Ingerbelle Compost Facility

Operating, Leachate and Odour Management Plans

December 2019

Prepared for:

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Statement of Limitations

The information and plans contained within this report is limited to the specific areas, materials and conditions that were identified and observed during site visits by the Qualified Professional. The recommendations and findings in this report must only be used in the context of the whole report and not in parts. The professional judgement and recommendations contained herein are based on the results of information from third parties believed to be true and accurate at the time of writing. The professional judgement and expertise contained herein do not include any assessment of structural or survey considerations related to the Ingerbelle Compost Facility or worker health and safety considerations. The authors take no responsibility for any errors or omissions of information provided by third parties nor for any impacts resulting from deviation from the recommendations set forth in this report. These plans are valid only for the site and time periods for which it was prepared.

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1. Introduction

The Ingerbelle Compost Facility (ICF) is located 20 kilometres south of Princeton, BC in a remote, heavy industrial area on the Copper Mountain Mine mineral tenure. The facility is an existing composting facility, previously used to produce mushroom compost in accordance with the *Mushroom Compost Facilities Regulation* (BC Reg 413/98), operating under the name All Seasons between approximately 2003 and early 2019. NutriGrow (part of the Arrow Group of Companies) has recently acquired the facility and intends to produce Class A Compost in accordance with the BC *Organic Matter Recycling Regulation* (BC Reg. 18/2002) (OMRR). The primary NutriGrow contact for the ICF is:

Mr. Jeff Mayer, Manager - Arrow Environmental, Arrow Group of Companies
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Compost will be produced at the ICF using a static aerated pile composting system and will be sold or otherwise distributed on a wholesale basis. This report was prepared as an attachment to the report *Ingerbelle Composting Facility Project Overview Report*, December 2019, which contains further details of the composting project.

1.1 Site Description

The facility is located on level ground on a terrace of land above the Similkameen River canyon, generally referred to as Ingerbelle (see Figure 1. Location plan included in Appendix A). The site is bounded on all sides by the Copper Mountain Mine mineral claim. The Ingerbelle deposit was mined between 1972 and 1996, generating waste rock and tailings as part of mining operations. The facility is constructed in the centre of the historic 701 Dumpsite, surrounded by grasses and weeds growing on the remainder of the waste rock storage pile.

Dense lodgepole pine and Douglas fir forest bounds the site to the north, west and south with open forest land and steep slopes down to the Similkameen River to southeast and east. The 701 Dump was deposited in the Deep Gulch Creek gully, with the creek flowing from southwest to northeast underneath the dump.

The waste rock dump varies in depth ranging from approximately 30 metres on the upslope side to over 100 metres on the downslope side. The dump materials consist of silty sand soils mixed with gravel and large angular cobbles and boulders. Native soils underlaying the waste rock dump are mapped as the Alleyne type; an orthic eutric brunisol (sandy loam) where the water table is not present in the soil horizon at any time (Ag Canada, 1979).

The Ingerbelle Compost Facility is located at an elevation of approximately 1,000 metres above sea level (mASL). The local climate in the area is characterized by dry summers and cold winters with low precipitation. The area receives approximately 350 mm of precipitation annually, based on climate data collected from the Princeton, BC station between 1981 and 2010 (Env. Canada). The site is located on a border of the Interior Douglas-fir very dry hot (IDFxh1) and the Interior Douglas fir-dry cool (IDFdk2) biogeoclimatic zones (DataBC, 2018).

Monthly wind speed and direction was assessed by Barnett & Associates while preparing the Pollution Prevention Plan (Barnett, 2003) for the original compost facility construction. In general, winds were found to

be most significant during the spring and summer months, originating from the west and northwest; blowing towards Copper Mountain Mine to the east (~2.5 kms away) and wilderness to the south. However, a review of wind data collected at Copper Mountain Mine and sources available online indicates that wind originates primarily from the west and south; more from the west between April and October and from the south between November and March.

2. Operating Plan

NutriGrow plans to receive and compost feedstocks listed under Schedule 12 of the BC Organic Matter Recycling Regulation (OMRR) at their Ingerbelle Compost Facility. Managed organic matter to be received will primarily consist of wastewater biosolids, food waste and yard and garden waste originating from various municipalities across southern BC. Managed organic matter will be composted using the static aerated pile technology. Specific details of the site infrastructure and layout are described in the *Ingerbelle Composting Facility Project Overview Report*, December 2019. Detailed process flow and operating specifications are described below.

2.1 Site equipment

The following heavy equipment is anticipated to be required to operate the composting facility:

- 2 x front-end loaders (each dedicated to handling either feedstocks or finished compost)
- 1 x Royer 466 shredder
- 1 x Scarab windrow turner
- 1 x screening plant

2.2 Feedstock receiving and pre-processing

Schedule 12 feedstocks are expected to primarily consist of biosolids, food waste and yard and garden waste. These feedstocks will be delivered to the site by truck and offloaded in the feedstock storage area, located on a concrete pad that is sloped to leachate collection points (see Figure 2. Site layout included in Appendix A). Quantities of incoming feedstocks will be determined and recorded using truck weights measured at production facilities or using the onsite truck weigh scale if incoming weights are not available when loads arrive. Bulk density measurements of incoming feedstocks will be taken periodically to convert feedstock weights to volumes for accurate blending purposes. The maximum storage capacity of the current feedstock receiving area is approximately 3,600 m3. Bulking agents will be delivered to the carbon storage area near the northeast corner of the site, with a storage capacity of over 16,000 m3.

2.2.1 Feedstock quality and blend ratios

Biosolids, food waste and yard and garden waste will be received separately so that feedstock quality and compost blend ratios, as determined by the Qualified Professionals, can be appropriately managed. Feedstocks may be received directly into bunkers according to prescribed blend ratios, or in the feedstock receiving area with separate areas demarcated using lock blocks or tall cones and signage. Incoming loads of feedstock will be visually inspected by operators and any anomalies noted and raised to the site supervisor. Examples of abnormalities include excessive inorganic debris (plastics), free-standing liquids (wet loads) or presence of unusual foreign matter (unusual sheens, powders). Operators are trained to identify abnormal loads by the Site Supervisor and Qualified Professionals. The site supervisor will determine if abnormal loads need to be segregated for further suitability assessment by the Qualified

Professionals. Based on experience at other projects, abnormal loads are expected to be infrequent and a small area between the feedstock receiving area and curing and storage area (see Figure 2) should be sufficient to store rejected loads until they can be reloaded and disposed of in accordance with the requirements of the feedstock producer (i.e. municipality or regional district).

The composition of yard and garden waste varies seasonally and may require pre-processing (i.e. chipping/shredding) prior to batching with other feedstocks and placing in the compost bunkers. Chipping/shredding will be completed on the concrete pad, between the feedstock receiving area and the aerated composting bunkers.

Municipal food waste quantity and quality is also expected to remain relatively consistent, with the exception of moisture content, which tends to vary significantly seasonally. Moisture content will be monitored and managed at the feedstock receiving stage by blending food waste with selected bulking agent materials. Yard and garden waste is expected to be received primarily in the spring, summer and fall months, with characteristics varying based on seasonal yard clean-up (i.e. woody trimmings in the spring, grass clippings in the summer, dry leaves in the fall etc.).

Biosolids feedstock quantity and quality is expected to remain consistent seasonally and annually, based on anticipated contracts and experience managing municipal biosolids in other projects.

Organic matter feedstocks will generally be blended with bulking agents at a ratio of 1-part organic matter to 1.5 or 2 parts bulking agent, on a bulk volume basis. Qualified Professionals will determine and adjust blend ratios based on routine feedstock quality monitoring data.

2.3 Active composting

Feedstocks will be batched in the composting bunkers according to the mix ratio determined by the Qualified Professionals. Feedstocks will be blended using a loader, a Royer 466 Shredder, a Scarab windrow turner or similarly effective equipment to ensure a relatively even pile size and homogeneous mix. Consistent porosity throughout the pile is important to ensure the mechanical blower system aerates the pile evenly.

Compost placed in the bunkers will be aerated using the blower system and turned periodically using a loader or the Scarab windrow turner, as and when required to maintain temperatures required for active composting. Compost temperatures will be monitored and in at least 4 locations throughout the pile, at a depth of approximately 60 cm into the pile. Temperature measurements will be recorded daily by facility operators during the first 17 days of active composting at a minimum to ensure that OMRR time and temperature requirements are met.

Optimum composting temperatures ranges from 40 to 60°C. Composting piles may be turned if temperatures exceed 65 to 70°C to ensure microbial activity is not negatively impacted by excessive heat. Cooler pile temperatures indicate there is likely insufficient degradable material (organic feedstock) available to activate and sustain the composting process. In the event a composting pile does not heat up sufficiently, the pile may need to be broken down and re-blended with fresh organic matter.

Moisture content in composting piles should be within 45 to 60% to maintain porosity and aeration of the piles, while providing sufficient moisture for composting microorganisms to function. Moisture content of composting piles will be managed through feedstock moisture content monitoring, blend ratios and addition of leachate, where required. Too high or too low moisture content may result in compost piles not heating up.

If daily temperature monitoring results do not meet minimum temperature requirements, moisture content of piles should be checked. Moisture content of composting piles will be field tested by digging into the pile approximately 60 cm and conducting a "squeeze test", whereby a handful of compost should feel damp and release a few droplets of liquid when squeezed (Forgie et al, 2004). Moisture should be checked in at least 4 or 5 separate locations around the pile. High moisture content can be addressed by adding more bulking agent to the mix; low moisture can be addressed by adding leachate while turning the compost. Adding leachate to the top of a pile is not typically effective at wetting the inner portions of the pile.

2.4 Curing and screening

After a minimum of 17 days of active composting in the aerated bins, the compost can be moved to the curing area located on the concrete pad (see Figure 2. Site layout included in Appendix A). A dedicated bobcat or loader will be used to handle curing piles and finished compost to ensure no cross-contamination from fresh compost feedstocks. Compost curing time will depend on effectiveness of the active composting phase and target compost quality (determined by end use market). For example, compost destined for landscaping markets will be screened prior to loading for delivery to end use sites, whereas compost destined for land reclamation may not be screened since coarser fragments in the final soil are acceptable and beneficial in a reclamation application. Screened overs will remain on site and used to cap compost stored in bins or reused as a bulking agent.

2.5 Loading and distribution to end uses

Screened material will be stored in designated storage areas (see Figure 2. Site layout, Appendix A), depending on compost markets, and loaded into trucks for delivery to end use sites. No additional additives or supplements will be blended into finished compost. Under the CFIA Trade Memoranda T-4-120 *Regulation of Compost under the Fertilizers Act and Regulations*, compost is defined in Schedule II of the Fertilizers Regulations and is exempt from registration and does not require a pre-market assessment (CFIA, 2018). However, compost that is sold in the marketplace must meet all of the prescribed standards and conform to the CFIA Regulations. Information required under the CFIA Regulations will be included in the shipping documents for bulk compost sales.

2.6 Compost storage

At least 50% of the compost produced at the facility will be removed from the site annually, which equates to an allowable compost storage capacity of 50,000 m^3. Storage of finished compost will preferentially occur on the northeast end of the compost curing area, on the concrete pad adjacent to the loading dock. This area can accommodate approximately 2,000 m^3 of compost. A secondary compost storage area is proposed for the south side of the compost facility, off of the concrete pad. The area would be designed to store up to 50,000 m^3 of compost. This area shall be assessed by a Qualified Professional for suitability prior to commencing storage of compost.

2.7 Meeting OMRR process and quality requirements

Section 12 (3) of the OMRR outlines requirements that must be met to produce Class A Compost from materials other than only yard waste or wood residuals.

(a) Schedule 1, Pathogen Reduction Processes;

(b) Schedule 2, Vector Attraction Reduction;

(c) Column 1 of Schedule 4, Quality Criteria

(b) Schedule 3, Pathogen Reduction Limits;

(c) Schedule 5, Sampling and Analyses — Protocols and Frequency;

(d) Schedule 6, Record-keeping

Process requirements: The composting process at the Ingerbelle Compost Facility is designed to produce Class A Compost. The compost is produced using the mechanically aerated static pile system, which is an approved method for production of Class A Compost under the OMRR.

Temperature monitoring requirements: In a static pile composting system, the OMRR requires that each static pile must reach 55° C (131°F) and maintain that temperature for a minimum of 3 consecutive days to meet Class A pathogen reduction requirements. To meet vector attraction reduction requirements, each compost pile must maintain a temperature higher than 40°C (104°F) and an average temperature of at least 45°C (113°F) for a minimum of 14 days after the 3-day pathogen reduction period is complete. To ensure that these temperature requirements are met, compost temperatures in compost bins are monitored and recorded daily over a minimum 17-day period during the active composting phase. An example of a composting operator daily log is included in Appendix B.

2.7.1 Compliance sampling and analysis

For pathogen level determination, seven (7) discrete samples will be collected from each 1,000 dry tonnes and submitted for fecal coliform determination in accordance with Schedule 3 of the OMRR. Each discrete sample collected must have fecal coliform levels < 1,000 MPN/gram of total solids to comply with OMRR Class A Compost criteria. For trace element, foreign matter and carbon:nitrogen ratio determination, one composite sample per 1,000 dry tonnes of composted organic matter must be collected and submitted for analysis. The results of laboratory analyses of the compost will be compared with OMRR Schedule 4 Class A Compost standards to ensure that the finished compost meets the required quality criteria. Results for carbon to nitrogen (C:N) analysis will be used to ensure finished compost complies with the Schedule 2 Vector Attraction Reduction allowable C:N range of 15:1 to 35:1. Compliance sampling and analysis will be completed prior to removal of any compost offsite.

Compost that does not comply with the OMRR Schedule 3 fecal coliform limit of < 1,000 MPN/gram will be returned to the aerated bunkers for an additional 3 days minimum. Compost that does not comply with the OMRR Schedule 4 trace element or foreign matter limits and/or the allowable carbon to nitrogen range should be referred to the Qualified Professionals for remedial measures.

2.7.2 Quality Assurance/Quality Control

The Quality Assurance/Quality Control (QA/QC) program begins at the feedstock receiving phase of the composting process. Biosolids quality confirmation (confirmation that material complies with OMRR quality criteria for Class A or B biosolids) is sometimes received from producers after material has been delivered to site. Therefore, unconfirmed loads of biosolids are segregated as per procedures outlined in section 2.1.1 until confirmation is received. Food waste and yard and garden waste does not require quality confirmation and therefore does not need to be segregated. Facility operators are trained to understand

feedstock hauling schedules and visual quality inspection criteria (for excess debris, free-liquids or other contamination). Operators will recognize and flag any unusual loads for further inspection prior to handling.

Prior to blending, mixing ratios are determined through periodic sampling of all feedstocks. Qualified Professionals review feedstock quality data and provide calculated blend ratios with built-in margins of safety to ensure optimum theoretical composting parameters are maintained. Once the active phase of composting is complete, the material is sampled to ensure compliance with OMRR criteria for Class A Compost.

All sampling shall be conducted in accordance with OMRR Schedule 5, Sampling and Analyses – Protocols and Frequency. Quality Control samples consist of collection and submission of 10% duplicates. All samples are submitted for analyses to a laboratory certified by the Canadian Association for Laboratory Accreditation, in accordance with the *Environmental Data Quality Assurance Regulation* BC Reg 301/90.

2.7.3 Record keeping and reporting

As per OMRR Schedule 6 – Record Keeping, daily records of compost temperatures and retention times and results of compost sampling and analyses shall be kept at the facility for 36 months and made available on request. An example of a compost operator daily log is included as Appendix B. Additional records/logs for leachate production and odour monitoring will also be kept on file. Tonnages for incoming loads of feedstock, with associated weigh scale records, will be logged and kept on file together with tonnages of outgoing finished compost.

2.8 Residuals Management

Food waste is known to contain a certain amount of foreign matter, which is defined by the OMRR as "a contaminant that is not readily decomposed during the composting process, and includes demolition waste, metal, glass, plastic, rubber and leather, but does not include silt, sand, rocks or stones, or gravel less than 2.5 centimetres in diameter, or other similar mineral materials naturally found in soil". Foreign matter residuals are expected to be produced during the compost screening process and may remain in the overs that are recycled back into the composting process. This is normal for food waste compost operations but wherever possible, foreign matter will be removed from the composting cycle, collected and periodically disposed of at the local landfill. Residuals will be collected in roll-off bins or similar waste container. No more than 15 m3 of residual foreign matter shall be stored at the compost facility at any time. Large woody debris, stones, rocks and other natural materials can be collected and reused or stored at the site indefinitely.

2.9 Animal attractant/vector control

Poorly managed feedstock and compost piles can generate significant odours and attract vectors such as flies, rodents, birds and bears. Biosolids can attract flies, but generally do not attract other types of vectors. Food waste can represent a significant attractant and problems are likely to occur if control measures are not implemented. Attractant odours will be minimized using the methods described in section 4. Odour Management Plan. Electric fencing will be deployed to exclude bears from food waste handling areas. A pest control contractor can be brought onsite to assist in managing smaller vectors, should they become an issue, however, it is expected that timely and proper management of incoming organic feedstocks will significantly reduce the potential for the site to attract vectors.

2.10 Personnel Training Program

The current compost facility site supervisor has attended a compost training course provided by Dr. John Paul, Transform Compost Systems in February 2019. New staff at the site will be provided basic composting training through a Compost Council of Canada certified compost facility operator's course and continuing education, and should attend annual refresher training. This will ensure that all staff understand the basics of compost production and how to troubleshoot any potential process, leachate or odour issues.

Further training will be provided on-site by Ms. Ruth McDougall consisting of the following general concepts:

1. Basics of composting:
    a) Process requirements for successful composting – blending feedstocks to balance C:N ratio, maintaining aerobic conditions and adequate moisture)
    b) The composting process – biological breakdown of wastes, physical changes in the pile
    c) Phases of composting – active phases, curing, length of each, characteristics of each phase including temperature, biological activity. How to determine when active composting is complete – compost maturity assessment (physical and chemical assessment)
2. Odour management – why odours are produced during the composting process, the importance of adequate aeration during composting, process control factors to limit odour production, trouble-shooting odours when they occur.
3. Leachate management – what is leachate and why must it be properly managed, environmental issues with leachate (chemical constituents, surface and groundwater pollution), preventing production of leachate during active composting
4. Trouble shooting – odours, leachate, process issues
5. Meeting OMRR monitoring and sampling requirements:
    a) OMRR process requirements for Class A Compost
    b) OMRR time-temperature requirements for Class A Compost
    c) Temperature monitoring requirements to demonstrate vector attraction reduction requirements and pathogen destruction requirements for Class A Compost
    d) Compost sampling requirements – sampling protocol, how to interpret results
    e) Record keeping – temperature monitoring

2.11 Environmental Monitoring Plan

The primary environmental receptors potentially impacted by composting facilities are air and water, therefore, no soil monitoring is currently recommended for the ICF. Details of water and air monitoring are provided below.

2.11.1 Water quality monitoring

The compost facility is situated on top of a historic waste rock dump that was placed within the steep sided Deep Gulch Creek gully. Deep Gulch Creek is shown entering the southern perimeter of the 701 Dump and exiting beneath the steep slopes of the waste rock on the northern perimeter, towards the Similkameen River canyon. In support of their application to reinitiate mining at the Ingerbelle site, Copper Mountain Mine has recent water quality data from 4 locations on Deep Gulch Creek (locations shown as red dots on Figure 3, included in Appendix A). CMM conducted periodic water quality sampling throughout the 2019

open water season at these locations to establish baseline conditions and has shared the data with Arrow. Arrow proposes that ongoing monitoring of these locations be used to assess potential impacts to groundwater from the compost facility. Proposed monitoring parameters would include pH, biological oxygen demand (BOD), total suspended solids (TSS), ammonia-N,nitrate-N/nitrite-N, total Kjeldahl nitrogen, dissolved orthophosphate, total phosphorus, sulfate, chloride, sodium, dissolved organic carbon andtotal organic carbon. Hemmera Envirochem Inc. (Hemmera) completed an Environmental Impact Study as part of the permit application process for the ICF. As part of the study, Hemmera considered monitoring data from these locations, specifically SW52 (upgradient) and SW57 (downgradient), as adequate for the purposes of identifying and assessing any impacts to groundwater from the compost facility operations.

2.11.2 Air monitoring

Potential air contaminants from the ICF are expected to include odour and dust. Odour is managed to minimize the risk of impacts to human receptors and is generally not considered an environmental pollutant. Details of odour control measures for the ICF can be found in section 4. Odour Management Plan. Significant and long-term dust migration offsite could impact vegetation growing adjacent to the facility. The ICF is not expected to generate significant dust due to the moisture content of managed materials. Fresh water is available on site to wet down work areas if dust becomes an issue. Routine odour monitoring will be conducted in the first year of operation, as described in section 4. Odour Management Plan. In addition, composting piles with C:N ratios lower than the recommended range can emit significant ammonia gas. Operators will be trained to note strong ammonia odours and take remedial action to correct low C:N ratios by adding additional carbon to compost piles.

2.12 Closure plan

In the event that the facility is closed permanently, the site will be decommissioned and/or cleaned up commensurate with the future use of the facility. Closure schedule will be dependent upon the timeline and requirements for site turn-over. At a minimum, all compost will be removed from the facility and sold or given away to end users. Any immature compost will remain at the facility until it has stabilized and then also be sold or given away. Any remaining overs and other residual waste shall be disposed at the local landfill. Any remaining bulking agent shall be hauled away for other uses. Leachate remaining in storage tanks will be pumped out and hauled to offsite disposal at the Princeton municipal wastewater treatment plant. The site shall be cleaned and decommissioned according to the requirements and schedule for future use.

3. Leachate Management Plan

Leachate is considered to include fluids leaching from feedstocks and/or all phases of compost piles, as well as any wash-down water, and rain or storm water landing on-site that comes into contact with the leachate. All of these liquids will be collected and contained within the leachate collection system, details of which are shown in Figure 4. Leachate collection system plan, included in Appendix A. No discharge of liquid waste from the compost facility is allowed.

3.1 Leachate production potential

It is expected that only a small amount of leachate will be produced during the dry summer months. During the wetter fall, winter and spring months, leachate will be collected in the leachate collection system and

stored in the leachate tanks for reuse in the composting process. Potential leachate production areas and management methods are described below.

3.1.1 Feedstock receiving area

Feedstocks will be received on an impermeable concrete surface. The surface slopes gently towards the leachate collection channel so that any leachate from the feedstocks will be collected in the system. No leachate can escape from the feedstock storage areas into the environment. Leachate generated in this area will be collected in the leachate collection system and will be incorporated with feedstocks back into compost bunkers, as required.

3.1.2 Composting bunkers

Composting feedstocks will be blended with bulking agent and placed into the concrete floor compost bunkers, producing a blended material with a moisture content below 60%, which is unlikely to generate leachate. High temperatures achieved during active composting results in the evaporative loss of a significant amount of moisture from the compost such that insufficient moisture in the compost is a more frequent concern than excess moisture. Any leachate produced within the bunkers is drained to the leachate collection system through small channels in the bunker floor. The compost bunkers are not covered but are constructed on a concrete pad, with concrete sides, and the open end is sloped towards the leachate collection point. This is an acceptable design because the facility is located in a dry area of the province, with very low annual precipitation.

3.1.3 Curing and storage area

Curing and current storage areas are located on the concrete pad. A small amount of leachate is expected to be generated from compost during the curing phase because the compost moisture content is projected to be less than 50% during this phase. Any leachate generated during precipitation events or snow melt is collected in the leachate collection channel that runs along the southeast edge of the curing area; leachate is directed into the leachate storage tanks via the slopes and channels in the concrete pad. Any leachate produced will be entirely contained within the curing and storage area and leachate collection system.

If additional storage capacity for finished compost is required on the south side of the facility, the area will be assessed by a Qualified Professional to ensure it is a suitably impermeable surface with curbs or berms where required, and that it is sloped towards a leachate collection area. This leachate will be allowed to evaporate or pumped periodically back into the composting process.

3.1.4 Run-on water

Annual precipitation levels in the Princeton area are low, however sudden strong precipitation events or snow melt can occur. The facility is located on high ground, overtop of a compacted, historic waste rock dump that is contoured to shed water away from the compost facility. Any direct precipitation will be collected in the leachate collection system.

3.2 **Leachate collection and management**

Leachate collection system: The leachate collection system gradients in the concrete slabs control the flow of leachate to collection points (catch basins). Leachate collected in the feedstock receiving, active composting and curing areas is directed via floor drains and troughs into an underground separator tank, which gravity

drains through underground pipes to the leachate storage tanks. Arrow personnel will routinely inspect and clean the collection systems, including curbs, troughs, screens and piping connections.

Leachate storage: All leachate generated on the site is directed to the leachate storage tanks through piping from the compost bunkers and concrete pad feedstock storage and curing areas. The primary leachate storage tank has an approximate capacity of 80 m3; the secondary leachate storage tank has an approximate capacity of 90 m3. The primary tank is equipped with pumps to transfer leachate to the secondary tank or to the composting bunkers for wetting compost piles. This total capacity is expected to be sufficient for biosolids and yard waste composting but may not be sufficient for food waste composting, particularly for food waste originating from the Metro Vancouver region in the fall, winter and spring months. Additional leachate storage capacity (additional tanks) shall be installed prior to receipt of any municipal food waste at the site. Leachate that accumulates in the tank will be reused during the composting process, via pumps located next to the leachate tanks. No leachate will be discharged into the environment.

Leachate reuse: Leachate will be reused as a wetting agent and inoculant for feedstocks placed in the composting bunkers. Moisture content of feedstocks and blended compost should be monitored to ensure moisture levels remain within optimum ranges for composting. Leachate quality can also be monitored to ensure appropriate nutrient content for compost wetting.

Leachate system inspections: Leachate collection troughs and piping shall be inspected daily or weekly or when areas are exposed (when compost is removed from bunkers) to ensure the system is operating properly and no leachate can escape. Leachate volumes collected and reused will be recorded weekly to help understand the relationship between leachate production and feedstock types, seasonality etc. This information will be used to plan for adequate leachate storage capacity.

3.3 Water quality monitoring

The compost facility is situated on top of a historic waste rock dump that was placed within the steep sided Deep Gulch Creek gully. Deep Gulch Creek is shown entering the southern perimeter of the 701 Dump and exiting beneath the steep slopes of the waste rock on the northern perimeter, towards the Similkameen River canyon. In support of their application to reinitiate mining at the Ingerbelle site, Copper Mountain Mine has recent water quality data from 4 locations on Deep Gulch Creek (locations shown as red dots on Figure 3, included in Appendix A). CMM conducted periodic water quality sampling throughout the 2019 open water season at these locations to establish baseline conditions and has shared the data with Arrow. Arrow proposes that ongoing monitoring of these locations be used to assess potential impacts to groundwater from the compost facility. Proposed monitoring parameters would include pH, biological oxygen demand (BOD), total suspended solids (TSS), ammonia-N, nitrate-N/nitrite-N, total Kjeldahl nitrogen, dissolved orthophosphate, total phosphorus, sulfate, chloride, sodium, dissolved organic carbon and total organic carbon. Hemmera Envirochem Inc. (Hemmera) completed an Environmental Impact Study as part of the permit application process for the ICF. As part of the study, Hemmera considered monitoring data from these locations, specifically SW52 (upgradient) and SW57 (downgradient), as adequate for the purposes of identifying and assessing any impacts to groundwater from the compost facility operations.

4. Odour Management Plan

4.1 Background on Mushroom Composting Facility odour

The facility was previously operated as a mushroom composting facility for 15 years between 2003 and 2019. During this time, the facility operated in accordance with the requirements of the *Mushroom Compost Facilities Regulation*, with a variance from the requirement to compost in-vessel due to an assessed low risk of odour impacts. Studies were conducted to model odour generation potential and migration offsite to potential receptors. The variance from the *Mushroom Compost Facilities Regulation* requirement to compost in-vessel was granted based on the results of these studies (MWLAP, 2003). No formal odour complaints were reported by the Ministry of Environment related to the facility (Tam, 2019).

Odours generated from the Ingerbelle Compost Facility during composting of biosolids, food waste and yard waste are expected to be less offensive than odours generated by mushroom composting, therefore the variance and track-record associated with the previous facility can be relied on for current odour management planning purposes.

4.2 General management of odours

The composting facility is located in a remote location south of Princeton, BC (see Figure 1. Location plan, included in Appendix A). Prevailing winds are generally from the southwest and west, blowing to the east and north towards the Copper Mountain Mine.. To address the conflicting information about wind direction, a windsock will be installed in an appropriate location to monitor local wind direction, for planning operational activities and following up on any odour complaints.

Odours from this type of compost facility are typically generated during the initial mixing of materials, during the first 2 weeks of active composting and during the first turning of material. Odours will be minimized during this time by careful management of the composting process (temperature, moisture and aeration) and timing of materials movement (i.e. moving material in the morning when air is rising and odours will be dispersed rather than in the evening when air is cooling and settling causing odours to be trapped near the ground) (MoA, 2014). Odours are expected to be minimal and less offensive after the active composting phase, when material is moved from compost bunkers to curing piles after 3 to 4 weeks of composting. Odours should also be minimal during the curing phase and screening as volatile organics have been destroyed by the end of the active composting phase and residual odour is generally of a musty or earthy nature.

Leachate is also a significant source of offensive odours. Proper maintenance and operation of the leachate collection system is critical for managing odours from leachate. The system will be fully inspected at least twice per year, with specific collection areas cleaned routinely during compost facility operation (i.e. bunker drains cleaned between batches, collection drains cleaned when exposed, etc.). The current facility design has all leachate stored in storage tanks, which should minimize migration of offensive odours.

Routine, proactive odour monitoring is recommended for the first year of operation, and beyond if any odour complaints are received or issues with odour migration are otherwise discovered. Monitoring is best conducted by a person(s) who is not present at the facility on a daily basis and is therefore not desensitized to composting facility odours. Monitoring events should be completed at least once every 2 weeks, using standardized methods, sample locations (see Figure 4. Proposed odour monitoring locations, included in Appendix A) and record-keeping practices.

Arrow is responsible for managing odours generated at the Ingerbelle Compost Facility, and accountable for any impacts from odours migrating offsite. Arrow will conduct annual reviews of odour monitoring records, including any complaints received and subsequent investigations records and remedial actions taken. Results of annual reviews will inform adjustments to operating procedures and the odour management plan for the site may be updated to reflect best management practices.

4.3 Odours during delivery, storage and pre-mixing of feedstocks

Delivery, storage and pre-mixing of feedstocks is one of the stages of composting during which offensive odours can be produced. The potential for odour generation during this stage of the process is considered high. Facility operators will endeavor to minimize odours during this initial stage of the composting process at the Ingerbelle Composting Facility.

Odour production during the delivery and pre-mixing of materials will be minimized by mixing or covering feedstocks with carbon or finished compost within one day of delivery. Biosolids can be stored without mixing for longer periods as odours dissipate quickly as the outer layer dries out, creating a crust which serves to contain odours. In emergency situations when it is not possible to mix food waste with bulking agent within 24 hours, the pile will be covered with a 150 mm minimum layer of wood fibre residuals or finished compost, and tarped if necessary, to contain odours until material can be mixed and placed into bins.

4.4 Odours during active composting

Offensive odours can be produced during the period of active composting, particularly during the first two weeks of active composting when organic matter is being degraded by composting organisms and odouriferous compounds can be produced if composting conditions are not optimal. The potential for odour generation during this stage of the composting process is also considered high.

Feedstocks will be blended to be within the optimal carbon to nitrogen ratio at the start of the composting process to ensure that microorganisms have access to sufficient carbon to utilize the nitrogen in the feedstock, and thus reduce the production and loss of ammonia by composting organisms. Composting materials are maintained in bins at the optimal moisture content and aerobic conditions (through regular pile aeration) thereby avoiding saturation of the pile and anaerobic conditions, which contributes to odour production. In this way, the production of odourous compounds during the active composting phase is minimized. Each bin of compost will also be capped with a minimum 150mm layer of overs or finished compost to contain odour-causing compounds that are produced.

There is potential for odours to be released during the movement of material from bin to bin, particularly after the initial 2 weeks of composting when there may still be some odourous compounds present in the compost. Odour production during moving of material from bin to bin after the first 2 weeks of composting is minimized by completing materials movement as quickly as possible and during times of day when winds are low.

4.5 Odours during curing and screening

Odours may also be produced during the curing phase, during movement of material from the composting bins at the end of the active composting phase to the curing area, and during screening of material. The potential for offensive odour generation during this stage of the composting process is considered moderate to low; odours generated by the compost during during and screening are generally of a musty or earthy

nature. Maintaining aerobic conditions within the curing piles by using forced aeration or periodic turning of the piles is expected to minimize generation of offensive odours. Movement of odours and dust off-site is further minimized by avoiding turning curing piles and screening compost on days with significant wind..

4.6 Response to odour complaints

The compost facility (formerly All Seasons) has operated for over 15 years without formal odour complaints. Despite this favourable track record, it is understood that conditions at the site cannot always be maintained at optimum levels for odour control and that there may be instances when odours migrate offsite. In the event an odour complaint is received, the following actions will be taken:

- Arrow personnel will follow-up with complainant (if possible) to gather and document specifics of odour incident (day/time, intensity, description, etc.).
- By the end of the working day the complaint is received, a facility operator will conduct an odour assessment throughout the facility, at the facility perimeter and in the current direction of wind travel. Results of the operators findings will be documented.
- A Qualified Professional, or other qualified environmental personnel, will conduct an inspection within 48 hours to assess odours throughout the facility to determine the primary source, as well as along the site boundaries and towards the direction of the complainant. Results and recommendations following the inspection will be documented.
- Weather and site conditions (including operational activity, e.g. truck offloading, blending, etc) at the time of the complaint will be reviewed and documented.
- Any incoming feedstock stockpiles not already covered will be covered with carbon or finished compost to act as a biofilter for potential odours.
- A Qualified Professional will review feedstock blending ratios, moisture content and overall composting conditions to ensure the process is within appropriate ranges.
- Where warranted, timing of composting operations will be adjusted to accommodate increased neighbourhood activities (i.e. avoid turning piles on long weekends when the Kennedy Lakes recreation area is busy).
- Routine odour monitoring will be increased to twice daily (morning and afternoon), commencing upon receipt of complaint for at least one (1) week or until odour issue is resolved if the problem persists beyond one week.
- Arrow will follow-up with the complainant (or referral agency) to confirm investigative/remedial actions and inquire whether odour impacts/complaints have persisted.

NutriGrow has developed a general inquiry response protocol, outlined the action flowchart included on the next page.

4.6.1 Odour complaint action flowchart

Complaint Type (examples)

Internal/Staff complaints, e.g.:

- facility personnel or other NutriGrow staff

Direct complaints, e.g.:

- to NutriGrow
- to Arrow Trucking
- to a third party
- Local word-of-mouth/rumours

Media complaints, e.g.:

- printed traditional or social media
- media phone inquiry

Regulatory complaints, e.g.:

- to MoE, Interior Health or other provincial agency
- to Town of Princeton or RDOS

Strategies/Actions

Proactively address potential issues by:

- assessing potential gaseous hazards onsite and providing adequate training/equipment
- holding regular crew talks, safety meetings and safety reviews
- providing all frontline staff with information about feedstocks and composting
- preparing and submitting all documentation in a timely manner
- providing accurate information about composting whenever an opportunity arises
- being a "good neighbour" and contributing positively to the community

If a complaint is received or noted:

1. Document inquiry and forward to Brad English

~All next steps are directed by Brad English (or alternate)~

2. Follow-up with original complaint to determine appropriate action to resolve complaint:
   a. operational corrective action (i.e. location of receptor, timing)
   b. issue straightforward written or verbal response, if required
   c. further action required (go to Step 3.)
3. Select appropriate strategy:
   a. Qualified Professionals investigate complaint to assess cause and corrective action
   b. use Compost Odour Wheel to determine further corrective actions
   c. face-to-face meetings
   d. crew training to ensure odour issue does not re-occur
4. Repeat follow-up until complaint is resolved.

Key Contacts

Brad English, NutriGrow Manager 604 798-7610 (alternate: Jeff Mayer, Environmental Manager 778 694-4560

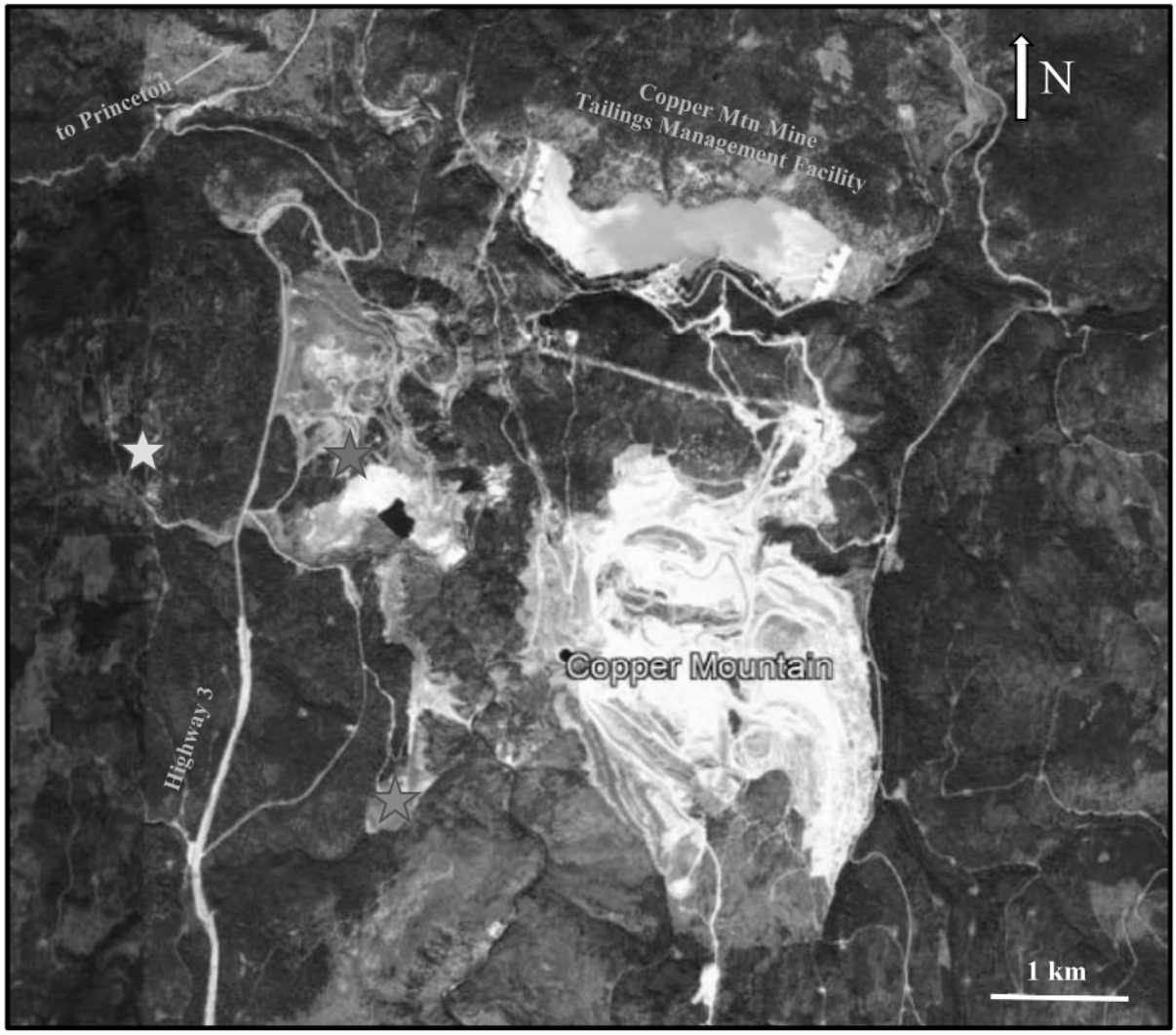
John Ablett, Arrow Site Supervisor 778 220-4494

Rob Davies, Arrow Trucking 250 792-6782

Ruth McDougall and Holly Suggitt, Qualified Professionals (P.Ag.'s) 604 313-9268 or 250 838-0255

Appendix A. Maps

Figure 1. Location plan



LEGEND:

- Ingerbelle Compost Facility
- Envirogreen Technologies contaminated soil remediation facility
- Kennedy Lake campground

Figure 2. Site layout

LEGEND:

- Site access roads
- Carbon/bulking agent receiving and storage area
- Schedule 12 managed organic matter receiving and storage area
- Composting bunkers
- Curing and compost storage area
- Bulking agent screening and storage area
- Leachate storage (existing tank and proposed additional capacity)
- Proposed future finished compost storage bin

Figure 3. Water quality monitoring locations

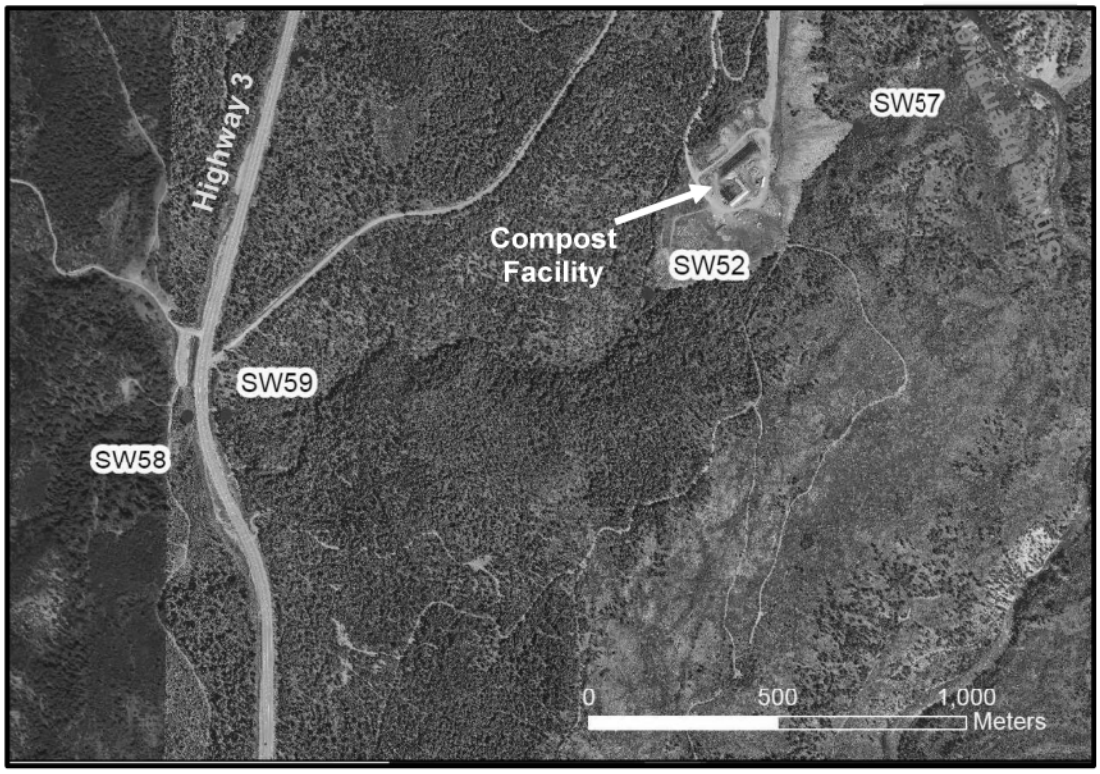
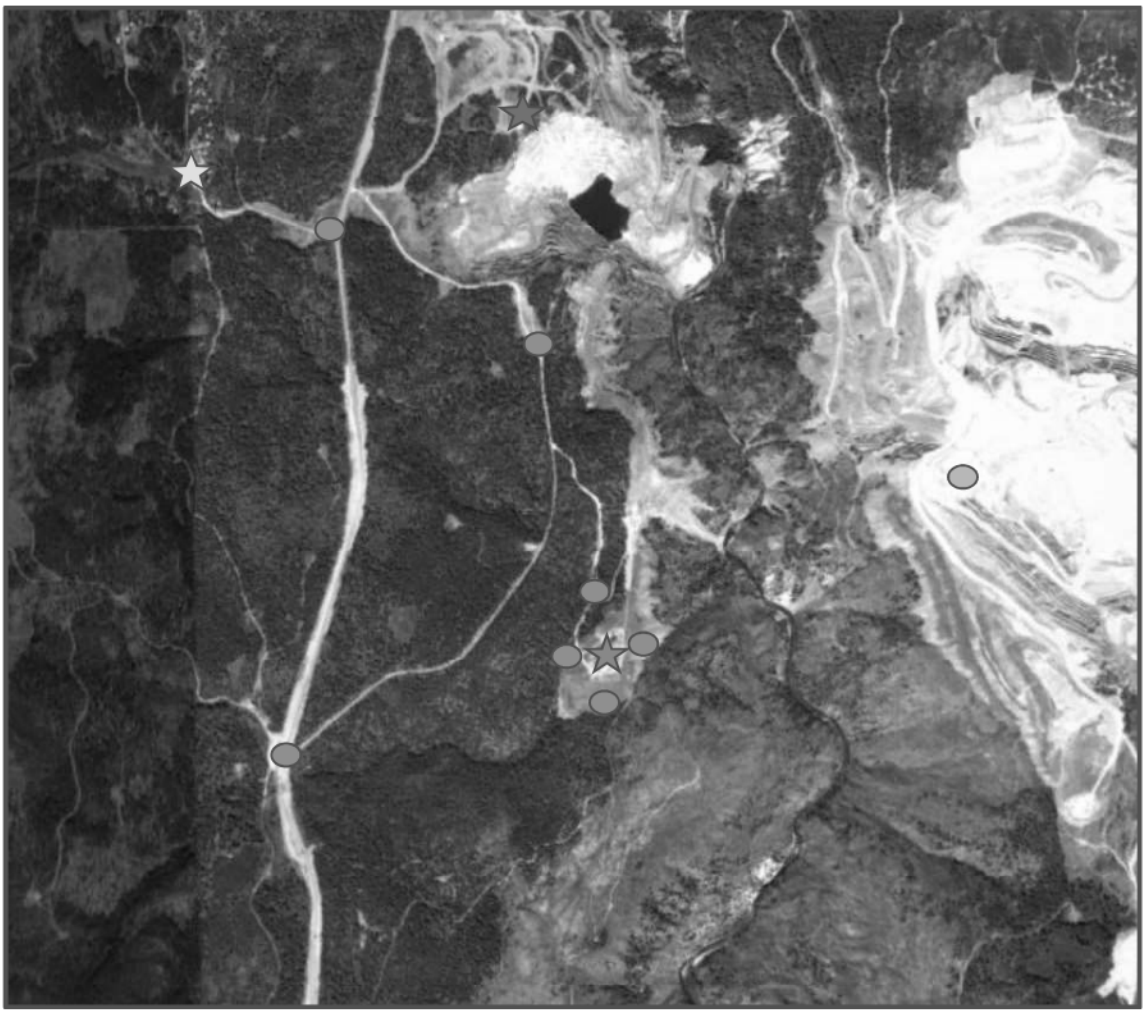


Figure 4. Proposed odour monitoring locations



LEGEND:

- Ingerbelle Compost Facility
- Envirogreen Technologies contaminated soil remediation facility
- Kennedy Lake campground
- Proposed routine odour monitoring location (sniff test)
- Proposed anecdotal odour monitoring (odours reported by mine staff)

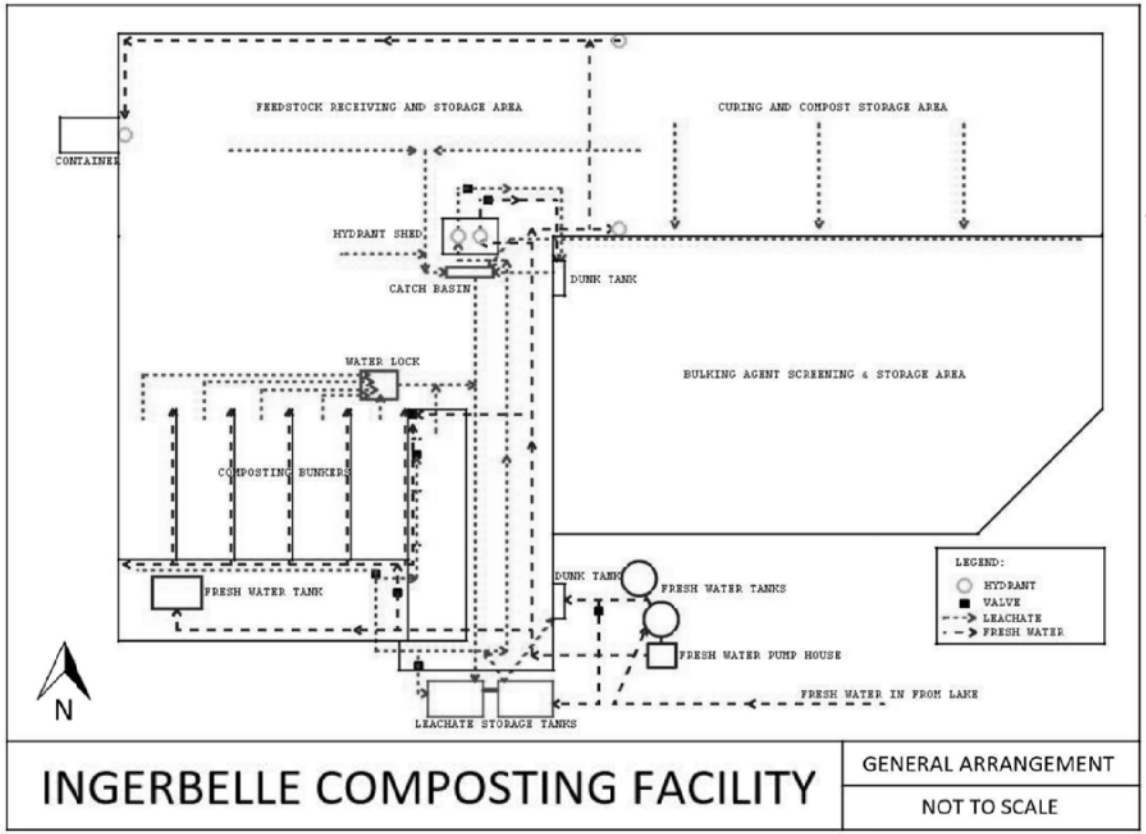


Figure 5. Leachate collection system

NET ZERO WASTE
ABBOTSFORD INC.

Operating and Closure Plan
Including Odour and Leachate Management Plans

Abbotsford Composting Facility
5050 Gladwin Road, Abbotsford, BC

Prepared For:
Net Zero Waste Abbotsford Inc.

Prepared By:

TerraWest Environmental Inc.
Tel. 1.866.500.1553 Fax 250.389.1554 Email info@terrawest.ca
TerraWest Project File: NZAB19-01

Date:
March 31, 2021

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OVERVIEW

Net Zero Waste Abbotsford Inc. (NZWA) currently operates a Compost Facility (the "Facility") within a leased portion of land AT 5050 Gladwin Road in Abbotsford, British Columbia. The Facility provides valuable composting services for curbside food and yard waste, commercial waste, and agricultural waste from communities within the Fraser Valley Regional District (FVRD) and Metro Vancouver region through multiple service agreements.

The Facility's composting process utilizes an in-vessel GORE™ Cover Processing Model inside of a primary composting building equipped with a biofilter for additional odour control and a fully contained leachate capture and storage system. Following feedstock receipt, yard trimmings and organic waste are fed into a shredder. The shredded material is inoculated with recycled leachate within the building and placed in long contained bunkers under a GORE™ Cover. The composting process consists of multiple phases for a total process time of between six to ten weeks. Materials are screened and compost is stored and flipped in outdoor bunkers for further curing and stabilization prior to sale as Class A Compost. The outdoor bunkers are covered and all works occur on an impermeable asphalt surface to prevent stormwater from coming into contact with organic material and to minimize weights for trucking to customers during the wet months of the year.

NZWA stands alone within the industry with an unprecedented zero odour incident and zero service disruption track record.

The Facility is situated in an agricultural setting with natural buffers on all sides. NZWA has obtained approval from the Agricultural Land Commission (ALC) for a Non-Farm Use Compost Facility for their current operations (ALC resolution #2552/2010). Annual updates have been provided to the ALC on the Facility's continued leachate and odour control improvements. The design of the composting process, leachate and stormwater management systems have proven to provide an effective low cost in-vessel composting solution to Abbotsford and the region for organic waste management.

This Operating Plan is in full compliance with the OMRR, follows the objectives of the FVRD Solid Waste Management Plan and contains comprehensive stormwater, leachate and odour management plans.

1.0 GENERAL FACILITY INFORMATION

The Facility location, zoning, and land use is described as the following:

Site Location & Zoning	
Operator	Net Zero Waste Abbotsford Inc.
Civic Address	5050 Gladwin Road, Abbotsford, BC, V4X 1X8
Legal Description	South Half Lot 12 Section 4, Township 17, New Westminster District, Plan 649A PID: 002-346-508
UTM	Lat 49° 5' 38.12" N Long 122° 18' 53.38" W
Zoning[1]	A2 – Agricultural
Land Use[2]	Agricultural

Reference to the Facility location can be found in Figure 1, a site plan can be viewed in Figure 2 and Facility design drawings and recent upgrades are presented in Appendix A.

Primary Contacts:

Mateo Ocejo, *P.Eng.* - Net Zero Waste Abbotsford Inc. Director
(604)-868-6075
mateo@netzerowaste.com

Environmental management and "Qualified Professional" (QP) services are provided by:

TerraWest Environmental Inc.
PO Box 58
Cowichan Bay, BC
V0R 1N0

Primary Contact:
Adam Mabbott, P.Chem., AScT, EP
(250) 616-7781
amabbott@terrawest.ca

2.0 TYPE, QUANTITY, AND QUALITY OF WASTE

The current forms of waste being accepted/delivered to NZWA are agricultural waste, commercial food waste, curbside food waste, yard waste and green waste. The majority of waste will be provided locally through the existing collection of yard and garden waste and

[1] City of Abbotsford (2020). City of Abbotsford online mapping tool. Available from: http://maps.abbotsford.ca/Html5Viewer/
[2] City of Abbotsford (2020). City of Abbotsford online mapping tool. Available from: http://maps.abbotsford.ca/Html5Viewer/

from the curbside Source Separated Organics (SSO) program. No bio-solids or sewage sludge of any kind are accepted at the Facility.

Materials Accepted/Delivered	Approximate Maximum Amounts (TPA)*
Commercial Organic Waste	10,000
Agricultural waste	10,000
Curbside food & yard waste(SSO)	35,000
Yard Waste	10,000
Other (ex. MFU, de-packaged organics)	5,000

*(TPA) Tonnes per annum, all quantities are maximum possibilities; the facility does not accept over its 40,000 tonne permit limit.

The Facility is currently processing approximately 40,000 tonnes per annum (TPA) of food waste, green waste, and agricultural waste to produce up to 8,000 dry tonnes of finished Class A compost per year. The Facility design capacity is in the process of expanding that will result in a design capacity capable of processing up to 60,000 wet tonnes of waste to produce up to 15,000 dry tonnes of finished Class "A" compost per year. Approximately 6 to 8 acres of the 20 acres available are being utilized at the Facility leaving an additional 12 to 14 acres for future expansion.

Design Capacity Stage	Processing and Production Quantities
Past (Phase I)	Processing capability of up to 20,000 wet tonnes/annum producing up to 4,400 dry tonnes of Class "A" finished compost
Completed in 2018 (Phase II)	Processing capability of up to 30,000 wet tonnes/annum producing up to 6,000 dry tonnes of Class "A" finished compost
Completed in 2020 (Phase III)	Processing capability of up to 40,000 wet tonnes/annum producing up to 8,000 dry tonnes of Class "A" finished compost
Future (Phase IV)	Processing capability of up to 60,000 wet tonnes/annum producing up to 15,000 dry tonnes of Class "A" finished compost.

The end product produced and distributed is a coarse screened, fine screened, or compost and sand blend. The intended distribution or use of the final product is a combination of bulk sales and bagged Class A compost that will be sold and distributed locally which provides the majority of soil sales revenue. Bulk sales should ensure that all end product is sold by the end of each year. Should this not occur due to market factors, the Facility has the capacity to store a significant amount of end product without impacting operations.

3.0 HANDLING METHODS

The Facility operates an encapsulated aerated static pile GORE™ Cover system for all composting stages, both inside of a large 25 m by 78 m building and outdoors over impermeable asphalt surfaces. The Facility building is under negative pressure and completely sealed from the environment. All leachate generated during the Stage 1 composting process is captured by the in-ground collection system and sump near the receiving area which gathers the leachate and directs it to two 19,000 L (5,000 gallon) tanks located on the west side of the building. An air filtration system is present within the Facility building directs air to a biofilter for treatment. Once moved outdoors compost piles are aerated and covered with the same GORE™ cover to protect from precipitation. A flow diagram of the Facility's composting process can be seen in Figure 3.

3.1 WEIGH AND RECEIVING PROCEDURES

NZWA has a 100 tonne industrial electronic weigh scale on-site where all customers hauling commercial food waste, source separated organics from single family units, yard waste and agricultural waste are weighed-in/weighed-out upon arrival and departure at the Facility as part of its reporting requirements to Regional Authorities. Upon scaling completion, a NZWA staff member will supply the hauler with a printed electronic weigh scale slip showing the hauler's gross, tare, and net weights for billing purposes for both parties. Scale operational hours are Monday to Sunday 8:00 am to 5:00 pm.

Once material has been accepted into the Facility it is immediately deposited within the tip room floor in the fully enclosed building. This ensures any leachate can be collected within the building sump and stored in the leachate tanks. Off-gassing from incoming materials is directed to the biofilter through a ventilation system prior to materials being placed under the Gore Cover. Materials are stored within the tipping floor for between 24 and 48 hours before being shredded.

3.2 SHREDDING, MIXING, BULKING, & MOISTURE CONTROL

The processing building acts as the mechanical and electrical center of the Facility and is where incoming waste is deposited and pre-processed prior to being placed under the GORE™ Cover system for the primary phase of composting. The facility utilizes the Doppstadt DW 3060 for pre-processing which provides slow speed shredding and mixing of all incoming feedstock. This unit is equipped with a hydraulically-controlled shredding comb that allows it to handle contaminants without issue, damages, or process disruptions. At the discharge belt of the Doppstadt DW 3060 there is a horizontal belt magnet that removes all metal. The noise level and the fuel consumption of the electronically controlled motor are very low.

The shredder is able to remove contaminants while providing a uniformly sized 6" minus discharge feedstock and the ideal location for leachate inoculant injection which is

completed at the Facility via an overhead shower into the discharge pile. This process which occurs within the primary process building reduces the likelihood of the public and employees of coming into contact with the leachate. Leachate is added as required in the mixing unit until the required consistency and water content of greater than 35% and less than 60% is achieved as per Schedule 2, Section 2 (b)(i) of the *Organic Matter Recycling Regulation* (OMRR). Moisture content is determined by a "squeeze ball" test before the GORE™ Cover is placed on the pile. Moisture content is monitored through temperature increase and oxygen uptake through sensors on probes that are inserted into each pile. If temperatures are not reaching greater than 55° C the moisture content will be adjusted. Moisture content is also measured by lab test results at the end of the composting process to ensure the final product is within compliance.

The moisture level of feedstocks and the time of year will determine the amount of leachate addition required. Overs, which typically consist of yard waste, are used for bulking at the front end of the system and their use is increased during the winter as they are predominantly dry and remain biologically active. In addition, the overs create ample air space which is ideal for wetter feedstocks. If piles are built too wet, excess leachate is drained out of the piles while within the building and captured by the leachate collection traps below the piles directed to leachate collection sumps. Leachate collection is supplemented with wash down water which is done weekly by fire hose. Even with this wash down water, the two 5,000 gallons of double-walled leachate storage tanks are seldom at capacity. The leachate storage tanks are partially drained when each new pile is constructed within the building. This leachate provides both the necessary hydration to often dry incoming materials, as well as bacterial inoculant to kick-start the composting process.

When the piles are relocated to the outdoor pads, the material typically has a moisture content of around 55%. The composting process has a negative water balance where excess leachate is collected and redistributed over the piles to maintain moisture content. Under normal operations there is no need to discharge leachate off site. During the wettest months of the year, when feedstocks are of a higher moisture content the leachate system inevitably sees dilution with atmospheric moisture (November to March). During these times, collection of leachate is retained within the system for off-site disposal at a licenced processing facility (approximately 12-20 trucks/year).

Mixing of materials occurs mechanically by loader bucket as they are handled throughout the process. There are no less than five mixes throughout the composting process prior to screening which ensures that adequate mixing occurs. Larger items such as stumps or logs are stored and ground up with the "overs" which come off the screening plant periodically throughout the year and are used as a bulking agent as needed.

3.3 PHASE 1 – PRIMARY HIGH RATE COMPOSTING: TEMPERATURE CONTROL, PATHOGEN REDUCTION, AND

VECTOR CONTROL

During Phase 1 or the primary stage of composting, temperature is carefully monitored to ensure a high rate of active composting is occurring as well as pathogen and vector reduction. Once a pile is constructed, the GORE™ Cover is pulled in place encapsulating the heap using a mobile cover winding unit and loader. Material remain under the GORE™ Cover for a period of three to four weeks before it is turned and then recovered for an additional two to three weeks. While under the GORE™ cover temperature and oxygen probes are inserted into each compost pile at a depth of approximately 1 m. The temperature probe has five sensor points along its length enabling it to measure temperature throughout the pile. Data is then transferred to the Yooda software where it can be monitored in real time and graphed. A sample of a daily report can be found in Appendix B.

Temperature is monitored and recorded at all sensor points hourly to ensure that each pile achieves temperatures in excess of 55° C for at least three consecutive days. This ensures a reduction in pathogens in accordance with Schedule 1, Section 3 and 4 (b) of the OMRR. Temperatures and retention times are monitored and recorded each working day. The records for each heap constructed are stored at the Facility for a minimum of 36 months post production as per Schedule 6, Section 1 (b) and 2 of the OMRR. Each pile has a unique file and temperature record stored at the Facility. All records are available upon request.

Due to 80 to 90% of waste material being comprised of curbside SSO, the Facility has not encountered imbalances in the carbon/nitrogen nutrient balance to-date. The carbon/nitrogen ratio is determined during the initial stage of mixing of the material. If a pile does not reach temperatures exceeding 55° C the pile will be reconstructed to ensure the ratio is correct. Compost is tested by laboratory analysis monthly to ensure the nutrient balance is in compliance with Schedule 2, Section 2 of the OMRR for vector attraction reduction. The Facility produces concentrated compost with a low carbon/nitrogen ratio. This ratio is a result of high nitrogen feedstocks and compost screening techniques which removes remaining woody debris. As this compost can still be shown to be stable through respiration tests, an alternative vector attraction reduction protocol was provided by ENV regarding Class A compost status for a carbon/nitrogen ratio less than 15. See Appendix C for alternative attraction reduction method letter.

NZWA acknowledges that due to the organic nature of the incoming feedstock, there is an increased possibility of vector attraction including rats, mice, and raccoons within the on-Site compost operations. The tipping area and first phase of processing is completely enclosed which will help to mitigate against birds and other vectors. Vectors that travel to the Site in the waste will experience temperatures of more than 55° C for approximately 40 days during the composting process which will ensure destruction and no further propagation in accordance with Schedule 2, Section 2 of the OMRR. The same will apply for invasive species or weed seeds due to the aggressive and sustained temperatures demonstrated using this system. Vectors are also mitigated using approximately 20 bait boxes located around the

Facility that are maintained weekly. Another natural vector deterrent utilized on-site is a resident owl located in one of the covered bays. The owl nest box is monitored to confirm the presence of the resident owl seasonally; however, if current vector control measures are found to be unsuccessful a pest control professional will be contacted and new control program will be implemented.

3.4 PHASE 2 – SECONDARY STABILIZATION COMPOSTING: FLIPPING AND BREAKDOWN

After a pile has completed the indoor composting process it is moved outdoors and encapsulated with a waterproof GORE™ Cover and aerated before the final screening process. When outdoors, the cover protects the pile from ambient weather conditions, retains moisture, as well as minimizes runoff from the piles. These outdoor piles have in ground leachate and forced aeration systems to help further breakdown the material. The Phase 2 process is generally between two to four weeks in duration.

3.5 PHASE 3 – COVERED CURING

Additional outdoor curing is completed with above ground positive forced aeration bays and the use of additional GORE™ covers. NZWA extends this curing phase and covers this material to comply with the changes proposed in OMRR. This additional time provides additional moisture control and decomposition for a period of two to eight weeks depending on the time of year. Stabilization is required as screening material which is still wet is not productive as it can bind the screen.

3.5 FINAL CURING, PRODUCT STORAGE & AGING

At this stage, final curing of an additional two weeks may occur if necessary, although compost is sufficiently stable at this time. All compostable material that has broken down and cured is ready to be screened. During the screening process, any remaining foreign matter will be removed via screens and plastic film and remaining lighter debris will be removed using airlift separators. Final screened product is then stored on our asphalt pad and is contained by lock blocks to ensure no spillage or product loss. The compost is then flipped at least 2-3 times, blended with sand or other amendments and re-screened to produce a premium ¼" Class A compost (weather permitting). This class A compost is stored in three large buildings (2 x 40' x 40' and 1 x 60' x 60') near the front off the Facility, see Figure 2, so that it can remain dry and out of the elements prior to sale. Hauling large wet loads limits the economics of transport and negatively impacts the customer with a difficult to apply product.

4.0 UNAUTHORIZED WASTE

The Facility is open to the public and any other supplier/contractor throughout the lower

Mainland. Weigh-in/weigh-out procedures are controlled by NZWA staff, load inspection criteria along with site security including access gates and a fully enclosed compost process ensures no other waste is received at the Facility. All customers bringing in unauthorized waste are turned away and directed to the nearest local waste/recycling facility that will accept the refused material or the restricted material will be accepted at a cost to the customer and disposed of by NZWA at the appropriate local waste/recycling facility. The Facility is equipped with front load type steel refuse containers if required as contingency for the disposal of municipal solid waste. Any unauthorized waste material that is received at the Facility is disposed of at the appropriate local waste management facility.

As the Facility is located in the ALR, no biosolids or sewage sludge is accepted. In addition manures of any kind are also not accepted in order to avoid the addition of unwanted salts and to allow the Facility to be Organic Material Review Institute (OMRI) listed so the finished Class "A" composted produced is usable for Certified Organic Farms.

5.0 PROTECTION MEASURES

Contingency measures to prevent and/or reduce environmental impacts at the Facility from spills, fire, flood, and seismic disturbance are described in the following sections. In the event that the Facility has to be shut down for a period of time the tipping floor will be cleaned and all materials within the compost process will be placed under cover until further action can be taken.

5.1 SPILLS

Spill kits are available in all machines and the office to address the potential for accidental release of petroleum hydrocarbons. Facility personnel will be suitably trained in spill response procedures and actions. Any on-site maintenance equipment will be conducted over concrete and will use spill pads to catch any accidental release of vehicle fluids.

In the event of contamination of soils, groundwater, or surface water due to a spill event during operations at this Facility, the following actions will be taken: as required by the *Spill Reporting Regulation*, the governing bodies and stakeholders affected will be notified immediately. Expertise on contamination or spill clean-up will be obtained through a Qualified Environmental Professional and consulting agency to assist in spill response, clean-up, and monitoring. The following government agencies will be informed in the event of a reportable spill:

City of Abbotsford – Public Works	1-604-853-5485
City of Abbotsford – Emergency After Hours	1-604-864-5552
Environmental Emergencies - BC	1-800-663-3456

5.2 FIRE

The Facility has an interior in-building high pressure stand pipe connected to a domestic water supply located at the entrance of the receiving bay building as well as an exterior stand pipe located to the east of the Site entrance. The in-house emergency fire water line is 1 inch in size with a 400 foot hose that is kept accessible for fire suppression on all piles. In addition, an on-site portable water tank is kept full and available for use to douse hot spots. There are fire extinguishers mounted in the office, receiving bay building, and bagging line building. Stockpiles of amendment and screened "overs" will be limited to approximately 1,000 yards in size and separated by a minimum of 5 feet. This is a precautionary measure that will provide both a physical buffer and access for equipment against a larger type pile size fire. Earthmoving equipment including excavator and loader are on-site to assist as required. Absolutely no smoking is permitted at the Facility at any time.

5.3 FLOODS

In the event of a flood, incoming deliveries of feedstock and bulking agents would be restricted or refused. The Facility building would remain closed to prevent water from coming in contact with the activated composting piles and appropriate authorities will be contacted as required.

5.4 SEISMIC DISTURBANCE

The Facility will temporarily shut-down pending complete investigation by the operator in the case of any significant seismic disturbance. All structural components and ground infrastructure will be thoroughly inspected to ensure no damage has occurred to the grounds or buildings which could create safety or health hazards. Leachate tanks have been placed on independent concrete pads with their own seismic restraints to inhibit shifting during an earthquake.

5.5 SAFETY

Safety procedures within the Facility will, at a minimum, include the following:

- All visitors and personnel must check-in at the scale house and/or with administrative staff;
- All personnel and visitors must wear proper personal protective equipment, including: hard hat, high visibility vest, pants, long or short sleeve shirts, and CSA-approved steel toed footwear;
- Personnel operating equipment or working near equipment shall also wear eye protection and hearing protection;

- Dust masks and/or respirators and portable gas detectors will be provided to personnel working near the compost; and,
- The Facility Office Manager always holds current health and safety certifications.

NZWA personnel will receive training on measures that will minimize the exposure of biological particulates and dust, including shutting equipment windows when possible and the use of dust masks and/or respirators when on-site conditions require it. More detailed information is available in the NZWA Heath and Safety Plan. A copy of the Compost Personnel Training Plan can be found in Appendix D.

6.0 STORMWATER MANAGEMENT PLAN

6.1 OVERVIEW

The Facility is located within an agricultural area of Abbotsford that is provided with lowland drainage and irrigation (Matsqui Irrigation Zone 4[3]). Ditching that surrounds properties and the Facility within this zone is referred to as irrigation ditching. This irrigation ditching is engineered with pumping stations, weirs, and control structures to provide water to the ditches during the dry season (back-flooding) for irrigation of crops and de-watering for flood protection during the wet season. These irrigation ditches can be found on the north and east sides of the Facility all which connect to irrigation ditching along Gladwin Road which has eventual connection further north to the Matsqui Slough. The irrigation ditching surrounding the Facility does not connect to the municipal wastewater system. The irrigation ditches surrounding the Facility are maintained annually to provide adequate containment of irrigation water when back-flooded at a grade lower than the Facility. This prevents run-on surface water from flooding onto the Site. The control of water within these irrigation ditches is provided by the Abbotsford municipal operations. Irrigation water within these ditches is not used within the Facility or for irrigation purposes by NZWA.

NZWA has made significant upgrades in order to control run-on and run-off stormwater drainage surrounding their Facility. The following sections provide information about the design of the Facility's stormwater drainage and their maintenance routine for this system.

6.2 DESIGN

The Facility has been designed with two separate collection and management systems, one for leachate and the other for stormwater. Impermeable asphalt surfacing throughout the entire Facility is utilized by both collection systems to prevent infiltration of surface waters to ground. Further description of the leachate collection system can be found in Section 7.2 of this report. The asphalt surfacing within the Facility is graded towards the central portion of

[3] https://www.abbotsford.ca/Assets/2014+Abbotsford/Engineering/Mapping/D-936+Matsqui+Prairie+Irrigation+Zones.pdf

the Site which directs stormwater towards the stormwater management system and away from the outdoor curing areas. Permanent buildings and GORE covers are utilized in all areas of the composting process to impede stormwater from contacting compost stored at the Facility.

The stormwater management system on Site provides stormwater collection and containment and is designed to provide enough storage capacity to manage runoff from the Facility during a 12-hour 1:10 year storm event with a safety factor of 1.5. The system is comprised of concrete weirs an aerated primary pond and a supplemental pond. The concrete weirs allow for the initial settling of any solids and fines that may be present in the water. Fines and solids are then collected from these weirs by two means: a combination mesh bin and excavator and a submerged pump. The mesh bin operated by an excavator extracts solids from the containment weirs and disposes the solids back within the first phase of the compost process.

From the concrete containments, water enters and open-air primary stormwater pond. This pond is constructed with soil berms and base with low hydraulic conductivity within approximately 1,250 m^2 area and a capacity of approximately 1,250,000 L. The pond utilizes a floating aerator which ensures that aerobic conditions exist, and no negative odours are experienced from the pond area. A recent sample collected by GHD on February 18, 2020 identified the dissolved oxygen to be at a concentration of 8.00 mg/L. In addition to the aerator, a skimmer is used within the pond to harvest duck-weed that accumulates within the pond. Collected duck-weed is placed within the feedstocks in the initial phase of the compost process on Site. The primary pond allows for evapotranspiration to take place and any additional settling of fines within the collected waters. When the primary pond nears capacity an automated system controlled by a float switch pumps water to the supplemental pond located on the south side of the Facility. The supplemental pond has an area of 900 m^2 and a capacity of 895,000 L. From here surface water is discharged to a vegetated irrigation ditch which flows east along the southern Site boundary, then north along the east Site boundary and connects to the irrigation ditch which flows west along the northern Site boundary. Due to the variable discharge and over-flow design features within the stormwater management system, the discharge period is not continuous, and a specific discharge time/rate/flow cannot be determined. A concept design for the newly upgraded stormwater management system including surface water quality characterization is presented in Appendix E with stormwater and leachate management systems presented on Figure 4.

Each pond is cleaned out annually during the dry summer months. All organics collected from the ponds are added to the front of the composting system for reprocessing. Due to plastic film which inevitably makes its way into the ponds due to the nature of food waste recycling, annual cleaning of the ponds down to the clay base is necessary to remove all organics as well as all contaminants.

6.3 MAINTENANCE

The stormwater management system is designed as an automated system that operates without active involvement by an employee. There is a wet well in the lower storage pond that is activated by a float switch when the water level rises. This initiates pumping and storm water transfer to the newly constructed South Pond until the lower pond level is lowered and the switch is turned off. Should there be a high enough and sustained rainfall event to result in the filling of the upper pond, the stormwater would discharge via the south spillway and travel through the 400 m of newly constructed bio-swale before rejoining the existing irrigation ditch. Daily inspections are conducted at the concrete containment weirs, which are cleaned out periodically to remove any accumulated solids. Submerged pumps, the pond aerator and other stormwater mechanical equipment are inspected daily to ensure all components are functioning as intended. These inspections are recorded, and appropriate measures are taken when functions of the system require repairs. Pump maintenance is conducted bi-annually in order to check seals and clean operations for effective use. Daily mechanical sweeping of all exposed asphalt surfaces is conducted to limit dust and debris from accumulating and inhibit contact water during precipitation events. This also minimizes debris from entering the stormwater management system. Annual training is provided to operations employees who maintain the system requirements.

7.0 LEACHATE MANAGEMENT PLAN

7.1 OVERVIEW

This Leachate Management Plan will address the procedures that the Facility will take to both minimize and manage leachate generated by the Facility. The Leachate Management Plan has been approved by the NZWA qualified professional engineer with similar designs implemented in multiple facilities across Canada. It is the intent of NZWA to ensure that the Facility does not cause any significant or long lasting impacts to neighbours or the environment and sets the standard for meeting or exceeding all applicable municipal, regional district, provincial, and federal regulatory requirements.

Leachate generated from the compost operation will be minimized through control of feedstocks, control of compost processes including receiving, mixing, and curing, and control of stormwater run-on and run-off.

7.2 LEACHATE CAPTURE

Leachate management can often be the cause of numerous problems at composting facilities. The Facility has taken design precautions to ensure that leachate generation is both minimized and separated from atmospheric stormwater at the Facility. As the GORE™ Cover System has a negative water balance, the Facility does not expect to generate any excess

leachate. During the wettest months of the year, when feedstocks are of a higher moisture content the leachate system inevitably sees dilution with some atmospheric moisture (November to March). During these times, collection of leachate is retained within the system for off-site disposal at a licenced processing facility (approximately 12-20 trucks/year). An example of leachate analytical results for disposal purposes is presented in Appendix F.

All compost processing is conducted on impermeable surfaces of either asphalt or concrete which prevents any leachate from entering the natural environment. Below each compost pile are two leachate collection channels that double as aeration trenches. These channels collect leachate which flow below the slab to a central location within the building where it is pumped to the leachate storage tank for re-introduction to the new incoming feedstock. Recycled leachate is only added into the composting material at the start of the process prior to the start of the compliance period for time and temperature requirements for pathogen reduction.

The leachate storage tanks are constructed of high density cross linked polyethylene and the leachate is aerated within the tank using a coarse bubble diffuser. The tanks are double walled and equipped with an alarm to notify Facility staff in the event of a leak. Exhaust air from the tanks is piped directly to the facility bio-filter to reduce odour impacts at the Facility. Aeration channels are cleaned out periodically as part of the NZWA standard operating procedures to remove any solids which may have accumulated in the aeration system. These maintenance tasks utilize a small amount of domestic water which supplements the leachate system. Water is also used for the cleaning of equipment and weekly housekeeping to ensure a clean and odour-free facility.

In the event that a mix is too wet or a load containing excessive moisture is added to a heap, the GORE™ Cover System easily corrects the situation. All heaps go through a period of densification and drainage which is usually greatest during the first few days following placement in a pile. Excessively wet loads drain leachate during this period and can slump and compresses the material preventing optimal aeration. While this is not expected to be a typical occurrence, when this situation arises the cover is simply peeled back and the material is flipped to a new row. Additional amendments can be added if necessary; however, flipping the pile after a few days of drainage typically solves an excessive moisture problem. Few technologies can provide this level of flexibility on process control and optimization. Figure 4 displays the leachate management system.

7.4 MONITORING

To ensure that the NZWA leachate management system is operating as intended to service the Facility, a monitoring program has been implemented starting at the time of construction. Regular maintenance and inspections shall be conducted and recorded for the leachate management system to ensure that operations continue with no discharge to the receiving environment.

NZWA shall adhere to the proposed monitoring plans concerning stormwater management which are presented within the NZWA's Environmental Impact Study, completed by TerraWest Environmental Inc.

7.5 LEACHATE CONTROL UPGRADES

Leachate management continues to be a priority at the Facility as it is related to a successful process and odour management. Since the Facility opened, NZWA have continued to implement a variety of design improvements above and beyond what was included in the base design. While the entire footprint of the receiving building is on an impermeable surface and contained as part of the leachate system, NZWA has also made the following improvements since the baseline Facility construction:

- Additional asphalt sealing material was added along the lock block concrete interface to ensure that no small amount of leachate that made its way through the interior containment walls could escape into the surrounding groundwater.
- All leachate lines were drained down and videoed following installation to ensure a water tight system. A broken pipe was uncovered, cracked from aggregate, that was removed, hydro-vac'd and replaced.
- Repairs were made to the building manholes and catch basin to ensure that no leachate was escaping the Facility from these locations.
- An 8 m by 8 m section of pavement was removed in the tipping floor that had pot holed out around the leachate catch basin, a key drainage location, and replaced with more durable and protective concrete.
- Areas in the tipping floor continue to see damages associated with heavy truck traffic and repeatedly dropped loads. Thus, continued asphalt maintenance and repairs including a complete repaving of the entire tipping floor with two lifts of up to 6" of pavement to improve drainage and repair all pot holes or possible failed surfaces are ongoing as necessary.
- Waterproof roofing membrane was lapped and sandwiched between new wood sheathing that was applied to the tip floor wall. New paving was then applied up to the wall. This provides a waterproof seal up and along the length of the wall further ensuring that no leachate can escape the tip floor.
- Several operational improvements such as removable slides for below equipment were completed to facilitate the cleaning and the removal of trapped organics following their use. Identifying locations that can be a source for trapped leachate and organics and acting pro-actively to remove these odour sources before they become a problem has been the focus of the Facility since opening.

- NZWA intends to construct a 3,000 m^3 aerobic and anoxic chambered lagoon and a lift station capable of meeting a one-in-ten-year 24-hour storm event. Further details are presented in the Weaver Technical Updated Leachate Management Plan dated March 2021.

8.0 ODOUR MANAGEMENT PLAN

8.1 OVERVIEW

Odour control is an essential element for all compost operations and the following Odour Management Plan has been approved by the NZWA qualified professional engineer. It is the intent of NZWA to ensure that the Facility does not cause any significant or long lasting impacts to neighbours and meets all applicable municipal, regional district, provincial, and federal regulatory requirements.

To date, using operational best practices and the utilization of the GORE™ Cover technology, NZWA is proud to stand behind a perfect odour compliance track record without a single odour complaint to date. The GORE™ Cover System has demonstrated superior odour control at facilities worldwide with their "standard" outdoor cover design. NZWA has further upgraded this system with the use of an enlarged processing building that also houses the covers during the first few weeks of processing when odour and leachate levels are at their highest point.

The technology is primarily comprised of a unique GORE™ Cover which is waterproof and breathable; it also includes temperature and oxygen probes, blowers, a control system, a trench system and operator training. NZWA has further improved the overall facility design with considerations that include the installation of spray foam between lock blocks and extended height wall sheathing to remove any potential organic traps that could generate harmful odours.

Using experience gained at the operation of other numerous GORE™ Cover Facilities across North America, and operational best practices, NZWA has and will continue to provide the City of Abbotsford, City of Chilliwack and Coquitlam with an organic management service that is state of the art. This includes regular repairs and replacement of wood sheathing and asphalt, grading and leachate management improvements.

8.2 ODOUR CONTROL – VENTILATION AND BIO-FILTER

The primary focus for odour control is the processing building as this is one of the largest potential odour generators on-site. The interior processing bays have bunker walls with a Waterstop that contains all leachate, which is one of the primary contributors to odours, during this stage of processing. Leachate controls are discussed further in the Leachate

Management Plan.

Bio-filters have a long history of successful odour control however the GORE™ Cover provides more than a 95% odour reduction removing the need for a bio-filter especially with low volumes of waste and low concentrations of commercial grade organics from restaurant and grocery stores. NZWA has layered these technologies by utilizing both the GORE™ Cover System and a bio-filter as dual odour prevention operational tools. All waste inside of the processing building is shredded and placed under a GORE™ Cover as soon as possible to further minimize odour generation. The cover can be pulled back off the material and/or installed part way along the heap during construction to minimize dust and the potential for odour release during construction of the bay or during flipping of materials from Phase I to Phase II. Further procedures are in place to address potential odour generation by maintaining a clean site including drive ways and the screening area. Monitoring of odours around the Facility is done by staff daily. The landowner currently lives on the site with some of their children and plans to continue to do so. Having a partner on-site full time provides another reliable and accurate source for odour monitoring, while also providing significant motivation to the NZWA team to ensure that the closest neighbour is not negatively impacted.

8.3 CONTROL OF FEEDSTOCKS

Incoming feedstocks are primarily comprised of the curbside SSO program and is comprised of accepted materials as described in Section 2.0 of this plan. All incoming feedstocks are controlled at the gate to ensure all waste entering the facility falls into the one of the waste streams listed in Section 2.0. Should the Facility intend to compost a new waste stream, investigation of the feedstock, its composition, including moisture content and structure, and its use on a small scale are part of the process to its acceptance on a larger scale within the system.

8.4 CONTROL OF COMPOSTING PROCESS

The GORE™ Cover composting system's emission reduction efficiency is achieved by the well-balanced interaction of all the system elements. The GORE™ Cover - as the critical component - allows for effective emission reduction by three means:

1) Pathogen retention within the pile by the micro-porous structure of the GORE™ ePTFE membrane:

Pathogen reduction of greater than 99% could be proved in several microbiological tests. Occupational safety and the safety of nearby residents is thus ensured. Due to the thermal insulation of the GORE™ Cover enclosure and the temperature-distributing excess pressure in the system, the temperature required for material hygienization can be ensured throughout the entire pile even during winter months. Pathogens throughout the composting

material are safely inactivated.

2) Directly retaining odorous compounds passing through the GORE™ Cover:

The GORE™ Cover laminate works against gaseous substances that escape from the composting material as a diffusion barrier. A fine film of condensate on the inner side of the GORE™ Cover develops during composting that retains odours and other gaseous substances. These gases mostly dissolve in the water film and drip back into the pile, and continue to be broken down by the composting process. This results in a reduction of the overall emission flux.

3) Minimization of odour formation by achieving optimal process conditions:

The use of a GORE™ membrane influences the moisture discharge during the composting process. Excessive moisture would result in odour forming anaerobic zones; lack of moisture would stop adequate decomposition of biogenic materials, especially in arid zones. The membrane confines air permeation leading to even air distribution throughout the heap and avoids channeling effects from creating dry and wet zones within the pile.

8.5 CURING

Once the first, second and third stages of the Gore Cover System are completed, the compost material is stored for a minimum of three months before being available to consumers. During this three month curing stage, compost is flipped as necessary to prevent anaerobic conditions and optimize the curing and continued stabilization of the end product.

8.6 SCREENING

No odour is anticipated to be released during the screening process prior to final product distribution. Screening is conducted at the rear of the facility in an area which minimizes airborne odour or dust. Finished and screened Class A compost is then stored under cover where it is either blended with other amendments or stored so that it is kept dry to optimize trucking and delivery to end markets. NZWA uses waterproof plastic covers and or Compostex™ breathable tarps for outdoor piles to help with coverage and minimizing water absorption while in storage and prior to placement within one of the three compost storage buildings.

8.7 ODOUR COMPLAINT PROCEDURES

While it is not the desire of NZWA to cause any impacts due to the composting operations, NZWA recognize that this may not always be possible. Should there be an operational issue that results in an odour incident, NZWA hopes to learn from the mistakes and better rectify

the problem using the following procedure:

1) Odour complaints will be dealt with by NZWA staff in a polite and courteous manner. A phone number will be provided on signage at the Facility entrance welcoming questions or concerns.

2) The odour complaint will be recorded on the NZWA Odour Incident Report form included in Appendix G.

3) NZWA staff will note the operating conditions at the Facility at the time of the odour complaint.

4) NZWA staff will visit the site of the odour impact, such as the complainant's home, to determine the nature of the odour and using the odour wheel as a guide in discussions with the complainant.

5) NZWA staff will determine what the problem is and what actions can be taken to mitigate the odour situation.

6) The appropriate actions will be taken.

7) After sufficient time for mitigating actions to have occurred, the situation at the site of the odour impact will be monitored and reported to the odour complainant.

8) If necessary, further actions will be taken until the odour problem is corrected.

8.8 CONTINGENCY PROCEDURES

If an ongoing odour issue persists an investigation will be initiated to investigate the cause of the odour using appropriate monitoring devices. Areas of investigation on the facility will include:

- Leachate tanks
- Front entrance of the receiving building
- North ditch by the facility
- At the entrance of the Facility
- Stormwater retention ponds
- Screening Area
- Biofilter

Based on the results from the investigation locations NZWA's team would respond accordingly to resolve the issue. For example, if the source of odour is determined to originate from the entrance of the receiving building, it could be due to excess materials waiting for

processing, or due to the material in storage becoming anaerobic and requiring immediate placement on forced air and containment within a pile under the GORE™ Cover System. If the source of odour is determined to originate at the leachate tanks, then the following procedures will be followed:

- Check if the hatches on top of the leachate tanks are open.
- Check the tanks and pipes for any leakage or openings.
- Check if the tanks are aerated or in anaerobic conditions.

If the source of odour is determined to originate at the biofilter, the biofilter will be flipped, measured for back ups or aeration leakage and the media changed if necessary. If any other investigation points such as a stormwater retention pond or ditch readings are determined to be abnormal, then our team will immediately investigate to determine the source of any pollution. Future pollution will then be minimized and operating procedures modified to and eliminate the cause and ensure that future issues can be avoided.

9.0 COMPOST SAMPLING AND ANALYSIS

To comply with Schedule 5 of the OMRR, NZWA personnel will obtain and submit compost samples to an accredited laboratory for select metals analysis, as outlined in Schedule 4 of the OMRR. The sample frequency will be one sample per 1,000 tonnes of dry weight of organic matter produced. The samples will also be submitted for carbon/nitrogen ratios, as required in Schedule 2 of the OMRR: Vector Attraction Reduction.

Samples will be submitted for laboratory analysis for the following parameters and will not exceed the limits, as follows:

Substance	Limit (µg/g)	Substance	Limit (µg/g)
Arsenic	13	Mercury	2
Cadmium	3	Molybdenum	5
Chromium	100	Nickel	62
Cobalt	34	Selenium	2
Copper	400	Zinc	500
Lead	150		

In addition to the laboratory sample, the compost will be visually inspected for:

- Foreign matter content to ensure it is less than or equal to 1% dry weight;
- Sharp foreign matter such as glass or metal shards; and,
- Small plastic labels or other plastic material contaminants.

10.0 REMEDIAL ACTIONS

No ground or surface water contamination is anticipated from composting activities at the Facility. The Facility is fully enclosed, sealed at the base, has sealed containment within its footprint and all outdoor composting activities occur on impermeable surfaces and under cover. NZWA will take immediate remedial action if required, which may include any of the following:

- Use of earth moving equipment to excavate/remove material;
- Use of vacuum truck to remove liquids and wash down as required; and/or
- Use of sweeper type equipment to clean paved surface areas.

11.0 CLOSURE PLAN

11.1 INTRODUCTION

In the event of Facility closure, the following measures will be considered and performed, where applicable, to ensure the Facility and property are left in, or as close to, pre-operating and/or pre-lease conditions as possible or as deemed acceptable by the owner.

11.2 CLOSURE METHODS

Closure operations will occur in the following order:

1.) Anticipated closure date will be agreed upon by FVRD Director and Manager and/or representative of the NZWA Facility.

2.) No new composting feedstocks shall be accepted within the composting facility 60 days before the anticipated closure date.

3.) Official closure date will be agreed upon by the FVRD Director and Manager and/ or representative of the NZWA Facility. Closure activities will commence within 30 days of notification to the FVRD.

4.) All customers will be given 60 days notice of Facility closure date to source alternative processing solutions.

5.) Once all existing cells have been composted and processed, the asphalt surface shall be swept clean of all compost debris and the entire asphalt area will be visually inspected for signs of wear/integrity.

6.) All Facility sumps and drains will be hydro-excavated and cleaned of any leachate and debris. Any leachate and/or debris removed from the sump will be properly disposed of at a licensed disposal facility.

7.) Surface water monitoring samples will be taken no later than six months after official closure date. Surface water samples will be tested for all parameters set out in the current property's Environmental Management Plan. All data collected will be done in accordance with the BC Field Sampling Manual.

8.) After the buildings are removed from the Facility, the original top soil would be reapplied to the site to restore the site to the original condition before the facility was built on the site.

9.) A formal QP closure report detailing the above closure and sampling works shall be submitted to the property owners within six months of completion of closure activities.

10.) Upon the receipt of the closure report being to the satisfaction of the property owner, the owner will provide written confirmation to NZWA that the property has been returned to is satisfaction and condition.

11.3 CONDITIONAL CLOSURE STATEMENT

Net Zero Waste Abbotsford Inc. is committed to fully comply with all conditions and timelines presented within this closure plan. This Operations and Closure Plan is solely to fulfill all compost operational requirements as set in the BC Ministry of Environment's (ENV) Organic Matter Recycling Regulation (OMRR).

The composting facility has been constructed in accordance with the plans and specifications provided within this document.

This Operating and Closure Plan has been prepared by a Qualified Environmental Professional employed by TerraWest Environmental Inc.

Adam Mabbott, *P.Chem., AScT, EP*
VP Operations

5050 Gladwin Road
Abbotsford, BC
Phone: (604) 557-7065
www.netzerowasteabbotsford.com

FIGURE 1. FACILITY LOCATION

FIGURE 1. SITE LOCATION

CLIENT: NET ZERO WASTE ABBOTSFORD INC.

LOCATION: 5050 GLADWIN ROAD, ABBOTSFORD, BC

PROJECT: NZAB20-01

DATE: MARCH 2021

CREATED BY: AK

LEGEND

— — — — SITE BOUNDARY

THIS FIGURE IS SUBJECT TO THE SAME LIMITATIONS OUTLINED IN THE REPORT BODY.
THIS FIGURE IS FOR INTERPRETATION ONLY AND IS INTENDED TO BE VIEWED IN COLOUR ON 8 1/2"X11" SIZED PAPER.
THE BOUNDARIES AND SCALE DEPICTED ARE APPROXIMATE.
SOURCE: GOOGLE EARTH IMAGES

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FIGURE 2. SITE PLAN

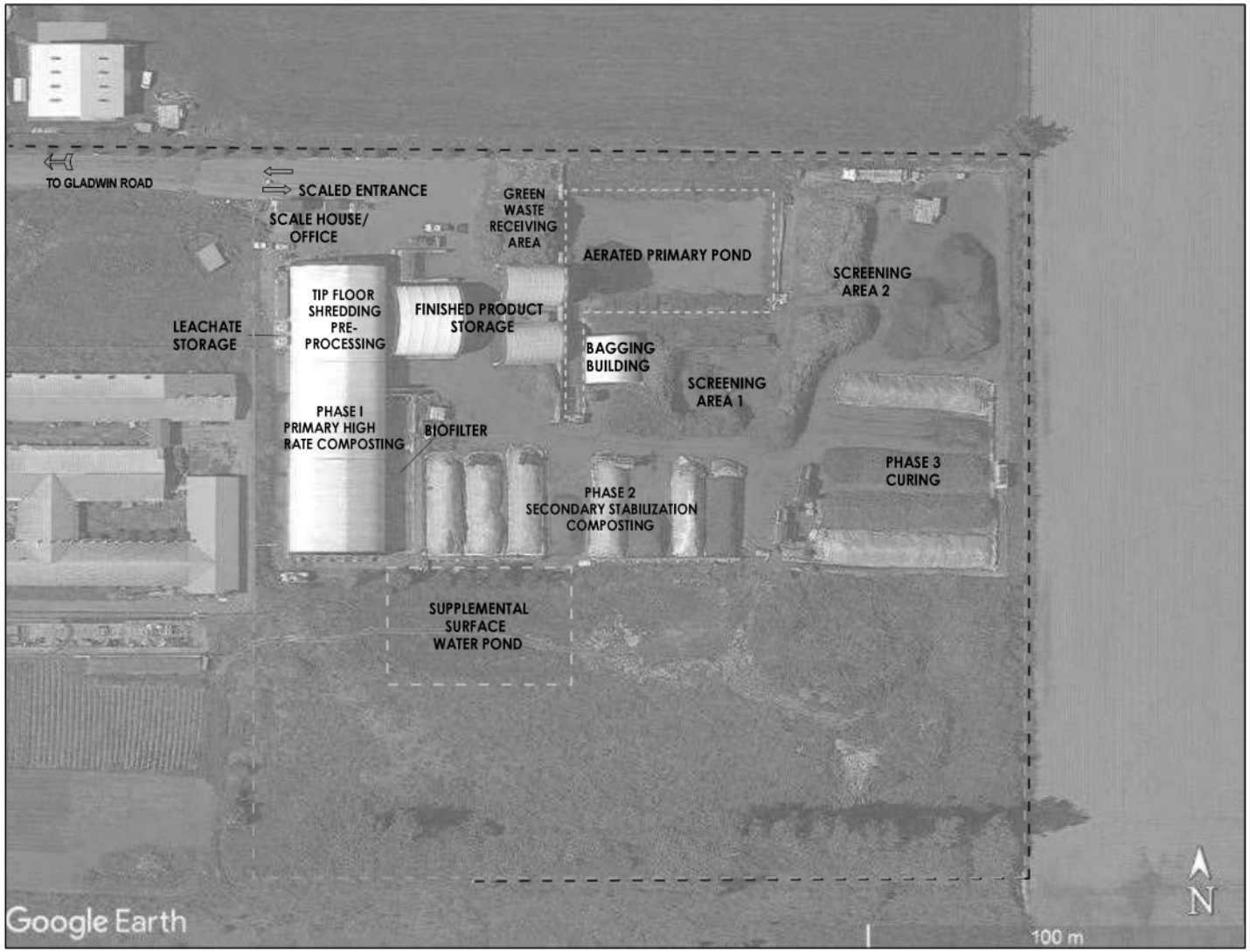

FIGURE 2. SITE PLAN

CLIENT: NET ZERO WASTE ABBOTSFORD INC.
LOCATION: 5050 GLADWIN ROAD, ABBOTSFORD, BC
PROJECT: NZAB20-01
DATE: MARCH 2021
CREATED BY: AK

LEGEND

- SITE BOUNDARY
- STORMWATER POND
- VEGETATED DITCH

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SOURCE: GOOGLE EARTH

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FIGURE 3. COMPOST FLOW CHART

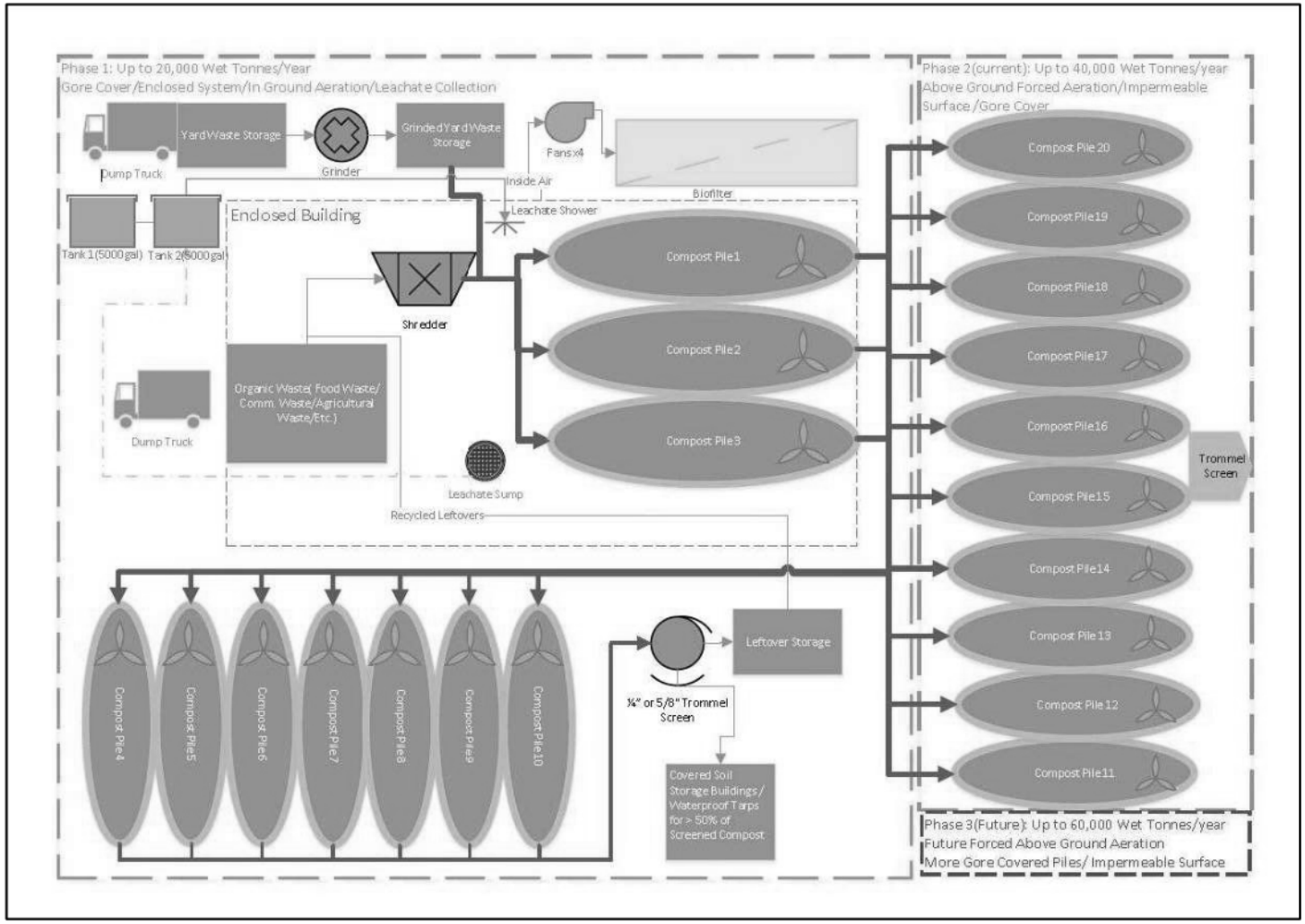

FIGURE 3. PROCESS FLOW DIAGRAM

CLIENT: NET ZERO WASTE ABBOTSFORD INC.
LOCATION: 5050 GLADWIN ROAD, ABBOTSFORD, BC
PROJECT: NZAB20-01
DATE: MARCH 2021
CREATED BY: A.K

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SOURCE: GOOGLE EARTH, ABBOTSFORD WEBMAP, IMAPBC.

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FIGURE 4. STORMWATER AND LEAHCATE MANAGEMENT SYSTEMS

FIGURE 4. STORMWATER AND LEACHATE MANAGEMENT SYSTEMS

CLIENT: NET ZERO WASTE ABBOTSFORD INC.

LOCATION: 5050 GLADWIN ROAD, ABBOTSFORD, BC

PROJECT: NZAB20-01

DATE: MARCH 2021

CREATED BY: AK

LEGEND

- STORMWATER MANAGEMENT SYSTEM
- STORMWATER PIPING AND TRANSFER
- STORMWATER FLOW DIRECTION
- LEACHATE FLOW DIRECTION
- LEACHATE CAPTURE AND UNDERSURFACE PIPING
- IRRIGATION DITCHING
- STORMWATER MONITORING LOCATION

STORMWATER MANAGEMENT SYSTEM

- THIS COLLECTED PRECIPITATION (STORMWATER) ENTERS INTO THE FIRST OF THREE CONCRETE CONTAINMENTS WITH ASSOCIATED WEIRS TO ALLOW FOR SETTLING OF SOLIDS.

-WATER IS PUMPED FROM THE THIRD CONCRETE CONTAINMENT TO TWO POLY STORAGE TANKS WHERE IT IS USED PERIODICALLY TO REHYDRATE FEEDSTOCKS WITHIN THE RECEIVING AREA OF THE FACILITY BUILDING.

- WATER FROM THE THIRD CONTAINMENT ENTERS THE AERATED PRIMARY POND WHERE IT HAS AN OPPORTUNITY FOR EVAPOTRANSPIRATION TO OCCUR. IN THE EVENT THAT THE POND LEVEL BECOMES TOO HIGH, STORMWATER IS PUMPED TO THE SUPLEMENTAL POND.

- FROM THE SUPPLMENTAL POND WATER DRAINS SOUTH TO A VEGITATED DITCH FLOWS AROUND THE FACILITY BOUNDARY BEFORE ENTERING THE IRRIGATION DITCH WHICH FLOWS NORTH ALONG GLADWIN ROAD.

LECHATE MANAGEMENT SYSTEM

- THE LEACHATE MANAGEMENT SYSTEM IS A CLOSED SYSTEM LOCATED WITHIN THE FACILITY'S COVERED BUILDING AND BELOW COMPOST PILES.

- LEACHATE IS COLLECTED FROM THE TIPPING FLOOR VIA GRADING AND COLLECTION SUMP. LEACHATE IS ALSO COLLECTED WITHIN LECAHATE COLLECTION CHANNELS LOCATED BELOW THE COMPOSTING PILES.

- UNDER-FLOOR PIPING CONNECT SUMPS AND CHANNELS TO THE TWO LEACHATE STORAGE TANKS LOCATED ON THE EXTERIOR OF THE FACILITY BUILDING.

- COLLECTED LEACHATE IS EITHER USED IN THE INITIAL PHASE OF THE COMPOSTING PROCESS OR COLLECTED AND DISPOSED OF OFF SITE BY AN APPROVED COLLECTION AND TRANSFER FACILITY.

THIS FIGURE IS SUBJECT TO THE SAME LIMITATIONS OUTLINED IN THE REPORT BODY.
THIS FIGURE IS FOR INTERPRETATION ONLY AND IS INTENDED TO BE VIEWED IN COLOUR ON 11"x17" SIZED PAPER.
THE BOUNDARIES AND SCALE DEPICTED ARE APPROXIMATE.
SOURCE: AERIAL IMAGERY OF SITE.

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APPENDIX A.

FACILITY DESIGN AND UPGRADES

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Withheld pursuant to/removed as

s.21

NET ZERO WASTE
ABBOTSFORD INC.

June 14th, 2020

Cassandra Caunce, BSc.
Director, Authorizations South
(office **NEW #**) 236.468-2227 • (cell) 604.862-7206
Ministry of Environment & Climate Change Strategy
Regional Operations Branch, Environmental Protection

Re: Net Zero Waste Abbotsford (NZWA) – Expansion of Infrastructure 2020

Shortly after starting our Ministry of Environment OMRR permit application in early 2018, NZWA was issued a stop work order by the ALC regarding a concern over total allowable impermeable surfaces (sq/ft) allowed in within our Non-Farm Use. The entire NZWA facility is either under roof or is on asphalt. NZWA completed a topographical survey for the ALC to provide the exact square footage utilized. We worked with ALC leadership to resolve their concerns. NZWA then shared this approval along with an full explanation to Ministry staff in February of 2020. Despite that delay (beyond our control) we have been threatened with an Administrative penalty by Ministry staff. Since obtaining our ALC approval, NZWA has completed many of the infrastructure upgrades discussed over the past 2 years which include:

- Re-grading and hard surfacing of low-lying areas. (Areas of the site that had seen settlement and were known to pool storm water / contact water)
- Increased covering of outdoor curing piles (additional Gore Covers Purchased with new buildings and roofs installed for storage of Class A Compost)
- Re-paving of the green waste receiving area and both 40’ wide compost storage tents.
- Removal of the on-site wetland: impossible to clean and a haven for vectors (rats).
- Substantial improvements to surface water spillways and settling chambers, prior to entering the storm water storage pond. Poured concrete & asphalt facilitate staff cleaning.
- Purchase of a new sweeper attachment for the Bobcat (reduced dust / mud in SW system)
- Eliminating the flow of discharge water from the current storage pond into the adjacent agricultural ditch though the removal of the discharge point.
- Installation of a 100’ x 100’ pond so as to facilitate cleaning of the existing pond annually and to reduce on-site flooding during high rain events with additional holding capacity.
- Design and construction of an engineered wetland and supporting drainage infrastructure on the south end of the site.
- Installation of 1,500 feet of new perimeter ditching bioswale.
- Installation of a new septic field & new storm drain screens to remove solids at manholes

Below are the before and after photographs related to the work listed above so that your team can visualize the improvements discussed. Improvements continue daily which have already started to positively impact the quality of our storm water which we test regularly.



Existing Storm Water Pond w Surface Aerator / SW catch basin screen / Compost Storage Tents


In Ground Leachate Collection – Bays 1-10 / Aerated Double Walled Leachate Storage Tanks

Spillway/settling chambers BEFORE

Spillway/settling chambers AFTER UPGRADES

Removal of Soil / Installation of Reinforced Concrete and Pavement Skirting (cleaning)

Standing Water Areas: Asphalt Damage (Before) Asphalt Re-Paving March & April 2020

New Paving and Grading of High Traffic Pad and Inside Compost Storage Tents (Dry)

New Bobcat Sweeper attachment / Mud removed w sweeper (Typically dumped on Tip Floor)

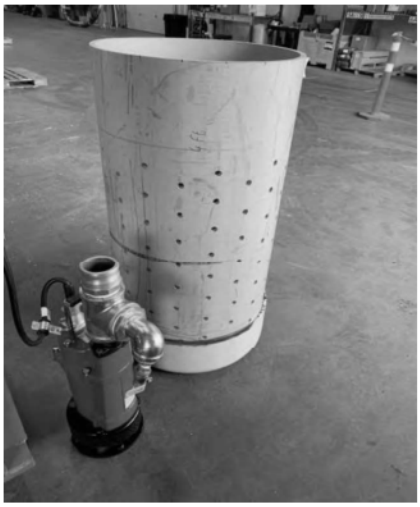
Building Roof Holes and Separation 7 years old / New Roof Installed October November 2019

Green waste receiving area BEFORE

Green waste area AFTER (March 2020)

Biofilter Reconstruction (Jan / Feb. 2020)

Septic Field Reconstruction (Mar.2020)



Transfer Pump and Sump (April / May 2020) / Installation of Wet Well / New Pond / Spillway

The BC Ministry of Environment has shown leadership in its development of the OMRR which is beyond what most Provinces have advanced regarding Organic Matter Recycling rules and regulations. NZWA, the CCC and our sister companies have all contributed to the update currently underway. It has been well documented through an expanding data set, that successful facilities across the country separate storm water and leachate as well as minimize contact water through the implementation of a storm water management plan. The now closed Harvest Power provides a relevant local example that demonstrates how critical it is to separate leachate and stormwater to avoid downstream impacts and odours. While the compost facilities across the Province vary in their technology and process, OMRR must be applied uniformly for all facilities in order for the industry to be sustainable and for closures and negative news stories to be avoided.

While our facility has extensive infrastructure with indoor receiving and processing under the Gore Cover for up to two months, other facilities are permitted to receive food waste outside and to co-mingled stormwater and leachate. We sell out of our compost annually, yet other sites are allowed to keep unscreened materials on site for many years. Some facilities require ground water monitoring wells, others do not. Even the frequency of sampling varies from site to site. At NZWA, we have spent the past four years sampling and assembling photographic evidence to demonstrate to the Ministry that the regular application of liquid manure to neighboring fields is what drives fecal in the irrigation ditch. Our feedstocks are documented and reported annually (to the tonne) and we have never accepted biosolids, sewage sludge or manure of any kind.

Key to our success has been the production of an OMRI listed, nutrient rich compost. The separation and reuse of our leachate keeps these nutrients within our compost. Our continued investment into improved storm water management infrastructure, additional on-site holding capacity, aeration, polishing and solids removal will continue to allow our facility to operate sustainably and without downstream impacts for years to come. We look forward to your continued support and to working with you to complete the permit process.

Very truly yours,

Mateo Ocejo, P.Eng; Director
Net Zero Waste Abbotsford Inc.

Net Zero Waste Abbotsford Inc. (604)868-6075 mateo@netzerowaste.com

5050 Gladwin Road
Abbotsford, BC
Phone: (604) 557-7065
www.netzerowasteabbotsford.com

APPENDIX B.

SAMPLE OF DAILY REPORT

KOMPMASTER protocol

Company : Net Zero Waste Abbotsford Inc.

Food Waste Composting Facility
5050 Gladwin Road, Abbotsford, BC

Stack- name : Heap19
File- name : D:\Gore Cover System\Data\Heap19_9-8-2013.CSV

Food Waste started sept 8

First data download at: 9/9/2013

Nr.:	Date/time	Temperature T5 / °C	T4 / °C	T3 / °C	T2 / °C	T1 / °C	O2[vol%	Blower On-time/min	Cycles	Depth s 55°C[cm]
1	9/8/2013 23:59	30	30	30	28	28	20.4	357	34	100
2	9/9/2013 23:59	74	71	70	67	66	2.1	719	144	0
3	9/10/2013 23:59	78	77	76	74	72	2.1	720	144	0
4	9/11/2013 23:59	80	80	80	79	77	1.8	678	118	0
5	9/12/2013 23:59	79	80	81	80	80	1.8	892	109	0
6	9/13/2013 23:59	77	79	79	79	79	2.3	1007	86	0
7	9/14/2013 23:59	77	78	79	78	78	3.3	896	85	0
8	9/15/2013 23:59	78	79	79	79	78	3.3	622	33	0
9	9/16/2013 23:59	80	80	81	80	79	3.5	664	36	0
10	9/17/2013 23:59	79	79	80	79	78	3.4	722	54	0
11	9/18/2013 23:59	79	79	80	79	78	2.3	591	42	0
12	9/19/2013 23:59	80	80	80	79	78	4.3	530	37	0
13	9/20/2013 23:59	80	80	80	80	79	4.4	489	36	0
14	9/21/2013 23:59	80	80	80	80	78	4.0	460	36	0
15	9/22/2013 23:59	80	80	80	80	78	2.5	405	35	0
16	9/23/2013 23:59	80	80	81	80	78	4.5	370	35	0
17	9/24/2013 23:59	80	80	81	80	78	3.6	339	34	0
18	9/25/2013 23:59	80	80	81	80	78	4.7	323	34	0
19	9/26/2013 23:59	77	77	78	78	77	6.2	649	32	0
20	9/27/2013 23:59	74	75	76	76	76	8.3	514	36	0
21	9/28/2013 23:59	74	75	75	75	75	7.8	424	29	0
22	9/29/2013 23:59	75	75	76	75	75	8.8	479	30	0
23	9/30/2013 23:59	74	75	75	75	75	9.0	511	31	0
24	10/1/2013 23:59	75	75	76	75	75	6.6	457	30	0
25	10/2/2013 23:59	75	76	76	75	75	6.5	418	31	0
26	10/3/2013 23:59	75	76	77	76	75	9.1	423	31	0
27	10/4/2013 23:59	75	76	77	76	76	9.2	426	32	0
28	10/5/2013 23:59	75	76	76	76	75	9.2	451	31	0
29	10/6/2013 23:59	24	24	24	23	23	20.9	503	58	100
30	10/7/2013 06:17	22	22	22	21	21	21.0	190	38	100
31	10/10/2013 23:59	75	77	76	75	74	9.6	114	14	0
32	10/11/2013 23:59	77	79	78	77	75	9.2	262	34	0
33	10/12/2013 23:59	76	78	77	75	74	10.3	224	32	0
34	10/13/2013 23:59	75	77	76	75	74	11.2	183	27	0
35	10/14/2013 23:59	76	78	77	75	74	10.4	159	25	0

Flip Pile

Print date/time : 10/17/2013 3:18:11 PM

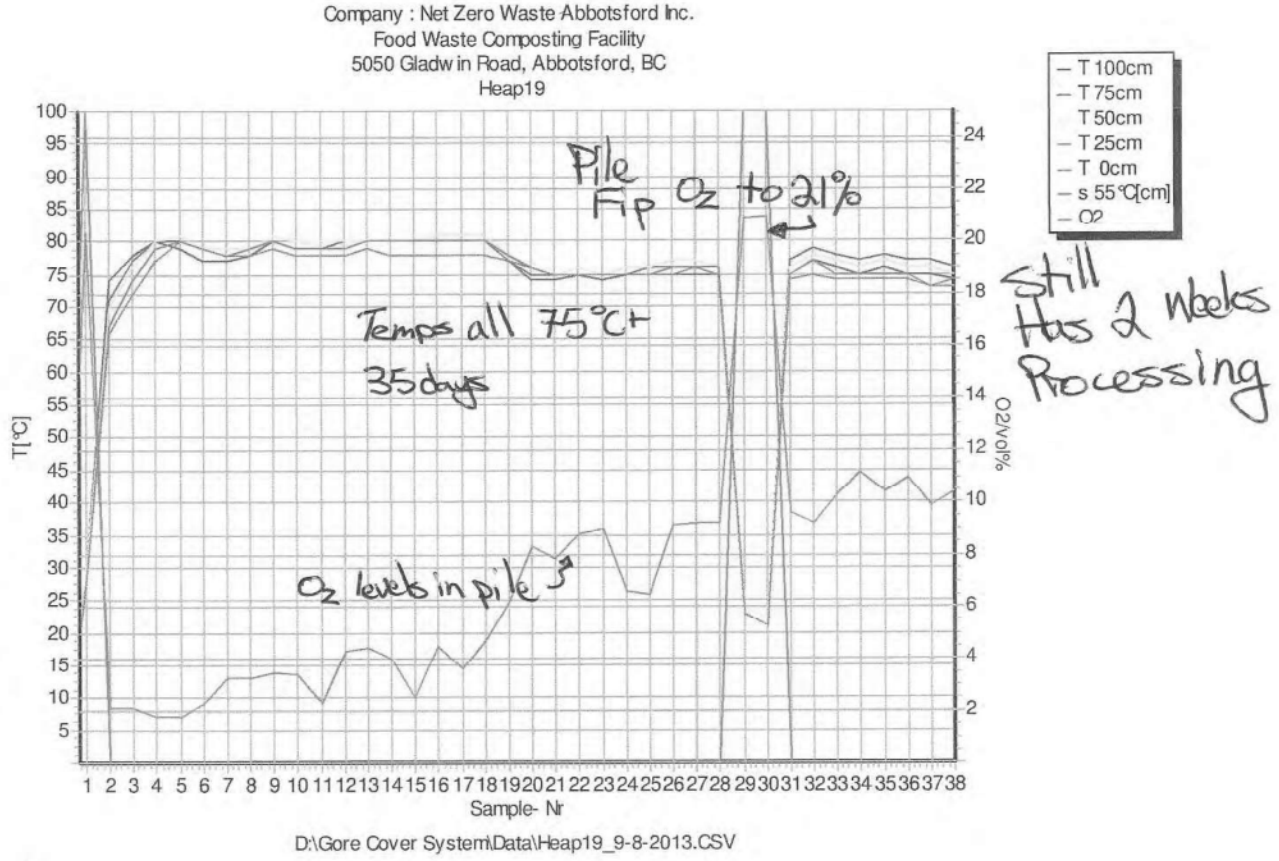
KOMPMASTER protocol

Company : Net Zero Waste Abbotsford Inc.

Food Waste Composting Facility
5050 Gladwin Road, Abbotsford, BC

Stack- name : Heap19
File- name : D:\Gore Cover System\Data\Heap19_9-8-2013.CSV
Food Waste started sept 8
First data download at: 9/9/2013

Nr.:	Date/time	Temperature T5 / °C	T4 / °C	T3 / °C	T2 / °C	T1 / °C	O2[vol%	Blower On-time/min	Cycles	Depth s 55°C[cm]
36	10/15/2013 23:59	75	77	76	75	74	11.0	156	24	0
37	10/16/2013 23:59	75	77	76	73	73	9.9	140	21	0
38	10/17/2013 14:58	74	76	75	74	73	10.4	86	13	0



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5050 Gladwin Road
Abbotsford, BC
Phone: (604) 557-7065
www.netzerowasteabbotsford.com

APPENDIX C.

ALTERNATIVE VECTOR ATTRACTION REDUCTION METHOD

BRITISH COLUMBIA

April 17, 2018

Authorization Number: 105854

Net Zero Waste Abbotsford Inc.
5050 Gladwin Road
Abbotsford, BC V4X 1B4

Dear Registrant,

Re: Request to use an Alternate Vector Attraction Reduction Method

The Ministry of Environment and Climate Change Strategy received a letter from Mateo Ocejo of Net Zero Waste Abbotsford Inc., dated January 30, 2018, requesting approval of an alternative test method to demonstrate vector attraction reduction.

In accordance with Schedule 2, Section 3 of the Organic Matter Recycling Regulation the following protocol is approved as an alternative to compliance with the carbon to nitrogen ratio test method set out in section 2 of Schedule 2, as a means of showing that vector attraction reduction has been achieved:

> ***The carbon dioxide evolution rate of Class A compost must be less than or equal to 4 milligrams of carbon in the form of carbon dioxide per gram of organic matter per day.***

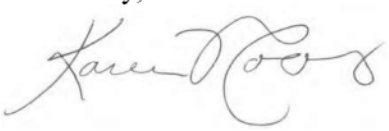
This alternate vector attraction reduction protocol is only considered effective for the Net Zero Waste Abbotsford Compost Facility (Registration 105854).

This alternate vector attraction reduction protocol is not considered an authorization under the *Environmental Management Act*. Notification and compliance with the requirements of the Organic Matter Recycling Regulation is required to effect authorization under the Regulation.

Your attention is respectfully directed to the terms and conditions specified in the Organic Matter Recycling Regulation. Contravention of any of the conditions is a violation of the *Environmental Management Act* and may result in prosecution. If the Regulation does not cover all waste streams at the site, additional authorizations may be required under the *Environmental Management Act*.

If you have any questions, please contact Don Vergamini, AScT, Environmental Protection Officer at Don.Vergamini@gov.bc.ca

Yours truly,



Karen Moores
Director's Designate
Ministry of Environment

Cc: Mateo Ocejo @ Mateo@netzerowaste.com

ENCL: None

5050 Gladwin Road
Abbotsford, BC
Phone: (604) 557-7065
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APPENDIX D.

COMPOSTING PERSONNEL TRAINING PLAN

NET ZERO WASTE
ABBOTSFORD INC.

SITE SPECIFIC COMPOST PERSONNEL TRAINING PLAN
NET ZERO WASTE FACILITY OPERATION
AT 5050 GLADWIN ROAD, ABBOTSFORD

Prepared by:

Mateo Ocejo, P.Eng

Facility Director and Qualified Professional

Farbod A. Diba, PMP

Project Engineer

CONFIDENTIAL

JULY 15, 2016

Contents

1.0 OPERATIONAL BACKGOURND & INTRODUCTION

Net Zero Waste Abbotsford Inc. (NZWA) has been operating an encapsulated aerated static pile Gore Cover system since January 2013 for which the 3 first stage piles have been housed inside of a building at 5050 Gladwin Road in Abbotsford, BC. This building is under negative pressure and completely sealed from the environment both for the containment of all leachate generated during the first few weeks of the composting process and the discharge of process air from the building which passes through a biofilter prior to the discharge to the environment.

NZWA has very capable lead operators to direct operations, training, reporting and record keeping. Operational certification training classes has been taken by the lead operators working at the facility. W.L Gore and associates have also provided some of the operational training classes related to the Gore Cover System. Finally, Net Zero Waste hosts an annual operational training program at the facility each year which is supported by a final exam from the Composting Council of Canada. These training programs include tours of existing operating facilities (such as the 200,000 TPA Cedar Site in Everett, WA where NZWA lead engineer and lead operator were trained). Operating Gore Cover Facilities, provide the unique ability to be trained on the use of specific components of the Gore Cover System Technology. Procedures for repairing components and best practices for ensuring a trouble free operation have been studied including lessons learned from other operating sites around the world.

The NZW composting facility operator training course is a week-long comprehensive course which broadens the operational understanding of the composting process and of the technical, environmental, and legal issues related to large-scale composting of organic waste materials. This comprehensive course is offered to new employees and newly hired operators so as to allow continued improvement on site. NZWA also offers this course to the public and to facility operators from other private and publicly owned sites. The content of this course includes but is not limited to:

- Feedstock recovery, feedstock preparation and composting
- Curing, screening & refining-storage and bagging
- Nuisance, vector and odour controls, and best practices
- Marketing of compost end products and possible value add options
- Compost biology, and process optimization
- Operational safety, PPE, facility design consideration

The information presented in the attached training plan is, to the best of our knowledge, and is current at the time of printing of July 2016. It is intended for general application for operations at the Abbotsford facility located at 5050 Gladwin Road.

2.0 GENERAL INFORMATION:

A. Site Address: 5050 Gladwin Rd, Abbotsford, BC V4X 1X8

B. Legal Description: Lot 12 Plan 649A Section 4 Township 17 Land District 36 S 1/2 Manufactured Home Reg.# 37640

C. Plan (Update) Prepared by: Mateo Ocejo ,P.Eng – Director (July 15, 2016)

3.0 GENERAL SITE DESCRIPTION

The Net Zero Waste Abbotsford facility is located in the north side of Abbotsford between Townshipline and Harris Road on 5050 Gladwin road. The facility is fully operational and receives Abbotsford's commercial and residential organic waste. Shown below in Figure #1 is an aerial site plan for the Net Zero Waste Abbotsford facility.

4.0 SITE HISTORY AND TRAINING PROGRAM

Net Zero Waste Abbotsford Inc. leases the land from Jayendee Farms. In 2015, NZWA accepted approximately 15,000 tons of organic waste materials. The facility provides curbside recycling services to a population of approximately 150,000 residents and provides a vital in-region processing option for commercial and agricultural wastes produced within the Fraser Valley Regional District.

Through the NZWA training program, our personnel are fully functional as compost professionals so that our facility can comply with:

- Part 3, Division 5 and 6 of the OMRR regarding Class A compost quality and the relationships between time, temperature and pathogen kill.
- Schedule 5 of the OMRR - Sampling and Analysis
- Schedule 6 of the OMRR - Record Keeping
- All other pertinent sections of OMRR

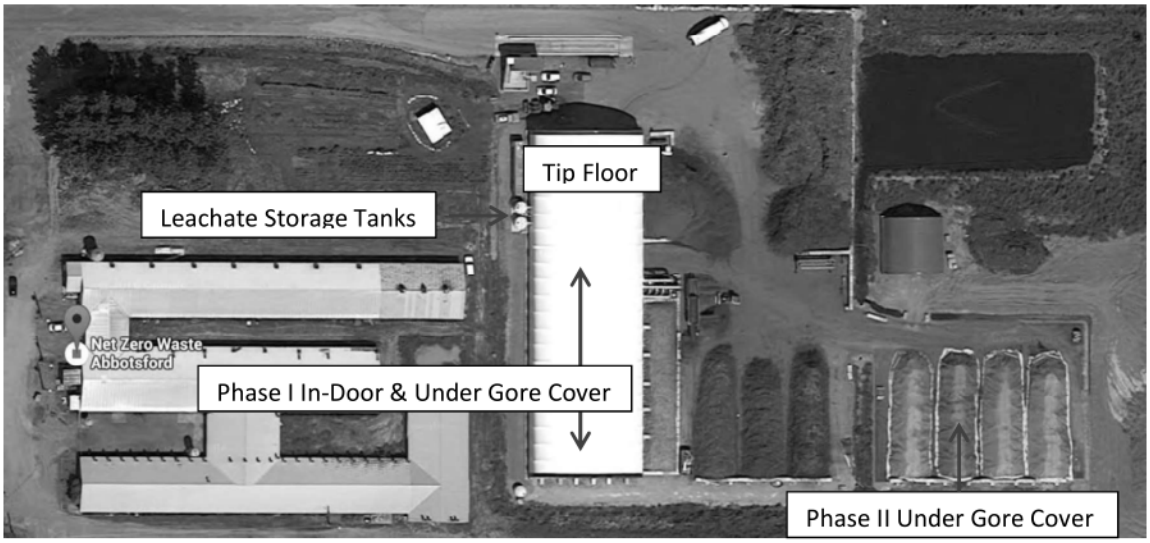
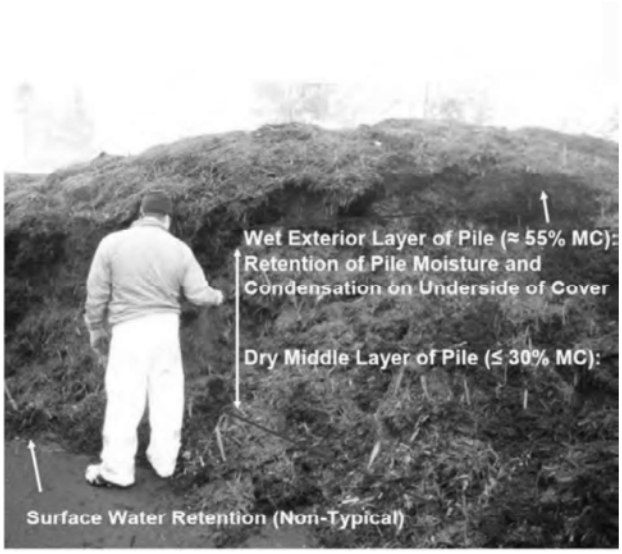


Figure 1-Net Zero Waste Abbotsford facility



In addition to understanding how to operate, monitor and manage a composting process, facility staff are also trained in all safety aspects of the compost facility operation, including machinery operation, dust, fungi, and microorganisms, Etc. *Most of the components of our training program will be conducted on site at the facility which provides the necessary equipment, professionals and feedstock's required to properly understand best operating practices for compost facility operations. Our overall program includes the following topics:*

- Basic information on composting
- The biological process, microorganisms, bacteria, fungi, dust, etc.
- Objectives of composting
- Pathogen destruction
- Product quality production
- Principals of aerobic composting

- Materials balance
- Feedstock characteristics
- Moisture / Total Solids
- Particle size & bulk density relationships
- Volatile solids
- Bulking agent functions
- Moisture control
- Porosity and aeration
- Pile Structure
- Adjustment of the carbon nitrogen balance
- Aeration basics and oxygen demand
- Aeration as a means of temperature control

Basic design aspects

- Mixing
- Controlling solids and moisture
- Importance of achieving homogeneity
- Effectiveness of mixing equipment
- Odour control

Encapsulated aerated pile composting- training on the use of Gore Cover System Technology

- Detailed training surrounding the specific operation of the Gore Cover System;
- Importance of pile construction and pile dimensions to suit the cover
- The importance of achieving a good seal of the Gore Cover to the impermeable surface
- How to check the data, analyze the performance of the pile and make adjustments
- Inspection procedures for the probes, their placement in the pile and understanding the produced
- Repairing the cover and repairing the probe replaceable components
- Advantages of utilizing the Gore Cover System

- How optimization of composting process is achieved using the Gore Cover System
- How energy processes are optimized through the use of intermittent aeration. Air pumped into the feedstock is retained to be consumed by the microorganisms through a low pressurization achieved below the cover.
- How piping will be used to aerate the pile and how the oxygen measurements from within the pile will determine when the blower is activated.

- Optimal moisture control at process initiation and when the addition of water during the process at the start of phase II can be necessary.

Odour control and process control options and troubleshooting

Compost Screening

Curing

Product Storage

Monitoring

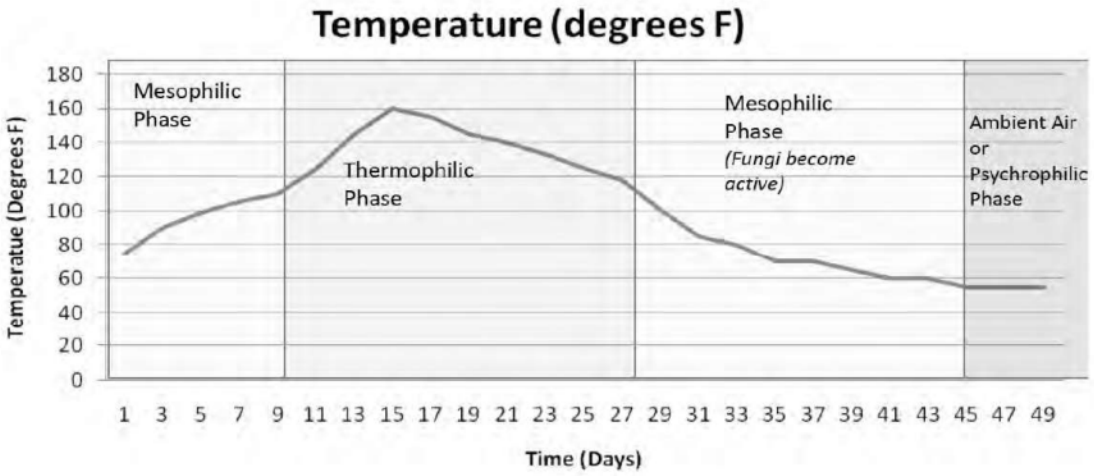
- Labeling piles and/or windrows
- Temperature collection and recording; creation of spreadsheet graphs
- Moisture analysis
- Oxygen analysis
- Monitoring date sheets and trendline graphs
- Analysis for regulatory compliance
- Sampling and testing compliance

Odour control

- Bio-filtration
- Design of Bio-filters
- Maintaining the Biofilter
- Moisture Control
- Pressure drop
- Determining when to replace biofilter media
- Process management

Record keeping

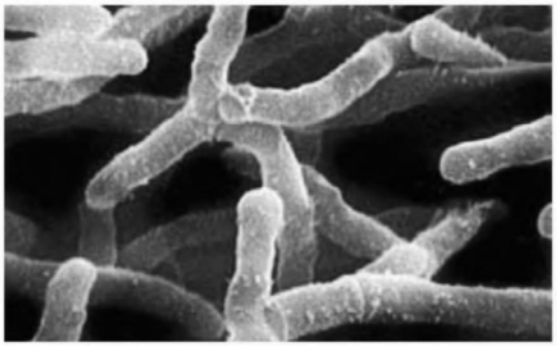
- Maintenance records
- Type of records; importance of trend line graphs
- Daily monitoring of data sheets
- Keeping track of quantities of material
- Process Management



Troubleshooting

- Odour issues (wind direction, daily site walkthrough)
- Pathogen destruction problems- time and temperature maintenance
- Cross contamination prevention
- Equipment Operation (loader use and best practices)

Safety Aspects



- Machinery Close Up
- Dust and Fungus
- Microorganisms

Product Marketing & Distribution

- Quality control
- Product testing
- Record keeping
- Marketing analysis; investigation into bulk vs. bagged sales and up-scaling of the compost end-product

In addition to the above, NZWA intends to keep all staff which oversee the compost facility operation up to date with the latest developments associated with changes to OMRR and organic management within BC. This will include periodic training and attendance and participation at local waste management conferences and personal development initiatives. It is NZWA culture and policy to encourage its employees to take advantage of conferences and regional training opportunities as these programs have the ability to assemble the large number of professionals from various industries so as to provide a full and comprehensive learning environment. It is our goal to maintain our full compliance track record with zero (0) odour incidents or complaints since opening the facility. Through the use of the above Training Program we will continue to minimize the risk of issues with our on-site operation and provide support when needed for our staff.

5.0 ROLES AND RESPONSIBILITIES

The following outlines the roles assigned to individuals and groups tasked with health and safety responsibilities at the Net Zero Waste Abbotsford facility site:

Net Zero Waste Director	**Mateo Ocejo, P.Eng. 604-868-6075**	**Overall responsibility for ensuring compliance with training personnel**
Project Engineer	**Farbod A. Diba, PMP, MEng 778-858-1556**	**Assistance in preparation of field reports and updating site specific training manuals for all field related activities.**
Lead Operator	**Doug Livesey 604-557-7065**	**Implementation of site-specific training plan for all field related activities performed by employees and contractors.**

5050 Gladwin Road
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APPENDIX E.

STORMWTER MANAGEMENT CONCEPT DESIGN

Page 083 of 260 to/à Page 098 of 260

Withheld pursuant to/removed as

s.21

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APPENDIX F.

LEACHATE ANALYTICAL RESULTS

Withheld pursuant to/removed as

s.21

5050 Gladwin Road
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www.netzerowasteabbotsford.com

APPENDIX G.

ODOUR INCIDENT REPORT FORM

NET ZERO WASTE
ABBOTSFORD INC.

ODOUR INCIDENT REPORT
NET ZERO WASTE FACILITY OPERATION
AT 5050 GLADWIN ROAD, ABBOTSFORD

Prepared by:
Mateo Ocejo , P.Eng
Director
Farbod A. Diba, PMP
Project Engineer

CONFIDENTIAL

JULY 15, 2016

In order to facilitate the review of odour incidents, this odour incident report will become part of the public record and a copy of it, including your contact information and comments will be provided to other parties including other persons, agencies, governments and the source(s) of the odour.

During the odour incident, please call:

Net Zero Waste Abbotsford Inc.

5050 Gladwin Road

(604)868-6075

Your Contact Information:

Name_____

Address_____

City and Postal Code_____

Telephone_____

Odour Incident Start Date and Time _____

Odour Incident End Date and Time _____

Location where you smelled the odour – Street Address_____

Other_____

Weather

Sunny ☐	Partly Cloudy ☐	Cloudy ☐	Foggy ☐	Raining ☐	Snowing☐

Wind Strength

None ☐	Light ☐	Medium ☐	Strong ☐	Very Strong☐

Wind Direction

From N ☐	From NE ☐	From E ☐	From SE ☐
From S ☐	From SW ☐	From W ☐	From NW ☐

Odour Intensity (Strength of the odour)

Not Perceptible ☐ Very Weak ☐	Weak ☐ Distinct ☐
Very Strong ☐ Extremely Strong ☐	

Odour Tone (Degree to which the odour is pleasant or unpleasant)

Very Pleasant ☐ Mildly Pleasant ☐	Neutral ☐ Mildly Unpleasant ☐
Very Unpleasant ☐	

Odour Character (Describe what the odour smells like) – Odour Wheel Provided Next Page

_____

_____

_____

_____

Source of Odour (Describe where the odour is coming from)

_____

_____

_____

_____

Effects of the Odour (Describe the effects of the odour on you and your lifestyle – please be specific)

_____

_____

_____

_____

Fraser Valley Aggregates – Castle Pit (Pit #7) Site 1 and Site 2

OMRR Biosolids Land Application Plan

September 2020-September 2022

Prepared for:

Arrow Transportation Systems Inc.
400 – 970 McMaster Way
Kamloops, BC V2C 6K2

Prepared by:

R. McDougall, M.Sc., P.Ag.
Consulting Agrologist
Enderby, BC

Reviewed by:

H. Suggitt, P.Ag.
Consulting Agrologist
Nelson, BC

Statement of Limitations

This Land Application Plan (LAP) describes blending of Metro Vancouver municipal biosolids with native soils from the Fraser Valley to make fabricated soils for reclamation of a portion of the Fraser Valley Aggregates Castle Pit (Pit #7) in Dewdney, BC. No reclamation plan for the site was available at the time of preparation of this LAP. This LAP describes only the production of biosolids-containing fabricated soils for use in reclamation of the site in accordance with the BC Organic Matter Recycling Regulation (OMRR). This LAP does not consider or supersede any of the requirements contained in the reclamation plan for the site or importation of soils to the site.

This LAP is limited to the specific areas, materials and conditions that were identified and observed during the site visits by the Qualified Professional and the accuracy of the data for background soil and biosolids quality. The recommendations and findings in this LAP must only be used in the context of the whole report and not in parts. The professional judgement and recommendations contained herein are based on the results of soil analyses and information from third parties believed to be true and accurate at the time of writing. The professional judgement and expertise contained herein are limited to assessment and recommendations related to soil chemistry and physical properties and do not include any assessment of structural or survey considerations related to using soils blended with biosolids. The authors take no responsibility for any errors or omissions of information provided by third parties nor for any impacts resulting from deviation from the recommendations set forth in this plan. This LAP is valid only for the site and time periods for which it was prepared.

Summary of 2020-2022 Castle Pit (Pit #7) Site 1 and Site 2 Biosolids Applications

General: This LAP describes the use of Metro Vancouver Class A and Class B municipal biosolids to reclaim a portion of the Fraser Valley Aggregates Castle Pit (Pit #7), located at 38205 and 38297 Bell Road in Dewdney BC. Arrow has partnered with Fraser Valley Aggregates to reclaim part of their aggregate extraction site known as Castle Pit or Pit #7; the areas are identified as Site 1 and Site 2 on Figure 2: Site Map. The site is located off the Norrish Creek Forest Service Road and is part of a larger, active gravel extraction operation. The site is located within the Agricultural Land Reserve and will be returned to agricultural production after reclamation.

Topsoil and subsoil blending, quality and applications: Up to 48,978 bt of Metro Vancouver biosolids will be received at the 13.7 ha site during the time frame of this LAP and blended with mineral soils sourced from the site and from area pits prior to placement on the site. Both subsoil and topsoil will be fabricated for reclamation of the site. Topsoil blended with biosolids will also be amended with a clean carbon feedstock to enhance nutrient stabilization and soil physical properties. Preliminary blend ratios have been modelled based on typical area subsoil materials to manage trace element concentrations in the amended soils. Blend ratios are summarized in Section 5.2 and Table 6 of this LAP. Blend ratios will be recalculated based on actual soil quality once these materials are available for sampling.

All soils will be thoroughly blended such that no biosolids clumps greater than 10 cm in diameter are apparent after blending. All amended soils must meet the OMRR soil standards for Agricultural Lands and will be monitored by the Qualified Professionals to confirm compliance. The amended soils will be placed on the site in accordance with the requirements of the reclamation permit for the site. Soils will not be placed until Fraser Valley Aggregates has signed off that the requirements of the reclamation permit have been met. Biosolids applications will also be managed in accordance with the new Code of Practice for Agricultural Environmental Management and good agricultural practice; a cover or other crop shall be required in the first growing season after soil placement.

Setbacks and restrictions: All Metro Vancouver biosolids received at the site will meet or exceed the setbacks for managed organic matter as set out in Schedule 8 of the OMRR. All restrictions for biosolids use outlined in Section 1 of Schedule 8 will be adhered to. Setbacks and restrictions required are outlined in Section 5.6 of the LAP.

The BC Water Resources Atlas mapping system shows no groundwater wells in the vicinity of the reclamation area. The Atlas shows one creek, Chilqua Creek, meandering through the cleared area between Site 2 and the east area of Site 1 (east of Norrish Creek Road). It is shown crossing the road and running in a wooded area south of Site 1. It appears to be a seasonal stream as it was not visible at the time of the site inspections. A 30 m buffer will be maintained between the creek and Sites 1 and 2. There is a wooded area along the south boundary of Site 1 that will be an adequate buffer between the stream and the proposed

biosolids application area. There are no onsite dwellings. There is one residence along the southwest edge of Site 1 which will require a 30 m or larger setback for biosolids applications. A minimum setback of 45 m has been recommended. Sections of the property abut the Norrish Creek Forest Service Road; a buffer of 10 m is recommended.

Storage: **Site 1**: Subsoil excavation and blending with biosolids will occur in the northwest area of Site 1. Biosolids for subsoil for Site 1 will be stored within the footprint of Site 1. Topsoil blending will occur on Site 2 and biosolids for Site 1 topsoil will be stored within the footprint of Site 2 (see Site Map on page 23). **Site 2**: Biosolids for Site 2 subsoil and topsoil will be stored within the footprint of Site 2 (see Site Map on page 23). On both sites, biosolids will not be stored within 30 m of a groundwater well or surface water feature. Soil blending will be conducted adjacent to the storage area within the reclamation footprint. Any changes to the configuration of storage and blending areas shall be reviewed and approved by a Qualified Professional prior to commissioning.

Monitoring requirements: Soils to be blended with biosolids will be tested prior to use and blend ratios confirmed based on test results. Final blended soil will be tested to ensure compliance with OMRR soil standards for Agricultural Land prior to placement. A Soil Monitoring Protocol (presented in Appendix 1) has been developed and is aligned with the requirements of Schedules 5 and 6 of the OMRR. The protocol includes routine site visits conducted by the Qualified Professional to sample amended soils and confirm compliance with this Land Application Plan and to ensure nutrient concentrations are appropriately managed through covering stockpiles, planting cover crops to utilize nitrogen or other methods prescribed by the Qualified Professional.

OMRR Schedule 7 Biosolids production and application information

Biosolids production facility: Metro Vancouver's Annacis Island, Lulu Island, Lions Gate and Iona Island wastewater treatment plants. Addresses:

- Annacis Island WWTP 1299 Derwent Way, Delta BC V3M 5V9
- Iona Island WWTP 1000 Ferguson Road, Richmond BC V7B 1W7
- Lions Gate WWTP 101 Bridge Road, West Vancouver BC V7P 3R2
- Lulu Island WWTP 13500 Gilbert Road, Richmond BC V7E 2H8

Biosolids contact person: Brad English, Nutrigrow Division Manager, #400-970 McMaster Way, Kamloops BC V2C 6K2. Phone: 604.798.7610 email: benglish@arrow.ca

Professional preparing the LAP: Ruth McDougall, M.Sc., PAg., office: 250.838.0255, email: mcdougallr@outlook.com

Registered owner of the application site: Gary Bailey, Fraser Valley Aggregates

Written authorization of land owner: included as Appendix 2

Address of biosolids application site: 38205 and 38297 Bell Road, Dewdney BC V0M 1G0

Application site contact information: Brad English, Nutrigrow Division Manager, phone 604.798.7610 email benglish@arrow.ca

Parcel Identifier of biosolids application site: PID 027-740-358, 013-421-611

Intended dates for biosolids application: Site will be reclaimed with biosolids beginning in September 2020 (date dependent on submission date of Notification) and activities are expected to continue for 2 years from that date. Biosolids brought to the site by the end date of the LAP may be managed on site in accordance with the LAP after that date.

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1 Introduction

This document is a Land Application Plan (LAP) prepared in accordance with, and fulfilling the requirements of, the BC Organic Matter Recycling Regulation (OMRR). It describes the reclamation of part of the Fraser Valley Aggregates (FVA) Castle Pit (Pit #7) using fabricated soil composed of mineral soil blended with Metro Vancouver municipal biosolids and possibly a carbon source. The project involves amending salvaged area native soils with Class A and B biosolids from Metro Vancouver's Wastewater Treatment Plants (WWTP) to reclaim the site. The information required by Schedule 13 of the OMRR is summarized in the Schedule 13 - Notification of Land Application of Biosolids at Fraser Valley Aggregates Castle Pit (Pit #7), included as Appendix 3.

Biosolids have historically been used for gravel pit reclamation in the Fraser Valley. Aldergrove Regional Park was created in 2000 by reclaiming a 12 hectare mined out gravel extraction site into parkland that includes a marsh area for wildlife, hiking trails and picnic area[1]. The Fraser Valley Aggregates Pit #15, which is adjacent to Aldergrove Regional Park, has been partially reclaimed using Metro Vancouver biosolids. Both sites are located over the sensitive Abbotsford-Sumas aquifer. Careful monitoring was done following reclamation of the Aldergrove Regional Park which demonstrated no negative effects on surface or groundwater as a result of using biosolids in the restoration process.

Arrow Transportation Systems Inc (Arrow) has partnered with Fraser Valley Aggregates to assist with site reclamation by providing biosolids for soil amendment as well as undertaking soil applications and providing other associated services. The proposed Castle Pit reclamation sites are located within the Agricultural Land Reserve and must be returned to agricultural production. Specific site reclamation requirements remain the responsibility of Fraser Valley Aggregates; this Land Application Plan deals strictly with amending mineral soils with biosolids, in accordance with the OMRR, to improve the agricultural capability of the soils prior to placing across the site and returning the land to agricultural production. Soil will not be placed until FVA has signed off that the requirements of their reclamation permit for the site have been met.

Arrow plans to use Class A and B biosolids as an amendment to enhance the quality of local mineral soil to produce productive subsoil and topsoil for the site. The biosolids will be used as an amendment based on a customized blend ratio for each soil type which is designed to enhance the soil nutrient and organic matter content. This Land Application Plan (LAP) covers the use of fresh biosolids from Metro Vancouver's Annacis Island, Lulu Island, Iona Island and Lions Gate WWTPs and lagoon-stabilised biosolids from their Iona Island WWTP. Annacis Island WWTP produces Class A biosolids that are freshly dewatered and hauled away from the WWTP on a daily basis. The Lulu Island and Lions Gate WWTPs produce Class B biosolids that are freshly dewatered and hauled away from the plants on a daily basis. In 2021, the Iona Island WWTP will begin producing freshly dewatered Class B biosolids.

[1] Metro Vancouver website, available: www.metrovancouver.org/services/parks/parks-greenways-reserves/aldergrove-regional-park Accessed: 20 August 2017.

Iona Island WWTP Class B biosolids are very old, lagoon-stabilised biosolids, some of which have been land-dried and stockpiled over many years and therefore have lower nutrient content and more stable physical properties than fresh, dewatered biosolids. The biosolids from the Annacis Island and Iona Island WWTPs have pathogen levels less than 1,000 MPN/g. The biosolids from the Lulu Island and Lions Gate WWTPs have pathogen levels less than 2 million MPN/g as will the dewatered biosolids from the Iona Island WWTP in 2021. The Iona Island, Lulu Island and Lions Gate biosolids meet the requirements for vector attraction reduction for Class B biosolids (outlined in Schedule 2 of the OMRR) and can therefore be used in accordance with the methods described in Part 1 of Schedule 8 of the BC OMRR. The Class A and B biosolids will be used as an amendment based on customized blend ratios for each soil type designed to enhance the soil nutrient and organic matter content.

This LAP meets the standards and requirements set out in the OMRR with modified presentation of data to properly characterize the use of biosolids as a blended amendment to mineral soils, rather than direct surface application to land with incorporation. Up to 32,538 bt of Iona Island WWTP Class B lagoon-stabilised biosolids will be blended with salvaged mineral soils to produce subsoil for the site. Up to 16,000 bt of fresh Metro Vancouver biosolids from the Annacis Island, Lulu Island, Iona Island and Lions Gate WWTPs will be blended with salvaged mineral soils and a carbon source to produce topsoil for the site. Although it is expected that all applications will be complete in the time period of this LAP (September 2020 with date dependent on OMRR Notification for two years), biosolids received at either site within this time period may be managed at the site beyond the expiration date of the LAP, in accordance with the requirements of this LAP and until such time that all of the biosolids delivered to the site have been land-applied in accordance with this LAP. This plan is based on information, site conditions and soil nutrient and trace element information that was current at the time of writing. This plan is valid for the application of biosolids to the areas indicated in this plan and at rates no higher than those indicated in this plan.

Where relevant to the use of municipal biosolids as a nutrient source, this plan also references the nutrient management requirements in the new Agricultural Environmental Management Code of Practice (AEM Code).

2 Site Description

The Fraser Valley Aggregates Castle Pit (Pit #7) is located at 38205 and 38297 Bell Road in Dewdney BC. It is in the Fraser Valley Regional District and is part of an active gravel extraction operation. The land is within the provincial Agricultural Land Reserve and will be returned to agricultural land. The proposed reclamation area is bounded by private land to the west which is partially forested and partially farmland, forested land owned by Fraser Valley Aggregates to the north and south, and an active gravel excavation area to the east which is part of the Castle Pit but under separate ownership. The Norrish Creek FSR also borders sections of both sites. Sites 1 and 2 of the Castle Pit are covered under this LAP as outlined on the map attached as Figure 2.

Castle Pit (Pit #7) is located within the Fraser Valley region of British Columbia and receives significant annual precipitation, particularly in the late fall, winter and spring months. Two areas of Castle Pit will be reclaimed under this LAP, Sites 1 and 2, which are approximately 8.5 and 5.2 ha in size respectively. The pit areas are located at street address 38205 and 38297 Bell Road (shown on the Site Map, page 23). A site visit was conducted by Ruth McDougall, M.Sc., P.Ag. on November 20, 2018 to assess the sites and on February 11, 2020 to reassess Site 1 and collect background soil samples.

Site 1 is a previously forested site that was logged and turned into agricultural land approximately 12 years ago. Gravel was removed from small areas of the site after logging. It has not been improved for agriculture since conversion from forest (aside from manure and fertilizer application) and will benefit from the addition of organic matter to the subsoil and of a nutrient-rich topsoil. Site 1 will be amended with biosolids to improve the agricultural capability of the land as follows: The existing subsoil will be excavated to an estimated depth of 1 m, blended with Iona Island WWTP lagoon-stabilised biosolids in the blend ratio provided in this LAP and replaced on the site. If it is determined that there is a salvageable topsoil layer, it will be removed prior to excavation and used in the topsoil. A topsoil layer up to 60 cm deep made of imported fill soil, salvaged topsoil from the site (if available) fresh Metro Vancouver (Annacis Island, Lulu Island, Iona Island or Lions Gate WWTP) biosolids and a carbon source blended in the ratios in this LAP will be placed on top of the amended subsoil.

Site 2 is a mined out gravel pit that is being backfilled to grades established as part of the overall reclamation program. It will be further reclaimed using an amended subsoil. The subsoil will be fabricated using imported fill soil and Iona Island WWTP lagoon-stabilised biosolids in the approximate blend ratio outlined in this LAP and will be placed across the site at a depth of approximately 1 m. This fabricated subsoil will be capped with a topsoil layer approximately 60 cm deep made of imported fill soil, fresh Metro Vancouver biosolids (Annacis Island, Lulu Island, Iona Island or Lions Gate WWTP) and a carbon source in the recommended mix ratio.

Amending mineral soils with biosolids will improve agricultural capability by adding macro and micro-nutrients required for plant growth and by increasing organic matter content, thereby improving soil structure. Once reclamation is complete, the area will be returned to agricultural production with crop type to be determined. The location of the application site is summarized in Table 1 below.

Table 1. Legal description of proposed 2020-22 application areas

Street Address	PID	Legal Description
38205 Bell Road	027-740-358 (Site 1)	Lot 2 Plan BCP38170 Section 4 Township 21 Land District 36
38297 Bell Road	013-421-611 (Site 2)	Parcel A Part 1 E Part 2 SE Section 4 Township 21 Land District 36 REF PL 5133; EXC:SE 5 X 20 CHAINS HAVING FRONTAGE OF 5 CHAINS ON S BOUNDARY & 20 CHAINS ON E BOUNDARY; EXC PCL 8 (EXP PL 13970)

Surface and groundwater: The nearest surface water features are Chilqua Creek and Norrish Creek.
Chilqua Creek is shown on the BC Water Resources Atlas flowing south between Site 1 and Site 2, and through the wooded area south of Site 1 (marked on Site Map). The creek was not visible in the area to the east of Norrish Creek Road and Site 1 at the time of the two site visits so it is assumed that it is mainly seasonal or has been diverted during gravel extraction activities. There is a wooded buffer between Chilqua Creek and the west area of Site 1 which is wider than the minimum 30 m buffer required. A 30 m buffer will be maintained between the creek and all application areas (Site 1 and Site 2).
Norrish Creek is located approximately 1,000 m to the east of the proposed reclamation area. There were no other surface water features noted within or adjacent to the proposed application areas during the November 2018 or February 2020 site visits by the Qualified Professional. The Castle Pit is situated over an aquifer that is rated as "High vulnerability" by the BC Water Resources Atlas due to the presence of unconsolidated layers. As the site is located well away from the valley bottom and the static water level in the closest recorded well was at 6 m (20') below surface, it is not expected that groundwater will ever be within 1 metre of the ground surface. The Water Resources Atlas mapping system showed no water wells on or near the proposed reclamation site. The closest registered wells are located to the southeast of the site, along Hess Road, over 200 m from the south edge of Site 2 (Well Tag #'s 118447 and 108482). The closest well is marked on the Site Map.

3 Characteristics of Mineral Soils for use in Reclamation Soils at Castle Pit

3.1 Soil testing requirements for local and imported soils

Site 1: Fabricated soil to be placed on Site 1 will be made of excavated existing subsoil blended with biosolids. Background soil data for Site 1 is presented in Table 2 and has been used to calculate predicted trace element concentrations in fabricated soil and final blend ratios. Samples were collected from the 15 cm depth only and trace metal content may not be representative of the whole depth of material to be excavated. Mineral soil to be used for reclamation will be tested once accessible on site and prior to blending with biosolids as per the Soil Monitoring Protocol found in Appendix 1; mix ratios will be recalculated if required.

Site 2: There is no salvaged topsoil or subsoil available at Site 2 to blend with biosolids for production of reclamation soils. Therefore, surplus soil from the lower mainland will be trucked in and blended with biosolids to make subsoil and topsoil for reclaiming the Site 2 area. These soils will be tested to ensure their quality meets OMRR trace element standards prior to blending into fabricated soil as per the Soil Monitoring Protocol found in Appendix 1. For the purposes of developing preliminary blend ratios for this LAP, quality data from stockpiled soil at Fraser Valley Aggregates Pit #15 have been used to model predicted trace elements in blended soils (Table 2, page 5). Final blend ratios will be determined based on quality data from the soils that will be used to make the fabricated soils on site.
Note: Importation of soils to the site is not covered under this Land Application Plan. It is assumed that the imported soils brought to site for blending into topsoil and subsoil will be free from contamination. Under

this LAP, the imported soils will only be tested to ensure they meet OMRR trace element standards for Agricultural Land.

Table 2. Soil quality data for Site 1 and Site 2 salvaged soils

	Sample date	Pit#15 Stockpiled salvage soil	Castle Pit Site #1 Surface Soil	OMRR Limits
Parameter	Sample ID / Units	Soil Average	Soil Average	Agricultural Lands[a]
General				
Electrical conductivity	dS/m	0.044	0.107	-
pH	pH units	6.4	6.5	-
Available nutrients (dry weight basis)				
Ammonium-N	mg/kg	3.0	5.7	-
Nitrate-N	mg/kg	2.5	9.7	-
Phosphorus	mg/kg	48	118	-
Potassium	mg/kg	80	385	-
CSR Strong acid leachable metals (dry weight basis)				
Arsenic	mg/kg	5.06	6.28	20
Cadmium	mg/kg	0.14	0.228	10
Chromium	mg/kg	34.0	30.6	60
Cobalt	mg/kg	8.9	9.5	25
Copper	mg/kg	21.4	61.9	150
Lead	mg/kg	8.3	11.1	120
Mercury	mg/kg	0.05	0.064	0.6
Molybdenum	mg/kg	0.66	0.88	80
Nickel	mg/kg	26.8	23.9	150
Selenium	mg/kg	<0.5	0.40	1.5
Zinc	mg/kg	57.6	90.0	200

[a] Matrix standards are based on OMRR Schedule 10.1 (updated Nov 1/17) soil standards for Agricultural Land. Site-specific factors of human intake of soil and toxicity to invertebrates and plants apply at all sites; the most restrictive of the site-specific factors of livestock ingesting soil and fodder or major microbial functional impairment have also been applied.

4 Characteristics of WWTP Biosolids

This LAP covers the use of Class A and B municipal biosolids from Metro Vancouver's Annacis Island, Lulu Island, Lions Gate and Iona Island WWTPs. The biosolids are generated following treatment of municipal wastewater in the Metro Vancouver region. Annacis Island WWTP produces Class A biosolids that are freshly dewatered and hauled away from the WWTP on a daily basis. Lulu Island and Lions Gate plants

produce freshly dewatered Class B biosolids. The Iona Island WWTP will begin producing fresh centrifuge dewatered biosolids in 2021 but currently has a quantity of lagoon-stabilised Class B biosolids that have been mechanically dewatered from the lagoons or land-dried and stockpiled over many years. Because of their age, the Iona Island WWTP lagoon-stabilised biosolids have lower nutrient content and more stable physical properties than fresh, dewatered biosolids. All Metro Vancouver biosolids are mainly organic in nature and meet the OMRR Class A or B pathogen and Schedule 4 substance standards.

Routine quality monitoring of Metro Vancouver's biosolids is conducted by in-house sampling staff and microbiology and chemistry laboratories. The labs are accredited by the Canadian Association for Laboratory Accreditation. Unlike fresh Annacis Island, Lulu Island, Iona Island and Lions Gate WWTP biosolids, lagoon-stabilised solids produced by the Iona Island WWTP are sourced from historic stockpiles of biosolids and from storage lagoons for which there is no weekly routine quality monitoring data. Ongoing sampling of the Iona Island WWTP lagoon-stabilised biosolids is done as material is removed from the stockpile and from the lagoons to confirm that the material meets all OMRR Class B biosolids quality standards. Recent quality data for all types of biosolids is presented in Table 5 (page 8) and laboratory data reports are available upon request.

4.1 Nutrient content and general soil quality

Table 5 (page 8) presents the nutrient concentration in the biosolids from all wastewater treatment plants. The biosolids are primarily a source of nitrogen and phosphorus but also contain significant amounts of all other micronutrients necessary for plant growth. Biosolids are also an excellent source of organic matter which has been shown to improve soil tilth (structure and water holding capacity).

Nitrogen:
Table 3 below contains information about the nitrogen content of the five types of biosolids covered under this LAP.

Table 3. Nitrogen content of biosolids

Biosolids	Total Kjeldahl Nitrogen (TKN)	Total nitrogen	Available nitrogen (ammonium+nitrate)	Organic nitrogen
	% dry basis	kg per bulk tonne	% of total N	% of total N
Iona Island Lagoon-stabilised Class B	1.55	7.5	1.7	98.3
Annacis Island Class A	5.50	14.9	17.8	82.2
Lulu Island Class B	6.45	15.6	15.9	84.1
Lions Gate Class B	4.18	12.1	17	83
Iona Island Class B*	9.9	25	53	47

**These values are estimates based on nutrient content of digestate from the WWTP and will be updated when centrifuged biosolids values are available. It is expected that nitrogen levels will be lower in centrifuged biosolids.*

Due to the lagoon and stockpile aging process, the Iona Island WWTP lagoon-stabilised biosolids contain much less total nitrogen than fresh biosolids, and less available nitrogen, making this type of biosolids a much lower source of this nutrient.

Phosphorus and potassium (Table 5): All 5 types of Metro Vancouver biosolids are good sources of plant-available phosphorus and will meet the phosphorus requirements of planted vegetation for several years after soil placement. Biosolids are generally a poor source of plant-available potassium; supplementation may be required once the site is cropped.

pH and conductivity (Table 5): All biosolids to be used in this project have a pH within the optimum range for crop production, 5 to 8. There are no concerns with the pH of any of the biosolids to be used in the fabricated soils. The electrical conductivity (E.C. or salinity) of the Iona Island WWTP lagoon-stabilised biosolids is well below 3 dS/m, which is the desirable upper limit for E.C. in soil. E.C. of the four types of fresh biosolids is higher at 5.6 to 7.1 dS/m which is normal in fresh biosolids and similar to the E.C. of other organic amendments such as manure and composts. This E.C. is considered acceptable because biosolids constitutes less than 20% of the final soil volume which results in an E.C. which is acceptable for plant growth. As well, as with other organic amendments such as manure, any increase in soil conductivity due to salts in the biosolids will be temporary.

4.2 Trace elements

The concentrations of trace elements in the biosolids are summarized in Table 5. The concentrations of all OMRR trace elements in biosolids from all WWTPs are well below the respective OMRR limits for Class A and B biosolids.

4.3 Pathogen and volatile solids treatment

Since native soils are being amended with biosolids via mixing technology prior to replacement across the site, all biosolids will have been incorporated through blending with the native soil prior to placement on the application site.

Pathogen reduction (Table 5):
The biosolids from the Annacis Island WWTP and the lagoon-stabilised Iona WWTP biosolids have pathogen levels less than 1,000 MPN/g. Centrifuged biosolids from the Lions Gate and Lulu Island WWTP's meet Class B pathogen standards and it is anticipated that fresh centrifuged biosolids from the Iona Island WWTP will also meet the Class B pathogen standard (less than 2,000,000 MPN/g).

Volatile solids treatment (Table 4):
Annacis Island Class A biosolids and Lulu Island, Iona Island and Lions Gate Class B biosolids have been treated to achieve the OMRR Schedule 2 Vector Attraction Reduction requirement of 38% volatile solids reduction for surface application of biosolids. Volatile solids reduction is presented in Table 4 below (Metro Vancouver 2018 data).

Table 4. Volatile solids reduction of Metro Vancouver biosolids

Plant	Volatile solids reduction (%)
Annacis Island	65
Lulu Island	63
Lions Gate	73
Iona Island	66

Table 5. Metro Vancouver WWTP biosolids quality data

Parameter	Units	Iona Lagoon-stabilized Biosolids[a]	Annacis Island Biosolids[b]	Lions Gate Biosolids[b]	Iona WWTP Biosolids[c]	Lulu Island Biosolids[b]	OMRR Biosolids Quality Standards	
		Class B	*Class A*	*Class B*	*Class B*	*Class B*	*Class B*	*Class A*
General								
Total solids	%	48.2	27.0	28.9	NA	24.2	-	-
Electrical conductivity (EC)	dS/m	0.8	7.1	5.7	5.6	5.7	-	-
pH	pH units	6.9	7.7	7.3	7.6	7.8	-	-
Foreign matter	%	<1	<1	<1	<1	<1	<1	<1
Sharp foreign matter	#	-	-	-	-	-	0	0
Nutrients (dry weight basis)								
Total Nitrogen-N (or TKN)	mg/kg	15,490	55,000	41,800	98850	64,500	-	-
Ammonium - N	mg/kg	214	9,730	7,100	52525	10,250	-	-
Available nitrate- N	mg/kg	45.5	<13.5	<1.4	NA	<13.6	-	-
Available phosphorus	mg/kg	933	2,500	2,640	NA	1,780	-	-
Available potassium	mg/kg	397	1,296	1,410	NA	946	-	-
CSR Strong acid leachable metals (dry weight basis)								
Arsenic	mg/kg	6.10	4.88	3.04	3.80	4.76	75	75
Cadmium	mg/kg	3.3	2.0	2.2	1.4	4.3	20	20
Chromium	mg/kg	63	56	30	25	32	1,060	-
Cobalt	mg/kg	6.20	4.1	2.5	3.9	5.4	150	150
Copper	mg/kg	623	672	646	378	510	2,200	-
Lead	mg/kg	112.0	40.4	71.0	39.5	26.1	500	500
Mercury	mg/kg	3.4	1.52	1.93	0.90	1.41	15	5
Molybdenum	mg/kg	6.0	10.1	7.4	5.4	10.4	20	20
Nickel	mg/kg	31.2	25	21	16	32	180	180
Selenium	mg/kg	3.20	6.91	5.70	3.80	5.41	14	14
Zinc	mg/kg	578	1,300	1,100	745	1,170	1,850	1,850
Bacteriology								
Fecal coliform[d]	MPN/g	<27.1	114	49,012	NA	218,842	<2,000,000	<1,000

[a] Results obtained from Metro Vancouver testing of stockpiled material in October 2019.

[b] Results obtained from Metro Vancouver routine quality monitoring between January 1 and December 31 2019.

[c] Results obtained from Metro Vancouver routine quality monitoring of Iona Island WWTP digestate between January 1 and December 31 2019

[d] Results for Class A biosolids are absolute values and for Class B biosolids are geometric means.

4.4 Physical properties

Annacis Island WWTP biosolids are solids produced from secondary wastewater treatment which have undergone thermophilic anaerobic digestion followed by centrifuge dewatering. These biosolids have a solids content of approximately 27%, a sticky consistency and a bulk density of about 1,000 kg/m^3. Annacis Island WWTP is equipped with fine screens and no debris has been observed in the treated solids.

Lulu Island WWTP biosolids are solids produced from secondary wastewater treatment which have undergone mesophilic anaerobic digestion followed by centrifuge dewatering. These biosolids have a solids content of approximately 24%, a sticky consistency and a bulk density of about 1,000 kg/m^3.

Lions Gate biosolids are solids produced from primary wastewater treatment which have undergone mesophilic anaerobic digestion followed by centrifuge dewatering. These biosolids are friable in texture, have a lower bulk density (~650 kg/m^3) and a higher solids content once dewatered (approximately 29%). Lulu Island and Lions Gate WWTPs are equipped with fine screens and no debris has been observed in the treated solids.

Iona Island WWTP biosolids are solids produced by primary wastewater treatment which have undergone mesophilic anaerobic digestion. Currently, digestate is stored in lagoons where the material stabilises over several years. This material is to be either land-dried on a historic biosolids stockpile or dewatered by a centrifuge. Because of many years of lagoon stabilization these biosolids have low odour and low nitrogen content. The lagoon-stabilised biosolids which have been land-dried have a soil-like consistency, a solids content of approximately 48% and a bulk density ranging from 850 to 1,300 kg/m^3. The future Iona Island WWTP biosolids that will be centrifuge dewatered are expected to have a consistency similar to other Metro Vancouver centrifuge dewatered biosolids, a solids content of 25% and a bulk density of 1,000kg/m^3. The Iona Island WWTP did not historically have fine screens and therefore some debris has been noted in the older lagooned and stockpiled material. Confirmatory sampling of the Iona Island WWTP lagoon-stabilised biosolids to determine foreign matter content is conducted on an on-going basis by Metro Vancouver and the results indicate that debris content does not exceed the <1% OMRR threshold. Confirmatory sampling and established protocols greatly reduce the likelihood of the delivered stockpiled material containing sharps. A centrifuge will become operational in 2021 which will produce fresh biosolids from the Iona Island wastewater treatment plant digesters that are expected to be similar to Lulu Island WWTP biosolids in consistency, solids content (25%) and bulk density (1,000kg/m^3).

5 Biosolids Stockpiling, Blending and Application Requirements

5.1 Biosolids receiving, storage and blending areas

Site 1: Subsoil mixing with biosolids will occur on Site 1. The soil blending area will be located in the northwest area of the field with appropriate setbacks from site boundaries. Topsoil blending for Site 1 will occur on Site 2.

Site 2: Biosolids and soil storage, and soil mixing will occur within the footprint of Site 2. The soil blending area will be located adjacent to the biosolids receiving and storage area and sited with appropriate setbacks from site boundaries and surface water sources.

Both sites: Once the biosolids are confirmed to meet OMRR Class A or B standards and when site and weather conditions allow, the biosolids will be batched with mineral soil based on the appropriate blend ratios, as confirmed by the Qualified Professional prior to mixing. The biosolids will then be thoroughly mixed with the mineral soil such that no biosolids clumps greater than 10 cm in diameter are apparent after blending. The blended biosolids and mineral soil product will be conveyed into stockpiles until compliance testing is completed by the Qualified Professional in accordance with Section 6 of this LAP and the Soil Monitoring Protocol in Appendix 3. Once the soil is confirmed to meet OMRR Agricultural Land criteria, the soil will be available for replacement across the site. Soil placement depths will be as per the site's Reclamation Plan. The Qualified Professional will only sign off that biosolids were used in accordance with the OMRR and this LAP once all placement of biosolids amended soils is complete and the site has been seeded to a cover crop (or crop requested by the site owner).

All biosolids received at the site shall be blended with soil and/or a carbon source. Amended soils stored in stockpiles over winter months must be located on level ground, piled in a compacted, sloped shape to shed water and may be required to be seeded to a cover crop (depending on type of biosolids in the stockpiled material and timing), as determined appropriate by the Qualified Professional.

Biosolids shall not be stored within 30 m of a groundwater well or surface water feature. The storage areas for biosolids will be separate and delineated from each other in order to manage the various classes of biosolids appropriately.

If amended soil application is delayed by more than one growing season and nutrient levels present a risk of leaching or runoff, the stockpiled amended soils shall be located on level ground and may be covered and/or seeded with a suitable cover crop, as determined appropriate by the Qualified Professional.

5.2 Soil amendment with biosolids - blend ratios

Blend ratios for the topsoil and subsoil horizons are calculated to ensure that trace elements do not exceed OMRR limits for Agricultural Lands. Based on meeting OMRR trace element standards, the following mix ratios and concentration of biosolids in soils (Table 6) are recommended:

Table 6. Mix ratios and concentration of biosolids in fabricated soils

WWTP Biosolids	% biosolids content (dry weight basis)	% biosolids content (bulk volume basis)	Operational blend ratio biosolids:soil (bulk volume basis)
Iona Island Class B – subsoil	13	25	1:3
Annacis Island Class A – topsoil	6	20	1:4
Lulu Island Class B – topsoil	6	20	1:4
Lions Gate Class B – topsoil	5	20	1:4
Iona Island Class B - topsoil	6	20	1:4

Tables 7a-e and 8a-e (pages 16-21) show the predicted trace element concentrations of all soils at the proposed mix ratios. The calculated predicted trace element concentrations in the amended soils are based on recent biosolids quality data and the average background soil trace element concentrations. Modelling includes consideration of material physical properties such as moisture and bulk density. Blend ratios may be adjusted by the Qualified Professional based on updated feedstock quality results and/or results of soil monitoring events.

The Site 1 subsoil will be retested for trace element concentration during soil excavation. Mix ratio modelling was based on a 0-15 cm surface sample collected from the site. It is expected that the soil concentrations of copper and zinc will be lower in the subsoil as this site has been manured periodically which gradually increases soil copper and zinc levels in the surface soil. The proposed mix ratio is limited by soil copper concentration.

Topsoil amendment may also include addition of a clean carbon feedstock that complies with the requirements of the Permit (non-cedar based). Addition of a carbon feedstock to the topsoil will serve to tie up available nitrogen in the biosolids for slow release over several growing seasons, as well as improve the physical properties of the soil. Topsoil amended with Class A biosolids and carbon may also meet the OMRR criteria for a Biosolids Growing Medium, in addition to the OMRR soil standards for Agricultural Lands. The BGM may be used in general site landscaping for dust suppression. Production and use of BGM on the site shall comply with the standards and requirements of the OMRR.

5.3 Biosolids applications on site

The tonnage of Class A and B biosolids to be managed under this LAP will vary depending on soil application depths but may not exceed 48,978 bulk tonnes in total as outlined below:

Site 1:

- Topsoil: A total of 10,200 bulk tonnes of Annacis Island, Lions Gate, Iona Island and/or Lulu biosolids
- Subsoil: A total of 20,188 bulk tonnes of Iona Island WWTP lagoon-stabilised biosolids

Site 2:

- Topsoil: A total of 6,240 bulk tonnes of Annacis Island, Lions Gate, Iona Island and/or Lulu biosolids
- Subsoil: A total of 12,350 bulk tonnes of Iona Island WWTP lagoon-stabilised biosolids

The area approved for amended soil application under this LAP is approximately 13.7 hectares (8.5 hectares at Site 1 and 5.2 hectares at Site 2). Once soils are amended with biosolids at the prescribed rates and confirmed to meet compliance standards under this LAP, the soil horizons will be replaced on the site in accordance with the reclamation requirements.

Reclamation areas, placement depths and biosolids quantities to be received are obtained through communication with Arrow and FVA. Actual quantities managed with associated compliance monitoring

details will be presented in a compliance report prepared (and kept on file in accordance with the OMRR) to confirm that biosolids were managed in accordance with this LAP.
Note: Soil amendment using biosolids to improve agricultural properties of the mineral soils at the FVA Castle Pit (Pit #7) site has been reviewed by the authors (Qualified Professionals) in the context of the requirements of the OMRR and good agricultural practice. All requirements associated with the importation of soil to the sites and reclamation of the FVA Castle Pit (Pit #7) remain the responsibility of the site owner and are not covered under this LAP.

5.4 Timing of placement of soil

The site is located in a designated high-precipitation area of BC and fabricated soils to be used in reclamation will contain municipal biosolids which is a nutrient source. Under the AEM Code, no nutrients are permitted to be applied to agricultural land during November, December and January in designated high-precipitation areas. Arrow is committed to applying this standard to their reclamation sites in designated high-risk areas and will comply with this Code requirement. Under the AEM Code, nutrient application during the shoulder months of February, March and October is restricted to suitable soil types and crops. The fabricated soils to be placed on the Castle Pit site will be medium textured which is an acceptable soil type for placement during the shoulder months. If soil is to be placed during the shoulder months, it is recommended that the site is seeded after soil placement. Soil placement during the rest of the year will occur only if site and weather conditions allow for equipment activity on the site.

5.5 Management of nutrients in fabricated soils post-application

The main nutrient of concern when managing municipal biosolids is nitrogen, and only the nitrogen that is present in available forms (ammonium and nitrate) is of concern for movement into the aquatic environment. In fresh biosolids, this represents 16 to 18% of the total nitrogen. While biosolids contain a significant amount of phosphorus, this phosphorus is held tightly in the soil and does not leach significantly with precipitation. Biosolids contain a relatively small amount of potassium.

Total nitrogen content in the Iona Island WWTP lagoon-stabilised biosolids is 30% or less of that in fresh biosolids, and of the total nitrogen in these aged biosolids, less than 2% is in available forms. Because of this low level of available nitrogen in the Iona Island WWTP lagoon-stabilised biosolids, leaching loss of nitrogen from these biosolids is not considered a significant concern. Fresh biosolids contain a significant amount of available nitrogen in the ammonium form, but contain a negligible amount in the nitrate form. Management of the available nitrogen in topsoil amended with fresh biosolids is important in the year of soil placement to ensure there is no movement of significant available nitrogen to surface or groundwater.

Arrow has completed several projects using the same type of fabricated soils as will be used at the FVA Castle Pit. In 2018-19 an area of FVA's Pit #15 in Abbotsford, BC was reclaimed using biosolids-amended fabricated soils. Fabricated topsoil and subsoil were placed on an area of FVA Pit#15 in September 2019 using the same mix ratios and placed at the similar depths as will be used at Castle Pit sites 1 and 2. Placed soils were tested in October 2019 using the protocol in the AEM Code to assess whether soils were compliant with Code requirements. The nitrate levels in the topsoil and subsoil were below the Code's

trigger level of 100 kg/ha indicating that the amount of residual nitrate in the soil was within Code limits and therefore compliant.

The placed soils at the FVA Pit #15 site were monitored monthly over winter 2019-20 to assess downward movement of ammonium-N. Testing indicated that very little of the ammonium-N was lost from the soil during the winter months, even during the maximum rainfall period of November through February.

Both of these findings suggest that placement of fabricated soil as was done at the Pit #15 site does not result in loss of an excessive amount of nitrogen from the soils over the first winter after soil placement. On-going monitoring of soils placed both in the summer and fall will continue to confirm these findings and soil placement timing will be fine-tuned based on the results of this ongoing monitoring.

5.6 Environmental and health considerations for Class B biosolids applications

If the terms and requirements of this LAP are adhered to, it is expected that potential risk of environmental or health impacts associated with the use of Class A and B biosolids at Castle Pit (Pit #7) Sites 1 and 2 are low. The greatest risk associated with the application is from nutrient loading. Nitrogen and phosphorus are the two main nutrients supplied to soils through amendment with biosolids. Risk of phosphorus runoff to surface water is very low since the biosolids will be incorporated into the soil profile, rather than surface applied, and because there will be adequate setbacks from surface water features near the application areas. Environmental risks associated with the application of nitrogen are primarily the potential for groundwater contamination through leaching of nitrogen in the nitrate form. The risk of nitrogen leaching to groundwater is considered low due to the low nutrient content in the Iona Island WWTP lagoon-stabilised biosolids, the low level of nitrate-N in the topsoil at the end of the growing season, the significant depth to groundwater at the site (approximately 6 metres or more) and the rapid conversion of available N to immobile N that has been observed in biosolids blended soils[2].

5.7 Setbacks and restrictions

The biosolids from the Annacis Island WWTP and the lagoon-stabilised Iona Island WWTP biosolids have pathogen levels less than 1,000 MPN/g and meet the requirements for vector attraction reduction for Class B biosolids (outlined in Schedule 2 of the OMRR) and can therefore be used in accordance with the methods described in Part 2 of Schedule 8 of the BC OMRR which include the setbacks and ground water table restriction outlined below.

Class B biosolids from the Lions Gate, Iona Island and Lulu Island WWTPs have pathogen levels <2,000,000 MPN/g. When used at the Castle Pit (Pit #7) site, setbacks and use restrictions as outlined in Part 1 of OMRR Schedule 8 will be adhered to. Requirements include signage, timing restrictions on grazing and production of food for human consumption and biosolids application setbacks, as outlined below.

[2] McDougall, R. and H. Suggitt. Nitrogen Dynamics in NutriGrow Biosolids Growing Medium. November, 2016.

Food production and grazing: Following placement of soils amended with biosolids, the land may be used to produce crops for livestock or be grazed by cattle with a 60 day restriction. Production of food for human consumption is restricted for 18 months for crops with above ground harvested parts and 38 months for crops with below ground harvested parts.

Setback distances: The following minimum setbacks apply:

- 30 metres to potable water sources and irrigation wells, lakes, rivers, streams, farm dwellings and off-property occupied dwellings or boundaries of property zoned for residences or recreation. This applies to the off-property residence on the west boundary of Site 1; a 45 m or larger setback is recommended as the residence is very close to the property line. This also applies to Chilqua Creek where it runs alongside Sites 1 and 2 where a 30 m buffer is required.
- 20 metres to major arterial roads or highways
- 10 metres to minor public roads excluding logging roads. Although the Norrish Creek Rd is a forest service road, it is recommended that a 10 m setback is left when applying biosolids.

In addition, biosolids must not be applied to land when the ground water table is within one metre of the surface. Signage must be posted as per Schedule 8 (Sections 1e and 1f) of the OMRR.

6 Monitoring

Schedule 7 of the OMRR requires a post-application monitoring plan if the proposed application rates exceed annual crop nutrient requirements. A soil monitoring plan for the Castle Pit (Pit #7) Site 1 and 2 applications is found as Appendix 3 of this LAP. It is expected that the site will be planted to a forage cover crop in the interim between completion of reclamation and conversion to the long-term agricultural use of the site. If the cover crop is to be harvested as feed for livestock, it should be tested for nitrates and if it contains elevated nitrates, the feed should be blended with lower nitrate-content crops prior to feeding. If the cover crop is to be turned into the soil, no vegetation quality testing is required. All soil and vegetation monitoring will be conducted in accordance with the Soil Monitoring Protocol (found in Appendix 3). Results of all monitoring activities will be kept on file in accordance with the OMRR Schedule 6 – Record Keeping.

7 Reporting

No formal report submission is required to fulfill this LAP; however, written certification from a Qualified Professional will be completed as part of a compliance report that summarizes findings of the monitoring program and observations during compliance visits by the Qualified Professionals, as per Section 5 (3) of the OMRR. One of the compliance visits will be conducted following completion of application of all biosolids-amended soils covered by this LAP. All required documentation will be kept on file in accordance with OMRR Schedule 6 – Record Keeping.

8 Plan Amendments

Any proposed amendments to this plan will be reviewed by the Qualified Professional for compatibility with the original plan and to determine if resubmission to regulatory authorities is required (if there are material changes). If approved, any amendments will be summarized in the final compliance report.

Land Application Plan prepared by:

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Consulting Agrologist
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Land Application Plan reviewed by:

Holly Suggitt, P.Ag.
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Nelson, BC

Prepared: August 7, 2020

Table 7. Site 1 recommended blend ratios and predicted trace elements for fabricated soils amended with Metro Vancouver biosolids

a. Site 1 topsoil amended with Annacis Island WWTP Class A biosolids

PARAMETER	FEEDSTOCK QUALITY DATA		FABRICATED SOIL CONCENTRATION	STANDARDS
	Biosolids	Soil	*Recommended blend ratio biosolids:soil (bulk volume basis)* ***1:4***	
	Average concentrations (mg/kg)	Average concentrations (mg/kg)	Predicted soil concentrations (mg/kg)	OMRR Agricultural Lands (mg/kg)
Arsenic	4.88	6.28	6.19	20
Cadmium	2.0	0.23	0.33	10
Chromium	56	30.6	32.09	60
Cobalt	4.1	9.48	9.15	25
Copper	672	61.9	98.51	150
Lead	40.4	11.10	12.86	120
Mercury	1.52	0.06	0.15	0.6
Molybdenum	10.1	0.88	1.43	80
Nickel	25	23.9	23.98	150
Selenium	6.91	0.40	0.79	1.5
Zinc	1,300	90	162.60	200

b. Site 1 topsoil amended with Lions Gate WWTP Class B biosolids

PARAMETER	FEEDSTOCK QUALITY DATA		FABRICATED SOIL CONCENTRATION	STANDARDS
	Biosolids	Soil	*Recommended blend ratio biosolids:soil (bulk volume basis)* ***1:4***	
	Average concentrations (mg/kg)	Average concentrations (mg/kg)	Predicted soil concentrations (mg/kg)	OMRR Agricultural Lands (mg/kg)
Arsenic	3.04	6.28	6.08	20
Cadmium	2.2	0.23	0.35	10
Chromium	30	30.6	30.54	60
Cobalt	2.5	9.48	9.06	25
Copper	646	61.9	96.95	150
Lead	71.0	11.10	14.69	120
Mercury	1.93	0.06	0.18	0.6
Molybdenum	7.4	0.88	1.27	80
Nickel	21	23.9	23.71	150
Selenium	5.70	0.40	0.71	1.5
Zinc	1,100	90	150.60	200

c. Site 1 topsoil amended with Lulu Island WWTP Class B biosolids

PARAMETER	FEEDSTOCK QUALITY DATA		FABRICATED SOIL CONCENTRATION	STANDARDS
	Biosolids	Soil	*Recommended blend ratio biosolids:soil (bulk volume basis)* ***1:4***	
	Average concentrations (mg/kg)	Average concentrations (mg/kg)	Predicted soil concentrations (mg/kg)	OMRR Agricultural Lands (mg/kg)
Arsenic	4.76	6.28	6.20	20
Cadmium	4.3	0.23	0.43	10
Chromium	32	30.6	30.63	60
Cobalt	5.4	9.48	9.27	25
Copper	510	61.9	84.31	150
Lead	26.1	11.10	11.85	120
Mercury	1.41	0.06	0.13	0.6
Molybdenum	10.4	0.88	1.35	80
Nickel	32	23.9	24.30	150
Selenium	5.41	0.40	0.65	1.5
Zinc	1,170	90	144.00	200

d. Site 1 topsoil amended with Iona Island WWTP fresh dewatered Class B biosolids

PARAMETER	FEEDSTOCK QUALITY DATA		FABRICATED SOIL CONCENTRATION	STANDARDS
	Biosolids	Soil	*Recommended blend ratio biosolids:soil (bulk volume basis)* ***1:4***	
	Average concentrations (mg/kg)	Average concentrations (mg/kg)	Predicted soil concentrations (mg/kg)	OMRR Agricultural Lands (mg/kg)
Arsenic	3.80	6.28	6.15	20
Cadmium	1.4	0.23	0.29	10
Chromium	25	30.6	30.29	60
Cobalt	3.9	9.48	9.20	25
Copper	378	61.9	77.71	150
Lead	39.5	11.10	12.52	120
Mercury	0.90	0.06	0.11	0.6
Molybdenum	5.4	0.88	1.10	80
Nickel	16	23.9	23.50	150
Selenium	3.80	0.40	0.57	1.5
Zinc	745	90	122.74	200

e. Site 1 subsoil amended with Iona Island WWTP Lagoon-stabilized Class B biosolids

PARAMETER	FEEDSTOCK QUALITY DATA		FABRICATED SOIL CONCENTRATION	STANDARDS
	Biosolids	Soil	*Recommended blend ratio biosolids:soil (bulk volume basis)* ***1:3***	
	Average concentrations (mg/kg)	Average concentrations (mg/kg)	Predicted soil concentrations (mg/kg)	OMRR Agricultural Lands (mg/kg)
Arsenic	6.10	6.28	6.25	20
Cadmium	3.3	0.23	0.63	10
Chromium	63	30.6	34.77	60
Cobalt	6.20	9.48	9.05	25
Copper	623	61.9	134.84	150
Lead	112.0	11.10	24.22	120
Mercury	3.4	0.06	0.50	0.6
Molybdenum	6.0	0.88	1.54	80
Nickel	31.2	23.9	24.85	150
Selenium	3.20	0.40	0.76	1.5
Zinc	578	90	153.44	200

All parameters are on a 100% dry weight basis

Matrix standards are based on OMRR Schedule 10.1 (updated Nov 1/17) soil standards for Agricultural Land. Site-specific factors of human intake of soil and toxicity to invertebrates and plants apply at all sites; the most restrictive of the site-specific factors of livestock ingesting soil and fodder or major microbial functional impairment have also been applied.

Table 8. Site 2 recommended blend ratios and predicted trace elements for fabricated soils amended with Metro Vancouver biosolids

a. Site 2 topsoil amended with Annacis Island WWTP Class A Biosolids

PARAMETER	FEEDSTOCK QUALITY DATA		FABRICATED SOIL CONCENTRATION	STANDARDS
	Biosolids	Soil	*Recommended blend ratio biosolids:soil (bulk volume basis)* ***1:4***	
	Average concentrations (mg/kg)	Average concentrations (mg/kg)	Predicted soil concentrations (mg/kg)	OMRR Agricultural Lands (mg/kg)
Arsenic	4.88	5.06	5.0	20
Cadmium	2.0	0.14	0.2	10
Chromium	56	34.0	35	60
Cobalt	4.1	8.9	8.6	25
Copper	672	21.4	61	150
Lead	40.4	8.3	10	120
Mercury	1.52	0.05	0.14	0.6
Molybdenum	10.1	0.66	1.2	80
Nickel	25	26.8	26.7	150
Selenium	6.91	0.5	0.9	1.5
Zinc	1,300	57.6	133	200

b. Site 2 topsoil amended with Lions Gate WWTP Class B biosolids

PARAMETER	FEEDSTOCK QUALITY DATA		FABRICATED SOIL CONCENTRATION	STANDARDS
	Biosolids	Soil	*Recommended blend ratio biosolids:soil (bulk volume basis)* ***1:4***	
	Average concentrations (mg/kg)	Average concentrations (mg/kg)	Predicted soil concentrations (mg/kg)	OMRR Agricultural Lands (mg/kg)
Arsenic	3.04	5.06	4.93	20
Cadmium	2.2	0.14	0.26	10
Chromium	30	34.0	33.78	60
Cobalt	2.5	8.9	8.50	25
Copper	646	21.4	58.88	150
Lead	71.0	8.3	12.04	120
Mercury	1.93	0.05	0.16	0.6
Molybdenum	7.4	0.66	1.06	80
Nickel	21	26.8	26.39	150
Selenium	5.70	0.5	0.81	1.5
Zinc	1,100	57.6	120.14	200

c. Site 2 topsoil amended with Lulu Island WWTP Class B biosolids

PARAMETER	FEEDSTOCK QUALITY DATA		FABRICATED SOIL CONCENTRATION	STANDARDS
	Biosolids	Soil	*Recommended blend ratio biosolids:soil (bulk volume basis)* *1:4*	
	Average concentrations (mg/kg)	Average concentrations (mg/kg)	Predicted soil concentrations (mg/kg)	OMRR Agricultural Lands (mg/kg)
Arsenic	4.76	5.06	5.04	20
Cadmium	4.3	0.14	0.35	10
Chromium	32	34.0	33.91	60
Cobalt	5.4	8.9	8.71	25
Copper	510	21.4	45.83	150
Lead	26.1	8.3	9.17	120
Mercury	1.41	0.05	0.12	0.6
Molybdenum	10.4	0.66	1.15	80
Nickel	32	26.8	27.00	150
Selenium	5.41	0.5	0.75	1.5
Zinc	1,170	57.6	113.22	200

d. Site 2 topsoil amended with Iona Island WWTP fresh dewatered Class B biosolids

PARAMETER	FEEDSTOCK QUALITY DATA		FABRICATED SOIL CONCENTRATION	STANDARDS
	Biosolids	Soil	*Recommended blend ratio biosolids:soil (bulk volume basis)* *1:4*	
	Average concentrations (mg/kg)	Average concentrations (mg/kg)	Predicted soil concentrations (mg/kg)	OMRR Agricultural Lands (mg/kg)
Arsenic	3.80	5.06	4.99	20
Cadmium	1.4	0.14	0.20	10
Chromium	25	34.0	33.57	60
Cobalt	3.9	8.9	8.63	25
Copper	378	21.4	39.23	150
Lead	39.5	8.3	9.84	120
Mercury	0.90	0.05	0.09	0.6
Molybdenum	5.4	0.66	0.90	80
Nickel	16	26.8	26.20	150
Selenium	3.80	0.5	0.67	1.5
Zinc	745	57.6	91.96	200

e. Site 2 subsoil amended with Iona Island WWTP Lagoon-stabilized Class B biosolids

PARAMETER	FEEDSTOCK QUALITY DATA		FABRICATED SOIL CONCENTRATION	STANDARDS
	Biosolids	Soil	*Recommended blend ratio biosolids:soil (bulk volume basis)* *1:3*	
	Average concentrations (mg/kg)	Average concentrations (mg/kg)	Predicted soil concentrations (mg/kg)	OMRR Agricultural Lands (mg/kg)
Arsenic	6.10	5.06	5.19	20
Cadmium	3.3	0.14	0.55	10
Chromium	63	34.0	37.77	60
Cobalt	6.20	8.9	8.53	25
Copper	623	21.4	99.61	150
Lead	112.0	8.3	21.76	120
Mercury	3.4	0.05	0.48	0.6
Molybdenum	6.0	0.66	1.35	80
Nickel	31.2	26.8	27.33	150
Selenium	3.20	0.5	0.85	1.5
Zinc	578	57.6	125.25	200

All parameters are on a 100% dry weight basis
Matrix standards are based on OMRR Schedule 10.1 (updated Nov 1/17) soil standards for Agricultural Land. Site-specific factors of human intake of soil and toxicity to invertebrates and plants apply at all sites; the most restrictive of the site-specific factors of livestock ingesting soil and fodder or major microbial functional impairment have also been applied.

Figure 1. Location Map – Fraser Valley Aggregates Castle Pit

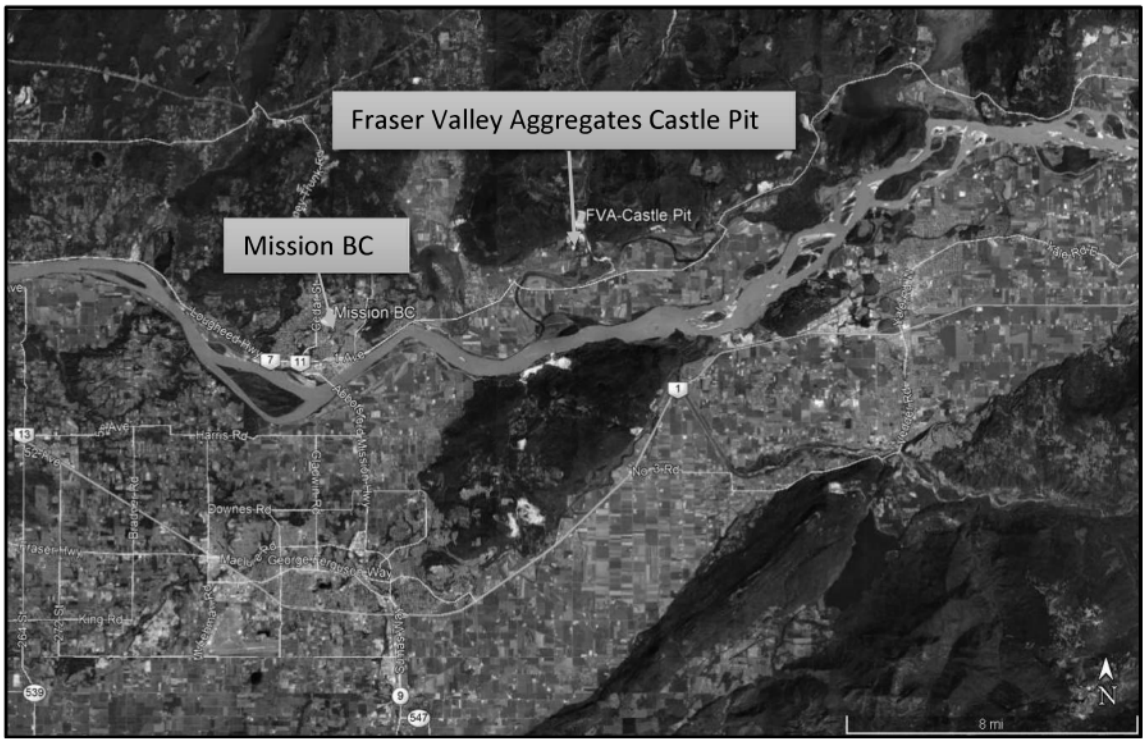

Figure 2. Site Map – Fraser Valley Aggregates Castle Pit (Pit #7) 2020-2022 Reclamation Area – Site 1 and Site 2

Note: Approximate site boundaries outlined in blue. Closest groundwater well identified by orange circle.

Appendix 1. Soil Monitoring Protocol for Castle Pit Reclamation Soils

1. *Soil quality standard*: Mineral soils excavated from Site 1 or sourced from the Fraser Valley will be amended with biosolids prior to placement across the site for reclamation. Since the final land use designation will be agricultural, the Agricultural Land standards for substances regulated in soil by the *Organic Matter Recycling Regulation* (OMRR) will apply under this Land Application Plan. Other soil quality parameters that are not regulated under the OMRR, such as physical properties and nutrient status, will also be assessed in the fabricated soil to ensure an appropriate growing medium is produced and nutrient overload to the site is prevented.

2. *Mineral soils and amendments:* For Site 1, mineral soils will be excavated from the site. For Site 2, there is no stockpiled soil available for reclamation use. Mineral soils will be sourced from the surrounding area to make the required reclamation soils. For both sources of mineral soils, samples from the soils will be collected and submitted for analysis of trace elements and nutrients prior to amending with biosolids. Class A and B biosolids from Metro Vancouver WWTP's will be used to enhance nutrient and organic matter content of mineral soils (details in LAP).

3. *Blend ratio:* To ensure final amended soils meet OMRR Agricultural Land limits for trace elements, it is recommended that topsoils amended with biosolids shall contain no more than 5% (Lions Gate WWTP) or 6% (Annacis Island, Iona Island and Lulu Island WWTPs) biosolids on a dry weight basis and subsoils amended with Iona Island WWTP lagoon-stabilised biosolids shall contain no more than 13% biosolids on a dry weight basis. If a higher % of biosolids is used, this will be based on soil trace element test results. Monitoring of blended soils, prior to placement on the application site, will include all OMRR regulated trace elements as well as nutrient parameters. Based on the results, protocols for soil and crop management will be established by the Qualified Professionals.

4. *Soil sampling frequency*: Amended soil compliance monitoring will be conducted at least once per 1,000 dry tonnes of biosolids that has been blended. Each monitoring event will consist of collecting at least one composite sample from the blended soil stockpile. This sampling program is aligned with the frequency and number of samples that would be required under the OMRR for an equivalent volume of Biosolids Growing Medium (BGM).

5. *Sampling personnel*: No less than 50% of the sampling events will be undertaken by Ruth McDougall, M.Sc., PAg. or Holly Suggitt, PAg., the Qualified Professionals overseeing the project. Up to 50% of the sampling events can be done by QP-approved Arrow staff.

6. *Sampling protocol*: Compliance monitoring events will be coordinated with the Arrow site supervisor. Each compliance sample will consist of 10 sub-samples of soil collected randomly

from the stockpiled biosolids amended material. Samples will be collected from at least 30 cm inside the pile, and the sampling sites will vary in height along the side of the pile or windrow. Sub-samples will be of approximately the same volume. Once collected, all 10 sub-samples will be placed in a clean, rectangular 20 to 30 litre Rubbermaid bin or similar container, and will be mixed thoroughly by trowel and by hand (with a single use glove) to ensure that lumps of biosolids can be identified and broken up during mixing. Samples will be mixed for a minimum of 5 minutes to ensure thorough mixing. All biosolids lumps larger than 4 mm will be crushed by hand or with a similarly effective tool, and thoroughly blended into the sample. All stones and inert debris will be removed.

Sample volume for lab: Once material is thoroughly mixed and all biosolids lumps larger than 4 mm in diameter have been broken up and well mixed into the rest of the sample, a sub-sample of 100 grams (no more than 1/2 cup of material) will be removed and placed in a labelled bag for lab analysis. The lab will be requested to dry and grind the entire submitted sample to avoid erroneous sample results due to the lab extracting a non-representative sample from the submitted material.

Samples will be placed on ice in a cooler, and couriered to a laboratory certified by the Canadian Association for Laboratory Accreditation for analysis of 'CSR strong acid leachable trace metals' (SALM) and total nitrogen, ammonia-N and nitrate-N at a minimum and other soil quality parameters, as required.

7. *Quality Assurance/Quality Control*: Sampling events and sample management will be conducted in accordance with the *Guidelines for Sampling Biosolids, Compost, Soil and Vegetation under the BC Organic Matter Recycling Regulation* (van Ham & McDougall, 2002) and the *British Columbia Field Sampling Manual* (BC Ministry of Water, Land and Air Protection, 2003). Quality Control samples will consist of collection and submission of 10% duplicates. All samples will be submitted to a laboratory certified by the Canadian Association for Laboratory Accreditation, in accordance with the *BC Environmental Data Quality Assurance Regulation*.

8. *Non-compliant soil*: When a batch of non-compliant soil is identified during routine compliance testing, the material should be re-sampled to confirm the original results. In this case, it is recommended that three composite samples of material are collected from the entire volume of suspect soil, with each composite consisting of at least 10 sub-samples. If non-compliant material is re-sampled, collection and preparation of samples will follow item 6 above. Alternatively, if preferred, the material can be re-mixed with additional feed stock material as required without re-testing, and then re-sampled and analyzed to confirm compliance. Blend ratios and recommended additional feed stock(s) for re-mixing will be calculated based on sample data. In any event, non-compliant soil will be re-sampled and analyzed after re-mixing to confirm compliance.

Appendix 2. Letter of Authorization

Mr. Brad English

July 1, 2020

Division Manager, NutriGrow
Arrow Transportation Systems Inc.
400 – 970 McMaster Way
Kamloops, BC V2C 6K2

Dear Mr. English,

I have been requested to provide a letter of authorization for Arrow Transportation Systems Inc. (Arrow) to receive and manage biosolids produced at Metro Vancouver's Annacis Island, Lulu Island, Lions Gate and Iona Island wastewater treatment plants at Pit #7 in Dewdney, BC, which is an aggregate extraction operation owned by Fraser Valley Aggregates. The civic address of the Pit #7 are located in Dewdney, BC and the land location is noted below. I confirm that I, Gary Bailey, am the legal owner of the lands described as Pit #7 and it is my understanding that Arrow plans to receive and manage both Class A and B biosolids that are dewatered or land dried on my land for the purposes of topsoil production and reclamation.

This letter is provided to fulfill the requirements for landowner authorization, as per the Organic Matter Recycling Regulation. I can be reached at (604) 539-3221 with any questions.

Land Location:

1. 38205 Bell Rd, Dewdney, BC
   PID: 027-740-358

2. 38297 Bell Rd, Dewdney, BC
   PID: 013-421-611

Sincerely,

Mr. Gary Bailey

President and Owner, Fraser Valley Aggregates

Fraser Valley Aggregates Marshall Rd and Ross Rd Sites (Pit #11)

2020-2022 Biosolids Land Application Plan

August 2020

Prepared for:

Arrow Transportation Systems Inc.
400 – 970 McMaster Way
Kamloops, BC V2C 6K2

Prepared by:

R. McDougall, M.Sc., P.Ag.
Consulting Agrologist
Enderby, BC

Reviewed by:

Holly Suggitt, P.Ag.
Consulting Agrologist
Nelson, BC

Statement of Limitations

This Land Application Plan (LAP) describes blending of Metro Vancouver municipal biosolids with stockpiled native soil from the larger gravel extraction site to make fabricated soils for reclamation of a portion of the FVA Marshall Rd and Ross Rd spent gravel pit sites (FVA Pit #11). No reclamation plan for the site was available at the time of preparation of this LAP. This LAP describes only the production of biosolids-containing fabricated soils for use in reclamation of the site in accordance with the BC Organic Matter Recycling Regulation (OMRR). This LAP does not consider or supersede any of the requirements contained in the reclamation plan for the site.

This LAP is limited to the specific areas, materials and conditions that were identified and observed during the site visit by the Qualified Professional and the accuracy of the data for background soil and biosolids quality. The recommendations and findings in this LAP must only be used in the context of the whole report and not in parts. The professional judgement and recommendations contained herein are based on the results of soil analyses and information from third parties believed to be true and accurate at the time of writing. The professional judgement and expertise contained herein are limited to assessment and recommendations related to soil chemistry and physical properties and do not include any assessment of structural or survey considerations related to using soils blended with biosolids. The authors take no responsibility for any errors or omissions of information provided by third parties nor for any impacts resulting from deviation from the recommendations set forth in this plan. This LAP is valid only for the site and time periods for which it was prepared.

Summary of 2020-2022 FVA Marshall Rd and Ross Rd site (FVA Pit #11) Biosolids Applications

General: This LAP describes the use of Metro Vancouver Class A and Class B municipal biosolids to reclaim a portion of the Fraser Valley Aggregates Marshall and Ross Rd spent gravel extraction sites, located at 29694 Marshall Rd and 1720 Ross Rd, Abbotsford BC. The site is identified on Figure 2: Site Map. The site is located south of the Marshall Rd extension and east of Ross Rd and is part of a larger, active gravel extraction operation. The site is located within the Agricultural Land Reserve and will be returned to agricultural production after reclamation.

Arrow has partnered with Fraser Valley Aggregates to reclaim the site. Arrow plans to use Class A and B biosolids as an amendment to enhance the quality of the salvaged soils that have been stockpiled on the gravel pit site since the operation began in the late 1980's. This Land Application Plan (LAP) covers the use of Class A and/or B biosolids from Metro Vancouver's Annacis Island, Lulu Island, Lions Gate, Iona Island and Northwest Langley Wastewater Treatment Plants (WWTPs). Topsoil that is amended with Class A biosolids from the Annacis Island WWTP and a clean, carbon feedstock may also meet the OMRR criteria for a Biosolids Growing Medium (BGM).

Topsoil and subsoil blending, quality and applications: Up to 42,900 bulk tonnes of Metro Vancouver biosolids will be received at the 12 hectare site during the time frame of this LAP and blended with mineral soils sourced from the stockpiled soil on site. Both subsoil and topsoil will be fabricated for reclamation of the site. Topsoil blended with biosolids will also be amended with a clean carbon feedstock to enhance nutrient stabilization and soil physical properties. Preliminary blend ratios have been modelled based on stockpiled soils to manage trace element concentrations in the amended soils. Blend ratios are summarized in Section 5.2 and Table 6 of this LAP.

All soils will be thoroughly blended such that no biosolids clumps greater than 10 cm in diameter are apparent after blending. All amended soils must meet the OMRR soil standards for Agricultural Lands and will be monitored by the Qualified Professionals to confirm compliance. The amended soils will be placed on the site in accordance with the requirements of the reclamation permit for the site. Soils will not be placed until Fraser Valley Aggregates has signed off that the requirements of the reclamation permit have been met. Biosolids applications will also be managed in accordance with the new Code of Practice for Agricultural Environmental Management and good agricultural practice; a cover crop may be required in the first growing season after soil placement.

Setbacks and restrictions: Because the area to be reclaimed at the Marshall Rd and Ross Rd site may be amended with Class B biosolids from the Lulu Island, Lions Gate or Iona Island WWTP, the setbacks and restrictions for Class B managed organic matter will apply to the whole site. The biosolids will therefore be used in accordance with the methods described in Part 1 of Schedule 8 of the OMRR. This will include setbacks from water, roads, and off-site dwellings, food production and grazing restrictions, access restrictions and signage.

The BC Water Resources Atlas mapping system shows one groundwater well within the site boundaries although the well was not observed during the site visit; status of the well will be confirmed with site owners and setbacks implemented as required. The Atlas shows no surface water sources within 400 metres of the reclamation site. There are no onsite dwellings. There is one residence along the northeast edge of the proposed reclamation area which will require a 30 m or larger setback for biosolids applications. A minimum setback of 45 m has been recommended. Sections of the property abut the Marshall Rd Extension and require a public road setback of 10 m for Class B biosolids applications.

Storage: All biosolids for use on the Marshall Rd and Ross Rd site will be stored at the existing FVA Pit #15 storage area (identified in Figure 3). All biosolids will be stored separately based on type and/or class and handled appropriately. Topsoil and subsoil for the site will be mixed at the Pit #15 site and stored there until placement on the reclamation site. Biosolids will not be stored within 30 m of a groundwater well or surface water feature. Soil blending will be conducted adjacent to the Pit #15 storage area. Any changes to the configuration of storage and blending areas shall be reviewed and approved by a Qualified Professional prior to commissioning.

Monitoring requirements: Metro Vancouver conducts routine monitoring of all biosolids as part of their management program; results are available weekly. Screening level and routine sampling of the stockpiled native soils has been conducted by the Qualified Professional. All results indicate the soil is suitable for amendment with biosolids however any noted fluctuations in trace element or soil quality parameters in future sampling results that may impact the final soil quality will trigger adjustments to the mix ratios to ensure all soils continue to meet target criteria. A Soil Monitoring Protocol (presented in Appendix 1) has been developed and is aligned with the requirements of Schedules 5 and 6 of the OMRR. The protocol includes routine site visits conducted by the Qualified Professionals to sample amended soils and confirm compliance with this Land Application Plan and to ensure nutrient concentrations are appropriately managed through planting of cover crops or other methods prescribed by the Qualified Professionals.

OMRR Schedule 7 Biosolids production and application information

Biosolids production facility: Metro Vancouver's Annacis Island, Lulu Island, Lions Gate and Iona Island wastewater treatment plants. Addresses:

- Annacis Island WWTP 1299 Derwent Way, Delta BC V3M 5V9
- Iona Island WWTP 1000 Ferguson Road, Richmond BC V7B 1W7
- Lions Gate WWTP 101 Bridge Road, West Vancouver BC V7P 3R2
- Lulu Island WWTP 13500 Gilbert Road, Richmond BC V7E 2H8

Biosolids contact person: Brad English, Nutrigrow Division Manager, #400-970 McMaster Way, Kamloops BC V2C 6K2. Phone: 604.798.7610 email: benglish@arrow.ca

Professional preparing the LAP: Ruth McDougall, M.Sc., PAg., office: 250.838.0255, email: mcdougallr@outlook.com

Registered owner of the application site: Gary Bailey, Fraser Valley Aggregates and Suki Bath (1185853 BC Ltd.)

Written authorization of land owners: included as Appendix 2

Address of biosolids application site: 1720 Ross Rd, 29694 Marshall Rd, Abbotsford BC

Application site contact information: Brad English, Nutrigrow Division Manager, phone 604.798.7610 email benglish@arrow.ca

Parcel Identifier of biosolids application site: PID 013-333-569, PID 001-599-445

Intended dates for biosolids application: Site will be reclaimed with biosolids beginning in September 2020 (date dependent on submission date of Notification) and activities are expected to continue for 2 years from that date. Biosolids brought to the site by the end date of the LAP may be managed on site in accordance with the LAP after that date.

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1 Introduction

This document is a Land Application Plan (LAP) prepared in accordance with, and fulfilling the requirements of the BC Organic Matter Recycling Regulation (OMRR). It describes the reclamation of an area of a spent gravel pit between Ross Road and the Marshall Road extension in Abbotsford, BC using biosolids-amended soils (see Figure 2: Site Map). The project involves amending salvaged native soils with Class A and B biosolids from Metro Vancouver's wastewater treatment plants to reclaim the site. The information required by Schedule 13 of the OMRR is summarized in the Schedule 13 - Notification of Land Application of Biosolids at FVA's Marshall Rd and Ross Rd sites and is included as Appendix 3 (as a separate pdf file).

This type of reclamation has historical precedent in the area. In 2018-19 Arrow reclaimed part of the Fraser Valley Aggregates Pit #15 using soils fabricated from stockpiled native soil and municipal biosolids similar to what is proposed for this project. Metro Vancouver biosolids have historically been used for gravel pit reclamation in the vicinity of the B&B Contracting Pit #15. Aldergrove Regional Park was created in 2000 by reclaiming a 12 hectare mined out gravel extraction site into parkland that includes a marsh area for wildlife, hiking trails and picnic area[1]. The site is located over the sensitive Abbotsford-Sumas aquifer and included careful monitoring to demonstrate no negative effects on surface or groundwater as a result of using biosolids in the restoration process.

Arrow Transportation Systems Inc (Arrow) has partnered with Fraser Valley Aggregates (FVA) to assist with site reclamation by providing biosolids for soil amendment as well as undertaking soil applications and providing other associated services. The proposed Marshall Rd and Ross Rd reclamation sites (FVA Pit #11) are located within the Agricultural Land Reserve and must be returned to agricultural production. Specific site reclamation requirements remain the responsibility of Fraser Valley Aggregates; this Land Application Plan deals strictly with amending mineral soils with biosolids, in accordance with the OMRR, to improve the agricultural capability of the soils prior to placing across the site and returning the land to agricultural production. Soil will not be placed until FVA has signed off that the requirements of their reclamation permit for the site have been met.

Arrow plans to use Class A and B biosolids as an amendment to enhance the quality of local mineral soil to produce productive subsoil and topsoil for the site. The biosolids will be used as an amendment based on a customized blend ratio for each soil type which is designed to enhance the soil nutrient and organic matter content. This Land Application Plan covers the use of fresh biosolids from Metro Vancouver's Annacis Island, Lulu Island, Iona Island and Lions Gate WWTPs, lagoon-stabilised biosolids from their Iona Island WWTP and aged, land-dried biosolids from the Northwest Langley WWTP. Annacis Island WWTP produces Class A biosolids that are freshly dewatered and hauled away from the WWTP on a daily basis. The Lulu Island and Lions Gate WWTPs produce Class B biosolids that are freshly dewatered and hauled away from the plants on a daily basis. In 2021, the Iona Island WWTP will begin producing freshly dewatered Class B biosolids.

[1] Metro Vancouver website, available: www.metrovancouver.org/services/parks/parks-greenways-reserves/aldergrove-regional-park Accessed: 20 August 2017.

Iona Island WWTP and Northwest Langley WWTP Class B biosolids are very old, lagoon-stabilised biosolids, some of which have been land-dried and stockpiled over many years and therefore have lower nutrient content and more stable physical properties than fresh, dewatered biosolids. The biosolids from the Annacis Island WWTP and the lagoon-stabilised, land-dried biosolids from the Iona Island and Northwest Langley WWTPs have pathogen levels less than 1,000 MPN/g. The biosolids from the Lulu Island and Lions Gate WWTPs have pathogen levels less than 2 million MPN/g as will the dewatered biosolids from the Iona Island WWTP in 2021. The Iona Island, Lulu Island, Northwest Langley and Lions Gate biosolids meet the requirements for vector attraction reduction for Class B biosolids (outlined in Schedule 2 of the OMRR) and can therefore be used in accordance with the methods described in Part 1 of Schedule 8 of the BC OMRR. The Class A and B biosolids will be used as an amendment based on customized blend ratios for each soil type designed to enhance the soil nutrient and organic matter content.

This LAP meets the standards and requirements set out in the OMRR. It uses modified presentation of data to properly characterize the use of biosolids as a blended amendment to mineral soils, rather than direct surface application to land with incorporation. Up to 28,500 bulk tonnes of Iona Island and Northwest Langley WWTP Class B lagoon-stabilised biosolids will be blended with salvaged mineral soils to produce subsoil for the site. Up to 14,400 bulk tonnes of fresh Metro Vancouver biosolids from the Annacis Island, Lulu Island, Iona Island and Lions Gate WWTPs will be blended with salvaged mineral soils and a carbon source to produce topsoil for the site. Although it is expected that all applications will be complete in the time period of this LAP (September 2020 with date dependent on OMRR Notification for two years), biosolids received at either site within this time period may be managed at the site beyond the expiration date of the LAP, in accordance with the requirements of this LAP and until such time that all of the biosolids delivered to the site have been land-applied in accordance with this LAP.

Where relevant to the use of municipal biosolids as a nutrient source, this plan also references the nutrient management requirements in the new Agricultural Environmental Management Code of Practice (AEM Code).

This plan is based on information, site conditions and soil nutrient and trace element concentrations that were current at the time of writing. This plan is valid for the application of biosolids to the areas indicated in this plan and at rates no higher than those indicated in this plan.

2 Site Description

The site covered under this LAP is a mined out gravel pit which is part of a larger, active gravel extraction operation. The site is located south of the Marshall Road Extension and east of Ross Road in Abbotsford, BC (see Figure 1: Location Map). The site is in the Fraser Valley Regional District and is within the Agricultural Land Reserve. The site is predominately flat with minor undulations. Along part of the east edge of the site, it slopes downwards to a forested area.

The site has been backfilled to grades established as part of the overall reclamation program prior to replacement of soil horizons across the site. Native soils (amended with biosolids) will be replaced across the site in 2020-2022. Amending native soils with biosolids will improve agricultural capability by adding macro and micro-nutrients required for plant growth and by increasing soil organic matter content, thereby improving soil structure. Once reclamation is complete, the area will be returned to agricultural production with crop type to be determined.

A site visit was conducted by Ruth McDougall, M.Sc., P.Ag. on June 8, 2020 to assess the site.

The street and legal description of the site is as follows (Table 1):

Table 1. Legal description of proposed 2020-2022 application area

Street Address	PID
29694 Marshall Road Extension	013-333-569
1720 Ross Road	001-599-445

Size: Approximate area to be reclaimed under this LAP is 12 ha. The size will be confirmed by survey before reclamation begins and biosolids volumes adjusted as necessary.

Boundaries of reclamation area:
North: Marshall Road Extension
South: Active gravel extraction area
West: Active gravel extraction area
East: North end of site bounded by privately owned land zoned for agriculture, south end of site is bush area which is part of the Ross Rd site.

Location of sensitive features
Surface water: The BC Water Resources Atlas showed no surface water sources within the vicinity of the site. The nearest surface water source is Pepin Creek which is located west of Ross Road and is >400 metres west of the site.
Groundwater: The site is located over the Sumas-Abbotsford aquifer which is listed as having high vulnerability. Depth to groundwater on the site appears to be at least 39 m based on the standing water level in a nearby well when drilled.
Wells: One well is identified in the BC Water Resources Atlas as being within the site but no wellheads were observed during the site assessment (marked on Figure 1: Site Map). The well will be confirmed as active/abandoned prior to applying fabricated soil. If present, biosolids applications will be set back 30 metres from it. The nearest off-site well appears to be approximately 50 m from the south boundary of the site (marked on Figure 1: Site Map).
Other features: There is a new residence being built very close to the property line in the northeast corner of the site (marked on Figure 1: Site Map). There is also a sloping area along part of the east side of the site. The area slopes downhill into a wooded area at the bottom of a gully. The sloping area is part of the parcel being reclaimed. Soil application depth should be modified in this area to ensure there is no movement of soil or nutrients downslope. Reclamation of the sloping area of the site with

fabricated soil will be discussed with the land owner and a strategy developed based on his end use plans for the site.

Fabricated soil application setbacks and restrictions

- A minimum 45 m buffer from the new residence which is very close to the property line in the northeast corner of the site
- A 10 m buffer from the area of the site that abuts private land to the east.
- A 10 m setback from Marshall Road Extension
- Modified topsoil and subsoil application will be required on the sloping area which runs along part of the east edge of the area being reclaimed. A plan for this area will be developed with the land owner's input.

3 Characteristics of Native Soils

3.1 Soil sampling protocols

Salvaged native soils from the site are stockpiled at the FVA Pit #15 in large stockpiles. This stockpiled soil will be blended with biosolids to make the fabricated topsoil and subsoil for reclamation of the Marshall and Ross Rd site. Samples of this soil were submitted to Caro in Richmond, BC for analysis of nutrients, soil quality and trace metals. Results of the soil analyses are presented in Table 2 and laboratory data reports are available upon request.

3.2 Nutrient content in Pit #15 native soils

The native soils that are stockpiled for replacement on the FVA Marshall and Ross Rd site are generally deficient in available nitrogen that would be required for crop production[2]. Both composite sample results for ammonium plus nitrate-N were less than 10ppm, which is considered low available nitrogen concentration. The East pile exhibited a higher concentration of available phosphorus, at 60ppm, while the West pile available phosphorus result was 35ppm; these concentrations are considered to be within the range of moderate. The East soil pile also exhibited higher levels of available potassium, at 95ppm, whereas the West pile had 65ppm; these concentrations are considered to be low to very low. Electrical conductivity results for both piles were low and pH was in the neutral to slightly acidic range, both of which are acceptable for plant growth.

3.3 Trace element concentrations in Pit #15 native soils

Samples of the stockpiled native soil were submitted for analysis of the eleven (11) trace elements regulated by the OMRR. Concentrations of the regulated metals in the native soils at the FVA site were all well within OMRR Agricultural Limits. Background trace element concentrations in the native soils

[2] BC Ministry of Agriculture, *Nutrient Management Reference Guide*, 2nd Ed. Nov 2010. BC Agriculture Research and Development Corporation. Accessed: 28 Sept 17. Available: http://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/agriculture-and-seafood/agricultural-land-and-environment/soil-nutrients/nutrient-management/nutrient-managment-reference-guide/nutrientmgmt_refguide.pdf

were used together with recent biosolids quality data to calculate predicted final trace element concentrations in the amended soils (see Tables 7a through 7f).

Table 2. Pit #15 background soil nutrient and trace element status

Parameter	Sample date / Sample ID / Units	07-Jul-17 East Pile Soil	07-Jul-17 West Pile Soil	Pit#15 Soil Average	OMRR Limits Agricultural Lands[a]
General					
Electrical conductivity	dS/m	0.047	0.040	0.044	-
Moisture	%	6.5	6.6	6.6	-
pH	pH units	6.7	6.0	6.4	-
Available nutrients (dry weight basis)					
Ammonium-N	mg/kg	3.0	3.0	3.0	-
Nitrate-N	mg/kg	3.1	1.9	2.5	-
Phosphorus	mg/kg	60	35	48	-
Potassium	mg/kg	95	65	80	-
CSR Strong acid leachable metals (dry weight basis)					
Arsenic	mg/kg	4.57	5.54	5.06	20
Cadmium	mg/kg	0.13	0.14	0.14	10
Chromium	mg/kg	33.5	34.5	34.0	60
Cobalt	mg/kg	8.6	9.2	8.9	25
Copper	mg/kg	23.4	19.4	21.4	150
Lead	mg/kg	11.2	5.4	8.3	120
Mercury	mg/kg	<0.04	0.05	0.05	0.6
Molybdenum	mg/kg	0.68	0.64	0.66	80
Nickel	mg/kg	24.4	29.1	26.8	150
Selenium	mg/kg	<0.5	<0.5	<0.5	1.5
Zinc	mg/kg	55.3	59.9	57.6	200

[a] Matrix standards are based on OMRR Schedule 10.1 (updated Nov 1/17) soil standards for Agricultural Land. Site-specific factors of human intake of soil and toxicity to invertebrates and plants apply at all sites; the most restrictive of the site-specific factors of livestock ingesting soil and fodder or major microbial functional impairment have also been applied.

4 Characteristics of WWTP Biosolids

This LAP covers the use of Class A and B municipal biosolids from Metro Vancouver's Annacis Island, Lulu Island, Lions Gate, Iona Island and Northwest Langley WWTPs. The biosolids are generated following treatment of municipal wastewater in the Metro Vancouver region. Annacis Island WWTP produces Class A biosolids that are freshly dewatered and hauled away from the WWTP on a daily basis. Lulu Island and Lions Gate plants produce freshly dewatered Class B biosolids. The Iona Island WWTP will begin producing fresh centrifuge dewatered biosolids in 2021 but currently has a quantity of lagoon-stabilised Class B biosolids that have been land-dried and stockpiled over many years or will be

mechanically dewatered from the lagoons. Northwest Langley WWTP Class B biosolids are very old, lagoon-stabilised biosolids that have been land-dried and stockpiled over many years. Because of their age, the Iona Island WWTP lagoon-stabilised biosolids and legacy Northwest Langley WWTP biosolids have lower nutrient content and more stable physical properties than fresh, dewatered biosolids. All Metro Vancouver biosolids are mainly organic in nature and meet the OMRR Class A or B pathogen and Schedule 4 substance standards.

Routine quality monitoring of Metro Vancouver's biosolids is conducted by in-house sampling staff and microbiology and chemistry laboratories. The labs are accredited by the Canadian Association for Laboratory Accreditation. Unlike fresh Annacis Island, Lulu Island, Iona Island and Lions Gate WWTP biosolids, lagoon-stabilised solids produced by the Iona Island WWTP are sourced from historic stockpiles of biosolids and from storage lagoons for which there is no weekly routine quality monitoring data. Ongoing sampling of the Iona Island WWTP lagoon-stabilised biosolids is done as material is removed from the stockpile and from the lagoons to confirm that the material meets all OMRR Class B biosolids quality standards. Northwest Langley legacy biosolids were tested to confirm compliance with OMRR Class B standards before removal from the site. Recent quality data for all types of biosolids is presented in Table 5 (page 10) and laboratory data reports are available upon request.

4.1 Nutrient content and general soil quality

Table 5 (page 10) presents the nutrient concentration in the biosolids from Metro Vancouver wastewater treatment plants. The biosolids are primarily a source of nitrogen and phosphorus but also contain significant amounts of all other trace elements (micronutrients) necessary for plant growth. Biosolids are also an excellent source of organic matter which has been shown to improve soil tilth (structure and water holding capacity).

Nitrogen:
Table 3 contains information about the nitrogen content of the six types of biosolids covered under this LAP.

Due to the lagoon and stockpile aging process, the Northwest Langley and Iona Island lagoon-stabilised biosolids contain much less total nitrogen than fresh biosolids, and less available nitrogen, making these two types of biosolids a much lower source of this nutrient.

Phosphorus and potassium (Table 5): All biosolids except the aged Northwest Langley material are good sources of plant-available phosphorus and will meet the phosphorus requirements of planted vegetation for several years after soil placement. The Northwest Langley biosolids contain very little plant-available phosphorus. All biosolids are poor sources of plant-available potassium; supplementation may be required once the site is cropped.

Table 3. Nitrogen content of biosolids

Biosolids	Total Kjeldahl Nitrogen (TKN)[a]	Total nitrogen	Available nitrogen (ammonium+nitrate)	Organic nitrogen
	% dry basis	kg per bulk tonne	% of total N	% of total N
Northwest Langley land dried Class B	1.1	6.1	1.4	98.6
Iona Island Lagoon-stabilised Class B	1.55	7.5	1.7	98.3
Annacis Island Class A	5.5	14.9	17.8	82.2
Lulu Island Class B	6.45	15.6	15.9	84.1
Iona Island Class B[b]	9.9	25	53	47
Lions Gate Class B	4.18	12.1	17	83

[a]Quality data provided by Metro Vancouver reported Total Nitrogen in Northwest Langley biosolids, rather than Total Kjeldahl Nitrogen.

[b]These values are estimates based on nutrient content of digestate from the WWTP and will be updated when centrifuged biosolids values are available. It is expected that the nitrogen content of centrifuged biosolids will be lower than these values and similar to that of the other WWTPs.

pH and conductivity (Table 5): All biosolids to be used in this project have a pH within the optimum range for crop production, 5 to 8. There are no concerns with the pH of any of the biosolids to be used in the fabricated soils. The electrical conductivity (E.C. or salinity) of the Iona Island WWTP lagoon-stabilised biosolids and the Northwest Langley material is well below 3 dS/m, which is the desirable upper limit for E.C. in soil. E.C. of the four types of fresh biosolids is higher at 5.6 to 7.1 dS/m which is normal in fresh biosolids and similar to the E.C. of other organic amendments such as manure and composts. This E.C. is considered acceptable because biosolids constitutes less than 20% of the final soil volume which results in an E.C. that will be acceptable for plant growth. As well, as with other organic amendments such as manure, any increase in soil conductivity due to salts in the biosolids is temporary.

4.2 Trace elements

The concentrations of trace elements in the biosolids are summarized in Table 5. The concentrations of all OMRR trace elements in biosolids from all WWTPs are well below the relevant OMRR limits for Class A and B biosolids.

4.3 Pathogen and volatile solids treatment

Since native soils are being amended with biosolids via mixing technology prior to replacement across the site, all biosolids will have been incorporated through blending with the native soil prior to placement on the application site.

Pathogen reduction (Table 5):
The biosolids from the Annacis Island WWTP as well as the lagoon-stabilised Iona WWTP biosolids and the Northwest Langley material have pathogen levels less than 1,000 MPN/g. Centrifuged biosolids from the Lions Gate and Lulu Island WWTP's meet Class B pathogen standards and it is anticipated that fresh

centrifuged biosolids from the Iona Island WWTP will also meet the Class B pathogen standard (less than 2,000,000 MPN/g).

Volatile solids treatment (Table 4):

Annacis Island Class A biosolids and Lulu Island, Iona Island, Lions Gate and Northwest Langley Class B biosolids have been treated to achieve the OMRR Schedule 2 Vector Attraction Reduction requirement of 38% volatile solids reduction for surface application of biosolids. Volatile solids reduction is presented in Table 4 below (Metro Vancouver 2012 and 2018 data).

Table 4. Volatile Solids Reduction of Metro Vancouver Biosolids

Plant	Volatile solids reduction (%)
Annacis Island	65
Lulu Island	63
Lions Gate	73
Iona Island	66
Northwest Langley land-dried biosolids	>43

Table 5. Metro Vancouver WWTP Biosolids Quality Data

Parameter	Units	Northwest Langley WWTP Biosolids[a] *Class B*	Iona WWTP Lagoon-stabilised Biosolids[b] *Class B*	Annacis Island WWTP Biosolids[c] *Class A*	Lions Gate WWTP Biosolids[c] *Class B*	Iona WWTP Biosolids[d] *Class B*	Lulu Island WWTP Biosolids[c] *Class B*	OMRR Biosolids Quality Standards *Class B*	OMRR Biosolids Quality Standards *Class A*
General									
Total solids	%	55.0	48.2	27.0	28.9	NA	24.2	-	-
Electrical conductivity (EC)	dS/m	2.1	0.8	7.1	5.7	5.6	5.7	-	-
pH	pH units	5.8	6.9	7.7	7.3	7.6	7.8	-	-
Foreign matter	%	<1	<1	<1	<1	<1	<1	<1	<1
Sharp foreign matter	#	0	0	0	0	0	0	0	0
Nutrients (dry weight basis)									
Total Nitrogen-N (or TKN)	mg/kg	8,283	15,490	55,000	41,800	98,850	64,500	-	-
Ammonium - N	mg/kg	295	214	9,730	7,100	52,525	10,250	-	-
Available nitrate- N	mg/kg	106.8	45.5	<13.5	<1.4	NA	<13.6	-	-
Available phosphorus	mg/kg	234	933	2,500	2,640	NA	1,780	-	-
Available potassium	mg/kg	342	397	1,296	1,410	NA	946	-	-
CSR Strong acid leachable metals (dry weight basis)									
Arsenic	mg/kg	8.90	6.10	4.88	3.04	3.80	4.76	75	75
Cadmium	mg/kg	2.1	3.3	2.0	2.2	1.4	4.3	20	20
Chromium	mg/kg	91	63	56	30	25	32	1,060	-
Cobalt	mg/kg	10.20	6.20	4.1	2.5	3.9	5.4	150	150
Copper	mg/kg	370	623	672	646	378	510	2,200	-
Lead	mg/kg	50.4	112.0	40.4	71.0	39.5	26.1	500	500
Mercury	mg/kg	1.5	3.4	1.52	1.93	0.90	1.41	15	5
Molybdenum	mg/kg	4.9	6.0	10.1	7.4	5.4	10.4	20	20
Nickel	mg/kg	56.9	31.2	25	21	16	32	180	180
Selenium	mg/kg	2.30	3.20	6.91	5.70	3.80	5.41	14	14
Zinc	mg/kg	368	578	1,300	1,100	745	1,170	1,850	1,850
Bacteriology									
Fecal coliform[e]	MPN/g	<88	<27.1	114	49,012	NA	218,842	<2,000,000	<1,000

[a] Results obtained from Metro Vancouver quality assessment dated Feb 15, 2017 and March 28, 2017.
[b] Results obtained from Metro Vancouver testing of stockpiled material in October 2019.
[c] Results obtained from Metro Vancouver routine quality monitoring between January 1 and December 31 2019.
[d] Results obtained from Metro Vancouver routine quality monitoring of Iona Island WWTP digestate between January 1 and December 31 2019
[e] Results for Class A biosolids are absolute values and for Class B biosolids are geometric means.

4.4 Physical properties

Annacis Island WWTP biosolids are solids produced from secondary wastewater treatment which have undergone thermophilic anaerobic digestion followed by centrifuge dewatering. These biosolids have a solids content of approximately 27%, a sticky consistency and a bulk density of about 1,000 kg/m^3. Annacis Island WWTP is equipped with fine screens and no debris has been observed in the treated solids.

Lulu Island WWTP biosolids are solids produced from secondary wastewater treatment which have undergone mesophilic anaerobic digestion followed by centrifuge dewatering. These biosolids have a solids content of approximately 24%, a sticky consistency and a bulk density of about 1,000 kg/m^3.

Lions Gate biosolids are solids produced from primary wastewater treatment which have undergone mesophilic anaerobic digestion followed by centrifuge dewatering. These biosolids are friable in texture, have a lower bulk density (~650 kg/m^3) and a higher solids content once dewatered (approximately 29%). Lulu Island and Lions Gate WWTPs are equipped with fine screens and no debris has been observed in the treated solids.

Iona Island WWTP biosolids are solids produced by primary wastewater treatment which have undergone mesophilic anaerobic digestion. Currently digestate is stored in lagoons where the material stabilises over several years. This material is to be either land-dried on a historic biosolids stockpile or dewatered by a centrifuge. Following the many years of lagoon stabilization these biosolids have low odour and low nitrogen content. The lagoon-stabilised biosolids which have been land-dried have a soil-like consistency, a solids content of approximately 48% and a bulk density ranging from 850 to 1,300 kg/m^3. The future Iona Island WWTP biosolids that will be centrifuge dewatered are expected to have a consistency similar to other Metro Vancouver centrifuge-dewatered biosolids, a solids content of 25% and a bulk density of 1,000 kg/m^3. The Iona Island WWTP did not historically have fine screens and therefore some debris has been noted in the older lagooned and stockpiled material. Confirmatory sampling of the Iona Island WWTP lagoon-stabilised biosolids to determine foreign matter content is conducted on an on-going basis by Metro Vancouver and the results indicate that debris content does not exceed the 1% OMRR threshold. Confirmatory sampling and established protocols greatly reduce the likelihood of the delivered stockpiled material containing sharps.

Northwest Langley WWTP biosolids to be used at the site are derived from a secondary treatment process that employs digestion of the solids, followed by lagoon stabilization and land-drying. Following many years of lagoon stabilization and land-drying in the stockpile, the biosolids have a soil-like consistency, low odour, solids content of approximately 38% and a bulk density similar to fresh centrifuged biosolids. Results from confirmatory sampling for foreign matter content has shown the Northwest Langley biosolids do not exceed the 1% OMRR threshold. Confirmatory sampling and established protocols greatly reduce the likelihood of the delivered stockpiled material containing sharps.

5 Biosolids Stockpiling, Blending and Application Requirements

5.1 Biosolids receiving, storage and blending areas

The biosolids receiving, storage and blending areas will be located at the FVA Pit #15 site (marked on Figure 3. Location map for Pit #15). Each type and/or class of biosolids will be stored separately with areas delineated in order to manage different types of biosolids appropriately. Biosolids storage areas will be located at least 30 m from any surface water source or well. Blended soils will be stockpiled at the Pit #15 site until they are to be placed at which time they will be trucked from the Pit #15 site to the Marshall Rd/Ross Rd site and placed.

Once the biosolids are confirmed to meet OMRR Class A or B standards and site and weather conditions allow, the biosolids will be batched with mineral soil based on the appropriate blend ratios, as confirmed by the Qualified Professional prior to mixing. The biosolids will then be thoroughly mixed with the mineral soil such that no biosolids clumps greater than 10 cm in diameter are apparent after blending. The blended biosolids and mineral soil product will be conveyed into stockpiles until compliance testing is completed by the Qualified Professional in accordance with Section 6 of this LAP and the Soil Monitoring Protocol in Appendix 1. Once the soil is confirmed to meet OMRR Agricultural Land criteria, the soil will be available for replacement across the site. Soil placement depths will be as per the site's Reclamation Plan. The Qualified Professional will only sign off that biosolids were used in accordance with the OMRR and this LAP once all placement of biosolids amended soils is complete and the site has been seeded to a cover crop (or crop requested by the site owner).

All biosolids received at the site shall be blended with soil and/or a carbon source. Amended soils stored in stockpiles over winter months must be located on level ground, piled in a compacted, sloped shape to shed water and may be required to be seeded to a cover crop (depending on type of biosolids in the stockpiled material and timing), as determined appropriate by the Qualified Professional.

If amended soil application is delayed by more than one growing season and nutrient levels present a risk of leaching or runoff, the stockpiled amended soils shall be located on level ground and may be seeded with a suitable cover crop, as determined appropriate by the Qualified Professional.

5.2 Soil amendment with biosolids - blend ratios

Blend ratios for the topsoil and subsoil horizons are calculated to ensure that trace elements do not exceed OMRR limits for Agricultural Lands. Based on meeting OMRR trace element standards, the following mix ratios and concentration of biosolids in soils are recommended (Table 6):

Table 6. Mix ratios and concentration of biosolids in fabricated soils

WWTP Biosolids	% biosolids content (dry weight basis)	% biosolids content (bulk volume basis)	Operational blend ratio biosolids:soil (bulk volume basis)
Northwest Langley Class B	14	25	1:3
Iona Island Lagoon-stabilised Class B	13	25	1:3
Annacis Island Class A	6	20	1:4
Lulu Island Class B	6	20	1:4
Lions Gate Class B	5	20	1:4
Iona Island Class B	5	20	1:4

Tables 7a through 7f (pages 18-20) show the predicted soil trace element concentrations at the proposed mix ratios. The calculated predicted trace element concentrations in the amended soils are based on recent biosolids quality data and the average background soil trace element concentrations. Modelling includes consideration of material physical properties such as moisture and bulk density. Blend ratios may be adjusted by the Qualified Professionals based on updated feedstock quality results and/or results of soil monitoring events.

Topsoil amendment may also include addition of a clean carbon feedstock that complies with the requirements of the Permit (non-cedar based). Addition of a carbon feedstock to the topsoil will serve to tie up available nitrogen in the biosolids for slow release over several growing seasons, as well as improve the physical properties of the soil. Topsoil amended with Class A biosolids and carbon may also meet the OMRR criteria for a Biosolids Growing Medium, in addition to the OMRR soil standards for Agricultural Lands. The BGM may be used in general site landscaping for dust suppression. Production and use of BGM on the site shall comply with the standards and requirements of the OMRR.

5.3 Biosolids applications on site

The total tonnage of biosolids to be managed at the FVA Marshall Road and Ross Road sites (FVA Pit #11) is 42,900 bulk tonnes. The breakdown between topsoil and subsoil is as follows.

- Topsoil: A total of 14,400 bulk tonnes of Annacis Island, Lions Gate, Iona Island or Lulu biosolids
- Subsoil: A total of 28,500 bulk tonnes of Iona Island WWTP lagoon-stabilised biosolids or Northwest Langley aged biosolids

The area approved for amended soil application under this LAP is approximately 12 hectares (7 hectares at the Marshall Rd site and 5 hectares at the Ross Rd site). Once soils are amended with biosolids at the prescribed rates and confirmed to meet compliance standards under this LAP, the soil horizons will be replaced on the site in accordance with the reclamation requirements.

Reclamation areas, placement depths and biosolids quantities to be received are obtained through communication with Arrow and FVA. Actual quantities managed with associated compliance monitoring

details will be presented in a compliance report prepared (and kept on file in accordance with the OMRR) to confirm that biosolids were managed in accordance with this LAP.

Note: Soil amendment using biosolids to improve agricultural properties of the mineral soils at the FVA Marshall Rd and Ross Rd sites has been reviewed by the authors (Qualified Professionals) in the context of the requirements of the OMRR and good agricultural practice. All requirements associated with reclamation of the site remain the responsibility of the site owner and are not covered under this LAP.

5.4 Timing of placement of soil

The site is located in a designated high-precipitation area of BC and fabricated soils to be used in reclamation will contain municipal biosolids which is a nutrient source. Under the AEM Code, no nutrients are permitted to be applied to agricultural land during November, December and January in designated high-precipitation areas. Arrow is committed to applying this standard to their reclamation sites in designated high-risk areas and will comply with this AEM Code requirement. Under the AEM Code, nutrient application during the shoulder months of February, March and October is restricted to suitable soil types and crops. The fabricated soils to be placed on the Marshall Rd/Ross Rd site will be medium textured which is an acceptable soil type for placement during the shoulder months. If soil is to be placed during the shoulder months, it is recommended that the site is seeded after soil placement. Soil placement during the rest of the year will occur only if site and weather conditions allow for equipment activity on the site.

5.5 Management of nutrients in fabricated soils post-application

The main nutrient of concern when managing municipal biosolids is nitrogen, and only the nitrogen that is present in available forms (ammonium and nitrate) is of concern for movement into the aquatic environment. In fresh biosolids, this represents 16 to 18% of the total nitrogen. While biosolids contain a significant amount of phosphorus, this phosphorus is held tightly in the soil and does not leach significantly with precipitation. Biosolids contain a relatively small amount of potassium.

Total nitrogen content in the Northwest Langley biosolids and the Iona Island WWTP lagoon-stabilised biosolids is 30% or less of that in fresh biosolids, and of the total nitrogen in these aged biosolids, less than 2% is in available forms. Less than 5% of the available nitrogen is in the nitrate-N form which is the leachable form. Because of this low level of available nitrogen and particularly nitrate-N in the Langley WWTP and Iona Island WWTP lagoon-stabilised biosolids, leaching loss of nitrogen from these biosolids is not considered a significant concern. Fresh centrifuged biosolids (from the Annacis Island, Lulu Island, Lions Gate and Iona Island WWTPs) contain a significant amount of available nitrogen in the ammonium form, but contain a negligible amount in the nitrate form. Management of the available nitrogen in topsoil amended with fresh biosolids is important in the year of soil placement to ensure there is no movement of significant available nitrogen to surface or groundwater.

Arrow has completed several projects using the same type of fabricated soils as will be used at the FVA Marshall Rd and Ross Rd sites. In 2018-19 an area of FVA's Pit #15 in Abbotsford, BC was reclaimed using biosolids-amended fabricated soils. Fabricated topsoil and subsoil were placed on an area of FVA

Pit#15 in September 2019 using the same mix ratios and placed at similar depths as will be used at these sites. Placed soils were tested in October 2019 using the protocol in the new (February 2019) AEM Code to assess whether soils were compliant with the Code. The nitrate levels in the topsoil and subsoil were below the Code's trigger level of 100 kg/ha indicating that the amount of residual nitrate in the soil was within Code limits and therefore compliant.

The placed soils at the FVA Pit #15 site were monitored monthly over winter 2019-20 to assess downward movement of ammonium-N. Testing indicated that very little of the ammonium-N was lost from the soil during the winter months, even during the maximum rainfall period of November through February.

Both of these findings suggest that placement of fabricated soil as was done at the Pit #15 site does not result in loss of an excessive amount of nitrogen from the soils over the first winter after soil placement. On-going monitoring of soils placed both in the summer and fall will continue to confirm these findings and soil placement timing will be fine-tuned based on the results of this ongoing monitoring.

5.6 Environmental and health considerations for Class B biosolids applications

If the terms and requirements of this LAP are adhered to, it is expected that potential risk of environmental or health impacts associated with the use of Class A and B biosolids at the FVA Marshall Rd and Ross Rd sites is low. The greatest risk associated with the application is from nutrient loading. Nitrogen and phosphorus are the two main nutrients supplied to soils through amendment with biosolids. Risk of phosphorus runoff to surface water is very low since the biosolids will be incorporated into the soil profile, rather than surface applied, and because there are no sources of surface water near the application area. Environmental risks associated with the application of nitrogen are primarily the potential for groundwater contamination through leaching of nitrogen in the nitrate form. The risk of nitrogen leaching to groundwater is considered low due to the low nutrient content in the Northwest Langley and Iona biosolids, the low level of nitrate-N in the topsoil at the end of the growing season, the significant depth to groundwater at the sites (approximately 39 metres or more) and the rapid conversion of available N to immobile N that has been observed in biosolids blended soils[3].

5.7 Setbacks and restrictions

Because the area to be reclaimed at the Marshall Rd and Ross Rd site may be amended with Class B biosolids from the Lulu Island, Lions Gate or Iona Island WWTP, the setbacks and restrictions for Class B biosolids will apply to the whole site. The biosolids will therefore be used in accordance with the methods described in Part 1 of Schedule 8 of the OMRR. According to Part 1 of Schedule 8 of the OMRR, the following setbacks and restrictions for Class B biosolids are applicable:

[3] McDougall, R. and H. Suggitt. Nitrogen Dynamics in NutriGrow Biosolids Growing Medium. November, 2016.

Setback distances: The following minimum setbacks apply:

- 30 metres to potable water sources and irrigation wells, lakes, rivers, streams, farm dwellings and off-property occupied dwellings or boundaries of property zoned for residences or recreation
- 20 metres to major arterial roads or highways
- 10 metres to minor public roads excluding logging roads

Food production and grazing: Domestic animal grazing must be restricted for 60 days. Production of food crops with above and below-ground harvested parts must be restricted for 18 and 38 months respectively.

Signage: Visible signage must be posted for 38 months after completion of the project that contains the information required in Schedule 8 Part 1(f).

Restricted public access: The site must have restricted public access.

Depth to groundwater: The site must not have groundwater within 1 metre of the soil surface at the time of application.

6 Monitoring

Schedule 7 of the OMRR requires a post-application monitoring plan if the proposed application rates exceed annual crop nutrient requirements. A soil monitoring plan for the Marshall Rd and Ross Rd application is found as Appendix 1 of this LAP. It is expected that the site will be planted to a cover crop in the interim between completion of reclamation and conversion to the long-term agricultural use of the site. If the cover crop is to be harvested as feed for livestock, it should be tested for nitrates and if it contains elevated nitrates, the feed should be blended with lower nitrate-content crops prior to feeding. If the cover crop is to be turned into the soil, no vegetation quality testing is required. All soil monitoring will be conducted in accordance with the Soil Monitoring Protocol (found in Appendix 1). Results of all monitoring activities will be kept on file in accordance with the OMRR Schedule 6 – Record Keeping.

7 Reporting

No formal report submission is required to fulfill this LAP; however, written certification from a Qualified Professional will be completed as part of a compliance report that summarizes findings of the monitoring program and observations during compliance visits by the Qualified Professionals. One of the compliance visits will be conducted following completion of application of all biosolids-amended soils covered by this LAP. A compliance report will be prepared following completion of the work. The compliance report will outline the findings of the monitoring program and observations during site visits by the Qualified Professionals, as per Section 5 (3) of the OMRR. All required documentation will be kept on file in accordance with OMRR Schedule 6 – Record Keeping.

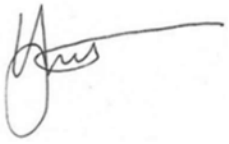
8 Plan Amendments

Any proposed amendments to this plan will be reviewed by the Qualified Professional for compatibility with the original plan and to determine if resubmission to regulatory authorities is required (if there are material changes). If approved, any amendments will be summarized in the final compliance report.

Land Application Plan prepared by:

Ruth McDougall, M.Sc., P.Ag.
Consulting Agrologist
Enderby BC

Land Application Plan reviewed by:



Holly Suggitt, P.Ag.
Consulting Agrologist
Nelson BC

August 17, 2020

Table 7 Optimum blend ratios and predicted trace elements in fabricated soils amended with Metro Vancouver biosolids at specified blend ratios *(blend ratios are presented on a bulk volume basis)*

Table 7a. Subsoil blended with Northwest Langley Class B biosolids

	Feedstock Quality Data		*biosolids:soil (bulk volume basis)* 1 : 3	Limits
Parameter	BIOSOLIDS average concentrations (mg/kg)	SOIL average concentrations (mg/kg)	Predicted soil concentrations (mg/kg)	OMRR Agricultural Lands (mg/kg)
Arsenic	8.90	5.06	5.60	20
Cadmium	2.1	0.14	0.4	10
Chromium	91	34.0	42	60
Cobalt	10.2	8.9	9.1	25
Copper	370	21.4	70	150
Lead	50.4	8.3	14.2	120
Mercury	1.5	0.05	0.25	0.6
Molybdenum	4.9	0.66	1.3	80
Nickel	56.9	26.8	31.0	150
Selenium	2.3	0.5	0.8	1.5
Zinc	368	57.6	101	200

Table 7b. Subsoil blended with Iona Island Lagoon-stabilised Class B biosolids

PARAMETER	FEEDSTOCK QUALITY DATA		FABRICATED SOIL CONCENTRATION	STANDARDS
	Biosolids	Soil	*Recommended blend ratio biosolids:soil (bulk volume basis)* *1:3*	
	Average concentrations (mg/kg)	Average concentrations (mg/kg)	Predicted soil concentrations (mg/kg)	OMRR Agricultural Lands (mg/kg)
Arsenic	6.10	5.06	5.19	20
Cadmium	3.3	0.14	0.55	10
Chromium	63	34.0	37.77	60
Cobalt	6.20	8.9	8.53	25
Copper	623	21.4	99.61	150
Lead	112.0	8.3	21.76	120
Mercury	3.4	0.05	0.48	0.6
Molybdenum	6.0	0.66	1.35	80
Nickel	31.2	26.8	27.33	150
Selenium	3.20	0.5	0.85	1.5
Zinc	578	57.6	125.25	200

Table 7c. Topsoil blended with Annacis Island Class A biosolids

PARAMETER	FEEDSTOCK QUALITY DATA		FABRICATED SOIL CONCENTRATION	STANDARDS
	Biosolids	Soil	*Recommended blend ratio biosolids:soil (bulk volume basis)* ***1:4***	
	Average concentrations (mg/kg)	Average concentrations (mg/kg)	Predicted soil concentrations (mg/kg)	OMRR Agricultural Lands (mg/kg)
Arsenic	4.88	5.06	5.0	20
Cadmium	2.0	0.14	0.2	10
Chromium	56	34.0	35	60
Cobalt	4.1	8.9	8.6	25
Copper	672	21.4	61	150
Lead	40.4	8.3	10	120
Mercury	1.52	0.05	0.14	0.6
Molybdenum	10.1	0.66	1.2	80
Nickel	25	26.8	26.7	150
Selenium	6.91	0.5	0.9	1.5
Zinc	1,300	57.6	133	200

Table 7d. Topsoil blended with Lions Gate Class B biosolids

PARAMETER	FEEDSTOCK QUALITY DATA		FABRICATED SOIL CONCENTRATION	STANDARDS
	Biosolids	Soil	*Recommended blend ratio biosolids:soil (bulk volume basis)* ***1:4***	
	Average concentrations (mg/kg)	Average concentrations (mg/kg)	Predicted soil concentrations (mg/kg)	OMRR Agricultural Lands (mg/kg)
Arsenic	3.04	5.06	4.93	20
Cadmium	2.2	0.14	0.26	10
Chromium	30	34.0	33.78	60
Cobalt	2.5	8.9	8.50	25
Copper	646	21.4	58.88	150
Lead	71.0	8.3	12.04	120
Mercury	1.93	0.05	0.16	0.6
Molybdenum	7.4	0.66	1.06	80
Nickel	21	26.8	26.39	150
Selenium	5.70	0.5	0.81	1.5
Zinc	1,100	57.6	120.14	200

Table 7e. Topsoil blended with Lulu Island Class B biosolids

PARAMETER	FEEDSTOCK QUALITY DATA		FABRICATED SOIL CONCENTRATION	STANDARDS
	Biosolids	Soil	*Recommended blend ratio biosolids:soil (bulk volume basis)* ***1:4***	
	Average concentrations (mg/kg)	Average concentrations (mg/kg)	Predicted soil concentrations (mg/kg)	OMRR Agricultural Lands (mg/kg)
Arsenic	4.76	5.06	5.04	20
Cadmium	4.3	0.14	0.35	10
Chromium	32	34.0	33.91	60
Cobalt	5.4	8.9	8.71	25
Copper	510	21.4	45.83	150
Lead	26.1	8.3	9.17	120
Mercury	1.41	0.05	0.12	0.6
Molybdenum	10.4	0.66	1.15	80
Nickel	32	26.8	27.00	150
Selenium	5.41	0.5	0.75	1.5
Zinc	1,170	57.6	113.22	200

Table 7f. Topsoil blended with fresh dewatered Iona Island Class B biosolids

PARAMETER	FEEDSTOCK QUALITY DATA		FABRICATED SOIL CONCENTRATION	STANDARDS
	Biosolids	Soil	*Recommended blend ratio biosolids:soil (bulk volume basis)* ***1:4***	
	Average concentrations (mg/kg)	Average concentrations (mg/kg)	Predicted soil concentrations (mg/kg)	OMRR Agricultural Lands (mg/kg)
Arsenic	3.80	5.06	4.99	20
Cadmium	1.4	0.14	0.20	10
Chromium	25	34.0	33.57	60
Cobalt	3.9	8.9	8.63	25
Copper	378	21.4	39.23	150
Lead	39.5	8.3	9.84	120
Mercury	0.90	0.05	0.09	0.6
Molybdenum	5.4	0.66	0.90	80
Nickel	16	26.8	26.20	150
Selenium	3.80	0.5	0.67	1.5
Zinc	745	57.6	91.96	200

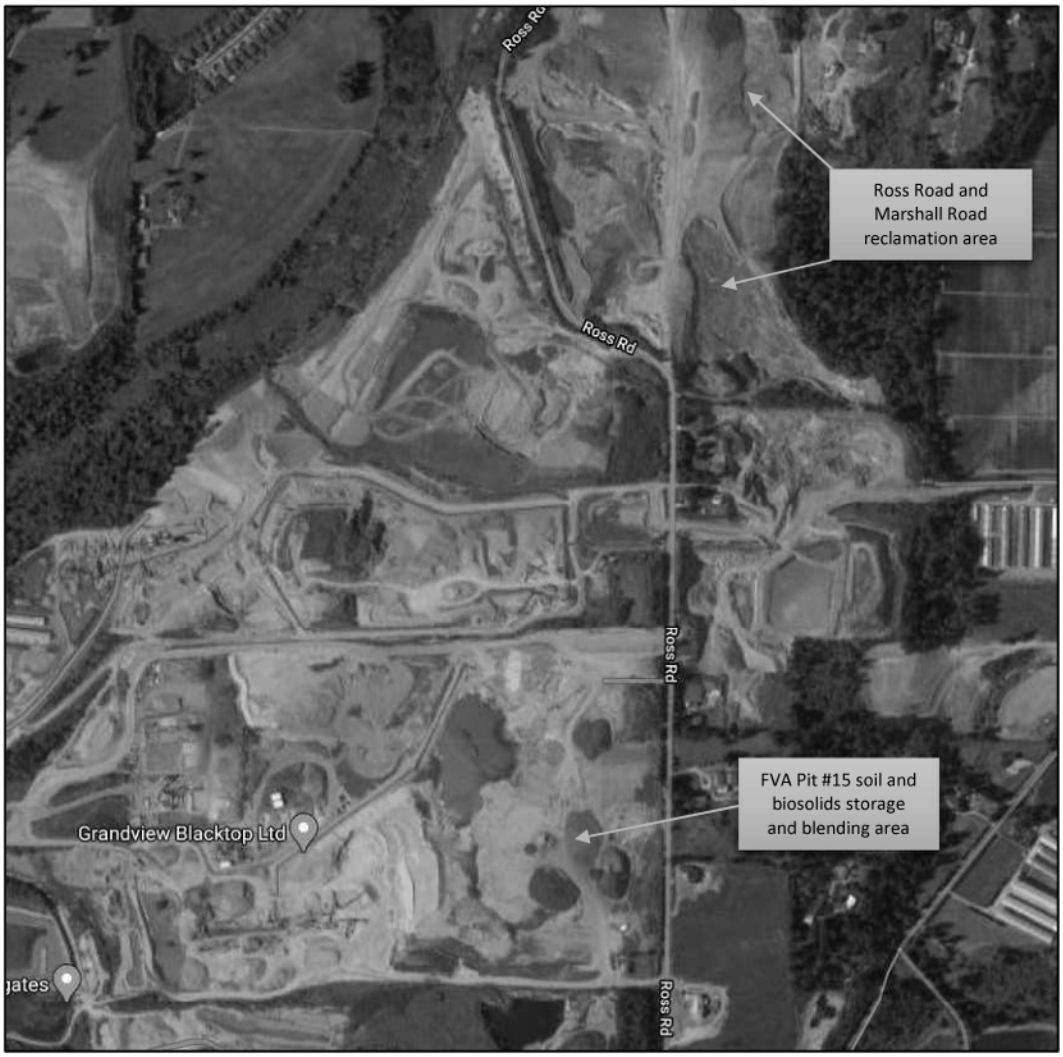
All parameters are on a 100% dry weight basis

Matrix standards are based on OMRR Schedule 10.1 (updated Nov 1/17) soil standards for Agricultural Land. Site-specific factors of human intake of soil and toxicity to invertebrates and plants apply at all sites; the most restrictive of the site-specific factors of livestock ingesting soil and fodder or major microbial functional impairment have also been applied.

Figure 1. Location Map – FVA Marshall Rd and Ross Rd (Pit #11) 2020-2022 Reclamation Areas

Figure 2. Site Map – FVA Marshall Rd and Ross Rd (Pit #11) 2020-2022 Reclamation Areas
Note: Property boundaries delineated by black lines. Orange lines delineate approx. reclamation areas within each property. On-site and nearest off-site water wells are identified by red circles.

Figure 3. Site Map – Location of Pit #15 soil storage and mixing area



Appendix 1. Soil Monitoring Protocol for FVA Marshall Rd and Ross Rd Reclamation Soils

1. *Soil quality standard*: Mineral soils stockpiled on site will be amended with biosolids prior to placement across the site for reclamation. Since the final land use designation will be agricultural, the Agricultural Land standards for substances regulated in soil by the *Organic Matter Recycling Regulation* (OMRR) will apply under this Land Application Plan. Other soil quality parameters that are not regulated under the OMRR, such as physical properties and nutrient status, will also be assessed in the fabricated soil to ensure an appropriate growing medium is produced and nutrient overload to the site is prevented.

2. *Mineral soils and amendments:* Mineral soils will be sourced from the stockpiled material at the FVA Pit#15 site to make the required reclamation soils. For both sources of mineral soils, samples from the soils will be collected and submitted for analysis of trace elements and nutrients prior to amending with biosolids. Class A and B biosolids from Metro Vancouver WWTP's will be used to enhance nutrient and organic matter content of mineral soils (details in LAP).

3. *Blend ratio:* To ensure final amended soils meet OMRR Agricultural Land limits for trace elements, it is recommended that topsoils amended with biosolids shall contain no more than 5% (Lions Gate WWTP) or 6% (Annacis Island, Iona Island and Lulu Island WWTPs) biosolids on a dry weight basis and subsoils amended with Iona Island WWTP lagoon-stabilised biosolids and Northwest Langley WWTP land-dried biosolids shall contain no more than 13% biosolids on a dry weight basis. If a higher % of biosolids is used, this will be based on soil trace element test results. Monitoring of blended soils, prior to placement on the application site, will include all OMRR regulated trace elements as well as nutrient parameters. Based on the results, protocols for soil and crop management will be established by the Qualified Professionals.

4. *Soil sampling frequency*: Amended soil compliance monitoring will be conducted at least once per 1,000 dry tonnes of biosolids that has been blended. Each monitoring event will consist of collecting at least one composite sample from the blended soil stockpile. This sampling program is aligned with the frequency and number of samples that would be required under the OMRR for an equivalent volume of Biosolids Growing Medium (BGM).

5. *Sampling personnel*: No less than 50% of the sampling events will be undertaken by Ruth McDougall, M.Sc., PAg. or Holly Suggitt, PAg., the Qualified Professionals overseeing the project. Up to 50% of the sampling events can be done by QP-approved Arrow staff.

6. *Sampling protocol*: Compliance monitoring events will be coordinated with the Arrow site supervisor. Each compliance sample will consist of 10 sub-samples of soil collected randomly from the stockpiled biosolids amended material. Samples will be collected from at least 30 cm inside the pile, and the sampling sites will vary in height along the side of the pile or windrow. Sub-samples will be of approximately the same volume. Once collected, all 10 sub-samples will be placed in a clean, rectangular 20 to 30 litre Rubbermaid bin or similar container, and will be mixed thoroughly by trowel and by hand (with a single use glove) to ensure that lumps of biosolids can be identified and broken up during mixing. Samples will be mixed for a minimum of 5 minutes to ensure thorough mixing. All biosolids lumps larger than 4 mm will be crushed by hand or with a similarly effective tool, and thoroughly blended into the sample. All stones and inert debris

will be removed.

Sample volume for lab: Once material is thoroughly mixed and all biosolids lumps larger than 4 mm in diameter have been broken up and well mixed into the rest of the sample, a sub-sample of 100 grams (no more than 1/2 cup of material) will be removed and placed in a labelled bag for lab analysis. The lab will be requested to dry and grind the entire submitted sample to avoid erroneous sample results due to the lab extracting a non-representative sample from the submitted material.

Samples will be placed on ice in a cooler, and couriered to a laboratory certified by the Canadian Association for Laboratory Accreditation for analysis of 'CSR strong acid leachable trace metals' (SALM) and total nitrogen, ammonia-N and nitrate-N at a minimum and other soil quality parameters, as required.

7. *Quality Assurance/Quality Control*: Sampling events and sample management will be conducted in accordance with the *Guidelines for Sampling Biosolids, Compost, Soil and Vegetation under the BC Organic Matter Recycling Regulation* (van Ham & McDougall, 2002) and the *British Columbia Field Sampling Manual* (BC Ministry of Water, Land and Air Protection, 2003). Quality Control samples will consist of collection and submission of 10% duplicates. All samples will be submitted to a laboratory certified by the Canadian Association for Laboratory Accreditation, in accordance with the *BC Environmental Data Quality Assurance Regulation*.

8. *Non-compliant soil*: When a batch of non-compliant soil is identified during routine compliance testing, the material should be re-sampled to confirm the original results. In this case, it is recommended that three composite samples of material are collected from the entire volume of suspect soil, with each composite consisting of at least 10 sub-samples. If non-compliant material is re-sampled, collection and preparation of samples will follow item 6 above. Alternatively, if preferred, the material can be re-mixed with additional feed stock material as required without re-testing, and then re-sampled and analyzed to confirm compliance. Blend ratios and recommended additional feed stock(s) for re-mixing will be calculated based on sample data. In any event, non-compliant soil will be re-sampled and analyzed after re-mixing to confirm compliance.

Appendix 2. Land Owner Authorization Letters

Mr. Brad English

July 1, 2020

Division Manager, NutriGrow
Arrow Transportation Systems Inc.
400 – 970 McMaster Way
Kamloops, BC V2C 6K2

Dear Mr. English,

I have been requested to provide a letter of authorization for Arrow Transportation Systems Inc. (Arrow) to receive and manage biosolids produced at Metro Vancouver's Annacis Island, Lulu Island, Lions Gate and Iona Island wastewater treatment plants at Pit #11, Pit #15 and Pit #17 in Abbotsford, BC, which is an aggregate extraction operation owned by Fraser Valley Aggregates. The civic address of the Pits are located in Abbotsford, BC and the land location is noted below. I confirm that I, Gary Bailey, am the legal owner of the lands described as above and it is my understanding that Arrow plans to receive and manage both Class A and B biosolids that are dewatered or land dried on my land for the purposes of topsoil production and reclamation.

This letter is provided to fulfill the requirements for landowner authorization, as per the Organic Matter Recycling Regulation. I can be reached at (604) 539-3221 with any questions.

Land Location:

1. 1239 Ross Rd, Abbotsford, BC
   PID: 013-332-279
2. 1367 Ross Rd, Abbotsford, BC
   PID: 004-196-881
3. 1439 Ross Rd, Abbotsford, BC
   PID: 013-332-252
4. 1720 Ross Rd, Abbotsford, BC
   PID: 001-599-445

Sincerely,

Mr. Gary Bailey

President and Owner, Fraser Valley Aggregates

Mr. Brad English

July 1, 2020

Division Manager, NutriGrow
Arrow Transportation Systems Inc.
400 – 970 McMaster Way
Kamloops, BC V2C 6K2

Dear Mr. English,

I have been requested to provide a letter of authorization for Arrow Transportation Systems Inc. (Arrow) to receive and manage biosolids produced at Metro Vancouver's Annacis Island, Lulu Island, Lions Gate and Iona Island wastewater treatment plants at 29694 Marshall Rd in Abbotsford, BC, which is an aggregate extraction operation owned by 1185853 BC . The civic address of the Pits are located in Abbotsford, BC and the land location is noted below. I confirm that I, Suki Bath, am the legal owner of the lands described as above and it is my understanding that Arrow plans to receive and manage both Class A and B biosolids that are dewatered or land dried on my land for the purposes of topsoil production and reclamation.

This letter is provided to fulfill the requirements for landowner authorization, as per the Organic Matter Recycling Regulation. I can be reached at **(604) 539-3221** with any questions.

Land Location:

1. 29694 Marshall Rd, Abbotsford, BC

   PID: 013-333-569

Sincerely,

Mr. Suki Bath

1185853 BC Ltd.

Blackwell Biosolids Land Application Plan

Prepared: September 2020

Prepared for:

Arrow Transportation Systems Inc.
102-1361 McGill Road
Kamloops, BC V2C 6K7

Prepared by:

Holly Suggitt, P.Ag.
Consulting Agrologist
Nelson, BC

Reviewed by:

R. McDougall, M.Sc., P.Ag.
Consulting Agrologist
Enderby, BC

Statement of Limitations

This Land Application Plan (LAP) is limited to the specific areas, materials and conditions that were identified and observed during the site visits by the Qualified Professionals. The recommendations and findings in this LAP must only be used in the context of the whole report and not in parts. The professional judgement and recommendations contained herein are based on the results of soil analyses and information from third parties believed to be true and accurate at the time of writing. The professional judgement and expertise contained herein are limited to assessment and recommendations related to soil chemistry and physical properties and do not include any assessment of structural or survey considerations related to using soils blended with biosolids. The authors take no responsibility for any errors or omissions of information provided by third parties nor for any impacts resulting from deviation from the recommendations set forth in this plan. This LAP is valid only for the site and time periods for which it was prepared.

Summary of 2021 Blackwell Biosolids Applications

General: Arrow has been managing Metro Vancouver biosolids at the Blackwell property since January 2014 starting with Biosolids Growing Medium (BGM). BGM is produced using Class A biosolids from the Annacis Island wastewater treatment plant (WWTP) and is used on the property as a topsoil and soil amendment to reclaim disturbed lands. Production and use of BGM is covered under a separate regulatory process. Arrow has also been receiving and managing Class B biosolids from Metro Vancouver wastewater treatment plants since September 2014 under the Land Application Plan (LAP) process. Class B biosolids are used to fabricate subsoil that is used to reclaim previously disturbed areas. This Land Application Plan (LAP) is a continuation of the biosolids work started in 2014/15.

Soil blending, quality and applications: Class B biosolids are blended with excavated native mineral soils to produce subsoil that is placed at varying depths to reclaim disturbed lands and level fields. Class B biosolids and native soils have been characterized and blend ratios modelled to manage trace element concentrations in the blended subsoil. Blend ratios and application rates are summarized in Section 5.2 and Tables 6a and 6b of this LAP. The maximum biosolids content of the subsoils (on a dry weight basis) shall be no more than 12%.

Biosolids will be blended with native soil such that no biosolids clumps greater than 10 cm in diameter are apparent in the soil after mixing and/or application. Soil blended under this LAP must meet OMRR soil standards for Agricultural Lands and will be monitored routinely by the Qualified Professionals to confirm compliance. The fabricated subsoils will be used on disturbed areas of the “Tod” and “Laura” gravel pits, shown together as the Upper Gravel Pit on Figure 2. Site Map. All placed subsoils will be capped with a 30 cm cap of BGM or salvaged topsoil; Iona subsoils will be capped with a minimum 60 cm cap consisting of either BGM/topsoil or a combination of 30 cm Lulu/Lions Gate subsoil plus 30 cm BGM/topsoil. All areas planned for applications will be used for production of feed crops and are not grazed by cattle.

Setbacks and restrictions: Features noted near the proposed application areas that require setbacks include:

> There are two ponds adjacent to the dairy farm and residences area that shall have 30 m setbacks from Class B biosolids application areas.
>
> The residences are serviced by municipal water but there may be historic wells associated with the older residences. 30 m setbacks from the area of the dwellings are recommended to ensure no risk to any groundwater wells that may be present.

For Class B biosolids application areas, visible signage must be posted at all entry points for a minimum of 38 months following final application of Class B biosolids. This signage shall clearly indicate the following:

- that wastewater biosolids have been applied to the site
- that the public should avoid ingesting plant material from the site for 18 months if harvested parts are above the surface and for 38 months if harvested parts are below the surface

- that domestic animal grazing on the site is restricted for at least sixty (60) days
- the name and telephone number of the site contact for additional information

All applications are on private land, therefore no public access control measures are required.

Storage: The biosolids storage facility is currently located on the Upper East Field (see Figure 2. Site Map). The storage facility is constructed on level ground with separate areas for receiving Lulu Island and Lions Gate biosolids and for Iona Island biosolids. Iona Island biosolids are drier and more soil-like and can be received in windrows or piles. Some biosolids are received in temporary storage areas prior to blending and placement on application areas. All storage areas are set back at least 30 m from the downslopes on the edges of fields and from surface and groundwater features. Soil blending is conducted adjacent to the storage areas; biosolids are contained until they are batched with other feedstocks and processed through mixing equipment. Biosolids received and stored for longer than 9 months will be contained within the storage facility. The biosolids receiving and management area may be moved closer to the upper gravel pits, in the vicinity of the proposed new application areas. Configuration of receiving and blending areas shall be reviewed and approved by a Qualified Professional prior to commissioning.

Monitoring requirements: Arrow and Metro Vancouver conduct routine monitoring of native soils and biosolids, respectively, prior to blending. Due to the requirement to hold biosolids in storage until compliance testing results are available, any fluctuations in trace metals that may require adjusting mix ratios are noted and accounted for prior to blending. A Soil Monitoring and Compliance Inspection Protocol (presented in Appendix 3) has been developed and is aligned with the requirements of OMRR Schedules 5, 6 and 7 section 3(b). The protocol includes routine site visits by the Qualified Professionals to sample blended soils and confirm compliance with this Land Application Plan. Vegetation monitoring in the first year of crop growth after soil applications will be completed to monitor nutrient levels in feed crops.

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1 Introduction

This document is a Land Application Plan (LAP) prepared in accordance with, and fulfilling the requirements of, the BC Organic Matter Recycling Regulation (OMRR). This document provides background information and recommendations for blending biosolids with native soil to create subsoil that will be used to reclaim areas disturbed by gravel extraction or landfill activities at the Blackwell property. The information required by Schedule 13 of the OMRR is summarized in the Notification of Land Application of Biosolids, included as Appendix 1.

Arrow has been managing Metro Vancouver biosolids at the Blackwell property in Kamloops, BC since January 2014. Arrow began by fabricating a Biosolids Growing Medium (BGM) using Class A biosolids from the Annacis Island Wastewater Treatment Plant (WWTP) and started managing Class B biosolids in fabricated subsoils in late 2014. Class B biosolids originate from the Lulu Island, Lions Gate and Iona Island WWTPs. Lulu Island and Lions Gate WWTPs produce fresh Class B biosolids that are dewatered and hauled away from the WWTPs on a weekly basis. The Iona Island biosolids are lagooned, land-dried and stockpiled over many years and therefore have lower nutrient content and more stable physical properties than fresh, dewatered biosolids.

Metro Vancouver biosolids are used at the Blackwell property as part of a land reclamation program. The farm has been actively reclaiming land from gullies by landfilling waste materials (under permit) since the 1990's and is extending existing fields into the reclaimed areas. There is also gravel extraction from areas of the property and these areas will progressively be turned into productive farmland as extraction is completed. Landfilling and gravel extraction activities on the property are on-going.

Metro Vancouver Class B biosolids are used as part of a fabricated subsoil. The subsoil consists of native silt and salvaged soil from the property blended with Class B biosolids in ratios that are designed based on the most recent biosolids and feedstock quality monitoring data. The blended subsoil is used to reclaim disturbed areas and provide adequate rooting depth for crops on marginal agricultural lands. The biosolids add nutrients and organic matter to the subsoil.

This LAP meets the standards and requirements set out in the OMRR with modified presentation of data to properly characterize the proposed use of biosolids blended with native soils, rather than surface application to land with incorporation. This LAP is valid for biosolids received at the Blackwell property between October 12, 2020 and October 12, 2021.

This plan is based on information, site conditions and soil nutrient and trace element information that was current at the time of writing. This plan is valid for the application of biosolids to the areas indicated in this plan and at rates no higher than those indicated in this plan.

2 Site Description

The Blackwell property is located approximately 15 km east of Kamloops, BC and is accessed from Barnhartvale Road, shown on Figure 1. Location Map (page 16). The Blackwell property is situated on benched lands above the South Thompson River valley and is at relatively low elevation, approximately 500 metres (1,640 feet) above sea level. The lands are located in the very dry hot (xh) subzone of the Ponderosa pine (PP) biogeoclimatic zone, along the boundary of the hotter Bunchgrass zone. This area is very arid with mean annual precipitation reported at 278 millimetres (Environment Canada[1]); however, sudden, heavy rainfall events can occur causing flash floods in low-lying areas and significant overland flow of water.

The 2021 proposed application sites are a continuation of work started in 2020 on disturbed areas to the east of the dairy barns at Blackwell Farm, shown on Figure 2. Site Map (page 17). There is significant disturbance due to gravel extraction throughout these areas that will require reclamation so that the land can be returned to agricultural production. Mining of these areas has been conducted under permits issued by the Ministry of Energy, Mines and Petroleum Resources (MEMPR). Gravel extraction has taken areas of land down to hardpan, which will not support agricultural crops without capping with an appropriate growth medium. All areas covered by the MEMPR permits shall be reclaimed in accordance with the reclamation program described therein.

Approximately 5 to 10 hectares of marginal and disturbed lands have been reviewed by the Qualified Professionals and included as potential application areas under this LAP. Three site visits, on March 2, 2018, April 16, 2018 and August 16, 2018 were conducted by Holly Suggitt to assess the suitability of the proposed biosolids application areas. The exact schedule for renovating these areas will be determined by gravel extraction and farming activities. Future land use for all areas will be agricultural fields, used for rotational cropping of corn and alfalfa.

The proposed application sites are summarized in Table 1 below along with estimated field sizes.

Table 1. Summary of proposed 2021 application areas

Field Name Parcel Identifiers	Area*	Description
Upper Gravel Pits (Tod's Pit and Laura's Pit) 029-046-986 028-046-650	11 ha	The large gravel pits situated between the Upper Pivot Field and the dairy barns are still active but have areas ready for progressive reclamation. Reclamation will consist of applying biosolids blended subsoils capped with BGM to return the land to agricultural use.

* Refers to the entire gravel/field area, not the specific areas for applications under this LAP. Specific areas will be determined once gravel operations cease and they become available.

The application areas are located on the benched area above the South Thompson River valley. There are two surface water features nearby the proposed application areas (see Figure 2. Site Map). Campbell Creek flows in a gully over 50 metres downslope from the south edge of the Upper Pivot Field.

[1] Environment Canada 1981-2010 Canadian Climate Normals – Kamloops A Station. Available: climate.weather.gc.ca/climate_normals. Accessed: 20 August 2020.

The 2021 proposed application areas are over 300 metres from the edge of the slope down towards Campbell Creek. There are also two ponds within the dairy farm footprint, one is adjacent to the proposed application areas and shall have a 30 m setback from Class B biosolids application areas. Although the proposed application areas are not adjacent to neighbouring properties, operations shall be conducted such that no dust from biosolids activities migrates offsite onto nearby properties.

The Barnhartvale and Dallas Drive area where the Blackwell property is situated is serviced by City of Kamloops municipal water and no water wells were noted during the site visits. The BC Water Resources Atlas was consulted to confirm the location of any groundwater wells within or nearby to the proposed application areas and to confirm the areas do not fall within a permitted water supply under the Drinking Water Protection Regulation (BC Reg 200/2003). A local public health officer[2] and the City of Kamloops CityMap[3] utilities mapping tool were also consulted to determine drinking water services in the area. Although no nearby domestic wells were indicated in the BC Water Resources Atlas, it is possible there are historical wells associated with the residence and farm operation and a minimum 30 metre setback from the residences and dairy shall be observed to ensure a minimum setback from potential wells and to minimize odour or other potential nuisance impacts to dairy, residences and outbuildings. There are also large ponds adjacent to the dairy barns and a farm residence that will require minimum 30 metre setbacks. Groundwater is not expected to be within one (1) metre of the ground surface since all proposed application areas are located on benched lands, elevated well above the valley bottom.

2.1 Historical biosolids use at Blackwell

Arrow has operated a Biosolids Growing Medium production facility at the Blackwell property since January 2014. Class A biosolids from Metro Vancouver's Annacis Island Wastewater Treatment Plant (WWTP) are received at this facility and blended with sawdust and native mineral soils to create a Biosolids Growing Medium (BGM), as defined by the OMRR. The BGM is intended for use on the property for reclamation of disturbed areas (historic landfill and gravel extraction areas) and to level sharply undulating fields. Fabrication and use of BGM at the Blackwell property is not covered under this LAP.

Arrow has been receiving Class B biosolids from Metro Vancouver's Lulu Island and Lions Gate WWTPs since September 2014 and from the Iona Island WWTP since October 2015. The Class B biosolids are blended with native mineral soils to produce a subsoil that is used to augment the rooting depth of the growth medium over reclaimed areas, level sharply undulating fields and enhance the poor quality mineral soils at the site.

[2] Personal communication with Kim Klepachek, Kamloops area Public Health Officer, at (250) 851-7324 in August 2014.
[3] City of Kamloops CityMap utilities mapping tool, available: http://www.kamloops.ca/maps/maps.shtml, accessed: 12 August 2020.

3 Characteristics of Native Soils

3.1 Soil sampling protocols

To characterize the materials to be used in fabricated soils and the proposed application sites, samples have been collected from mineral soils planned for use as feedstock in the blended subsoil (labelled 'silt' and 'soil' in Table 4). Subsoils produced in 2021 are expected to be blended from the native silt that has been used since the program began in 2015 and is excavated from various reserves on the property, as well as native soil that was salvaged from the gravel extraction areas and is stored in stockpiles adjacent to the Upper Gravel Pit area. Samples have been collected from excavated bank silt since 2015. The salvaged 'soil' was sampled in summer 2019 and results are considered representative of background soil in the disturbed areas since this is soil that was salvaged from the pits prior to starting gravel extraction. Background soil sampling was completed on April 16, 2018 by Holly Suggitt and July 23, 2019 by Michelle Harris (Arrow environmental staff). All samples were submitted to Caro Analytical in Richmond, BC for analysis of nutrients, soil quality and trace metals (all laboratory data included in previous years' LAPs). Results of the soil sample analyses are presented in Table 4 (page 13).

3.2 Nutrient content in native mineral soils for feedstock

Samples for nutrient analysis were collected from the two main types of native mineral soil that will be used as feedstock to blend soil, described as 'silt' and 'soil'. The samples were submitted for analyses of available nutrients and results are presented in Table 4. The native soils are excavated or salvaged from various areas on the property and are generally very deficient in nutrient and organic matter content. The silt-textured soil has very low levels of available nitrogen and phosphorus and a low level of potassium. It has a low to moderate electrical conductivity. The salvaged soil material has very low levels of available nitrogen, phosphorus and potassium. Both materials have a slightly alkaline pH, which is acceptable for plant growth.

3.3 Trace element concentrations in native soils

Concentrations of the eleven (11) OMRR regulated metals in the native soils at the Blackwell property were all within OMRR Agricultural Limits. Sample results for chromium in the silt have been elevated throughout the historical background soil sampling program. The silt has exceeded the Agricultural Land standard in 2014 sampling results (at approximately 71 mg/kg) and was elevated (at 56.4 mg/kg) in the 2015 sample results. See section 3.4 of this LAP for a discussion of the regional background reference level for chromium in the Thompson/Okanagan region. Background trace element concentrations in the silt and soil to be used as feedstocks were used to calculate predicted final trace element concentrations in the Class B biosolids blended subsoils (see Tables 6a and 6b, page 15).

3.4 Regional background chromium levels

Background levels of chromium in the silt textured mineral soil has been found to exceed the OMRR standards for agricultural sites in background soil sampling results. This is likely normal background chromium concentrations since the Thompson/Okanagan region has documented naturally-occurring elevated chromium levels in soil. The reference background soil chromium concentration for this region

is 150 µg/g (Protocol 4- Determining Background Soil Quality referenced in MoE Environmental Protection Branch's website:
https://www2.gov.bc.ca/assets/gov/environment/air-land-water/site-remediation/docs/protocols/protocol_4.pdf

With respect to the elevated background soil chromium levels at the site, Part 5, section 11(3) of the B.C. *Contaminated Site Regulation* (CSR) states that:

> 'a site is not a contaminated site with respect to a substance in the soil, surface water or groundwater if the site does not contain any substance with a concentration greater than or equal to the local background concentration of that substance in the soil, surface water or groundwater respectively.'

Protocol 4 of the CSR further states that:

> 'if the site-specific local background soil quality has not been directly quantified for the site, the regional background soil quality estimates found in Table 1 of Protocol 4 may be used as determinants of background soil quality for the site.'

Blending or applying biosolids from any of the WWTP sources with native soil excavated from the Blackwell property at the maximum recommended blend ratio or application rate is not expected to exacerbate the soil chromium concentration. Chromium concentrations in amended soils will be monitored to ensure levels remain within background concentrations observed in the native soils from the Blackwell property.

There were no concerns with nutrient or trace element concentrations in the native soil samples collected that would preclude applying a biosolids blended soil on the site.

3.5 Physical properties of excavated mineral soil for feedstock

Texture of the native soils to be used as feedstock at the Blackwell property ranges from sand and gravel to fine silt. Materials for use in the fabricated subsoil will be selected based on texture.

4 Characteristics of WWTP Biosolids

This LAP covers the use of municipal biosolids from Metro Vancouver's Lulu Island, Lions Gate and Iona Island WWTPs. The biosolids are generated following treatment of municipal wastewater at three WWTPs located in the Metro Vancouver region. The biosolids are mainly organic in nature and meet the OMRR pathogen and Schedule 4 substance standards.

Routine quality monitoring of Lulu Island and Lions Gate WWTP biosolids is conducted by Metro Vancouver's in-house sampling staff and microbiology and chemistry laboratories. The labs are accredited by the Canadian Association for Laboratory Accreditation Inc. Solids produced by the Iona Island WWTP are monitored by Metro Vancouver's in-house lab as they are discharged from the WWTP to lagoons, however, the biosolids covered by this LAP are from the historic stockpile of biosolids for which there is no weekly routine quality monitoring data. Due to the lack of recent data on the Iona

material from the stockpile, Metro Vancouver has implemented a sampling program for the Iona Island WWTP biosolids that will be delivered to the Blackwell property to confirm that the material meets all OMRR Class B biosolids quality standards prior to use. Recent quality data for each of the WWTP biosolids is presented in Table 5.

4.1 Nutrient content and general soil quality

Table 5 (page 14) lists the nutrient concentration in the biosolids from each of the wastewater treatment plants. The biosolids are primarily a source of nitrogen and phosphorus and other trace elements necessary for plant growth as well as organic matter, which has been shown to improve soil tilth (structure and water holding capacity).

Nitrogen:
The table below contains information about the nitrogen content of the three types of biosolids covered under this LAP.

Table 2. Nitrogen content in Metro Vancouver WWTP biosolids

Biosolids	Total Kjeldahl Nitrogen (TKN) (% dry basis)	Total nitrogen (kg per bulk tonne)	Available nitrogen Ammonium+nitrate (% of total N)	Organic nitrogen (% of total N)
Lulu Island Class B	6.5	15	16%	84%
Lions Gate Class B	4.2	10	17%	83%
Iona Island Class B	1.3	3	7%	93%

The Iona Island biosolids contain less than half of the TKN as the Lulu Island and Lions Gate material, and less available nitrogen, making it a much poorer source of nitrogen.

Phosphorus: Lulu Island and Lions Gate Class B biosolids contain on average 1,780 and 2,640 mg/kg respectively. Iona Island WWTP biosolids contain approximately 738 mg/kg of plant-available phosphorus (dry weight basis). Lulu Island biosolids contain approximately 0.4 kg plant-available phosphorus per bulk tonne, Lions Gate biosolids contain approximately 0.6 kg plant-available phosphorus per bulk tonne, and Iona Island biosolids contain approximately 0.2 kg/bulk tonne.

Potassium: Municipal wastewater biosolids are generally not a significant source of potassium and available potassium levels in biosolids from all 3 WWTPs are low, ranging from 946 to 1,410 mg/kg (dry basis).

pH and conductivity: The pH of the biosolids is generally neutral, ranging from 6.9 for Iona biosolids to 7.8 for Lulu Island biosolids; these levels are suitable for land application. The electrical conductivity (E.C.) of the Lulu Island and Lions Gate biosolids averages 5.7 dS/m, which is a higher than optimum level for plant growth but is acceptable because the biosolids are blended with soil and, as with other organic amendments such as manure, any increase in soil conductivity due to salts in the biosolids will be temporary. Iona Island biosolids electrical conductivity is lower at 1.7 dS/m, likely due to long term stockpiling, and is closer to optimum levels for plant growth than the fresh, dewatered biosolids.

4.2 Trace elements

The concentrations of trace elements in the biosolids are summarized in Table 5 (page 14). The concentration of all OMRR trace elements in biosolids from all 3 WWTPs are well below the OMRR Class limits.

4.3 Pathogen and volatile solids treatment

Class B biosolids from the Lulu Island, Lions Gate and Iona Island WWTPs have been treated to achieve volatile solids reduction of greater than 38% (87% for Lulu Island, 73% for Lions Gate and 66% for Iona Island[4]) and meet the OMRR Schedule 2 Vector Attraction Reduction requirements for surface application as well as the Schedule 1 pathogen limits for Class B biosolids. Pathogen testing of Iona Island WWTP stockpiled biosolids during routine sampling indicates that pathogen levels in Iona Island WWTP biosolids are very low at an average of less than 170 MPN/g. Table 5 contains pathogen monitoring data for biosolids produced at all three WWTPs.

4.4 Physical properties

Lulu Island WWTP biosolids have undergone mesophilic secondary treatment followed by centrifuge dewatering. These biosolids have a solids content of approximately 24%, a sticky consistency and a bulk density of about 1,000 kg/m^3. Lions Gate biosolids are primary mesophilic treated solids that are also centrifuge dewatered. These biosolids are friable in texture, have a lower bulk density (~650 kg/m^3) and a higher solids content once dewatered (approximately 29%) than secondary treatment biosolids. Lulu Island and Lions Gate WWTPs are equipped with fine screens and no debris has been observed in the treated solids.

Iona Island WWTP biosolids are derived from a primary treatment process that employs digestion of the solids, followed by lagoon stabilization and land-drying of the resulting biosolids. Following many years of lagoon stabilization and land-drying in the stockpile, the biosolids from Iona Island WWTP have a soil-like consistency, low odour, solids content of approximately 50% and a bulk density ranging from 850 to 1,300 kg/m^3. The Iona Island WWTP did not historically have fine screens and therefore some debris has been noted in the stockpile. Confirmatory sampling of the Iona material to determine foreign matter content has been conducted by Metro Vancouver and the results indicate that debris content does not exceed the <1% OMRR threshold.

5 Biosolids Stockpiling, Blending and Application Requirements

5.1 Biosolids receiving, storage and blending

The biosolids receiving and stockpiling area is located adjacent to the previous work area on the lower fields (Upper East Field, see Figure 2. Site Map) with blended soils trucked to the upper application areas. Once gravel pit and farm operations allow, the main biosolids receiving and storage facility may

[4] Metro Vancouver Liquid Waste Services Environmental Management and Quality Control. 2019. *The 2018 Greater Vancouver Sewerage & Drainage District Environmental Management and Quality Control Annual Report*. Burnaby, BC: Metro Vancouver (most recent available report)

be moved closer to the proposed application areas. The storage facility will be constructed on level ground with separate areas to track and manage incoming loads of Lulu Island and Lions Gate biosolids. A windrow or stockpiling system is used for receiving and tracking Iona Island biosolids which have a higher solids content than dewatered biosolids and can be piled higher and contained without berms with no risk of movement of material. Soil berms are also used to control runoff water from entering or escaping the stockpile facility and temporary storage sites. Some biosolids may be stockpiled nearer to the proposed application areas in temporary stockpile sites.

The soil blending area is typically located adjacent to the receiving and storage areas. All biosolids are contained separately until they have passed the quality confirmation period. Once the biosolids are confirmed to meet OMRR standards, they are batched with other feedstocks (native soil and/or silt) into preliminary stockpiles and then mixed using a soil shredder, windrow turner or loader. The biosolids are thoroughly blended with native soil such that no biosolids clumps greater than 10 cm in diameter are apparent in the soil after blending. The blended material is then conveyed into stockpiles until the soil is ready to be transferred to the application sites, or is pushed directly into the existing soil placement area. Class B subsoil is placed at varying depths using surveyed markers to create level fields. The blended soils will be routinely monitored for compliance with OMRR Agricultural Land soil standards.

Configuration of receiving and blending areas shall be reviewed and approved by a Qualified Professional prior to commissioning and any changes will be outlined in a year-end compliance summary.

5.2 Biosolids blend ratios and application rates

Class B biosolids: Blend ratios are calculated to ensure that trace elements do not exceed OMRR limits for Agricultural Lands[5] (with the possibility of slightly elevated chromium concentrations due to elevated background levels). For subsoils, since trace element concentrations in the Iona Island WWTP biosolids are different than concentrations in Lulu Island and Lions Gate biosolids, different blend ratios were modelled and recommended for the biosolids from Lulu Island and Lions Gate WWTPs and for the aged biosolids from the Iona Island WWTP historic stockpile. In order to meet OMRR Agricultural Land standards for trace elements in soil, the recommended biosolids content in the subsoil blends are:

Table 3. Blend ratios by WWTP biosolids type

WWTP Biosolids	% biosolids content (dry weight basis)	% biosolids content (bulk volume basis)	Blend ratio biosolids:soil (bulk volume basis)
Lulu Island or Lions Gate	6 - 8%	20 - 25%	1:4 – 1:3
Iona Island	9 - 12%	20 - 25%	1:4 – 1:3

Tables 6a and 6b (page 15) show how the ratios of biosolids to soil (biosolids:soil) impact the predicted soil trace element concentrations. The calculated predicted trace element concentrations in the

[5] Standards based on OMRR Schedule 10.1 soil standards for Agricultural Lands. Site-specific factors of human intake of soil and toxicity to invertebrates and plants apply at all sites; the most restrictive of the site-specific factors of livestock ingesting soil and fodder or major microbial functional impairment have also been applied.

fabricated subsoil are based on recent biosolids quality data and the average mineral soil trace element concentrations. Blend ratios may be adjusted by the Qualified Professionals throughout the year based on results of monitoring events and/or based on updated biosolids quality data obtained from routine quality monitoring.

5.3 Biosolids applications

The Lower East Field was completed and planted to alfalfa (with a cover crop of oats) in fall 2017. Most of the West Field and Upper East Field have been renovated with blended subsoils, capped with topsoil, and planted to silage corn in the late spring of 2020. Peripheral areas of the Upper East Field and the West Field are still planned for completion at a later date, once operations in these areas cease (e.g. the biosolids receiving and blending area and the NutriGrow office and parking area will be completed once they are no longer used for operations).

Areas approved for biosolids application under this LAP (see Figure 2. Site Map) will generally receive a layer of subsoil blended from Iona Island biosolids at approximately 1 m in depth followed by one of two capping layers: a) a 30 cm layer of subsoil blended from a combination of Lulu Island and/or Lions Gate biosolids plus a 30 cm layer of topsoil, or b) a 60 cm layer of topsoil.

A 60 cm cap over subsoil blended from Iona Island biosolids is recommended as a precaution due to the potential for weed seeds and small amount of visible debris present in this material. The decision as to which combination of subsoil and topsoil to use in a particular area will be based on material availability. The Iona subsoil will be capped with either a minimum of 60 cm of topsoil, or a combination of 30 cm of subsoil blended Lulu and/or Lions Gate biosolids plus 30 cm of topsoil.

Gravel extraction activities have taken the ground surface down to hardpan and replacement of soil layers at a depth suitable for the specified crops is required. If the soil is too thin, water could pool below the soil surface, creating anaerobic conditions for roots and poor crop productivity. This depth also provides adequate rooting depth without restriction to their natural growth form, particularly for crops with a tap root, such as alfalfa.

Field and crop management following biosolids soil applications

Once the final soil elevation has been reached and capping with topsoil is compete, the fields are slated for rotational cropping of corn and alfalfa for use as feed on farm. Mature corn can root up to 90 cm deep and alfalfa can develop an even deeper, extensive root system. It is expected that, over time, these crops will root deeply enough to access the nutrients from biosolids that will be present in the subsoil layer. The blend ratios for Lulu Island and Lions Gate biosolids modelled for this LAP will provide nutrient loading in excess of crop uptake in the first growing season, however excess nutrient loading is not expected for Iona Island subsoil blends since the nutrient content in this material is low. Higher than agronomic application rates are used in reclamation programs at mines and other disturbed sites where rates are prescribed on the basis of building soils from deficient native materials and to provide sufficient nutrients over a longer term rather than adding a one or two year supply of nutrients to

existing, healthy soils. Schedule 7 of the OMRR requires a post-application monitoring plan if the proposed application rates exceed the annual crop nutrient requirement. A soil monitoring protocol for biosolids applications has been developed and used at the site since 2015.

Areas of fields where subsoil application is completed and left fallow over a growing season, or large stockpiles that will be stored over a growing season, will be seeded to an annual cover crop to mitigate weed infestation, uptake available nutrients and minimize the potential for dust generation. These cover crops can be harvested and removed as feed (in accordance with the requirements of Section 5.4 of this LAP) or tilled-in as green manure.

Environmental and health considerations for Class B biosolids applications

If the terms and requirements of this LAP are adhered to, there appears to be low risk of environmental or health impacts associated with the proposed use of Class B biosolids at the Blackwell property. Deep layers of fabricated subsoil containing Iona Island biosolids have been used to reclaim sloped, disturbed sites with good success in the past. Potential environmental risks associated with the proposed application of this subsoil at the Blackwell property were identified and reviewed in the preparation of the LAPs and the primary risk factor for movement of biosolids offsite was considered to be improper irrigation practices (breakage of water lines) or sustained, heavy rainfall events where runoff is not properly directed away from fields. Heavy and prolonged water discharge could result in erosion or sloughing of soils over banks and down gullies, which would be a risk with any actively cultivated area in the setting of the fields at Blackwell Farm. The Blackwell property is situated on benched land high above the South Thompson River valley. The landscape is characterized by erosional processes, creating deep gullies where runoff collects and drains from the hillsides to the valley bottom during heavy rainfall. The fields slated for subsoil applications are situated on land in between the gullies and runoff is currently diverted away from the fields to ensure this important agricultural land is not eroded away. Land contouring shall be completed during soil placement to ensure runoff is properly directed away from the fields. The use of proper irrigation practices, berms and final site contouring has been successful to date and is expected to continue to ensure soils and nutrients remain stable and in-place.

Note: fabrication and placement of soil for the purposes of reclamation and levelling fields at the Blackwell property has been reviewed by the Qualified Professionals in the context of the requirements of the OMRR and good agricultural practice. Structural qualities of the subsoil or other considerations are not covered under this LAP.

5.4 Setbacks and restrictions for Class B biosolids

The following OMRR minimum setbacks and restrictions for Class B biosolids are applicable based on the specific site conditions and land use of the application areas.

Food production and grazing: The land is not used to produce crops for human consumption nor is it grazed by cattle. A sixty (60) day waiting period shall be observed between placement of soil containing Class B biosolids and harvesting of crops used as feed for cattle. If the cover crop is turned under as green manure, no waiting period is required.
Setback distances: The following minimum setbacks apply:

- at all sites, 30 metres to potable water sources and irrigation wells, lakes, rivers, streams, farm dwellings and off-property occupied dwellings or boundaries of property zoned for residences or recreation
- at all sites, 20 metres to major arterial roads or highways
- at all sites, 10 metres to minor public roads excluding logging roads
- minimum 30 metres from the slope adjacent to the south edge of the Upper Pivot Field

Signage: At sites that have received Class B biosolids, visible signage must be posted for 38 months which states the following:

- biosolids derived from a wastewater treatment plant have been applied to the site
- the public should avoid ingesting plant material from the site for 18 months if harvested parts are above the surface and for 38 months if harvested parts are below the surface
- domestic cattle grazing must be restricted for at least 60 days, and
- the name and telephone number of a contact person for additional information.

All required setbacks and restrictions appeared to have been adhered to during compliance inspections conducted by the Qualified Professionals; signage will be updated as applications progress.

6 Site Monitoring

Compliance monitoring of the blended subsoil is required because the proposed application is not a typical agronomic application of biosolids for crop fertilization. A detailed Soil Monitoring Protocol has been developed and used since the program began in 2015. In addition, vegetation monitoring in the first year of crop production on fields that have had subsoil applications is also recommended. Vegetation monitoring should consist of sampling and analysis for nutrients and micronutrients and results discussed with the farm manager to ensure that any crops exhibiting elevated levels of nutrients can be mixed with lower nutrient-content crops prior to feeding. Vegetation monitoring will be conducted by the Qualified Professionals. Results of all monitoring activities will be kept on file in accordance with the OMRR Schedule 6 – Record Keeping.

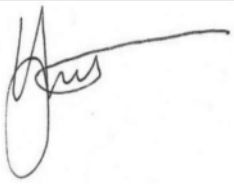
7 Reporting

No formal report submission is required to fulfill this LAP; however, written certification from a Qualified Professional will be completed as part of a compliance report that summarizes findings of the monitoring program and observations during compliance visits by the Qualified Professionals. One of the compliance visits will be conducted following completion of all applications covered by this LAP and a compliance report prepared. The compliance report will outline the findings of the monitoring program and observations during site visits by the Qualified Professionals, as per Section 5 (3) of the OMRR. All required documentation will be kept on file in accordance with OMRR Schedule 6 – Record Keeping.

8 Plan Amendments

If any amendments to this plan occur during the term covered by this LAP, they will be reviewed by the Qualified Professional for compatibility with the original plan and, if approved, summarized in the final compliance report.

Land Application Plan prepared by:



Holly Suggitt, P.Ag.
Consulting Agrologist
Nelson, BC

Land Application Plan reviewed by:

Ruth McDougall, M.Sc., P.Ag.
Consulting Agrologist
Enderby, BC

Table 4. Blackwell background soil nutrient and trace element concentrations

Parameter	Units	SILT [c] feedstock *average*	SOIL[d] feedstock *average*	OMRR Soil Standards Agricultural Land (AL)
General				
pH (1:2 soil:water)	pH units	8.54	8.09	-
Electrical conductivity	dS/m	1.22	0.18	-
Nutrients (dry weight basis)				
Total Kjeldahl Nitrogen (TKN)	%	<0.01	0.09	-
Ammonium+nitrate-N	mg/kg	10.8	24.2	-
Available phosphorus	mg/kg	4	36	-
Available potassium	mg/kg	125	115	-
CSR Strong acid leachable metals (dry weight basis)				
Arsenic	mg/kg	4.47	6.6	20[a]
Cadmium	mg/kg	0.170	0.257	10[a]
Chromium	mg/kg	53.2	37.2	60[a]/150[b]
Cobalt	mg/kg	15.0	12.4	25[a]
Copper	mg/kg	34.6	49	150[a]
Lead	mg/kg	6.26	4.8	120[a]
Mercury	mg/kg	0.066	<0.040	0.6[a]
Molybdenum	mg/kg	0.88	0.59	80[a]
Nickel	mg/kg	49.2	35.4	150[a]
Selenium	mg/kg	0.5	0.3	1.5[a]
Zinc	mg/kg	63.2	64.0	200[a]

[a] Matrix standards are based on OMRR Schedule 10.1 (updated Nov 1/17) soil standards for Agricultural Land. Site-specific factors of human intake of soil and toxicity to invertebrates and plants apply at all sites; the most restrictive of the site-specific factors of livestock ingesting soil and fodder or major microbial functional impairment have also been applied.

[b] The BC CSR reference level for total chromium in background soils of the Thompson/Okanagan region is 150 mg/kg.

[c] Results represent the average of 4 composite samples collected between 2015 and 2018.

[d] Results represent the average of 2 composite samples collected on July 23, 2019.

Table 5. Metro Vancouver WWTP biosolids quality data

Parameter	Units	Lulu Island WWTP[a]	Lions Gate WWTP[a]	Iona Island WWTP[b]	OMRR Class B Biosolids Criteria
General					
Total solids	%	24.2	28.9	50.0	-
Electrical conductivity (EC)	dS/m	5.7	5.7	1.7	-
pH (2:1)	pH units	7.8	7.3	6.9	-
Nutrients (dry weight basis)					
Total Kjeldahl Nitrogen (TKN)	mg/kg	64,500	41,800	13,216	-
Ammonia-N	mg/kg	10,250	7,100	868	-
Available nitrate-N	mg/kg	<30	<30	69	-
Available phosphorus	mg/kg	1,780	2,640	738	-
Available potassium	mg/kg	946	1,410	-	-
CSR Strong acid leachable metals (dry weight basis)					
Arsenic	µg/g	4.76	3.04	6.0	75
Cadmium	µg/g	4.33	2.20	4.3	20
Chromium	µg/g	32.1	30.3	66.9	1,060
Cobalt	µg/g	5.40	2.51	6.3	150
Copper	µg/g	510	646	747	2,200
Lead	µg/g	26.1	71.0	146	500
Mercury	µg/g	1.41	1.93	4.50	15
Molybdenum	µg/g	10.4	7.4	6.6	20
Nickel	µg/g	31.8	20.8	34.2	180
Selenium	µg/g	5.41	5.70	3.3	14
Zinc	µg/g	1,170	1,100	614	1,850
Bacteriology					
Fecal coliform	MPN/g	218,842	49,012	170	<2,000,000

[a] Average results based on routine quality samples collected between January 1 to December 31, 2019.

[b] Average results based on quality monitoring samples collected between September 2015 and June 2020.

Table 6a. Blend ratios and predicted trace elements in subsoils blended with Lulu Island and Lions Gate WWTP biosolids

	Feedstock Quality Data		*biosolids:soil (bulk volume basis)*		Limits
			1 : 3	1 : 4	
Parameter	BIOSOLIDS average[a] concentrations (mg/kg)	SILT/SOIL average[b] concentrations (mg/kg)	Predicted soil concentrations (mg/kg)	Predicted soil concentrations (mg/kg)	OMRR Agricultural Lands[c] (mg/kg)
Arsenic	3.9	5.2	5.1	5.1	20
Cadmium	3.27	0.199	0.38	0.34	10
Chromium	31.2	47.8	47	47	60/150
Cobalt	3.96	14.2	13.5	13.7	25
Copper	578	39	72	64	150
Lead	48.6	5.8	8.3	7.7	120
Mercury	1.67	0.058	0.15	0.13	0.6
Molybdenum	8.9	0.78	1.3	1.1	80
Nickel	26.3	44.6	43.5	43.8	150
Selenium	5.56	0.6	0.9	0.8	1.5
Zinc	1,135	63.5	127	112	200

All parameters are on a 100% dry weight basis. The detection limit is presented and used for results that were non-detect.

[a] Values presented are the average of monitoring results from Lulu Island and Lions Gate WWTPs from January 1 to December 31, 2019.

[b] Values presented are the average of 6 composite samples collected between 2015 and 2019.

[c] Matrix standards are based on OMRR Schedule 10.1 (updated Nov 1/17) soil standards for Agricultural Land. Site-specific factors of human intake of soil and toxicity to invertebrates and plants apply at all sites; the most restrictive of the site-specific factors of livestock ingesting soil and fodder or major microbial functional impairment have also been applied. The BC Contaminated Sites Regulation reference level for total chromium in background soils of the Thompson/Okanagan region is 150 mg/kg.

Table 6b. Blend ratios and predicted trace elements in subsoils blended with Iona Island WWTP biosolids

	Feedstock Quality Data		*biosolids:soil (bulk volume basis)*		Limits
			1 : 3	1 : 4	
Parameter	BIOSOLIDS average[a] concentrations (mg/kg)	SILT/SOIL average[b] concentrations (mg/kg)	Predicted soil concentrations (mg/kg)	Predicted soil concentrations (mg/kg)	OMRR Agricultural Lands[c] (mg/kg)
Arsenic	6.0	5.2	5.3	5.2	20
Cadmium	4.3	0.199	0.6	0.5	10
Chromium	66.9	47.8	49.8	49.4	60/150
Cobalt	6.3	14.2	13.3	13.5	25
Copper	747	39	114	97	150
Lead	146	5.8	21	17	120
Mercury	4.50	0.058	0.53	0.42	0.6
Molybdenum	6.6	0.78	1.4	1.3	80
Nickel	34.2	44.6	43.5	43.7	150
Selenium	3.3	0.6	0.8	0.8	1.5
Zinc	614	63.5	122	108	200

All parameters are on a 100% dry weight basis. The detection limit is presented and used for results that were non-detect.

[a] Values presented are the average of monitoring results collected between September 2015 and June 2020.

[b] Values presented are the average of 6 composite samples collected between 2015 and 2019.

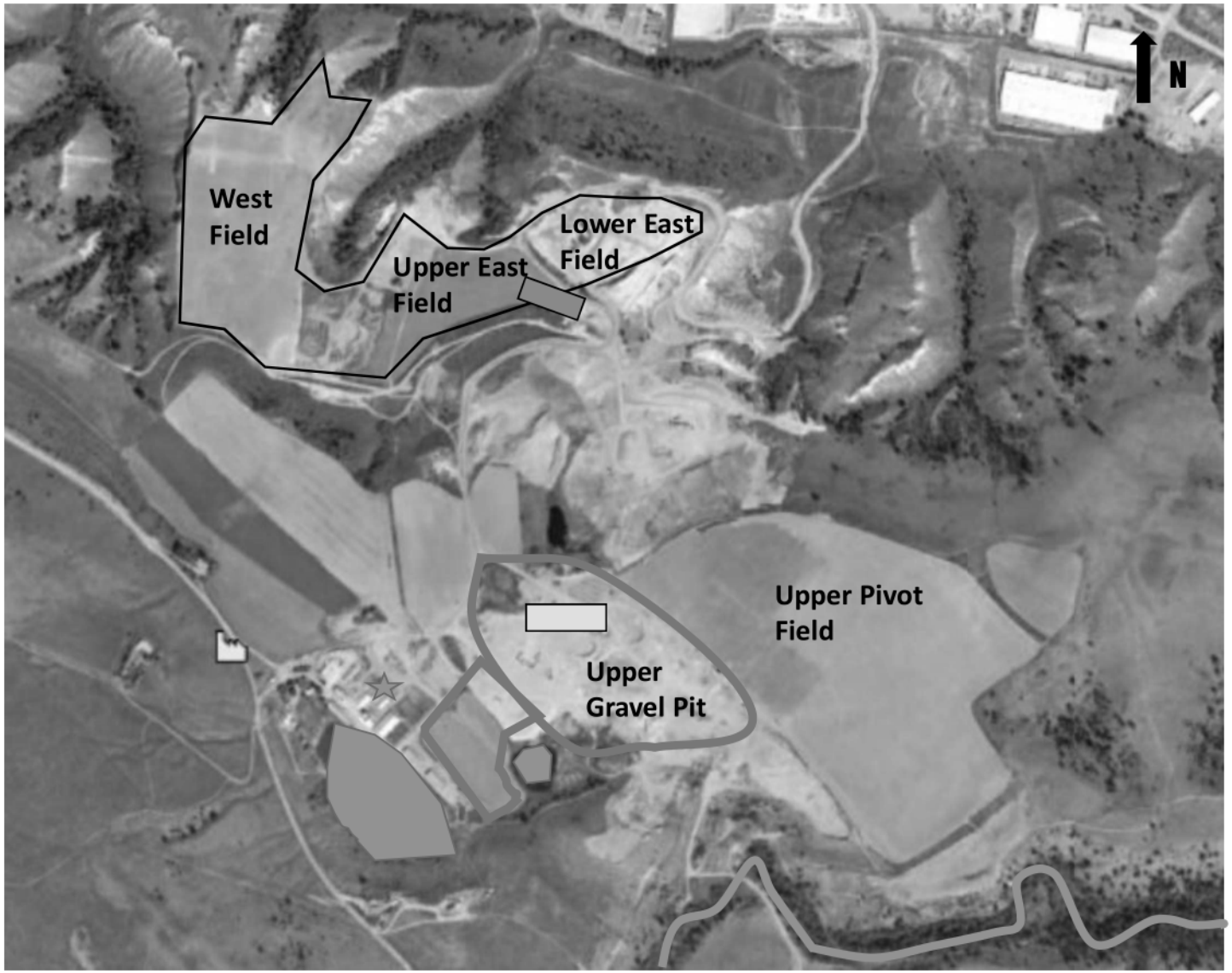
[c] Matrix standards are based on OMRR Schedule 10.1 (updated Nov 1/17) soil standards for Agricultural Land. Site-specific factors of human intake of soil and toxicity to invertebrates and plants apply at all sites; the most restrictive of the site-specific factors of livestock ingesting soil and fodder or major microbial functional impairment have also been applied. The BC Contaminated Sites Regulation reference level for total chromium in background soils of the Thompson/Okanagan region is 150 mg/kg.

Blackwell Farm
2021
Land Application Plan

Legend:	
(line)	Major highways
(line)	Secondary roads

Figure 1: Location Plan

September 2020



Blackwell Farm 2021 Land Application Plan

Legend:	
	Current storage facility
	Proposed storage facility
	Proposed application areas
	Potential water wells
	Surface water features

Figure 2: Site Map

September 2020

APPENDIX 1. Organic Matter Recycling Regulation Schedule 13 Notification

Ministry of Environment and Climate Change Strategy

Notification of Land Application Form

for authorization to discharge waste under the *Environmental Management Act*

Organic Matter Recycling Regulation

FORM REFERENCE CODE: EPD-OMR-04.2

INSTRUCTIONS:

The notification process under this Regulation does not require a preliminary notification or pre-notification meetings with Ministry staff. **This form may be used for submission of a Notification for the land application of compost or managed organic matter under the Organic Matter Recycling Regulation.**

Before completing this registration form, please review the following:

- Organic Matter Recycling Regulation under the *Environmental Management Act* at www.bclaws.ca; and,
- Ministry information and guidance documents that will assist in understanding the registration process and any other documents that may be required at http://www2.gov.bc.ca/gov/content?id=0876E90DA4744A449423D35EB4E09785.

It is preferred that this form is completed using a computer or typewriter. If completing this form by hand, please PRINT clearly.

Mandatory fields are marked with an asterisk (*). Please ensure all required fields are completed or the notification form may not be accepted.

Sending the following completed information to the Ministry of Environment and Climate Change Strategy by email or mail to the address noted below constitutes submitting a notification to a Director under the Regulation.

Under the *Environmental Management Act,* SBC 2003, c. 53 (the "Act"), a person is prohibited from introducing waste into the environment except in compliance with the Act and any applicable regulations. The registrant does not have authorization to discharge under the Regulation until a complete notification form and all required information has been submitted. Managed organic matter must not be land applied until:

- 30 calendar days after the date the person delivers the completed notification to a Director, a Medical Health Officer and the Agricultural Land Commission (if applicable);

OR

- The parties may agree to amend the time limit.

This notification can be submitted to the Ministry by email (preferred), by mail or by courier.

There is no notification fee or annual fee required for this notification under the Organic Matter Recycling Regulation.

Mail or Email	Courier
Environmental Protection Division Business Services PO Box 9377 Stn Prov Govt Victoria, BC V8W 9M6 **Email:** PermitAdministration.VictoriaEPD@gov.bc.ca	Ministry of Environment & Climate Change Strategy Environmental Protection Division Business Services 3rd Floor, 525 Superior Street Victoria, BC V8V 0C5

Section 1: Purpose of Notification

***Application Type** (check one)	☒ New notification ☐ Change in information to an existing notification (provide registration #)	1
***Authorization Number** (if applicable)		2

To change information for an existing notification, a person must submit this completed form prior to implementing any changes to the proposed land application.

Section 2: Registrant Information ("the Registrant")

This must be the name of the company or person submitting notification under the Regulation, NOT an Agent acting on their behalf.

***Registrant Type**	☒ Business ☐ Individual ☐ Government			1
***Company Legal Name** *as registered with the BC Registrar of Companies*	Arrow Transportation Systems Inc.			2
OR * Individual's Full Legal Name				3
Doing Business As *if applicable*				4
Incorporation Number *as registered with the BC Registrar of Companies (if applicable)*	0010862			5
***Contact Numbers** *e.g. (999) 999-9999*	Phone: 1-855-507-7645	Mobile: 778-694-4560		6
***Email Address** *generic company email address*	jmayer@arrow.ca			7
***Legal Address** *as registered with BC Registrar of Companies*	Unit # / Street: 1300-999 West Hastings St			8
	City: Vancouver	Province: BC	Postal Code: V6C 2W2	9

***Mailing Address** *if different from above*	☐ Same as Legal Address			10
	Unit # / Street 400-970 McMaster Way			11
	City Kamloops	Province BC	Postal Code V2C 6K2	12
***Billing Address** *if different from above*	☒ Same as Mailing Address ☐ Same as Legal Address			13
	Unit # / Street			14
	City	Province	Postal Code	11
Billing Email Address *if different than above*	admin.nutrigrow@arrow.ca			12

Section 3: Registrant's Contact for Technical Information

Name of the person the Ministry can contact regarding the technical details for this notification that is NOT the Agent.

Contact's Last Name	Mayer			1
Contact's First Name	Jeff			2
Contact's Title	Regional Manager			3
Mailing Address	☒ Mailing ddress is the same as Section 2 above			4
	Unit # / Street			5
	City	Province	Postal Code	6
Contact Numbers *e.g. (999) 999-9999*	Phone 778-694-4560	Mobile 778-694-4560		7
Email Address	jmayer@arrow.ca			8

Section 4: Authorized Agent ("the Agent")

The Registrant may authorize an Agent to deal with the Ministry directly on future aspects of this registration. This section must be completed in full if an Agent is used. An Agent is a person who is not an employee of the Registrant.

Agent's Company Legal Name *as registered with the BC Registrar of Companies*	Holly Suggitt, P.Ag.			1
Doing Business As *if different than above*				2
Agent's Last Name	Suggitt			3
Agent's First Name	Holly			4
Agent's Title	Consulting Agrologist			5
Mailing Address	Unit # / Street 2954 Six Mile Lakes Road			6
	City Nelson	Province BC	Postal Code V1L 6W3	7
Contact Numbers *e.g. (999) 999-9999*	Phone 604 313-9268	Mobile		8
Email Address	hollyksuggitt@gmail.com			9

In this section:
"Registrant" means the applicant as identified in section 2 of this registration form;
"Agent" means the Agent as identified in section 4 of this registration form.

I/we (the Registrant) hereby authorize the above-named Agent to deal with the Ministry directly on all aspects of this registration. I/we (the Registrant) understand and agree with the terms and conditions in Section 8 of this registration form.

Registrant's Full Name ***NOT the Agent***	Jeff Mayer	10
Date signed	Sept 11, 2020	11
Signature of the Registrant		12

Section 5: Schedule 13 - Land Application Location

FOR INTERNAL USE ONLY: • Use Primary BCENIC of 569990 – Waste treatment – land application of soilds • Waste Discharge Regulation Schedule: 2 "soil enhancement using wastes"			
***Regional District**	Thompson-Nicola Regional Distrct		1
***Land Application Location** *approximate centre of the site* *must be in decimal degree format to 4 decimal places*	Latitude (e.g., 49.8952) N 50.6467	Longitude (e.g., 116.8177) W -120.1192	2
***Source of Data**	☐ GPS ☐ Survey ☒ Google Earth ☐ Other (specify):		3
Either Legal Land Description or PID/PIN/Crown File Number is required.			
Legal Land Description (Lot/Block/Plan)	Lot C, Plan KAP89596, Section 26, Township 19, Range 16 Lot A, Plan KAP89596, Section 26, Township 19, Range 16		4
PID/PIN/Crown File No.	029-046-986, 028-046-650		5
***Facility Address**	*Street / City / Province / Postal Code* *OR if no civic address, describe location (e.g. 3 km north of Sechelt, BC, on Highway 101)* 7000 Blackwell Road, Kamloops BC, V2C 6V7		6

Section 6: Schedule 13 - Legal Land Owner of Land Application Site

***The Legal Land Owner of the land application site is the Registrant.**	☐ Yes ☒ No	1
If the Registrant is not the Legal Land Owner:		
Is this federal or provincial Crown land?	☐ Yes ☒ No	2
Is the Legal Land Owner aware of the proposed application to discharge waste?	☒ Yes ☐ No	3
Has the Legal Land Owner received a copy of this application?	☒ Yes ☐ No	4
Legal Land Owner First and Last Name	Ted Blackwell	5

Legal Land Owner Contact Numbers *e.g. (999) 999-9999*	Phone: 250 573-3649	Mobile:	6
Legal Land Owner Email Address	ejblackwelldairy@telus.net		7

Section 7: Schedule 13 - Regulation Specific Requirements

***Is the application site in the Agricultural Land Reserve (ALR)?**	☒ Yes ☐ No	1
If yes, has the Agricultural Land commission been notified?	☒ Yes ☐ No	2
***Is the application site in a watershed used for a permitted water supply under B.C. Reg 230/92, The Safe Drinking Water Regulation?**	☐ Yes ☒ No	3
If yes, has the Medical Health Officer been notified?	☒ Yes ☐ No	4
***Is the application site agricultural land?**	☒ Yes ☐ No	5
If yes, has the Medical Health Officer been notified?	☒ Yes ☐ No	6
***If ALR or agricultural land, will it be used:**		
to grow edible crops with harvested parts above ground?	☐ Yes ☒ No	7
to grow edible crops with harvested parts below ground?	☐ Yes ☒ No	8
for tree crops?	☐ Yes ☒ No	9
for livestock grazing?	☐ Yes ☒ No	10
for forage crops?	☒ Yes ☐ No	11
***Have there been any previous land applications at this site authorized under a permit?** **If yes, indicate permit number, if applicable/known**	110057	12
***Description of the managed organic matter to be applied**	Land disturbed by gravel extraction will be reclaimed back to agricultural land by amending salvaged native soils with Class B biosolids from Metro Vancouver's Lulu Island, Lions Gate and Iona Island wastewater treatment plants.	13

***Intended date(s) for land application for that year**	2021-01-01 to 2021-12-31 (yyyy-mm-dd)	14
***Application rates**	Iona max 1,195 dt/hectare	15
	Lulu/Lions Gate max 645 dt/hectare	16
	dt/hectare	17

***Cumulative additions for that year of substances listed in Schedule 4 of the Organic Matter Recycling Regulation** — 18

Substance	Concentration (µg/g dry weight)
Arsenic	0.08
Cadmium	0.183
Chromium	0.99
Cobalt	0.61
Copper	32.1
Lead	2.5
Mercury	0.1
Molybdenum	0.48
Nickel	0.8
Selenium	0.3
Zinc	63.8

***Are pre-approved, site-specific numeric soil standards applicable?**	☐ Yes (please attach) ☒ No	19
***Is a map or site plan attached identifying the bounds of the application site?**	☒ Yes, attached ☐ No	20
***Has a land application plan been prepared by a qualified professional?**	☒ Yes ☐ No	21

Section 8: Declaration and Signature

Please carefully read the following before placing your signature.

By completing this Notification, the Registrant understands and agrees with the following terms and conditions:

1. In this section:

   "Registrant" means the registrant as identified in section 2 of this registration form;

   "Director" means any statutory decision maker under EMA;

   "EMA" means the *Environmental Management Act*, S.B.C. 2003, c. 53, as amended or replaced from time to time;

   "FOIPPA" means the *Freedom of Information and Protection of Privacy Act*, R.S.B.C. 1996, c. 165, as amended or replaced from time to time;

   "Province" means Her Majesty the Queen in Right of British Columbia;

   "Regulatory Document" means:

   a) this registration form,
   b) any document that the Registrant submits or causes to be submitted to the Province or the Director in support of this registration, and
   c) any document that the Registrant submits or causes to be submitted to the Director or the Province pursuant to
      i. any regulation made under EMA that regulates the facility described above or the discharge of waste from that facility; or
      ii. any order issued under EMA directed against the Applicant that is related to the facility described above or the discharge of waste from that facility.

2. In consideration of the Province receiving this registration form, subject to paragraph 3, the Registrant hereby irrevocably authorizes the Province to publish on the B.C. government website the entirety of any Regulatory Document.

3. Despite paragraph 2, if the Registrant clearly identifies on the face of a Regulatory Document that the Regulatory Document, or clearly identified portions of it, are confidential and provides in writing with the document a rationale for why the document or portion thereof could not be disclosed under FOIPPA, the Registrant does not consent to the Province publishing the document or any portion of it if, in the opinion of the Director, the document or portion could not be disclosed under FOIPPA, if it were subject to a request under section 5 of FOIPPA.

4. In consideration of the Province receiving this application, the Registrant agrees that it will indemnify and save harmless the Province and the Province's employees and agents from any claim for infringement of copyright or other intellectual property rights that the Province or any of the Province's employees or agents may sustain, incur, suffer or be put to at any time that arise from the publication of a Regulatory Document.

5. The Registrant certifies that the information provided in this registration form is true, complete and accurate, and acknowledges that the submission of insufficient information may result in this registration being returned causing delays in the registration review process.

*Name of Registrant or Agent (print)	*Signature of Registrant or Agent	*Date
Jeff Mayer		Sept 11, 2020

APPENDIX 2. Landowner Letter of Authorization

NutriGrow

400 - 970 MCMASTER WAY, KAMLOOPS BC CANADA V2C 6K2
TELEPHONE: (604) 798-7610
TOLL FREE: 1-855-507-SOIL (7645)

Date: Sept 3, 2019

Mr. Jeff Mayer,
Regional Manager
Arrow Transportation Systems Inc.
400 – 970 McMaster Way
Kamloops, BC V2C 6K2

Dear Mr. Mayer,

I have been requested to provide a letter of authorization for Arrow Transportation Systems Inc. (Arrow) to receive and manage Metro Vancouver Class A and B biosolids at the Blackwell property in Kamloops, BC. I confirm that I, Ted Blackwell, represent the legal land owners of the lands described as Blackwell Farms and it is my understanding that Arrow plans to receive and manage both Class A and B biosolids on this land.

This letter is provided to fulfill the requirements for landowner authorization, as per the *BC Organic Matter Recycling Regulation*. I can be reached at (250) 573-3649 with any questions.

Sincerely,

X

Mr. Ted Blackwell
Owner, Blackwell Farm

APPENDIX 3. Soil Monitoring Protocol

Soil Monitoring and Compliance Inspection Protocol - Blackwell 2021 Biosolids Land Application Plan

1. *Soil quality standard*: Class B biosolids are used to fabricate subsoils for use in reclaiming disturbed lands and for improving marginal cropland at the Blackwell property near Kamloops, BC. Class A biosolids are used to fabricate BGM, which is covered under a separate regulatory process than the Land Application Plan for use of Class B biosolids. The property is currently used for residential, agricultural and industrial purposes, including cultivated fields interspersed with landfill and aggregate extraction areas. Since the final land use for the proposed application areas will be agricultural, the Agricultural Land soil standards for substances regulated by the *Organic Matter Recycling Regulation* (OMRR) will apply. Other soil quality parameters that are not regulated under the OMRR, such as physical properties and nutrient status, are also periodically assessed in the fabricated soil to ensure an appropriate growing medium is produced.

2. *Fabricated soil feedstocks:* Subsoil is produced by blending Class B biosolids with excavated native mineral soils. These soils generally have a silty or sandy texture and are deficient in nutrients and organic matter. Native soils were sampled to determine soil quality parameters including the 11 trace metals regulated by OMRR. The sandy soil met all limits for Agricultural Lands under OMRR; however, the silty soil exhibited naturally elevated chromium levels, with some results slightly higher than the OMRR soil standard for Agricultural Land.

3. *Blend ratios:* The soil shall be mixed at a ratio containing no more than the maximum content dictated by the LAP, periodically adjusted by the Qualified Professionals when required, to ensure final soil metals concentrations comply with OMRR Agricultural Land soil standards. Due to naturally slightly elevated concentrations of chromium in the native silt, the final blended soil may have a chromium content that exceeds the 60 mg/kg OMRR standard for Agricultural Land soil. However, the Ministry of Environment has established a background chromium level in soils of the Thompson/Okanagan region of 150 ppm, and the blended soil shall not exceed this regional background concentration.

4. *Soil sampling frequency:* Fabricated soil compliance monitoring will be conducted once per 1,000 dry tonnes of biosolids that have been blended, or twice per year, whichever is more frequent. Each monitoring event will consist of collecting at least one (1) composite sample from the blended subsoil. The frequency may be adjusted by the Qualified Professionals based on soil sampling results obtained during compliance monitoring events.

   These sampling programs are aligned with, or exceed, the frequency and number of samples required under the OMRR for an equivalent volume of Biosolids Growing Medium (BGM).

5. *Sampling personnel*: All sampling will be done by Ruth McDougall or Holly Suggitt, the Qualified Professionals overseeing the project, or by another qualified person under their direct supervision. However, at least 50% of all compliance samples will be collected by one of the Qualified Professionals.

6. *Sampling protocol*: Compliance monitoring events will be coordinated with the Arrow site supervisor. Each compliance sample will consist of 10 to 20 sub-samples of soil collected randomly from the stockpiled or windrowed material. Samples will be collected from at least 30 cm inside the pile, and the sampling sites will vary in height along the side of the pile or windrow. Sub-samples will be of approximately the same volume. Once collected, all sub-samples will be placed in a clean 20 to 30 litre tote or similar container, and will be mixed thoroughly by trowel to ensure that small clumps of biosolids can be identified and broken up during mixing. All biosolids clumps larger than 4 mm will be crushed with a trowel or similarly effective

instrument and thoroughly blended into the sample. All stones and debris will be removed.

Sample volume for lab: Once material is thoroughly mixed and all biosolids clumps larger than 4 mm in diameter have been broken up and well mixed into the rest of the sample, a sub-sample of 250 ml (approximately 1 cup of material) will be removed and placed in a labelled bag for lab analysis. (Samples submitted to Pacific Soil Analysis Inc. must have at least 500 ml – 2 cups of material). The lab will be requested to dry and grind the entire submitted sample to avoid erroneous sample results due to the lab extracting a non-representative sample from the submitted material. An additional sample of approximately 250 ml (or 1 cup of material) shall be taken from the thoroughly blended composite sample and placed in a labelled bag for storage until laboratory results are confirmed. Samples will be placed on ice in a cooler and couriered to a laboratory certified by the Canadian Association for Laboratory Accreditation for analysis of 'CSR strong acid leachable metals' and other soil quality parameters, where required.

7. *Quality Assurance/Quality Control*: Sampling events and sample management will be conducted in accordance with the *Guidelines for Sampling Biosolids, Compost, Soil and Vegetation under the BC Organic Matter Recycling Regulation* (van Ham & McDougall, 2002) and the *British Columbia Field Sampling Manual* (BC Ministry of Environment, 2013). Quality Control samples will consist of collection and submission of 10% duplicates. All samples will be submitted to a laboratory certified by the Canadian Association for Laboratory Accreditation, in accordance with the *BC Environmental Data Quality Assurance Regulation*. Some samples are submitted to Pacific Soil Analysis Inc. (PSAI) for analysis of general soil quality parameters. Although PSAI is not a CALA accredited lab, it is considered an industry-standard lab within BC and results are often used for comparison with results from the CALA lab.

8. *Non-compliant soil*: With the exception of chromium[1], subsoil found to exceed OMRR Agricultural Land standards for any of the 11 monitored trace metals will result in isolation and re-mixing of the corresponding batch of soil. In the case of anomalous laboratory data, the lab will be requested to perform a recheck. The duplicate sample collected and kept in storage can also be shipped for analysis to confirm results. If laboratory data remains consistent, the material can be re-sampled to confirm the original results. If material is re-sampled, collection and preparation of samples will follow item 6 above. Alternatively, the material can be re-blended with additional feedstock material as required and then re-sampled and analyzed to confirm compliance. Blend ratios and recommended additional feedstock(s) for re-mixing will be calculated based on sample data. In any event, non-compliant soil will be re-sampled and analyzed after re-mixing to confirm compliance.

[1] The *BC Contaminated Sites Regulation Protocol 4 - Determining Background Soil Quality* recognizes that areas of BC have naturally-occurring elevated trace element concentrations. For the Thompson/Okanagan region, the reference level for total chromium in background soils is 150 mg/kg.

ORGANICS & DIVERSION MANAGEMENT
COMPOST FACILITY OPERATIONAL PLAN
SEPTEMBER 2020

Prepared by:
Net Zero Waste Inc.
4283 Perry Street
Vancouver, BC V5N 3X6

Prepared For:
Brenda Renewables Ltd.
#304- 20338 65th Avenue, Langley, BC, V2Y 2X3

Brenda RENEWABLES
ORGANIC WASTE CONVERSION

CONFIDENTIAL

September 13th, 2020

NET ZERO WASTE

September 14th, 2020

Ministry of Environment Environmental Management Branch
P.O Box 9377 Stn. Prov Govt, 3rd Floor 2975 Jutland Road
Victoria BC, V8 W 9M1

To Whom It May Concern:

Re: Notification Process for Composting Facility at Brenda Mines, Peachland BC

Please accept this letter as notification of the intent to construct and operate a composting facility to be registered under the name of Western Organics Management Ltd. and operated by Brenda Renewables.

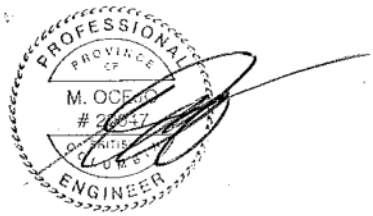
The site will be located at Brenda Mines, approximately 20 Kilometers west of Peachland BC. Suitable organics will be composted with the product being used at the site for land reclamation purposes.

Existing utilities at the site will be integrated to provide the necessary power requirements. Leachate management and odor control will be managed through in a covered structure, utilizing an aerated static pile method, leachate recycling, storage and rehydration.

All feedstocks will be received inside of the sealed building which will ensure that it does not come in contact with atmospheric moisture. Amendment will be added to ensure adequate porosity and feedstocks will then be flipped to different bays within the processing building. This will allow the materials to be uniformly mixed throughout the process ensuring that the time temperature requirements of OMRR are met.

The following document will outline the leachate and odour control systems which will ensure full capture of contact water with building air vented to a biofilter. The site has significant buffers from any potential downstream impacts and the Class "A" compost that is produced will be an ideal fit for the reclamation of the mine site.

Very truly yours,



Mateo Ocejo, P.Eng; Director

Net Zero Waste Inc.

LDRWMA: Organic Management Facility Operational Plan: Table of Contents

LIST OF APPENDICES

LIST OF FIGURES

1. PROJECT INTRODUCTION

Please find enclosed the Operational and Closure Plan for the above-mentioned project. This plan describes the design of the compost operation as it relates to the Brenda Renewables (BA) facility and goes over various operational scenarios. It is the intent of this plan to provide the reader with an understanding of the proper operation for the facility. Facility operations are directly linked to odour and leachate controls and as a result, a basic understanding of composting has been provided. As this process control system has no moving parts, it is up to the operator to construct a healthy pile. The structure, feedstock mixtures, moisture content and C:N ratio are critical for an optimized operation so how to ensure this is also discussed in detail. Significant leachate control and recycling systems have been installed as a part of the facility which should function as a negative water balance.

This Operational Plan also discusses the "Wet" Biosolids / Food Waste which will be pre-processed and undergo "High Rate" Composting as pre-treatment for providing suitable growing media to be applied on site as part of the mines remediation plan. This project will provide accelerated moisture removal and an excellent class A compost to be used on site. We are recommending a quick change Trommel Drum so that compost used on site can be screened to 2" minus for higher throughput and should any material be used off site it can be screened to the standard ¾" or smaller fractions. There will be a longer curing period after the organics have been processed inside of the aerated bunkers. Utilization of the large site footprint will be completed to allow for storage of these materials after they have undergone PFRP and VAR time temperature requirements. This will provide additional curing and allow for semi-annual screening which can be completed during dry conditions when materials are not likely to stick together or bind in the screen.

Our design has made allowances for the duplication of the bio-filter fans as well as for an oversized leachate storage tank with a capacity of 9,000 gallons which will be used for feedstock seeding at the start of the composting process. A similar design and air-floor has been successfully installed in multiple other composting facilities around the country and across North America.

The Brenda Mines Facility design incorporates the use of large interior mass beds which also have inground leachate collection and in floor aeration. This mass bed design provides the optimum use for the building footprint giving materials the maximum possible time under cover before they are removed for long term curing. There is one interior tipping / filling bay where incoming materials are dumped and blended. The primary processing building is under negative pressure and is completely sealed from the environment both for the containment of all leachate generated during the composting process and the discharge of air from the building which passes through a biofilter.

The ventilators will be mounted on the exterior concrete walls away from the potential impact of loader traffic.

2. GENERAL INFORMATION

A. **Registration Name:** Brenda Renewables Ltd.

B. **Contact Phone Number and Email Address:** Matthew Malkin, matthew@malkingroup.ca, (778)384-3825

C. **Company Legal Address:** #304- 20338 65th Avenue, Langley, BC, V2Y 2X3

D. **Company Mailing Address:** #304- 20338 65th Avenue, Langley, BC, V2Y 2X3

E. **Design Capacity:** Up to 10,000 TPA of Biosolids / Food Waste mixed with up to 10,000 TPA of Wood and Green Waste or other suitable amendment.

F. **Plan Prepared by:** Mateo Ocejo; P.Eng (Director) July 19, 2020

3. GENERAL DESCRIPTION

The project site is located at Brenda Mines Road, approximately 20 kilometers West of Peachland BC. This Composting Facility is being developed so as to utilize available space and land reclamation activities at a mine which is no longer in service. Glencore Brenda Mines is the owner of the site. This site will not generally be open to the public and will only accept compostable waste for processing in accordance with Part 5 of the Agricultural Waste Control Regulation, B.C. Reg. 131/92. Historically the site was operated as a copper-molybdenum mine which is no longer active. The owner (Glencore) is currently undertaking reclamation activities, primarily in the form of storm water management and treatment. All composting operations and storage of finished compost to be completed under cover and the site design will be incorporated into the catchment of the existing site stormwater management system.

Site improvements such as road improvements and grading will be undertaken prior to the start of compost operations. It is expected that the above-mentioned organics will be processed under cover for a period of 4-8 weeks before being cured and applied to selected on site areas in the fall after optimum screening can be completed during dry weather. Site access and egress will be via Brenda Mine Road. The site has access allowances and suitable turning areas for accepting large walking floor trailers which means the traffic impact of processing these materials will be minimal.

The processing area is located on the south of the closed mine pit so as to maximize the natural site buffers and distance to the closest neighbor (please reference the areas reclaimed map of the site shown in the appendix for special siting of the compost facility in relation to the other areas of the mine. The West, North and East sides of the processing area also have raised land formations which will aid in minimizing wind borne odours.

The area designated for operations is located to the south of the closed mine pit which allows the owner/operator to take advantage of the existing utilities, structures and formations to minimize impact on any adjacent properties. A copy of the site plan indicating traffic patterns, as well as an elevation map are included with this document.

The facility is intended to produce approximately 5,000 tonnes per year of finished product for use on site. Scales will be installed at the facility in order to record and control all receiving material. The processing area is located on the West side of the site so as to maximize the natural site buffers and distance to the closest neighbor. The West side of the property also has a large hill which aids in minimizing wind borne odours. No leachate will be discharged to the environment as the composting operation is a negative water balance and the leachate collected will be reintroduced to the front end of processing as

a bacterial inoculant. Should there be any surplus leachate generated at the Composting Facility, then these materials will be disposed of at a licensed liquid waste treatment facility. There are currently no plans to sell compost from the site to the public. The future and long term goal will be to produce a quality Class "A" compost to be shared with the agricultural community as a low cost, stabilized soil amendment once facility operations and feedstocks have been normalized.

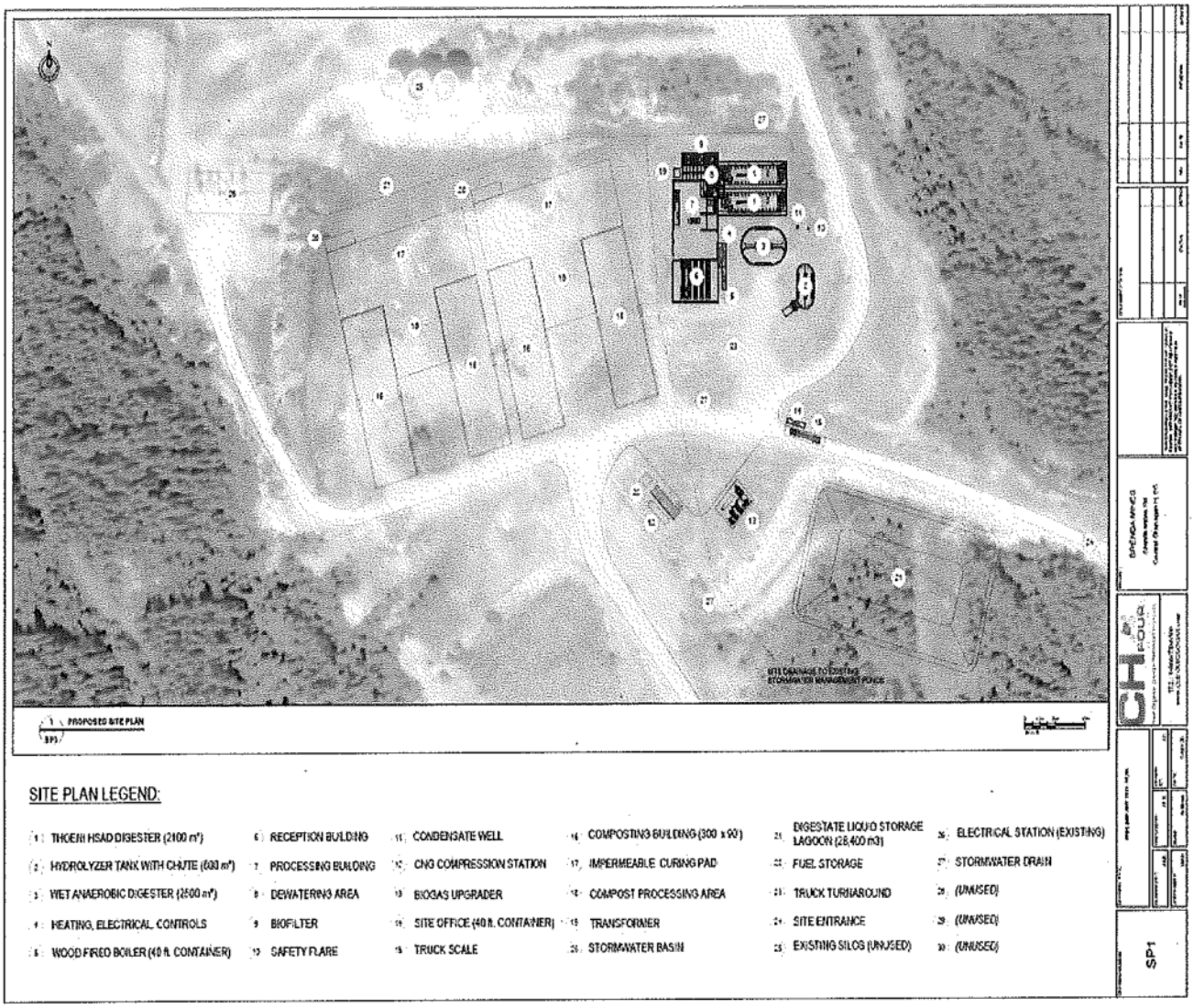
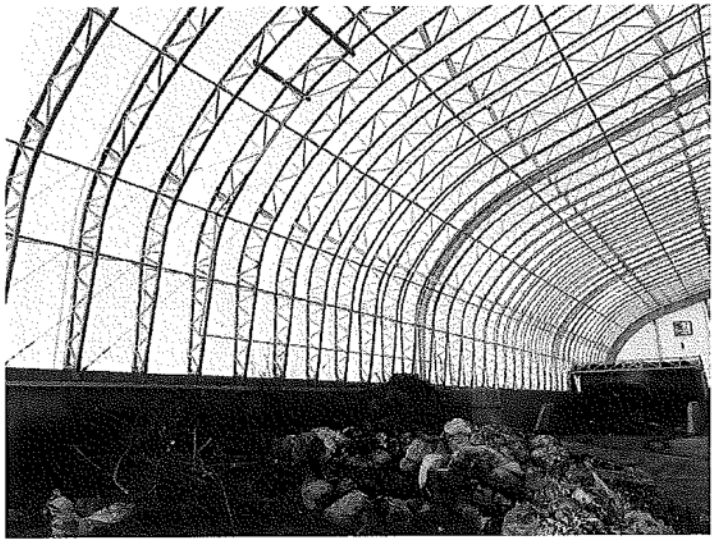


FIGURE 3-1: SITE PLAN AND LOCATION OF PRIMARY COMPOSTING BUILDING (300' x 90')

4. LEACHATE MANAGEMENT

The primary processing building will act as the mechanical and electrical control center of the facility and will be where incoming waste is deposited, mixed and pre-processed with moisture addition before being placed on positive aeration so as to ensure aerobic conditions and controlled leachate management.

A large loader will be on-site full time to assist with material handling and mixing for the facility. As the process is a negative water balance, we do not intend there to be any need to discharge or dispose of leachate off site as part of the normal process of the operation. In the event that excess leachate is generated by the operation, it will be trucked off site for treatment and disposal at a local waste water treatment facility. Despite this fact, all processing and mixing of materials will be done on an impermeable surface with poured concrete walls to ensure full containment of all materials in process.



The interior of the building will allow the operation to be completed under controlled conditions with lighting and separation from atmospheric moisture. This design allows us to process organics with considerable leachate control and no discharge of any kind to the environment. Our team brings experience with this type of in building positive aeration operation. The feedstocks are predominantly carbon based and dry compost blending agent will be stored inside of the tipping area to be used to help to ensure the optimal moisture content. Leachate will be directed through surface grading inside of the building to a leachate collection sump. As leachate management can often be the cause of numerous problems at composting facilities, our operation will take extra-ordinary precautions to ensure that leachate generation is both minimized, and separated from atmospheric storm water at this facility. We intend to utilize recycled storm water when possible or domestic on-site treated water as make-up water to supplement the leachate system and minimize the need for domestic water.

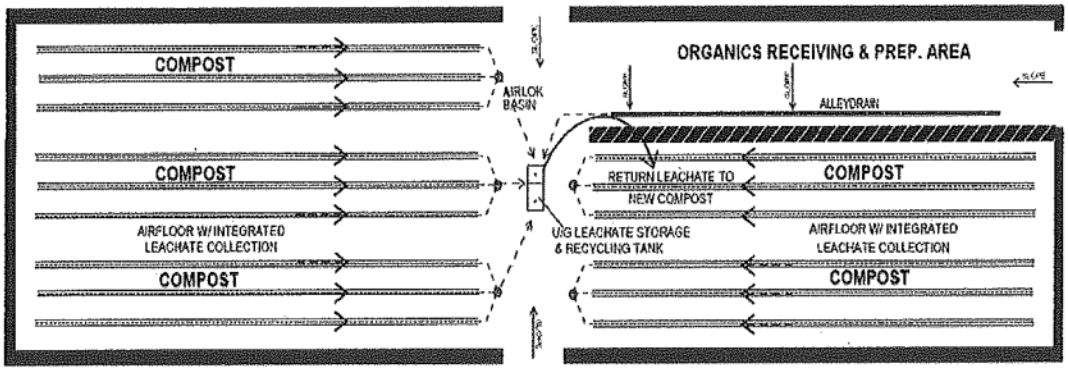
The leachate that is collected from the curbing and surface drainage within the building as well as what is captured below grade will all flow to a series of sumps, and ultimately to a large 9,000 gallon storage tank. It will be stored in the tank where it will be held until re-introduction to new incoming feedstocks. Recycled leachate will only be added into the composting material at the start of the process and prior to the start of the compliance period for any time and temperature requirements for pathogen reduction.

A water line will also be provided to the processing building for the cleaning of equipment and for weekly housekeeping which will supplement and support the refilling of the leachate system for optimum processing.

Our site development plan is one which uses improvements to site grading to direct runoff from clean non-compost related areas away from our processing operations. Any solids that are collected in the stormwater drainage system will be periodically removed and added as feedstocks to the front end of the composting process. In order to ensure that the proposed leachate management system is operating as intended to service the facility, a monitoring program will be implemented with annual sampling. This regular sampling and testing of storm water can have the sampling frequency increased as deemed necessary.

Weekly records will also be kept regarding the amount of leachate added to each batch during the initial feedstock preparation and if any leachate requires disposal off site. The leachate storage tanks are relatively small as the feedstocks used for this processing operation are dry with an average moisture content of 40%. The small size of any leachate sump removes any issues related to confined spaces as they would only be cleaned out by sucker truck and too small for a person to physically enter. Leachate storage is expected to be minimal lasting on average less than one week per cycle.

The above leachate management plan has been approved by our qualified professional engineer. It is our intent to ensure that this composting operation located on Brenda Mine Road will not cause any significant or long lasting impacts to our neighbors. As demonstrated at our other facility, our operation will meet all applicable municipal, regional district, provincial and federal regulatory requirements and will cooperate and work with the various stakeholders to ensure no negative downstream impacts due to our operation.



LEACHATE COLLECTION PLAN

ALL SURFACE LEACHATES FLOW VIA AIRFLOOR® PLENUMS INTO CENTRAL STORAGE TANK FOR APPLICATION TO FRESH COMPOST PILES

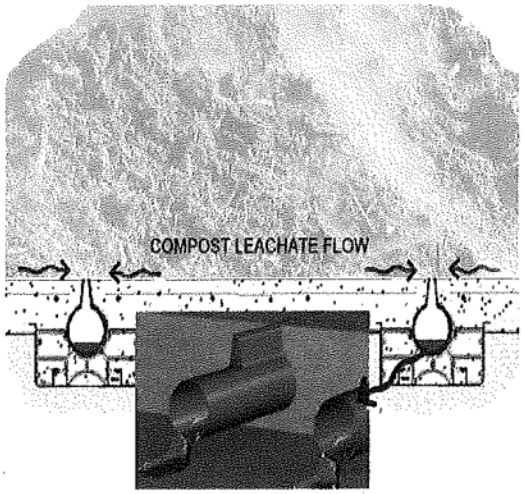
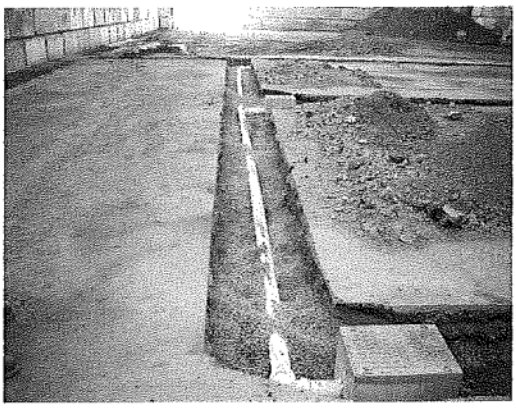


FIGURE 4-1: SITE PLAN AND LAYOUT INSIDE OF PRIMARY COMPOSTING BUILDING (300' x 90')



Mixing of feedstocks and the preparation of the biosolids or foodwaste blend will occur mechanically by loader bucket first on the tip floor and later as materials are handled throughout the process. There are expected to be no less than 5 mixes through the composting process prior to screening which ensures that incoming feedstocks are mixed adequately and that there are no variations in the final compost quality.

All incoming carbon bulking agent will be pre-ground to facilitate mixing which will occur at approximately 4:1 by volume. "Overs" which come off the screening plant periodically over the year will also be reintroduced as added

bulking agent during the winter months when dry carbon can be difficult to source. As the process is a negative water balance, there is not typically any need to discharge or dispose of leachate off site. Leachate is actually supplemented with wash down water which is done weekly by firehose as a part of building cleaning.

The amount of wash water that can be applied is determined by first inspecting the tank level to see how much leachate is contained before adding to the total. Even with this wash down water, it is expected that the more than 34,000 Liters of storage will seldom be seen at capacity. Leachate can be drained while each new tipping floor bay is constructed of approximately 400 - 500 tonnes. This leachate provides both the necessary hydration to often dry incoming materials, as well as bacterial inoculants so as to kick start the composting process. The leachate tank will be aerated and vented to the biofilter to ensure that there are no gases which could build up and collect in the processing building.

The tipping building floor provides a sealed catchment area where blended feedstocks can then be moved into a row (still inside of the tipping building) so as to immediately commence with High Rate Composting. Once the pile is constructed, a remote controlled RioTemp temperature probe will be used to ensure that time temperature requirements are being met. Leachate not collected below the pile is directed through surface grading inside of the building to a leachate collection sump where it is pumped into the leachate storage tanks (see below typical design detail).

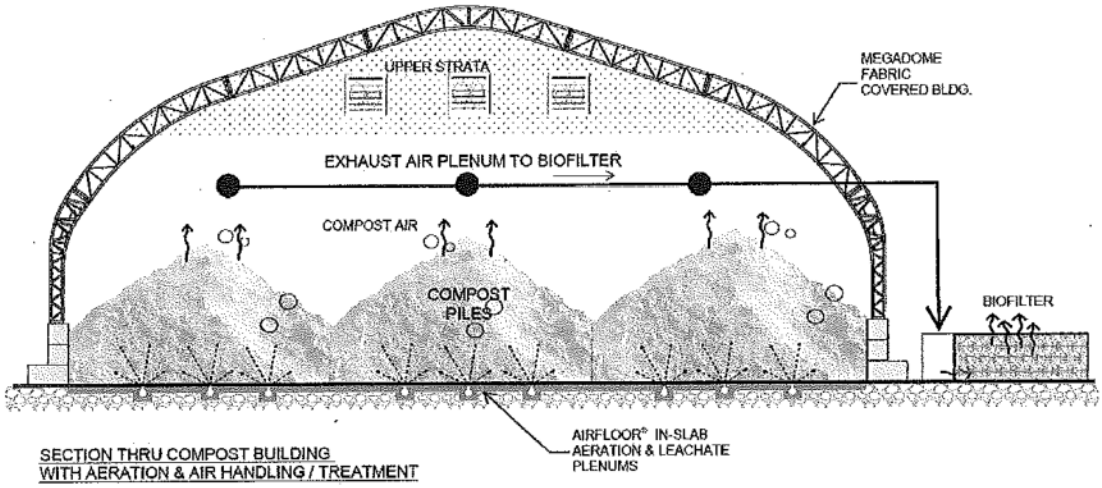


FIGURE 4-2: CROSS SECTION OF PRIMARY BUILDING AND HVAC / ODOUR CONTROL TO BIOFILTER

All compost processing is conducted on impermeable surfaces of either asphalt or concrete which prevents any leachate from entering the natural environment. Below the mass beds contained within the process building are numerous leachate collection channels that double as aeration trenches. These channels collect leachate which flow below the slab (see photo previous page) to a central location within the building so as to minimize potential impacts from freezing. It will then have a re-hydration line which will allow the leachate to be reapplied back to the incoming compost feedstocks. Recycled leachate is only added into the composting material at the start of the process and prior to the start of the compliance period for any time and temperature requirements for pathogen reduction.

The leachate (also known as compost tea) is aerated within the concrete tank through the use of a coarse bubble diffuser. The exhaust air from the tank is piped directly to the facility bio-filter ducting to ensure no odour impacts at the facility. Aeration channels are cleaned out periodically as part of our standard operating procedure and to remove any solids which may have accumulated in the aeration system. These maintenance tasks utilize a small amount of domestic water which supplements the leachate system. Process water is also used for the cleaning of equipment and weekly housekeeping so as to ensure a clean and odour free facility.

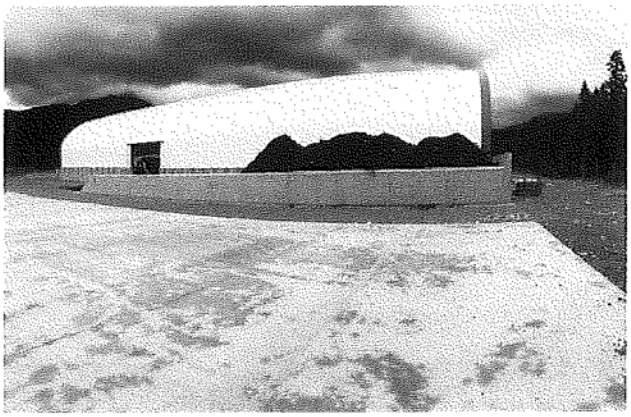
All heaps go through a period of densification and drainage which is usually greatest during the first few days following placement in a pile. We expect the incoming materials to be able to hold a slump, but that once they are constructed to the design height of approximately 4m they will free drain excess leachate.

Excessively wet loads drain leachate during this initial period and usually the pile slumps and compresses preventing optimal aeration. While this is not expected to be a typical occurrence, the construction of a tipping bay will allow the materials to drain and homogenize before high rate composting starts on the aerated bays. Additional amendment can be added if necessary, however usually flipping the pile after a few days of drainage solves an excessive moisture problem.

The site will utilize Glencor's existing Storm Water Management infrastructure for storm water treatment so as to uptake any possible dust or compost which gets picked up from operations.

In order to ensure that our leachate management system is operating as intended to service the facility, a monitoring program has been implemented starting at the time of construction. This includes regular sampling (annually) of the process leachate and of the discharge end of the storm water management infrastructure already in place. Sampling frequency will be increased as deemed necessary by the results obtained. Sampling will be conducted annually of both the leachate system, and any storm water discharge into the existing management system so as to ensure compliance with regulations.

5. ODOUR MANAGEMENT



Odour control is an essential element for all compost operations. A well-run composting operation should be able to function without causing any significant or long-lasting impacts to facility neighbors. The Brenda Mines facility will meet all applicable municipal, regional district, provincial and federal regulatory requirements. This design has demonstrated at multiple locations throughout Canada (combined with the use of operational best practices) to ensure an excellent odour compliance track record.

HVAC ducting will travel the length of the building interior and will vent the facility to a large bio-filter that will run parallel to the building and provide a standard 2 air exchanges per hour. There will be duplicate 20 Horsepower biofilter fans so if there are conditions which result in excessive moisture inside the building which could result in operational impacts, the second fan can be activated.

Bio-filters have a long history of successful odour control, which combined with the natural buffers of the site and its remote location and the small quantity of material to be processed annually we do not anticipate any odour issues from this facility.

While it is not our desire to cause our neighbors any impacts due to our composting operations, we recognize that this may not always be possible. Should there be an operational issue that results an odour incident then we hope to learn from our mistakes and better rectify the problem through the use of the following procedure:

1. Odour complaints will be dealt with by our staff in a polite and courteous manner. A phone number will be provided on signage at our entrance welcoming questions or concerns.
2. The odour complaint will be recorded on the BRI odour incident report form
3. Our staff will note the operating conditions at the plant
4. Our staff will visit the site of the odour impact, e.g. the complainant's home, to

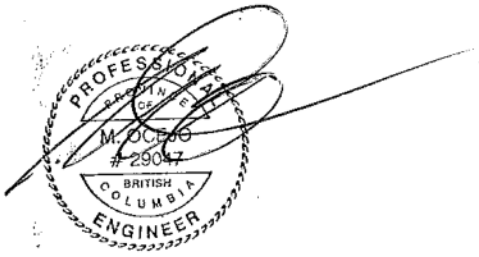
determine the nature of the odour (using the odour wheel as a guide in discussions with the complainant)

5 Staff will determine what the problem is and what actions can be taken to mitigate the odour situation

6 The appropriate actions will be taken

7. After sufficient time for the mitigating actions to have occurred, the situation at the site of the odour impact will be monitored and reported to the odour complainant.

8 If necessary, further actions will be taken until the odour problem is solved



6. ROLES AND RESPONSIBILITIES

The following outlines the roles assigned to individuals and groups tasked with health and safety responsibilities at the Brenda Renewables Inc. site:

Director: Matthew Malkin - Overall responsibility for ensuring compliance with Odour Management Plan

Project Engineer: Claire Allen - Assistance in preparation of field reports and updating site specific training manuals for all field related activities.

Lead Operator: Paul Eck - Implementation of site-specific Odour Management plan all field related activities performed by employees and contractors

All staff who operate the facility will have been trained with a CCC certified operator training course and have passed the National Canadian Compost Council Exam. Should any complaints be received, our team has an odour complaint procedure that will be followed and an odour incident report that will be completed as per Appendix D .

Any complaints will be documented, and the affected party will be provided support by our staff in a polite and courteous manner to identify and remove the odour source. A phone number has been provided on the signage at our entrance welcoming questions or concerns. Staff will take daily note of operating conditions should unusual odour or leachate conditions be presented. As the entire facility is located under cover, environmental controls are optimized and with a small annual capacity of agricultural waste processed negative impacts are not expected.

All site workers will be trained in particular with regards to Personal Protective Equipment (PPE), equipment operation and maintenance, hygiene and safety concerns as specifically related to composting operations. Additional training documentation is provided in the attached appendices.

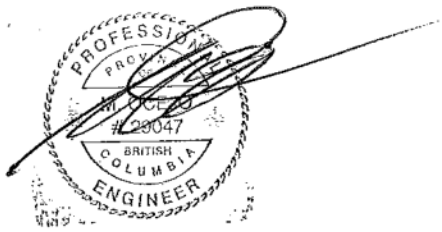
All incoming material will be allowed entry to the site via a video monitored secured gate. Appropriate signage will be installed to direct the driver(s) to the composting facility. Trucks will be weighed when entering and exiting the site in order to control the amount of material entering the site. Trucks will unload in the unloading area which will be impermeable with runoff control.

Once the compost has undergone appropriate time temperature conditions (55 °C for three consecutive days and at least 14 days at 45°C) it will be moved to the curing area prior to be used for reclamation purposes. All appropriate testing will be completed prior to use.

7. CLOSURE PLAN

Should the facility experience an event which would result in an unplanned closure, the composting area will be remediated to the satisfaction of the property owner (Glencore). Structures and piping are such that they could be disassembled for sale or reuse at another facility.

A 90-day notice will be provided to all organic's suppliers prior to cessation of composting operations. Once the 90-day window has closed, the composting building will operate for another three days to ensure that desired composting levels have been achieved. Remaining compost will cure until it can be land applied.



APPENDIX A: Microorganisms: A Pile Cross Section

APPENDIX B: Factors Affecting Composting

APPENDIX C: Facility Safety and Workplace Risks Associated with Feedstocks

APPENDIX D: Brenda Mines - Odour Incident Report

OK Ranch – Grasslands and Hayfields Fertilization

Land Application Plan
Updated: March 2021

Prepared for:

OK Ranch
Owner: Lawrence Joiner
5930 Big Bar Road
Clinton, BC, Canada
V0K 1K0

Prepared by:

SYLVIS Environmental
427 Seventh Street
New Westminster, BC
Canada, V3M 3L2
Phone: 604.777.9788
Fax: 604.777.9791
www.SYLVIS.com

SYLVIS DOCUMENT #1354-20

SYLVIS

DECLARATION

SYLVIS has prepared a Land Application Plan (LAP) for the purpose of biosolids fertilization of grasslands and hayfields at the OK Ranch. This LAP is limited to the specific site, development, and design objectives for fertilization activities at the OK Ranch utilizing biosolids meeting the quality requirements of the British Columbia (BC) *Organic Matter Recycling Regulation* (OMRR). The OK Ranch is located on Big Bar Road, northwest of Clinton, British Columbia.

This LAP sets forth all the assumptions and limiting conditions imposed by the terms of our engagement affecting the analysis, opinions, and conclusions contained in the LAP. The entire LAP, including all conclusions and opinions, pertains only to the above-referenced property and is based on our present knowledge and information with respect to the current data for the property, as of the date of signature below. The findings in this LAP may be subject to change as a result of the passage of time.

This LAP provides information required by the OMRR for biosolids fertilization activities at the OK Ranch, and replaces previous LAPs authored for this site. Activities prescribed in this LAP comply with requirements of the British Columbia Code of Practice for Agricultural Environmental Management, however this LAP is not intended to be a substitute for a complete nutrient management plan for your agricultural operation. If there are any questions or comments regarding this LAP, please contact me by phone at the number indicated on the cover page or by email (rdionne@sylvis.com).

This report is valid only if it bears the original signature and seal of the author.

I, René-Carl Dionne, confirm by signature and seal below that the information contained in this LAP is true to the best of my knowledge.

Professional Seal

Signature _____

Date March 12, 2021

LIST OF ABBREVIATIONS

List of general abbreviations used in this document:

AEM Code – Code of Practice for Agricultural Environmental Management
ALR – Agricultural Land Reserve
ALC – Agricultural Land Commission
BC – British Columbia
ENV – Ministry of Environment & Climate Change Strategy
FN – First Nation
LAP – Land Application Plan
N – Nitrogen
OMRR – Organic Matter Recycling Regulation
PID – Parcel Identifier
TKN – Total Kjeldahl Nitrogen
VAR – Vector Attraction Reduction
WWTP – Wastewater Treatment Plant

List of unit abbreviations used in this document:

˚C – degrees Celsius
dt – dry tonne
dw – dry weight
ds/m – deciSiemens per metre
g – gram
ha – hectare
hr – hour
kg – kilogram
km – kilometre
m – metre
mg – milligrams
mm – millimetre
MPN – most probable number
µg/g – microgram per gram

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APPENDIX ONE – TABLES

APPENDIX TWO – FIGURES

1 THIS DOCUMENT AND THE ORGANIC MATTER RECYCLING REGULATION

This document is a Land Application Plan (LAP) prepared in accordance with the British Columbia (BC) *Organic Matter Recycling Regulation* (OMRR). This LAP provides background information and rationale for grasslands restoration and hayfields fertilization using biosolids from multiple wastewater treatment plants (WWTPs) at the OK Ranch. Biosolids used at OK Ranch meet OMRR requirements and will be used for fertilization activities outlined in this document.

The following information is provided as requested by the OMRR Schedule 7:

Discharger	
Local Contact	Lawrence Joiner, President of OK Ranch, a division of s.79 s.79
Local Address	PO Box 17 Clinton, BC, Canada, V0K 1K0
Telephone Number	250.459.2311
Qualified Professional	
Plan Producer	Rene-Carl Dionne, P.Ag.
Address	427 Seventh Street New Westminster, BC, Canada, V3M 3L2
Telephone Number	604.777.9788

2 NOTIFICATIONS

As per the OMRR, the following parties were notified of the proposed land application at the OK Ranch, through the standardised notification form available on the Ministry of Environment & Climate Change Strategy (ENV) website.

Party	Notification Method	Date Notified
Ministry of Environment (ENV)	Email: PermitAdministration.VictoriaEPD@gov.bc.ca	January 6, 2021
Medical Health Officer - Interior Health	Email: HBE@interiorhealth.ca	January 6, 2021
Agricultural Land Commission (ALC)	Email: OMRR.ALCNotifications@gov.bc.ca	January 6, 2021

The land parcels prescribed for biosolids land applications in this LAP are agricultural land and hold the designation of Agricultural Land Reserve (ALR) within the BC Land Reserve Commission designation system. As per the OMRR, the Agricultural Land Commission (ALC) and the Medical

Health Officer having jurisdiction over this region were notified of this land application at least 30 days prior to the proposed start date of biosolids fertilization.

As per the OMRR, the ENV director was notified 30 days prior to the proposed start date of biosolids fertilization. This LAP will be amended from time to time and provided to the discharger, as required. Biosolids fertilizations activities are occurring over multiple years with re-application requirements assessed over time.

The following parties were also notified of this biosolids project involving fertilization and transport, as a best management practice:

Party	Contact Person	Notification Method	Date Notified
Thompson-Nicola Regional District	Sally Watson, Director Area E	Email: director.swatson@tnrd.ca	March 12, 2021
Stswecem'c Xgat'tem First Nation	Ellen Torng	Email: stewardship@sxfn.ca	March 12, 2021
High Bar First Nation	Judah Vickers	Email: nrsassistant@hbfn.ca	March 12, 2021

3 SITE CHARACTERISTICS

The OK Ranch is located on private land and has restricted public access. The OK Ranch parcels included for biosolids fertilization under this LAP include irrigated hayfields and grasslands.

The following information is provided as requested by the OMRR Schedule 7:

Site Characteristics	
Registered Owner of the Land	Lawrence Joiner, President OK Ranch, a division of s.79 One parcel is leased from Carol Banman
Land Application Site Address	5930 Big Bar Road Clinton, BC Canada, V0K 1K0
Land Application Site Coordinates	Latitude 51.3053 N Longitude 121.9853 W
Registered Owner Land Authorization	Lawrence Joiner and Carol Banman were notified of this LAP and provided written authorization (Appendix 4)

3.1 Location and Access

The OK Ranch comprises over five thousand hectares of land and is located approximately 35 kilometers (km) northwest of Clinton, BC in the Thompson Nicola Regional District (Figure 1, Appendix Two).

Parcel Identifiers (PID) at the OK Ranch owned by s.79 for biosolids fertilization are:

Upper Grasslands (Eastern and Western Grasslands)

- 006-896-014
- 006-895-913
- 006-895-492
- 006-896-022
- 006-896-081
- 006-895-506
- 006-895-522
- 006-895-531
- 001-534-165
- 001-534-114
- 001-534-084
- 001-532-774
- 006-895-859
- 006-895-948
- 006-895-921
- 006-895-557
- 001-534-157
- 001-534-122
- 001-532-740
- 006-895-999
- 006-895-930
- 006-895-441
- 006-895-573
- 006-895-590
- 006-895-981
- 002-741-172
- 006-895-875
- 006-895-867
- 006-895-956
- 006-895-743
- 006-895-760
- 006-895-701
- 006-895-654
- 006-895-638
- 006-895-727
- 006-896-057
- 006-896-073
- 006-896-065
- 006-895-786
- 006-895-794
- 006-895-671
- 006-895-689
- 006-895-964
- 006-895-972
- 006-895-476
- 006-895-891
- 006-895-395
- 006-896-006
- 006-895-905
- 006-895-611
- 006-895-484
- 006-896-049
- 029-378-761
- 001-532-715
- 013-310-089
- 013-310-054

Lower Grasslands (Lower Crows Bar)

- 001-531-140
- 001-532-685
- 001-531-115
- 001-531-107
- 001-531-123
- 001-531-191
- 001-523-961
- 001-523-953
- 001-523-937
- 001-523-945
- 001-528-602
- 001-523-988
- 001-528-611
- 001-528-645
- 006-895-409

Hayfields

- 006-895-379
- 006-895-387
- 006-895-417
- 006-895-433
- 006-895-450
- 006-895-468
- 006-896-031
- 011-608-897

Parcel Identifiers (PID) at the OK Ranch owned by Carol Banman for biosolids fertilization are:

Hayfields

- 029-378-753

Biosolids fertilization will occur on suitable areas of land within these parcels, which will be identified and assessed prior to biosolids applications by the SYLVIS qualified professional and landowner. A location map of the OK Ranch is depicted in Figure 1 of Appendix Two. Site maps of the eastern grasslands, western grasslands, lower crows bar grasslands and hayfields are presented in Figure 2, Figure 3, Figure 4, and Figure 5, respectively.

3.2 Soils and Soil Sampling

Pre-application soil sampling was completed at OK Ranch to characterize the areas where biosolids fertilization activities will occur. As per the OMRR all sites proposed for fertilization were assessed for fertilization rate and trace element concentration determination. A portion of the OK Ranch has received biosolids fertilization historically – these areas were samples post-fertilization.

Soil sampling and soil quality information is provided below.

Soil Information	
Soil Sampling Dates	• August 21, 2015 • April 27-28, 2016 • June 13-14 and July 28, 2017 • June 20 and July 26, 2018 • May 15, June 11 and July 9, 2019 • June 16, 2020
Number of Samples Collected	35 composite samples, each consisting of eight equal volume sub-samples.
Sampling Depth	0 - 0.15 m
Soil Quality	Compliant with OMRR Schedule 10.1, as presented in Table 2 and Table 3, Appendix One.
Average Soil pH	6.6 for grasslands 7.7 for hayfields
Average Soil Electrical Conductivity	0.39 for grasslands 0.95 for hayfields
Site-Specific Factors Considered	• Intake of contaminated soil • Toxicity to soil invertebrates and plants • Livestock ingesting soil and fodder (cattle)

3.3 Hydrology

A hydrogeological assessment has not been prepared for the OK Ranch during the preparation of this LAP. Surface water and groundwater setbacks are presented in Section 7.1.

The OK Ranch is located within the Fraser Plateau groundwater sub-region. There is one known aquifer located near the OK Ranch. A small portion of the site (mainly located to the north of the

ranch house) sits over the Fraser Plateau Lava Bedrock Aquifer. This aquifer extends from 100 Mile House to 70 Mile House and is classified as lightly developed and moderately vulnerable with an Aquifer Ranking Value of 11 out of 21 (BC Ministry of Environment, 2019).

There is little available data on depths to aquifers or wells in the immediate area. Of the reported wells in the area, the majority are in unconsolidated deposits, which typically yield less than 1 litre/second and are for farm animal and domestic use (Foweraker, 1994). The closest domestic water well is located at the Big Bar Guest Ranch approximately 60 m from the OK Ranch property boundary and 150m from possible fertilization areas. Drilling data indicates a water depth of 13 m (BC Ministry of Environment, 2018). Spring water points of diversion are also located throughout the OK Ranch and the surrounding area.

The dominant water feature associated with the OK Ranch is the Fraser River, which flows adjacent to the western boundary of the property. The OK Ranch is located in the Big Bar Creek Watershed; Big Bar Creek flows near the ranch house and continues southwest of the property down to the Fraser River. Also, Deadman Creek flows down the Lower Crows Bar area to the Fraser River, in a well-defined ravine.

There are several small lakes and runoff collection ponds scattered throughout the OK Ranch property. Some of these water bodies are utilized as water sources for cattle during the spring and fall periods. The land application area is not within a community watershed, source protection area or permitted water supply watershed as defined under the Drinking Water Protection Regulation, B.C. Reg. 200/2003.

4 BIOSOLIDS CHARACTERISTICS

Biosolids used in this fertilization project will originate from Metro Vancouver, the City of Abbotsford, the City of Chilliwack, Tsawwassen First Nation, the Village of Ashcroft, the Village of Cache Creek, the Town of Agassiz, and the Village of Harrison Hot Springs WWTP. Sampling and analysis of biosolids for the purposes of confirming OMRR compliance and application rate calculation is completed annually. The most recent set of complete annual data is presented in Table 1 and Table 2, Appendix One.

Biosolids quality will be monitored during the biosolids land application period at the OK Ranch to ensure ongoing compliance with the OMRR.

The following information is provided as requested by the OMRR Schedule 7:

Facility	Metro Vancouver – Annacis Island	Metro Vancouver – Lulu Island	Metro Vancouver – Lions Gate	City of Abbotsford	City of Chilliwack
Legal Name of Facility Producing Biosolids	Annacis Island Wastewater Treatment Plant	Lulu Island Wastewater Treatment Plant	Lions Gate Wastewater Treatment Plant	Joint Abbotsford Mission Environmental Systems (JAMES) Wastewater Treatment Plant	Chilliwack Wastewater Treatment Plant
Facility Address	1299 Derwent Way Delta, BC, V3M 5V9	13500 Gilbert Road Richmond, BC, V7E 2H8	101 Bridge Road North Vancouver, BC, V7P 3R2	5959 Gladwin Road Abbotsford, BC V4X 1V9	44820 Wolfe Road Chilliwack, BC V2P 8A8
Facility Primary Contact	Graeme Hystad	Graeme Hystad	Graeme Hystad	Joe Vurzinger	Ben Loewen
Primary Contact Number	604.451.6261	604.451.6261	604.451.6261	604.864.5617	604.792.7251
Primary Contact Email	Graeme.Hystad@metrovancouver.org	Graeme.Hystad@metrovancouver.org	Graeme.Hystad@metrovancouver.org	jvurzinger@abbotsford.ca	bloewen@chilliwack.com
Annual Production (Dry Tonnes)	12,900	2,000	730	1,216	680
Sets of Samples Required Per Year	13	2	1	2	1
Pathogen Reduction Process	Heat treatment method at 50°C or higher for more than 30 minutes	Fecal coliform reduced to levels < 2,000,000 MPN/g	Fecal coliform reduced to levels < 2,000,000 MPN/g	Fecal coliform reduced to levels < 2,000,000 MPN/g	Fecal coliform reduced to levels < 2,000,000 MPN/g
Vector Attraction Reduction Process	Digestion process resulting in the mass of volatile solids being reduced by more than 38%	Digestion process resulting in the mass of volatile solids being reduced by more than 38%	Digestion process resulting in the mass of volatile solids being reduced by more than 38%	Digestion process resulting in the mass of volatile solids being reduced by more than 38%	Digestion process resulting in the mass of volatile solids being reduced by more than 38%
Biosolids Class (A or B)	Class A	Class B	Class B	Class B	Class B

Facility	Tsawwassen First Nation	Village of Ashcroft	Village of Cache Creek	Town of Agassiz	Village of Harrison Hot Springs
Legal Name of Facility Producing Biosolids	Tsawwassen First Nations Sewage Treatment Plant	Ashcroft Sewage Treatment Plant	Cache Creek Sewage Treatment Plant	Kent Wastewater Treatment Plant	Harrison Hot Springs Wastewater Treatment Plant
Facility Address	4515 Salish Sea Drive Tsawwassen, BC V4M 4G5	1604 Highland Valley Rd Ashcroft, BC V0K 1A0	Sage and Sands Drive Cache Creek, BC V0K 1A0	1088 Tranmer Road Agassiz, BC V0M 1A2	495 Hot Springs Road Harrison Hot Springs, BC V0M 1K0
Facility Primary Contact	Michael Murphy	Brian Bennewith	Martin Dalsin	Steven Nuttall	Tyler Simmonds
Primary Contact Number	604.952.6004	250.453.9161	250.457.6237	604.997.6838	604.798.5974
Primary Contact Email	mmurphy@tsawwassenfirstnation.com	Brian@ashcroftbc.ca	cao@cachecreek.info	snuttall@kentbc.ca	tsimmonds@harrisonhotsprings.ca
Annual Production (Dry Tonnes)	10	25	200	60	18
Sets of Samples Required Per Year	1	1	1	1	1
Pathogen Reduction Process	Fecal coliform reduced to levels < 2,000,000 MPN/g	Fecal coliform reduced to levels < 2,000,000 MPN/g	Fecal coliform reduced to levels < 2,000,000 MPN/g	Fecal coliform reduced to levels < 2,000,000 MPN/g	Fecal coliform reduced to levels < 2,000,000 MPN/g
Vector Attraction Reduction Process	SOUR less than 1.5 mg of oxygen per hour per gram of total solids	Digestion process resulting in the mass of volatile solids being reduced by more than 38%	Digestion process resulting in the mass of volatile solids being reduced by more than 38%	SOUR less than 1.5 mg of oxygen per hour per gram of total solids	SOUR less than 1.5 mg of oxygen per hour per gram of total solids
Biosolids Class (A or B)	Class B	Class B	Class B	Class B	Class B

4.1 Alternative Biosolids Sources

Areas that will be identified for fertilization activities at the OK Ranch are limited by biosolids availability, and as such several biosolids sources are identified in this LAP. Alternative biosolids sources will be used as a substitute and/or supplement, providing that:

1. the biosolids conform to the quality requirements of the OMRR;
2. the application rates and cumulative trace element additions are within the appropriate regulatory limits; and,
3. a qualified professional authorizes the alternative biosolids source for use in this project ensuring conformity with statements 1 and 2 above.

If there is a change in the biosolids to be used in this fertilization project, the Qualified Professional will update this LAP for the new source of biosolids and provide the updated LAP to the landowner.

5 BIOSOLIDS TEMPORARY STORAGE

Biosolids delivered to the OK Ranch will be stored in accordance with the following requirements for storage sites, as defined by the OMRR:

Storage Information	
Type of Temporary Storage	Storage site
Local Precipitation (October to March inclusive)[(a)]	196 mm
Runoff and Leachate Management	Uncovered stockpiles directly within fertilization areas, which will not allow the escape of biosolids
Storage Buffers	30 m from any watercourse and any source of water used for domestic purposes
Storage Time	9 months maximum

(a) 1981 to 2010 data average obtained from the 100 Mile House weather station at a similar elevation 70 km to the north east of the site (Environment Canada, 2019).

6 BIOSOLIDS FERTILIZATION

This LAP was authored to enable biosolids applications to the land parcels identified in Section 3.1 of this document. Biosolids fertilization will increase the long-term productivity of the grasslands and hayfields by providing nutrients, improving soil fertility and enhancing soil structure.

6.1 Biosolids Application Areas

Biosolids fertilization will occur over the hayfields and grasslands portions of the OK Ranch. The large OK Ranch grasslands have a cumulative area of over 5,000 hectares (ha). For ease of reference, the grasslands have been separated into three areas: Eastern Grasslands, Western

Grasslands and Lower Crows Bar Grasslands, as shown in Figure 2 to Figure 4. Biosolids will be applied to a portion of this extensive area over the term of this LAP.

Biosolids fertilization will also occur within on irrigated hayfields shown in Figure 5, for a total area of approximately 230 ha.

6.2 Land Application Dates

Biosolids applications are anticipated to occur when the weather is favourable throughout the year. Biosolids applications will cease under conditions of inclement weather (e.g., intense rainfall or snowfall events) or at the discretion of the project manager.

6.3 Application Rate

For the purposes of research on vegetation and soil response to biosolids fertilization, biosolids application rates may exceed agronomic rates or be reduced in selected fertilization areas. Post fertilization soil trace element concentrations will not exceed the applicable soil standards specified in Schedule 10.1 of the OMRR for Agricultural Land.

Maximum Application Rate	
Grasslands	
Agronomic Land Application Rate	15 dt/ha
Research Land Application Rate	30 dt/ha
Hayfields	
Agronomic Land Application Rate	18 dt/ha
Research Land Application Rate	36 dt/ha

The maximum application rate presented in this LAP is a maximum for research and trials purposes, applicable to biosolids produced at WWTPs identified in Section 4.

6.3.1 Crop nutrient requirements calculation

The exact fertilization rate provided to the land application operator will be calculated by a Qualified Professional based on the agronomic nutrient uptake of the vegetation, the nutrient concentrations and bulk densities of the soils, and the quantity of nutrients supplied by each of the biosolids source. The agronomic rate will be calculated using crop requirements presented below and will be equal or less than the maximum rate presented in the table above.

This agronomic application rate is based on the following calculation:

- $agronomic\ rate = \frac{NR_{site} - NC_{site}}{PAN_{biosolids}}$
- Where:

- NR_{site} = nutrient requirement of the site including crop nutrient uptake, other vegetation nutrient uptake, and soil immobilization;
- NC_{site} = nutrient credits resulting from use of biosolids, manures, or chemical fertilizers in the current or previous years; and
- $PAN_{biosolids}$ = potentially available nitrogen in biosolids: (NH_4 and NO_3 nitrogen) + (nitrogen mineralized from the organic nitrogen fraction of the biosolids) – (volatilization losses) – (denitrification losses).

Predicted post-application soil trace element concentrations are presented in Table 3 and Table 4, Appendix One. Post-application soil trace element concentrations will not exceed the applicable soil standards specified in Schedule 10.1 of the OMRR for agricultural land with the site-specific factors presented in Section 3.2. Predictions assume that biosolids will naturally incorporate into the soil surface to a depth of 15 cm over time, and that a portion of the solid matter will become part of the soil (accounting for a 50% loss of the organic matter).

Grasslands

The agronomic rate of application will supply approximately 640 kilograms of nitrogen (kg N) per ha, of which 31% (or 200 kg N/ha) is expected to be available to the vegetation in the first growing season.

Hayfields

The agronomic rate of application will supply approximately 615 kilograms of nitrogen (kg N) per ha, of which 41% (or 253 kg N/ha) is expected to be available to the vegetation in the first growing season.

7 SITE-SPECIFIC MANAGEMENT METHODS

All biosolids delivered and land applied to the OK Ranch will be managed as per Schedule 8, Article 1 of the OMRR.

7.1 Setbacks

In accordance with Schedule 8 of the OMRR, the following buffers (setbacks) will be adhered to for Class B biosolids during stockpiling and land application:

- A 30 m buffer will be maintained surrounding all lakes, rivers, streams, and water wells;
- A 30 m buffer will be maintained surrounding water sources, irrigation wells, dwellings, and properties zoned for residences or recreation;
- A 20 m buffer will be maintained from major arterial roads;
- A 10 m buffer will be maintained from minor public roads;
- Biosolids will not occur in areas where groundwater occurs within 1 m of the soil surface at the time of application; and,
- Biosolids will not occur in well-defined erosion paths within the landscape where water only flows seasonally.

The same buffers will be adhered to for the land application of Class A biosolids, as a best management practice. Buffers to known water features are identified in Figure 2 to Figure 5, Appendix Two. Additional buffers will be put in place for water features identified on site, as required.

7.2 Application Requirements

Biosolids are considered a nutrient source under the BC *Code of Practice for Agricultural Environmental Management* (AEM Code). Setbacks prescribed in this LAP are more restrictive than those prescribed in the AEM Code. In addition to OMRR setbacks, and in accordance with Section 49(1) of the AEM Code, applications will not occur to land:

- on which there is standing water or water-saturated soil;
- on ground in which the top 5 cm of soil is frozen so as to be impenetrable to manually-operated equipment;
- on a field having at least 5 cm of ice or snow over at least 50% of its area; or
- at a rate of application, under meteorological, topographical or soil conditions, or in a manner that may cause nutrient sources or contaminated runoff, leachate or solids to enter a watercourse, cross a property boundary or go below the seasonal high water table.

7.3 Signage

Biosolids application signs will be posted at the OK Ranch prior to fertilization activities, specifically at the entrance points to the fertilization areas. All signs will remain in place for at least 38 months after biosolids have been applied. The signs will include all requirements of Schedule 8 of the OMRR.

7.4 Post-application Monitoring

Soil and vegetation monitoring will occur on research areas that receive an application rate of biosolids greater than the calculated agronomic rate. In these research areas, soil and vegetation quality will be monitored annually for a minimum of two years. Research results allow SYLVIS to optimize fertilization activities to meet specific grassland restoration objectives.

8 REPORTING AND RECORD-KEEPING

The most current version of this LAP, the associated sampling data and the OMRR notification form will be kept by the discharger and the registered owners of the land for at least 36 months following applications, as required by Schedule 6 of the OMRR. As per the AEM Code, the OK Ranch must make and keep a record of all of the following in respect of each field to which biosolids were applied:

- the crop yields of the field;
- the date and location of each application of nutrients;
- the rate at which nutrients were actually applied;

Throughout biosolids applications, a qualified professional or designate from SYLVIS will assist and supervise to ensure that biosolids are applied in accordance with the LAP. Written certification from the Qualified Professional in the form of a post-application certification letter will be provided to the discharger annually as per Part 3, Article 5 (3) of the OMRR.

9 REFERENCES

BC Ministry of Environment. 2019. BC Water Resources Atlas. Available at https://catalogue.data.gov.bc.ca/dataset?download_audience=Public

Environment Canada. 2019. Canadian Climate Normals - Environment Canada. Available at http://climate.weather.gc.ca/climate_normals/.

Foweraker, J.C. 1994. Fraser Plateau. *In* Groundwater Resources of British Columbia. Government of British Columbia.

Government of British Columbia. 2002. *Environmental Management Act and Public Health Act*: Organic Matter Recycling Regulation. B.C. Reg. 18/2002, Last amended February 28, 2019 by B.C. Reg. 7/2019. Victoria.

Government of British Columbia. 2018. *Environmental Management Act*: Code of Practice for Agricultural Environmental Management. Ministerial Order No. M039, November 26, 2018. Victoria.

APPENDIX ONE – TABLES

Table 1: Trace element and physicochemical quality for biosolids produced at Metro Vancouver, the City of Abbotsford and City of Chilliwack WWTPs.

Constituent	Annacis Island Biosolids	Lulu Island Biosolids	Lions Gate Biosolids	City of Abbotsford Biosolids	City of Chilliwack Biosolids	Class A Biosolids Limits[a]	Class B Biosolids Limits[b]	Units (dw)
Number of samples collected	11 to 61	2 to 60	1 to 59	11	1	-	-	-
Samples collection year	2020	2020	2020	2020	2020	-	-	-
Conventional Parameters								
Total Nitrogen – TKN	54,155	66,518	42,182	67,900	47,900	-	-	µg/g
Ammonium plus Ammonia – N	9,767	10,945	7,061	6,470	7,160	-	-	µg/g
Nitrate – N	12.8	13.2	13.2	5	10	-	-	µg/g
Phosphorus (available)	1,922	1,520	2,500	3,300	2,800	-	-	µg/g
Potassium (available)	1,107	860	1,256	674	946	-	-	µg/g
Total Solids	26.7	23.6	29.0	23.2	16.5	-	-	%
Moisture Content	73.3	76.4	71.0	76.8	83.5	-	-	%
Conductivity	7.6	8.2	6.2	3.2	7.34	-	-	dS/m @ 25°C
pH	7.6	7.7	7.2	6.9	7.0	-	-	pH units
Foreign Matter	NA [c]	NA [c]	NA [c]	NA [c]	NA [c]	1	1	%
Microbiology								
Fecal Coliform (Geometric Mean)	450 [d]	218,800 [e]	96,000 [e]	12 [f]	67,100 [g]	1,000	2,000,000	MPN/g
Trace Elements								
Arsenic	4.99	4.94	2.97	4.94	11.0	75	75	µg/g
Cadmium	1.99	2.68	2.02	1.32	1.40	20	20	µg/g
Chromium	63.7	29.3	25.7	28.4	34	-	1,060	µg/g
Cobalt	3.91	4.35	2.25	2.43	4.1	150	150	µg/g
Copper	686	490	580	587	370	-	2,200	µg/g
Lead	37.0	25.5	46.6	22.7	30	500	500	µg/g
Mercury	1.26	1.11	1.37	1.66	0.53	5	15	µg/g
Molybdenum	9.8	9.6	6.1	7.5	7.3	20	20	µg/g
Nickel	26.5	27.5	32.5	19.2	19	180	180	µg/g
Selenium	7.01	5.81	5.36	5.91	6.0	14	14	µg/g
Zinc	1,295	1,292	1,054	1,108	1,000	1,850	1,850	µg/g

Note: When the value was reported as below detection limit, the detection limit was used in calculating the mean.

[a] Limits specified in Trade Memorandum T-4-93 (September 1997), Standards for Metals in Fertilizers and Supplements.

[b] Limits specified in OMRR for Class B biosolids, Schedule 4, Column 3.

[c] Biosolids are delivered directly from the WWTP and visual observations confirm no foreign matter.

[d] Value represents the maximum of 75 discrete grab samples collected by from Metro Vancouver in 2020.

[e] Value represents the geometric mean of the last seven discrete grab samples collected by Metro Vancouver in 2020. Six additional sets of 7 samples were collected in 2020, all in compliance with the OMRR.

[f] Value represents the geometric mean of the last seven discrete grab samples, collected by the City of Abbotsford in 2020. Another set of 7 samples was collected in 2020 with a geometric mean of 7 MPN/g.

[g] Value represents the geometric mean of seven discrete grab samples, collected in 2020 by SYLVIS. Samples were analyzed by ALS in Burnaby, BC.

Table 2: Trace element and physicochemical quality for biosolids produced at the Village of Ashcroft, Village of Cache Creek, Tsawwassen First Nation, Town of Agassiz and Village of Harrison Hot Springs WWTPs.

Constituent	Village of Ashcroft Biosolids	Village of Cache Creek Biosolids	Tsawwassen First Nation Biosolids	Town of Agassiz Biosolids	Village of Harrison Hot Springs Biosolids	Class A Biosolids Limits[a]	Class B Biosolids Limits[b]	Units (dw)
Number of samples collected	1	1	2	1	1	-	-	-
Samples collection year	2020	2020	2020	2020	2020	-	-	-
Conventional Parameters								
Total Nitrogen – TKN	56,300	62,200	45,600	85,200	53,800	-	-	µg/g
Ammonium plus Ammonia – N	9,390	1,720	2,403	10,600	18	-	-	µg/g
Nitrate – N	10	< 10	1,650	< 10	30	-	-	µg/g
Phosphorus (available)	4,500	1,300	4,050	6,300	1,600	-	-	µg/g
Potassium (available)	2,730	3,460	3,965	4,050	2,390	-	-	µg/g
Total Solids	41.1	35.5	25.2	17.3	16.3	-	-	%
Moisture Content	58.9	64.5	74.8	82.7	83.7	-	-	%
Conductivity	5.46	6.28	6.48	17.10	2.40	-	-	dS/m @ 25°C
pH	6.9	6.9	6.5	5.9	6.6	-	-	pH units
Foreign Matter	NA [c]	NA [c]	NA [c]	NA [c]	NA [c]	1	1	%
Microbiology								
Fecal Coliform (Geometric Mean)	150,300 [d]	101,900 [d]	29,800 [d]	179,600 [e]	25,100 [f]	1,000	2,000,000	MPN/g
Trace Elements								
Arsenic	2.9	18	2.3	3.6	14	75	75	µg/g
Cadmium	0.77	0.44	1.08	0.35	0.53	20	20	µg/g
Chromium	21	8.3	19	13	10	-	1,060	µg/g
Cobalt	3.2	1.5	2.7	1.9	1.3	150	150	µg/g
Copper	680	1,100	440	170	280	-	2,200	µg/g
Lead	26	10	12	6.2	15	500	500	µg/g
Mercury	0.68	0.14	0.81	0.34	0.36	5	15	µg/g
Molybdenum	6.9	7.8	7.3	7.5	4.4	20	20	µg/g
Nickel	17	13	20	13	10	180	180	µg/g
Selenium	5.1	4.8	5.2	6.3	3.5	14	14	µg/g
Zinc	430	330	780	220	360	1,850	1,850	µg/g

Note: When the value was reported as below detection limit, the detection limit was used in calculating the mean.

[a] Limits specified in Trade Memorandum T-4-93 (September 1997), Standards for Metals in Fertilizers and Supplements.

[b] Limits specified in OMRR for Class B biosolids, Schedule 4, Column 3.

[c] Biosolids are delivered directly from the WWTP and visual observations confirm no foreign matter.

[d] Value represents the geometric mean of seven discrete grab samples collected in 2020 by SYLVIS. Samples were analyzed by ALS in Burnaby, BC.

[e] Value represents the geometric mean of seven discrete grab samples collected in 2020 by the District of Kent.

[f] Value represents the geometric mean of seven discrete grab samples collected in 2020 by the Village of Harrison Hot Springs.

Table 3: Pre-application and projected maximum post-application soil concentrations for grassland soils at the OK Ranch which are to be fertilized with biosolids.

Constituent	Pre-application OK Ranch grasslands mean concentrations in soil[(a)]	Projected post-fertilization concentrations[(b)]	OMRR Soil Standard[(c)]	Units (dw)
Trace Elements				
Arsenic	4.2	4.6	20	µg/g
Cadmium	0.45	0.49	20	µg/g
Chromium	28	29	100	µg/g
Cobalt	13	13	25	µg/g
Copper	34	62	150	µg/g
Lead	4.2	4.9	120	µg/g
Mercury	0.088	0.123	10	µg/g
Molybdenum	1.9	2.1	80	µg/g
Nickel	38	38	150	µg/g
Selenium	0.64	0.75	1.5	µg/g
Zinc	94	119	450	µg/g

Note: When the value was reported as below detection limit, the detection limit was used in calculating the mean.

(a) Values were obtained from 26 samples each comprised of eight equal volume subsamples, collected from the OK Ranch grasslands in 2018, 2019 and 2020. Samples were analyzed by Elements in Surrey, BC.

(b) Projected concentrations are calculated using the maximum application rate presented in Section 6.3 for any biosolids sources identified in Section 4.

(c) Most restrictive soil standards as per OMRR schedule 10.1 for Agricultural Land, using site-specific standards listed in Section 3.2.

Table 4: Pre-application and projected maximum post-application soil concentrations for hayfield soils at the OK Ranch which are to be fertilized with biosolids.

Constituent	Pre-application OK Ranch mean hayfield concentrations in soil[(a)]	Projected post-fertilization concentrations[(b)]	OMRR Soil Standard[(c)]	Units (dw)
Trace Elements				
Arsenic	5.8	6.3	20	µg/g
Cadmium	0.6	1.1	20	µg/g
Chromium	29	30	100	µg/g
Cobalt	14	14	25	µg/g
Copper	39	71	150	µg/g
Lead	4.6	5.5	120	µg/g
Mercury	0.029	0.070	10	µg/g
Molybdenum	2.0	2.2	80	µg/g
Nickel	46	46	150	µg/g
Selenium	0.90	1.07	1.5	µg/g
Zinc	84	114	450	µg/g

Note: When the value was reported as below detection limit, the detection limit was used in calculating the mean.

(a) Values were obtained from 9 samples, each comprised of eight equal volume subsamples, collected on August 21, 2015 (3 samples) and July 28, 2017 (6 samples). Samples were analyzed by Elements in Surrey, BC.

(b) Projected concentrations are calculated using the maximum application rate presented in Section 6.3 for any biosolids sources identified in Section 4.

(c) Most restrictive soil standards as per OMRR schedule 10.1 for Agricultural Land, using site-specific standards listed in Section 3.2.

APPENDIX TWO – FIGURES

Figure 1: Location map of the OK Ranch site and surrounding area.

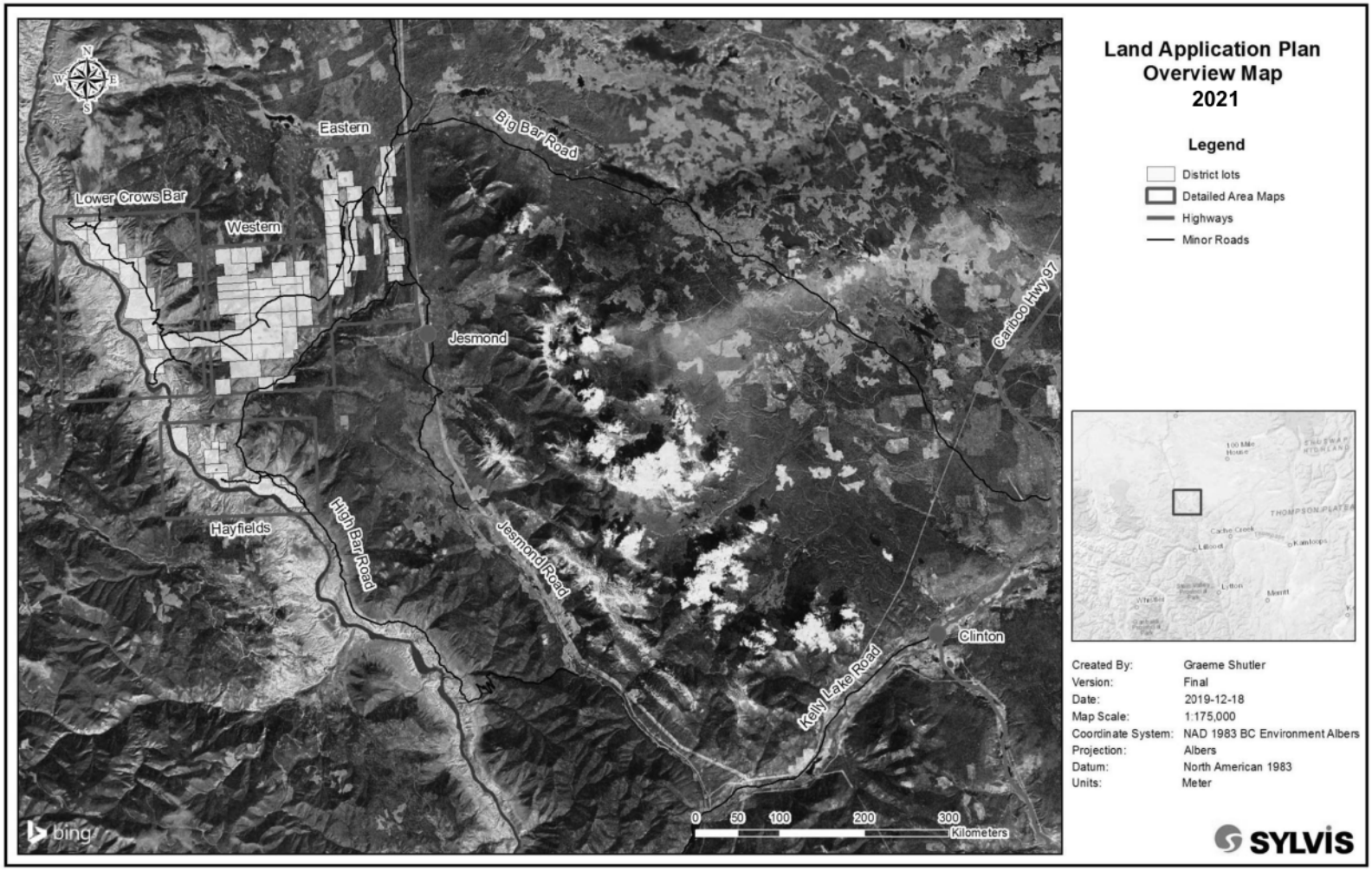


Figure 2: Site map of the eastern portion of the OK Ranch grasslands depicting land parcels (LAP boundary), access roads and surface water features.

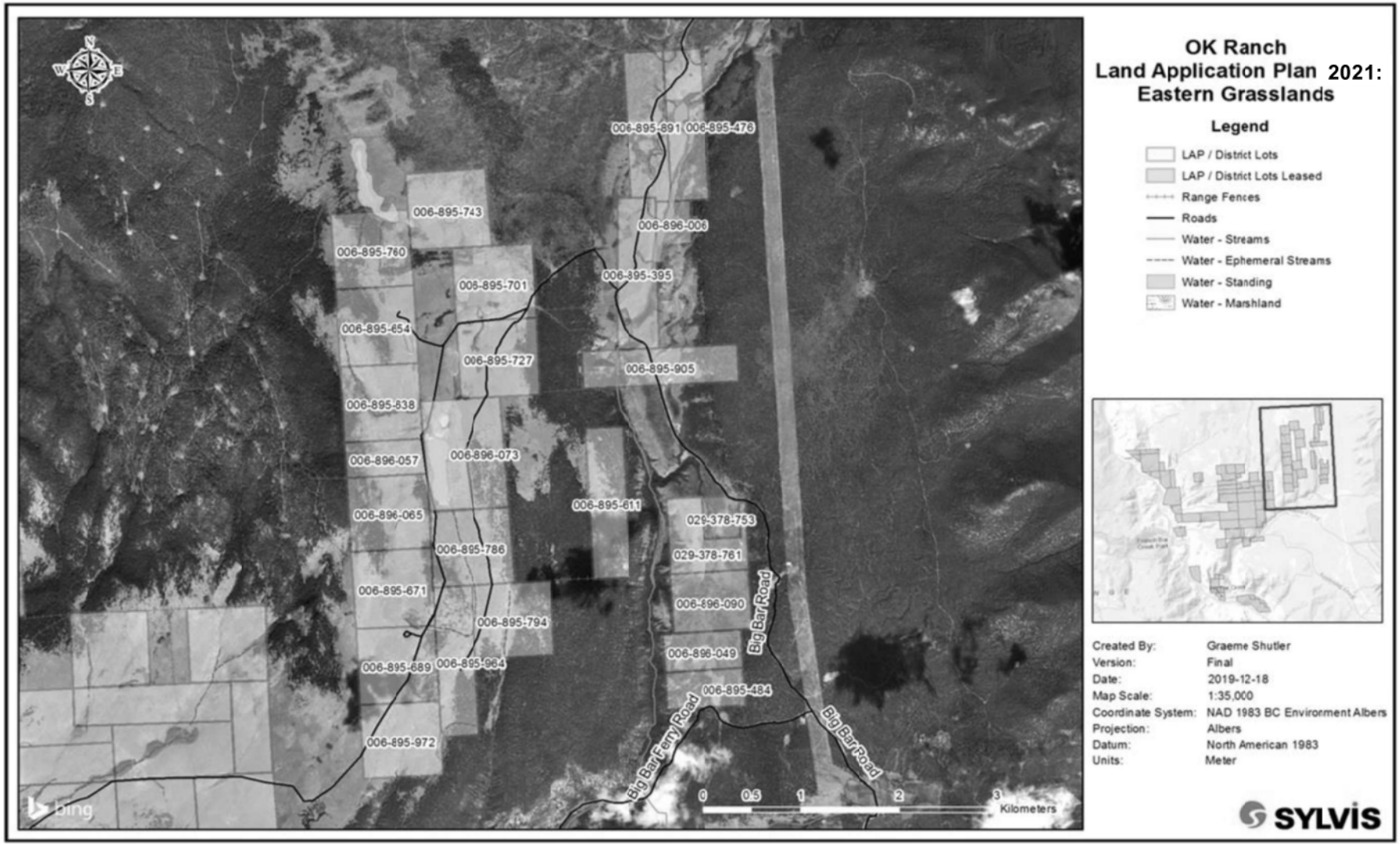


Figure 3: Site map of the western portion of the OK Ranch grasslands depicting land parcels (LAP boundary), access roads and surface water features.

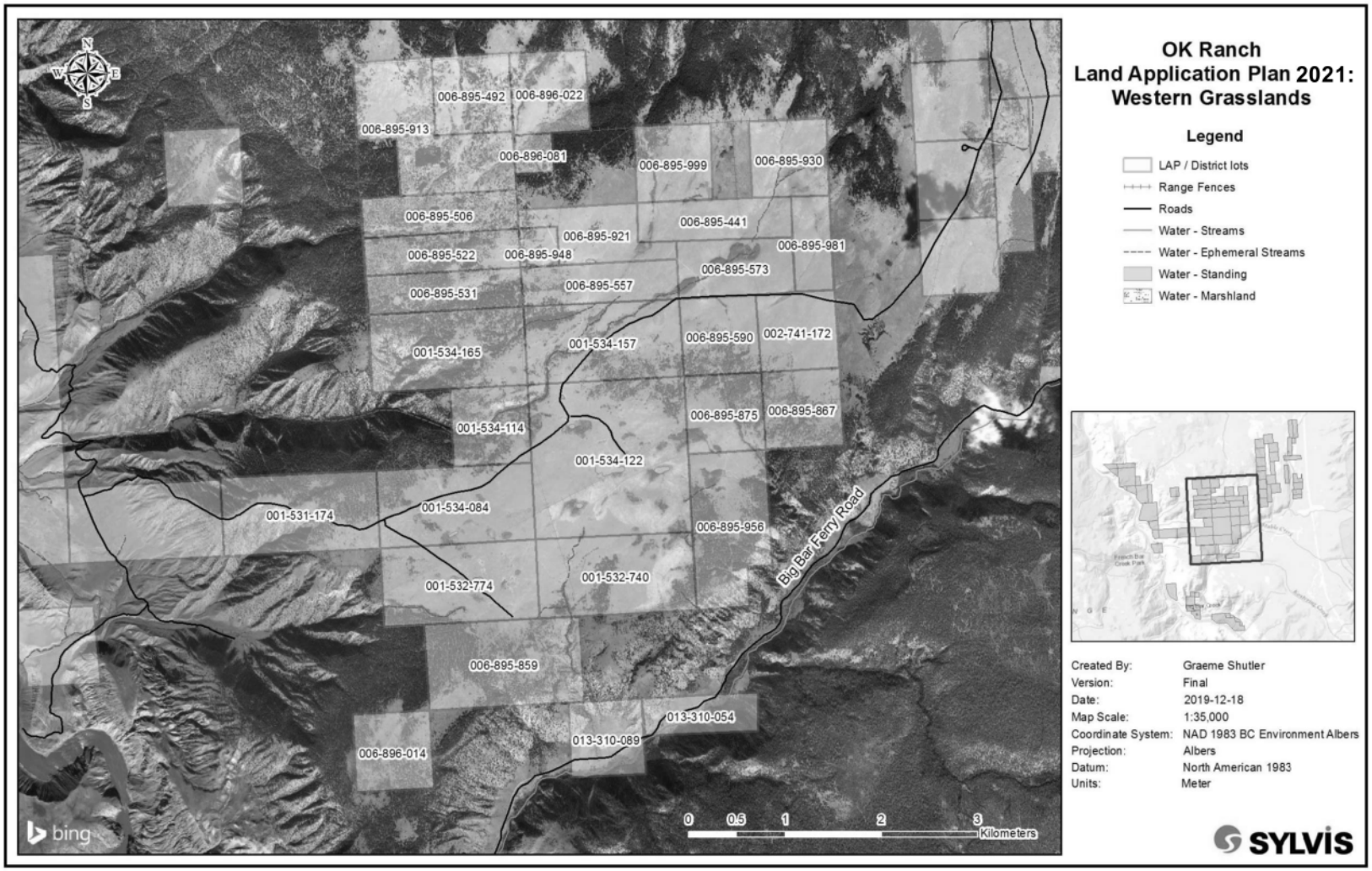


Figure 4: Site map of the Lower Crows Bar grasslands portion of the OK Ranch depicting land parcels (LAP boundary), access roads and surface water features.

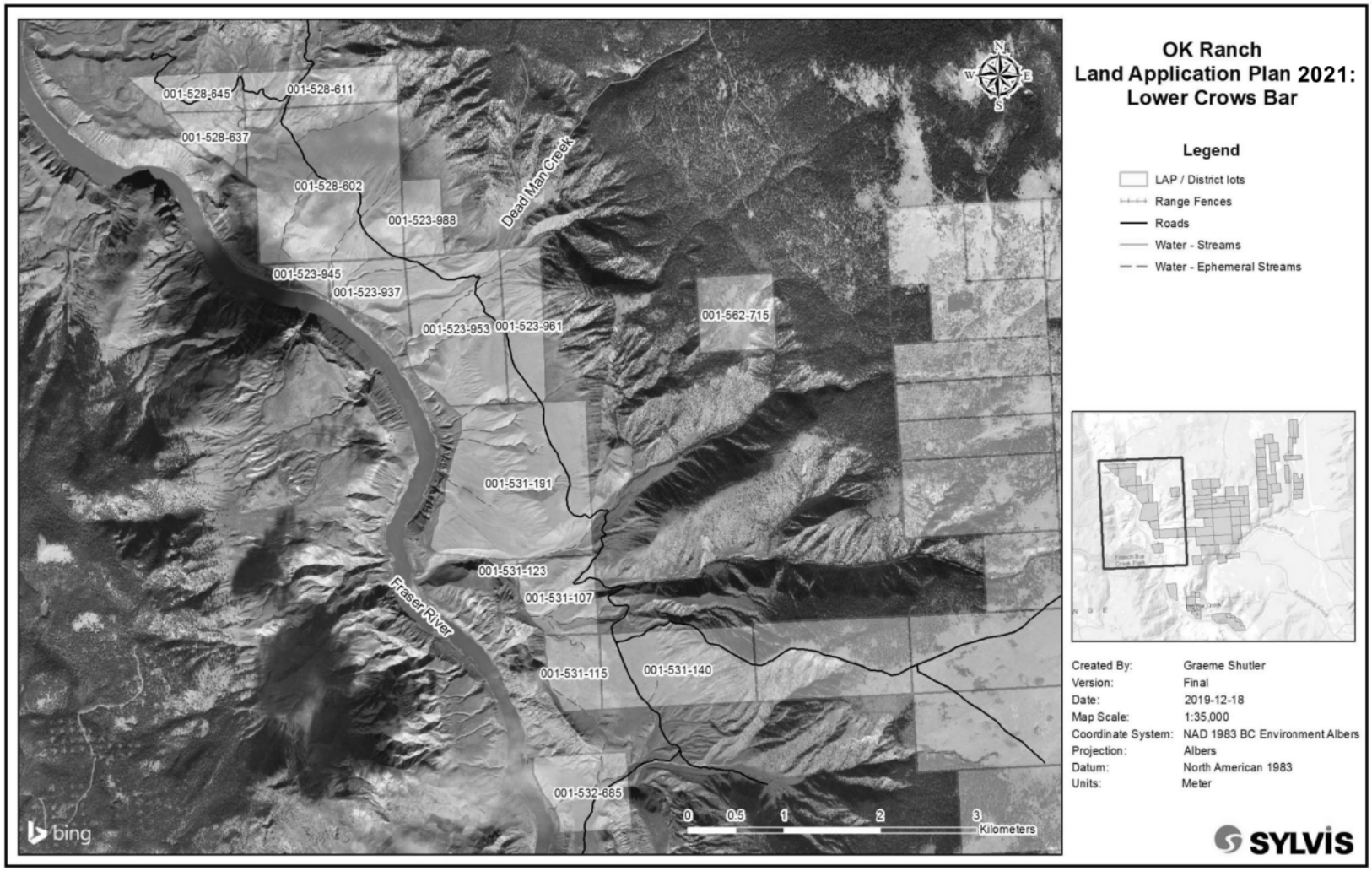
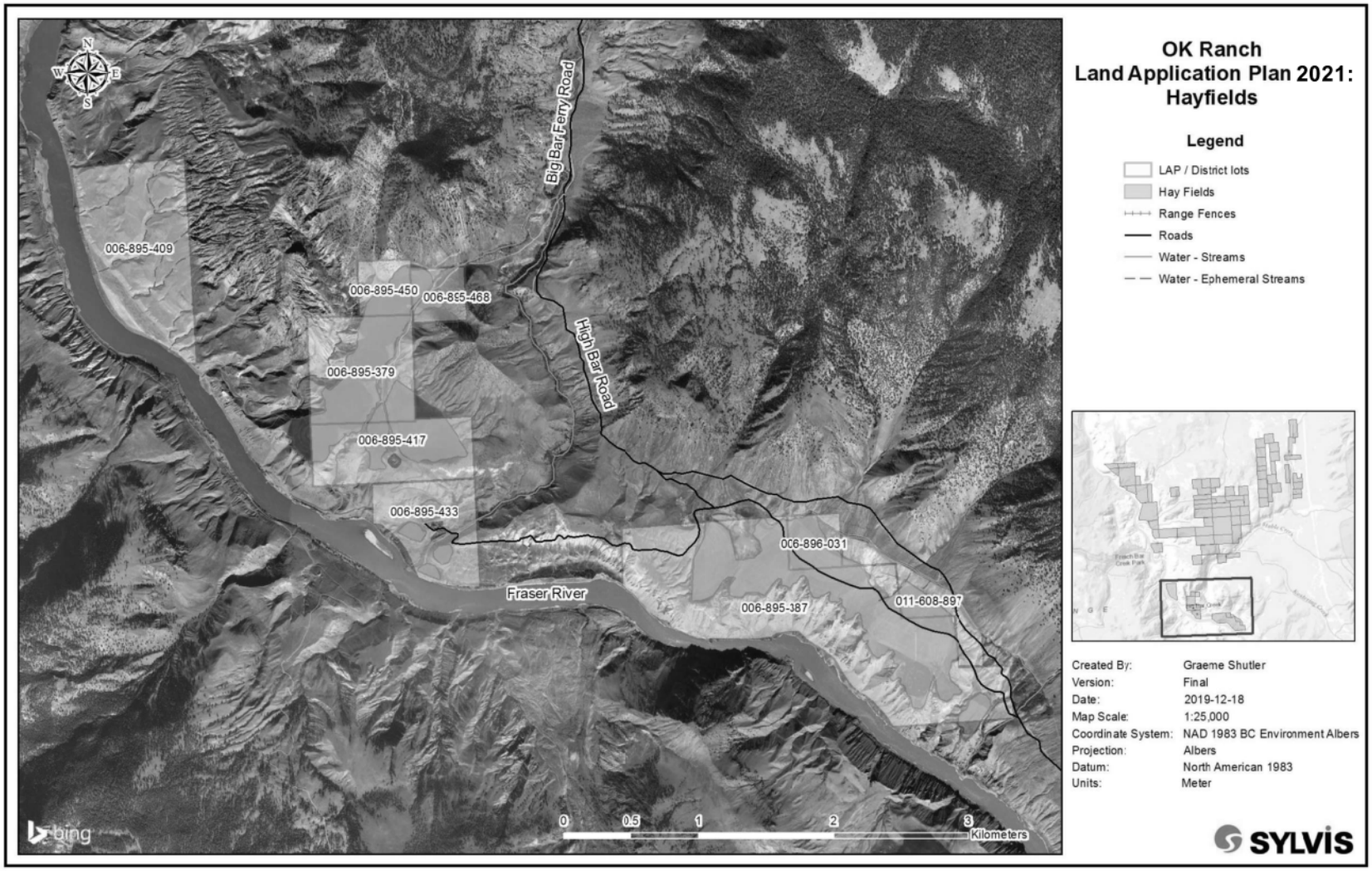


Figure 5: Site map of the hayfields portion of the OK Ranch depicting cultivated hay fields, land parcels (LAP boundary), access roads and surface water features.



APPENDIX THREE – LANDOWNER AUTHORIZATION

Mr. Lawrence Joiner, President of the OK Ranch, supports biosolids fertilisation and authorizes SYLVIS to act as his agent with regards to this LAP through the letter provided on the following page.

One land parcel is leased from Carol Banman, who is aware and supports biosolids fertilisation under this LAP through the letter provided on the following page.

December 23, 2019 2020

SYLVIS Environmental
Attn: Mike Van Ham
427 Seventh Street,
New Westminster, BC
V3M 3L2

Re: Authorization for the Application of Managed Organic Matter under the BC Organic Matter Recycling Regulation

Dear Mr. Van Ham:

Your firm is preparing a BC Organic Matter Recycling Regulation Land Application Plan for the OK Ranch. This Land Application Plan is required under the BC Organic Matter Recycling Regulation for the proposed application of managed organic matter (biosolids) to the OK Ranch, located at 5930 Big Bar Road, Clinton BC. The land parcels subject to this agreement include all parcels currently owned by the OK Ranch, a division of s.79 s.79

This letter serves to provide written authorization from the OK Ranch, being the registered owner of the land acknowledging that the OK ranch is fully aware and sanctions the application of managed organic matter to the aforementioned property according to the most current Land Application Plan prepared by SYLVIS.

Any questions on this authorization for the land application of managed organic matter to the OK Ranch should be directed to myself.

Yours truly,

Lawrence Joiner
Owner, OK Ranch, a division of s.79

SYLVIS

Date: December 23, 2020

SYLVIS Environmental
Attn: Mike Van Ham
427 Seventh Street
New Westminster, BC
V3M 3L2

Re: Authorization for the Application of Managed Organic Matter under the BC Organic Matter Recycling Regulation

Dear Mr. Van Ham:

Through this letter I authorize SYLVIS Environmental to prepare the required BC Organic Matter Recycling Regulation Land Application Plan (LAP) for the proposed application of managed organic matter to parcel of land that I own and lease to the OK Ranch, located at 5930 Big Bar Road, for the purpose of rangeland and hayfield fertilization.

- 029-378-753

This letter serves to provide written authorization from Carol Banman, being either the registered owner of the land or agent thereof acknowledging that Carol Banman is fully aware and sanctions the application of managed organic matter to the aforementioned property in accordance with the most current Land Application Plan prepared for the property.

Any questions on this authorization for the land application of managed organic matter to this land parcel managed by the OK Ranch should be directed to myself.

Yours truly,

Carol Banman

Carol Banman

Address: 6195 Big Bar Road, Clinton, BC V0K 1K0
Phone: 250.459.2946

SYLVIS

APPENDIX FOUR – STATEMENT OF LIMITATIONS

SYLVIS has prepared a Land Application Plan (LAP) for the purpose of biosolids applications to soil. This LAP will be limited to the specific site, development, and design objectives for fertilization of the OK Ranch managed by Lawrence Joiner, ("Landowner") accessed from Big Bar Road near Clinton, BC.

This LAP is intended for use by persons or companies familiar with biosolids and their management, real property such as the subject property, and persons or companies that are familiar with land use terminology, methodology, and reporting. Any questions about this LAP, its use, terms, scope, research, or the analytical methodology used should be directed to its author.

This LAP must not be used partially but only in the context in which it is presented. SYLVIS cannot monitor changes to their reports once they leave their office, nor can they prevent changes, additions or deletions in copies of their reports. SYLVIS recommends that people intending to rely on their report do so only after reading an original report in its entirety.

The Client and/or Landowner and regulators are the only parties who may rely on the opinions expressed in this LAP. As this LAP has been prepared exclusively for the OK Ranch, no one else may rely on this LAP without the written consent of the author, which SYLVIS may not provide retroactively. SYLVIS expressly denies any legal liability for unauthorized reliance and for any other use.

No one other than the Landowner or biosolids Producer/Client may use or copy this LAP for any purpose without the written consent of SYLVIS. Exceptions exist when required by due process of law or if subject to confidential review by the Regulatory Agencies.

The analysis contained in this LAP and the basis for the opinions and estimates may rely upon written and verbal information obtained from a variety of sources that SYLVIS considers reliable. This LAP is not prepared for court purposes or for arbitration; as such, some of the information set out in this LAP may not be fully documented or confirmed by reference to primary sources. Information provided by the Landowner and/or Producer may not be verified with other parties unless so indicated in this LAP. Any information provided to SYLVIS by the Landowner and/or Producer is believed to be correct and reliable. General market and environmental information is derived from various public sources as well as from various individuals believed to be knowledgeable in these matters. It is recognized that information from others is believed to be correct, but accuracy cannot be guaranteed. The veracity of information provided to SYLVIS by others will be accepted unless SYLVIS has specific reason for doubt, in which case further confirmation is sought. Soil quality predictions are predicated upon laboratory analysis of the soil and biosolids, and that SYLVIS cannot assume responsibility for the accuracy of such analyses where the basis is third-party sources. SYLVIS has included plans and sketches for visual reference only and SYLVIS cannot assume responsibility for the accuracy of such illustrations where the basis was third-party sources.

SYLVIS will not complete technical investigations such as:

- Contaminated Site Assessments;

- Hydrogeological Assessments; and
- Terrain Stability Assessments.

Unless otherwise stated in this LAP, the existence of any contaminants or hazardous materials, which may or may not be present on the property, is not assessed. SYLVIS will neither source hazardous materials or contaminated land studies nor commission such a study. SYLVIS has no knowledge of the existence of such materials on or in the property. SYLVIS is not retained to detect such substances, the presence of which may materially affect the value of the property. No responsibility is assumed by SYLVIS for any such conditions, or for any specialized expertise or engineering knowledge required to discover them or to remove or eliminate them.

Attendance at any legal proceedings with respect to this LAP, and any fees and expenses for preparation and attendance are to be agreed upon in advance. However, neither this nor any other of these limiting conditions is an attempt to limit the use that might be made of this LAP should it properly become evidence in a judicial proceeding. In such a case it is the judicial body that will decide the use of this LAP that best serves the administration of justice.

APPENDIX FIVE – ENV ACKNOWLEDGEMENT LETTER 110592

BRITISH COLUMBIA

February 2, 2021

Tracking Number: 399722
Authorization Number: 110592

s.79
doing business as
OK Ranch, a division of s.79
P.O. Box 390
9259 Main St
Chilliwack BC V2P 6K2

Dear s.79 doing business as OK Ranch, a division of s.79
s.79

Re: Notification under the Organic Matter Recycling Regulation

Receipt of your completed notification under the Organic Matter Recycling Regulation is acknowledged. The effective date of notification is January 7, 2021. Thirty days following the effective date of notification you are exempt from section 6(2) and 6(3) of the *Environmental Management Act* so long as biosolids are land applied in accordance with the regulation.

Please indicate the ministry authorization number shown above on all future correspondence with the Ministry regarding this land application.

In accordance with Section 5(1)(a) and Schedule 13(i) of the Organic Matter Recycling Regulation this Notification is effective for one year from the submission date. Should you intend on land applying biosolids in subsequent years, a new Notification will be required. The associated land application plan will need to be updated if it reflects a multi-year land application.

Your attention is respectfully directed to the terms and conditions specified in the regulation. Contravention of any of the conditions is a violation of the *Environmental Management Act* and may result in prosecution. If the regulation does not cover all waste streams at the site, additional authorizations may be required under the *Environmental Management Act*.

This acknowledgement of your notification should not be construed as a representation that the works are adequately designed or will satisfy the regulation requirements. It is the responsibility of the discharger to ensure that the facility is adequately designed, constructed and operated to ensure compliance.

Acknowledgement of your notification under the regulation is without prejudice to any additional requirements that may be specified by the Director. The Director may also issue Orders under the *Environmental Management Act*.

Ministry of Environment and Climate Change Strategy
Regional Operations Branch
Environmental Protection Division
Website: www.gov.bc.ca/env
Guidance, Forms and Fees

SYLVIS

February 2, 2021 2 Tracking Number: 399722
Authorization Number: 110592

Acknowledgement of your notification under the regulation does not authorize entry upon, crossing over, or use for any purpose of private or Crown lands or works, unless and except as authorized by the owner of such lands or works. The responsibility for obtaining such authority rests with the operator. It is also the responsibility of the operator to ensure that all activities conducted under this regulation are carried out with regard to the rights of third parties, and comply with other applicable legislation that may be in force. The operator must also obtain any necessary approvals from other agencies.

Administration of this regulation will be carried out by Ministry of Environment Compliance staff. Plans, data and reports pertinent to the regulation are to be submitted to the Regional Director, Environmental Protection, in accordance with the electronic data and reporting submissions requirements located at the following website: http://www2.gov.bc.ca/gov/content/environment/waste-management/waste-discharge-authorization/data-and-report-submissions

Yours truly,

Linden Terry, B.Sc.
Environmental Protection Officer
Authorizations South
Environmental Protection Division
Email: Linden.Terry@gov.bc.ca, Phone: (778) 671-0111

ENCL: None