

August 30, 2021

Manitoba Conservation and Climate
Environmental Approvals Branch
123 Main Street, Suite 160
Winnipeg, Manitoba R3C 1A5

Attention: Ms. Laura Pyles
Acting Director

Re: R.M. of St Clements – Notice of Alteration (NoA) for Pilot Project for Leachate Irrigation at St. Clements Waste Disposal Ground Licence No 2274 S2 RRR – NoA Revision

Dear Ms. Pyles:

On behalf of the R.M. of St. Clements, Kontzamanis Graumann Smith MacMillan Inc (KGS Group) is pleased to provide you with one (1) electronic copy of the NoA revision regarding a pilot project for leachate irrigation at the St. Clements Waste Disposal Ground.

BACKGROUND

The site currently operates under Environment Act Licence No. 2274 S2 RRR. The Site is classified as a Class 1 WDG under the *Waste Management Facilities Regulation (M.R. 37/2016)*. The site accepts commercial and residential waste from residents of the R.M. of St. Clements (R.M.).

On July 8, 2016, KGS Group on behalf of the R.M., submitted a Notice of Alteration to Environment Act Licence No. 2274 S2 RR for the addition of two leachate collection ponds and associated infrastructure for evaporation and installation of a leachate extraction header into the existing waste area.

As with all landfills, leachate will continue to be generated on an ongoing basis, requiring interim storage and ultimately treatment/management to replenish storage capacity and containment within the pond system. The R.M. is interested in examining optional leachate management technologies in addition to the current evaporation method used at the leachate ponds to ensure a long-term solution. Leachate irrigation is an approach that the R.M. would like to evaluate. However, the parameters for design of leachate irrigation systems and measurement of long-term impacts need to be determined before considering a full scale project. Therefore, a pilot project approach is required to develop site specific design parameters for this potential application.

A Notice of Alteration for a leachate irrigation pilot project was submitted on May 27, 2021. The approval was received from the Environmental Approvals Branch Director on June 18, 2021(see Appendix A).

After obtaining the approval from MCC and discussing the pilot project and timing with the R.M., it was decided to split the current project into two phases. Phase I (2021) for Construction, and Phase II (2022) for the leachate irrigation and testing, to better schedule the project for assessing plant performance with leachate irrigation over a full growing season. Given the on-going excessive heat and drought conditions in 2021, leachate irrigation this summer may have resulted in an inaccurate result, since surface water contributions from rain and balancing of irrigation management with rainfall would have been unique in 2021.

In addition, the collection of leachate from the evaporation/aeration ponds is now planned instead of from the leachate manhole. This is estimated to result in more uniform leachate concentrations for irrigation, representative of the pond as a whole, as compared to at landfill manholes. This should reduce the frequency of sampling for reporting purposes. On June 24, 2021, KGS Group on behalf of the R.M., contacted MCC about these proposed changes. At that time it was advised to submit a new NoA submission (see Appendix B). The following is a revised methodology for this project to reflect these changes.

PROJECT METHODOLOGY

The proposed field study will be carried out at the St. Clements Waste Disposal Ground and will involve KGS Group personnel, with the assistance of staff of the RM of St Clements. It is proposed to develop this field study in two phases.

Phase I – Construction (2021)

The First Phase will involve the earthworks, construction of test plots including the containment berms, earth berm separating the control and leachate test plots, ditching for draining surface water away from the plots, addition of top soil within the test plots, seeding and regularly watering (clean water) to grow the grasses within both test plots.

Two irrigation plots (25m x 10m each) are proposed at the Libau landfill for the pilot study, located in an area that will be used for future landfill cell development and expansion. Seeds for Alfalfa and the selected salt tolerant species such as slender wheatgrass, switchgrass and inland salt grass will be seeded in late summer 2021 in each plot (control and irrigation test plots) as shown in Figure 1. Only water will be used to irrigate the plots in 2021 to increase plant germination and adaptability to the plots.

Phase II – Pilot Irrigation Program (2022)

This second phase will involve the leachate irrigation from the South Leachate pond to the leachate irrigation test plot, testing raw leachate, and soil and grasses from the control and test plots before and after completing the leachate irrigation study.

The St. Clements Waste Disposal Ground has aeration at the two existing leachate ponds. The North Pond carries out aeration using fire nozzles and the South Pond uses EcoMister Nozzles. Each aeration system is mounted on a floating platform.

Aeration increases the REDOX (reduction-oxidation) of the leachate, promoting precipitation of metals, removal of organics and promoting ammonia/odors/VOC's (Volatile Organic Compounds) volatilization.

Aerated leachate will be pumped from the South Leachate pond, using a submersible pump in the existent manhole between the ponds, via flexible hose with an inline leachate flow meter for recording volume extracted, to the sprinklers on the irrigation plot.

It is anticipated that a minimum of 25 m³ of leachate could be irrigated onto the irrigation test plot over the growing season for testing purposes, however, the total amount of leachate irrigated will depend on weather conditions such as rainfall, heat and wind.

Potential environmental and human health effects

Leachate migration into the soil vertically and laterally.

Mitigation measures

It is important to note that the leachate irrigation will follow stringent operational procedures as follows:

- Containment of leachate within the irrigation test plot by using clay enclosing berms, and ditching external to the berms to divert surface water from the plots (see Figure 1).
- Growing the plants to a germination stage before adding leachate, to minimize detrimental initial growth issues which could inhibit the uptake of leachate by the plants.
- Irrigating will need to vary according to weather events, particularly precipitation. For example, during high rainfall intensity events, long rainfall duration, or excessive moisture conditions in the ground, minimal leachate irrigation will be carried out. For severe drought conditions, supplemental irrigation with clean water may be required to compensate for typical precipitation over the span of the project. Overall, leachate irrigation rates will be adjusted to maximize plant uptake and minimize leachate migration from the test plots both vertically and laterally.
- Test plots will be located on a future landfill cell area.

Expected irrigation rates for St. Clements Waste Disposal Ground

The Mar-kit landfill in Hallock (Minnesota, USA) irrigates aerated leachate at a maximum rate of 93 L/m². In 2019, KGS Group and the University of Manitoba carried out various pot tests under greenhouse controlled conditions, testing various leachate irrigation rates from 79 L/m² to 170 L/m², showing no detrimental effects. After the greenhouse study, KGS Group carried out a pilot leachate irrigation project at a regional landfill in Saskatchewan with an estimate irrigation rate of 100 L/m². For this pilot leachate irrigation project, KGS Group estimates a leachate irrigation range between 70 L/m² and 150 L/m², respectively.

Proposed Testing

Plant performance will be assessed by biomass and height at the end of the project in comparison to the control plot. The grasses and alfalfa above ground biomass will be harvested at the end of the growing season and analyzed for total metals accumulation (various metals such as Antimony, Arsenic, Barium, Beryllium, Bismuth, Boron, Cadmium, Calcium, Cesium, Chromium, Copper, Iron, Manganese, Nickel, Titanium and others). Soil samples will likewise be taken before the startup and end of this pilot project to check for accumulation of total

metals (same as above) with depth. During this project, aerated leachate will be sampled three (3) times, as no major variations in quality are expected, and sent to an accredited CALA laboratory to test for the parameters specified in the notice of approval (see Appendix A – Attachment 1 Section A).

A final report describing the pilot project details and results will be submitted to the R.M. of St Clements and MCC with recommendations as to next steps for advancing this technology.

Proposed Schedule

Phase I – Construction: Earthworks, construction of test plots and seeding August-September 2021

Phase II – Pilot Testing: Leachate irrigation testing and reporting May – October 2022

KGS Group trusts that the above meets your requirements. If you have any questions regarding this submission, please contact the undersigned.

Prepared By:



Stan Lozecznik, PhD., P.Eng.
Environmental Engineer

Reviewed By:



for/ Tony Kuluk, P.Eng.
Solid Waste Specialist

Approved By:



Jason Mann, M.Sc., P.Geo.
Environmental Department Head/Associate Principal

SAL/jr
Enclosure

STATEMENT OF LIMITATIONS AND CONDITIONS

Limitations

This report has been prepared for R.M. of St. Clements in accordance with the agreement between KGS Group and R.M. of St. Clements (the “Agreement”). This report represents KGS Group’s professional judgment and exercising due care consistent with the preparation of similar reports. The information, data, recommendations and conclusions in this report are subject to the constraints and limitations in the Agreement and the qualifications in this report. This report must be read as a whole, and sections or parts should not be read out of context.

This report is based on information made available to KGS Group by R.M. of St. Clements. Unless stated otherwise, KGS Group has not verified the accuracy, completeness, or validity of such information, makes no representation regarding its accuracy and hereby disclaims any liability in connection therewith. KGS Group shall not be responsible for conditions/issues it was not authorized or able to investigate or which were beyond the scope of its work. The information and conclusions provided in this report apply only as they existed at the time of KGS Group’s work.

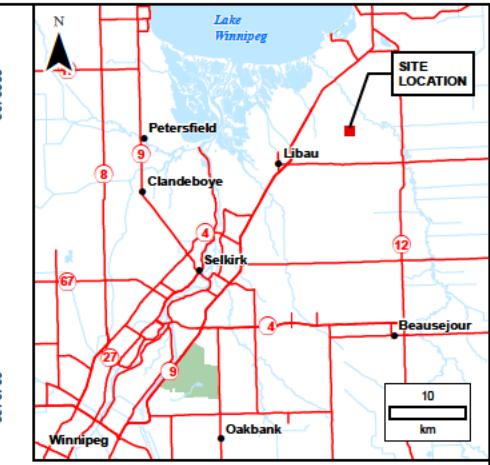
Third Party Use of Report

Any use a third party makes of this report or any reliance on or decisions made based on it, are the responsibility of such third parties. KGS Group accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions undertaken based on this report.

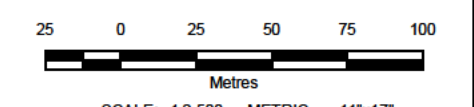
Geo-Environmental Statement of Limitations

KGS Group prepared the geo-environmental conclusions and recommendations for this report in a professional manner using the degree of skill and care exercised for similar projects under similar conditions by reputable and competent environmental consultants. The information contained in this report is based on the information that was made available to KGS Group during the investigation and upon the services described, which were performed within the time and budgetary requirements of R.M. of St. Clements. As this report is based on the available information, some of its conclusions could be different if the information upon which it is based is determined to be false, inaccurate, or contradicted by additional information. KGS Group makes no representation concerning the legal significance of its findings or the value of the property investigated.

FIGURE



LEGEND:
 Active Cells
 Future Cells Development



SCALE: 12,500 METRIC 11"x17"
 All units are metric and in metres unless otherwise specified.
 Transverse Mercator Projection, NAD 1983, Zone 14.
 Elevations are in metres above sea level (MSL).

NO.	DATE	DESCRIPTION	ISSUED BY	CHECK BY
0	21/08/20	ISSUED WITH REVISED NoA REPORT	SAL	BJI

REVISIONS / ISSUE

LEACHATE MANAGEMENT AT
 LIBAU LANDFILL

PILOT LEACHATE IRRIGATION PROJECT
 LAYOUT

PRELIMINARY
 NOT TO BE USED FOR CONSTRUCTION

APPENDIX A

Notice of Alteration Approval – Pilot Project for
Leachate Irrigation at Libau Landfill WDG



Conservation and Climate

Environmental Stewardship Division

Environmental Approvals Branch

1007 Century St

Winnipeg MB R3H 0W4

T 204-945-8321 F 204-045-5229

www.gov.mb.ca/sd

File No.: 3967.10

June 18, 2021

Greg Elson
Manager, Public Works
Rural Municipality of St. Clements
Box 2 Grp 35 RR1
East Selkirk MB R03 0M0
pwmanager@rmofstclements.com

Dear Greg Elson:

Re: Rural Municipality of St. Clements – Notice of Alteration Approval – Pilot Project for Leachate Irrigation at Libau Waste Disposal Ground - Environment Act Licence No. 2274 S2 RRR

Thank you for your May 26, 2021 Notice of Alteration request for alteration to Environment Act Licence No. 2274 S2 RRR, originally issued for the operation of the Development being a Class 1 Waste Disposal Ground located on east half of 29-15-7 EPM in the Rural Municipality of St. Clements. The submission is considered a Notice of Alteration pursuant to Section 14 of The Environment Act.

The intent of the request is to conduct a pilot project for leachate irrigation at Cell No. 2 of the Libau Waste Disposal Ground in the Rural Municipality of St. Clements to assess the viability of leachate irrigation as an alternative leachate treatment.


Upon review of the request, I am satisfied that the environmental effects of the proposed leachate irrigation pilot project at Cell No. 2 of Libau Waste Disposal Ground as described in the May 26, 2021 Notice of Alteration would be insignificant. Therefore, in accordance with Section 14(2) of The Environment Act, I hereby approve implementation of the above pilot study in accordance with Schedule A of this Notice of Alteration Approval.

All clauses of Environment Act Licence No. 2274 S2 RRR remain in effect.

If you have any questions concerning this Notice of Alteration Approval, please contact Edwin Yazon, Environmental Engineer, Environmental Approvals Branch, at Edwin.Yazon@gov.mb.ca or 431-335-2554.

For questions relating to the ongoing administration of Environment Act Licence No. 2277 S2 RRR, please contact Tyler Kneeshaw, Regional Supervisor, Environmental Compliance and Enforcement Branch, at Tyler.Kneeshaw@gov.mb.ca or 204-239-3608.

Yours sincerely,

A large black rectangular redaction box covering the signature of the sender.

for Shannon Kohler, Director
The Environment Act

cc: Stan Lozecznik, Bonnie Hoffensetz, Jason Mann, Tony Kuluk - KGS group
Kristal Harman, Yvonne Hawryliuk, Tyler Kneeshaw - Environmental Compliance and Enforcement
Asit Dey, Edwin Yazon - Environmental Approvals
Public Registry

**Schedule A to June 18, 2021 Notice of Alteration Approval for the Leachate
Irrigation Project at Libau Waste Disposal Ground – Environmental Act
Licence No. 2274 S2 RRR**

SPECIFICATIONS, LIMITS, TERMS AND CONDITIONS

1. The Licencee shall construct the storage tanks and irrigation plots on Cell No. 2 of the Development as described in the May 26, 2021 Notice of Alteration, unless otherwise approved by the Director of Environmental Approvals Branch.
2. The Licencee shall construct containment berms surrounding the aeration tanks and irrigation plots to prevent escape of leachate and/or surface runoff contaminated with leachate from aeration tanks and irrigation plots.
3. The Licencee shall not carry out leachate irrigation between the 15^h day of October of any year and the 15th day of May of the following year, unless otherwise approved by the assigned Environment Officer of the Environmental Approvals Branch.
4. The Licencee shall, in the event of an accidental spill of leachate, take all necessary actions to report the spill by calling the Environmental Emergency Report Line 204-944-4888 (toll free 1-855-944-4888) in accordance with regulatory requirements, contain the spill, manage the impacted environment, and restore the environment to the satisfaction of the Director of Environmental Compliance and Enforcement.
5. The Licencee:
 - a) shall carry out leachate irrigation only when weather conditions and irrigation spray locations are such that the aerated leachate will not be carried onto public roadways or onto neighboring private properties;
 - b) shall not carry out leachate irrigation for more than 10 continuous hours in any 24 hour period;
 - c) shall reduce the spray irrigation application rate during any application of leachate if ponding or surface runoff occurs during irrigation;
 - d) shall, if wind causes the aerated leachate to drift within the restricted zones as outlined in the Clause 5d) of this Notice of Alteration Approval, stop the leachate irrigation until the wind conditions subside; and
 - e) shall not carry out leachate irrigation:
 - i) within 300 metres of any dwelling not owned or not lawfully controlled by the Licencee;
 - ii) within 15 metres of a groundwater feature covered by permanent vegetation or 20 metres of a groundwater feature without any permanent vegetation;
 - iii) 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;
 - iv) within 30 metres of a lake or reservoir, not designated as vulnerable;
 - v) within 15 metres of a river, creek or stream designated as vulnerable;
 - vi) within 3 metres of a river, creek or stream designated as vulnerable, a 3rd order drain or higher, a major wetland, bog, marsh or swamp, or a constructed retention; or
 - vii) where there is escape of leachate from the containment berms or property boundary.

6. The Licencee shall not recirculate leachate or contaminated water collected at the Development into the landfill cells, unless approved by the Director of Environmental Compliance and Enforcement Branch.
7. The Licencee shall conduct a monitoring and analysis program, in accordance with Attachments 1 and 2 of this Notice of Alteration Approval, to determine the following:
 - a) the composition of the aerated leachate;
 - b) the background levels of selected soil parameters for each irrigation plot before leachate irrigation;
 - c) the levels of selected soil parameters for each irrigation plot after leachate irrigation; and
 - d) the total metals accumulated in the plants for each irrigation plot.
8. The Licencee shall submit to the Director of Environmental Approvals Branch a final report on the findings and recommendations of the pilot study by February 28, 2022. The final report shall include details of, but not limited to, the following:
 - a) the details of the field monitoring programs on the leachate irrigation project;
 - b) copies of the laboratory analytical results in accordance with Clause 7 of this Notice of Alteration Approval;
 - c) summary of laboratory analytical results in accordance with Clause 7 of this Notice of Alteration Approval; and
 - d) discussion of the results of monitoring and analysis carried out pursuant to Clause 7 of this Notice of Alteration Approval.

Attachment 1 to June 18, 2021 Notice of Alteration Approval

(Leachate Irrigation Pilot Project at Libau Waste Disposal Ground - Environment Act Licence No. 2274 S2 RRR)

Monitoring and analysis requirements pursuant to Clause 7 of Schedule A to June 18, 2021 Notice of Alteration Approval

A. Aerated Leachate

1. Representative samples of leachate shall be collected from aerated tanks.
2. The sample of leachate shall be analyzed for the following parameters*:

a) conductivity	u) antimony
b) pH	v) arsenic
c) alkalinity	w) barium
d) chloride	x) beryllium
e) sulphate	y) bismuth
f) sodium	z) boron
g) potassium	aa) cadmium
h) Polycyclic Aromatic Hydrocarbons (PAHs)	bb) calcium
i) COD	cc) cesium
j) BOD	dd) chromium
k) total organic carbon	ee) copper
l) total solids	ff) iron
m) volatile solids	gg) lead
n) nitrate nitrogen	hh) magnesium
o) total Kjeldahl nitrogen	ii) manganese
p) ammonia nitrogen	jj) mercury
q) organic nitrogen	kk) nickel
r) total phosphorus	ll) potassium
s) ortho Phosphorus	mm) titanium
t) total hardness	nn) zinc

*Analysis for heavy metals must be carried out in accordance with Attachment 2 of this Notice of Alteration Approval.

B. Soil

1. Representative samples from each irrigation plot shall be taken before and after leachate irrigation.
2. Soils samples shall be analyzed for the following parameters:

a) conductivity	h) Polycyclic Aromatic Hydrocarbons (PAHs)
b) pH	i) COD
c) alkalinity	j) BOD
d) chloride	k) total organic carbon
e) sulphate	l) total solids
f) sodium	m) volatile solids
g) potassium	n) nitrate nitrogen

- | | |
|----------------------------|---------------|
| o) total Kjeldahl nitrogen | bb) calcium |
| p) ammonia nitrogen | cc) cesium |
| q) organic nitrogen | dd) chromium |
| r) total phosphorus | ee) copper |
| s) ortho Phosphorus | ff) iron |
| t) total hardness | gg) lead |
| u) antimony | hh) magnesium |
| v) arsenic | ii) manganese |
| w) barium | jj) mercury |
| x) beryllium | kk) nickel |
| y) bismuth | ll) potassium |
| z) boron | mm) titanium |
| aa) cadmium | nn) zinc |

*Analysis for heavy metals must be carried out in accordance with Attachment 2 of this Notice of Alteration Approval.

C. Plants

1. The type of plants grown on the irrigation plots shall be identified.
2. Each type of plant samples shall be analyzed for the following parameters:

a) antimony	k) copper
b) arsenic	l) iron
c) barium	m) lead
d) beryllium	n) magnesium
e) bismuth	o) manganese
f) boron	p) mercury
g) cadmium	q) nickel
h) calcium	r) potassium
i) cesium	s) titanium
j) chromium	t) zinc

Attachment 2 to Notice of Alteration Approval

(Leachate Irrigation Pilot Project at Libau Waste Disposal Ground - Environment Act Licence No. 2274 S2 RRR)

Analysis of metals pursuant Clause 7 of the Schedule A of June 18, 2021 Notice of Alteration Approval

The analysis for all metals shall be carried out in accordance with the following requirements:

1. The laboratory performing these analysis shall:
 - a) possess and maintain accreditation with the Canadian Association for Laboratories Inc. (CALA);
 - b) operate a quality assurance program acceptable to the assigned Environment Officer;
 - c) monitor the accuracy of the leachate and soil analyses for each set of samples of leachate or soil through the use of a suitable reference material acceptable to the assigned Environment Officer; and
 - d) analyze field duplicates of samples with acceptance criteria of +/- 10 percent.

2. A copy of the analytical procedures and the analytical results for associated reference materials used in the laboratory, and any other controls used in the analysis, shall be submitted with the field sample results.

3. If the analytical results of any associated materials do not meet the following criteria, the leachate and/or soil samples must re-analyzed:

a) Arsenic	+/- 35 percent from the reference value
b) Cadmium	+/- 25 percent from the reference value (for values above 1 microgram/gram)
c) Cadmium	+/- 35 percent from the reference value (for values below 1 microgram/gram)
d) Chromium	+/- 25 percent from the reference value
e) Copper	+/- 25 percent from the reference value
f) Lead	+/- 25 percent from the reference value
g) Mercury	+/- 25 percent from the reference value
h) Nickel	+/- 25 percent from the reference value
i) Zinc	+/- 25 percent from the reference value

APPENDIX B

Notice of Alteration Form

Notice of Alteration Form



Client File No. : 3967	Environment Act Licence No. : 2274 S2RR
Legal name of the Licencee: The Rural Municipality of St. Clements	
Name of the development: St. Clements Waste Disposal Ground	
Category and Type of development per Classes of Development Regulation: Waste Treatment and Storage <input type="button" value="v"/> <SELECT>	
Licencee Contact Person: Greg Elson Mailing address of the Licencee: 1043 Kittson Road, Box 2 Grp 35 RR1 City: East Selkirk Province: Manitoba Postal Code: R03 0M0 Phone Number:(204) 482-3300 Fax: (204) 482-3098 Email: pwmanager@rmofstclements.com	
Name of proponent contact person for purposes of the environmental assessment (e.g. consultant): Stan Lozeczniak, PhD, P.Eng.	
Phone: (204) 896-1209 Fax:	Mailing address: 3rd floor - 865 Waverley Street
Email address: slozeczniak@kgsigroup.com	
Short Description of Alteration (max 90 characters): Pilot Leachate Irrigation project to be carried out at the St. Clements Waste Disposal Ground	
Alteration fee attached: Yes: <input checked="" type="checkbox"/> No: <input type="checkbox"/> If No, please explain:	
Date: August 30, 2021	Signature: Printed name: <i>ARLITA MADRIGGA ON BEHALF OF GREG ELSON.</i>
<p>A complete Notice of Alteration (NoA) consists of the following components:</p> <ul style="list-style-type: none"> <input checked="" type="checkbox"/> Cover letter <input checked="" type="checkbox"/> Notice of Alteration Form <input checked="" type="checkbox"/> 2 hard copies and 1 electronic copy of the NoA detailed report (see "Information Bulletin - Alteration to Developments with Environment Act Licences") <input checked="" type="checkbox"/> \$500 Application fee, if applicable (Cheque, payable to the Minister of Finance) 	<p>Submit the complete NoA to:</p> <p>Director Environmental Approvals Branch Manitoba Sustainable Development 1007 Century Street Winnipeg, Manitoba R3H 0W4</p> <p>For more information:</p> <p>Phone: (204) 945-8321 Fax: (204) 945-5229 http://www.gov.mb.ca/sd/ea/</p>
<p>Note: Per Section 14(3) of the Environment Act, Major Notices of Alteration must be filed through submission of an Environment Act Proposal Form (see "Information Bulletin – Environment Act Proposal Report Guidelines")</p>	