DILLON CONSULTING

RURAL MUNICIPALITY OF GREY

St. Claude Environment Act Proposal Land Application of Lagoon Biosolids

Final Report

September 2021 – 16-3823

September 9, 2021

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Attention: Mr. Travis Parsons, M.A.Sc., P.Eng.
Chief Engineer

St. Claude Environment Act Proposal Land Application of Biosolids

Dear Mr. Parsons:

Dillon Consulting Limited (Dillon) is pleased to submit an Environmental Act Proposal for the land application of biosolids within the community of St. Claude in the Rural Municipality of Grey, Manitoba. Please find enclosed four (4) hard copies and one (1) electronic copy of the final proposal for submission to Manitoba Climate and Conservation.

If you have any questions, please contact the undersigned at (204)453-2301 or via email at vfisher@dillon.ca.

Sincerely,

DILLON CONSULTING LIMITED

[redacted]

Virginia Fisher, P. Eng.
Project Manager

CP:lf

cc: Brenda Poulsen, Utility Manager, Rural Municipality of Grey
Travis Parsons, Chief Engineer, Manitoba Water Services Board

Our file: 16-3823

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Executive Summary

Dillon Consulting Limited (Dillon) is submitting this Environment Act Proposal to Manitoba Climate and Conservation (MCC) for issuance of an Environment Act Licence towards the land application of biosolids material from the St. Claude wastewater treatment lagoon. St. Claude has a three (3)-cell lagoon system made up of two (2) aerated primary cells (Cells 1 and 2) and a larger secondary cell (cell 3). Biosolid material will be dredged from Cell 1 and 2 for land application.

Biosolid application rates are based on crop removal rates of available nitrogen and phosphorus, specifically with respect to cereal crops, forage crops, oil seed crops, field peas and lentils. The biosolid material was analyzed for levels of nitrogen, phosphorus, pH and conductivity, and metals to determine land application rates. Sections 22 and 23 within the township were selected for land application. The Rural Municipality of Grey (RM) has selected a land owner to participate in the land application program. Detailed soil sample analysis has been undertaken for the selected field, and a detailed prescription rate has been prescribed to MCC for approval prior to land application.

Soil analyses were conducted in each field; two (2) in SE 22-8-7 W1 and three (3) in SW and SE 23-8-7 W1. The average of the analyses for each field was used in calculating the biosolid application rates. Application rates were calculated based on application of biosolids from Cell 1 and Cell 2 to sections of both fields. Soil analysis indicated that the concentration of P_2O_5 was between 10 and 14 ppm, well below the 60 ppm threshold where P_2O_5 application is restricted. As a result, the application of biosolids is based on crop nitrogen demand.

1.0 Introduction

Dillon Consulting Limited (Dillon) is submitting this Environment Act Proposal (EAP) to Manitoba Climate and Conservation (MCC) for issuance of an Environment Act Licence (EAL) towards the land application of biosolids material from the St. Claude wastewater treatment lagoon. The LUD of St. Claude, located in the Rural Municipality of Grey (herein referred to as "the RM"), has a three (3)-cell lagoon system to treat the wastewater; two (2) aerated primary cells (Cells 1 and 2) and a larger secondary cell (Cell 3). Biosolids material will be dredged from Cell 1 and 2 for land application under this EAL.

1.1 Background

The RM is seeking to develop a land application program for biosolids materials from the St. Claude wastewater treatment lagoon Cells 1 and 2. The Manitoba Water Services Board (MWSB) is assisting the RM with a feasibility study and this EAP. Dillon's assessment on behalf of MWSB is targeted at assessing the sludge volume and composition, recommend application rates and preparation of an EAP to obtain a licence for sludge removal and disposal.

St. Claude's lagoon system treats the wastewater from the LUD with two (2) aerated primary cells and a larger secondary cell. Under normal operation, the two (2) primary cells are operated in series. In addition to the wastewater generated by St. Claude's approximately 590 residents, the lagoon treats wastewater from two industrial sources; a dairy processing facility and an abattoir.

2.0 Description of Proposed Project

The study area for the proposed project includes three (3) quarter sections of land located within 5 km of St. Claude (**Figure 1**, appended) in Sections 22 and 23. Five (5) fields were identified as suitable locations for biosolids application based on proximity to the lagoon. There are two (2) field in SE 22-8-7 W1 and three in SW and SE 23-8-7 W1. The biosolids removed from Cells 1 and 2 will be applied at the selected locations within the study area at rates appropriate to the individual sites.

The following has been completed with respect to the proposed project:

- Dillon identified potentially suitable agricultural land for biosolids application within the study area indicated on **Figure 2** (appended) in February 2018. A desktop study was conducted which included considerations for agricultural capability and soils, nutrient management zone classes and buffer zones required from water features, setbacks and restrictions;
- Assiniboine Injections Ltd. (AI) completed a survey of sludge accumulation in May 2016. AI completed laboratory analysis of the biosolids in January 2019. Laboratory analysis accessed biosolids quality for nutrient levels, metals, conductivity and pH;
- The RM used information on the agricultural land identified as potentially suitable by Dillon and found a land owner interested in allowing biosolids application;
- R-Way Ag/Agvise Laboratories completed soil sampling in November 2018;
- Dillon determined initial loading rates for each selected site based on existing soil characteristics, crops and biosolids characteristics; and,
- The RM has developed a land use agreement with the interested land owner, attached in **Appendix F**.

Biosolids will be removed from Cells 1 and 2 in conjunction with upgrade of the existing aeration equipment. The construction phasing will be submitted with the Notice of Alteration (NoA) for the aeration system upgrades.

The RM will be required to maintain a record of biosolids applications at each location.

2.1 Proposed Project Schedule

The project tasks and schedule of events are outlined in **Table 2-1**.

Table 2-1: Proposed Project Schedule

Task	Timeline[1]
Sludge survey of lagoon	Complete
Desktop study of suitability agricultural land for biosolids application.	Complete
RM to identify and approach land owners for biosolids application and formalize access for soils testing.	Complete
RM to develop land use agreements with owners with appropriate soils.	Complete
Laboratory analysis of lagoon sludge and receiving fields to finalize application rates.	August 2021
EAP approval and issuance of an EAL by MCC.	September 2021
Land application of biosolids materials.	Fall 2021 (depending on funding)

2.2 Study Area

As previously indicated the study area for the proposed project includes two (2) quarter sections of land located within 5 km of St. Claude (**Figure 1**, appended). Excluding the area directly within St. Claude, all fields are zoned as Agricultural General Zone (AG) under the RM Zoning Bylaw No. 5/03. An AG zone "provides for general agricultural uses and other small holding and non-farm development compatible with farming operations". There are no indicated restrictions to biosolids application within the RM.

The St. Claude wastewater treatment lagoon is indicated on **Figure 1** (appended) on the east side of St. Claude.

3.0 Description of Existing Environment in Study Area

3.1 Biophysical Environment

The study area is located within the MacGregor Ecodistrict on the west side of the Lake Manitoba Plain Ecoregion. It is a part of the broader Prairies Ecozone (Smith et al., 1998).

3.1.1 Physiography and Drainage

The district is part of the Lower Assiniboine Delta with a smooth and level to very gently sloping sandy glaciolacustrine plain. Slopes range from level to less than 2%. The mean elevation is approximately 328 meters above sea level (Smith et al., 1998).

The Whitemud River and the Assiniboine River, both of which flow eastward, collect from tributary creeks and gullies including the Pine, Squirrel and Willowbend Creeks. These creeks and gullies have lower erosional banks. The Dauphin River Division serves the northern part of the MacGregor Ecodistrict. The Assiniboine River and Red River Divisions serve the remainder of the area (Smith et al., 1998).

3.1.2 Surficial Soils and Bedrock Geology

The Macgregor Ecodistrict consists mainly of imperfectly drained Gleyed Rego Black Chernozems. The chernozems developed on the shallow sediments of the Lower Assiniboine Delta, which are calcareous, sandy glaciolacustrine and deltaic. A clay layer between approximately 1 to 3 m below ground surface slows drainage and results in high water tables (Smith et al., 1998).

Within the RM of Grey, there are mainly sandy glacio-fluvial and lacustrine deposits from the Assiniboine Delta, and clayey deposits of the Red River Plain. The sandy deposits vary in thickness from less than 1 to 5 m on the western part of the RM in the vicinity of St Claude (Land Resource Unit, 1999).

Site-specific test holes were carried out by the RM of Grey to identify whether clay was present at depths underlying the three quarter sections (SE 22-8-7 W1, SE 23-8-7 W1 and SE 23-8-7 W1) identified for land application of biosolids. The test holes were excavated to depths of approximately 3 to 3.5 m. While soil stratigraphy was not logged, clay-like materials were not identified in the test pits on SE 22-8-7 W1, and the photographs indicate a sandy-silty matrix to the base of the excavations. Silt and fines content appears to increase from the west to the east. Silty sand with clay may be present (based on review of the photographs) in SE 23-8-71. Based on the photographs provided, clay-like materials may have been encountered at the base of SW 23-8-7 W1.

Based on review of the provided photographs of the test pit excavations, groundwater was not observed to seep in any of the test holes at the depths evaluated. A photograph from each quarter section is shown below on **Figure 3-1** to illustrate general area soil conditions.

Figure 3-1: Sample Photographs from Test Pit Excavations.

3.1.3 Climate

As previously mentioned, St. Claude is in the MacGregor Ecodistrict. The MacGregor Ecodistrict is part of the Grassland Transition Ecoclimatic Region in southern Manitoba and has a cool, sub-humid Boreal soil climate. This Ecodistrict is the warmest of the region and has short, warm summers and long, cold winters. Characteristics of the climate include (Smith et al. 1998):

- Mean annual temperature: ~ 2.6°C
- Average growing season: ~ 182 days
- Mean annual precipitation: ~ 500 mm (~25% as snow)
- Average annual moisture deficit: ~ 190 mm

3.1.4 Groundwater and Hydrological Description

The lowlands of the Pembina Hills Sub-region surficial deposits consist of thick clay in the upper layer, as well as clay under the surface sand area. The groundwater in the area below the clay is salty which combined with the low permeability of the clay results in minimal potable water availability from aquifers (Water Resources Branch, 1985). However, sand and gravel aquifers at the base and shortly east of the Manitoba Escarpment are fresh water (Water Resources Branch, 1985).

Historical well logs were reviewed (Groundwater Information Network, GWDrill) in the immediate vicinity of the area. "Sand" was identified as the overlying surficial deposits within each well log. Depth to clay-containing materials and observed groundwater are presented below in **Table 3-1**.

Table 3-1: Summary of Nearby Historical Well Logs

Well ID	Purpose, Water Use (if known)	Location	Depth to Clay (m)	Approximate Thickness of Clay Layer (m)	Depth to Groundwater (m) and (Year of Observation)
51246	Production, Domestic	NW-22-08-07-W1	'Mud', 4.27 (Clay, Plastic, Grey)	> 4	2.44 (1984)[1]
4082	Test Well	SW-27-08-07-W1	'Mud' 2.13 (Clay, silty) 'Diamicton' 44.20	> 40 > 40	Not recorded
49558	Test Well	SE-27-08-07-W1	'Mud' 0 (Clay, some Silt) 'Gravel' 40.54	>40 (upper clay layer)	Not recorded
41322	Test Well	SE-26-08-07-W1	'Mud' 1.22 (Brown Clay) 'Diamicton' 36.88 (Blue Clay)	~40 >15	Not recorded
41323	Production, Domestic	SE-26-08-07-W1	'Mud' 0.91 (Brown and Blue Clay) 'Sand' 37.19	~40	6.71 (1981)[2]
5316	Test Well	NW-14-08-07-W1	'Mud' 3.96 (Clay) 'Diamicton' 39.62	~ 40 ~4	Not recorded
5318	Test Well	NE-14-08-07-W1	'Mud' 0.91 (Clay) 'Diamicton' 38.10	~40 >40 (End of Borehole)	Not recorded
5317	Test Well	NE-14-08-07-W1	'Mud' 1.22 (Clay, seam of gravel at approximately 40 m depth)) 'Diamicton' 39.62	~40 >4 (End of Borehole)	Not recorded
4083	Test Well	SE-21-08-07-W1	'Mud' 2.74 (Clay, some Silt) 'Diamicton' 43.28	> 40 ~4	Not recorded
54844	Production, Domestic	NW-21-08-07-W1	'Mud' 2.74 (Clay, Grey, Silty) 'Sand' 3.96 'Mud' 4.57 (Clay)	~2 (upper clay layer) > 4 (lower clay layer)	0.91 (1985)[3]
66667	Production, Domestic	SW-21-08-07-W1	'Mud' 2.44 (Clay Silt)	> 1 (upper clay layer) > 4 (lower clay layer)	2.13 (1989)[4]

Well ID	Purpose, Water Use (if known)	Location	Depth to Clay (m)	Approximate Thickness of Clay Layer (m)	Depth to Groundwater (m) and (Year of Observation)
			'Sand' 3.05 'Mud' 4.27 (Grey Clay, silty, increasing plasticity with depth)		
68589	Production, Livestock	SW-24-08-07-W1	'Mud' 2.13 (Grey Clay) 'Gravel' 39.93	> 40 (upper clay layer)	13.41 (1990)[5]

Table Notes
1. Well screen construction from 2.44 to 8.53 metres below ground surface.
2. Well screen construction from 37.19 to 38.71 metres below ground surface.
3. Well screen construction from 2.74 to 11.89 metres below ground surface.
4. Well screen construction from 2.44 to 8.53 metres below ground surface.
5. Well screen construction from 39.93 to 41.45 metres below ground surface.

The above observations note that the existence of a historical perched aquifer residing in the sand stratigraphy. This perched aquifer was historically used for potable water consumption, to the west of the study area. The perched groundwater table likely flows in the area from west to the east based on the water level observations. As groundwater was not observed in the test pits (as shown above in **Figure 3-1**), this perched aquifer may not be present at the study site, and given the absence, is unlikely to be used as a reliable potable and/or production water source.

The test pits shown above on **Figure 3-1** extended to a maximum depth of 3.5 m. Test pits on the western portions of the proposed study area were likely not deep enough to encounter the lower permeability materials identified from the well logs in **Table 3-1**. The increasing presence of silt and clay-like materials was noted in the test pits moving eastwards, which corroborates with borehole stratigraphy logged in the surrounding area (as shown above in **Table 3-1**).

The review also indicates that there is the presence of clay between the surface and underlying deeper aquifer in use for domestic and livestock production. The clay layer is observed beginning from 1 to 4 metres below ground surface, and extends to approximately 40 metres below ground surface.

A sand and/or gravel layer is observed in some boreholes in the area at approximately 40 metres below ground surface (observed in well IDs 68589, 49558, and 41323). This layer appears to be productive, and may be used in the area currently for production wells (e.g., domestic, livestock, and irrigation use). Groundwater levels observed from these wells screened at depth (i.e., screens placed at 40 metres below ground surface), may not reflect the water table conditions for the area, but may reflect a

potentiometric surface, as the 40 metre thickness of a lower hydraulic conductivity material may act as a confining layer for the underlying aquifer.

3.1.5 Surface Water Bodies

In the MacGregor Ecodistrict, the Whitemud River and the Assiniboine River both flow eastward and collect from tributary creeks and gullies including the Pine, Squirrel and Willowbend Creeks. The Assiniboine River is closer to St Claude than the Whitemud River (Smith et al., 1998).

3.1.6 Vegetation

Only small amounts of native vegetation remain in an unaltered manner within the MacGregor Ecodistrict. Cultivation and agriculture have led to significant changes in the vegetation of the area. Native vegetation included tall prairie grasses, meadow grasses, willow trees, trembling aspen, balsam poplar, with shrubs consisting of snowberry, red-osier dogwood, willow and Saskatoon and associated herbs (Smith et al., 1998).

3.1.7 Wildlife

The Lake Manitoba Plain Ecoregion includes habitat for white tailed deer, coyote, ground squirrels and waterfowl (Smith et al., 1998).

3.2 Potential Species of Concern

The Manitoba Conservation Data Centre completed a search of the rare species database as a result of a request made on December 19, 2017. Mr. Chris Friesen of the Manitoba Conservation Data Centre completed a search of all land sections within the RM of Grey (Sections 1-36, Township 8, Range 7W). From this search, it was found that no species of concern reside in Sections 22 and 23 of the RM. The correspondence with Mr. Chris Friesen can be found in **Appendix E**.

3.3 Socioeconomic Environment

3.3.1 Population

According to Statistics Canada, the 2016 population of the LUD of St. Claude is 603 while the RM of Grey has a total population of 2648 individuals (Statistics Canada, 2016).

3.3.2 Existing Land Uses

Excluding the area within the LUD of St. Claude, all fields in the study area are zoned as Agricultural General Zone (AG) under the Rural Municipality of Grey Zoning By-Law No. 5/03 (June 18, 2008). Under the Zoning By-Law, AG Zone is defined as: "general agricultural uses and other small holdings and non-farm development compatible with farming operations".

3.3.3 Heritage Resources

The Manitoba Historic Resources Branch was consulted on April 8, 2019 for a heritage screening within the RM of Grey. It was determined that there are no concerns with respect to Sections 22 and 23, Township 8, Range 7W (**Appendix E**). If a heritage site is accidentally encountered, work will cease and the Historic Resources Branch will be contacted immediately.

3.3.4 First Nations

No land within the study area has been identified as a First Nation community.

4.0 Biosolids Receiving Lands

A desktop analysis was carried out to determine the suitability of lands for biosolids application. The following sections detail soil characteristics of the study area as well as nutrient characteristics and setbacks that would be required from specific areas (i.e., water bodies).

4.1 Dominant Soil Series

Soil series information for the RM was available from the Manitoba Land Initiative database. Descriptions for the soil series were found in the Manitoba Agriculture, Food and Rural Initiatives Soil Series Descriptions (2010). The four (4) most common soil types in the study area are the Almasippi Series, the Long Plain Series, the St. Claude Series and the Willowcrest Series. Descriptions of the four (4) most common soil series in the area are outlined below in **Table 4-1**.

Table 4-1: Soil Series Descriptions within Study Areas

Soil Code	Soil Name	Texture	Drainage	Hectares within Study Area	Percent within Study Area	Ag. Capability Class and Subclass
ASS	Almasippi Series	Sand	Imperfect	1120	12%	3M
LOP	Long Plain Series	Sand	Imperfect	2231	23%	4M
SUE	St Claude Series	Coarse Loamy	Imperfect	1268	13%	3NW, 3W
WWC	Willowcrest Series	Sand	Imperfect	2143	22%	3M, 3ME

Soil series correspond with specific agriculture capability classes and subclasses, some of which are capable of accepting biosolids material, and some that are not. The four (4) most common soil series' in the study area are capable of accepting biosolids material.

4.2 Soil Capability and Nutrient Management

The Nutrient Management Regulation (62/2008) under *The Water Protection Act (C.C.S.M. c. W65)* provides nutrient management zones and criteria for the application of nutrients (i.e., biosolids) on agricultural land. The regulation is based on the Canada Land Inventory Soil Capability Classification for Agriculture. The Canada Land Inventory (CLI) is a multi-disciplinary land inventory of rural Canada; mapping land capability for agriculture, forestry, wildlife, and recreation. Although CLI map sheet interpretations are still largely valid, they were created during the 1960's, 70's, and early 80's, and more recent soil survey information is available for the RM from the Manitoba Land Initiative (MLI) database. Therefore, data was obtained from the MLI database. Data was reviewed to ensure the less capable of the soils was chosen when there was more than one (1) soil in the map unit. Review of the MLI data resulted in changes to six (6) data points.

There are seven (7) classes used to rate agricultural land capability, with Class 1 having the highest capability and Class 7 having the lowest. There are thirteen (13) subclasses or *limitations*. Nutrient management zones have been developed based on these classes and subclasses. The corresponding nutrient management zone to agricultural capability class is organized below in **Table 4-2**. **Figure 2** (appended) outlines the nutrient management zones in the study area.

Table 4-2: Nutrient Management Zone

Ag. Capability Class and Subclass	Nutrient Management Zone	Hectares	Percent
1	N1	613	6%
2M	N1	1044	11%
2W	N1	429	4%
2X	N1	13	0%
3M	N2	3202	33%
3ME	N2	69	1%
3NW	N1	48	0%
3W	N1	1204	12%
4M	N2	2253	23%
4N	N2	36	0%
4W	N2	26	0%
5W	N3	290	3%
6M	N4	25	0%
6W	N4	210	2%
O3W	N4	97	1%
St. Claude (No Ag Capability)	N5	75	1%

Biosolids may be applied to land within zones N1, N2, and N3, however, nitrogen application limits exist such that the residual nitrate nitrogen concentration within the top 0.6 m of soil at the end of the growing season must be no greater than:

- 157.1 kg/ha in land zoned as N1;
- 101 kg/ha in land zoned as N2; and,
- 33.6 kg/ha in land zoned as N3.

Phosphorus application rates are also dependent on the soil test phosphorus level. According to the Nutrient Management Regulation application should be based on soil test phosphorus levels as follows:

- Soil test P < 60 ppm, use nitrogen crop removal rate;
- Soil test P 60 ppm – 119 ppm, use 2 x phosphorus crop removal rate; and,
- Soil test P 120 ppm – 179 ppm, use 1 x phosphorus crop removal rate.

No nutrients may be applied to land within zone N4. Phosphorus restrictions exist for zone N5, although they are not applicable to biosolids application as zone N5 is all area within the LUD of St. Claude. It is worth noting, for transportation purposes, that no person shall discharge, release, apply or allow the escape of biosolids onto a paved or other impervious surface in zone N5. If biosolids are spilled onto a paved or other impervious surface in zone N5, they must be removed so that they do not drain into a storm or sewage drainage system. No nutrients may be applied to land within a Nutrient Buffer Zone.

4.3 Nutrient Buffer Zones

The Nutrient Buffer Zone is measured from the water body's high water mark, or the top of the outermost bank on that side of the water body, whichever is further from the water, to the distance set out in **Table 4-3**.

Table 4-3: Nutrient Buffer Zones

Description of Water Body	Setback if applicable area is covered with permanent vegetation:	Setback if applicable area is not covered with permanent vegetation:
A lake or reservoir designated as vulnerable[1]	30 m	35 m
A groundwater feature[2] A lake or reservoir (not including a constructed stormwater retention pond) not designated as vulnerable A river, creek or stream designated as vulnerable	15 m	20 m
A river, creek or stream not designated as vulnerable An Order 3, 4, 5, or 6 drain A major[3] wetland, bog, marsh, or swamp A constructed stormwater retention pond	3 m	8 m
Land within a roadside ditch or an Order 1 or 2 drain	No direct application	
Land between the water's edge and the high water mark of a wetland, bog, marsh or swamp other than a major wetland, bog, marsh or swamp	No direct application	

[1] Water bodies designated as vulnerable are listed in Schedule E of the Nutrient Management Regulation under The Water Protection Act. There are no vulnerable water bodies in the study area.
[2] A "groundwater feature" means a sinkhole, a spring or a well other than a monitoring well.
[3] Defined in 1(2) of the Nutrient Management Regulation under The Water Protection Act. "For the purposes of this regulation, a wetland, bog, marsh, or swamp is major if:
a. It has an area greater than 2 ha (4.94 acres);
b. It is connected to one or more downstream water bodies or groundwater features; and
c. It contains standing water or saturated soils for periods of time sufficient to support the development of hydrophytic vegetation."

According to the *Livestock Manure and Mortalities Management Regulation (133/2008)*, the minimum setback distance for land application of biosolids is 10 m from any property boundary (including highways and railways). If permission from the director has been granted for winter land application of

biosolids (between November 10 and April 10 of the following year), setback distances to any surface watercourse, sinkhole, spring, or well are required depending on the mean slope of the land. It is assumed that the RM will not be land applying the sludge during the winter.

5.0 Biosolids Application Rates

Assiniboine Injections Ltd (AI) carried out a sludge survey on the quantity of biosolids in Cells 1 and 2 of the lagoon. The results of this survey can be found in **Appendix A**. A sample of the sludge was also taken by AI on January 31, 2019, for laboratory analysis. The results of the laboratory analysis can be found in **Appendix B**. It is anticipated that biosolids material will be dredged from the lagoon cell bottom and applied to land in a liquid state. The liquid will be injected directly into the soil to minimize soil compaction, odor, run off and to maximize absorption.

5.1 Sampling

The analysis of sludge provides an understanding of the characteristics of the sludge which can be used to quantify mass to be disposed of and sludge quality. A composite sample from Cell 1 and 2 was sent to ALS Environmental (ALS) in January 2019 for analysis. Sludge samples were analyzed by ALS for the following parameters:

- pH and conductivity;
- Moisture Content;
- Metals;
- Phosphorus;
- Nitrogen; and,
- Ammonia.

5.2 Quantity of Biosolids

A survey of biosolids accumulation in the two primary cells was done in May 2016. Biosolids depth measurements were taken on a regular grid pattern and used to determine the volume in each cell. Cells 1 and 2 have a surface area of approximately 2.7 ha (6.7 acres). The anticipated volume of biosolids material that will be collected from Cells 1 and 2 and land applied is 7,671 m^3 and 4,077 m^3, respectively, as indicated in **Table 5-1**. The total volume of 11,748 m^3 represents 31.4% of the total Cell 1 and Cell 2 volume. This indicates a significant reduction in storage capacity and therefore treatment capacity of the lagoon system.

Table 5-1: Estimated Biosolids Quantity from Cell 1 and 2

Item	Primary Cell #1	Primary Cell #2
Biosolids Volume (m^3)	7,671	4,077
15% Contingency Factor (m^3)	8,822	4,689
Specific Gravity (assumed)	1.01	1.01
Average Depth (m)	0.95	0.45
Mass (t)	8,910	4,735

5.3 Quality of Biosolids

An analysis of the biosolids samples collected in January 2019 was carried out to determine nutrient concentrations, pH, electrical conductivity, solids content and metals concentrations. These quality characteristics of the biosolids need to be taken into account when considering land application. The nutrient concentration of the biosolids must be reflected in the area over which it is applied while considering the uptake of the crops and the nutrient present in the soils. *Manure Management Facts: Calculating Manure Application Rates* (Province of Manitoba, January 2009) provides a methodology for calculating application rates with respect to estimated crop removal rates. It also indicates how to select the most appropriate application rate for the soil conditions present. Calculations for application rates are included in **Appendix D**. The biosolids sample was taken as part of preliminary works toward this project and is a composite sample from Cell 1 and a composite sample from Cell 2. Additional sampling and testing of the biosolids should be done in conjunction with soils testing at the proposed application sites, prior to biosolids application.

The electrical conductivity (salinity) of the biosolids material was found to be 3.73 dS/m in Cell 1 and 2.00 dS/m in Cell 2. Because the biosolids are being applied directly to the soils, sampling and testing will be part of the monitoring program, as some crops are sensitive to salinity in soils.

5.4 Quality of Receiving Soils

Five (5) fields were selected for biosolids application in the community of St. Claude. These fields were selected based on proximity to the lagoon and considered suitable for land application based on nutrient content and crop type. The land owner was contacted by the RM and agreed to participate in the land application program. The selected land sections are listed below.

- Field 1: SW 23-8-7 W1 (E 1/2 SW 23);
- Field 2: SW 23-8-7 W1 (W 1/2 SW 23);
- Field 3: SE 23-8-7 W1 (W 1/2 SE 23);
- Field 4: SE 22-8-7 W1 (E 1/2 SE 22); and
- Field 5: SE 22-8-7 W1 (W 1/2 SE 22).

R-Way Ag/Agvise Laboratories was hired as a sub consultant to complete a soil sampling program on November 14, 2018, at each of the five (5) selected locations. A crop was selected for each location based on the land owner's selection/preference for the 2019 agricultural season. The laboratory results for the soil sampling program are shown in **Appendix C**. The nutrient concentration of the receiving soils is reflected in the calculated application rate. **Table 5-2** outlines the recommended crop type for each field and the accompanying yield goal.

Table 5-2: Recommended Crop Type and Yield Goal

Land	Field Number	Size (Ha) [Acres]	Crop Choice	Yield Goal
SW 23-8-7 W1 (E 1/2 SW 23)	1	36.4 [90]	Canola	50 BU
SW 23-8-7 W1 (W 1/2 SW 23)	2	22.3 [55]	Canola	50 BU
SE 23-8-7 W1 (W 1/2 SE 23)	3	36.4 [90]	Canola	50 BU
SE 22-8-7 W1 (E 1/2 SE 22)	4	32.4 [80]	Spring Wheat	70 BU
SE 22-8-7 W1 (W 1/2 SE 22)	5	32.4 [80]	Spring Wheat	70 BU

5.5 Proposed Biosolids Application Rates

Gaia Consulting (Gaia) was hired as a sub consultant to determine application rates based on nutrient removal targets for spring wheat and canola crops. Soil analysis indicated that the concentration of P_2O_5 was between 10 and 14 ppm (averaged), well below the 60 ppm threshold where P_2O_5 application is restricted. As a result, the application of biosolids is based on crop nitrogen demand. R-Way Ag and Gaia selected target application rates for spring wheat of 129 kg/ha of required nitrogen, and one (1) (46 kg/ha) and two (2) time (93 kg/ha) P_2O_5 crop removal. They selected target application rates for canola of 157 kg/ha of required nitrogen, and one (1) (58 kg/ha) and two (2) time (117 kg/ha) P_2O_5 crop removal. Calculations for application rates using these crop uptakes are included in **Appendix D**.

Soil analyses were conducted in each field; two (2) in SE 22-8-7 W1 and three in SW and SE 23-8-7 W1. The average of the analyses for each field was used in calculating the biosolids application rates. Application rates were calculated based on application of biosolids from Cell 1 and Cell 2 to sections of both fields. **Table 5-3** details the land area required for biosolids application.

Table 5-3: Land Area Required for Biosolids Application

Biosolids Location	Field Number[1]	Crop Choice	Land Area Required (Ha) [Acres]
Cell 1	4, 5	Wheat	52.7 [130]
Cell 1	1, 2, 3	Canola	43.3 [106]
Cell 2	4, 5	Wheat	8.5 [21.0]
Cell 2	1, 2, 3	Canola	7.0 [17.3]

[1] The average nutrient content between fields located in the same quarter section used to calculate application rate and land area required

6.0 Description of Environmental Effects and Mitigation Measures of the Proposed Project

6.1 Soils

The effects of nutrients (nitrogen and phosphorus) on soils can be monitored by regular sampling and analysis of both soils and biosolids materials. Regular sampling will allow for the adjustment of application rates to optimize crop uptake while considering factors such as the existing levels of nutrients, salinity and metal concentrations.

The biosolids application rate will ultimately be based on soils and biosolids testing /characteristics with the objective of optimizing uptake by specific crops at each agricultural site, to avoid excessive loading of nutrients to soils as well as surface runoff.

6.2 Groundwater

Biosolids application to agricultural lands can impact groundwater if nutrients were to permeate the soils at a rate that would allow leaching to the groundwater/aquifer layers. This is another reason that regular testing of soils and biosolids is essential to maintain an appropriate application rate for the crops being grown. An information bulletin (97-21) put out by Agriculture and Agri-Food Canada, Land Resource Unit Brandon Research Centre for the RM of Grey indicates that 49.6% of the RM has a high potential environmental impact under irrigation and 43.9% of the RM has a minimal potential impact under irrigation (Land Resource Unit, 1999).

A desktop hydrogeological review and shallow test pitting program (discussed above in **Sections 3.1.4** and **3.1.2** of this report, respectively) has been conducted to evaluate the suitability of the study area for biosolids application. Key findings included:

- *The existence of a historical perched aquifer residing in the sand stratigraphy.* This perched aquifer was historically used for potable water consumption, to the west of the study area. The perched groundwater table likely flows in the area from west to the east based on the water level observations.
- *No shallow water was found on site during test pitting activities, above the clay stratigraphy.* As groundwater was not observed in the test pits (as shown on **Figure 3-1**), this perched aquifer may not be present at the study site, and given the absence, is unlikely to be used as a reliable potable and/or production water source.
- Based on review of borehole logs and test pit information, *there is a clay layer between the surface and underlying deeper aquifer in use for domestic and livestock production*. The clay layer is observed beginning from 1 to 4 metres below ground surface, and extends to approximately 40 metres below ground surface.

- *There is a sand and gravel aquifer underlying a confining layer at approximately 40 metres below ground surface*. A sand and/or gravel layer is observed in some boreholes in the area at approximately 40 metres below ground surface (observed in well IDs 68589, 49558, and 41323). This layer appears to be productive, and may be used in the area currently for production wells (e.g., domestic, livestock, and irrigation use). Groundwater levels observed from these wells screened at depth (i.e., screens placed at 40 metres below ground surface), may not reflect the water table conditions for the area, but may reflect a potentiometric surface, as the 40 metre thickness of a lower hydraulic conductivity material may act as a confining layer for the underlying aquifer.

These findings attenuate the conditions that have been identified by as limitations MCC for biosolids application.

- A depth of clay or clay till of less than 1.5 m between the soil surface and the water table;
- Within 100 m of an identifiable boundary of an aquifer which is exposed to the ground surface;

Based on the desktop review of site-specific conditions, biosolids should be applied preferentially to the eastern most available fields prior to applying to the western to be conservatively protective of underlying potential groundwater receptors.

While historical well logs were reviewed (Groundwater Information Network, GWDrill) in the immediate vicinity of the study area, we note that historical records may be imperfect and may not take into account more recent changes to groundwater use by the surrounding properties. Groundwater features, such as drinking wells, will have to be identified by landowners and the appropriate setback distance (either 15 m or 20 m) will be enforced. This list can be compared against the wells identified in **Table 3-1** of this report to identify if there are any recent of different additions that have not yet been considered.

6.3 Surface Water

The impact to the Assiniboine River and Whitemud River of potential nutrient loading from surface runoff is expected to be minimal due to the nutrient buffer zones in the area and use of appropriate application rates into the soil minimizing the potential of overland flooding. There are no vulnerable water bodies in the study area. There is one (1) lake within the study area, Lac á Parker, located just west of St. Claude. Since the selected land application will occur in Sections 22 and 23, no impact is expected to Lac á Parker. All drains within the study area are Order 1 and 2, therefore, no setback distance is enforced, however, there is no direct application allowed within the drains.

6.4 Wildlife

The impact to wildlife could potentially come from disturbed habitat and vehicle/wildlife collisions. Agricultural land does not provide good conditions for wildlife habitat. The increased traffic during application is done by large trucks and typically go slower than posted speed limits minimizing the potential for increased collisions with wildlife

6.5 Heritage Resources

The impact to heritage resources is low in the immediate vicinity of the development. The biosolids application will occur on agricultural fields. In the event that heritage sites are accidently encountered, a stop work order will be put in place. The Historic Resources Branch will be contacted to determine the next steps.

6.6 Socioeconomics

There is a positive socioeconomic benefit to land application of biosolids. The land owner will not be charged for the application of biosolids materials to their agricultural fields. This will result in potentially significant cost savings to the land owner as fertilizer requirements will decrease. The RM may also find this arrangement financially favourable depending on the land use agreements in place with each land owner. The transportation and disposal of biosolids from the lagoon could be a costly depending on the trucking distance and fees incurred at the landfill accepting the biosolids, thereby making agricultural land application advantageous to all.

6.7 Greenhouse Gas Considerations

Greenhouse gas (GHG) are expected to be a net improvement with land application of biosolids. By utilizing nutrients from the biosolids, the farmer is less reliant on commercial fertilizer that is manufactured and shipped contributing to GHG emission. GHG emissions will come from heavy equipment during transport, land application and biosolids incorporation. The practice of applying biosolids to agricultural lands minimizes GHG emissions in comparison to landfill disposal involving truck hauling. The selected fields are located within 1 km of the lagoon, while the landfill is located over 30 km away in the community of Elm Creek. Vehicle emissions can be mitigated by limiting unnecessary long-time idling during application activities.

6.8 Human Health

The injection of biosolids will help to mitigate risks to human health in that they will not be applied to the surface, therefore reducing possible exposure to bacteria and the biosolids themselves.

Excessive metals that crops pick up from the biosolids can also be a concern to human health. This is one of the items that will be monitored by soils testing prior to and after biosolids application. To minimize exposure to metals, biological components of the biosolids, etc., non-root crops such as cereal

crops, forage crops, oil seed crops, field peas or lentils will have to be planted for three years after biosolids application.

6.8.1 Additional Buffer Zones

In addition to the buffer zones mentioned under **Section 4.3**, there are further setbacks and buffers that will be observed as the specific location for biosolids application may dictate.

There are no vulnerable water bodies in the study area. Groundwater features, such as drinking wells, will have to be identified by landowners and the appropriate setback distance will be enforced depending on whether the area is covered by vegetation (15 m) or not (20 m). All drains within the study area are Order 1 and Order 2, therefore, no setback distance is enforced; however, there is no direct application allowed within the drains.

Additional setbacks that may be expected by MCC include the following:

- A minimum of 75 m from any occupied residence (other than the residence occupied by the owner of the land on which the sludge solids are to be applied); and,
- A minimum of 400 m from a residential area.

MCC may consider the following conditions as limitations for biosolids application:

- A depth of clay or clay till of less than 1.5 m between the soil surface and the water table;
- Within 100 m of an identifiable boundary of an aquifer which is exposed to the ground surface;
- Soil pH is less than 6.0 prior to biosolids application;
- Land surface slopes are greater than 5%;
- On land that is subject to flooding; and,
- Where nitrogen and phosphorus levels exceed residual levels in the soils prior to biosolids application for the appropriate nutrient management zone.

Additionally, cows may not pasture on land where biosolids have been applied for three years following application. Also, a cereal crop, a forage crop, an oil seed crop, field peas or lentils will have to be planted for the three years in areas where biosolids have been applied.

6.8.2 Construction Phasing

A preliminary construction schedule has been included under **Appendix F**.

7.0 Recommendations on Practices, Operations and Monitoring

Once an Environment Act Licence (EAL) is issued, it is recommended that the following be carried out as part of the biosolids application process:

- Finalize application rates based on specific crops for each owner / agricultural land with the land owner and biosolids contractor, prior to application:
- The land application of the biosolids should be monitored for compliance with the EAL, along with buffer zones from areas described within this document, methodology and rate of application;
- Biosolids should be applied preferentially to the eastern most available fields prior to applying to the western to be conservatively protective of underlying potential groundwater receptors;
- Biosolids and soils of receiving fields should be tested prior to land application. Soils should be tested after application, possibly more than once and as indicated in the EAL to monitor nitrogen and phosphorus levels; and,
- Reporting should be completed as per MCC requirements and those of the EAL.

8.0 Limitations

This report was prepared by Dillon Consulting Limited for the sole benefit of the Rural Municipality of Grey. The material in this report reflects Dillon's best judgement in light of the information available to Dillon at the time of preparation. Dillon accepts no responsibilities for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

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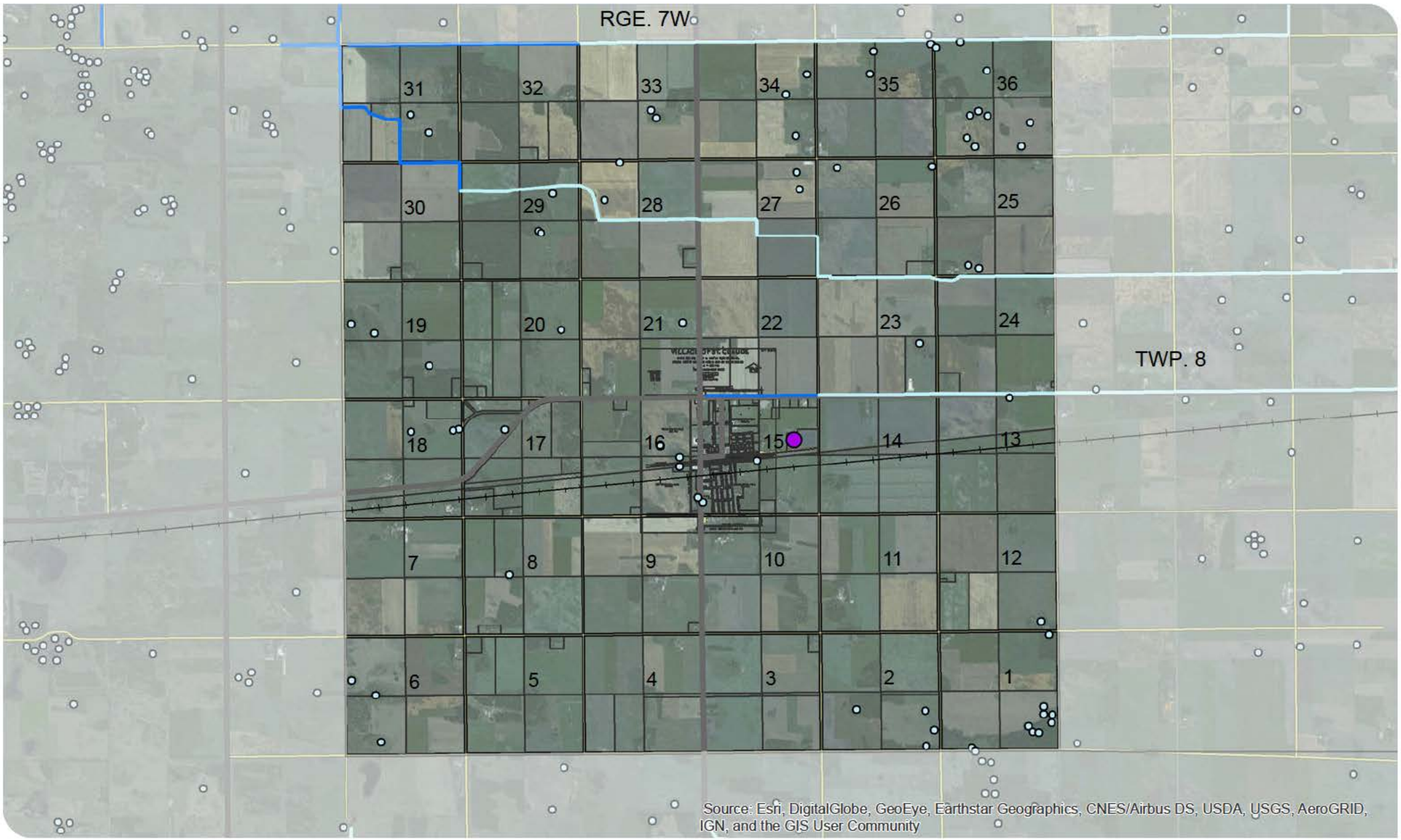
Figures



ST CLAUDE

Figure 1 Study Area

Legend

- RAIL LINE
- HIGHWAYS
- MUNICIPAL ROADS
- LAGOON SITE
- MARSHES/SWAMPS

Drainage Order

- 1
- 2

DILLON CONSULTING

MAP DRAWING INFORMATION:
DATA PROVIDED BY MLI

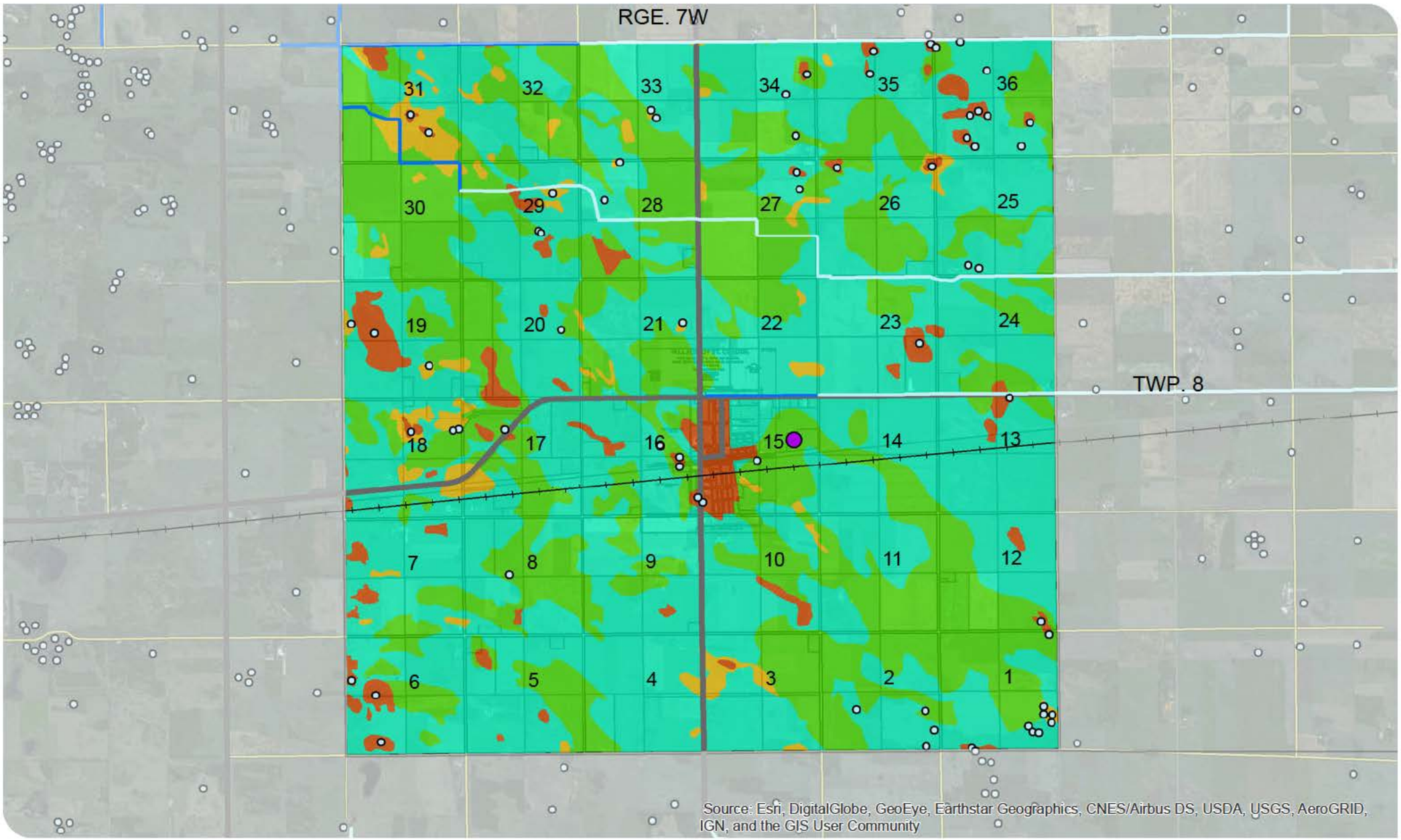
MAP CREATED BY: LH
MAP CHECKED BY: IM
MAP PROJECTION: NAD 1983 UTM Zone 14N

0 0.5 1 2 km

SCALE 1:70,000

FILE LOCATION: \\dillon.ca\DILLON_DFS\Winnipeg\Winnipeg CAD\GIS\163823

PROJECT: 16-3823 STATUS: DRAFT DATE: 10/20/2017



ST CLAUDE

Figure 2 Nutrient Management Zones

Legend

- RAIL LINE
- HIGHWAYS
- MUNICIPAL ROADS
- LAGOON SITE
- MARSHES/SWAMPS

Drainage Order
- 1
- 2

Nutrient Zone
- N1
- N2
- N3
- N4
- N5

DILLON CONSULTING

MAP DRAWING INFORMATION:
DATA PROVIDED BY MLI

MAP CREATED BY: LH
MAP CHECKED BY: IM
MAP PROJECTION: NAD 1983 UTM Zone 14N

0 0.5 1 2 km

SCALE 1:70,000

FILE LOCATION: \\dillon.ca\DILLON_DFS\Winnipeg\Winnipeg CAD\GIS\163823

PROJECT: 16-3823 STATUS: DRAFT DATE: 10/20/2017

Appendix A

Sludge Survey

ASSINIBOINE INJECTIONS LTD.

BOX 160 NOTRE DAME, MB ROG 1M0 PH: 248-2559 FAX: 248-2799 SHOP: 749-2123

Bill To:
DILLON CONSULTING
1558 WILLSON PLACE
WPG, MB
R3T 0Y4

INVOICE: 2016009
DATE: 31-May-16

GST # 890844434

	ACRES	RATE	COST
Sludge Survey for Cell 1 and Cell 2	1		$2,000.00
Sludge sampling and analysis for Cell 1 and Cell 2	1		$500.00

SUBTOTAL	$2,500.00
GST 5%	$125.00
PST 8%	
TOTAL	$2,625.00

Make cheques payable to Assiniboine Injections Ltd

THANK YOU FOR YOUR BUSINESS!

Assiniboine Injections Ltd.

Box 160 177 Notre Dame Ave Notre Dame de Lourdes, MB R0G-1M0
PH: 204-248-2559 FAX: 204-248-2799 EMAIL: info@lagooncleaning.com

DATE: May 31, 2016
TOWN: ST.CLAUDE LAGOON

As requested, Assiniboine Injections Ltd completed our biosolids survey of the primary and secondary cell. This survey was completed on MAY 17, 2016.

Methodology

The cells were surveyed using a grid pattern.
Measurements are obtained by going out on a boat and probing the bottom with a measuring pole. The depth is determined by top of sludge blanket to base of lagoon.

Please find maps of cells, grid locations, indicating depth to sludge and depth to bottom of cell.

Cell Sludge Volume

CELL	SLUDGE VOLUME
PRIMARY CELL	7671.34 M3
SECONDARY CELL	4077 M3

Thank you for allowing us to help you with this project. Please let me know if we can be of any more help with your biosolids management requirements. We look forward to working with you in the future.

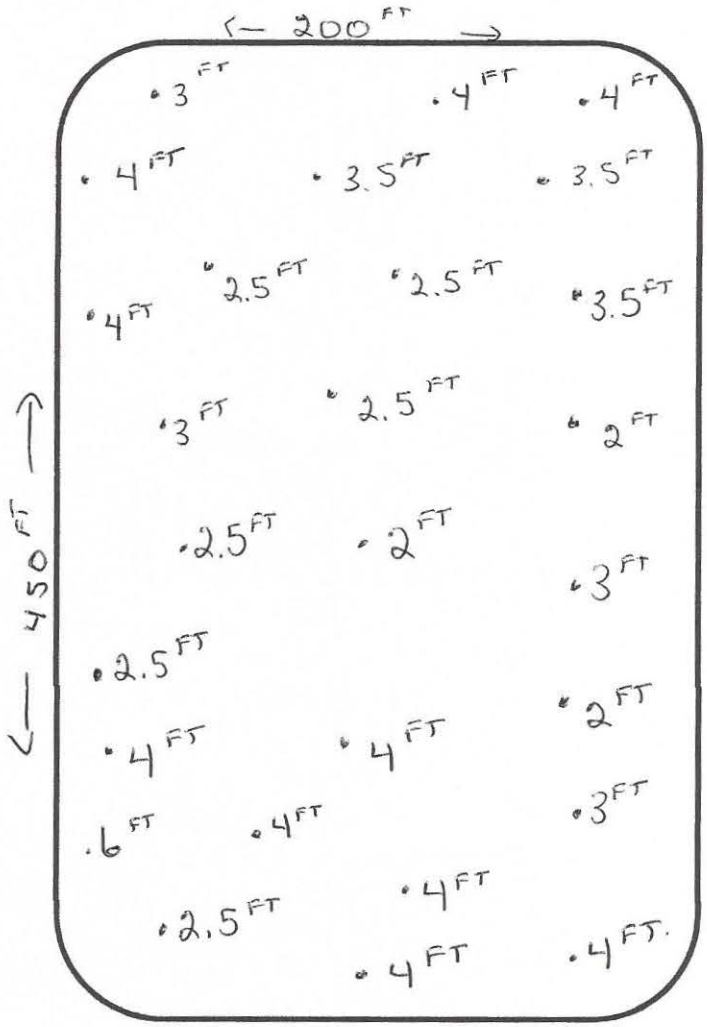
Yours Truly,
Assiniboine Injections Ltd

Assiniboine Injections Ltd.

Box 160 177 Notre Dame Ave Notre Dame de Lourdes, MB R0G-1M0
PH: 204-248-2559 FAX: 204-248-2799 EMAIL: info@lagooncleaning.com

Project No. 1 Survey Date: MAY 17, 2016 Survey Crew: Jeff
Client: Village of St. Claude Lagoon Id: Primary Lagoon Dimensions: 200feet x 450 feet
Avg. Sludge Depth: 3.1 feet Samples Taken: Yes

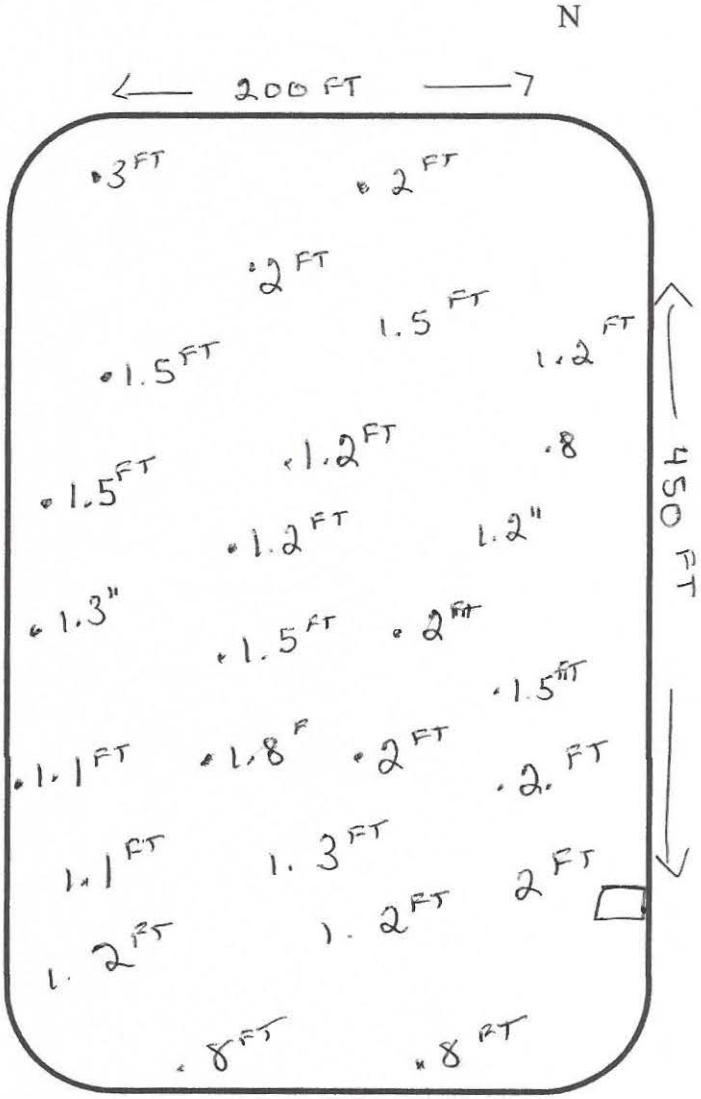
N



Assiniboine Injections Ltd.

Box 160 177 Notre Dame Ave Notre Dame de Lourdes, MB R0G-1M0
PH: 204-248-2559 FAX: 204-248-2799 EMAIL: info@lagooncleaning.com

Project No. 1 Survey Date: MAY 17, 2016 Survey Crew: Jeff
Client: Village of St. Claude Lagoon Id: Secondary Cell Lagoon Dimensions: 200feet x 450 feet
Avg. Sludge Depth: 3.1 feet Samples Taken: Yes



Assiniboine Injections Ltd. (Notre Dame De Lourdes)
ATTN: JEFF JAMAULT
Box 160
126 Notre Dame Ave W.
Notre Dame De Lourdes MB R0G 1M0

Date Received: 17-MAY-16
Report Date: 31-MAY-16 10:48 (MT)
Version: FINAL

Client Phone: 204-248-2559

Certificate of Analysis

Lab Work Order #: L1770072
Project P.O. #: NOT SUBMITTED
Job Reference: ST CLAUDE MB
C of C Numbers:
Legal Site Desc:

[redacted]
Hua Wo
Chemistry Laboratory Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1770072-1 ST-CLAUDE CELL 1&2							
Sampled By: NOEL B on 17-MAY-16 @ 14:30							
Matrix: WW							
Miscellaneous Parameters							
Available Phosphate-P	354		1.0	mg/kg	27-MAY-16	27-MAY-16	R3466227
Note: By Olsen Method							
Mercury (Hg)	0.256		0.0050	mg/kg	24-MAY-16	25-MAY-16	R3465984
% Moisture	93.3		0.10	%	20-MAY-16	20-MAY-16	R3462382
Total Nitrogen by LECO	1.48		0.020	%	24-MAY-16	24-MAY-16	R3463446
Total Solids and Total Volatile Solids							
Total Solids	5.87		0.10	%	24-MAY-16	24-MAY-16	R3463414
Total Volatile Solids (dry basis)	25.3		0.10	%	24-MAY-16	24-MAY-16	R3463414
pH and EC (1:2 Soil:Water Extraction)							
Conductivity (1:2)	2.84		0.050	dS m-1	27-MAY-16	27-MAY-16	R3466010
pH (1:2 soil:water)	8.23		0.10	pH	27-MAY-16	27-MAY-16	R3466010
Metals in Soil by CRC ICPMS							
Aluminum (Al)	11400		50	mg/kg	24-MAY-16	27-MAY-16	R3466663
Antimony (Sb)	0.85		0.10	mg/kg	24-MAY-16	27-MAY-16	R3466663
Arsenic (As)	6.04		0.10	mg/kg	24-MAY-16	27-MAY-16	R3466663
Barium (Ba)	273		0.50	mg/kg	24-MAY-16	27-MAY-16	R3466663
Beryllium (Be)	0.42		0.10	mg/kg	24-MAY-16	27-MAY-16	R3466663
Boron (B)	14.9		5.0	mg/kg	24-MAY-16	27-MAY-16	R3466663
Bismuth (Bi)	5.79		0.20	mg/kg	24-MAY-16	27-MAY-16	R3466663
Cadmium (Cd)	0.865		0.020	mg/kg	24-MAY-16	27-MAY-16	R3466663
Calcium (Ca)	69100		50	mg/kg	24-MAY-16	27-MAY-16	R3466663
Chromium (Cr)	26.9		0.50	mg/kg	24-MAY-16	27-MAY-16	R3466663
Cobalt (Co)	5.06		0.10	mg/kg	24-MAY-16	27-MAY-16	R3466663
Copper (Cu)	143		0.50	mg/kg	24-MAY-16	27-MAY-16	R3466663
Iron (Fe)	15200		50	mg/kg	24-MAY-16	27-MAY-16	R3466663
Lead (Pb)	16.4		0.50	mg/kg	24-MAY-16	27-MAY-16	R3466663
Lithium (Li)	10.3		2.0	mg/kg	24-MAY-16	27-MAY-16	R3466663
Magnesium (Mg)	11000		20	mg/kg	24-MAY-16	27-MAY-16	R3466663
Manganese (Mn)	950		1.0	mg/kg	24-MAY-16	27-MAY-16	R3466663
Molybdenum (Mo)	14.0		0.10	mg/kg	24-MAY-16	27-MAY-16	R3466663
Nickel (Ni)	22.2		0.50	mg/kg	24-MAY-16	27-MAY-16	R3466663
Phosphorus (P)	22000		50	mg/kg	24-MAY-16	27-MAY-16	R3466663
Potassium (K)	2000		100	mg/kg	24-MAY-16	27-MAY-16	R3466663
Selenium (Se)	1.68		0.20	mg/kg	24-MAY-16	27-MAY-16	R3466663
Silver (Ag)	2.84		0.10	mg/kg	24-MAY-16	27-MAY-16	R3466663
Sodium (Na)	2670		50	mg/kg	24-MAY-16	27-MAY-16	R3466663
Strontium (Sr)	248		0.50	mg/kg	24-MAY-16	27-MAY-16	R3466663
Thallium (Tl)	0.195		0.050	mg/kg	24-MAY-16	27-MAY-16	R3466663
Tin (Sn)	7.8		2.0	mg/kg	24-MAY-16	27-MAY-16	R3466663
Titanium (Ti)	83.2		1.0	mg/kg	24-MAY-16	27-MAY-16	R3466663
Uranium (U)	10.1		0.050	mg/kg	24-MAY-16	27-MAY-16	R3466663
Vanadium (V)	36.9		0.20	mg/kg	24-MAY-16	27-MAY-16	R3466663
Zinc (Zn)	312		2.0	mg/kg	24-MAY-16	27-MAY-16	R3466663
Zirconium (Zr)	3.1		1.0	mg/kg	24-MAY-16	27-MAY-16	R3466663
Total Organic Nitrogen - Soil							
Available Ammonium-N							
Available Ammonium-N	1060	DLHC	18	mg/kg	20-MAY-16	20-MAY-16	R3463139
Note: Done as Rec'd, back calc to dry							
Nitrogen, Total Organic - calculation							
Total Organic Nitrogen	1.11		0.020	%		26-MAY-16	
Total Kjeldahl Nitrogen							
Total Kjeldahl Nitrogen	1.22	DLHC	0.30	%	26-MAY-16	26-MAY-16	R3465663

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1770072-1 ST-CLAUDE CELL 1&2							
Sampled By: NOEL B on 17-MAY-16 @ 14:30							
Matrix: WW							
Available N, P and K							
Available Nitrate-N							
Available Nitrate-N	<4.0	NSSM	4.0	mg/kg	27-MAY-16	27-MAY-16	R3467354
Plant Available Phosphorus and Potassium							
Available Phosphate-P	803	DLHC	40	mg/kg	30-MAY-16	30-MAY-16	R3467973
Available Potassium	516	DLHC	20	mg/kg	30-MAY-16	30-MAY-16	R3467973
Note: By Modified Kelowna method							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

Sample Parameter Qualifier Key:

Qualifier	Description
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).
NSSM	Non-standard sample matrix. Modified methods were used for sample processing and analysis.
NSSM	Non-standard sample matrix. Modified methods were used for sample processing and analysis.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ETL-N-TOTORG-CALC-SK	Soil	Nitrogen, Total Organic - calculation	APHA 4500 Norg-Calculated as TKN - NH3-N
HG-200.2-CVAF-SK	Soil	Mercury in Soil by CVAFS	EPA 200.2/1631E (mod)

Soil samples are digested with nitric and hydrochloric acids, followed by analysis by CVAFS.

MET-200.2-CCMS-SK	Soil	Metals in Soil by CRC ICPMS	EPA 200.2/6020A (mod)

Soil samples are digested with nitric and hydrochloric acids, followed by analysis by CRC ICPMS.

Method Limitation: This method is not a total digestion technique. It is a very strong acid digestion that is intended to dissolve those metals that may be environmentally available. This method does not dissolve all silicate materials and may result in a partial extraction. depending on the sample matrix, for some metals, including, but not limited to Al, Ba, Be, Cr, Sr, Ti, Tl, and V.

MOIST-SK	Soil	Moisture Content	ASTM D2216-80

The weighed portion of soil is placed in a 105□C oven overnight. The dried soil is allowed to cooled to room temperature, weighed and the % moisture is calculated.

Reference: ASTM D2216-80

N-TOT-LECO-SK	Soil	Total Nitrogen by combustion method	SSSA (1996) P. 973-974

The sample is ignited in a combustion analyzer where nitrogen in the reduced nitrous oxide gas is determined using a thermal conductivity detector.

N-TOTKJ-COL-SK	Soil	Total Kjeldahl Nitrogen	CSSS (2008) 22.2.3

The soil is digested with sulfuric acid in the presence of CuSO4 and K2SO4 catalysts. Ammonia in the soil extract is determined colrimetrically at 660 nm.

NH4-AVAIL-SK	Soil	Available Ammonium-N	CSSS(1993) 4.2/COMM SOIL SCI 19(6)

Ammonium (NH4-N) is extracted from the soil using 2 N KCl. Ammonium in the extract is mixed with hypochlorite and salicylate to form indophenol blue, which is determined colorimetrically by auto analysis at 660 nm.

NO3-AVAIL-SK	Soil	Available Nitrate-N	Method = Alberta Ag (1988)

Available Nitrate and Nitrite are extracted from the soil using a dilute calcium chloride solution.
Nitrate is quantitatively reduced to nitrite by passage of the sample through a copperized cadmium column. The nitrite (reduced nitrate plus original nitrite) is then determined by diazotizing with sulfanilamide followed by coupling with N-(1-naphthyl) ethylenediamine dihydrochloride. The resulting water soluble dye has a magenta color which is measured at colorimetrically at 520nm.

Reference:
Recommended Methods of Soil Analysis for Canadian Prairie Agricultural Soils. Alberta Agriculture (1988) p. 19 and 28

PH,EC-1:2-SK	Soil	pH and EC (1:2 Soil:Water Extraction)	CSSC 3.13/CSSS 18.3.1

1 part dry soil and 2 parts de-ionized water (by volume) is mixed. The slurry is allowed to stand with occasional stirring for 30 - 60 minutes. After equilibration, pH of the slurry is measured using a pH meter. Conductivity of the filtered extract is measured by a conductivity meter.

PO4-AVAIL-OLSEN-SK	Soil	Available Phosphate-P by Olsen	CSSS (1993) 7.2,7.3.1

Plant available phosphorus is extracted from the sample with sodium bicarbonate. PO4-P in the filtered extract is determined colorimetrically at 880 nm.

PO4/K-AVAIL-SK	Soil	Plant Available Phosphorus and Potassium	Comm. Soil Sci. Plant Anal, 25 (5&6)

Plant available phosphorus and potassium are extracted from the soil usng Modified Kelowna solution. Phosphorous in the soil extract is determined colorimetrically at 880 nm, while potassiumis determined by flame emission at 770 nm.

SOLIDS-TOT/TOTVOL-SK	Manure	Total Solids and Total Volatile Solids	APHA 2540G

A well-mixed sample is evaporated in a weighed dish and dried to constant weight in an oven at 103-105"C. The increase in weight over that of the empty dish represents the Total Solids. The crucible is then ignited at 550"–10"C for 1 hour. The remaining solids represent the Total Fixed Solids, while the weight lost on ignition represents the Total Volatile Solids.

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
SK	ALS ENVIRONMENTAL - SASKATOON, SASKATCHEWAN, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.
mg/kg - milligrams per kilogram based on dry weight of sample
mg/kg wwt - milligrams per kilogram based on wet weight of sample
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight
mg/L - unit of concentration based on volume, parts per million.
< - Less than.
D.L. - The reporting limit.
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Appendix B

Biosolids Laboratory Analysis

Assiniboine Injections Ltd. (Notre Dame De Lourdes)
ATTN: JEFF JAMAULT
Box 160
126 Notre Dame Ave W.
Notre Dame De Lourdes MB R0G 1M0

Date Received: 31-JAN-19
Report Date: 13-FEB-19 14:24 (MT)
Version: FINAL

Client Phone: 204-248-2559

Certificate of Analysis

Lab Work Order #: L2227471
Project P.O. #: NOT SUBMITTED
Job Reference: ST. CLAUDE LAGOON SLUDGE (BIOSOLIDS)
C of C Numbers:
Legal Site Desc:

Connor Cattani
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2227471-1	L2227471-2			
	Description	BIOSOLID	BIOSOLID			
	Sampled Date	31-JAN-19	31-JAN-19			
	Sampled Time					
	Client ID	ST. CLAUDE - PRIMARY LAGOON CELL	ST. CLAUDE - SECONDARY LAGOON CELL			
Grouping	**Analyte**					
SOIL						
Physical Tests	Loss on Ignition @ 440 C (%)	34.8	18.5			
	Ash Content @ 440 C (%)	65.2	81.5			
	% Moisture (%)	90.6	95.6			
	Moisture (%)	90.7	99.2			
Leachable Anions & Nutrients	Total Kjeldahl Nitrogen (%)	2.42 DLHC	1.55 DLHC			
	Total Organic Nitrogen (%)	2.15	1.36			
Plant Available Nutrients	Available Ammonium-N (mg/kg)	2750 DLM	1840 DLM			
	Nitrate+Nitrite-N (mg/kg)	17.4 DLM	16.4 DLM			
	Nitrate-N (mg/kg)	7.6 DLM	7.6 DLM			
	Nitrite-N (mg/kg)	9.9 DLM	8.8 DLM			
	Available Phosphate-P (mg/kg)	642 DLHC	753 DLHC			
Saturated Paste Extractables	SAR (SAR)	4.81	6.52			
	Calcium (Ca) (mg/L)	154 DLDS	77 DLDS			
	Conductivity Sat. Paste (dS m-1)	3.73	2.00			
	Magnesium (Mg) (mg/L)	56 DLDS	36 DLDS			
	pH in Saturated Paste (pH)	7.07	7.24			
	Potassium (K) (mg/L)	37 DLDS	29 DLDS			
	% Saturation (%)	OVERSAT	OVERSAT			
	Sodium (Na) (mg/L)	274 DLDS	276 DLDS			
Bacteriological Tests	Coliform Bacteria - Fecal (MPN/g)	117000	216000			
Metals	Aluminum (Al) (mg/kg)	10300	5870			
	Antimony (Sb) (mg/kg)	1.39	0.71			
	Arsenic (As) (mg/kg)	9.22	5.99			
	Barium (Ba) (mg/kg)	336	204			
	Beryllium (Be) (mg/kg)	0.32	0.25			
	Bismuth (Bi) (mg/kg)	16.8	3.98			
	Boron (B) (mg/kg)	13.4	31.4			
	Cadmium (Cd) (mg/kg)	1.66	0.473			
	Calcium (Ca) (mg/kg)	69900	47800			
	Chromium (Cr) (mg/kg)	24.9	11.5			
	Cobalt (Co) (mg/kg)	4.18	3.67			
	Copper (Cu) (mg/kg)	306	84.7			
	Iron (Fe) (mg/kg)	16000	10500			
	Lead (Pb) (mg/kg)	25.4	8.42			
	Lithium (Li) (mg/kg)	6.9	10.0			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2227471-1	L2227471-2			
	Description	BIOSOLID	BIOSOLID			
	Sampled Date	31-JAN-19	31-JAN-19			
	Sampled Time					
	Client ID	ST. CLAUDE - PRIMARY LAGOON CELL	ST. CLAUDE - SECONDARY LAGOON CELL			
Grouping	**Analyte**					
SOIL						
Metals	Magnesium (Mg) (mg/kg)	13300	9590			
	Manganese (Mn) (mg/kg)	952	609			
	Mercury (Hg) (mg/kg)	0.532	0.127			
	Molybdenum (Mo) (mg/kg)	26.6	11.2			
	Nickel (Ni) (mg/kg)	21.2	12.9			
	Phosphorus (P) (mg/kg)	28200	19500			
	Potassium (K) (mg/kg)	1390	3980			
	Selenium (Se) (mg/kg)	2.92	2.30			
	Silver (Ag) (mg/kg)	4.80	1.35			
	Sodium (Na) (mg/kg)	2840	25700			
	Strontium (Sr) (mg/kg)	200	155			
	Sulfur (S) (mg/kg)	12100	10800			
	Thallium (Tl) (mg/kg)	0.200	0.112			
	Tin (Sn) (mg/kg)	15.3	4.7			
	Titanium (Ti) (mg/kg)	70.4	59.2			
	Tungsten (W) (mg/kg)	0.63	<0.50			
	Uranium (U) (mg/kg)	14.1	7.53			
	Vanadium (V) (mg/kg)	27.2	21.0			
	Zinc (Zn) (mg/kg)	652	244			
	Zirconium (Zr) (mg/kg)	3.9	2.4			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

Additional Comments for Sample Listed:

Samplenum	Matrix	Report Remarks	Sample Comments
L2227471-1	Soil	Note: Analyzed as received and calculated to dry	
L2227471-2	Soil	Note: Analyzed as received and calculated to dry	

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)

Qualifiers for Individual Parameters Listed:

Qualifier	Description
DLDS	Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ETL-N-TOTORG-CALC-SK	Soil	Nitrogen, Total Organic - calculation	APHA 4500 Norg-Calculated as TKN - NH3-N
FCOLI-DRY-MTF-VA	Soil	Fecal coliform by MPN	EPA Method 1680

This analysis is carried out using procedures adapted from EPA Method 1680 "Fecal Coliforms in Sewage Sludge (Biosolids) by Multiple Tube Fermentation using Lauryl Tryptose Broth (LTB) and EC medium". Serial dilutions of the sample are incubated with the appropriate growth medium, and fecal coliforms are quantified by a statistical estimation of bacteria density (most probable number). The test involves initial 48 hour incubation (presumptive test), positive results are further tested (up to an additional 24 hours) to confirm and quantify fecal coliforms. Results are reported on a dry weight basis.

HG-200.2-CVAA-WP	Soil	Mercury in Soil	EPA 200.2/1631E (mod)

Soil samples are digested with nitric and hydrochloric acids, followed by analysis by CVAAS.

LOI-440-SK	Soil	Loss on Ignition @ 440 C	ASTM D2974-14 Method C

An oven-dried test specimen is ignited in a muffle furnace at 440°C for 16-20 hours. Loss on ignition is measured by gravimetric difference in sample weight pre- and post- ignition.
Loss on Ignition at 440°C can be used as an approximation of organic matter (ASTM D2974-14 Method C)

MET-200.2-CCMS-WP	Soil	Metals in Soil by CRC ICPMS	EPA 200.2/6020A (mod)

Soil/sediment is dried, disaggregated, and sieved (2 mm). Strong Acid Leachable Metals in the <2mm fraction are solubilized by heated digestion with nitric and hydrochloric acids. Instrumental analysis is by Collision / Reaction Cell ICPMS.

Limitations: This method is intended to l berate environmentally available metals. Silicate minerals are not solubilized. Some metals may be only partially recovered (matrix dependent), including Al, Ba, Be, Cr, S, Sr, Ti, Tl, V, W, and Zr. Elemental Sulfur may be poorly recovered by this method. Volatile forms of sulfur (e.g. sulfide, H2S) may be excluded if lost during sampling, storage, or digestion.

MOIST-SK	Soil	Moisture Content	CCME PHC in Soil - Tier 1 (mod)

The weighed portion of soil is placed in a 105°C oven overnight. The dried soil is allowed to cooled to room temperature, weighed and the % moisture is calculated.

MOISTURE-VA	Soil	Moisture content	CCME PHC in Soil - Tier 1 (mod)

This analysis is carried out gravimetrically by drying the sample at 105 C for a minimum of two hours.

N-TOTKJ-COL-SK	Soil	Total Kjeldahl Nitrogen	CSSS (2008) 22.2.3

The soil is digested with sulfuric acid in the presence of CuSO4 and K2SO4 catalysts. Ammonia in the soil extract is determined colrimetrically at 660 nm.

N2/N3-AVAIL-SK	Soil	Nitrate, Nitrite and Nitrate+Nitrite-N	APHA 4500 NO3F

Available Nitrate and Nitrite are extracted from the soil using a dilute calcium chloride solution. Nitrate plus Nitrite is quantitatively reduced to nitrite by passage of the sample through a copperized cadmium column. The nitrite (reduced nitrate plus original nitrite) is then determined by diazotizing with sulfanilamide followed by coupling with N-(1-naphthyl) ethylenediamine dihydrochloride. The resulting water soluble dye has a magenta color which is measured at colorimetrically at 520nm. Nitrite is determined on the same extract by following the same instrumental procedure without a cadmium column.
Reference: Recommended Methods of Soil Analysis for Canadian Prairie Agricultural Soils. Alberta Agriculture (1988) p. 19 and 28

NH4-AVAIL-SK	Soil	Available Ammonium-N	CSSS Carter 6.2 / Comm Soil Sci 19(6)

Ammonium (NH4-N) is extracted from the soil using 2 N KCl. Ammonium in the extract is mixed with hypochlorite and salicylate to form indophenol blue, which is determined colorimetrically by auto analysis at 660 nm.

PO4-AVAIL-OLSEN-SK	Soil	Available Phosphate-P by Olsen	CSSS (2008) 8

Reference Information

Plant available phosphorus is extracted from air dried soil using a fixed ratio bicarbonate extraction. Phosphorus is determined by colorimetry.

SAR-CALC-SK	Soil	SAR and Cations in saturated soil	CSSS 18.4-Calculation

Ca, Mg, Na and K in a saturated soil extract are determined by ICP-OES.

SAT/PH/EC-SK	Soil	pH and EC (Saturated Paste)	CSSS 18.2.2/CSSC 3.14/CSSS 18.3.1

pH of a saturated soil paste is measured using a pH meter. After equilibration, an extract is obtained by vacuum filtration with conductivity of the extract measured by a conductivity meter.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
SK	ALS ENVIRONMENTAL - SASKATOON, SASKATCHEWAN, CANADA
WP	ALS ENVIRONMENTAL - WINNIPEG, MANITOBA, CANADA
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Quality Control Report

Workorder: L2227471 Report Date: 13-FEB-19

Client: Assiniboine Injections Ltd. (Notre Dame De Lourdes)
Box 160 126 Notre Dame Ave W.
Notre Dame De Lourdes MB R0G 1M0
Contact: JEFF JAMAULT

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
FCOLI-DRY-MTF-VA	**Soil**							
Batch R4491029								
WG2981271-1 MB								
Coliform Bacteria - Fecal			<2		MPN/g		2	01-FEB-19
HG-200.2-CVAA-WP	**Soil**							
Batch R4496469								
WG2983453-4 CRM		**CANMET TILL-1**						
Mercury (Hg)			93.1		%		70-130	06-FEB-19
WG2983453-2 LCS								
Mercury (Hg)			102.0		%		80-120	06-FEB-19
WG2983453-1 MB								
Mercury (Hg)			<0.0050		mg/kg		0.005	06-FEB-19
LOI-440-SK	**Soil**							
Batch R4504377								
WG2986524-1 DUP		**L2227471-2**						
Loss on Ignition @ 440 C		18.5	20.5		%	10	20	12-FEB-19
WG2986524-3 IRM		**SAL2001**						
Loss on Ignition @ 440 C			106.1		%		80-120	12-FEB-19
WG2986524-2 MB								
Loss on Ignition @ 440 C			<1.0		%		1	12-FEB-19
MET-200.2-CCMS-WP	**Soil**							
Batch R4490150								
WG2983362-4 CRM		**CANMET TILL-1**						
Aluminum (Al)			100.5		%		70-130	05-FEB-19
Antimony (Sb)			109.5		%		70-130	05-FEB-19
Arsenic (As)			100.3		%		70-130	05-FEB-19
Barium (Ba)			96.0		%		70-130	05-FEB-19
Beryllium (Be)			97.8		%		70-130	05-FEB-19
Boron (B)			1.7		mg/kg		0-8.2	05-FEB-19
Bismuth (Bi)			106.7		%		70-130	05-FEB-19
Cadmium (Cd)			103.4		%		70-130	05-FEB-19
Calcium (Ca)			89.2		%		70-130	05-FEB-19
Chromium (Cr)			94.6		%		70-130	05-FEB-19
Cobalt (Co)			98.1		%		70-130	05-FEB-19
Copper (Cu)			101.4		%		70-130	05-FEB-19
Iron (Fe)			98.7		%		70-130	05-FEB-19
Lead (Pb)			106.7		%		70-130	05-FEB-19

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-200.2-CCMS-WP	**Soil**							
Batch R4490150								
WG2983362-4 CRM		**CANMET TILL-1**						
Lithium (Li)			97.2		%		70-130	05-FEB-19
Magnesium (Mg)			101.6		%		70-130	05-FEB-19
Manganese (Mn)			104.2		%		70-130	05-FEB-19
Molybdenum (Mo)			98.7		%		70-130	05-FEB-19
Nickel (Ni)			97.8		%		70-130	05-FEB-19
Phosphorus (P)			99.8		%		70-130	05-FEB-19
Potassium (K)			82.6		%		70-130	05-FEB-19
Selenium (Se)			0.30		mg/kg		0.12-0.52	05-FEB-19
Silver (Ag)			0.24		mg/kg		0.12-0.32	05-FEB-19
Sodium (Na)			86.2		%		70-130	05-FEB-19
Strontium (Sr)			95.7		%		70-130	05-FEB-19
Thallium (Tl)			0.128		mg/kg		0.075-0.175	05-FEB-19
Tin (Sn)			1.0		mg/kg		0-3.1	05-FEB-19
Titanium (Ti)			82.2		%		70-130	05-FEB-19
Tungsten (W)			0.15		mg/kg		0-0.66	05-FEB-19
Uranium (U)			109.4		%		70-130	05-FEB-19
Vanadium (V)			94.6		%		70-130	05-FEB-19
Zinc (Zn)			97.5		%		70-130	05-FEB-19
Zirconium (Zr)			0.7		mg/kg		0-1.8	05-FEB-19
WG2983362-2 LCS								
Aluminum (Al)			103.9		%		80-120	05-FEB-19
Antimony (Sb)			103.9		%		80-120	05-FEB-19
Arsenic (As)			100.7		%		80-120	05-FEB-19
Barium (Ba)			100.4		%		80-120	05-FEB-19
Beryllium (Be)			104.0		%		80-120	05-FEB-19
Boron (B)			101.2		%		80-120	05-FEB-19
Bismuth (Bi)			100.4		%		80-120	05-FEB-19
Cadmium (Cd)			100.7		%		80-120	05-FEB-19
Calcium (Ca)			101.6		%		80-120	05-FEB-19
Chromium (Cr)			102.9		%		80-120	05-FEB-19
Cobalt (Co)			102.4		%		80-120	05-FEB-19
Copper (Cu)			101.9		%		80-120	05-FEB-19
Iron (Fe)			98.7		%		80-120	05-FEB-19
Lead (Pb)			102.5		%		80-120	05-FEB-19

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-200.2-CCMS-WP	**Soil**							
Batch R4490150								
WG2983362-2 LCS								
Lithium (Li)			104.5		%		80-120	05-FEB-19
Magnesium (Mg)			113.0		%		80-120	05-FEB-19
Manganese (Mn)			102.4		%		80-120	05-FEB-19
Molybdenum (Mo)			102.9		%		80-120	05-FEB-19
Nickel (Ni)			100.3		%		80-120	05-FEB-19
Phosphorus (P)			104.3		%		80-120	05-FEB-19
Potassium (K)			102.9		%		80-120	05-FEB-19
Selenium (Se)			102.7		%		80-120	05-FEB-19
Silver (Ag)			104.8		%		80-120	05-FEB-19
Sodium (Na)			106.6		%		80-120	05-FEB-19
Strontium (Sr)			106.1		%		80-120	05-FEB-19
Sulfur (S)			105.3		%		70-130	05-FEB-19
Thallium (Tl)			99.2		%		80-120	05-FEB-19
Tin (Sn)			101.4		%		80-120	05-FEB-19
Titanium (Ti)			101.1		%		80-120	05-FEB-19
Tungsten (W)			106.9		%		70-130	05-FEB-19
Uranium (U)			112.8		%		80-120	05-FEB-19
Vanadium (V)			103.4		%		80-120	05-FEB-19
Zinc (Zn)			101.6		%		80-120	05-FEB-19
Zirconium (Zr)			105.6		%		80-120	05-FEB-19
WG2983362-1 MB								
Aluminum (Al)			<50		mg/kg		50	05-FEB-19
Antimony (Sb)			<0.10		mg/kg		0.1	05-FEB-19
Arsenic (As)			<0.10		mg/kg		0.1	05-FEB-19
Barium (Ba)			<0.50		mg/kg		0.5	05-FEB-19
Beryllium (Be)			<0.10		mg/kg		0.1	05-FEB-19
Boron (B)			<5.0		mg/kg		5	05-FEB-19
Bismuth (Bi)			<0.20		mg/kg		0.2	05-FEB-19
Cadmium (Cd)			<0.020		mg/kg		0.02	05-FEB-19
Calcium (Ca)			<50		mg/kg		50	05-FEB-19
Chromium (Cr)			<0.50		mg/kg		0.5	05-FEB-19
Cobalt (Co)			<0.10		mg/kg		0.1	05-FEB-19
Copper (Cu)			<0.50		mg/kg		0.5	05-FEB-19
Iron (Fe)			<50		mg/kg		50	05-FEB-19

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-200.2-CCMS-WP	**Soil**							
Batch R4490150								
WG2983362-1 MB								
Lead (Pb)			<0.50		mg/kg		0.5	05-FEB-19
Lithium (Li)			<2.0		mg/kg		2	05-FEB-19
Magnesium (Mg)			<20		mg/kg		20	05-FEB-19
Manganese (Mn)			<1.0		mg/kg		1	05-FEB-19
Molybdenum (Mo)			<0.10		mg/kg		0.1	05-FEB-19
Nickel (Ni)			<0.50		mg/kg		0.5	05-FEB-19
Phosphorus (P)			<50		mg/kg		50	05-FEB-19
Potassium (K)			<100		mg/kg		100	05-FEB-19
Selenium (Se)			<0.20		mg/kg		0.2	05-FEB-19
Silver (Ag)			<0.10		mg/kg		0.1	05-FEB-19
Sodium (Na)			<50		mg/kg		50	05-FEB-19
Strontium (Sr)			<0.50		mg/kg		0.5	05-FEB-19
Sulfur (S)			<1000		mg/kg		1000	05-FEB-19
Thallium (Tl)			<0.050		mg/kg		0.05	05-FEB-19
Tin (Sn)			<2.0		mg/kg		2	05-FEB-19
Titanium (Ti)			<1.0		mg/kg		1	05-FEB-19
Tungsten (W)			<0.50		mg/kg		0.5	05-FEB-19
Uranium (U)			<0.050		mg/kg		0.05	05-FEB-19
Vanadium (V)			<0.20		mg/kg		0.2	05-FEB-19
Zinc (Zn)			<2.0		mg/kg		2	05-FEB-19
Zirconium (Zr)			<1.0		mg/kg		1	05-FEB-19
MOIST-SK	**Soil**							
Batch R4490928								
WG2982349-3 LCS								
% Moisture			100.4		%		90-110	05-FEB-19
WG2982349-2 MB								
% Moisture			<0.10		%		0.1	05-FEB-19
MOISTURE-VA	**Soil**							
Batch R4490055								
WG2983498-2 LCS								
Moisture			100.5		%		90-110	05-FEB-19
WG2983498-1 MB								
Moisture			<0.25		%		0.25	05-FEB-19
N-TOTKJ-COL-SK	**Soil**							

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
N-TOTKJ-COL-SK	**Soil**							
Batch R4495047								
WG2983931-1 DUP		**L2227471-2**						
Total Kjeldahl Nitrogen		1.55	1.58		%	2.3	20	07-FEB-19
WG2983931-2 IRM		**08-109 SOIL**						
Total Kjeldahl Nitrogen			97.4		%		80-120	07-FEB-19
WG2983931-3 MB								
Total Kjeldahl Nitrogen			<0.020		%		0.02	07-FEB-19
N2/N3-AVAIL-SK	**Soil**							
Batch R4501067								
WG2986617-3 IRM		**SAL814**						
Nitrite-N			0.37		mg/kg		0-1.14	11-FEB-19
Nitrate+Nitrite-N			119.7		%		70-130	11-FEB-19
WG2986617-2 MB								
Nitrite-N			<0.40		mg/kg		0.4	11-FEB-19
Nitrate+Nitrite-N			<2.0		mg/kg		2	11-FEB-19
NH4-AVAIL-SK	**Soil**							
Batch R4499608								
WG2982338-3 IRM		**SAL814**						
Available Ammonium-N			107.8		%		70-130	05-FEB-19
WG2982338-4 LCS								
Available Ammonium-N			93.0		%		80-120	05-FEB-19
WG2982338-2 MB								
Available Ammonium-N			<1.0		mg/kg		1	05-FEB-19
PO4-AVAIL-OLSEN-SK	**Soil**							
Batch R4504388								
WG2983171-3 IRM		**FARM2005**						
Available Phosphate-P			107.4		%		80-120	07-FEB-19
WG2983171-2 MB								
Available Phosphate-P			<1.0		mg/kg		1	07-FEB-19
SAR-CALC-SK	**Soil**							
Batch R4499748								
WG2980419-3 IRM		**SK-SAL-17**						
Calcium (Ca)			96.3		%		70-130	05-FEB-19
Potassium (K)			96.3		%		70-130	05-FEB-19
Magnesium (Mg)			103.3		%		70-130	05-FEB-19
Sodium (Na)			101.8		%		70-130	05-FEB-19
WG2980419-2 MB								
Calcium (Ca)			<5.0		mg/L		5	05-FEB-19

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
SAR-CALC-SK	**Soil**							
Batch R4499748								
WG2980419-2 MB								
Potassium (K)			<5.0		mg/L		5	05-FEB-19
Magnesium (Mg)			<5.0		mg/L		5	05-FEB-19
Sodium (Na)			<5.0		mg/L		5	05-FEB-19
SAT/PH/EC-SK	**Soil**							
Batch R4488281								
WG2980419-3 IRM		**SK-SAL-17**						
pH in Saturated Paste			7.56		pH		7.38-7.98	05-FEB-19
Conductivity Sat. Paste			100.9		%		80-120	05-FEB-19
WG2980419-4 LCS								
% Saturation			25.79		%			05-FEB-19
pH in Saturated Paste			6.99		pH		6.66-7.06	05-FEB-19
Conductivity Sat. Paste			100.0		%		80-120	05-FEB-19
WG2980419-2 MB								
% Saturation			0.03		%			05-FEB-19
Conductivity Sat. Paste			<0.10		dS m-1		0.1	05-FEB-19

Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
DLDS	Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).

Quality Control Report

Hold Time Exceedances:

ALS Product Description	Sample ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Plant Available Nutrients							
Nitrate, Nitrite and Nitrate+Nitrite-N							
	1	31-JAN-19	04-FEB-19 17:00	3	4	days	EHT
	2	31-JAN-19	04-FEB-19 17:00	3	4	days	EHT

Legend & Qualifier Definitions:

EHTR-FM:	Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended.
EHTR:	Exceeded ALS recommended hold time prior to sample receipt.
EHTL:	Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.
EHT:	Exceeded ALS recommended hold time prior to analysis.
Rec. HT:	ALS recommended hold time (see units).

Notes*:
Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes.
Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L2227471 were received on 31-JAN-19 15:50.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

ALS Environmental

Request Form

68 9878

L2227471-COFC

COC # _____

Page ___ of ___

Report To							
Company:	ASSINIBOINE INJECTIONS LTD (W10296)	☑ PDF	☑ Excel	☐ Digital	☐ Fax		
Contact:	NOEL JAMAULT	Email 1:	info@lagooncleaning.com				
Address:	Box 160 126 Notre Dame Ave W.	Email 2:	kwhyte@dillon.ca				
	Notre Dame de Lourdes, MB, R0G 1M0	Email 3:	imaharaj@dillon.ca				
Phone:	204-248-2559 Fax: 204-248-2799						
Invoice To	☐ Yes ☐ No	**Client / Project Information**					
Hardcopy of Invoice with Report?	☐ Yes ☐ No	Job #:	St Claude Lagoon Sludge (Biosolids)				
Company:	(W10296)	PO / AFE:					
Contact:		LSD:					
Address:							
Phone:	Fax:	Quote #:	Q71209				
Lab Work Order # (lab use only)		ALS Contact:		Sampler:			

Service Requested (Rush for routine analysis subject to availability)

- ◉ Regular (Standard Turnaround Times - Business Days)
- ○ Priority (2-4 Business Days) - 50% Surcharge - Contact ALS to Confirm TAT
- ○ Emergency (1-2 Bus. Days) - 100% Surcharge - Contact ALS to Confirm TAT
- ○ Same Day or Weekend Emergency - Contact ALS to Confirm TAT

Analysis Request

Please indicate below Filtered, Preserved or both (F, P, F/P)

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	MET-200.2-CCMS-WP	HG-200.2-CVAA-WP	LOI-440-SK (Volatile Solids)	MOIST-SK	N-TOT-ORG-SK (Incl TKN & NH4)	N2/N3-AVAIL-SK	PO4-AVAIL-OLSEN-SK	SAL-BASIC-SK (Incl SAR)	PREP-DRY/GRIND-SK	FCOLI-DRY-MTF-VA			Number of Containers
	St Claude - Primary Lagoon Cell				X	X	X	X	X	X	X	X	X	X			
	St Claude - Secondary Lagoon Cell				X	X	X	X	X	X	X	X	X	X			

Special Instructions / Regulations with water or land use (CCME-Freshwater Aquatic Life/BC CSR - Commercial/AB Tier 1 - Natural, etc) / Hazardous Details

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.

By the use of this form the user acknowledges and agrees with the Terms and Conditions as provided on a separate Excel tab.

Also provided on another Excel tab are the ALS location addresses, phone numbers and sample container / preservation / holding time table for common analyses.

SHIPMENT RELEASE (client use)			SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)			
Released by:	Date (dd-mmm-yy)	Time (hh-mm)	Received by:	Date:	Time:	Temperature:	Verified by:	Date:	Time:	Observation Yes / No ? If Yes a
			[redacted]	31/1/19	3:50	11.9 °C				

Appendix C

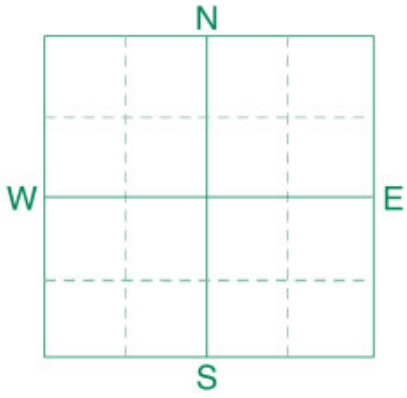
Soils Laboratory Analysis

AGVISE LABORATORIES

Soil Analysis by Agvise Laboratories
(http://www.agvise.com)
Northwood: (701) 587-6010
Benson: (320) 843-4109

SOIL TEST REPORT

FIELD ID **E1/2 OF SE 22**
SAMPLE ID
FIELD NAME
COUNTY
TWP **8-7 W1** RANGE
SECTION **22** QTR **SE** ACRES **80**
PREV. CROP **Soybeans**



SUBMITTED FOR:
R.M. OF GREY

SUBMITTED BY: **TE0509**
R-WAY AG.
PO BOX 388
ST CLAUDE, MB **R0G 1Z0**

REF # **14105418** BOX # **421**
LAB # **NW193308**

Date Sampled **11/14/2018** Date Received **11/15/2018** Date Reported **3/7/2019**

Nutrient In The Soil		Interpretation			
		VLow	Low	Med	High
0-6" 7 lb/ac 6-24" 12 lb/ac 0-24'' 19 lb/ac Nitrate		****			
Olsen Phosphorus	11 ppm	**********	**********	**********	
Potassium	146 ppm	**********	**********	**********	**********
0-24'' Chloride	124 lb/ac	**********	**********	**********	**********
0-6" 46 lb/ac 6-24" 360 +lb/ac Sulfur		**********	**********	**********	**********
Boron	0.8 ppm	**********	**********		
Zinc	0.84 ppm	**********	**********	**********	
Iron	27.5 ppm	**********	**********	**********	**********
Manganese	2.3 ppm	**********	**********	**********	**********
Copper	0.23 ppm	**********			
Magnesium	294 ppm	**********	**********	**********	**********
Calcium	3466 ppm	**********	**********	**********	**********
Sodium	35 ppm	**********			
Org.Matter	2.3 %	**********	**********		
Carbonate(CCE)	1.7 %	**********	**********		
0-6" 0.21 mmho/cm 6-24" 0.4 mmho/cm Sol. Salts		**********	**********		

1st Crop Choice			2nd Crop Choice			3rd Crop Choice		
Wheat-Spring								
YIELD GOAL			YIELD GOAL			YIELD GOAL		
70 BU								
SUGGESTED GUIDELINES			SUGGESTED GUIDELINES			SUGGESTED GUIDELINES		
Band/Maint.								
LB/ACRE		APPLICATION	LB/ACRE		APPLICATION	LB/ACRE		APPLICATION
N	155		N			N		
P_2O_5	44	Band *	P_2O_5			P_2O_5		
K_2O	26	Band *	K_2O			K_2O		
Cl	0		Cl			Cl		
S	0		S			S		
B	0		B			B		
Zn	2	Band (Trial)	Zn			Zn		
Fe	0		Fe			Fe		
Mn	0		Mn			Mn		
Cu	3	Band	Cu			Cu		
Mg	0		Mg			Mg		
Lime			Lime			Lime		

Soil pH	Buffer pH	Cation Exchange Capacity	% Base Saturation (Typical Range)				
			% Ca	% Mg	% K	% Na	% H
0-6" **7.8** 6-24" **8.2**		**20.3 meq**	(65-75) **85.3**	(15-20) **12.1**	(1-7) **1.8**	(0-5) **0.7**	(0-5)

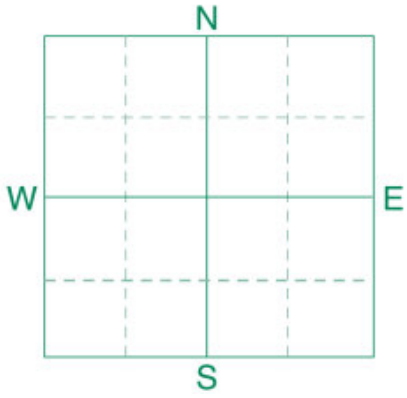
General Comments: Texture is not estimated on high pH soils.

Crop 1: * Caution: Seed Placed Fertilizer Can Cause Injury * Nitrogen is credited 15 lbs for the previous crop. Nitrogen credits may need to be adjusted based on local conditions. Many crops may respond to a starter application of P & K even on high soil tests. Crop Removal: P2O5 = 44 K2O = 26 AGVISE Band/Maintenance guidelines will build P & K test levels to the medium range over many years and then maintain them.

AGVISE LABORATORIES
Soil Analysis by Agvise Laboratories
(http://www.agvise.com)
Northwood: (701) 587-6010
Benson: (320) 843-4109

SOIL TEST REPORT

FIELD ID **M1/3 OF SW 23**
SAMPLE ID
FIELD NAME
COUNTY
TWP **8-7 W1** RANGE
SECTION **23** QTR **SW** ACRES **90**
PREV. CROP **Wheat-Spring**



SUBMITTED FOR:
R.M. OF GREY

SUBMITTED BY: **TE0509**
R-WAY AG.
PO BOX 388
ST CLAUDE, MB **R0G 1Z0**

REF # **14105420** BOX # **479**
LAB # **NW193310**

Date Sampled **11/14/2018** Date Received **11/15/2018** Date Reported **3/7/2019**

Nutrient In The Soil		Interpretation			
		VLow	Low	Med	High
0-6" 7 lb/ac 6-24" 9 lb/ac 0-24'' 16 lb/ac Nitrate		***			
Olsen Phosphorus	8 ppm	**********			
Potassium	144 ppm	**********	**********	**********	****
0-24'' Chloride	124 lb/ac	**********	**********	**********	**********
0-6" 62 lb/ac 6-24" 360 +lb/ac Sulfur		**********	**********	**********	**********
Boron	1.1 ppm	**********	**********	****	
Zinc	0.47 ppm	*********	***		
Iron	19.7 ppm	**********	**********	**********	**********
Manganese	3.2 ppm	**********	**********	*********	**
Copper	0.3 ppm	******			
Magnesium	290 ppm	**********	**********	*********	**
Calcium	4421 ppm	**********	**********	**********	**********
Sodium	20 ppm	***			
Org.Matter	2.8 %	**********	******		
Carbonate(CCE)	2.7 %	**********	**********		
0-6" 0.23 mmho/cm 6-24" 0.38 mmho/cm Sol. Salts		******			
		**********	***		

1st Crop Choice			2nd Crop Choice			3rd Crop Choice		
Canola-bu								
YIELD GOAL			YIELD GOAL			YIELD GOAL		
50 BU								
SUGGESTED GUIDELINES			SUGGESTED GUIDELINES			SUGGESTED GUIDELINES		
Band/Maint.								
LB/ACRE		APPLICATION	LB/ACRE		APPLICATION	LB/ACRE		APPLICATION
N	159		N			N		
P_2O_5	45	Band *	P_2O_5			P_2O_5		
K_2O	23	Band *	K_2O			K_2O		
Cl		Not Available	Cl			Cl		
S	12	Band	S			S		
B	0		B			B		
Zn	3	Band (Trial)	Zn			Zn		
Fe	0		Fe			Fe		
Mn	0		Mn			Mn		
Cu	1	Band	Cu			Cu		
Mg	0		Mg			Mg		
Lime			Lime			Lime		

Soil pH	Buffer pH	Cation Exchange Capacity	% Base Saturation (Typical Range)				
			% Ca	% Mg	% K	% Na	% H
0-6" **8.1** 6-24" **8.4**		**25.0 meq**	(65-75) **88.5**	(15-20) **9.7**	(1-7) **1.5**	(0-5) **0.3**	(0-5)

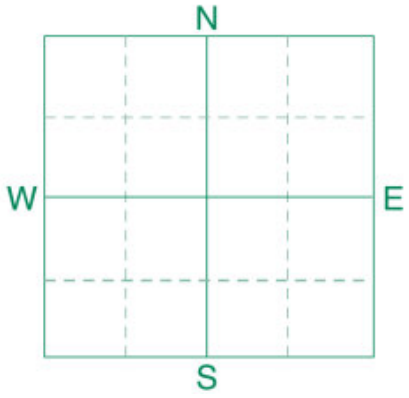
General Comments: Texture is not estimated on high pH soils.

Crop 1: ** Chloride yield data is limited for this crop. * Caution: Seed Placed Fertilizer Can Cause Injury * Many crops may respond to a starter application of P & K even on high soil tests. Crop Removal: P2O5 = 45 K2O = 23 AGVISE Band/Maintenance guidelines will build P & K test levels to the medium range over many years and then maintain them.

Soil Analysis by Agvise Laboratories
(http://www.agvise.com)
Northwood: (701) 587-6010
Benson: (320) 843-4109

SOIL TEST REPORT

FIELD ID **E1/3 OF SW 23**
SAMPLE ID
FIELD NAME
COUNTY
TWP **8-7 W1** RANGE
SECTION **23** QTR **SW** ACRES **55**
PREV. CROP **Wheat-Spring**



SUBMITTED FOR:
R.M. OF GREY

SUBMITTED BY: **TE0509**
R-WAY AG.
PO BOX 388
ST CLAUDE, MB **R0G 1Z0**

REF # **14105421** BOX # **421**
LAB # **NW193306**

Date Sampled **11/14/2018** Date Received **11/15/2018** Date Reported **3/7/2019**

Nutrient In The Soil		Interpretation (VLow / Low / Med / High)
Nitrate	0-6" **4 lb/ac** 6-24" **9 lb/ac** 0-24'' **13 lb/ac**	***
Phosphorus	**Olsen** **13 ppm**	**********
Potassium	**96 ppm**	**********
Chloride	0-24'' **288 lb/ac**	**********
Sulfur	0-6" **46 lb/ac** 6-24" **168 lb/ac**	**********
Boron	**0.7 ppm**	**********
Zinc	**0.46 ppm**	**********
Iron	**31.3 ppm**	**********
Manganese	**3.6 ppm**	**********
Copper	**0.68 ppm**	**********
Magnesium	**374 ppm**	**********
Calcium	**3460 ppm**	**********
Sodium	**31 ppm**	*****
Org.Matter	**1.8 %**	*******
Carbonate(CCE)	**1.5 %**	********
Sol. Salts	0-6" **0.21 mmho/cm** 6-24" **0.32 mmho/cm**	***** ********

1st Crop Choice		
Canola-bu		
YIELD GOAL		
50 BU		
SUGGESTED GUIDELINES		
Band/Maint.		
LB/ACRE		APPLICATION
N	**162**	
P_2O_5	**45**	**Band ***
K_2O	**40**	**Band ***
Cl		**Not Available**
S	**12**	**Band**
B	**1**	**Broadcast**
Zn	**2**	**Band (Trial)**
Fe	**0**	
Mn	**0**	
Cu	**0**	
Mg	**0**	
Lime		

2nd Crop Choice		
YIELD GOAL		
SUGGESTED GUIDELINES		
LB/ACRE		APPLICATION
N		
P_2O_5		
K_2O		
Cl		
S		
B		
Zn		
Fe		
Mn		
Cu		
Mg		
Lime		

3rd Crop Choice		
YIELD GOAL		
SUGGESTED GUIDELINES		
LB/ACRE		APPLICATION
N		
P_2O_5		
K_2O		
Cl		
S		
B		
Zn		
Fe		
Mn		
Cu		
Mg		
Lime		

Soil pH	Buffer pH	Cation Exchange Capacity	% Base Saturation (Typical Range)				
			% Ca	% Mg	% K	% Na	% H
0-6" **7.9** 6-24" **8.2**		**20.8 meq**	(65-75) **83.2**	(15-20) **15.0**	(1-7) **1.2**	(0-5) **0.6**	(0-5)

General Comments: Texture is not estimated on high pH soils.

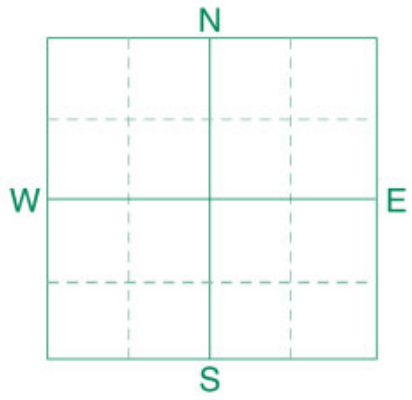
Crop 1: ** Chloride yield data is limited for this crop. * Caution: Seed Placed Fertilizer Can Cause Injury * Many crops may respond to a starter application of P & K even on high soil tests. Crop Removal: P2O5 = 45 K2O = 23 AGVISE Band/Maintenance guidelines will build P & K test levels to the medium range over many years and then maintain them.

AGVISE LABORATORIES

Soil Analysis by Agvise Laboratories
(http://www.agvise.com)
Northwood: (701) 587-6010
Benson: (320) 843-4109

SOIL TEST REPORT

FIELD ID **W1/2 OF SE 22**
SAMPLE ID
FIELD NAME
COUNTY
TWP **8-7 W1** RANGE
SECTION **22** QTR **SE** ACRES **80**
PREV. CROP **Soybeans**



SUBMITTED FOR:
R.M. OF GREY

SUBMITTED BY: **TE0509**
R-WAY AG.
PO BOX 388
ST CLAUDE, MB **R0G 1Z0**

REF # **14105417** BOX # **421**
LAB # **NW193307**

Date Sampled **11/14/2018** Date Received **11/15/2018** Date Reported **3/7/2019**

Nutrient In The Soil		Interpretation			
		VLow	Low	Med	High
Nitrate	0-6" 4 lb/ac 6-24" 9 lb/ac 0-24'' 13 lb/ac	***			
Phosphorus	Olsen 16 ppm	**********	**********	**********	**********
Potassium	132 ppm	**********	**********	**********	**
Chloride	0-24'' 296 lb/ac	**********	**********	**********	**********
Sulfur	0-6" 56 lb/ac 6-24" 210 lb/ac	**********	**********	**********	**********
Boron	0.9 ppm	**********	**********	**********	
Zinc	0.51 ppm	**********	**********		
Iron	30.7 ppm	**********	**********	**********	**********
Manganese	3.1 ppm	**********	**********	**********	**
Copper	0.2 ppm	****			
Magnesium	380 ppm	**********	**********	**********	**********
Calcium	3742 ppm	**********	**********	**********	**********
Sodium	37 ppm	**********			
Org.Matter	2.1 %	**********			
Carbonate(CCE)	1.8 %	**********	**********		
Sol. Salts	0-6" 0.25 mmho/cm 6-24" 0.36 mmho/cm	**********	**********		

1st Crop Choice			2nd Crop Choice			3rd Crop Choice		
Wheat-Spring								
YIELD GOAL			YIELD GOAL			YIELD GOAL		
70 BU								
SUGGESTED GUIDELINES			SUGGESTED GUIDELINES			SUGGESTED GUIDELINES		
Band/Maint.								
LB/ACRE		APPLICATION	LB/ACRE		APPLICATION	LB/ACRE		APPLICATION
N	161		N			N		
P_2O_5	44	Band *	P_2O_5			P_2O_5		
K_2O	33	Band *	K_2O			K_2O		
Cl	0		Cl			Cl		
S	0		S			S		
B	0		B			B		
Zn	2	Band (Trial)	Zn			Zn		
Fe	0		Fe			Fe		
Mn	0		Mn			Mn		
Cu	3	Band	Cu			Cu		
Mg	0		Mg			Mg		
Lime			Lime			Lime		

Soil pH	Buffer pH	Cation Exchange Capacity	% Base Saturation (Typical Range)				
			% Ca	% Mg	% K	% Na	% H
0-6" **7.8** 6-24" **8.2**		**22.4 meq**	(65-75) **83.6**	(15-20) **14.2**	(1-7) **1.5**	(0-5) **0.7**	(0-5)

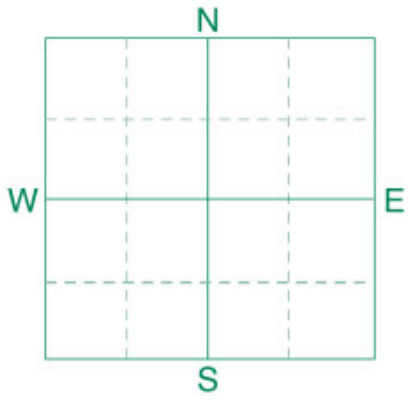
General Comments: Texture is not estimated on high pH soils.

Crop 1: * Caution: Seed Placed Fertilizer Can Cause Injury * Nitrogen is credited 15 lbs for the previous crop. Nitrogen credits may need to be adjusted based on local conditions. Many crops may respond to a starter application of P & K even on high soil tests. Crop Removal: P2O5 = 44 K2O = 26 AGVISE Band/Maintenance guidelines will build P & K test levels to the medium range over many years and then maintain them.

Soil Analysis by Agvise Laboratories
(http://www.agvise.com)
Northwood: (701) 587-6010
Benson: (320) 843-4109

SOIL TEST REPORT

FIELD ID **W1/3 OF SW 23**
SAMPLE ID
FIELD NAME
COUNTY
TWP **8-7 W1** RANGE
SECTION **23** QTR **SW** ACRES **90**
PREV. CROP **Wheat-Spring**



SUBMITTED FOR:
R.M. OF GREY

SUBMITTED BY: **TE0509**
R-WAY AG.
PO BOX 388
ST CLAUDE, MB **R0G 1Z0**

REF # **14105419** BOX # **422**
LAB # **NW193309**

Date Sampled **11/14/2018** Date Received **11/15/2018** Date Reported **3/7/2019**

Nutrient In The Soil		Interpretation			
		VLow	Low	Med	High
0-6" 8 lb/ac 6-24" 12 lb/ac 0-24'' 20 lb/ac Nitrate		****			
Olsen Phosphorus	8 ppm	**********			
Potassium	116 ppm	**********	**********	*****	
0-24'' Chloride	196 lb/ac	**********	**********	**********	**********
0-6" 120 +lb/ac 6-24" 360 +lb/ac Sulfur		**********	**********	**********	**********
Boron	1.0 ppm	**********	**********	***	
Zinc	0.38 ppm	*******			
Iron	16.4 ppm	**********	**********	**********	**********
Manganese	2.0 ppm	**********	**********	******	
Copper	0.26 ppm	*****			
Magnesium	429 ppm	**********	**********	**********	**********
Calcium	5009 ppm	**********	**********	**********	**********
Sodium	25 ppm	****			
Org.Matter	2.4 %	*********	***		
Carbonate(CCE)	3.5 %	**********	*********	**	
0-6" 0.62 mmho/cm 6-24" 1.11 mmho/cm Sol. Salts		**********	**********	***	
		**********	**********	**********	**

1st Crop Choice		
Canola-bu		
YIELD GOAL		
50 BU		
SUGGESTED GUIDELINES		
Band/Maint.		
LB/ACRE		APPLICATION
N	155	
P_2O_5	45	Band *
K_2O	30	Band *
Cl		Not Available
S	12	Band
B	0	
Zn	3	Band (Trial)
Fe	0	
Mn	0	
Cu	1	Band
Mg	0	
Lime		

2nd Crop Choice		
YIELD GOAL		
SUGGESTED GUIDELINES		
LB/ACRE		APPLICATION
N		
P_2O_5		
K_2O		
Cl		
S		
B		
Zn		
Fe		
Mn		
Cu		
Mg		
Lime		

3rd Crop Choice		
YIELD GOAL		
SUGGESTED GUIDELINES		
LB/ACRE		APPLICATION
N		
P_2O_5		
K_2O		
Cl		
S		
B		
Zn		
Fe		
Mn		
Cu		
Mg		
Lime		

Soil pH	Buffer pH	Cation Exchange Capacity	% Base Saturation (Typical Range)				
			% Ca	% Mg	% K	% Na	% H
0-6" **8.1** 6-24" **8.2**		**29.0 meq**	(65-75) **86.3**	(15-20) **12.3**	(1-7) **1.0**	(0-5) **0.4**	(0-5)

General Comments: Texture is not estimated on high pH soils.

Crop 1: ** Chloride yield data is limited for this crop. * Caution: Seed Placed Fertilizer Can Cause Injury * Many crops may respond to a starter application of P & K even on high soil tests. Crop Removal: P2O5 = 45 K2O = 23 AGVISE Band/Maintenance guidelines will build P & K test levels to the medium range over many years and then maintain them.

Appendix D

Biosolids Application Rate Calculations

Cell	1	
Target Field Location	SW/W ½ SE 23-8-7 W1	
Area (ac)	234	
Area (ha)	95	
2019 Crop	Canola	
Target Yield	50	bu/ac
	lb/ac	kg/ha
Target Nitrogen Recommended:	140	157
Fertilizer Phosphate (P2O5) Recommended:	40	45
1 x P2O5 Crop Removal @ Target Yield*	52	58
2 x P2O5 Crop Removal @ Target Yield*	104	117

Plant Available Nutrients Soil Test Data			
Agvise Sample ID	14105419, 14105420 and 14105421		
Sample Depth	0-15 cm	15-60cm	Total 0-60 cm
Available Nitrate-N kg/ha	7	11	18
Available Phosphate-P (Olsen) ppm	10		10
Available Potassium ppm	119		119
Available Sulfate-S kg/ha	85	332	417

St Claude Biosolids Characteristics and Analysis			
Parameter Name	**Parameter Description**	**Unit**	**Biosolid Analysis**
Estimated Biosolid Volume (+15% safety volume)	In-field	m3	8821.65
Specific Gravity	As Received	kg/L	1.01
Estimated Biosolids		tonnes	8909.8665
Dry Tonnes Biosolids Available (=wet tonnes x %solids)	Dry Basis	tonnes	837.527451
Moisture	As Received	%	91%
Total Solids	As Received	%	9%
Total Volatile Solids	Dry Basis	%	25%
N:P Ratio	Dry Basis	x:1	0.858156028
pH			7.07
Nitrogen Characteristics			
TKN	Dry Basis	%	2.42
TKN	Dry Basis	mg/kg	24200
TKN	Dry Basis	kg/tonne	24 2
Ammonium - N	Dry Basis	mg/kg	2750
Ammonium - N	Dry Basis	kg/tonne	2.75
Available Nitrate	Dry Basis	mg/kg	
Available Nitrate-N	Dry Basis	mg/kg	
Available Nitrate-N	Dry Basis	kg/tonne	
Organic N (TKN - Ammonium-N)	Dry Basis	mg/kg	21450
Organic N	Dry Basis	kg/tonne	21.45
Method of Application			Injected
Anticipated Weather			Cool/dry
Anticipated Volatilization (%)			-
Available Organic N	Dry Basis	kg/tonne	5.36
Ammonium-N Available	Dry Basis	kg/tonne	2.75
Total Available N (Year 1) (@25%)	Dry Basis	kg/tonne	8.11
Mineralization N Year 2 (@12%)	Dry Basis	kg/tonne	2.57
Mineralization N Year 3 (@6%)	Dry Basis	kg/tonne	1.29
Phosphorus Characteristics			
Total Phosphorus	Dry Basis	mg/kg	28200
Total Phosphorus	Dry Basis	kg/tonne	28.20
P2O5 (equivalent)	Dry Basis	kg/tonne	64.86
Total Available P2O5 (@50%)	Dry Basis	kg/tonne	32.43

Application Rate based on Nitrogen				Land Area Required (Ha)
Nitrogen Based Application Rate	Dry Basis	tonne/ha	19 34285302	43 30
Amount of Available P2O5 Applied	Dry Basis	kg/ha	627.2887235	
P2O5 Application Check		%	1399.14%	

Application Rate based on Phosphorus (1xCR)				Land Area Required (Ha)
Total Phosphorus Based Application Rate	Dry Basis	tonne/ha	1.797229758	466 01
Amount of Nitrogen Applied	Dry Basis	kg/ha	14 58002641	
Additional Nitrogen Required		kg/ha	142	

Application Rate based on Phosphorus (2xCR)				Land Area Required (Ha)
Total Phosphorus Based Application Rate	Dry Basis	tonne/ha	3.594459516	233 01
Amount of Nitrogen Applied	Dry Basis	kg/ha	29.16005282	
Additional Nitrogen Required		kg/ha	128	

Cell	1	
Target Field Location	SE 22-8-7 W1	
Area (ac)	160	
Area (ha)	65	
2019 Crop	Spring Wheat	
Target Yield	70	bu/ac
	lb/ac	kg/ha
Target Nitrogen Recommended:	115	129
Fertilizer Phosphate (P2O5) Recommended:	32	36
1 x P2O5 Crop Removal @ Target Yield*	41	46
2 x P2O5 Crop Removal @ Target Yield*	83	93

Plant Available Nutrients Soil Test Data			
Agvise Sample ID	14105417 and 14105418		
Sample Depth	0-15 cm	15-60cm	Total 0-60 cm
Available Nitrate-N kg/ha	6	12	18
Available Phosphate-P (Olsen) ppm	14		14
Available Potassium ppm	139		139
Available Sulfate-S kg/ha	57	319	376

St Claude Biosolids Characteristics and Analysis			
Parameter Name	**Parameter Description**	**Unit**	**Biosolid Analysis**
Estimated Biosolid Volume (+15% safety volume)	In-field	m3	8821.65
Specific Gravity	As Received	kg/L	1.01
Estimated Biosolids		tonnes	8909.8665
Dry Tonnes Biosolids Available (=wet tonnes x %solids)	Dry Basis	tonnes	837.527451
Moisture	As Received	%	91%
Total Solids	As Received	%	9%
Total Volatile Solids	Dry Basis	%	25%
N:P Ratio	Dry Basis	x:1	0.858156028
pH			7.07
Nitrogen Characteristics			
TKN	Dry Basis	%	2.42
TKN	Dry Basis	mg/kg	24200
TKN	Dry Basis	kg/tonne	24.2
Ammonium - N	Dry Basis	mg/kg	2750
Ammonium - N	Dry Basis	kg/tonne	2.75
Available Nitrate	Dry Basis	mg/kg	
Available Nitrate-N	Dry Basis	mg/kg	
Available Nitrate-N	Dry Basis	kg/tonne	
Organic N (TKN - Ammonium-N)	Dry Basis	mg/kg	21450
Organic N	Dry Basis	kg/tonne	21.45
Method of Application			Injected
Anticipated Weather			Cool/dry
Anticipated Volatilization (%)			-
Available Organic N	Dry Basis	kg/tonne	5.36
Ammonium-N Available	Dry Basis	kg/tonne	2.75
Total Available N (Year 1) (@25%)	Dry Basis	kg/tonne	8.11
Mineralization N Year 2 (@12%)	Dry Basis	kg/tonne	2.57
Mineralization N Year 3 (@6%)	Dry Basis	kg/tonne	1.29
Phosphorus Characteristics			
Total Phosphorus	Dry Basis	mg/kg	28200
Total Phosphorus	Dry Basis	kg/tonne	28.20
P2O5 (equivalent)	Dry Basis	kg/tonne	64.86
Total Available P2O5 (@50%)	Dry Basis	kg/tonne	32.43

Application Rate based on Nitrogen				Land Area Required (Ha)
Nitrogen Based Application Rate	Dry Basis	tonne/ha	15.88877213	52.71
Amount of Available P2O5 Applied	Dry Basis	kg/ha	515.27288	
P2O5 Application Check		%	1436.61%	

Application Rate based on Phosphorus (1xCR)				Land Area Required (Ha)
Total Phosphorus Based Application Rate	Dry Basis	tonne/ha	1.427415173	586.74
Amount of Nitrogen Applied	Dry Basis	kg/ha	11.57990559	
Additional Nitrogen Required		kg/ha	117	

Application Rate based on Phosphorus (2xCR)				Land Area Required (Ha)
Total Phosphorus Based Application Rate	Dry Basis	tonne/ha	2.854830346	293.37
Amount of Nitrogen Applied	Dry Basis	kg/ha	23.15981119	
Additional Nitrogen Required		kg/ha	106	

Cell	2	
Target Field Location	SW/W ½ SE 23-8-7 W1	
Area (ac)	234	
Area (ha)	95	
2019 Crop	Canola	
Target Yield	50	bu/ac
	lb/ac	kg/ha
Target Nitrogen Recommended:	140	157
Fertilizer Phosphate (P2O5) Recommended:	40	45
1 x P2O5 Crop Removal @ Target Yield*	52	58
2 x P2O5 Crop Removal @ Target Yield*	104	117

Plant Available Nutrients Soil Test Data			
Agvise Sample ID	14105419, 14105420 and 14105421		
Sample Depth	0-15 cm	15-60cm	Total 0-60 cm
Available Nitrate-N kg/ha	7	11	18
Available Phosphate-P (Olsen) ppm	10		10
Available Potassium ppm	119		119
Available Sulfate-S kg/ha	85	332	417

St Claude Biosolids Characteristics and Analysis			
Parameter Name	**Parameter Description**	**Unit**	**Biosolid Analysis**
Estimated Biosolid Volume (+15% safety volume)	In-field	m3	4688.55
Specific Gravity	As Received	kg/L	1.01
Estimated Biosolids		tonnes	4735.4355
Dry Tonnes Biosolids Available (=wet tonnes x %solids)	Dry Basis	tonnes	208.359162
Moisture	As Received	%	96%
Total Solids	As Received	%	4%
Total Volatile Solids	Dry Basis	%	25%
N:P Ratio	Dry Basis	x:1	0.794871795
pH			7.24
Nitrogen Characteristics			
TKN	Dry Basis	%	1.55
TKN	Dry Basis	mg/kg	15500
TKN	Dry Basis	kg/tonne	15.5
Ammonium - N	Dry Basis	mg/kg	1840
Ammonium - N	Dry Basis	kg/tonne	1.84
Available Nitrate	Dry Basis	mg/kg	
Available Nitrate-N	Dry Basis	mg/kg	
Available Nitrate-N	Dry Basis	kg/tonne	
Organic N (TKN - Ammonium-N)	Dry Basis	mg/kg	13660
Organic N	Dry Basis	kg/tonne	13.66
Method of Application			Injected
Anticipated Weather			Cool/dry
Anticipated Volatilization (%)			-
Available Organic N	Dry Basis	kg/tonne	3.42
Ammonium-N Available	Dry Basis	kg/tonne	1.84
Total Available N (Year 1) (@25%)	Dry Basis	kg/tonne	5.26
Mineralization N Year 2 (@12%)	Dry Basis	kg/tonne	1.64
Mineralization N Year 3 (@6%)	Dry Basis	kg/tonne	0.82
Phosphorus Characteristics			
Total Phosphorus	Dry Basis	mg/kg	19500
Total Phosphorus	Dry Basis	kg/tonne	19 50
P2O5 (equivalent)	Dry Basis	kg/tonne	44 85
Total Available P2O5 (@50%)	Dry Basis	kg/tonne	22.43

Application Rate based on Nitrogen				Land Area Required (Ha)
Nitrogen Based Application Rate	Dry Basis	tonne/ha	29.86087443	6.98
Amount of Available P2O5 Applied	Dry Basis	kg/ha	669.6301092	
P2O5 Application Check		%	1493 58%	

Application Rate based on Phosphorus (1xCR)				Land Area Required (Ha)
Total Phosphorus Based Application Rate	Dry Basis	tonne/ha	2.599070727	80.17
Amount of Nitrogen Applied	Dry Basis	kg/ha	13.65811667	
Additional Nitrogen Required		kg/ha	143	

Application Rate based on Phosphorus (2xCR)				Land Area Required (Ha)
Total Phosphorus Based Application Rate	Dry Basis	tonne/ha	5.198141454	40.08
Amount of Nitrogen Applied	Dry Basis	kg/ha	27.31623334	
Additional Nitrogen Required		kg/ha	130	

Cell	2	
Target Field Location	SE 22-8-7 W1	
Area (ac)	160	
Area (ha)	65	
2019 Crop	Spring Wheat	
Target Yield	70	bu/ac
	lb/ac	kg/ha
Target Nitrogen Recommended:	115	129
Fertilizer Phosphate (P2O5) Recommended:	32	36
1 x P2O5 Crop Removal @ Target Yield*	41	46
2 x P2O5 Crop Removal @ Target Yield*	83	93

Plant Available Nutrients Soil Test Data			
Agvise Sample ID	14105417 and 14105418		
Sample Depth	0-15 cm	15-60cm	Total 0-60 cm
Available Nitrate-N kg/ha	6	12	18
Available Phosphate-P (Olsen) ppm	14		14
Available Potassium ppm	139		139
Available Sulfate-S kg/ha	57	319	376

St Claude Biosolids Characteristics and Analysis			
Parameter Name	**Parameter Description**	**Unit**	**Biosolid Analysis**
Estimated Biosolid Volume (+15% safety volume)	In-field	m3	4688.55
Specific Gravity	As Received	kg/L	1.01
Estimated Biosolids		tonnes	4735.4355
Dry Tonnes Biosolids Available (=wet tonnes x %solids)	Dry Basis	tonnes	208.359162
Moisture	As Received	%	96%
Total Solids	As Received	%	4%
Total Volatile Solids	Dry Basis	%	25%
N:P Ratio	Dry Basis	x:1	0.794871795
pH			7.24
Nitrogen Characteristics			
TKN	Dry Basis	%	1.55
TKN	Dry Basis	mg/kg	15500
TKN	Dry Basis	kg/tonne	15.5
Ammonium - N	Dry Basis	mg/kg	1840
Ammonium - N	Dry Basis	kg/tonne	1.84
Available Nitrate	Dry Basis	mg/kg	
Available Nitrate-N	Dry Basis	mg/kg	
Available Nitrate-N	Dry Basis	kg/tonne	
Organic N (TKN - Ammonium-N)	Dry Basis	mg/kg	13660
Organic N	Dry Basis	kg/tonne	13.66
Method of Application			Injected
Anticipated Weather			Cool/dry
Anticipated Volatilization (%)			-
Available Organic N	Dry Basis	kg/tonne	3.42
Ammonium-N Available	Dry Basis	kg/tonne	1.84
Total Available N (Year 1) (@25%)	Dry Basis	kg/tonne	5.26
Mineralization N Year 2 (@12%)	Dry Basis	kg/tonne	1.64
Mineralization N Year 3 (@6%)	Dry Basis	kg/tonne	0.82
Phosphorus Characteristics			
Total Phosphorus	Dry Basis	mg/kg	19500
Total Phosphorus	Dry Basis	kg/tonne	19.50
P2O5 (equivalent)	Dry Basis	kg/tonne	44.85
Total Available P2O5 (@50%)	Dry Basis	kg/tonne	22.43

Application Rate based on Nitrogen				Land Area Required (Ha)
Nitrogen Based Application Rate	Dry Basis	tonne/ha	24.52857543	8.49
Amount of Available P2O5 Applied	Dry Basis	kg/ha	550.0533039	
P2O5 Application Check		%	1533.58%	

Application Rate based on Phosphorus (1xCR)				Land Area Required (Ha)
Total Phosphorus Based Application Rate	Dry Basis	tonne/ha	2.064261943	100.94
Amount of Nitrogen Applied	Dry Basis	kg/ha	10 84769651	
Additional Nitrogen Required		kg/ha	118	

Application Rate based on Phosphorus (2xCR)				Land Area Required (Ha)
Total Phosphorus Based Application Rate	Dry Basis	tonne/ha	4.128523886	50.47
Amount of Nitrogen Applied	Dry Basis	kg/ha	21 69539302	
Additional Nitrogen Required		kg/ha	107	

Gaia Consulting Ltd
Box 314
Portage la Prairie MB R1N 3B5
(204) 267-2665
www.gaiaconsulting.mb.ca

March 7, 2019

Indira Maharaj
Dillon Consulting Limited
1558 Willson Place
Winnipeg, Manitoba, R3T 0Y4

Dear Ms Maharaj,

Re: Environment Act Proposal, Municipality of Gray – St Claude Land Application of Lagoon Sludge.

Below are my comments regarding the calculations to apply biosolids from Cells 1 and 2 of the St Claude sewage lagoon onto agricultural land.

Multiple soil analyses were conducted in each field; two in SE 22-8-7 W1 and three in SW and SE 23-8-7 W1. The average of the analyses for each field was used in calculating the biosolid application rates.

The field identification labels in the three soil analysis reports for SW 23-8-7 W1 are incorrectly labeled. The correct field identifications are listed below:

Original Field ID	Corrected Field ID
E 1/3 Of SW 23	W 1/2 SE 23
M 1/3 Of SW 23	E 1/2 SW 23
W 1/3 Of SW 23	W 1/2 SW 23

Soil analysis indicated that the concentration of P2O5 was between 10 and 14 ppm, well below the 60 ppm threshold where P2O5 application is restricted. As a result, the application of biosolids is based on crop nitrogen demand.

The Agvise soil reports contain fertilizer recommendations for specific target yields. Steph Rouire, a crop consultant with R-Way Ag, recommended lower application rates of nitrogen for both the wheat and canola crops. R-Way Ag nutrient recommendations were used in calculating the rate of biosolid application.

Yours truly,

[redacted]

Blair Geisel,
Gaia Consulting Ltd.

Appendix E

Species of Concern and Heritage Resources Correspondence

DILLON CONSULTING

Pogue, Charlie <cpogue@dillon.ca>

Heritage Resources Search Request - RM of Grey

+WPG574 - HRB Archaeology (SCH) <HRB.archaeology@gov.mb.ca> Tue, Apr 9, 2019 at 9:27 AM
To: "Pogue, Charlie" <cpogue@dillon.ca>

Good morning Charlie,

The Hi toric Re ource Branch ha reviewed the propo ed St Claude wa tewater lagoon land application of bio olid work in the RM of Grey (specifically sections 22 and 23-8-7 W) and have **no concerns** at this time.

If at any time, however, heritage resources are encountered in association with this project, the Historic Resources Branch must be immediately contacted.

If there are further questions, please feel free to reach me at the contact info below.

Thank you.

Sincerely,

Holly Cote

Holly Cote

Municipal Heritage Consultant

Historic Resources Branch

Main Floor - 213 Notre Dame Avenue, Winnipeg, MB R3B 1N3

Phone (204) 945-7259; Fax (204) 948-2384

E-mail: Holly.Cote@gov.mb.ca

Manitoba

Sport, Culture and Heritage

From: Pogue, Charlie <cpogue@dillon.ca>
Sent: April 8, 2019 11:21 AM
To: +WPG574 - HRB Archaeology (SCH) <HRB.archaeology@gov.mb.ca>
Cc: Indira Maharaj <imaharaj@dillon.ca>
Subject: Re: Heritage Resources Search Request - RM of Grey

Hi Holly,

I am following up on a request I made early in 2018 in regards to a search conducted for any potential heritage resources that may be located in a project study area. I am preparing an Environmental Act Proposal for Sustainable Development. The project involves the land application of biosolids from the St. Claude wastewater lagoon in the RM of Grey. There is no development for the project, it is utilizing previously identified agricultural land.

It has been determined that there will be minimal subsurface disturbance at the site from biosolid injection. Please advise if this changes anything with your earlier assessment.

The location of interest includes Sections 22 and 23 at Township 8, Range 7, Meridian W1.

Thanks,

Charlie Pogue
Dillon Consulting Limited
1558 Willson Place
Winnipeg, Manitoba, R3T 0Y4
T - 204.453.2301 ext. 4051
F - 204.452.4412
CPogue@dillon.ca
www.dillon.ca

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[Quoted text hidden]
[Quoted text hidden]

Thanks,

--

Charlie Pogue
Dillon Consulting Limited
1558 Willson Place
Winnipeg, Manitoba, R3T 0Y4

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Please consider the environment before printing this email

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DILLON CONSULTING

Pogue, Charlie <cpogue@dillon.ca>

RM of Grey Biosolids Application

Friesen, Chris (SD) <Chris.Friesen@gov.mb.ca> Tue, Jan 2, 2018 at 8:54 AM
To: "cpogue@dillon.ca" <cpogue@dillon.ca>

Charlie

Thank you for your information request. I completed a search of the MB Conservation Data Centre rare species database which resulted in the following occurrences:

Bank Swallow (Riparia riparia), S5B, SARA Threatened, COSEWIC Threatened
SW 14-8-7W
SE 15-8-7W

Bobolink (Dolichony oryzivoru), S4B, SARA Threatened, COSEWIC Threatened
NE 13-8-7W
SE 24-8-7W
NW 35-8-7W
SE 35 8 7W
SW 36-8-7W

Barn Swallow (Hirundo rustica), S4B, SARA: Threatened, COSEWIC: Threatened
NW 32 8 7W

Grasshopper Sparrow (Ammodramus savannarum), S3B
N 36-8-7W

Further information on this ranking system can be found on our website at http://www.gov.mb.ca/conservation/cdc/consranks.html and these designations can be found at http://web2.gov.mb.ca/laws/statutes/ccsm/e111e.php, http://www.cosewic.gc.ca/ and http://www.sararegistry.gc.ca/default_e.cfm.

Manitoba's recommended setback distances can be found at http://www.gov.mb.ca/conservation/cdc/pubs.html

The information provided in this letter is based on existing data known to the Manitoba CDC of the Wildlife and Fisheries Branch at the time of the reque t The e data are dependent on the re earch and ob ervation of our cienti t and reflects our current state of knowledge. An absence of data does not confirm the absence of any rare or endangered species. Many areas of the province have never been thoroughly surveyed, however, and the absence of data in any particular geographic area does not necessarily mean that species or ecological communities of concern are not present. The information hould, therefore, not be regarded a a final tatement on the occurrence of any pecie of concern nor should it substitute for on-site surveys for species or environmental assessments. Also, because our Biotics database is continually updated and because information requests are evaluated by type of action, any given response is only appropriate for its respective request.

Please contact the Manitoba CDC for an update on this natural heritage information if more than six months passes before it is utilised.

Third party reque t for product wholly or partially derived from the Biotic databa e mu t be approved by the Manitoba CDC before information is released. Once approved, the primary user will identify the Manitoba CDC as data contributors on any map or publication using data from our database, as the Manitoba Conservation Data Centre; Wildlife and Fisheries Branch, Manitoba Sustainable Development.

This letter is for information purposes only - it does not constitute consent or approval of the proposed project or activity, nor does it negate the need for any permits or approvals required by the Province of Manitoba.

We would be intere ted in receiving a copy of the re ult of any field urvey that you may undertake, to update our database with the most current knowledge of the area.

If you have any questions or require further information contact me directly at (204) 945-7747.

Chris Friesen
Coordinator
Manitoba Con ervation Data Centre
204-945-7747
chris.friesen@gov.mb.ca
http://www.manitoba.ca/sd/cdc/

-----Original Message-----
From:
Sent: December-19-17 1:32 PM
To Frie en, Chri (SD) Chri Frie en@gov mb ca
Subject: Spam: WWW Form Submission

Below is the result of your feedback form. It was submitted by WWW Information Request () on Tuesday, December 19, 2017 at 13 32 17

DocumentID: Manitoba_Conservation

Project Title: RM of Grey Biosolids Application

Date Needed: 2017/01/12

Name: Charlie Pogue

Company/Organization: Dillon Consulting

Address: 1558 Willson Place

City: Winnipeg

Province/State: Manitonba

Phone: 2044532301

Fax: 2044524412

Email: cpogue@dillon.ca

Project Description: The information will be used to develop an Environmental Act Proposal for the Rural Municipality of Grey for biosolid land application of their wastewater lagoon.

Information Reque ted Rare and at ri k pecie within the tudy area

Format Requested: Microsoft Word and map

Location Land urrounding the town of St Claude within the RM of Grey Section 1 31, Town hip 8, Range 7, Meridian W1.

action: Submit

Appendix F

Land Use Agreement - Signed

RURAL MUNICIPALITY OF
MUNICIPALITÉ RURALE DE
Grey

Dear Farm Producer,

The Rural Municipality of Grey requires agricultural land to apply bio solids from the aeration cells at the St Claude Lagoon. Applying bio solids to agricultural land is a beneficial and sustainable means to manage this organic material. This is a letter agreement to allow land application to occur on the land parcels outlined below. The following outlines the point of this agreement:

1. Each quarter section will be soil sampled and analyzed for nutrients, metals, and salts. Soil sampling will be completed by truck and is required to determine the rate of application of bio-solids. The soil sampling and analysis will be the responsibility of the biosolids application contractor.
2. Soil sampling may need to occur on more than one occasion and will occur prior to spring seeding and/or post-harvest depending on requirements of environmental license.
3. Bio solids will be applied at agronomic prescribed rates taking into account crop nutrient requirements and Province of Manitoba nutrient management regulations.
4. Application of bio-solids will take place in the spring, after the soil thaws and before seeding and in the fall, after harvest and before the soil freezes.
5. Land application of bio solids will be completed with heavy field equipment and will need good access to the land parcel(s).
6. Landowner is responsible for tillage to break up soil clods and remove wheel tracks caused by the bio-solid application.
7. Biosolids/sludge may require tillage incorporation shortly after application depending upon the application method. This will be done by the biosolids application contractor.
8. If applicable, buffer zones may be left with no bio solid application near property lines, home, groundwater wells and surface water as required by the Manitoba Environment Act.
9. There are no fees to be paid from the Rural Municipality of Grey to the landowner or lessee for:
    a) Bio solids/sludge or nutrients
    b) Use of Land
    c) Application process
    d) Tillage requirements

Box 99
27 Church Avenue East
Elm Creek, Manitoba
R0G 0N0
1-204-436-2014
1-204-436-2543 (fax)
info@rmofgrey.ca (email)
www.rmofgrey.ca (website)

10. Volume of bio solids is not exact, not all the land may be required for application.
11. The landowner has the right to pull out of the program, with sufficient notice (2 weeks).
12. Manitoba Conservation & Climate imposes cropping restrictions for a period of three (3) years following the date of bio solid application to land, the following crops can only be grown; cereal crops, oil seed crops, forage, field peas or lentils.

Legal land location for each parcel: SE 22-8-7W
SW 23-8-7W
Pt W½ SE 23-8-7W

Name Bernard Gaultier

Signature [redacted] Date Jan 9 2021

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Elm Creek, Manitoba
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