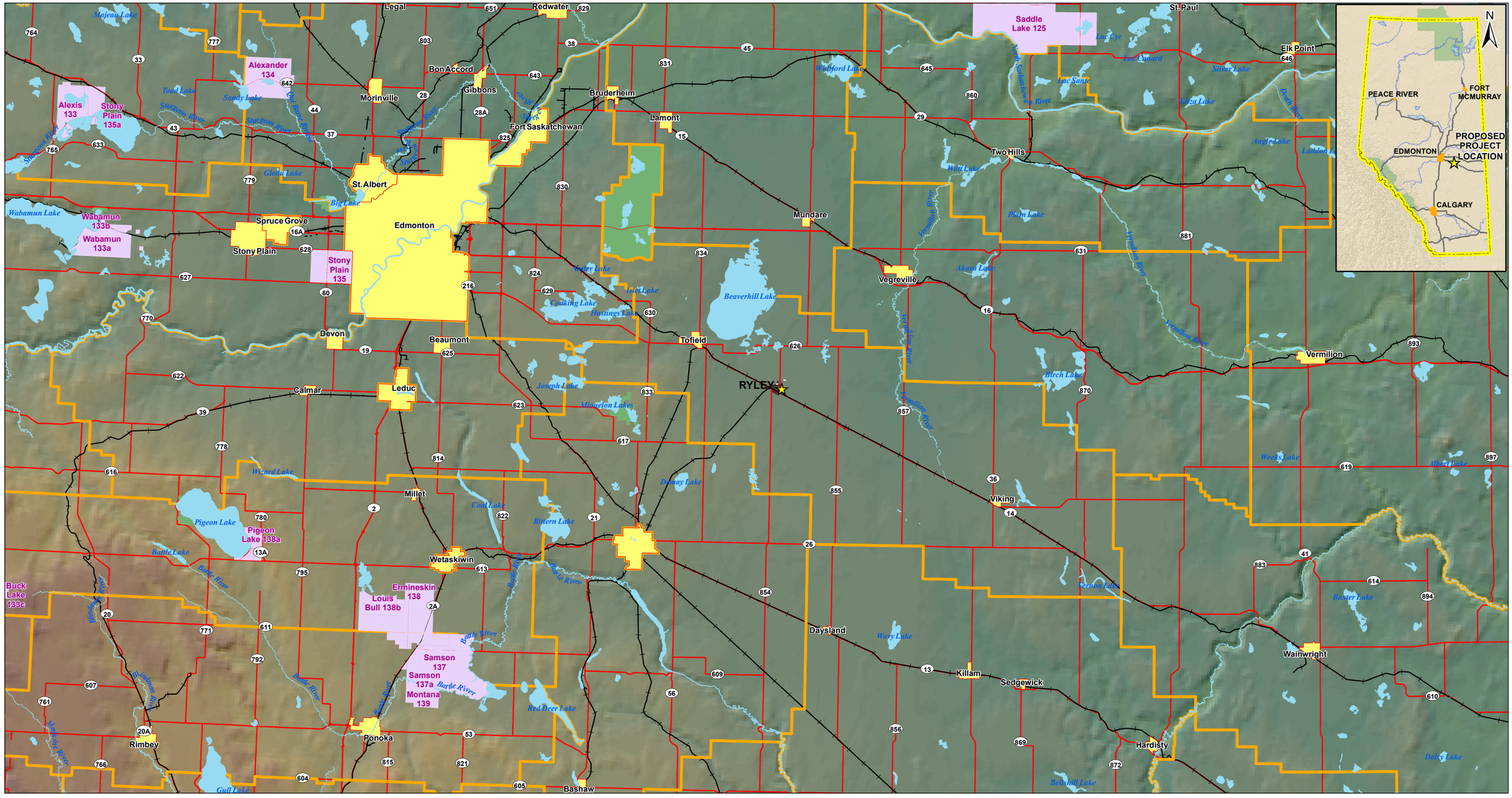

Legend

- Project Location
- Water Body
- Watercourse
- Community
- Indian Reserve
- Metis Settlement
- County / Municipality
- Park
- Railways
- Major Road

0 15 30
Kilometres
1:750,000
NAD 1983 UTM Zone 12N

G-M PEARSON
RYLEY BIOMEDICAL WASTE INCINERATOR
CEAA PROJECT DESCRIPTION

ABORIGINAL LANDS

OneWay to zero harm

Date:	Drawn by:	Edited by:	App'd by:
07-NOV-14	T.G.	T.G.	TJ.

WorleyParsons resources & energy

WorleyParsons Project No. 307074-01969-300

FIG No 4 | REV B

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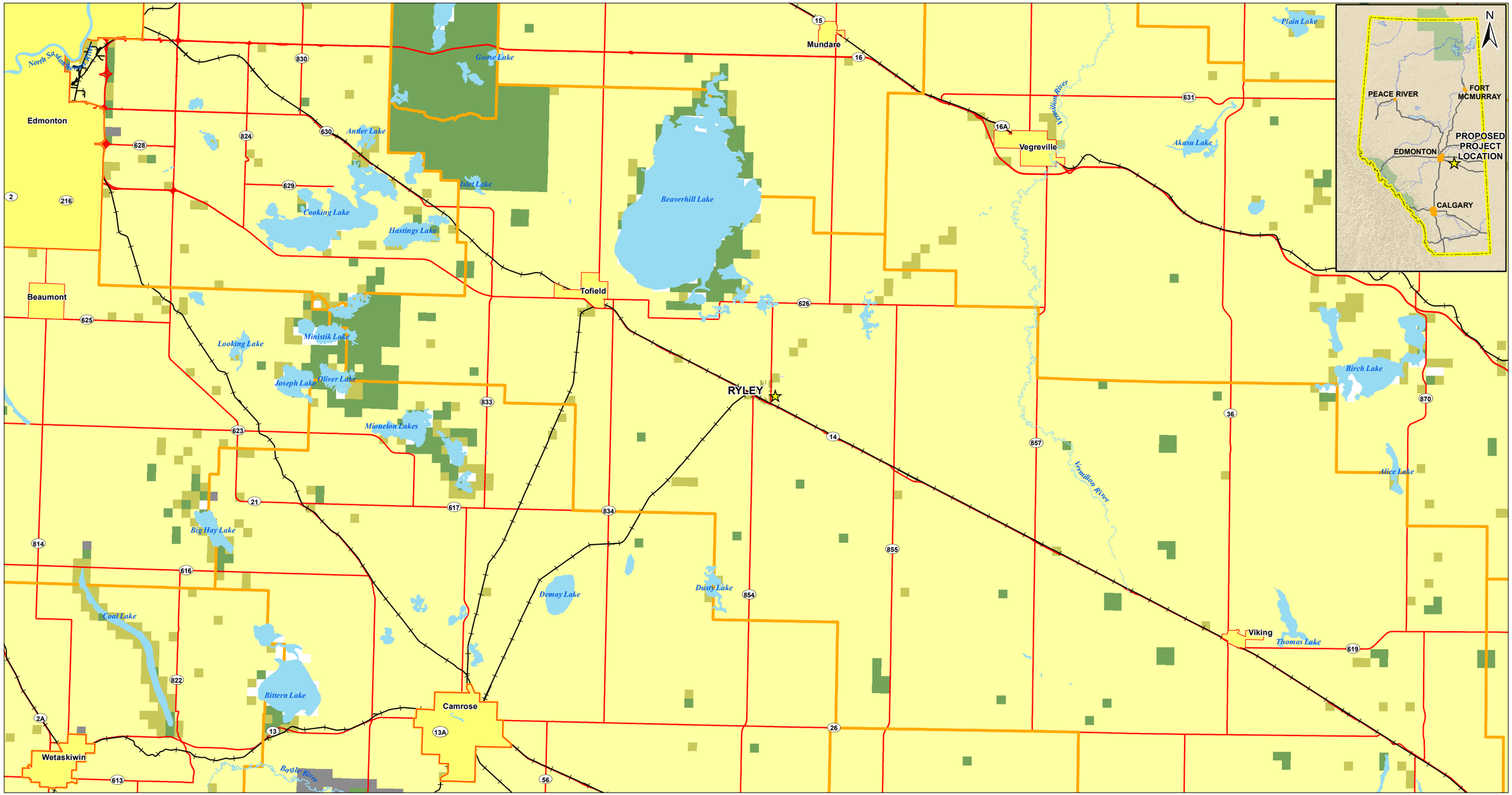
PLOT DATE & TIME: 30/01/2014 12:43:37 PM USER NAME: tom.graham
SAVE DATE & TIME: 07/11/2014 2:28:10 PM ISSUING OFFICE: CALGARY GIS

FILE LOCATION: N:\PROJECTS\G-M Pearson\Ryley_Biomedical_Incinerator\MXDs\307074-01969.300\NativeLandsOverview_RevB.mxd



Legend

- Project Location
- Crown Land (Provincial and Federal)
- Freehold/Private
- Mixed
- Other
- Community
- County / Municipality
- Railways
- Major Road
- Watercourse
- Water Body

0 5 10
Kilometres
1:350,000
NAD 1983 UTM Zone 12N

G-M PEARSON
RYLEY BIOMEDICAL WASTE INCINERATOR
CEAA PROJECT DESCRIPTION

FEDERAL LAND

Date:	Drawn by:	Edited by:	App'd by:
27-OCT-14	T.G.	E.H.	TJ

WorleyParsons Project No.: 307074-01969-300

FIG No: 5

REV: A

OneWay to zero harm

WorleyParsons resources & energy

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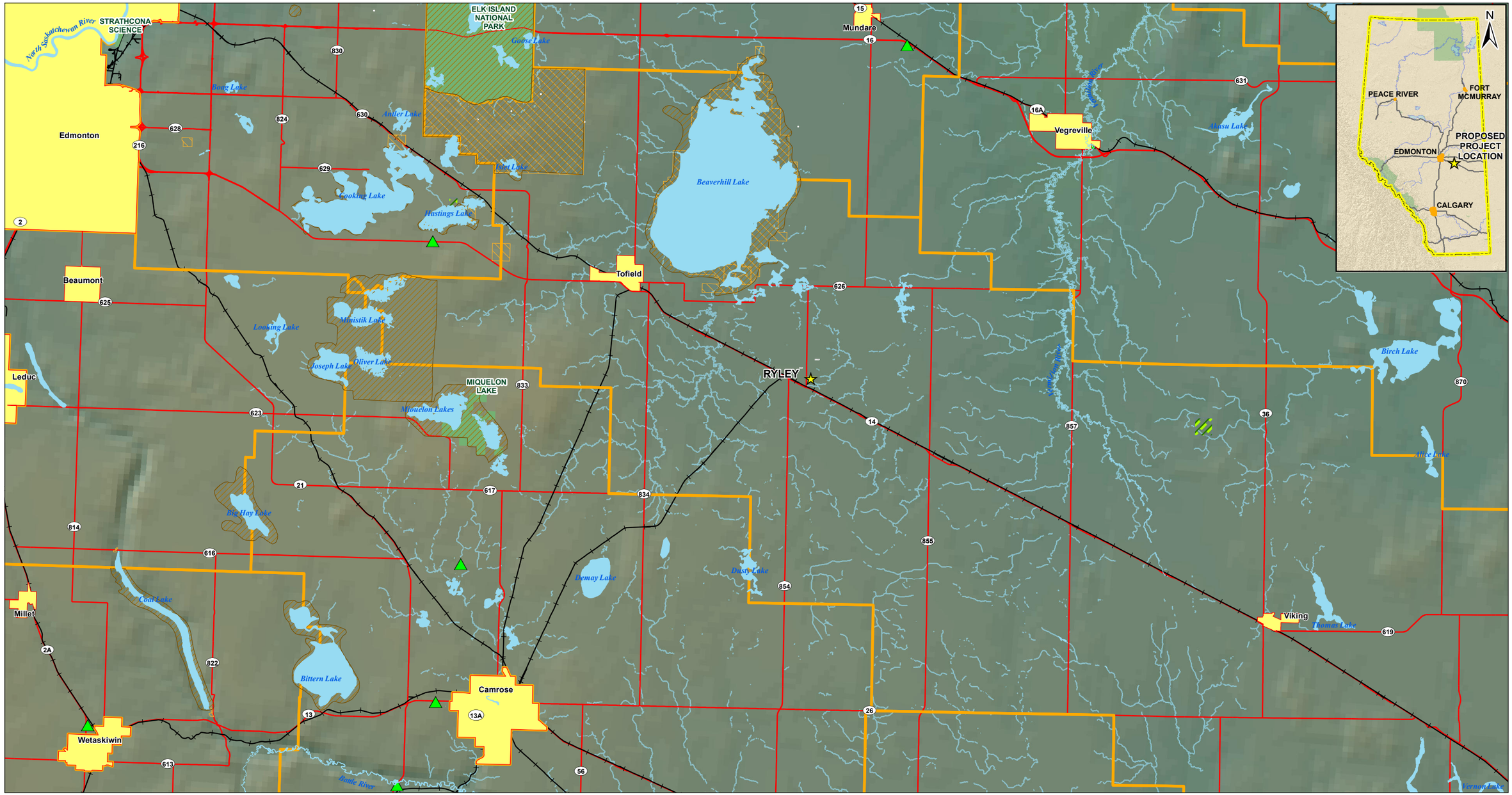
PLOT DATE & TIME: 30/01/2014 12:45:37 PM USER NAME: Eddie Hebert
SAVE DATE & TIME: 27/10/2014 4:17:27 PM ISSUING OFFICE: CALGARY GIS

FILE LOCATION: N:\PROJECTS\G-M Pearson\Ryley_Biomedical_Incinerator\MXDs\307074-01969.300\FederalLandsOverview_RevA.mxd



Legend

- Project Location
- Heritage Site
- Community
- County / Municipality
- Critical Wildlife
- Environment Designation
- Environmentally Significant Area
- Protected Area
- Park
- Railways
- Major Road
- Watercourse
- Water Body

0 5 10
Kilometres
1:350,000
NAD 1983 UTM Zone 12N

G-M PEARSON
RYLEY BIOMEDICAL WASTE INCINERATOR
CEAA PROJECT DESCRIPTION

ENVIRONMENTALLY SENSITIVE AREAS

OneWay™ to zero harm

WorleyParsons resources & energy

Date:	Drawn by:	Edited by:	App'd by:
27-OCT-14	T.G.	E.H.	TJ

WorleyParsons Project No.: 307074-01969-300

FIG No: 6 | REV: A

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PLOT DATE & TIME: 30/01/2014 12:43:37 PM USER NAME: Eddie Hebert
SAVE DATE & TIME: 27/10/2014 2:09:51 PM ISSUING OFFICE: CALGARY GIS

FILE LOCATION: N:\PROJECTS\G-M Pearson\Ryley_Biomedical_Incinerator\MXDs\307074-01969.300\RiskMapOverview_RevA.mxd

Appendices

Appendix 1 Environmental Impact Assessment Confirmation

Environment and Sustainable Resource Development

Environmental Operations
Provincial Programs Branch
111 Twin Atria Building
4999 - 98 Avenue
Edmonton, Alberta T6B 2X3, Canada
Tel: 780-427-5828 Fax: 780-427-9102
www.environment.alberta.ca

February 27, 2014

Jenna Morrish, Staff Environmental Engineer
WorleyParsons, Suite 500
151 Canada Olympic Road SW
Calgary, Alberta T3B 6B7

Dear Ms. Morris:

Further to your email of February 21, 2014, I wish to advise you that pursuant to Section 44 of the *Environmental Protection and Enhancement Act* (EPEA) I have considered the application of the environmental assessment process for S-M Pearson's (SM) proposed Ryley Biomedical Waste Incinerator's facility located near Ryley, Alberta.

This activity is not a mandatory activity for the purposes of environmental assessment. Having regard to the consideration set out in Section 44(3) of EPEA, I have decided that further assessment of the activity is not required (i.e., a screening report will not be prepared and no environmental impact assessment report is required).

Please note that this decision is based on the current information about the project and that I reserve the ability to review this decision should different and/or new information come to light. Also, SM should note that Section 47 of EPEA gives the Minister of Environment the authority to order the preparation of an environmental impact assessment report under appropriate circumstances notwithstanding a director's decision to not require an environmental impact assessment report.

SM should be advised that although an environmental impact assessment report is not required for this project, Environment and Sustainable Resource Development may have other regulatory requirements under EPEA and/or *Water Act*. For more information about these requirements, please contact Mohammad Habib at Mohammad.Habib@gov.ab.ca or 780-415-9629.

SM should contact Shauna Sigurdson (780-495-2236) with the Canadian Environmental Assessment Agency to identify any potential federal triggers (including those under the Fisheries Act and Navigable Waters Protection Act) thus any federal environmental assessment requirements under the *Canadian Environmental Assessment Act*.

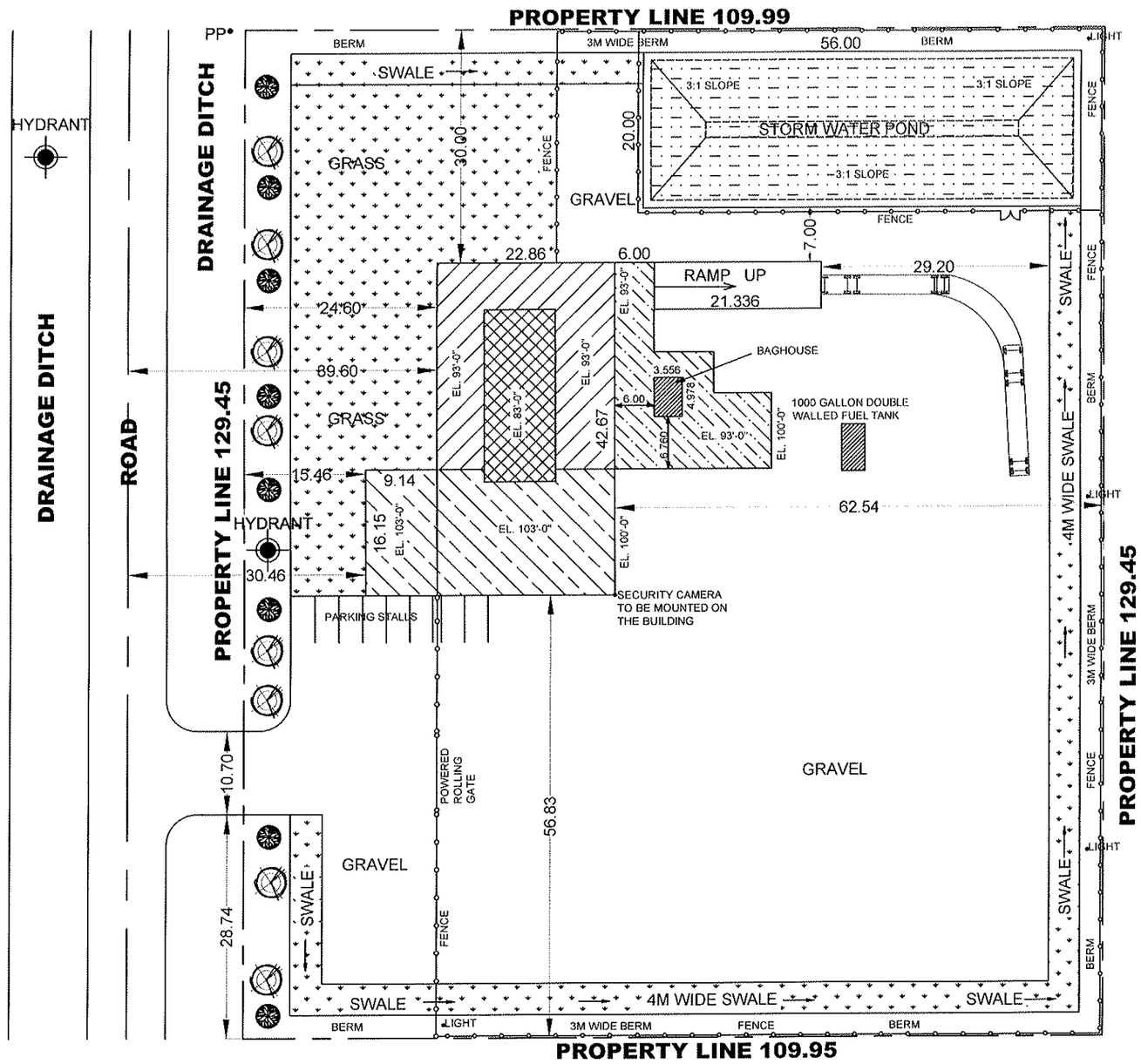
If you have any questions or need further information please contact me at (780) 427-9116.

Sincerely,

Corinne Kristensen
Acting Environmental Assessment Team Leader
Provincial Programs Branch
(Designated Director under the Act)

cc: M. Habib (ESRD) S. Sigurdson (CEAA)

Appendix 2 Floor Plan and Elevations



SITE PLAN

LEGAL DESCRIPTION

PLAN: 042 7065
BLOCK: 1
LOT: 2
LSD:

MUNICIPAL ADDRESS

BEAVER COUNTY, ALBERTA

BUILDING CLASSIFICATION

- ALBERTA BUILDING CODE:2006
- GROUP F - DIVISION 2 (MEDIUM HAZARD)
- CLAUSE - 3.2.2.71
- SINGLE STOREY, FACING ONE STREET
- NON - SPRINKLERED
- NON-COMBUSTIBLE CONSTRUCTION PERMIT PERMITTED
- MAXIMUM AREA ALLOWED = 1250M²

LOT COVERAGE

LOT AREA = 1.42 ha = 14245 m²
BUILDING AREA = 1123 m²
LOT COVERAGE = 7.88 %

OCCUPANCY & USE

TYPE OF BUSINESS -

1. MEDICAL WASTE DISPOSAL
2. HOURS OF OPERATION WILL BE 24/7
3. THIS LOT IS FAIRLY LEVEL THEREFORE NO EXTRA SOIL WILL BE BROUGHT IN OR CARTED AWAY

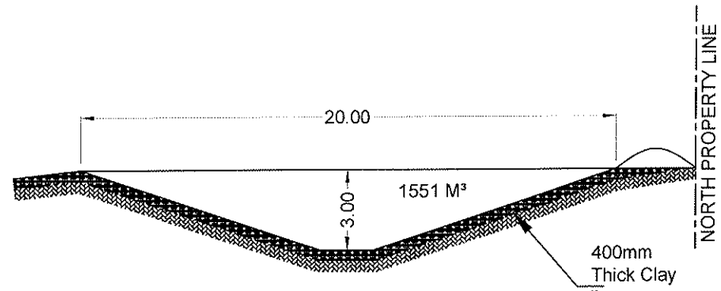
EXTERIOR LIGHTS ON BUILDING

HIGH PRESSURE SODIUM (shown on Building Elevations)

a. 400W MOUNTED AT HIGH ELEVATION ON BUILDING
b. 250W MOUNTED AT LOW ELEVATION ON BUILDING

SIGNAGE ON THE BUILDING

THERE WILL BE 8FT. X 4FT. SIGN BOARD ATTACHED TO WEST WALL NOT SHOWN ON ELEVATION



SECTION THRU STORM WATER POND

OLYMPIA ENGINEERING PERMIT TO PRACTICE APEGA PERMIT NO.P3536

PERMIT

NO.	DATE	REVISION	BY	CHKD	DATE
B	21/10/2014	FLOOR ELEVATIONS AND DIMENSIONS ADDED.	--	--	--
A	-- 06/08/2014	BUILDING SIZE REVISED.			

SEAL

DESIGNED BY RAJ
DRAWN BY KIRAN
DATE JULY/28/2014
CHECKED BY
DATE
SCALE 1:400
APPD

OLYMPIA ENGINEERING (1982) INC.
CALGARY ALBERTA

HELMS CONSTRUCTION LTD.
CALGARY, ALBERTA

PROJECT No 14012

BIOMEDICAL WASTE INCINERATION FACILITIES
EQUITY INDUSTRIAL PARK, NEAR RYLEY, ALBERTA

SITE PLAN LOT 2 , BLOCK 1

DRAWING No A1 REV.A

N

B C D E

75'-0"
25'-0" 25'-0" 25'-0"
20'-0"
70'-0"

EL.93'-0"
15'-4"
22'-0"
22'-0"
22'-0"
22'-0"
29'-4"
19'-4"
16'x18' O.H.D.
4'-0"
RAMP UP
20'-8"
17'-11"
5'-0"
EL.83'-0"
EL.93'-0"
EL.83'-0"
COMPRESSED AIR
UP
1
A2A4
ROTARY FURNACE
DISCHARGE STACK
ASH DISPOSAL BIN
11'-8"
10'-8"
20'-0"
BAGHOUSE Approx. Ht. 38'
FAN
21'-7 5/8"
CARBON STORAGE&FEED
5'x9'
x23'H
QUENCH VESSEL
REACTION TOWER
22'-2"
12' Dia. x 39'H
LIME STORAGE&FEED
32'-2"
1'-0"
30'-0"
ELECTRICAL ROOM
DN
8X8 CONC. CURB CHAIN LINK FENCE ON TOP
65'-8"
140'-0" OUT TO OUT OF CONCRETE
OFFICES
WASTE FEED AUGER/SHREDDER
8'x9' O.H.D.
4'-0"
2'-0"
4'-0"
4'-0"
EL.103'-0"
EL.103'-0"
MATERIAL STAGING AND HANDLING
2
A2A5
26'-0"
26'-0"
20'-0"
CHANGE ROOM
CONTROL ROOM
16'-0"
20'-0"
19'-4"
12X16 O.H.D.
30'-0" 25'-0" 25'-0" 25'-0"
105'-0" OUT TO OUT OF CONCRETE

A B C D E F

1 2 3 4 5 6 7

MAIN FLOOR PLAN

Area:
Main Building = 10500 S.F.
Office = 1590 S.F.
Total = 12090 S.F.
= 1123 M^2

TANK 1 = 5000 GAL.
TANK 2 = 3500 GAL.
TANK 3 = 3500 GAL.

NO.	DATE	REVISION	BY	CHKD	DATE
		-	-	-	

PERMIT SEAL

DESIGNED BY RAJ
DRAWN BY METAL
DATE 17/07/2014
CHECKED BY
DATE
SCALE AS SHOWN
APP'D

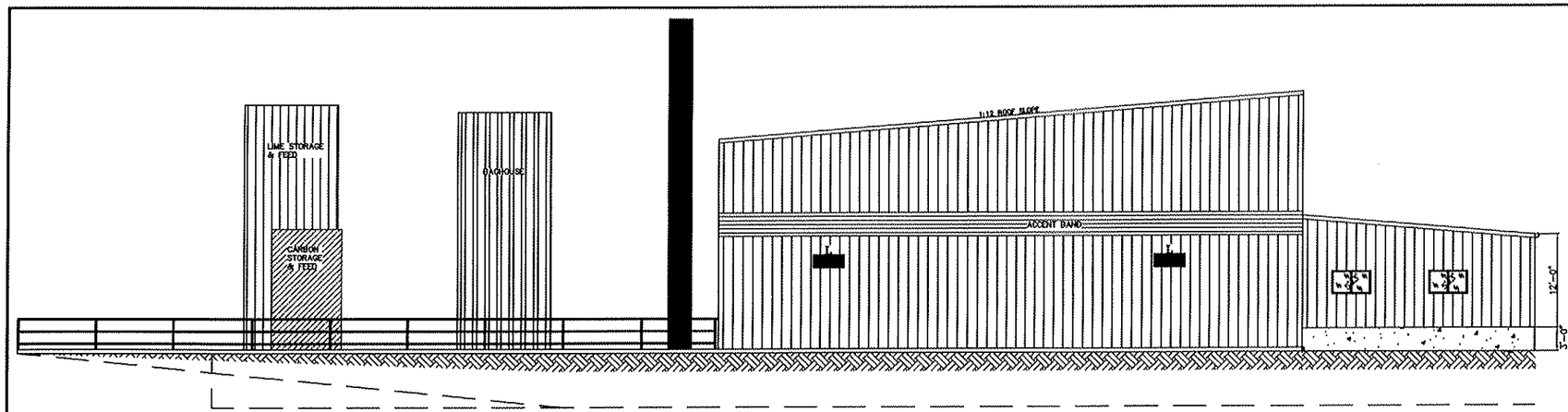
OLYMPIA ENGINEERING (1982) INC.
CALGARY ALBERTA

HELMS CONSTRUCTION LTD.
CALGARY, ALBERTA

BIOMEDICAL WASTE INCINERATION FACILITIES
EQUITY INDUSTRIAL PARK, NEAR RYLEY, ALBERTA

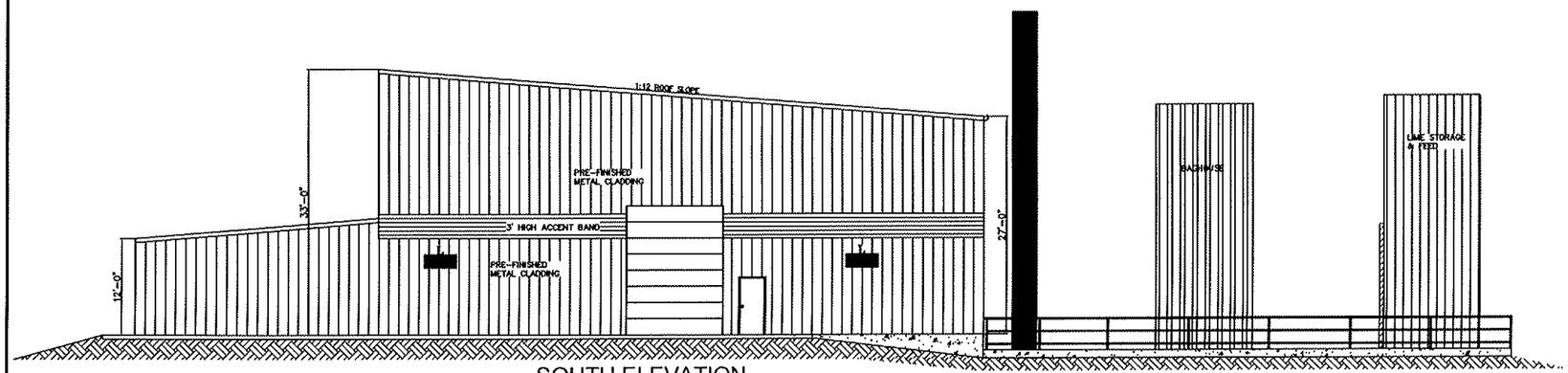
FLOOR PLAN

PROJECT No. 14012
DRAWING No. A2



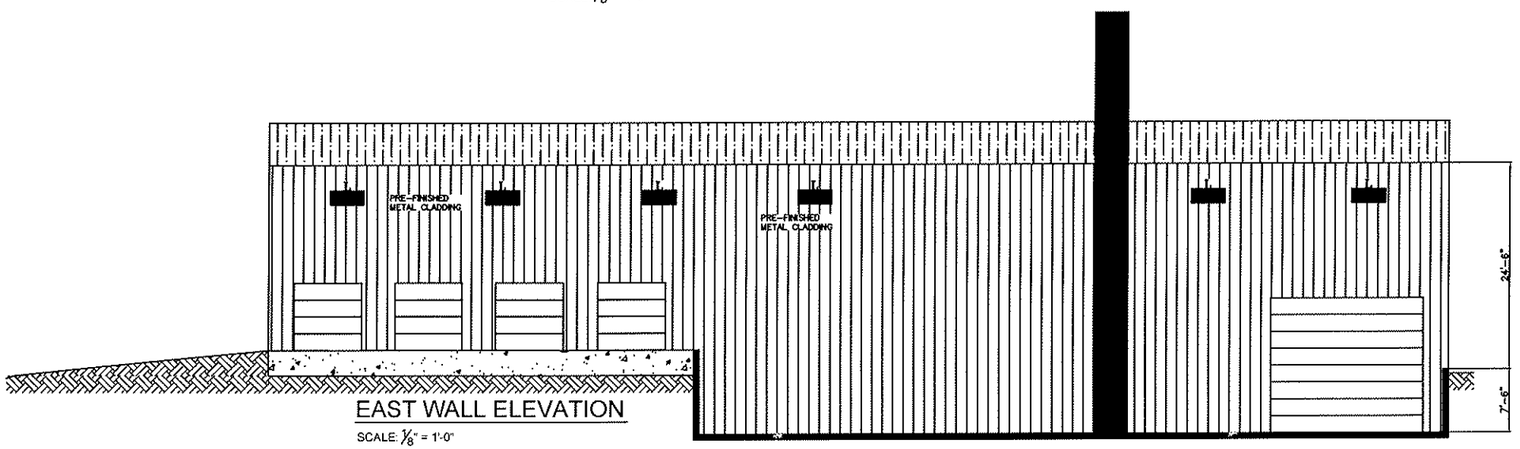
NORTH ELEVATION

SCALE: 1/8" = 1'-0"



SOUTH ELEVATION

SCALE: 1/8" = 1'-0"



EAST WALL ELEVATION

SCALE: 1/8" = 1'-0"

NO.	DATE	REVISION	BY	CHKD	DATE
-			-	-	-

PERMIT

SEAL

DESIGNED BY	RAJ
DRAWN BY	HETAL
DATE	17/07/2014
CHECKED BY	
DATE	
SCALE	AS SHOWN
APP'D	

OLYMPIA ENGINEERING (1982) INC.
CALGARY ALBERTA

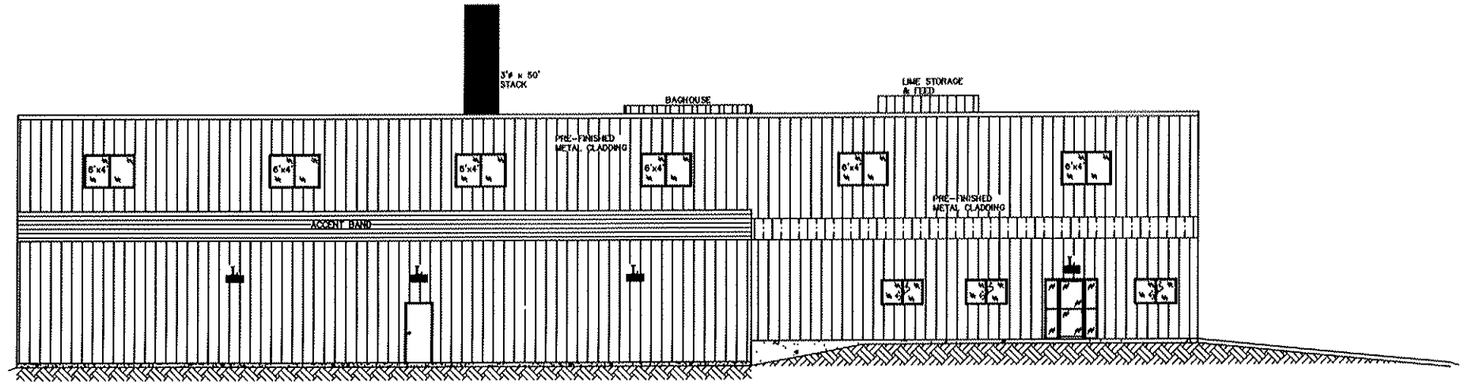
HELMS CONSTRUCTION LTD.
CALGARY, ALBERTA

PROJECT No. 14012

BIOMEDICAL WASTE INCINERATION FACILITIES
EQUITY INDUSTRIAL PARK, NEAR RYLEY, ALBERTA

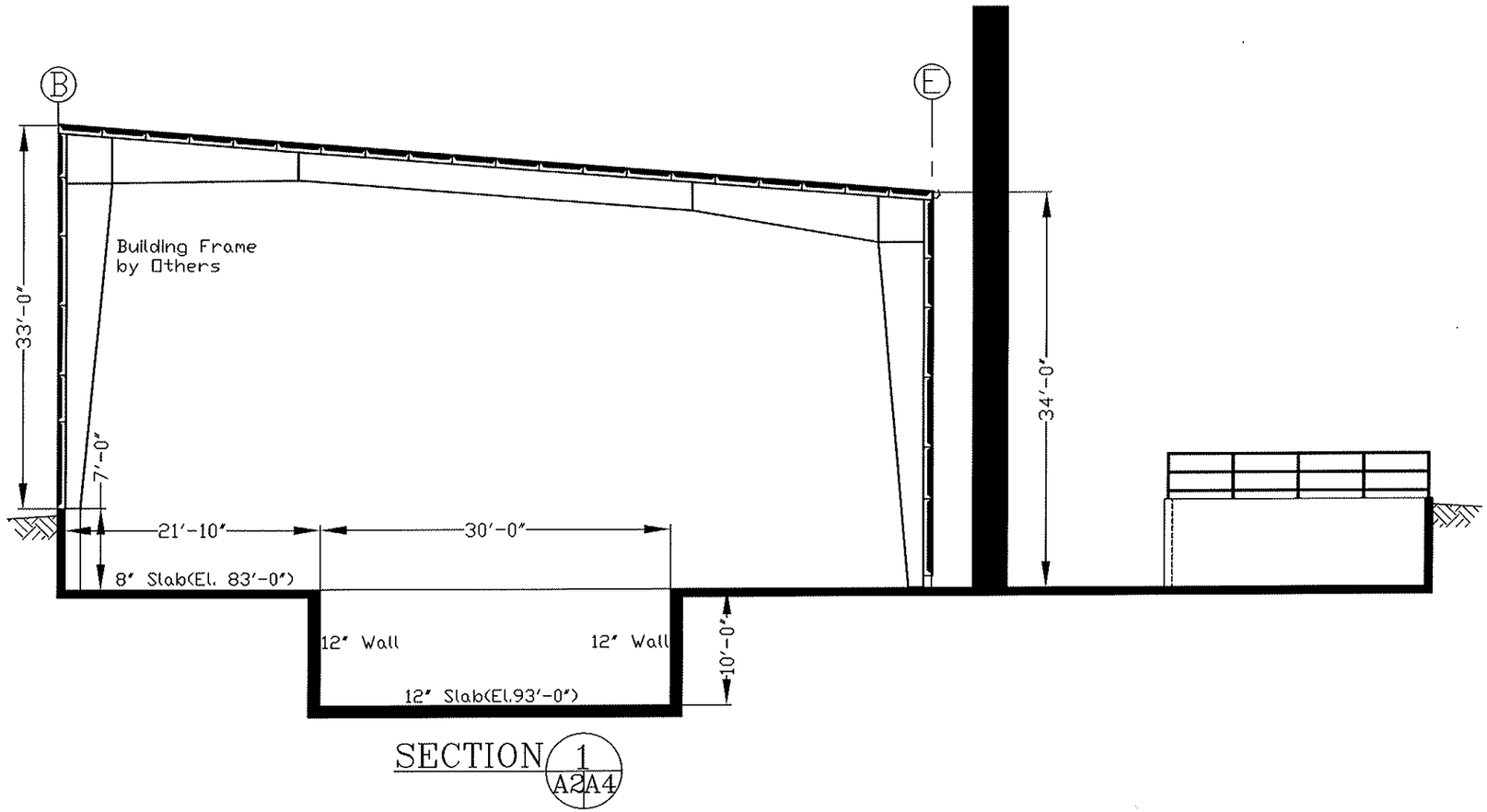
DRAWING No. A3

ELEVATIONS



WEST ELEVATION

SCALE: 1/8" = 1'-0"



SECTION 1 A2/A4

NO.	DATE	REVISION	BY	CHKD	DATE
-			-	-	-

PERMIT

SEAL

DESIGNED BY	RAJ
DRAWN BY	HETAL
DATE	17/07/2014
CHECKED BY	
DATE	
SCALE	AS SHOWN
APP'D	

OLYMPIA ENGINEERING (1982) INC.
CALGARY ALBERTA

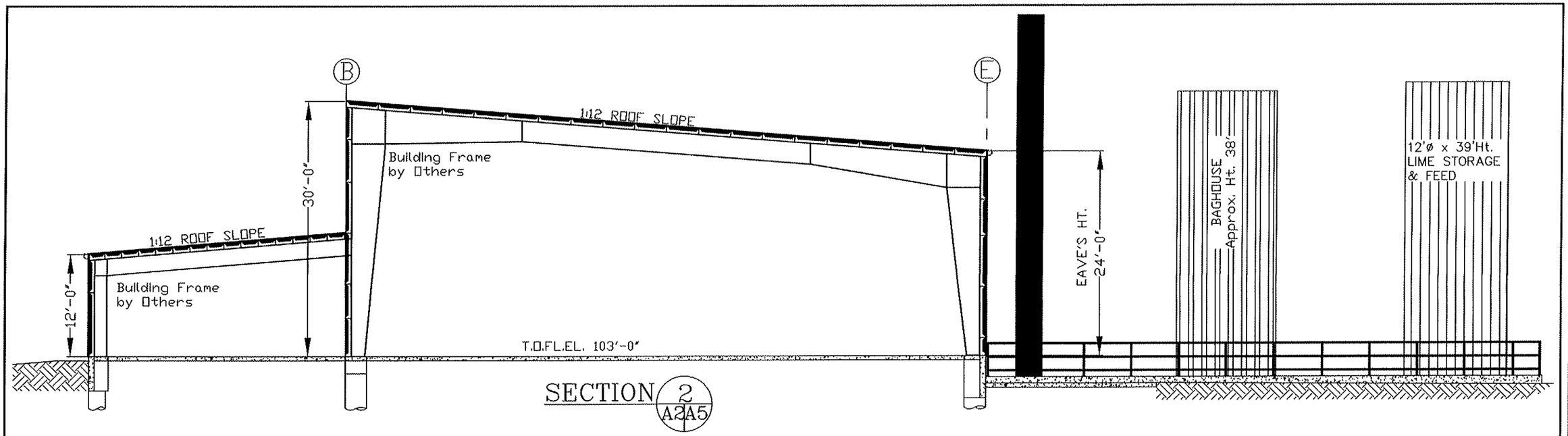
HELMS CONSTRUCTION LTD.
CALGARY, ALBERTA

PROJECT No. 14012

BIOMEDICAL WASTE INCINERATION FACILITIES
EQUITY INDUSTRIAL PARK, NEAR RYLEY, ALBERTA

DRAWING No. A4

ELEVATION & SECTION



SECTION 2 / A2A5

PERMIT	NO.	DATE	REVISION	BY	CHKD	DATE
	-		-	-	-	

SEAL

DESIGNED BY	RAJ
DRAWN BY	HETAL
DATE	17/07/2014
CHECKED BY	
DATE	
SCALE	AS SHOWN
APP'D	

OLYMPIA ENGINEERING (1982) INC.
CALGARY ALBERTA

HELMS CONSTRUCTION LTD.
CALGARY, ALBERTA

PROJECT No. 14012

BIOMEDICAL WASTE INCINERATION FACILITIES
EQUITY INDUSTRIAL PARK, NEAR RYLEY, ALBERTA

SECTION

DRAWING No. A5

Appendix 3 Site Photographs

Photo A Photograph of the Site looking north

Photo B Photograph of the Site taken from Equity Industrial Park internal road looking southeast

Photo C Photograph of the Site looking south

Photo D Photograph of the Site looking west

Appendix 4 Air Emission Modelling Report

WorleyParsons
resources & energy

EcoNomics

G-M PEARSON ENVIRONMENTAL INC.

Air Dispersion Modelling in Support of Application of Industrial Approval

G-M Pearson Biomedical Waste Incinerator

307074-01969-500-EN-REP-0001

31 October 2014

WorleyParsons Canada
Suite 500, 151 Canada Olympic Rd SW
Calgary, AB T3B 6B7 CANADA
Phone: +1 403 247 0200
Toll-Free: 1 800 668 6772
Facsimile: +1 403 247 4811
www.worleyparsons.com

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PROJECT 307074-01969 - AIR DISPERSION MODELLING IN SUPPORT OF APPLICATION OF INDUSTRIAL APPROVAL

REV	DESCRIPTION	ORIG	REVIEW	WORLEY - PARSONS APPROVAL	DATE	CLIENT APPROVAL	DATE
0	Issued as final	T.A. T. Alexan	S.H. S. Hanearin	T.J. T. Jacklin	31-Oct-14		

EcoNomics™

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EXECUTIVE SUMMARY

WorleyParsons Canada Services Ltd. (WorleyParsons) was retained by G-M Pearson Environmental Inc. to prepare the application of an industrial approval (Application) for the G-M Pearson Biomedical Waste Incinerator (the "Project") in Equity Industrial Park, Beaver County (the "Site") located at NW-3-50-17-W4M.

The Site collects and incinerates biomedical wastes at a rate of 1400 kg/hr. The Project is regulated under *Alberta Environmental Protection and Enhancement Act* (*EPEA*) and will require an industrial approval issued by Alberta Environment and Sustainable Resource Development (ESRD).

A standard dispersion modelling approach, employing AERMOD model, was used to predict maximum oxides of nitrogen (NO_x) which include nitrogen dioxide (NO_2), sulphur dioxide (SO_2), total particulate matter (TPM) and particulate matter less than 2.5 microns ($PM_{2.5}$) concentrations due to emissions from the Site. Industrial emissions from sources within 5 km of this Site are considered negligible in this assessment.

Concentrations of NO_x, SO_2, TPM, and $PM_{2.5}$ under maximum design operation and also in the case of emergency power generation were evaluated. In all cases, the maximum ground level NO_2, SO_2, TPM, and $PM_{2.5}$ concentrations were predicted by AERMOD to be less than their respective Alberta Ambient Air Quality Objectives (AAAQOs).

CONTENTS

Tables within Text

Figures

ABBREVIATIONS

AAAQO	Alberta Ambient Air Quality Objectives
ACAA	Alberta Capital Airshed Alliance
AERMOD	AERMOD View 8.6.0
ASL	Above sea level
CASA	Clean Air Strategic Alliance
CDED	Canadian Digital Elevation Data
DEM	Digital Elevation Model
EPEA	Environmental Protection and Enhancement Act
ESRD	Alberta Environment and Sustainable Resource Development
MJ/hr	Megajoules per hour
NO	Nitric Oxide
NO_2	Nitrogen Dioxide
NO_x	Oxides of Nitrogen
NPRI	National Pollutant Release Inventory
O_3	Ozone
OLM	Ozone Limiting Method
PBL	Planetary Boundary Layer
PFD	Process Flow Diagram
ppmv	Parts Per Million by Volume
PM_{10}	Particulate Matter less than 10 microns
$PM_{2.5}$	Particulate Matter less than 2.5 microns
PVMR	Plume Volume Molar Ratio
SO_2	Sulphur Dioxide
TPM	Total Particulate Matter
WorleyParsons	WorleyParsons Canada Services Ltd.

1. INTRODUCTION

WorleyParsons Canada Services Ltd. (WorleyParsons) was retained by G-M Pearson Environmental Inc. (G-M Pearson) to prepare the application of an industrial approval (Application) for the G-M Pearson Biomedical Waste Incinerator (the "Project") in Equity Industrial Park, Beaver County (the "Site") located at NW-3-50-17-W4M. G-M Pearson proposes to incinerate biomedical wastes in a new rotary kiln incinerator constructed at the Ryley site. This facility would replace the current incinerator at the Town of Wainwright regional landfill site. . The Project is regulated under *Alberta Environmental Protection and Enhancement Act* (*EPEA*) and will require an industrial approval issued by Alberta Environment and Sustainable Resource Development (ESRD).

This report presents the air quality assessment (the "Assessment"), submitted as part of the Application. Oxides of nitrogen (NO_x), sulphur dioxide (SO_2), total particulate matter (TPM) and particulate matter less than 2.5 microns ($PM_{2.5}$) are identified as contaminants of potential concern.

The emissions of NO_x, SO_2, TPM, and $PM_{2.5}$ were evaluated to determine whether they may result in changes in ambient air quality in the vicinity of the Site. To support the application for the Project, an assessment including an air dispersion modelling study (to evaluate the effects from the emissions from the Project under normal operations) and the surrounding emission sources on the ambient air quality was completed.

The purpose of this air quality assessment was to evaluate changes in potential air quality effects, which are attributed to the proposed facility. Predictions were made for maximum ground-level concentrations of SO_2, NOx as nitrogen dioxide (NO_2), and TPM. The modeling scenarios considered are as follows:

- Scenario 1: Normal Operations where biomedical waste is continuous incinerated at a rate of 1,400 kg/hr;
- Scenario 2: Emergency Power Generation where a diesel generator is used to produce power in case of a power cut, and the waste incineration is expected to continue for one hour after the power cut; and
- Scenario 3: Emergency Operation (Shutdown conditions).

2. SITE LOCATION

The Site is located in the Northwest Section, Township 50, Range 17, and west of the 4th Meridian, on a relatively level terrain with elevation ranging from 685 m to 688 m above sea level (ASL). The latitude and longitude are 53.2924 and -112.4055, respectively. The Site is approximately 750 m east of the Village of Ryley, Alberta. Figure 1 shows the location of the Site.

3. FACILITY DESCRIPTION

Figure 2 shows the process flow diagram (PFD) of the biomedical waste incineration system. The Project consists of a waste loading/shredder/feeder, a rotary kiln incinerator, an afterburner, a quench tower, a reaction tower, a baghouse, an induced draft fan, a lime storage silo, a carbon storage silo and an exhaust stack.

3.1 Process Description

Boxes and containers of biomedical waste from the loading area are fed into the rotary kiln incinerator using an enclosed feeder. It is anticipated that the biomedical waste will consist of plastics, paper, food wastes, textiles, and non-combustible waste as metal and glass (Table 3-1). The rotary kiln (primary burner) will operate at a minimum fire rate of approximately 976 MJ/hr, burning approximately 1,400 kg of waste an hour at a temperature of 1,038 °C. Organic materials are incinerated and inorganic materials are disinfected. The inorganic materials will drop out of the kiln with the organic ash. These materials will then be shipped to an approved landfill for disposal.

Table 3-1 Biomedical Waste Composition

Waste type	Composition Percentage (% by Weight)
Paper	22.5
Textiles	10.0
Plastics as Polyvinyl Chloride	6.0
Plastics as Polyurethane	34.0
Food Wastes	20.0
Non-combustible Wastes as Metals and Glasses	7.5

Exhaust gas from the rotary kiln incinerator will then be pulled by the inducted drafted fan directly into the afterburner where the exhaust gas will remain for about 2 seconds and further combusted at a temperature of 1,093 °C. All residual organic waste particles will be completely incinerated at this point. Combustion exhaust gas will then move to the quench chamber and cooled down to about 149 °C by water sprays. All water will be evaporated in this process.

Finally, the combusted exhaust gas will enter the baghouse. Volatile metals, semi-volatile metals, and trace amounts of organic materials from the combusted exhaust gas stream will be removed by activated carbon that is injected into the gas ducting leading to the baghouse. Any acids will also be neutralized using hydrated lime. Combustion exhaust gas will then enter the exhaust stack through the inducted draft fan, and is emitted into the atmosphere.

Excess air for will be maintained at 30.0 weight % of the stoichiometric mass of air required for 100% combustion of the fuel.

3.2 Air Treatment and Control

The exhaust gases from the rotary kiln incinerator will be directed in the afterburner to ensure the destruction of the exhaust fumes. The afterburner, as mentioned in Section 3.1, will operate at a minimum temperature of 1,093 °C with a volumetric residence time of 2 seconds. Excess combustion air will be maintained at 30.0 weight % to ensure complete destruction of all organic material present.

The afterburner combustion exhaust gases flow to the combustion off-gas treatment system for cooling, acid gas scrubbing and filtration.

3.2.1 Quench Tower

The off-gases from the afterburner will be cooled down to a temperature suitable for the baghouse. Cooling will be done in the quench tower. The combustion gas will be quenched by fresh water to slightly above the dew point temperature to prevent moisture collection in the baghouse.

3.2.2 Baghouse

In the baghouse, activated carbon and acid gas sorbents will be injected into the cooled combustion off-gas to remove the volatile metals and traces of organic materials. The acid gas sorbent will react with the acid gases to form salt products that are then removed by the fabric filters. Fine particulates will also be removed by the fabric filters.

4. APPLICABLE GUIDELINES AND REGULATIONS

The *EPEA* outlines the application procedure necessary to apply for an approval. Details of the approval process are described in the Guide to Content for Industrial Approval Application (ESRD 2014). In addition, to ensure that the assessment fulfills the requirements of the *EPEA*, the Air Quality Model Guideline (ESRD 2013a) was also used.

The Government of Alberta has established Ambient Air Quality Objectives (AAAQOs) (ESRD 2013b), which form a part of the Alberta air quality management system. Components of the system relevant to air release limits are Plume Dispersion Modelling and Ambient and Source Emission Monitoring. This system was designed to ensure that air emissions are minimized through the use of demonstrated technology and that residual emissions are dispersed so that the AAAQOs are not exceeded. Table 4-1 summarizes the AAAQOs for NO_x as nitrogen dioxide (NO_2), SO_2, TPM and $PM_{2.5}$ used in this assessment to compare with the predicted ambient concentrations.

Table 4-1 Alberta Ambient Air Quality Objectives for Nitrogen Dioxide (NO_2), Sulphur Dioxide (SO_2), Total Particulate Matter (TPM) and Particulate Matter Less Than 2.5 Microns ($PM_{2.5}$) (ESRD 2013b)

Substance	Averaging Time	Ambient Air Quality Objectives
NO_2	1-hour	300 µg/m^3
	Annual	45 µg/m^3
SO_2	1-hour	450 µg/m^3
	24-hour	125 µg/m^3
	30-day	30 µg/m^3
	Annual	20 µg/m^3
TPM	24-hour	100 µg/m^3
	Annual	60 µg/m^3
$PM_{2.5}$	24-hour	30 µg/m^3

5. INPUTS TO MODEL

5.1 Emissions Data

This section describes the emissions for the three cases of operation under:

- Normal operating conditions;
- Emergency power generation condition; and
- Shutdown conditions.

5.1.1 Normal Operating Conditions

The maximum design operations considered one point source with continuous emissions from the Site operating at full capacity. The location of exhaust stack is as shown in Figure 3.

Table 5-1 provides the parameters of the stack source and design base emissions used in the assessment. Emissions for these sources were calculated based on maximum design operations as provided by G-M Pearson.

Table 5-1 Exhaust Parameters for Stack

Parameter		Value
Location of Source		
	UTM E	406310.38
	UTM N	5905740.55
Fire Rating (MJ/hr)		976
Design Hours of Operation		24
Actual Hours of Operation		24
Release Height (m ASL)		15.24
Exhaust Stack Inside Diameter (m)		1.219
Exhaust Gas Temperature (C°)		163
Exhaust Gas Velocity (m/s)		6.24

Parameter		Value
NO_x Emission Rate		
	(g/s)	1.17
	(ppmv)	154
	(g/GJ)	159.0
SO_2 Emission Rate (g/s)		0.39
TPM Emission Rate (g/s)[2]		0.012
Building Peak Height (m)		8.6

Notes:
[1] Emission rates were provided by G-M Pearson
[2] TPM emission rate is conservatively assumed as $PM_{2.5}$ emission rate

The Project TPM emissions were assumed to be equivalent to $PM_{2.5}$ emissions. This is a conservative assumption as $PM_{2.5}$ emissions are typically equal to or less than the TPM emissions. The ambient air $PM_{2.5}$ concentrations are also typically equal to or less than the ambient air TPM concentrations due to their respective emissions.

5.1.2 Emergency Power Generation

A diesel generator will be on-site to provide emergency power during an electrical power disruption to the incinerator. The diesel generator has an electrical capacity of 300 kW with a diesel engine rated at 450 HP. The approximated diesel fuel consumption is 59.9 kg/hr. When there is a power disruption, the diesel generator will provide auxiliary power, and the waste feed stops and burndown occurs. It is anticipated for the burn-down duration to last no longer than one hour, during which the incinerator stack and diesel generator stack will be the only two emitting sources from the project.

After one hour, the diesel generator will be the only source of air emissions. This case will conservatively model air emissions from complete waste incineration and the diesel generator operation.ons as provided by G-M Pearson.

Table 5-2 provides the parameters of the stack source and design base emissions used in the assessment. Emissions for these sources were calculated based on maximum design operations as provided by G-M Pearson.

Table 5-2 Exhaust Parameters for the Air Emission Sources associated with Emergency Power Generation

Parameter		Value	
Stack (Emission sources)		Waste Incinerator	Diesel Generator
Location of Source			
	UTM E	406310.38	406286.39
	UTM N	5905740.55	5905765.91
Rating (MJ/hr)		976	1208
Design Hours of Operation		1	12
Actual Hours of Operation		24	12
Release Height (m ASL)		15.24	11.58
Exhaust Stack Inside Diameter (m)		1.219	0.203
Exhaust Gas Temperature (C°)		163	497
Exhaust Gas Velocity (m/s)		8.47	26.78
NO_x Emission Rate			
	(g/s)	1.17	0.061
	(ppmv)	154	161.1
	(g/GJ)	4.32	0.18
SO_2 Emission Rate (g/s)		0.39	0.072
TPM Emission Rate (g/s)[2]		0.012	0.002
Building Peak Height (m)		8.6	8.6

Notes:
[1] Emission rates were provided by G-M Pearson
[2] TPM emission rate is conservatively assumed as $PM_{2.5}$ emission rate

5.1.3 Shutdown Conditions

Shutdown conditions occur approximately once per year. During the shutdown process, the material in the incinerator is burned down and the incinerator is fired on natural gas. Once the material in the incinerator has burned down, the bypass stack is opened to allow residual emissions and heat to be released. As a result, contaminant emissions from the bypass stack are considered to be insignificant and have not been modeled.

5.2 Cumulative Effects

According to the National Pollutant Release Inventory (NPRI), there is no other facility reported to emit the contaminants of concern in the vicinity of Ryley, Alberta. Therefore, this assessment does not include emissions from other facilities and industrial operations nearby as they will have negligible impact to the assessment results.

5.3 Land Use Surface Characteristics

Land use surface characteristics are essential in order to simulate the dispersion of the pollutant plume within the planetary boundary layer (PBL), which is the lowest part of the atmosphere.

The surface characteristics are processed by AERMET to calculate the PBL characteristics. The parameters which describe the surface characteristics are albedo, Bowen ratio, and surface roughness. These characteristics are site specific and dependent on the land use of the region around the Site to be modelled (e.g. urban area, farmland, woodlot, forest, swamp).

- Albedo is the fraction of total incident radiation reflected by the surface back to space without absorption. Typical albedo values range from 0.1 for heavily forested areas (i.e. little solar radiation is reflected) to 0.9 for fresh snow (i.e. most radiation is reflected back to space).
- The daytime Bowen Ratio is the ratio of the sensible heat flux (i.e. transfer of heat upwards from the ground due to surface heating) to the latent heat flux (i.e. energy loss at the ground and gain aloft, due to evaporation and condensation).
- The surface roughness length is related to the height of obstacles that interfere with the wind flow. In general, trees and buildings have large surface roughness, while sand and water have very low surface roughness.

The AERMET component allows these surface characteristic parameters to be defined in all directions around the site being modelled. Table 5-3 summarizes the surface characteristics used in AERMET, which are representative values for grassland obtained from ESRD (2013a). It is assumed that the land use surface characteristics are constant over the modelling domain due to the uniform terrain characteristics.

Table 5-3 Surface Properties Used in AERMET

Month	Albedo	Bowen Ratio	Surface Roughness
January	0.60	1.5	0.001
February	0.60	1.5	0.001
March	0.18	0.4	0.05
April	0.18	0.4	0.05
May	0.18	0.4	0.05
June	0.18	0.8	0.1
July	0.18	0.8	0.1
August	0.18	0.8	0.1
September	0.20	1.0	0.01
October	0.20	1.0	0.01
November	0.20	1.0	0.01
December	0.60	1.5	0.001

5.4 Terrain Elevation

Terrain information for the area depicted in Figure 4 was extracted from Natural Resources Canada's Canadian Digital Elevation Data (CDED). The Digital Elevation Model (DEM) is set to a 3 arc-second or nominal 90 meter post-spacing resolution, which is sufficient for dispersion modelling purposes. The elevations used were from 1:50,000 map scale data (15-Minute DEM) which has a grid resolution range of 0.75 to 3 arc-seconds.

The terrain is generally flat to gently rolling in the area of the facility.

5.5 Receptors

Ground level concentrations were modelled at selected geographical locations (i.e. receptors) within the modelling domain using nested grids with different spacing of receptor points. Figure 6 shows the receptor points which had the following spacing specified:

- 20 m receptor spacing at the Site boundary;
- 50 m receptor spacing within 0.5 km from the Site;
- 250 m receptor spacing within 2 km from the Site;
- 500 m receptor spacing within 5 km from the Site; and

- 1,000 m receptor spacing beyond 5 km from the Site.

Receptors with 250 m spacing are also applied to communities within the modelling domain. These communities include the Town of Tofield, the Village of Holden, the Town of Vegreville, the Hamlet of Bruce, the Hamlet of Kingman, and the Hamlet of Round Hill.

5.6 Buildings

Buildings in the vicinity of the stacks have a potential to cause building downwash effects. Building downwash effects are explained in Section 6.5. Building inputs are summarized in Table 5-4 below.

Table 5-4 Building Input Summary

Description	UTM Coordinates		Height
	Easting	Northing	
Shop	406283.58	5905766.21	8.64 m
	406306.45	5905765.80	
	406305.67	5905723.20	
	406282.83	5905723.79	
Office	406279.03	5905739.87	4.06 m
	406283.06	5905739.76	
	406282.83	5905723.79	
	406279.71	5905723.79	
Baghouse	406311.96	5905745.38	11.58 m
	406312.17	5905750.30	
	406315.57	5905745.24	
	406315.57	5905745.24	
Diesel Storage Tank			
	406350.88	5905699.68	1.83 m
	406353.85	5905699.62	
	406353.77	5905693.66	
	406350.79	5905693.71	

Description	UTM Coordinates		Height
	Easting	Northing	
Carbon Storage and Feed			
	406319.91	5905745.57	7.1 m
	406319.98	5905747.09	
	406322.70	5905746.99	
	406322.67	5905745.49	
Lime Storage Tank			
Center	406321.99	5905742.0	3.66 m
		Height	11.89 m

6. AIR DISPERSION MODELLING METHODOLOGY

Air dispersion modelling requires local meteorology and terrain data. This section provides an overview of the dispersion model used, the spatial data used in modelling, meteorology, terrain, the method for converting NO_x to NO_2, and building downwash.

6.1 Air Dispersion Model

6.1.1 AERMOD

AERMOD View 8.6.0 (AERMOD; Lakes Environmental Software 2014) was selected for the assessment. AERMOD is one of the approved models recommended by ERSD (2013a). This is a multi-source steady-state plume model.

In the stable boundary layer, the concentration distribution is assumed to be Gaussian in both the vertical and horizontal. In the convective boundary layer, the horizontal distribution is assumed to be Gaussian, but the vertical distribution is described with a bi-Gaussian probability density function. Additionally, in the convective boundary layer, AERMOD treats “plume lofting” whereby a portion of plume mass, released from a buoyant source, rises to and remains near the top of the boundary layer before becoming mixed into the convective boundary layer. AERMOD also tracks any plume mass that penetrates into elevated stable layer, and then allows it to re-enter the boundary layer when and if appropriate.

AERMOD consists of a dispersion model and two pre-processors called AERMET and AERMAP. The AERMET pre-processor characterizes the meteorological conditions of the domain being modelled. The AERMAP pre-processor characterizes terrain, generates receptor grids and produces topographic scales used in the model calculations.

AERMOD was selected for the assessment primarily because of the focus on the local-scale modelling, the need to model, and the type of representative meteorological and terrain data available for the area surrounding the Site.

6.1.2 Model Limitations

AERMOD is designed for near-field and steady-state conditions, and has some limitations for application in complex terrain and for source-receptor distances exceeding roughly 50 km in all types of terrain situations. There is no consideration in AERMOD of causal effects (i.e. the time it takes for pollutants to travel from point A to point B), the trajectory of the airflow is treated as a straight-line, and it relies on spatially uniform meteorological conditions. Furthermore, because of the Gaussian plume model formulation, AERMOD can only consider wind data from a single location and it cannot directly simulate near-stagnation conditions (i.e. very low wind speeds).

6.2 Model Spatial and Temporal Boundaries

The spatial boundaries for the model were outlined by a 50 km × 50 km box centered on the Site (Figure 4). This is the maximum spatial boundary that AERMOD can effectively predict the dispersion of the emitted pollutants.

6.3 Meteorological Data

An AERMET data set is created to simulate the meteorology in the region of the Site. This meteorology dictates the transport and dispersion of the atmospheric emissions from the Site, as well as the resulting ground-level concentrations.

The ESRD (2013a) recommends using the following meteorological data, listed by preference:

- Minimum of 1 year of site-specific meteorology;
- The most recent 5 years of meteorological data, readily available from a nearby airport station, that has similar site surface characteristics; and
- AENV-developed Fifth Generation NCAR/Penn State Mesoscale Model version 3.5. (MM5) meteorological data for 2002-2006.

The Site does not operate a meteorological station within its boundaries; hence the MM5 meteorological data is used.

The MM5 meteorological data are based on five years (2002-2006) of surface and upper air data. Meteorological parameters of interest include wind direction, wind speed and Pasquill-Gifford (PG) atmospheric stability class. Figure 5 shows the wind speed frequency distribution/wind rose, which presents the percent distribution of wind direction divided into 16 wind classes. The dominant winds are from the west to west-northwest. The distribution of the wind speeds divided in to 6 ranges. The dominant wind speeds ranged from 2.0 to 40 m/s over 40 % of the time.

6.4 NO_X to NO_2 Conversion

The NO_x emissions from the Site are a mixture of nitric oxide (NO) and NO_2. However, the emissions of NO are unstable and will react in the atmosphere to form NO_2. Because the ambient air quality criteria are based on NO_2 concentrations, estimating the fraction of NO that has transformed into NO_2 is necessary. There are several methods for estimating NO_2 concentrations that should be implemented using a tiered approach.

The first and most conservative method is the Total Conversion Method, which the ESRD requires to be presented in all cases. This method assumes 100% of the NO_x is converted to NO_2.

If the NO_2 objectives are not met with this approach, the Plume Volume Molar Ratio (PVMR) Method, the Ozone Limiting Method (OLM) or the RIVAD/ARM3 chemistry formulation should be used. These methods require the use of onsite or airshed background ozone (O_3) values.

6.5 Building Downwash

Winds blowing across and around buildings create turbulence, which has a significant effect on the dispersion of airborne pollutants. If emissions are released through short stacks, a plume could potentially be trapped in the turbulent wake of a building by an effect referred to as building downwash. Two effects can result from the dispersion of pollutants within a turbulent wake:

- increased turbulence disperses the plume more readily than with no building present; or
- increased dispersion causes portions of the plume to be forced down to the ground resulting in increased ground-level concentrations with the presence of the building.

The current modelling guidance requires the assessment of building downwash effects for any air emissions assessment project. In this assessment, building downwash was simulated using the PRIME algorithm.

6.6 Background Concentration

Background air quality is defined as ambient concentrations that occur in the absence of the Project. Other potential sources could include other facilities, communities and traffic. The National Pollutant Release Inventory (Environment Canada 2014) was reviewed to determine if there are facilities, within a 5 km radius, that have reported their emissions. There are no other emission sources in the vicinity of the Site with reportable air emissions. Ambient air quality data for NO_2, SO_2, and $PM_{2.5}$ were obtained from the Edmonton East monitoring station.

The Edmonton East monitoring station is part of the Alberta Capital Airshed Alliance (ACAA) zone, and is located in an urban area in central Alberta about 70 km northwest of the Site. The ambient air quality is expected to best represent background levels in the vicinity of the Site as it is the closest continuously monitored station. Its elevated background level due to an urban setting would provide a conservative estimate of air quality for the Site.

Table 6-1 shows the background NO_2, SO_2, and $PM_{2.5}$ values that were assumed to represent 1-hour, 24-hour, monthly, and/or annual averages in the vicinity of the Site (Clean Air Strategic Alliance, CASA; 2014). The background 1-hour average concentrations in Table 6-1 are the 90^{th} percentile of the hour measurements collected in 2013. The 24-hour, monthly and annual average background SO_2 concentration; and the 24-hour $PM_{2.5}$ concentration were assumed equivalent to the 1-hour average concentrations, which is a conservative approach, as in general, 1-hour averages have the highest values. To ensure the validity of the data, error messages and flags were checked for the entire period of 2013, and it was confirmed via CASA that the data have been verified and validated.

Background TPM concentrations were not available for the whole ACAA zone. The summation of ambient air quality data for particulate matter less than 10 microns (PM_{10}) and $PM_{2.5}$ data was assumed equivalent to the TPM background concentration. The Edmonton South monitoring station was used to obtain PM_{10}, since the data was not present from the Edmonton East monitoring station.

Table 6-1 Background NO_2, SO_2 and $PM_{2.5}$ Concentrations based on 2013 Measurements at the Alberta Capital Airshed Alliance (ACAA)

Contaminant	Molecular Weight (g/mole)	Time Average[3]	90th Percentile (ppm)	90th Percentile (µg/m3)	Average (µg/m3)
NO_2[1]	46	1-Hour	0.033	61.3	
		Annual	-	-	11.8
SO_2[1]	64	1-Hour	0.002[3]	5.2	
		24-Hour	-	-	5.2[2]
		Monthly	-	-	5.2[2]
		Annual[2]	-	-	5.2[2]
TPM[4]	-	1-Hour	-	49.0	-
		24-Hour			49.0[2]
		Annual			49.0[2]
PM_{10}[5]	-	1-Hour	-	29.0	-
		24-Hour			
	-	Annual	-	-	29.0[2]
$PM_{2.5}$[1]	-	1-Hour	-	20.0	
		24-Hour	-	-	20.0[2]

Notes:
[1] NO_2, SO_2 and $PM_{2.5}$ background concentrations are from Edmonton East air monitoring station obtained from Clean Air Strategic Alliance (CASA), Alberta Ambient Air Data Management System.
[2] 24-Hour, monthly, and annual background concentrations are conservatively assumed to be equivalent to the 1-hour 90th percentile background concentration.
[3] Data has been verified and validated by CASA.
[4] Representative background TPM concentrations are not available hence assumed to be equivalent to the total of $PM_{2.5}$ and PM_{10} background concentrations
[5] PM_{10} background concentrations are from Edmonton South air monitoring station obtained from Clean Air Strategic Alliance (CASA), Alberta Ambient Air Data Management System.

7. PREDICTED AMBIENT CONCENTRATIONS

AERMOD generated the predicted ambient air concentrations of NO_2, SO_2, TPM, and $PM_{2.5}$ over a 5 five years period.

7.1 Normal Operation

7.1.1 Predicted NO_2 Concentrations

Table 7-1 summarizes the predicted maximum NO_2 concentrations using the Total Conversion Method. The NO_x results were converted to NO_2 values. Predicted concentrations at ground level can be high due to extreme, rare, and transient meteorological conditions and can be considered outliers, therefore, the 99.9th percentile value is selected (ESRD 2013a). The modeled results show that the 99.9th percentile 1-hour and annual predicted concentrations, depicted in Figures 7 and 8, respectively, would meet the AAAQOs and the other conversion methods specified in section 6.4 are not warranted.

Table 7-1 Maximum Predicted NO_2 Concentrations

Averaging Time	AAQO (µg/m^3)	Background Concentrations (µg/m^3)	Maximum Predicted Concentrations using Total Conversion Method (µg/m^3)	Maximum Predicted Concentrations using OLM (µg/m^3)	Percentage of AAQO
1 hour	300	61.3	85.3	146.6	49%
Annual	45	11.8	2.1	13.9	31%

7.1.2 Predicted SO_2 Concentrations

Table 7-2 summarizes the predicted maximum SO_2 concentrations. Maximum predicted 1-hour, 24-hour, 30-day, and annual average concentrations are depicted in Figures 9 to 12, respectively. The maximum 1-hour average concentrations represent the 99.9th percentile value.

The dispersion model predictions which include the background concentrations indicate that the SO_2 concentration would meet the AAAQOs in all cases.

Table 7-2 Maximum Predicted SO_2 Concentrations

Averaging Time	Alberta Ambient Air Quality Objectives ($\mu g/m^3$)	Background Concentrations ($\mu g/m^3$)	Maximum Predicted Concentrations ($\mu g/m^3$)	Background + Maximum Predicted Concentrations ($\mu g/m^3$)	Percentage of AAQO
1-hour	450	5.2	28.7	33.9	8%
24-hour	125	5.2[1]	17.7	22.9	18%
30-day	30	5.2[1]	2.33	7.54	25%
Annual	20	5.2[1]	0.72	5.93	30%

Notes:

[1] 24-Hour, monthly, and annual background concentrations are conservatively assumed to be equivalent to the 1-hour average background concentration.

7.1.3 Predicted Particulate Matter Concentrations

Table 7-3 summarizes the predicted maximum TPM concentrations. Maximum predicted TPM 24-hour and annual average concentrations are depicted in Figures 13 and 14, respectively. It is worth noting that these values do not include background levels since they are not available for the whole ACAA zone. However, the predicted TPM concentrations including background levels did not exceed their respective AAAQOs.

The predicted TPM concentrations as $PM_{2.5}$, including background concentrations, indicate that the $PM_{2.5}$ concentrations would also meet the $PM_{2.5}$ AAAQOs. Maximum predicted 24-hour average $PM_{2.5}$ concentration is depicted in Figure 15.

Table 7-3 Maximum Predicted Particulate Matter Concentrations

Averaging Time	Alberta Ambient Air Quality Objectives ($\mu g/m^3$)	Background Concentrations ($\mu g/m^3$)	Maximum Predicted Concentrations ($\mu g/m^3$)	Background + Maximum Predicted Concentrations ($\mu g/m^3$)	Percentage of AAQO
TPM					
24-hour	100	49.0[1]	0.54	49.55	50%
Annual	60	49.0[2]	0.02	49.03	82%

Averaging Time	Alberta Ambient Air Quality Objectives (µg/m^3)	Background Concentrations (µg/m^3)	Maximum Predicted Concentrations (µg/m^3)	Background + Maximum Predicted Concentrations (µg/m^3)	Percentage of AAQO
$PM_{2.5}$					
24-hour	30	20.0	0.54	20.54	68%

Notes:

[1] TPM 24-hour background concentration was conservatively assumed to be equivalent to the sum of 1-hour average background $PM_{2.5}$ and PM_{10} concentrations of 20 and 29 µg/m^3, respectively.

[2] TPM annual background concentration was conservatively assumed to be equivalent to the 24-hour average background TPM concentration.

7.2 Emergency Power Generation

The results presented in this section are due to emissions from the diesel generator and waste incineration. This is a conservative representation, as in case of a power failure, while the diesel generator is operating, the waste incineration gradually decreases to a total stop within an hour.

7.2.1 Predicted NO_2 Concentration

Table 7-4 summarizes the predicted maximum NO_2 concentrations using the Total Conversion Method. The NO_x results were converted to NO_2 values. The maximum 1-hour average concentrations represent the 99.9th percentile value. The modeled results show that the 99.9th percentile 1-hour and annual predicted concentrations, depicted in Figures 16 and 17, respectively, would meet the AAAQOs. Therefore, other conversion methods specified in section 6.4 are not warranted.

Table 7-4 Maximum Predicted NO_2 Concentrations during Emergency Power Generation

Averaging Time	AAQO (µg/m^3)	Background Concentrations (µg/m^3)	Maximum Predicted Concentrations using Total Conversion Method (µg/m^3)	Maximum Predicted Concentrations using OLM (µg/m^3)	Percentage of AAQO
1 hour	300	61.3	89.6	150.9	50%
Annual	45	11.8	2.84	14.64	33%

7.2.2 Predicted SO_2 Concentrations

Table 7-5 summarizes the predicted maximum SO_2 concentrations. Maximum predicted 1-hour, 24-hour, 30-day, and annual average concentrations are depicted in Figures 18 to 21, respectively. The maximum 1-hour average concentrations represent the 99.9th percentile value, since predicted concentrations at ground level can be high due to extreme, rare, and transient meteorological conditions and can be considered outliers (ESRD 2013a).

The dispersion model predictions which include the background concentrations indicate that the SO_2 concentration would meet the AAAQOs in all cases.

Table 7-5 Maximum Predicted SO_2 Concentrations

Averaging Time	Alberta Ambient Air Quality Objectives (µg/m^3)	Background Concentrations (µg/m^3)	Maximum Predicted Concentrations (µg/m^3)	Background + Maximum Predicted Concentrations (µg/m^3)	Percentage of AAQO
1-hour	450	5.2	39.9	45.1	10%
24-hour	125	5.21	26.6	31.81	25%
30-day	30	5.21	5.05	10.26	34%
Annual	20	5.21	2.43	7.64	38%

Notes:

[1] 24-Hour, monthly, and annual background concentrations are conservatively assumed to be equivalent to the 1-hour average background concentration.

7.2.3 Predicted Particulate Matter Concentrations

Table 7-6 summarizes the predicted maximum TPM concentrations. Maximum predicted TPM 24-hour and annual average concentrations are depicted in Figures 22 and 23, respectively. It is worth noting that these values do not include background levels since they are not available for the whole ACAA zone. However, the predicted TPM concentrations including background levels did not exceed their respective AAAQOs.

The predicted TPM concentrations as $PM_{2.5}$, including background concentrations, indicate that the $PM_{2.5}$ concentrations would also meet the $PM_{2.5}$ AAAQOs. Maximum predicted 24-hour average $PM_{2.5}$ concentration is depicted in Figure 24.

Table 7-6 Maximum Predicted Particulate Matter Concentrations

Averaging Time	Alberta Ambient Air Quality Objectives (µg/m^3)	Background Concentrations (µg/m^3)	Maximum Predicted Concentrations (µg/m^3)	Background + Maximum Predicted Concentrations (µg/m^3)	Percentage of AAQO
TPM					
24-hour	100	49.0[1]	0.72	49.7	50%
Annual	60	49.0[2]	0.06	49.1	82%
$PM_{2.5}$					
24-hour	30	20.0	0.72	20.7	69%

Notes:

[1] TPM 24-hour background concentration was conservatively assumed to be equivalent to the sum of 1-hour average background $PM_{2.5}$ and PM_{10} concentrations of 20 and 29 µg/m^3, respectively.

[2] TPM annual background concentration was conservatively assumed to be equivalent to the 24-hour average background TPM concentration.

8. CONCLUSION

An ESRD approved modelling approach was used to determine maximum predicted NO_2, SO_2, TPM and $PM_{2.5}$ concentrations due to emission from the Site under normal operating conditions and emergency power generation. Emission sources within 5 km of the Site were not included in the dispersions model as they are considered to have a negligible effect on the ambient air quality.

The AERMOD model was employed, and in all cases, the maximum ground-level NO_2, SO_2, TPM and $PM_{2.5}$ concentrations were predicted to be below their respective AAAQOs.

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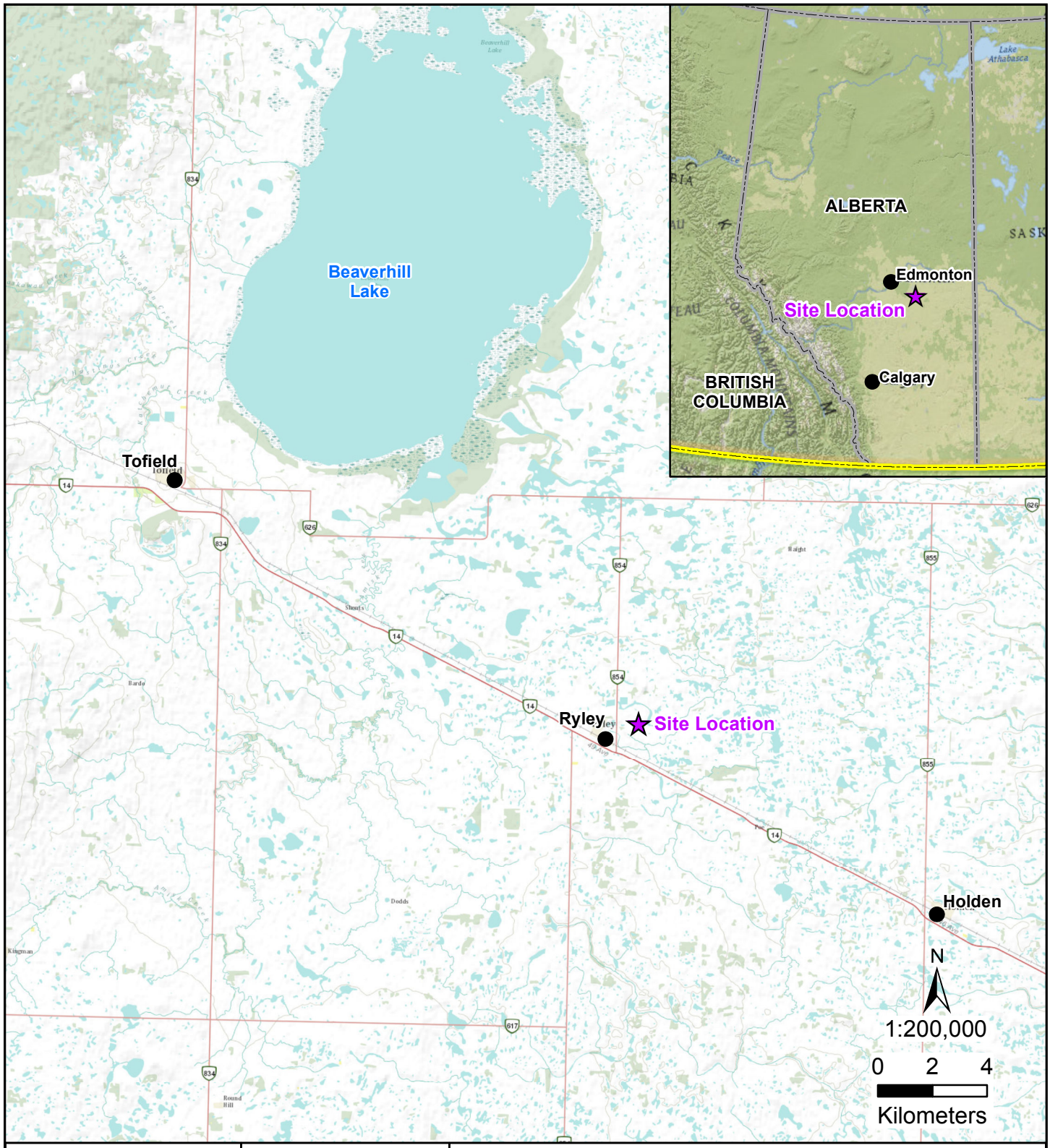
Figures



A SHEET	SCALE: SHOWN
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Drawn By:	Y.M.
Edited By:	XX
App'd By:	T.A.

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WORLEYPARSONS PROJECT No:	FIG No:	REV
307074-01969	1	0

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USER NAME: Yao.mo
ISSUING OFFICE: Burnaby GIS

PLOT DATE & TIME:29/10/2014 10:15:45 AM
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REFERENCE DRAWINGS:

CRE-14015-G-001
CRE-14015-D-001

NOTES:

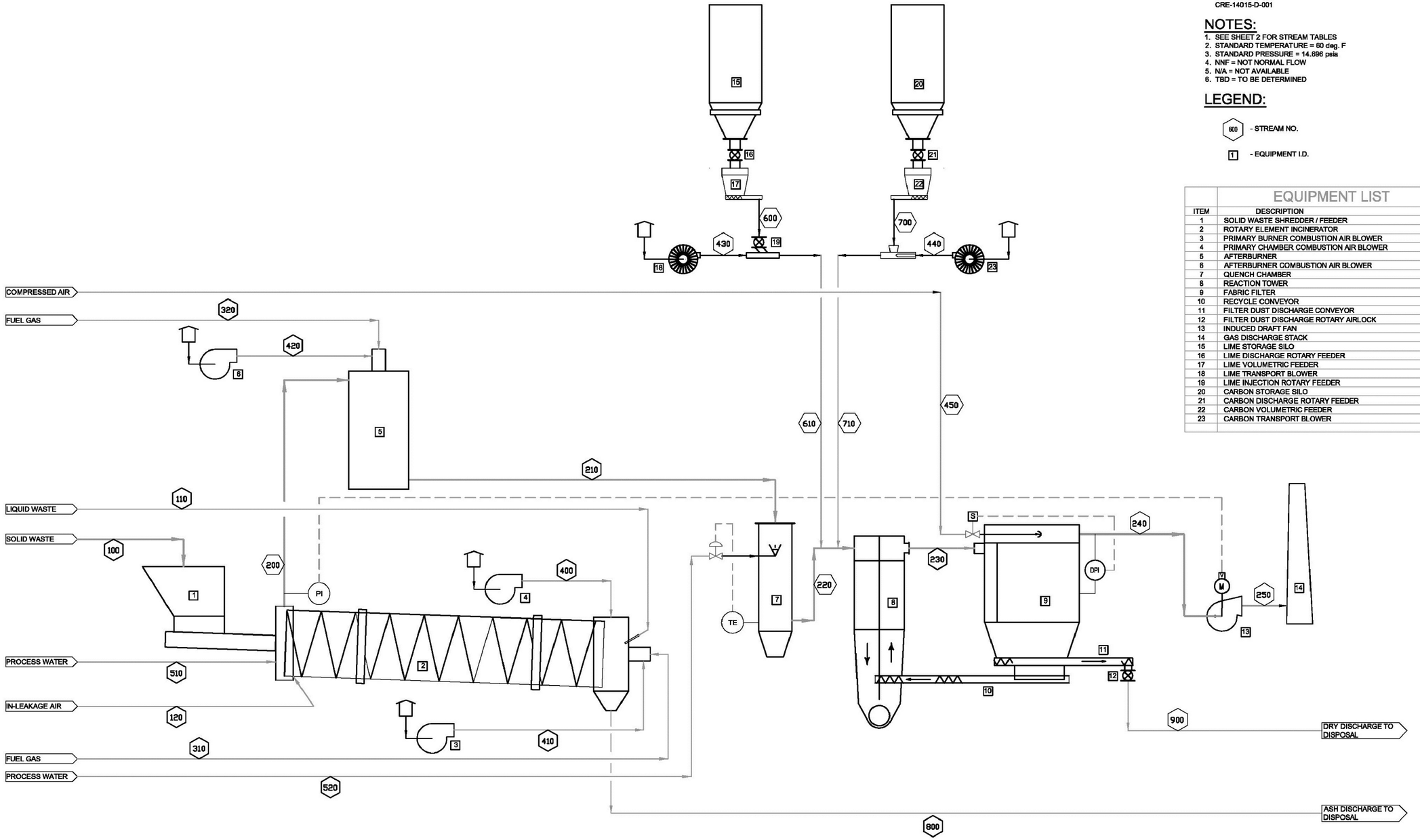
1. SEE SHEET 2 FOR STREAM TABLES
2. STANDARD TEMPERATURE = 60 deg. F
3. STANDARD PRESSURE = 14.696 psia
4. NNF = NOT NORMAL FLOW
5. N/A = NOT AVAILABLE
6. TBD = TO BE DETERMINED

LEGEND:

(800) - STREAM NO.

[1] - EQUIPMENT I.D.

EQUIPMENT LIST		
ITEM	DESCRIPTION	QTY.
1	SOLID WASTE SHREDDER / FEEDER	1
2	ROTARY ELEMENT INCINERATOR	1
3	PRIMARY BURNER COMBUSTION AIR BLOWER	1
4	PRIMARY CHAMBER COMBUSTION AIR BLOWER	1
5	AFTERBURNER	1
6	AFTERBURNER COMBUSTION AIR BLOWER	1
7	QUENCH CHAMBER	1
8	REACTION TOWER	1
9	FABRIC FILTER	1
10	RECYCLE CONVEYOR	1
11	FILTER DUST DISCHARGE CONVEYOR	1
12	FILTER DUST DISCHARGE ROTARY AIRLOCK	1
13	INDUCED DRAFT FAN	1
14	GAS DISCHARGE STACK	1
15	LIME STORAGE SILO	1
16	LIME DISCHARGE ROTARY FEEDER	1
17	LIME VOLUMETRIC FEEDER	1
18	LIME TRANSPORT BLOWER	1
19	LIME INJECTION ROTARY FEEDER	1
20	CARBON STORAGE SILO	1
21	CARBON DISCHARGE ROTARY FEEDER	1
22	CARBON VOLUMETRIC FEEDER	1
23	CARBON TRANSPORT BLOWER	1



Source: Continental Research & Engineering, LLC

B SHEET SCALE: SHOWN

OneWay™ to zero harm

Date:	29/10/2014
Drawn By:	Y.M.
Edited By:	XX
App'd By:	T.A.

CUSTOMER

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WorleyParsons resources & energy

Process Flow Diagram

WORLEYPARSONS PROJECT No:	FIG No:	REV
307074-01969	2	0

FILE LOCATION: Y:\Yao.Mo\for_Quincy\Ryley\MXD\Process_Flow.mxd
USER NAME: Yao.mo
ISSUING OFFICE: Burnaby GIS
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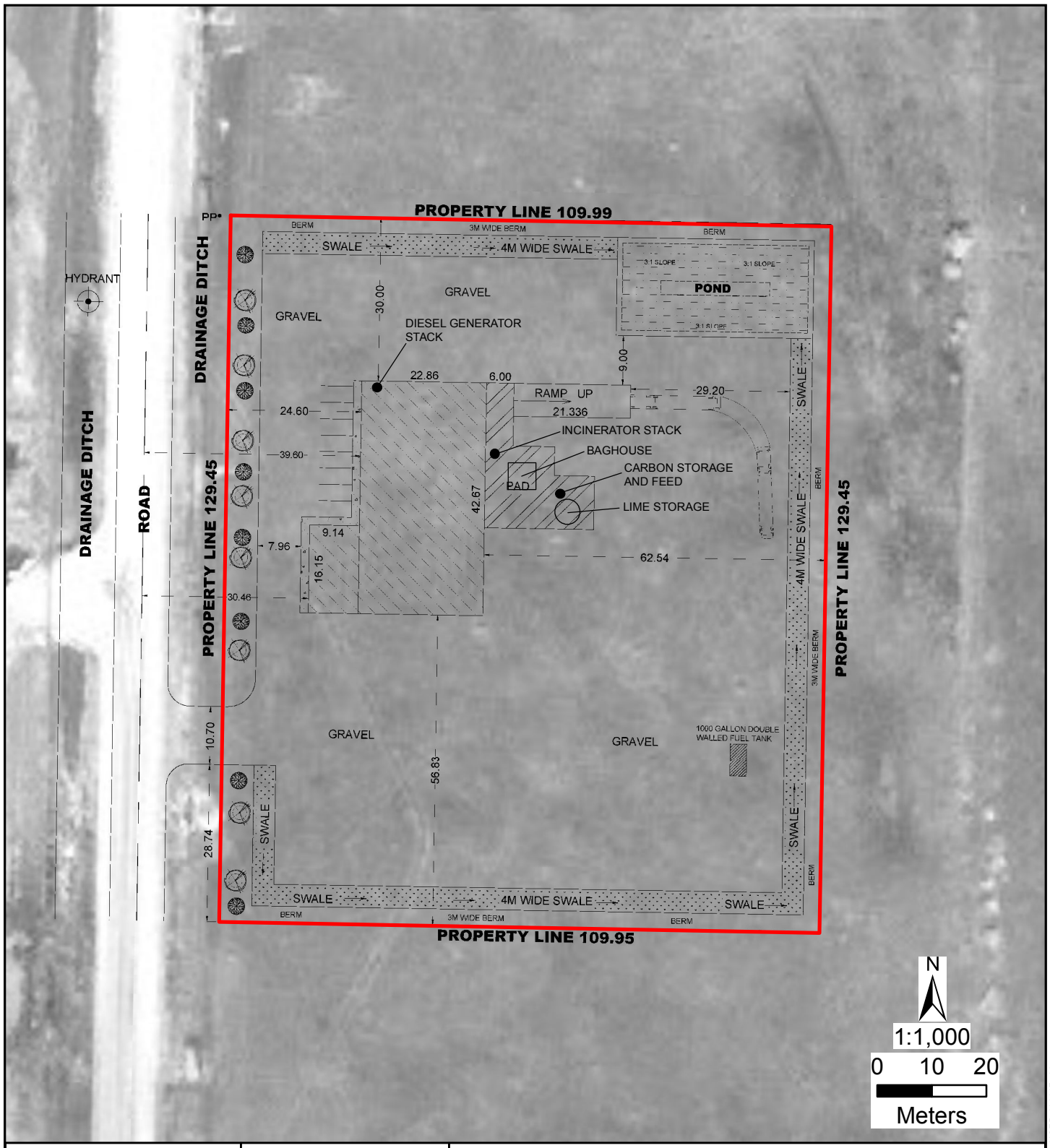

A SHEET	SCALE: SHOWN
Date:	29/10/2014
Drawn By:	Y.M.
Edited By:	XX
App'd By:	T.A.

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Site Plan

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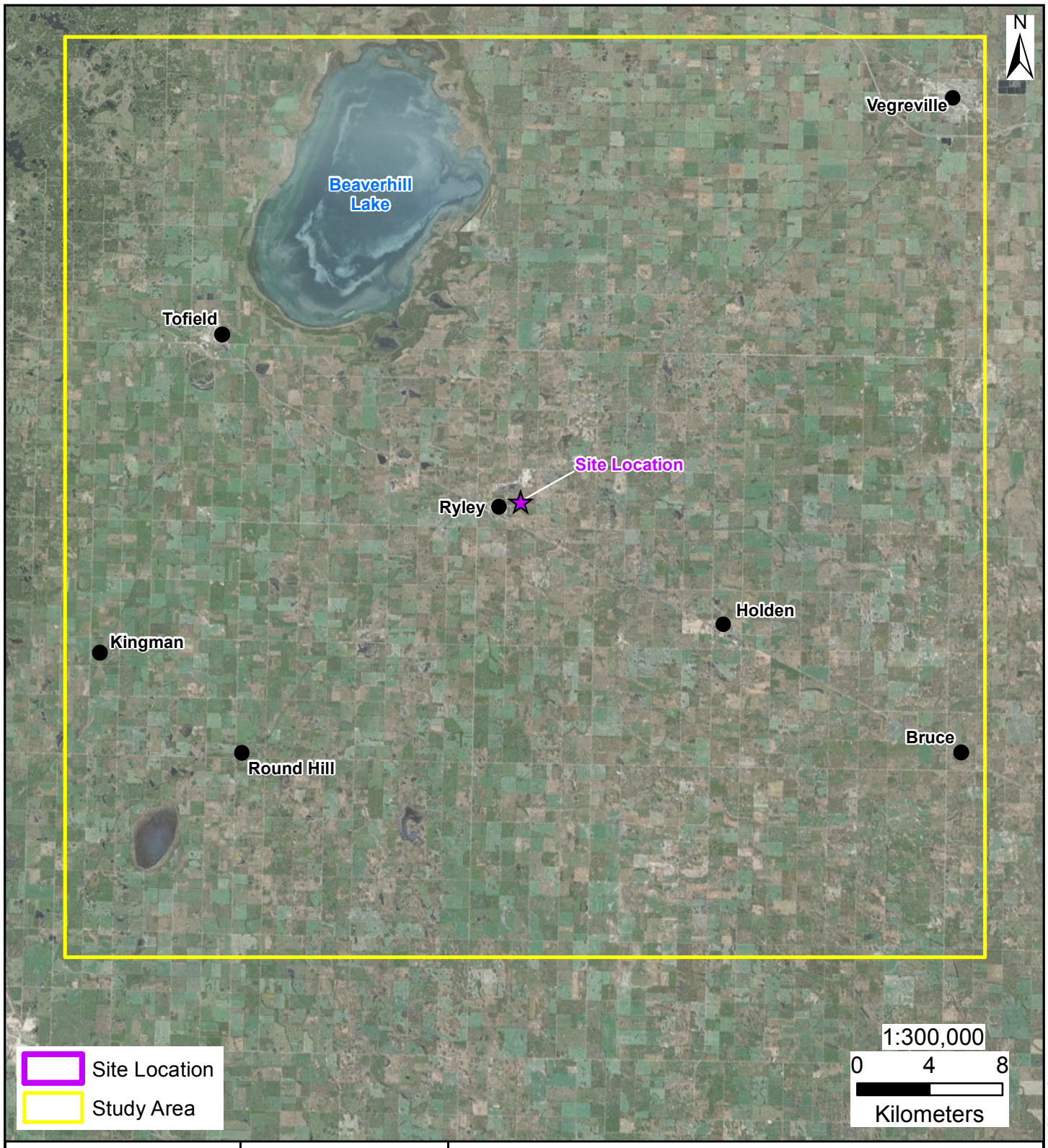
WORLEYPARSONS PROJECT No:	FIG No:	REV
307074-01969	3	0

FILE LOCATION: Y:\Yao.Mo\for_Quincy\Ryley\MXD\Site_Plan.mxd

USER NAME: Yao.mo
ISSUING OFFICE: Burnaby GIS

PLOT DATE & TIME:29/10/2014 10:15:01 AM
SAVE DATE & TIME:29/10/2014 10:14:37 AM

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community



A SHEET	SCALE: SHOWN
Date:	29/10/2014
Drawn By:	Y.M.
Edited By:	XX
App'd By:	T.A.

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Study Area

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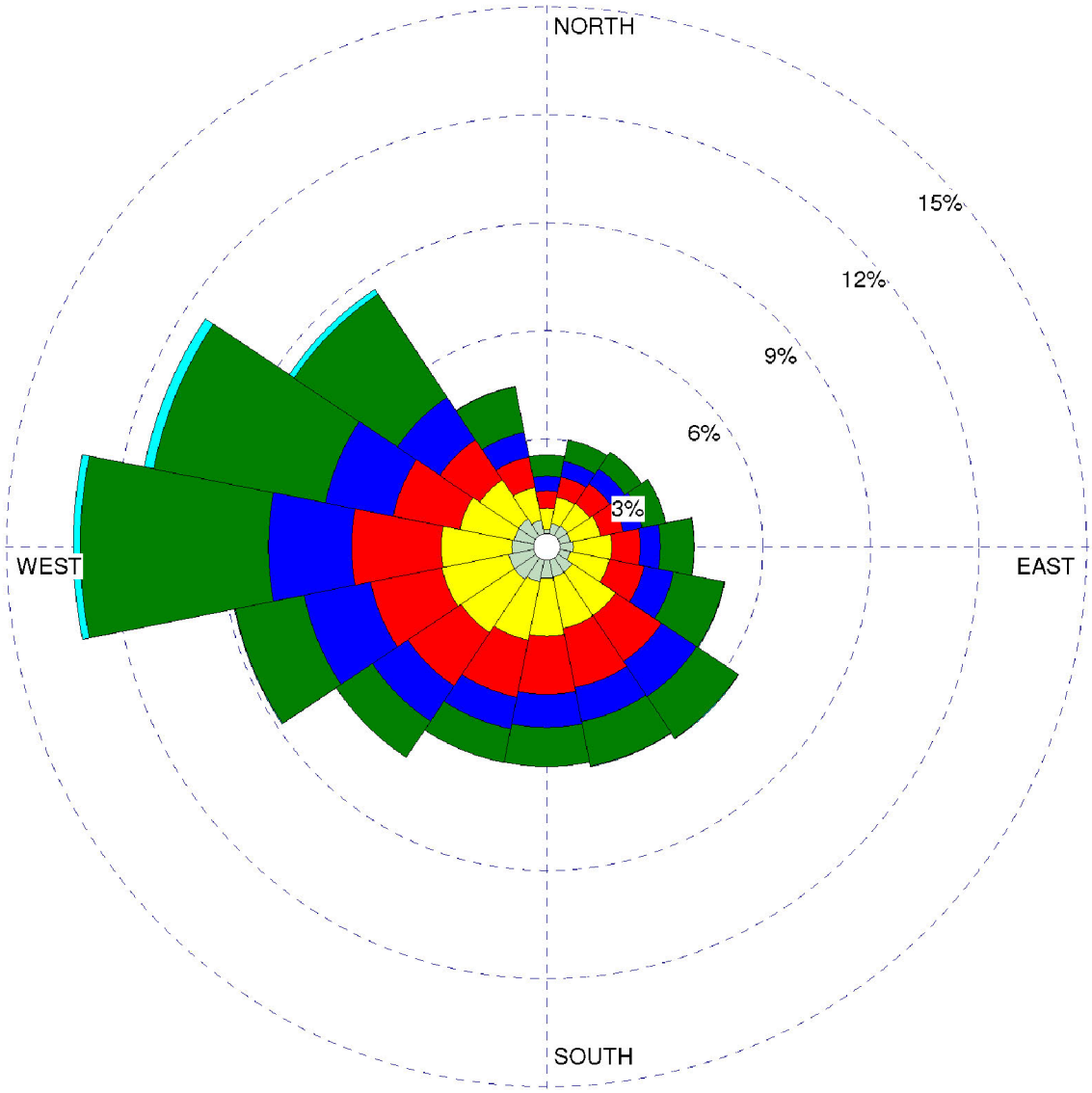
WORLEYPARSONS PROJECT No:	FIG No:	REV
307074-01969	4	0

FILE LOCATION: Y:\Yao.Mo\for_Quincy\Ryley\MXD\Study_Area.mxd

USER NAME: Yao.mo
ISSUING OFFICE: Burnaby GIS

PLOT DATE & TIME:29/10/2014 10:14:06 AM
SAVE DATE & TIME:29/10/2014 10:13:59 AM

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community



A SHEET	SCALE: SHOWN
OneWay™ to zero harm	
Date:	29/10/2014
Drawn By:	Y.M.
Edited By:	XX
App'd By:	T.A.

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Windspeed Frequency Distribution / Windrose

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WORLEYPARSONS PROJECT No:	FIG No:	REV
307074-01969	5	0

FILE LOCATION: Y:\Yao.Mo\for_Quincy\Ryley\MXD\Windspeed_Freq_and_windrose.mxd

USER NAME: Yao.mo
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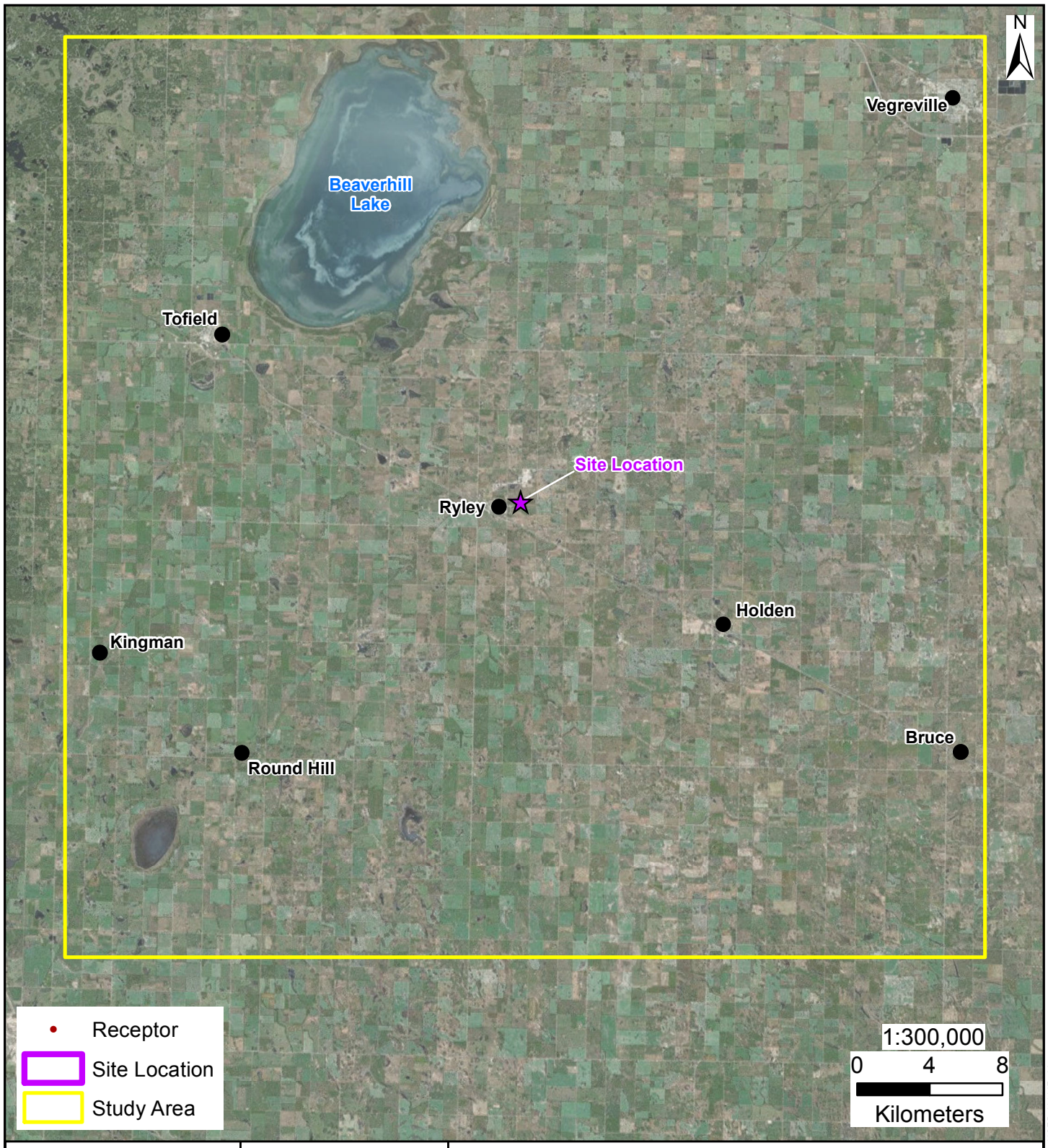

A SHEET	SCALE: SHOWN
Date:	29/10/2014
Drawn By:	Y.M.
Edited By:	XX
App'd By:	T.A.

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Nested Grid of Receptors

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WORLEYPARSONS PROJECT No:	FIG No:	REV
307074-01969	6	0

FILE LOCATION: Y:\Yao.Mo\for_Quincy\Ryley\MXD\Receptor_Grid.mxd

USER NAME: Yao.mo
ISSUING OFFICE: Burnaby GIS

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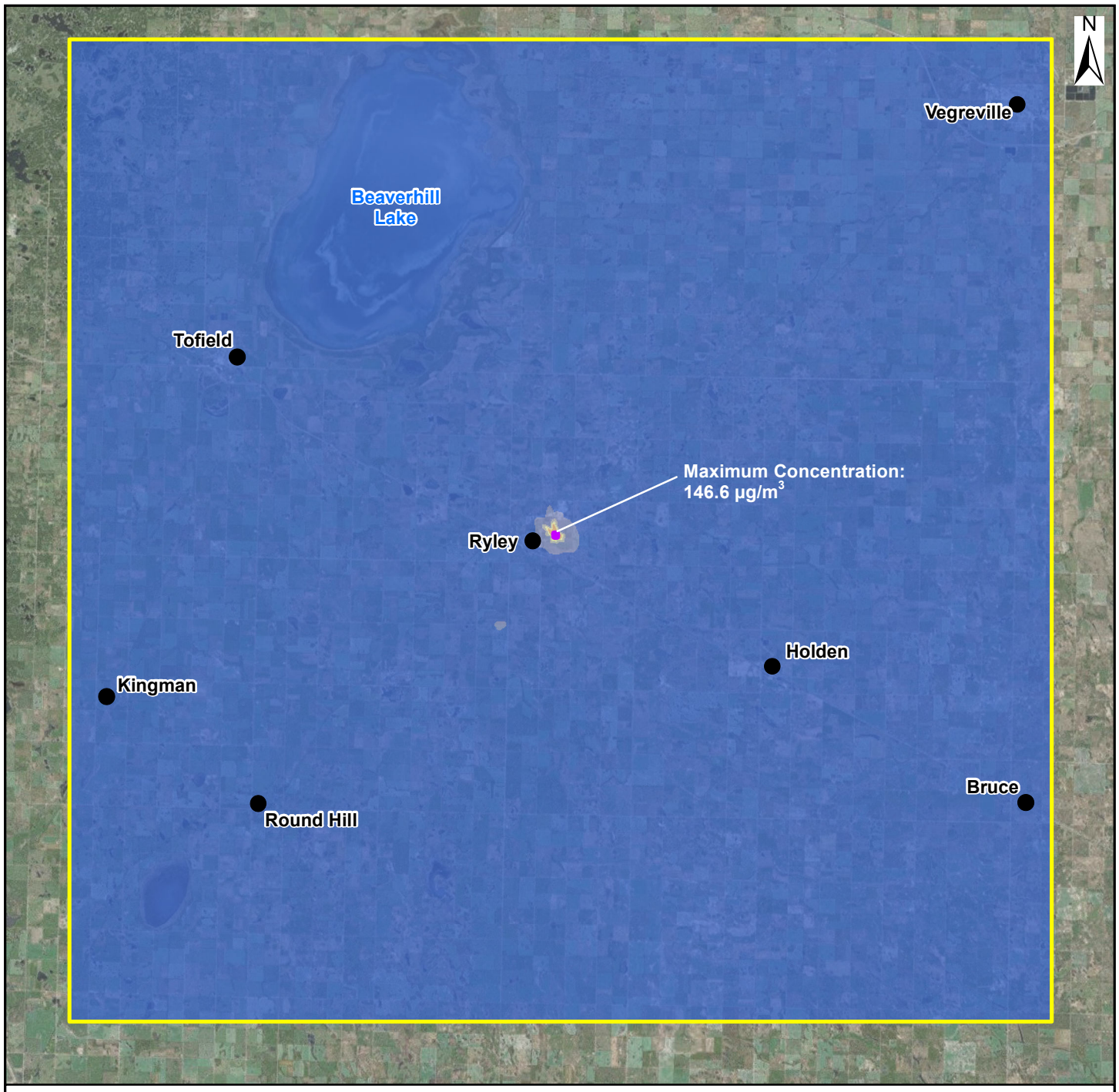
Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community



Site Location

Study Area

NO_x as NO_2 Concentration (µg/m³)

60 70 80 90 100 200 300

1:300,000

0 4 8

Kilometers

A SHEET	SCALE: SHOWN
Date:	29/10/2014
Drawn By:	Y.M.
Edited By:	XX
App'd By:	T.A.

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Maximum Predicted 1-Hour Average NO_x as NO_2 Concentration Including Background Concenctration during Normal Operations

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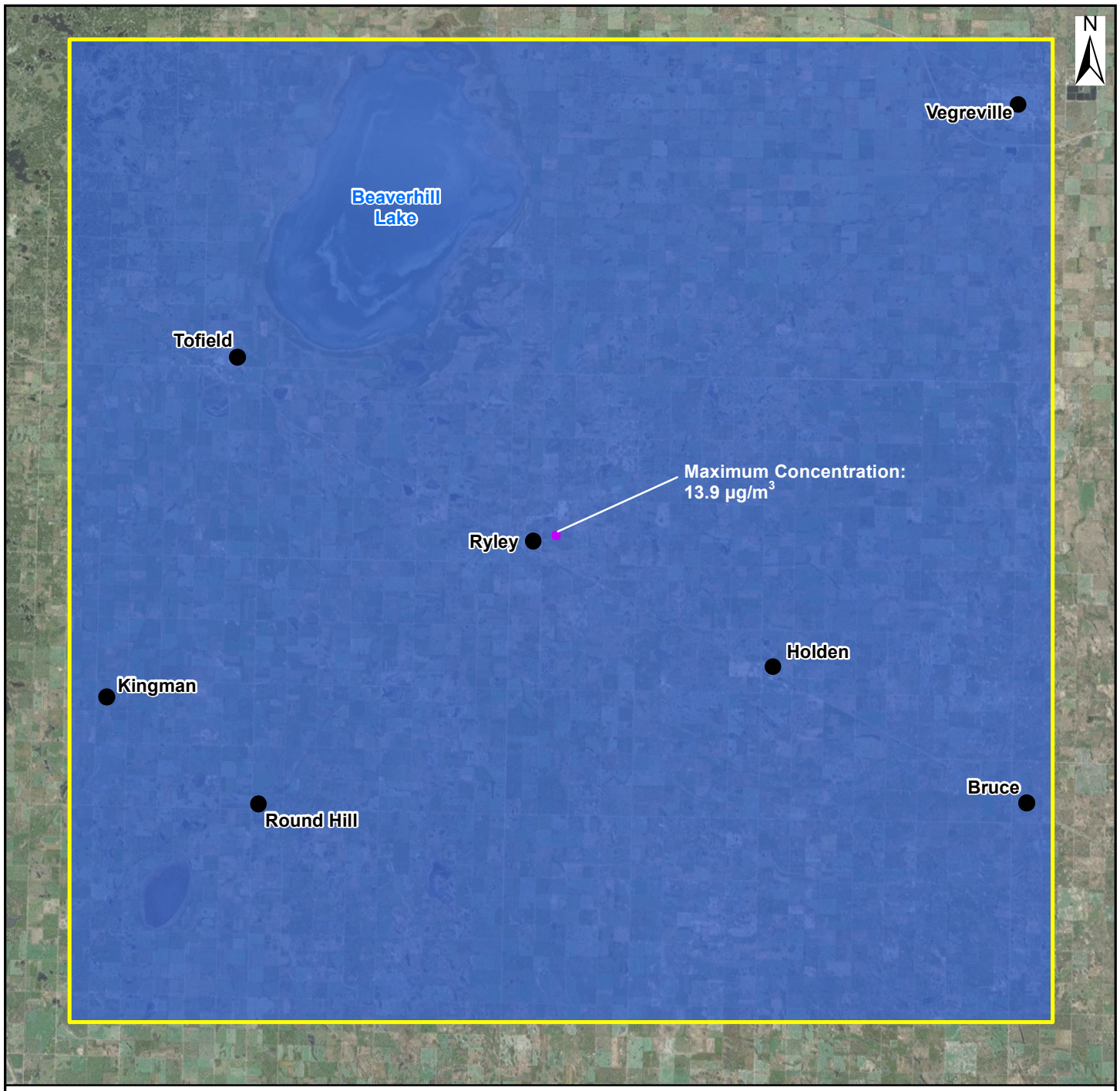
WORLEYPARSONS PROJECT No:	FIG No:	REV
307074-01969	7	0

FILE LOCATION: Y:\Yao.Mo\for_Quincy\Ryley\MXD\Fig_7_NO2_1hour.mxd

USER NAME: Yao.mo
ISSUING OFFICE: Burnaby GIS

PLOT DATE & TIME:29/10/2014 10:17:45 AM
SAVE DATE & TIME:29/10/2014 10:17:27 AM

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community



Site Location

Study Area

NO_x as NO_2 Concentration (µg/m³)

10 15 20 25 30 35 40 45

1:300,000

0 4 8

Kilometers

A SHEET	SCALE: SHOWN
Date:	29/10/2014
Drawn By:	Y.M.
Edited By:	XX
App'd By:	T.A.

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Maximum Predicted Annual Average NO_x as NO_2 Concentration Including Background Concenctration during Normal Operations

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WORLEYPARSONS PROJECT No:	FIG No:	REV
307074-01969	8	0

FILE LOCATION: Y:\Yao.Mo\for_Quincy\Ryley\MXD\Fig_8_NO2_annual.mxd

USER NAME: Yao.mo
ISSUING OFFICE: Burnaby GIS

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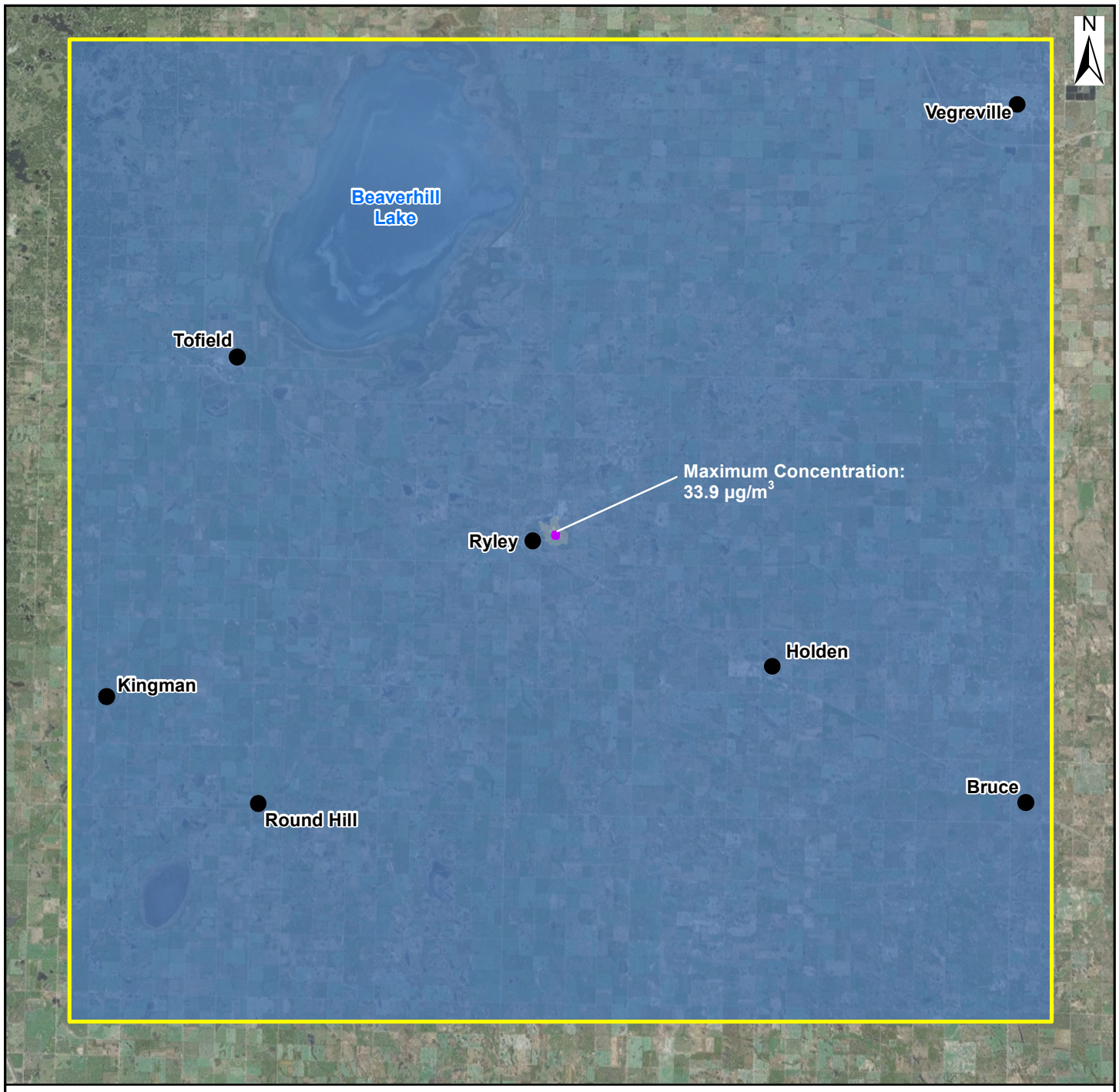
SAVE DATE & TIME:29/10/2014 10:21:03 AM

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community



Site Location

Study Area

SO_2 Concentration (µg/m³)

0 10 20 40 60 80 100 200 450

1:300,000

0 4 8

Kilometers

A SHEET	SCALE: SHOWN
Date:	29/10/2014
Drawn By:	Y.M.
Edited By:	XX
App'd By:	T.A.

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Maximum Predicted 1-Hour Average SO_2 Concentration Including Background Concenctration during Normal Operations

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WORLEYPARSONS PROJECT No:	FIG No:	REV
307074-01969	9	0

FILE LOCATION: Y:\Yao.Mo\for_Quincy\Ryley\MXD\Fig_9_SO2_1hour.mxd

USER NAME: Yao.mo
ISSUING OFFICE: Burnaby GIS

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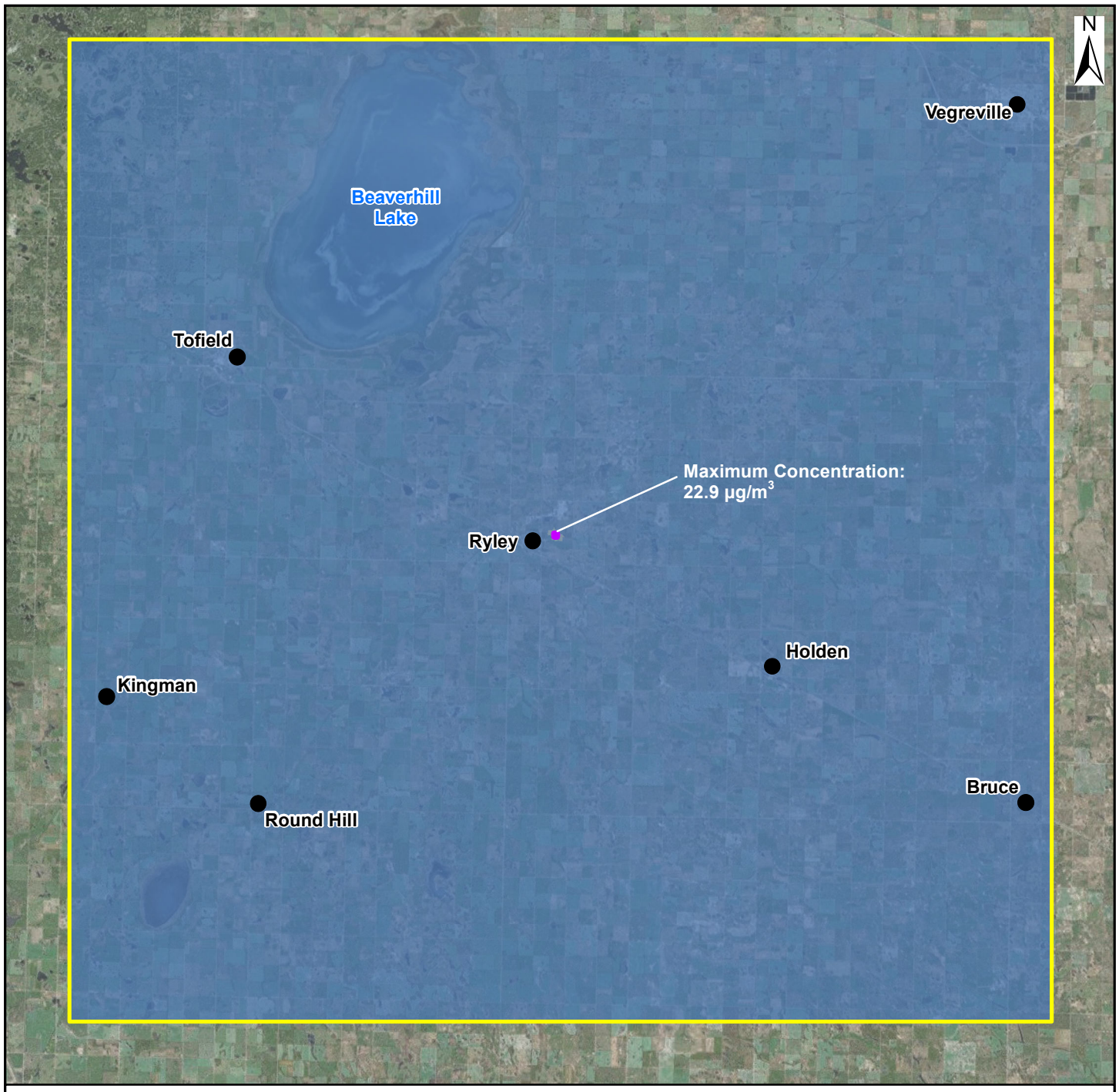
SAVE DATE & TIME:29/10/2014 10:20:22 AM

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community



Site Location

Study Area

SO_2 Concentration (µg/m³)

0 10 20 40 60 80 100 125

1:300,000

0 4 8

Kilometers

A SHEET	SCALE: SHOWN
Date:	29/10/2014
Drawn By:	Y.M.
Edited By:	XX
App'd By:	T.A.

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Maximum Predicted 24-Hour Average SO_2 Concentration Including Background Concenctration during Normal Operations

WORLEYPARSONS PROJECT No:	FIG No:	REV
307074-01969	10	0

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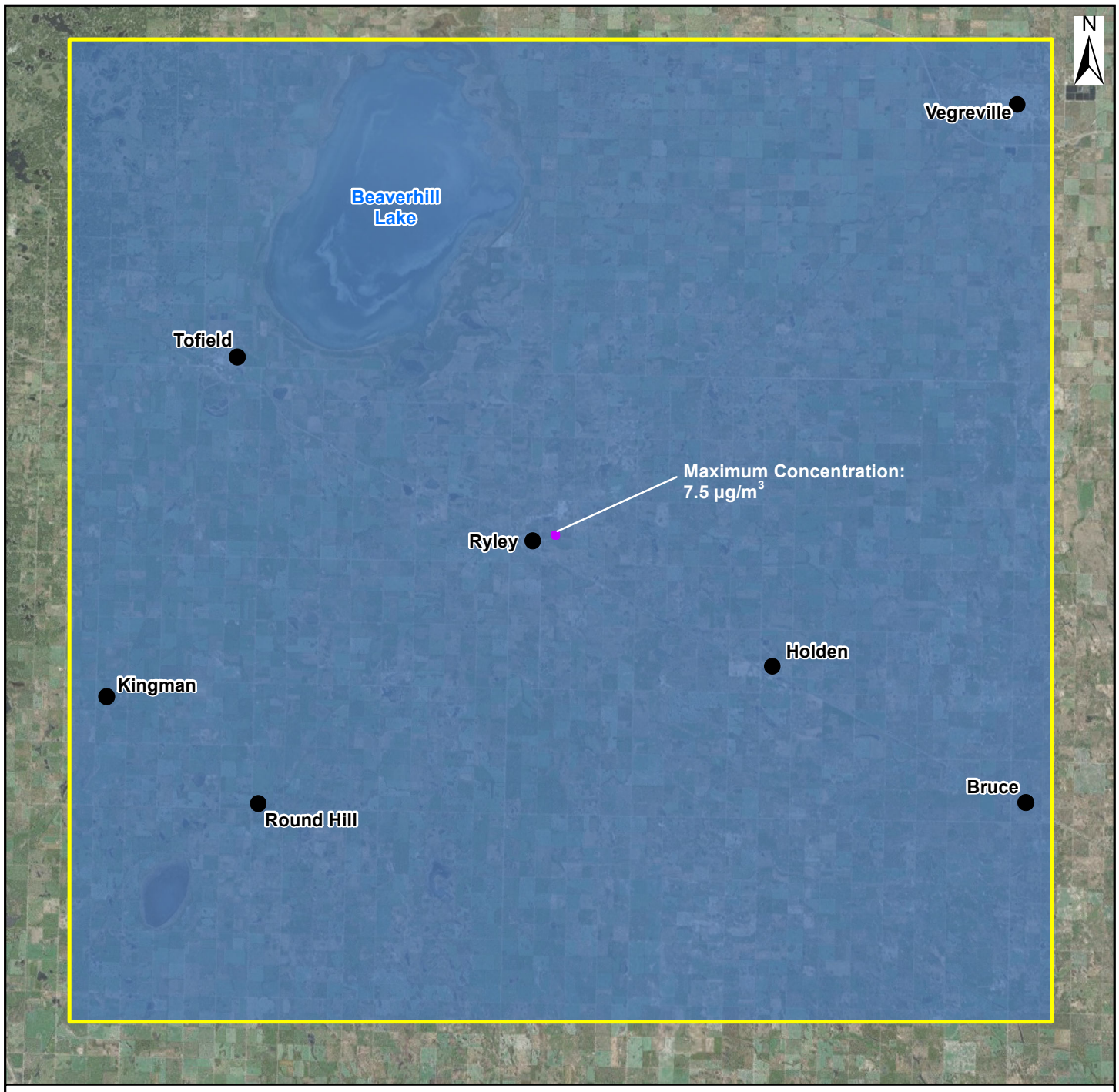
FILE LOCATION: Y:\Yao.Mo\for_Quincy\Ryley\MXD\Fig_10_SO2_24hour.mxd

USER NAME: Yao.mo
ISSUING OFFICE: Burnaby GIS

PLOT DATE & TIME:29/10/2014 10:19:35 AM
SAVE DATE & TIME:29/10/2014 10:19:29 AM

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community



Site Location

Study Area

SO_2 Concentration (µg/m³)

5 10 15 20 25 30

1:300,000

0 4 8

Kilometers

A SHEET	SCALE: SHOWN
Date:	29/10/2014
Drawn By:	Y.M.
Edited By:	XX
App'd By:	T.A.

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Maximum Predicted 30-Day Average SO_2 Concentration Including Background Concenctration during Normal Operations

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WORLEYPARSONS PROJECT No:	FIG No:	REV
307074-01969	11	0

FILE LOCATION: Y:\Yao.Mo\for_Quincy\Ryley\MXD\Fig_11_SO2_monthly.mxd

USER NAME: Yao.mo
ISSUING OFFICE: Burnaby GIS

PLOT DATE & TIME:29/10/2014 10:22:59 AM
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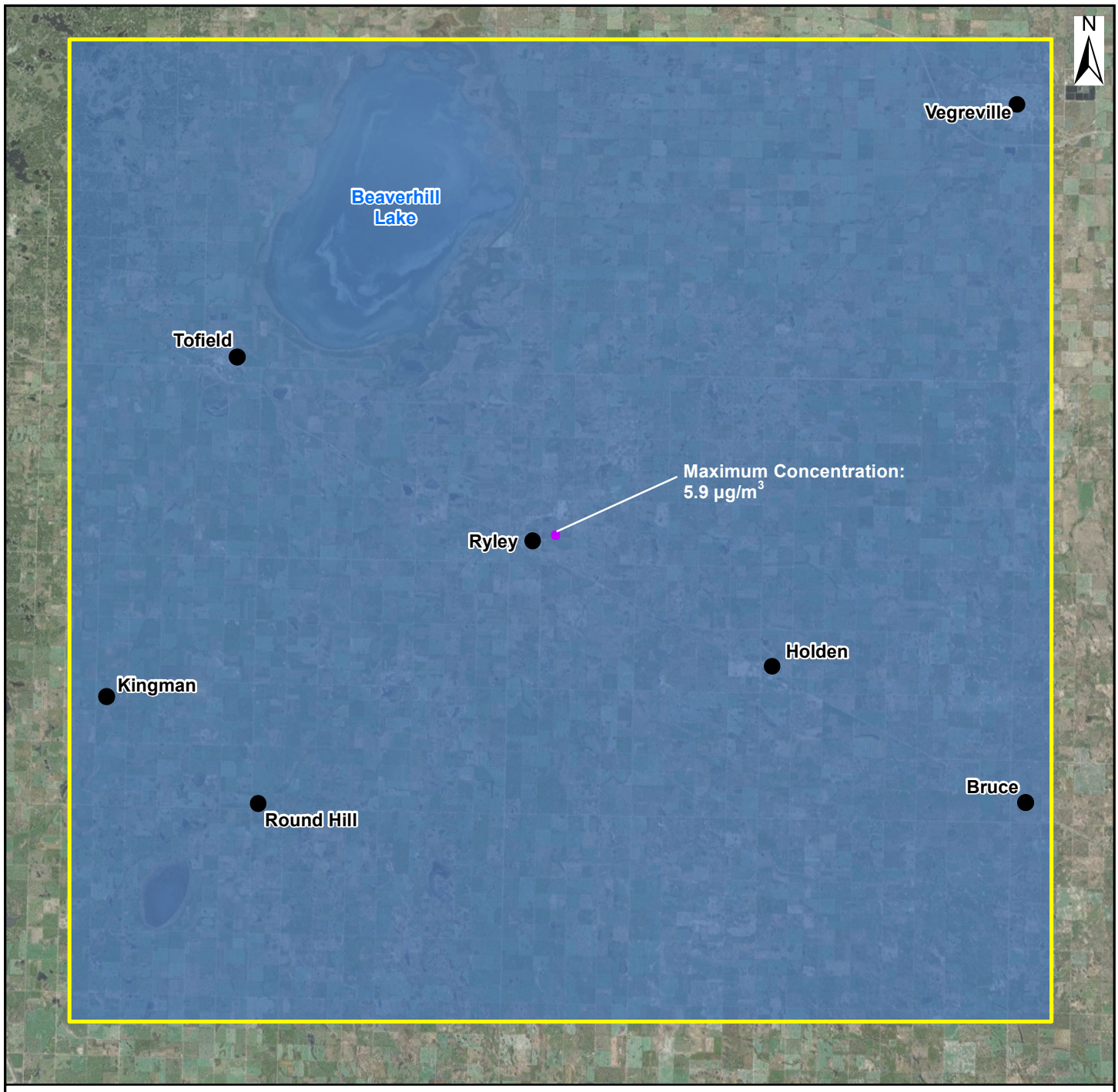
Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community



Site Location

Study Area

SO_2 Concentration (µg/m³)

5 10 15 20

1:300,000

0 4 8

Kilometers

A SHEET	SCALE: SHOWN
Date:	29/10/2014
Drawn By:	Y.M.
Edited By:	XX
App'd By:	T.A.

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Maximum Predicted Annual Average SO_2 Concentration Including Background Concenctration during Normal Operations

WORLEYPARSONS PROJECT No:	FIG No:	REV
307074-01969	12	0

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FILE LOCATION: Y:\Yao.Mo\for_Quincy\Ryley\MXD\Fig_12_SO2_annual.mxd

USER NAME: Yao.mo
ISSUING OFFICE: Burnaby GIS

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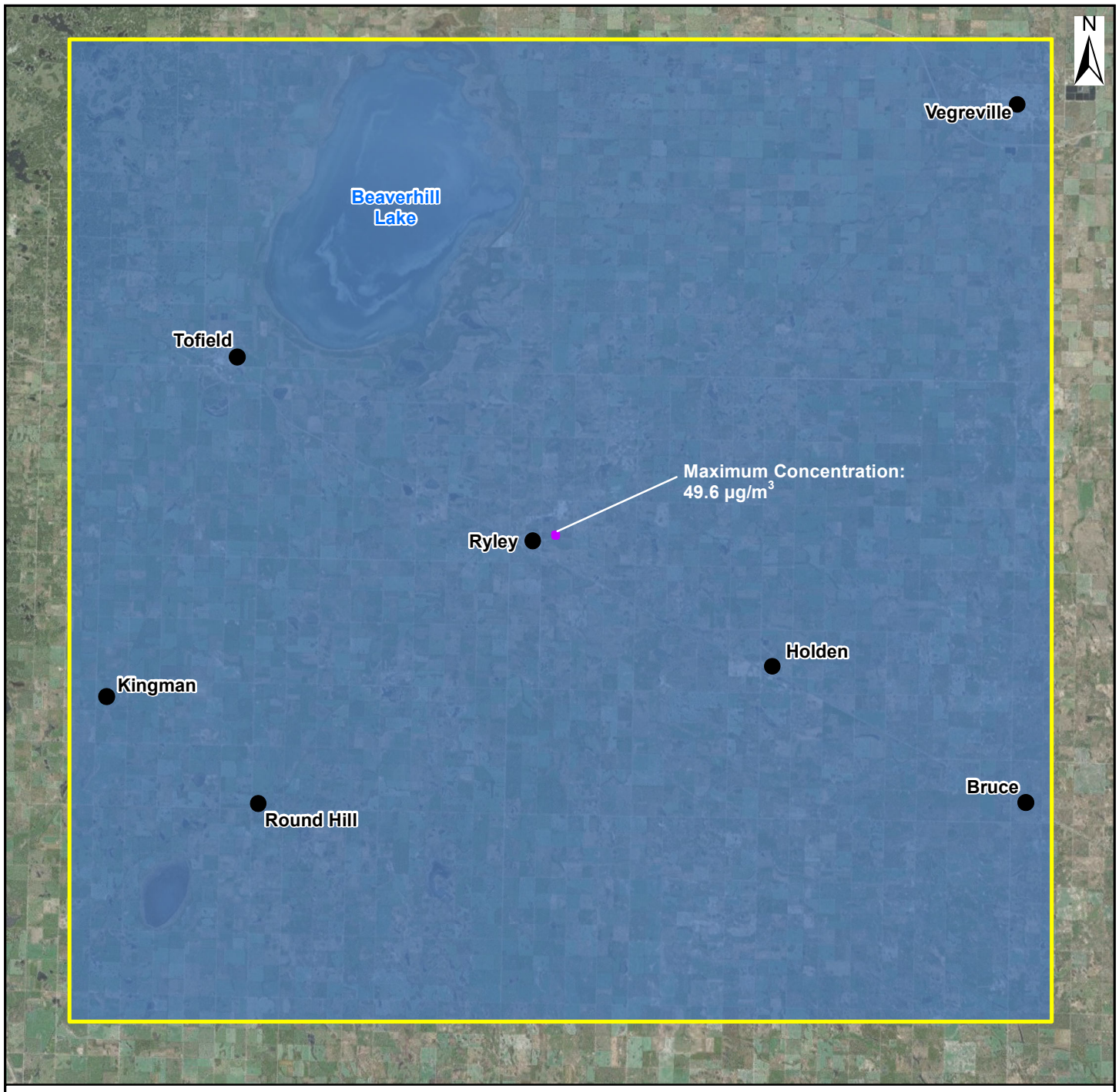
Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community



Site Location

Study Area

TPM Concentration (µg/m³)

40 50 60 70 80 90 100

1:300,000

0 4 8

Kilometers

A SHEET	SCALE: SHOWN
Date:	29/10/2014
Drawn By:	Y.M.
Edited By:	XX
App'd By:	T.A.

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Maximum Predicted 24-Hour Average TPM Concentration Including Background Concentration during Normal Operations

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WORLEYPARSONS PROJECT No:	FIG No:	REV
307074-01969	13	0

FILE LOCATION: Y:\Yao.Mo\for_Quincy\Ryley\MXD\Fig_13_TPM_24hour.mxd

USER NAME: Yao.mo
ISSUING OFFICE: Burnaby GIS

PLOT DATE & TIME:29/10/2014 11:18:38 AM
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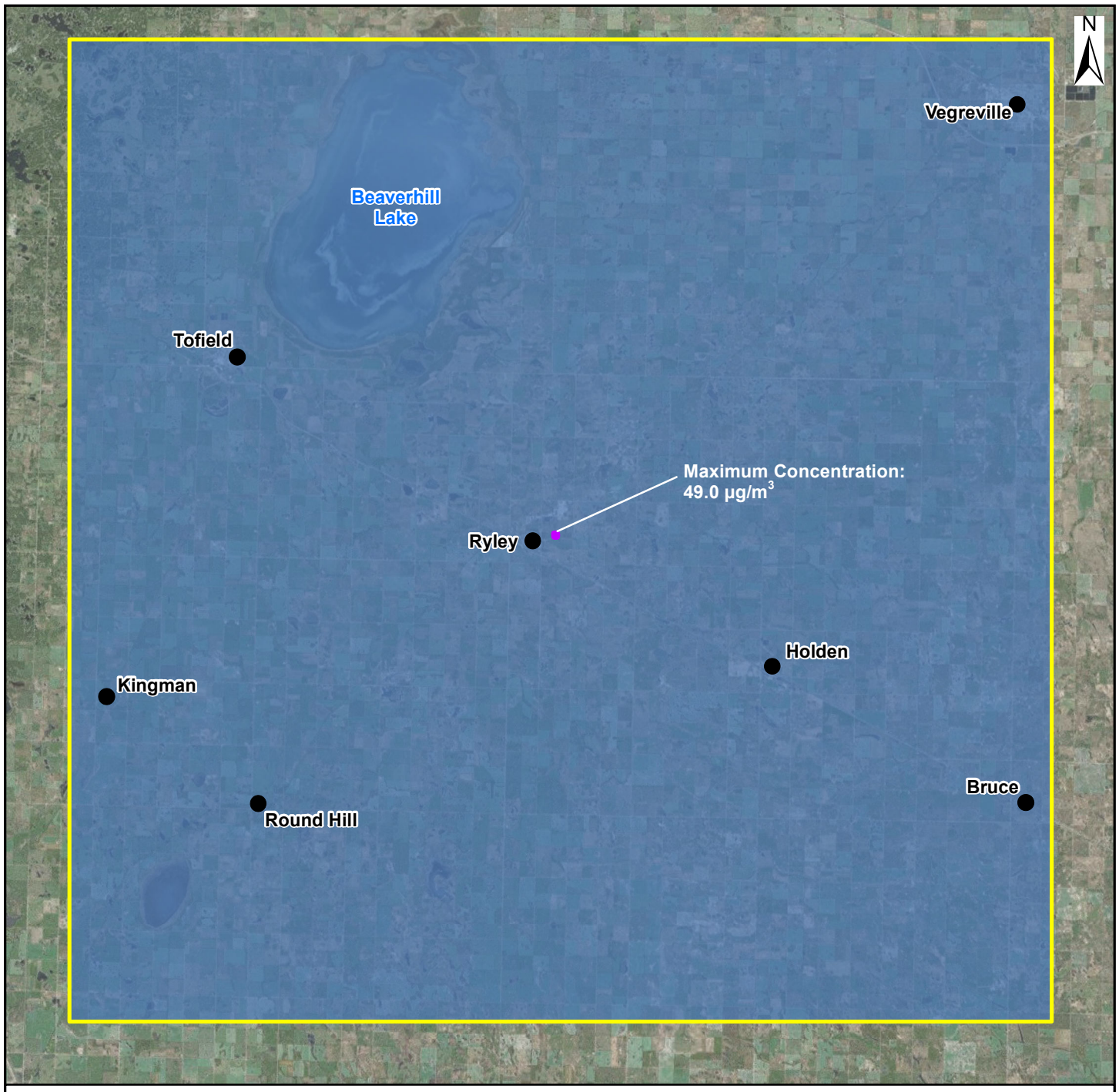
Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community



Site Location

Study Area

TPM Concentration (µg/m³)

45 50 55 60

1:300,000

0 4 8

Kilometers

A SHEET	SCALE: SHOWN
CUSTOMER	
Date:	29/10/2014
Drawn By:	Y.M.
Edited By:	XX
App'd By:	T.A.

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Maximum Predicted Annual Average TPM Concentration Including Background Concentration during Normal Operations

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WORLEYPARSONS PROJECT No:	FIG No:	REV
307074-01969	14	0

FILE LOCATION: Y:\Yao.Mo\for_Quincy\Ryley\MXD\Fig_14_TPM_annual.mxd

USER NAME: Yao.mo
ISSUING OFFICE: Burnaby GIS

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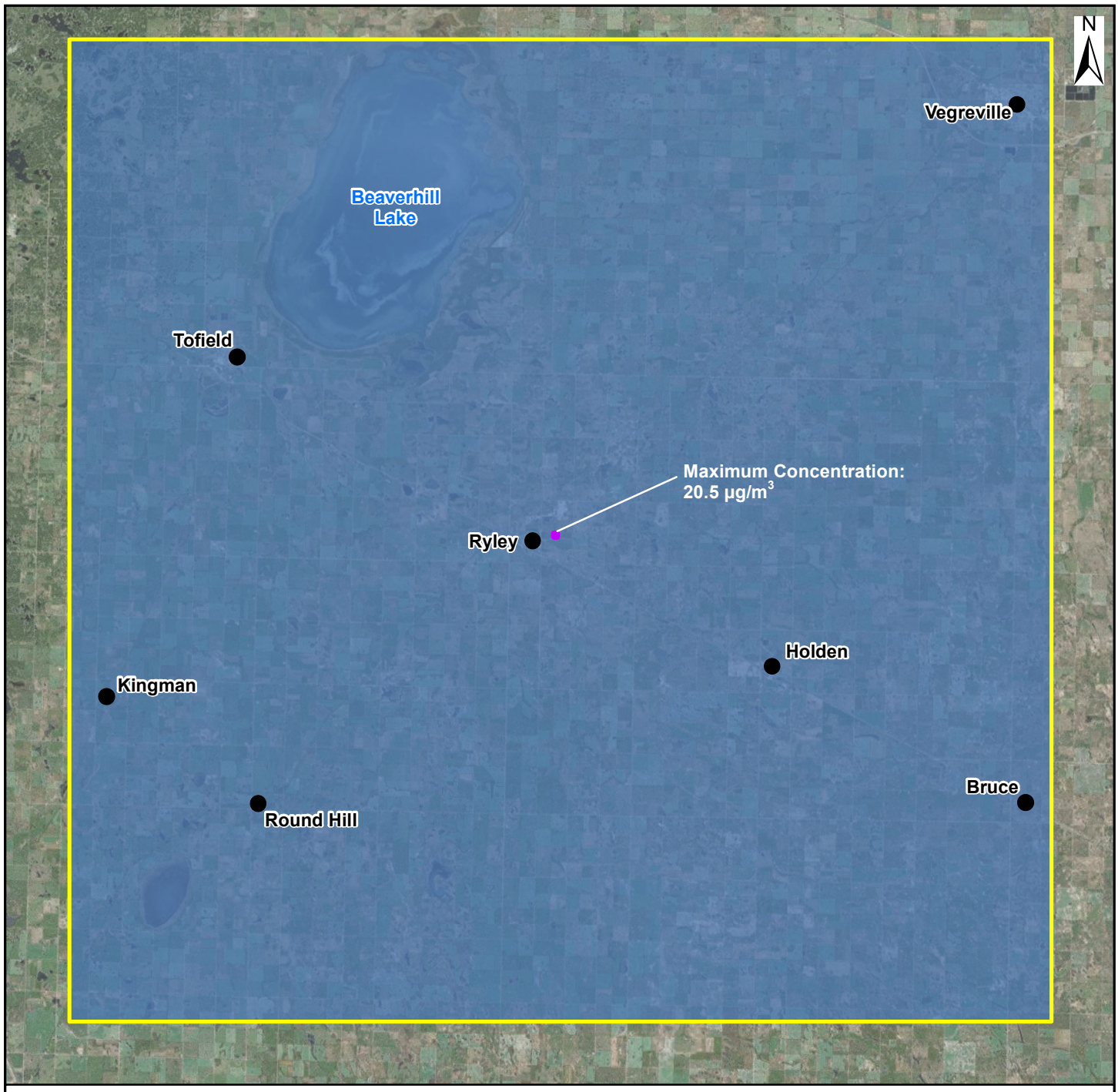
Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community



Site Location

Study Area

$PM_{2.5}$ Concentration (µg/m³)

20 22 24 26 28 30

1:300,000

0 4 8

Kilometers

A SHEET	SCALE: SHOWN
Date:	29/10/2014
Drawn By:	Y.M.
Edited By:	XX
App'd By:	T.A.

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Maximum Predicted 1-Hour Average $PM_{2.5}$ Concentration Including Background Concentration during Normal Operations

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WORLEYPARSONS PROJECT No:	FIG No:	REV
307074-01969	15	0

FILE LOCATION: Y:\Yao.Mo\for_Quincy\Ryley\MXD\Fig_15_PM25_1hour.mxd

USER NAME: Yao.mo
ISSUING OFFICE: Burnaby GIS

PLOT DATE & TIME:29/10/2014 10:45:14 AM
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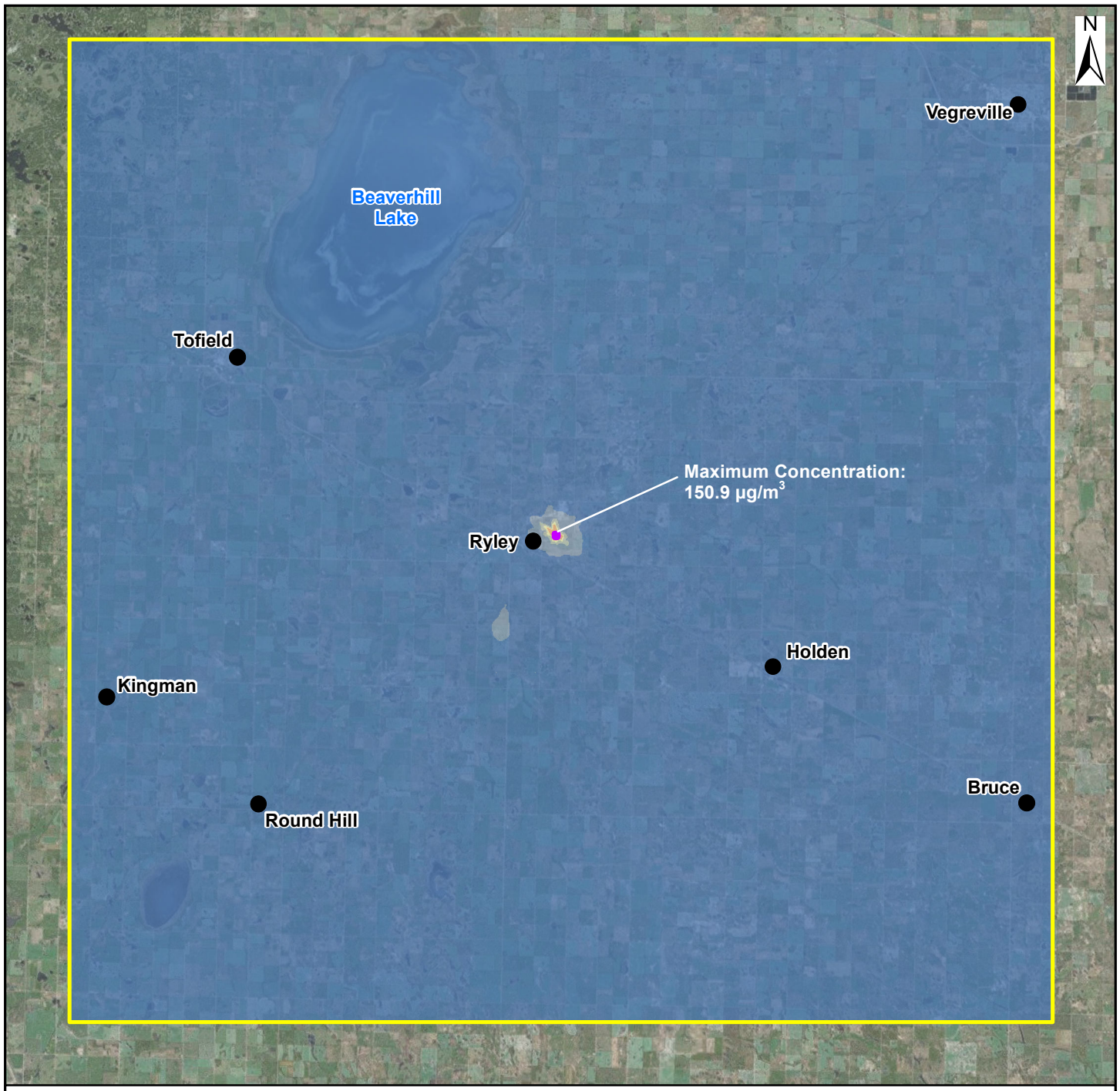
Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community



Site Location

Study Area

NO_x as NO_2 Concentration (µg/m³)

60 70 80 90 100 200 300

1:300,000

0 4 8

Kilometers

A SHEET SCALE: SHOWN

OneWay™ to zero harm

Date:	29/10/2014
Drawn By:	Y.M.
Edited By:	XX
App'd By:	T.A.

CUSTOMER

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WorleyParsons resources & energy

Maximum Predicted 1-Hour Average NO_x as NO_2 Concentration Including Background Concenctration during Emergency Power Generation and Incineration

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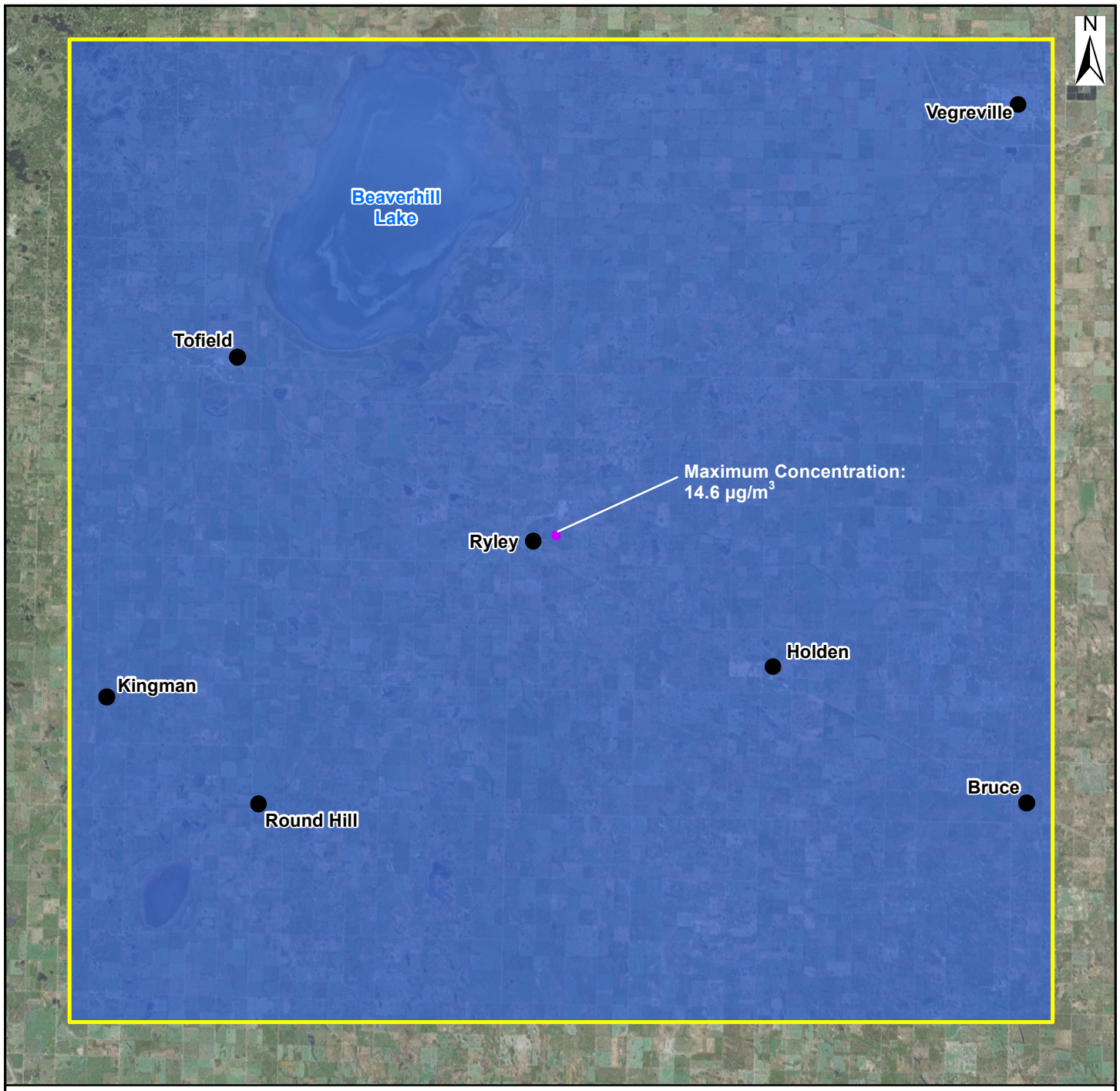
WORLEYPARSONS PROJECT No:	FIG No:	REV
307074-01969	16	0

FILE LOCATION: Y:\Yao.Mo\for_Quincy\Ryley\MXD\Fig_16_NO2_1hour.mxd

USER NAME: Yao.mo
ISSUING OFFICE: Burnaby GIS

PLOT DATE & TIME:29/10/2014 11:25:57 AM
SAVE DATE & TIME:29/10/2014 11:25:49 AM

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community



Site Location

Study Area

NO_x as NO_2 Concentration (µg/m³)

10 15 20 25 30 35 40 45

1:300,000

0 4 8

Kilometers

A SHEET	SCALE: SHOWN
Date:	29/10/2014
Drawn By:	Y.M.
Edited By:	XX
App'd By:	T.A.

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Maximum Predicted Annual Average NO_x as NO_2 Concentration Including Background Concenctration during Emergency Power Generation and Incineration

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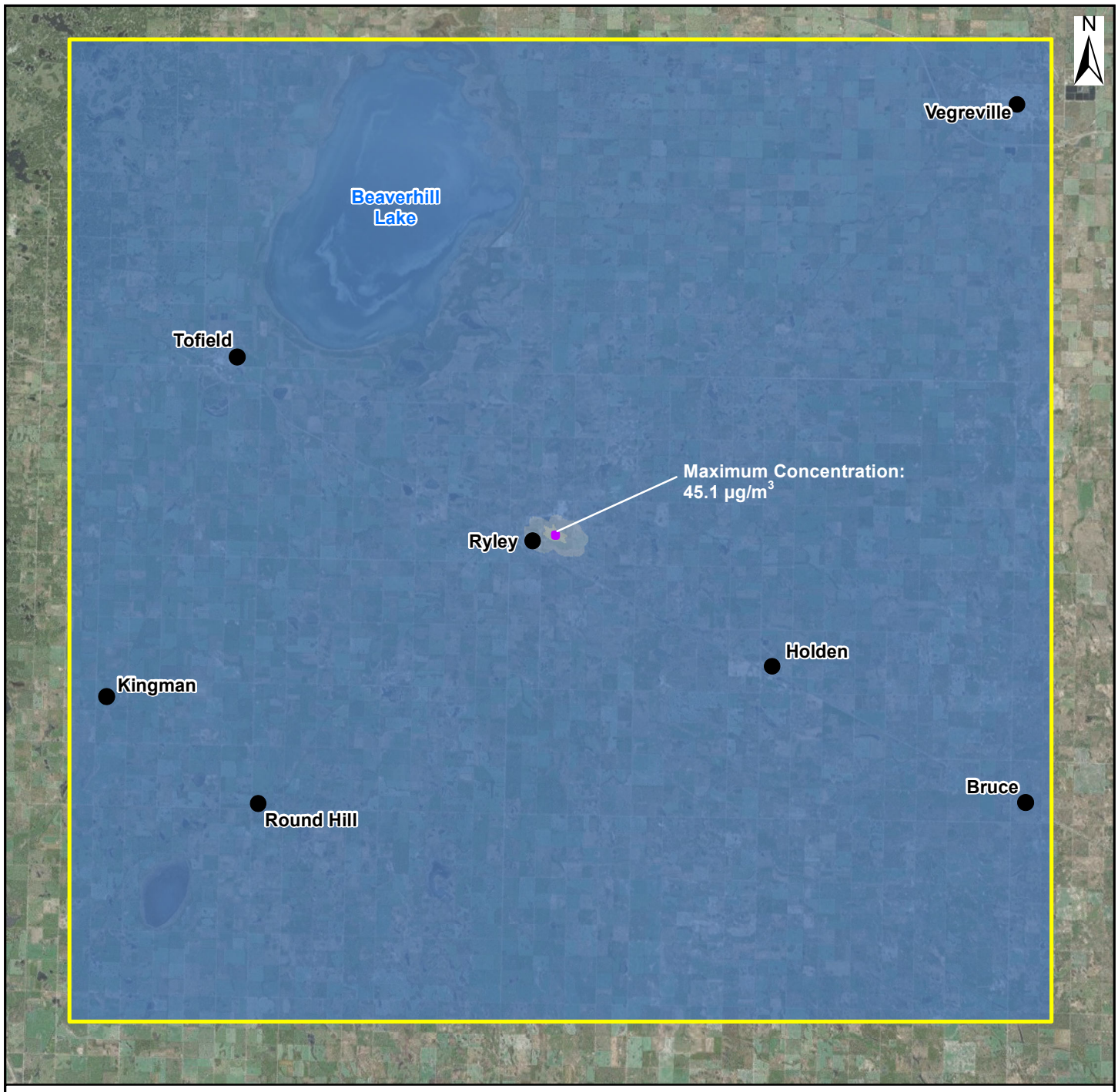
WORLEYPARSONS PROJECT No:	FIG No:	REV
307074-01969	17	0

FILE LOCATION: Y:\Yao.Mo\for_Quincy\Ryley\MXD\Fig_17_NO2_annual.mxd

USER NAME: Yao.mo
ISSUING OFFICE: Burnaby GIS

PLOT DATE & TIME:29/10/2014 11:25:27 AM
SAVE DATE & TIME:29/10/2014 11:25:19 AM

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community



Site Location

Study Area

SO_2 Concentration (µg/m³)

0 10 20 40 60 80 100 200 450

1:300,000

0 4 8

Kilometers

A SHEET SCALE: SHOWN

CUSTOMER

OneWay™ to zero harm

G-M Pearson Biomedical Waste Specialists

WorleyParsons resources & energy

Date:	29/10/2014
Drawn By:	Y.M.
Edited By:	XX
App'd By:	T.A.

Maximum Predicted 1-Hour Average SO_2 Concentration Including Background Concenctration during Emergency Power Generation and Incineration

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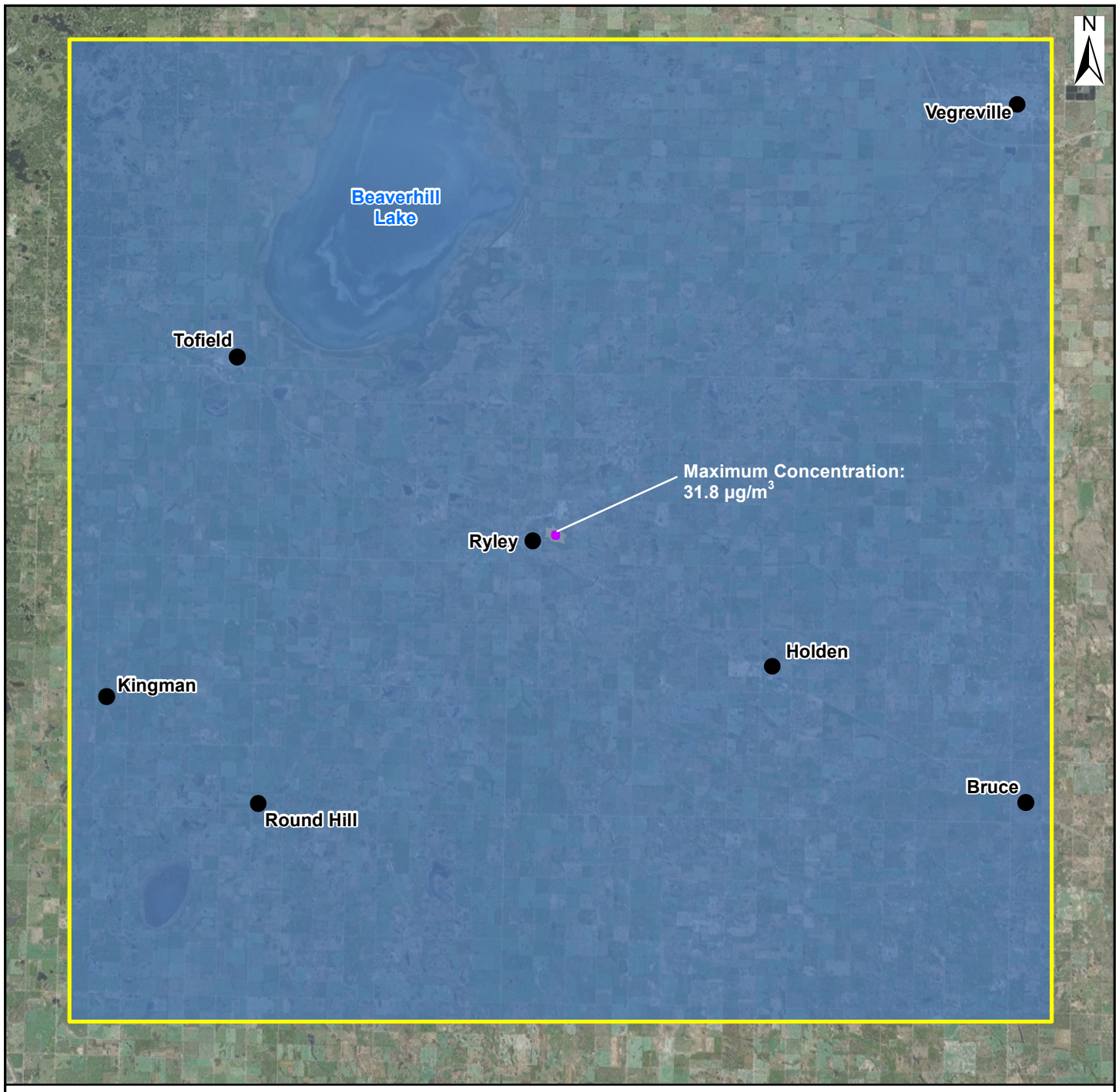
WORLEYPARSONS PROJECT No:	FIG No:	REV
307074-01969	18	0

FILE LOCATION: Y:\Yao.Mo\for_Quincy\Ryley\MXD\Fig_18_SO2_1hour.mxd

USER NAME: Yao.mo
ISSUING OFFICE: Burnaby GIS

PLOT DATE & TIME:29/10/2014 11:48:16 AM
SAVE DATE & TIME:29/10/2014 11:47:54 AM

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community



Site Location

Study Area

SO_2 Concentration (µg/m³)

0 10 20 40 60 80 100 125

1:300,000

0 4 8

Kilometers

A SHEET SCALE: SHOWN

CUSTOMER

OneWay™ to zero harm

G-M Pearson Biomedical Waste Specialists

WorleyParsons resources & energy

Date:	29/10/2014
Drawn By:	Y.M.
Edited By:	XX
App'd By:	T.A.

Maximum Predicted 24-Hour Average SO_2 Concentration Including Background Concenctration during Emergency Power Generation and Incineration

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WORLEYPARSONS PROJECT No:	FIG No:	REV
307074-01969	19	0

FILE LOCATION: Y:\Yao.Mo\for_Quincy\Ryley\MXD\Fig_19_SO2_24hour.mxd

USER NAME: Yao.mo
ISSUING OFFICE: Burnaby GIS

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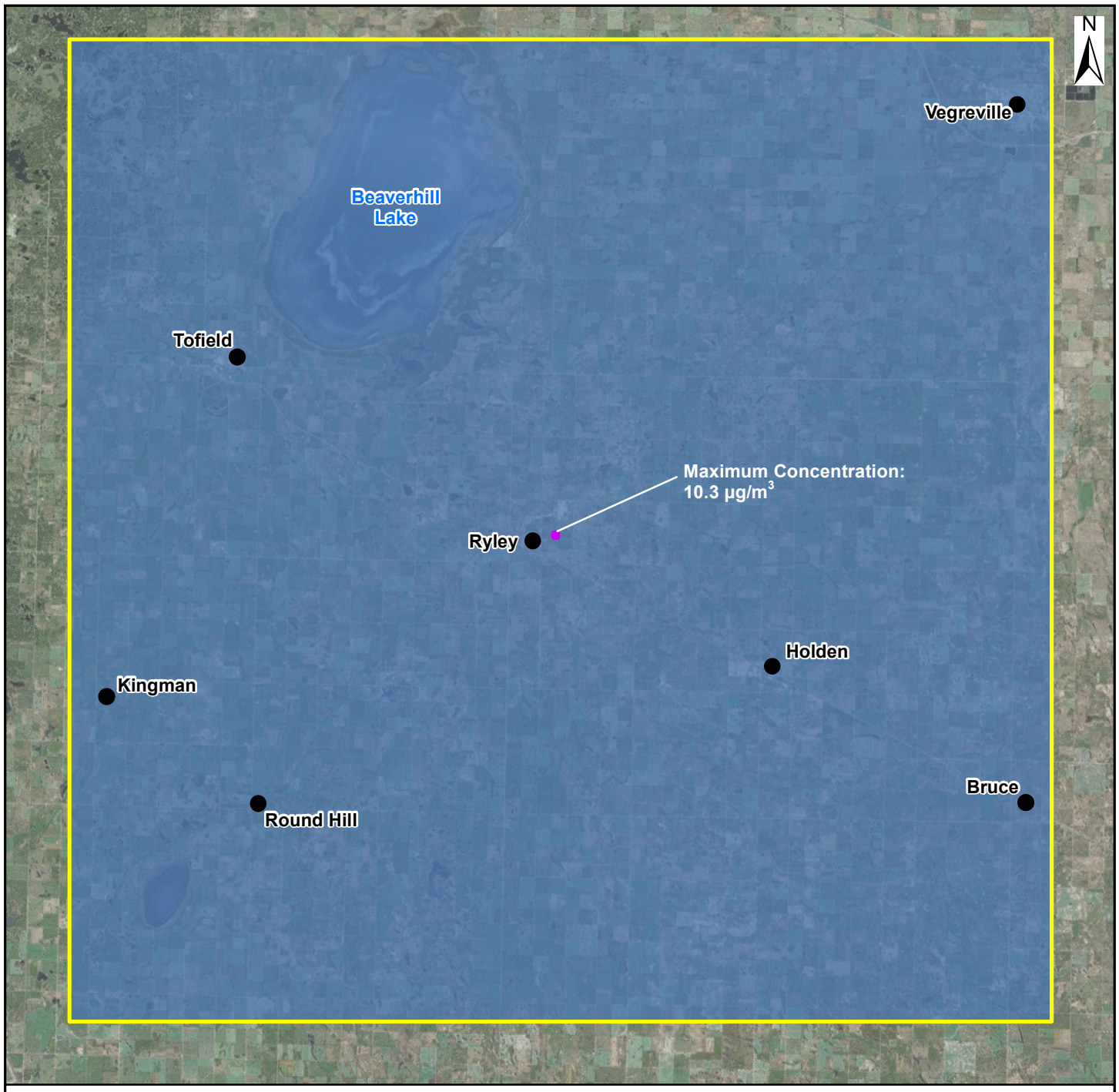
SAVE DATE & TIME:29/10/2014 11:48:25 AM

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community



Site Location

Study Area

SO_2 Concentration (µg/m³)

5 10 15 20 25 30

1:300,000

0 4 8

Kilometers

A SHEET	SCALE: SHOWN

OneWay™ to zero harm

Date:	29/10/2014
Drawn By:	Y.M.
Edited By:	XX
App'd By:	T.A.

CUSTOMER

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Maximum Predicted 30-Day Average SO_2 Concentration Including Background Concenctration during Emergency Power Generation and Incineration

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WORLEYPARSONS PROJECT No:	FIG No:	REV
307074-01969	20	0

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

FILE LOCATION: Y:\Yao.Mo\for_Quincy\Ryley\MXD\Fig_20_SO2_monthly.mxd

USER NAME: Yao.mo
ISSUING OFFICE: Burnaby GIS

PLOT DATE & TIME:29/10/2014 11:23:43 AM
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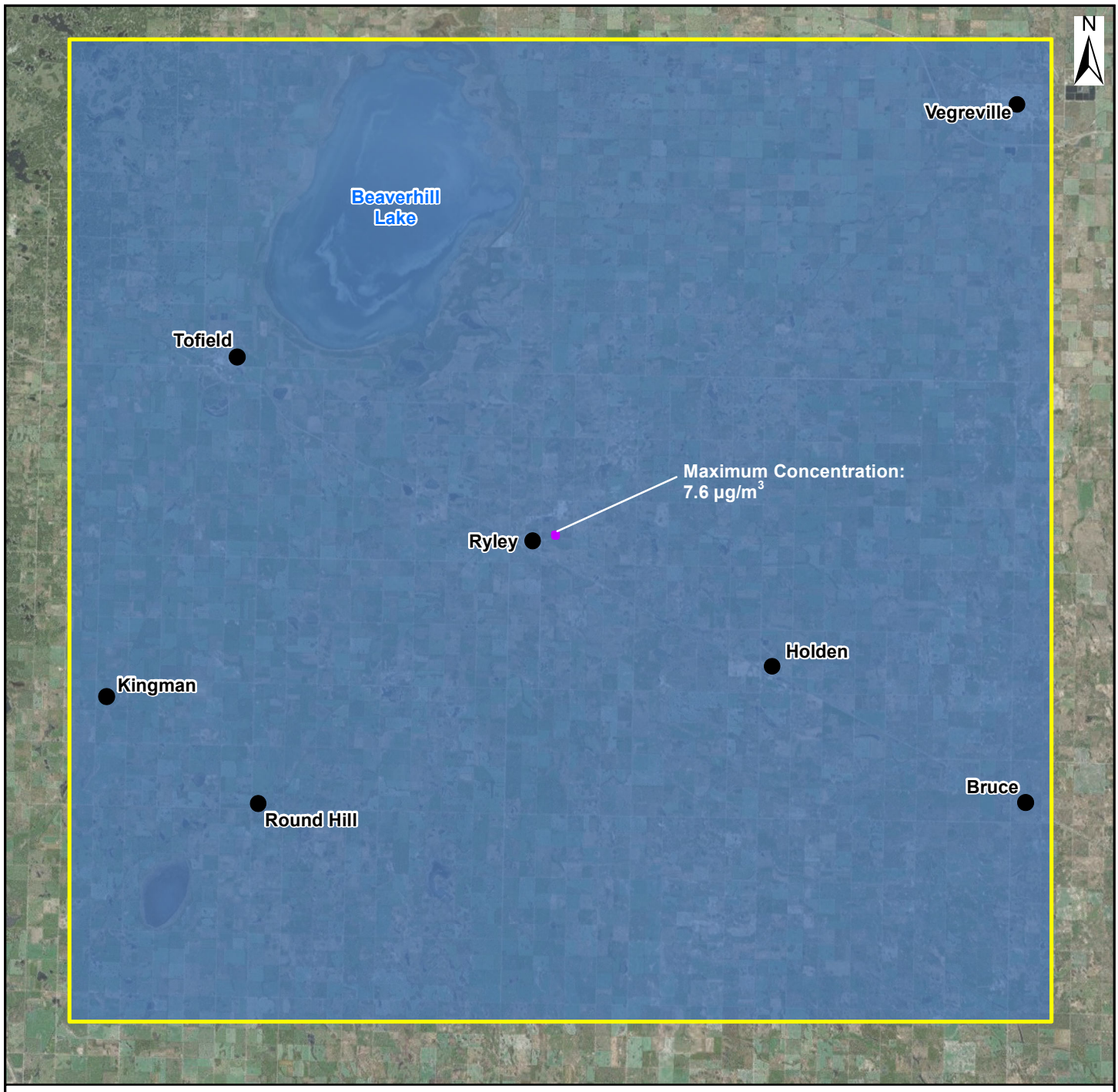

Site Location

Study Area

SO_2 Concentration ($\mu g/m^3$)

5 10 15 20

1:300,000

0 4 8

Kilometers

A SHEET	SCALE: SHOWN
Date:	29/10/2014
Drawn By:	Y.M.
Edited By:	XX
App'd By:	T.A.

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Maximum Predicted Annual Average SO_2 Concentration Including Background Concenctration during Emergency Power Generation and Incineration

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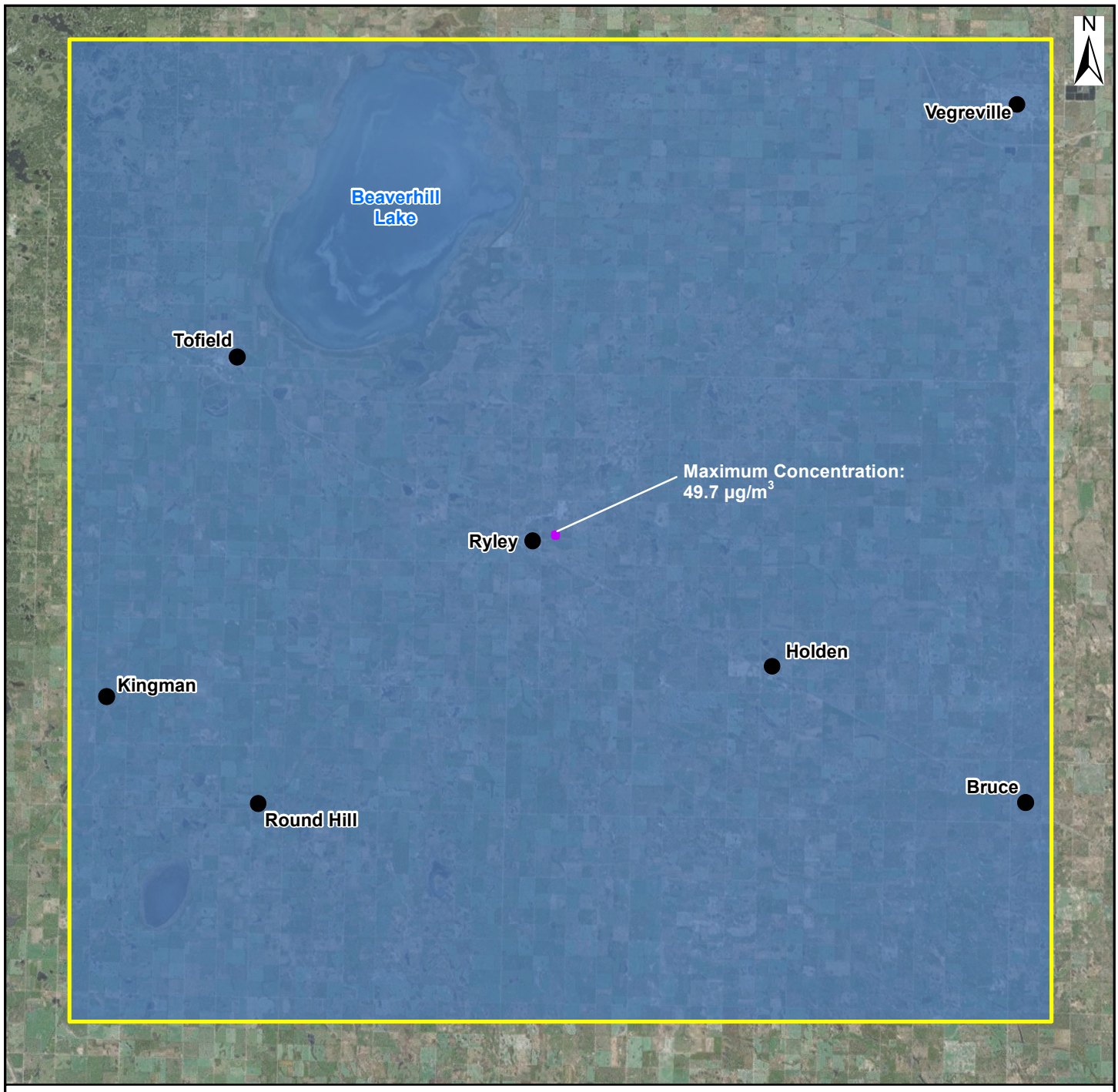
WORLEYPARSONS PROJECT No:	FIG No:	REV
307074-01969	21	0

FILE LOCATION: Y:\Yao.Mo\for_Quincy\Ryley\MXD\Fig_21_SO2_annual.mxd

USER NAME: Yao.mo
ISSUING OFFICE: Burnaby GIS

PLOT DATE & TIME:29/10/2014 12:58:10 PM
SAVE DATE & TIME:29/10/2014 12:58:03 PM

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community



Site Location

Study Area

TPM Concentration (µg/m³)

40 50 60 70 80 90 100

1:300,000

0 4 8

Kilometers

A SHEET	SCALE: SHOWN
Date:	29/10/2014
Drawn By:	Y.M.
Edited By:	XX
App'd By:	T.A.

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Maximum Predicted 24-Hour Average TPM Concentration Including Background Concentration during Emergency Power Generation and Incineration

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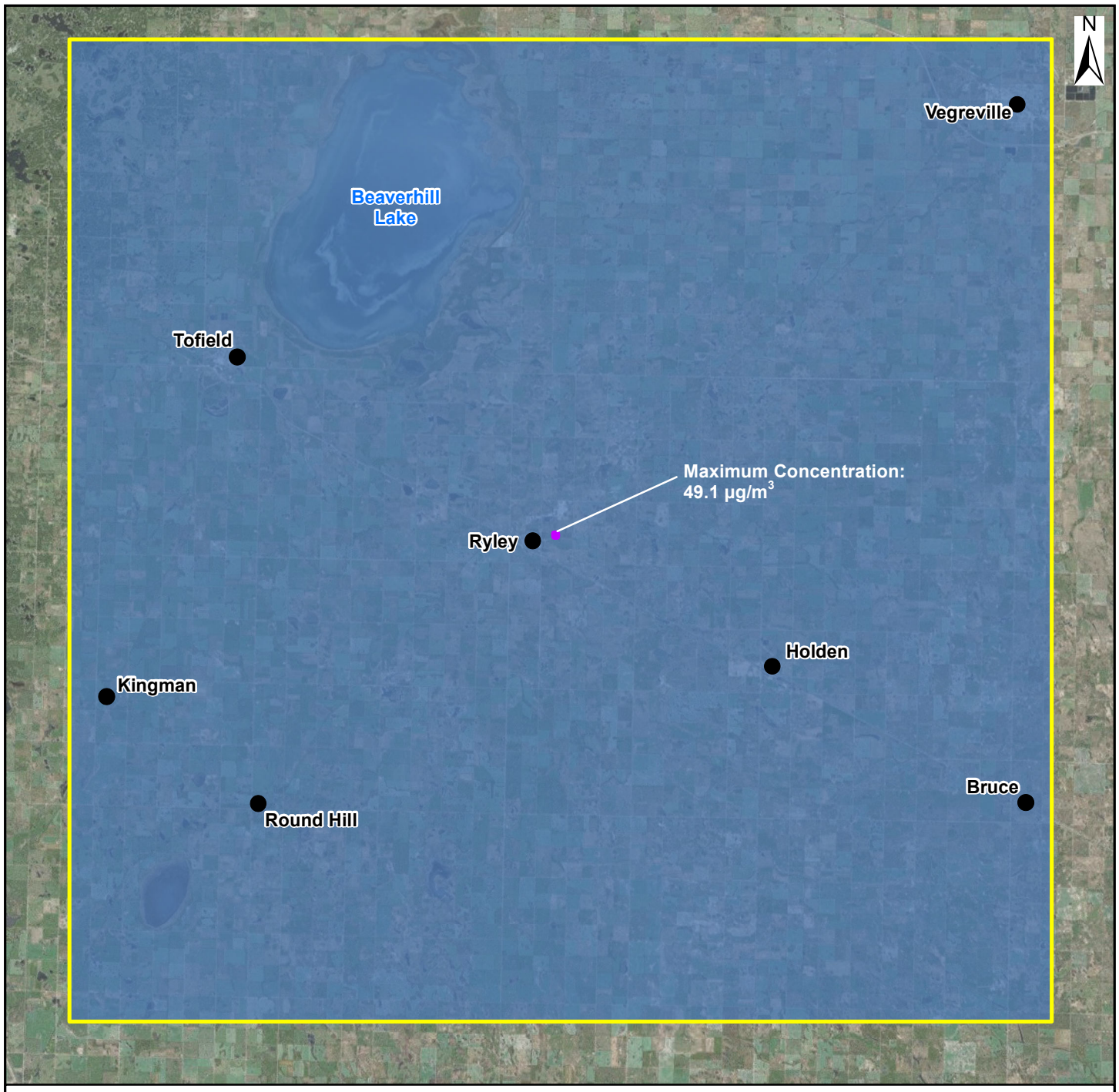
WORLEYPARSONS PROJECT No:	FIG No:	REV
307074-01969	22	0

FILE LOCATION: Y:\Yao.Mo\for_Quincy\Ryley\MXD\Fig_22_TPM_24hour.mxd

USER NAME: Yao.mo
ISSUING OFFICE: Burnaby GIS

PLOT DATE & TIME:29/10/2014 12:58:28 PM
SAVE DATE & TIME:29/10/2014 12:58:20 PM

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community



Site Location

Study Area

TPM Concentration (µg/m³)

45 50 55 60

1:300,000

0 4 8

Kilometers

A SHEET	SCALE: SHOWN
CUSTOMER	
Date:	29/10/2014
Drawn By:	Y.M.
Edited By:	XX
App'd By:	T.A.

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Maximum Predicted Annual Average TPM Concentration Including Background Concentration during Emergency Power Generation and Incineration

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WORLEYPARSONS PROJECT No:	FIG No:	REV
307074-01969	23	0

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

FILE LOCATION: Y:\Yao.Mo\for_Quincy\Ryley\MXD\Fig_23_TPM_annual.mxd

USER NAME: Yao.mo
ISSUING OFFICE: Burnaby GIS

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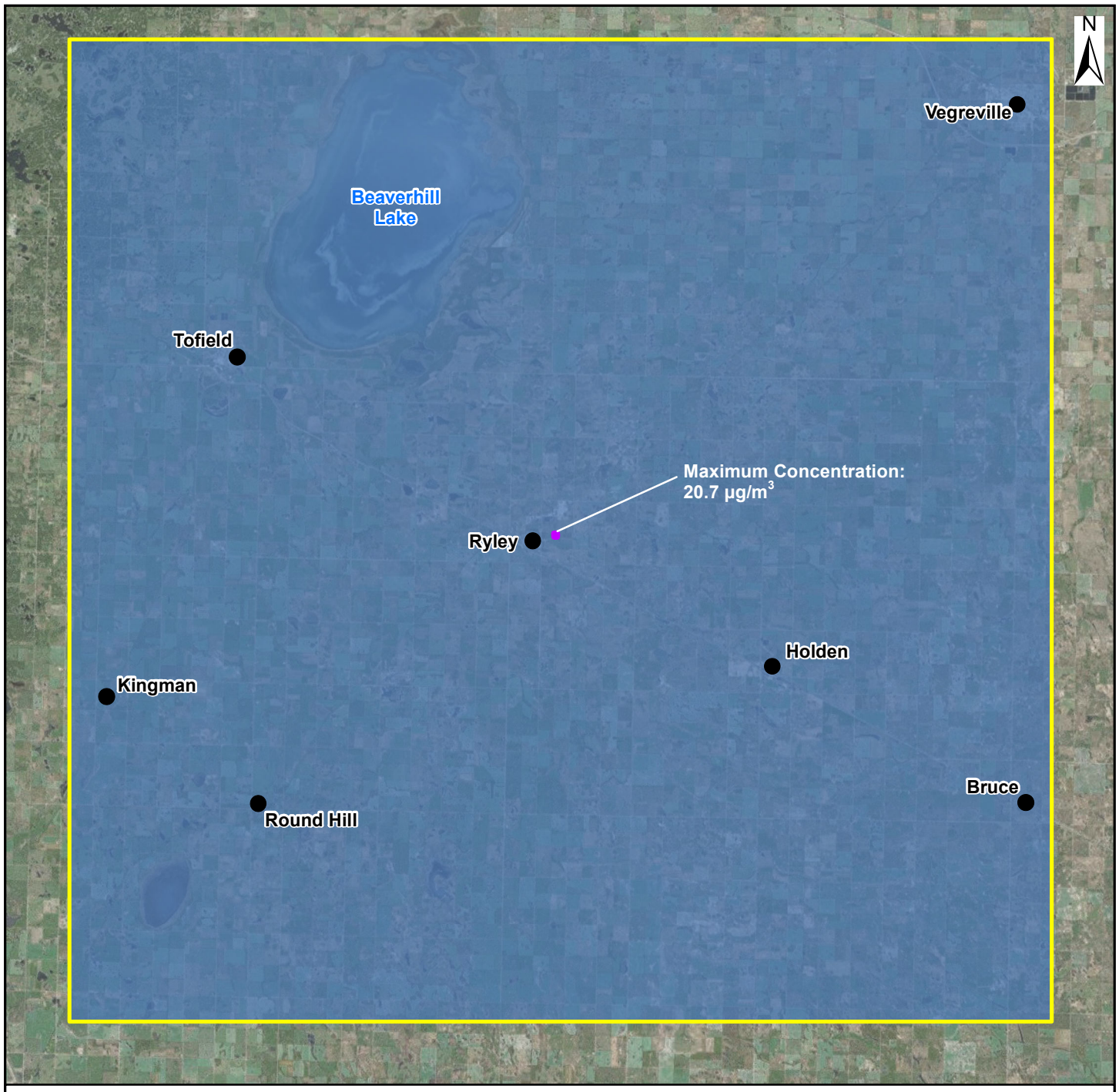

Site Location

Study Area

$PM_{2.5}$ Concentration (µg/m³)

20 22 24 26 28 30

1:300,000

0 4 8

Kilometers

A SHEET	SCALE: SHOWN
Date:	29/10/2014
Drawn By:	Y.M.
Edited By:	XX
App'd By:	Y.M.

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Maximum Predicted 1-Hour Average $PM_{2.5}$ Concentration Including Background Concentration during Emergency Power Generation and Incineration

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WORLEYPARSONS PROJECT No:	FIG No:	REV
307074-01969	24	0

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

FILE LOCATION: Y:\Yao.Mo\for_Quincy\Ryley\MXD\Fig_24_PM25_1hour.mxd

USER NAME: Yao.mo
ISSUING OFFICE: Burnaby GIS

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