Utilities Environment
ANNUAL REPORT
2018

ABBOTSFORD

DISTRICT OF Mission ON THE FRASER

Abbotsford Mission Water & Sewer Services

EXECUTIVE SUMMARY

Environmental Services is responsible for the management and operation of:

- **Source Control Program:**

The purpose of the Abbotsford/Mission Water and Sewer Commission Source Control Program (WSCSCP) is to reduce the amount of contaminants that industries, businesses, institutions and households discharge into the sanitary sewer system. Reduction of contaminants discharged to the sanitary sewer will protect the sewage collection system, the treatment facilities, the biosolids quality, the receiving environment, and the health and safety of the public and sewer workers. The City of Abbotsford Sewer Rates and Regulations Bylaw No. 2664-2017 and the District of Mission Sewer Bylaw No. 5033-2009 serve as the main regulatory instrument for the WSCSCP.

Wastewater discharge permits (WWDP) are issued to industries, businesses, or other operations that discharge significant volumes of non-domestic wastewater into the sanitary sewer, or that discharge wastewater having the potential to contain high concentrations of contaminants. In 2018, 51 WWDPs were initiated within the combined area of City of Abbotsford and the District of Mission.

Codes of Practice (COP) regulate non-domestic waste discharged to the sanitary sewer from commercial, industrial, and institutional business sectors. Codes of practice are different from WWDPs in that they set out minimum waste treatment, equipment maintenance, and record keeping requirements for specific types of operations. In 2018, WSCSCP staff completed 369 inspections for businesses operating under five separate COPs: Dental Operations, Photo Imaging Operations, Dry Cleaning Operations, Automotive Operations, and Vehicle Wash Operations.

In 2018, ongoing monitoring for oil & grease focused on industrial customers identified in the 2012 risk assessment study. The Bylaw limits are 150 mg/L for total oil and grease and 15 mg/L for oil and grease hydrocarbons. In 2018, 21 grab samples were collected and analyzed for oil and grease after a visual inspection confirmed the presence of these contaminants. The results from an external accredited laboratory found that 86% of these grab samples were above the Bylaw limits.

High-risk dischargers such as metal finishers and public hospitals were monitored in 2018. Monitoring of two metal finishing companies and two public hospitals was carried out. A total of 107 samples were collected and analyzed for total metals (with the hospital samples also being analyzed for pH, Total Suspended Solids and Biochemical Oxygen Demand).

In 2018, a total of 1,262 samples (445 grab and 817 composite) were collected from industrial businesses and analyzed for pH compliance. The collected pH data showed 28% were non-compliant and outside the bylaw limit of 5.5 to 9.5 pH units. A continuous pH monitoring system using in-line sensors is an application used at various locations for compliance monitoring. In 2018, 84 sessions of continuous pH monitoring were successfully completed.

- **Class IV Wastewater Plant Laboratory:**

The JAMES Wastewater Treatment Plant (WWTP) operates and monitors liquid and solid discharges under the Municipal Sewage Regulation (MSR), the Wastewater Systems Effluent Regulations (WSER) and the Organic Matter Recycling Regulations (OMRR). The JAMES WWTP Laboratory performs testing as required by each regulation and performs a variety of special projects and other testing for plant performance requirements. It operates using well-defined Quality Assurance and Quality Control (QA/QC) methods and procedures based on the *Standard Methods for the Examination of Water and Wastewater* 22nd *Edition*. It also participates in the Canadian Association for Laboratory Accreditation (CALA) Proficiency Test Program twice a year.

In 2018, the JAMES WWTP Laboratory saw a 21% overall increase in sample workload that produced a total of 21,770 test results. 39% (8,564) of the total test results were attributed to internal QA/QC testing. The JAMES WWTP Laboratory also submitted 827 samples to external laboratories for analysis. Testing performed at the JAMES WWTP Laboratory include pH, Ammonia, Biochemical Oxygen Demand, Chemical Oxygen Demand, Total Suspended Solids, Total Solids, Volatile Solids, Settleable Solids, Total Alkalinity, Volatile Acids, Total Chlorine and Fecal Coliform. In June 2018, Fecal Coliform analysis in-house was cancelled pending a review of current control measures. All fecal coliform tests have been added to the regular laboratory projects and sent on a weekly basis to an external laboratory. These projects also include Weekly Influent & Effluent, Bimonthly Influent & Effluent, and Effluent Toxicity with pH stabilization, JAMES WWTP Lab Water, Total Dissolved Solids, WSER, Weekly Biosolids, Biosolids Coliforms, and Monthly Biosolids.

In 2010, efforts were taken by staff to develop and implement better QA/QC practices in the laboratory. The QA/QC system provides written documentation that ensures the accuracy, precision, and reliability of laboratory analyses and that data produced in the laboratory meets or exceeds user requirements. In addition, Standard Operating Procedures (SOPs) for all analyses performed in the JAMES WWTP Laboratory were also developed and implemented to ensure consistency with all analytical procedures and to document variations from the procedures referenced in the *Standard Methods for the Examination of Water and Wastewater 22nd Edition*.

- **Biosolids Management**

Biosolids produced from the JAMES Wastewater Treatment Plant (WWTP) are managed in accordance with applicable Provincial and Federal regulations and in a beneficial manner that supports a commitment to protecting the public and the environment. The Provincial Organic Matter Recycling Regulation (OMRR) applies to the production, distribution, storage, sale and use or land application of biosolids. The JAMES WWTP produces “Class A” biosolids that is identified in OMRR as the highest quality of biosolids. The pasteurization process at the JAMES WWTP is the key treatment step in enabling the production of “Class A” Biosolids

Historically Class A biosolids have been used in mine reclamation, soil production, and tree farm applications. In 2015, the City of Abbotsford implemented a biosolids management agreement with a third party contractor to beneficially use JAMES WWTP biosolids in accordance with applicable Provincial and Federal regulations.

In 2018, 5,154 wet tonnes (wt) of “Class A” biosolids were produced from the JAMES WWTP with approximately 1,218 wt carried over in JAMES WWTP storage from 2017 production. In 2018, the contractor hauled 4,123 wt from the JAMES WWTP storage site for beneficial end use. In addition, 2,611 wt stored at application sites in 2017 is scheduled for application in 2018.

In 2018 a total of 3,292 wt (2,611 from 2017 & 681 from 2018) was applied to seven locations under seven different LAP’s. An additional 909 wt from 2018 was used for the production of a Biosolids Growing Medium (BGM). 2,533 wt was stored by the contractor in 2018 at four different application sites for application in 2019. 2,091 wt of biosolids produced in 2018 remain in storage at James WWTP carried over for beneficial use in 2019.

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A. Source Control Program

1.0 Introduction

The primary objective of the Abbotsford/Mission Water and Sewer Commission Source Control Program (WSCSCP) is to reduce the amounts of contaminants that industries, businesses, and institutions discharge into the sanitary sewer system. These discharges may contain significant quantities of contaminants and other substances that can affect the collection and treatment system as well as the health of workers, the public, and the aquatic environment. Some contaminants are removed from the solids through treatment processes and end up in the biosolids, a condition that can restrict the beneficial use or result in costly remediation and recycling efforts. The efficiency of the treatment and its costs closely relates to the quantity and quality of the wastewater treated. Consequently, an effective source control program is an economical and sustainable means of managing wastewater treatment.

The objectives of the WSCSCP are to:

- Ensure the health and safety of sewer workers and the general public is not put at risk due to the presence of wastewater contaminants;
- Protect the aquatic receiving environment adjacent to the JAMES Wastewater Treatment Plant (WWTP) sewage outfall;
- Protect the JAMES WWTP against corrosion, blockage and other harmful effects related to the presence of wastewater contaminants;
- Protect the JAMES WWTP against treatment process upsets due to high contaminant loadings;
- Protect the quality of the biosolids produced at the JAMES WWTP to allow unrestricted options for beneficial use and recycling; and
- Promote responsible pollution prevention practices including reduction, reuse, recycling, recovery, and residuals management.

2.0 Source Control Program Activities & Accomplishments – 2018

The 2018 WSCSCP activities and accomplishments are discussed under the following broad groups of activities:

- Program administration;
- Aboveground sampling kiosks;
- BOD & TSS waste program;
- Codes of practice (COP);
- Wastewater discharge permits;
- Wastewater discharge assessments;
- Wastewater compliance plans;
- Contaminant reduction;
- Key manhole monitoring; and
- Unauthorized discharge events.

2.1 Program Administration

The WSCSCP manages Wastewater Discharge Permit (WWDP) holders and Codes of Practice (COP) customers using a multiphase approach that ensures Bylaw compliance of non-domestic waste discharged into any sewers and drains connected to the sanitary sewer system. All correspondence is documented and serves as historical reference.

The administration of the WWDP process involves thorough assessment of WWDP applications and supporting documentation (e.g. analytical data, sewer volumes, schematic flow diagrams, site layout, etc.). Additionally, meetings and site visits are arranged to verify and supplement information presented in the application. It also provides an opportunity to share information between parties with the emphasis on meeting Bylaw requirements. In 2018, a total of 52 WWDPs were issued.

The administration of the Codes of Practice (COP) refers to conducting site inspections that determine compliance with the Bylaw. Customers are notified of an upcoming inspection using different methods of communication at least two months in advance. These notifications also include pertinent information on regulatory rules such as the applicable Schedule of the Bylaw, checklists, logbooks, diagrams, and FAQs. During an inspection, a checklist is used to document and carefully identify items in contravention of the Bylaw. After inspection, customers are notified of either compliance or non-compliance of the COP or exemption from the COP. Customers with non-compliant items are required to complete and provide progress reports on remedial actions within a reasonable time. Customers exempt from the COP are inspected every three years to confirm validity of exemption.

A multilevel approach taken through a notification process was developed to ensure a consistent approach in managing customer's compliance requirements. Refer to Figure 1 for a schematic flow of the different levels.

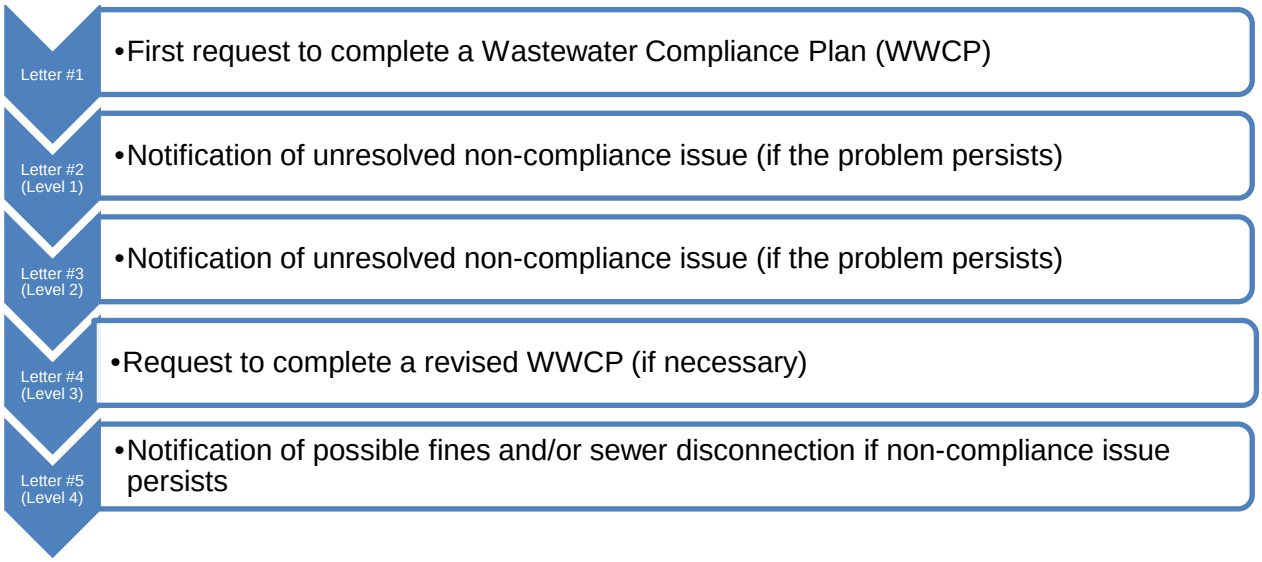


Figure 1. Schematic Flow of Non-compliance Notification Procedure

In 2018, the administration of the WSCSCP began an environmental initiative by transitioning from paper-based communications to software and electronic solutions. This platform resulted in a reduction in costs associated with paper distribution and an increase in productivity from real-time delivery of documents. Refer to Figure 2 for a comparison of the letters distributed since the letter distribution's inception in 2008.

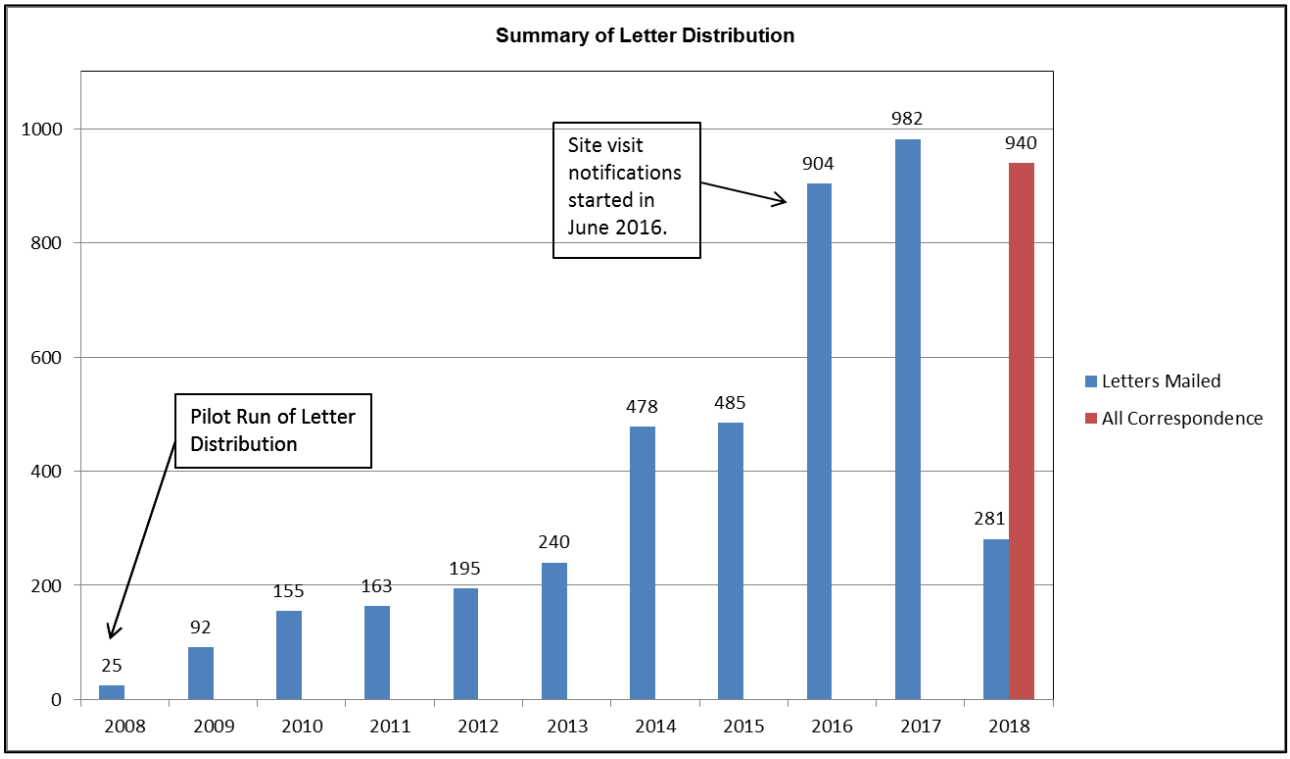


Figure 2. Summary of Letter Distribution from 2008 – 2018

It is important to note that the significant increase in letter distribution in 2016 is due to the addition of site visit notifications that provide customers with a timeline of when to expect an upcoming inspection. In 2018, only 281 of the 940 letters distributed were paper-based resulting in substantial reduction in cost and carbon footprint. Refer to Table 1 for a summary of letters distributed in 2018.

Table 1. Letters Distributed by the Source Control Program - 2018

	Number of Letters Distributed	
Letter Type	Mail	Email
WASTEWATER COMPLIANCE (WWCP)		
WWCP Approved	0	2
WWCP Required	0	1
WWCP Review	0	3

Table 1. Letters Distributed by the Source Control Program – 2018 (continued)

WASTEWATER DISCHARGE ASSESSMENTS (WWDA)		
WWDA Application Request	0	7
WWDA Review	4	1
WASTEWATER DISCHARGE PERMITS (WWDP)		
Request for WWDP Application	4	37
Missing WWDP Application	1	4
WWDP Approval/Review	3	49
CODES OF PRACTICE (COP)		
Site Visit Review (General)	4	148
Exempt Notification	12	94
Missing Progress Report	11	44
Compliance Achieved	2	84
Deadline Extended	1	80
Notification of Site Visit	215	101
Mobile Wastewater Assessment	27	0
Total	281	659

The amount of paper-based communication is expected to decrease even further in the near future as the WSCSCP fully integrates into other electronic and software solutions. In 2018, the program began using the AMANDA software for automation, management, and document control of the administration of Codes of Practice. This application is also available in mobile devices and is used when conducting inspections thus, improving accuracy of data collection and shortening the inspection lifecycle.

2.2 Aboveground Sampling Kiosks

In 2018, WSCSCP staff arranged the installation of an aboveground sampling kiosk at a strata property in Mission, BC and added the weekly sample monitoring to the Metal Finishers project.

Figure 3. Photographs of a Sampling Kiosk at a Metal Finishers Strata Property

Figure 3. Photographs of a Sampling Kiosk at a Metal Finishers Strata Property (continued)

2.3 BOD & TSS Waste Program

Heavy loadings of biochemical oxygen demand (BOD) and total suspended solids (TSS) in wastewater entering the JAMES WWTP can adversely affect the treatment processes and can contribute to increased treatment plant expansion needs. To mitigate these effects, wastewater monitoring programs developed in 1995 ensured cost recovery for treating this type of waste. Over the years, many changes and improvements made to the wastewater monitoring program led to the formation of the "BOD and TSS Waste Program". The coordination and implementation of the BOD and TSS Waste Program is administered by WSCSCP staff.

In 2018, the WSCSCP staff routinely monitored thirty-one industrial customers as part of the BOD and TSS Waste Program (two located within the District of Mission and twenty-nine located within the City of Abbotsford). The monitoring program consisted of 24-hour composite samples collected on a random schedule, one to ten times per month. Industrial customers with larger discharge volumes were monitored on a more frequent basis than customers with smaller discharge volumes. These samples were submitted to an accredited external laboratory for pH, BOD and TSS analysis. The monthly average BOD and TSS concentrations combined with the monthly sanitary sewer discharge volumes determined the BOD and TSS waste mass loading fees for each customer for that month. The mass loading fees remained the same as in 2014 and are provided in Table 2. An overall summary for the BOD and TSS Waste Program is also provided in Table 3.

Table 2. BOD & TSS Waste Fees – 2018

	Fee:
Biochemical Oxygen Demand (BOD)	$0.42/kg/month
Total Suspended Solids (TSS)	$0.47/kg/month

Table 3. BOD & TSS Waste Program Monitoring - 2018

	Total:
# of Samples Collected	981
Volume Discharged (m^3)	2,192,110
BOD Discharged (kg)	2,721,869
TSS Discharged (kg)	1,199,831
BOD Waste Fees Collected	$1,143,085.42
TSS Waste Fees Collected	$560,550.36
BOD & TSS Waste Fees Collected	$1,703,635.78

Refer to Figures 4, 5, 6 and 7 for the trends in 2018. Monitoring of the thirty-one locations will continue in 2019.

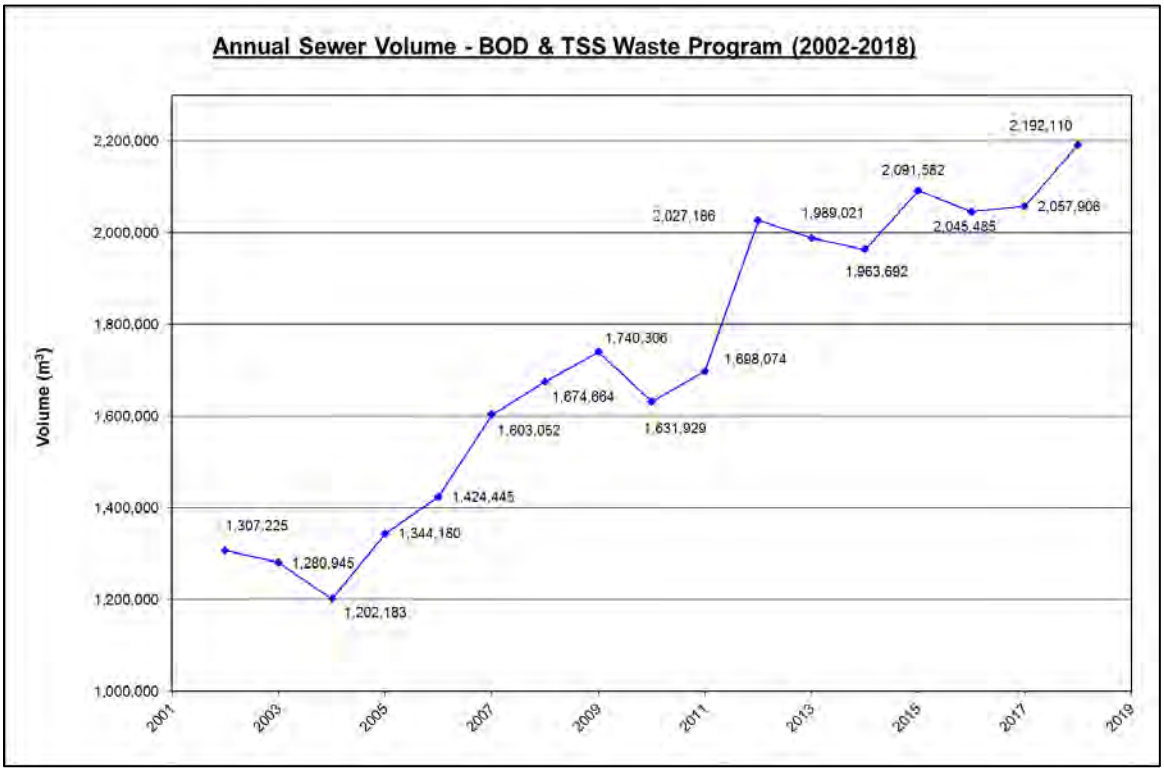


Figure 4. BOD & TSS Waste Program – Total Sewer Volumes (2002 – 2018)

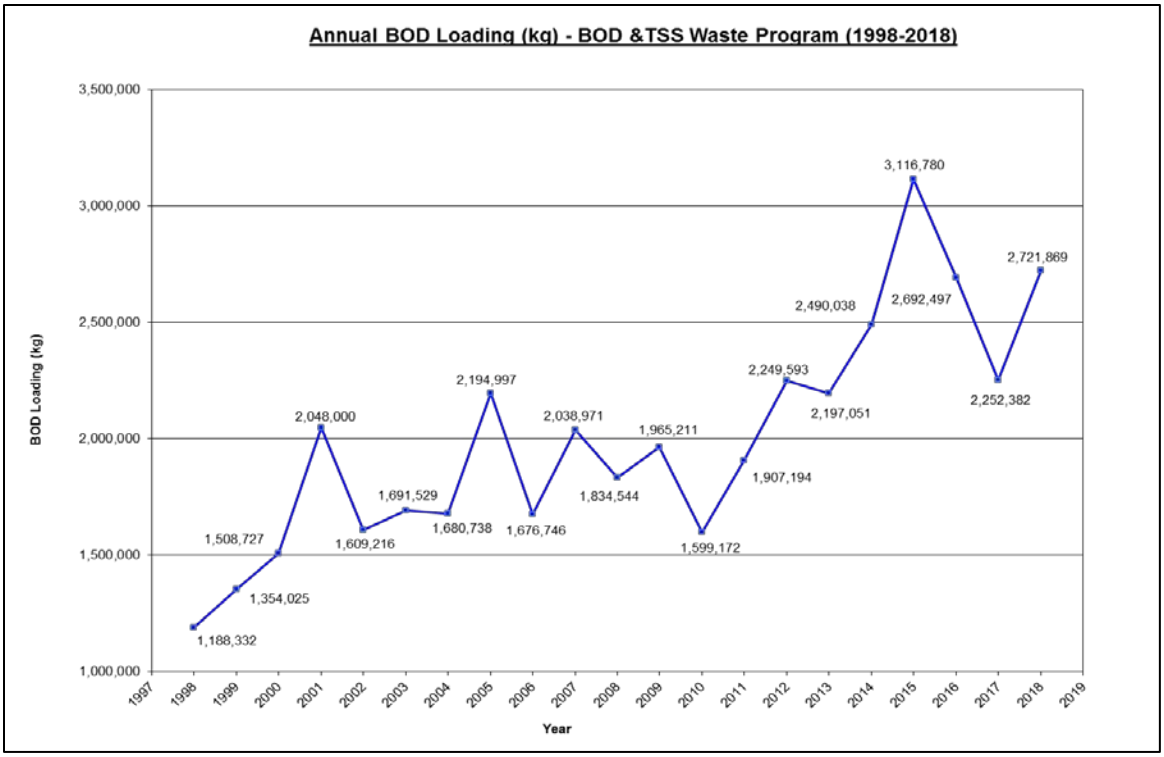


Figure 5. BOD & TSS Waste Program – Total BOD Mass Loading (2002 – 2018)

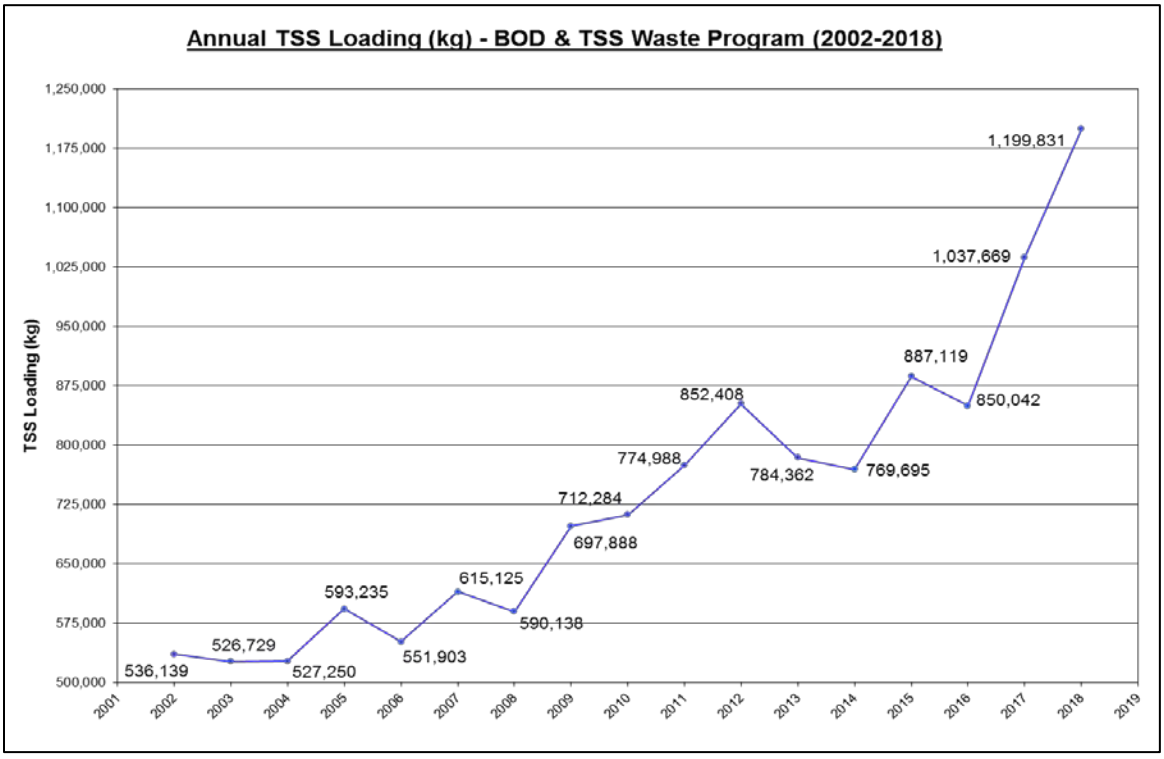


Figure 6. BOD & TSS Waste Program – Total TSS Mass Loading (2002 – 2018)

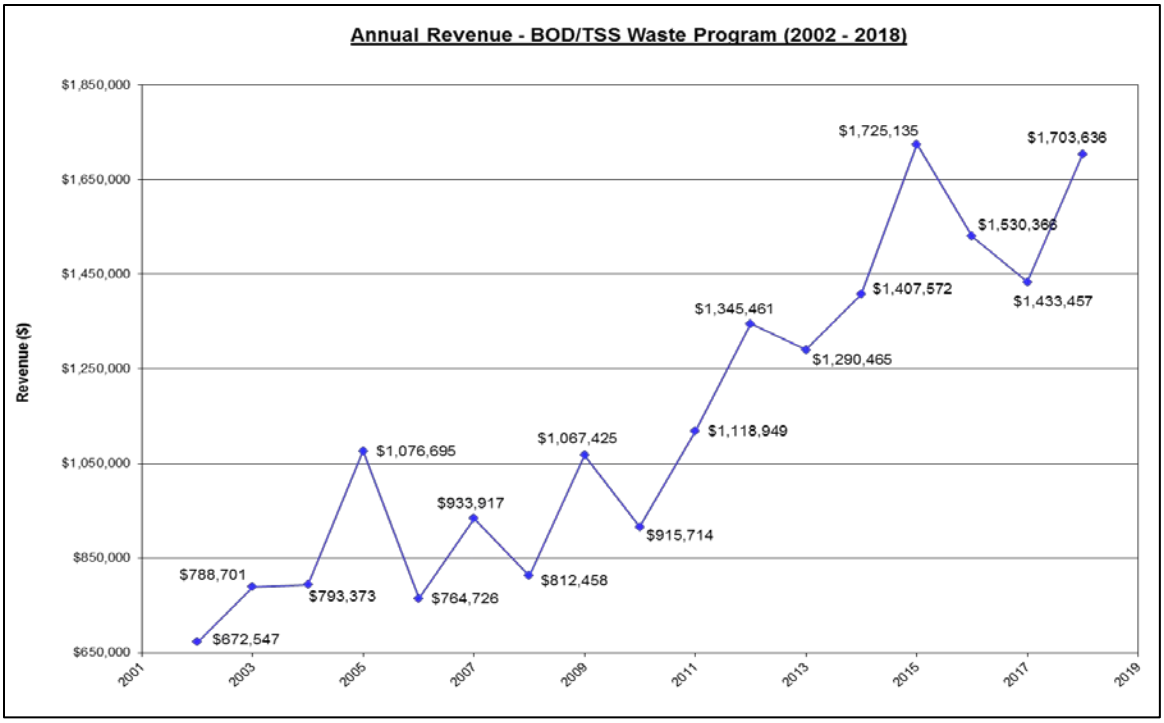


Figure 7. BOD & TSS Waste Program – Annual Revenue (2002 – 2018)

2.4 Codes of Practice

2.4.1 Background

The City of Abbotsford Bylaw No. 2664-2017, "Sewer Regulations Bylaw" and the District of Mission Bylaw No. 5033-2009, "Sewer Bylaw" defines Code of Practice (COP) as "a regulatory document, developed by the City/District which contains mandatory sanitary sewer discharge standards for specific industrial, institutional or commercial operations". It sets out requirements on minimum waste treatment, equipment maintenance, record-keeping and retention, spill prevention of hazardous, prohibited, and restricted wastes, and off-site waste management. It does not apply to a discharging operation subject to a (WWDP) unless required by the City/District engineer.

The Abbotsford/Mission Water & Sewer Commission Services has made a commitment to the development and implementation of COP sectors. In late 2018, the WSCSCP staff began streamlining its administration and data management of the COP to the same electronic application used by other permitting departments within the City of Abbotsford called AMANDA. The transition period is expected to continue in 2019 and full integration into the AMANDA workflow will be completed later in the year. Refer to Table 4 for a summary of the adoption and effective dates for the five Codes of Practice.

Table 4. Summary of Codes of Practice Adoption & Effective Dates

Codes of Practice	City of Abbotsford Adoption Date	District of Mission Adoption Date	Effective Date
Dental Operations	July 13, 2009	June 15, 2009	January 1, 2010
Photo Imaging Operations	July 13, 2009	June 15, 2009	January 1, 2010
Automotive Operations	December 19, 2011	April 23, 2012	*City of Abbotsford:* December 19, 2011 *District of Mission:* April 23, 2012
Vehicle Wash Operations	December 19, 2011	April 23, 2012	*City of Abbotsford:* December 19, 2011 *District of Mission:* April 23, 2012
Dry Cleaning Operations	December 19, 2011	April 23, 2012	*City of Abbotsford:* December 19, 2011 *District of Mission:* April 23, 2012

2.4.2 Development & Implementation Summary

2.4.2.1 Dental Operations

The Dental Operations COP is a regulation that applies to dental operations that produce non-domestic waste containing dental amalgam. It requires wastewater pretreatment using a certified amalgam separator to ensure restricted waste found in dental amalgam (e.g. mercury, silver, copper, and zinc) does not enter the sanitary sewer. Dental offices that produce liquid waste from photographic imaging containing silver are also required to comply with the COP for Photo Imaging Operations. WSCSCP staff began inspecting dental operations in early 2010 to ensure the codes were being adhered to. Refer to section 2.4.3 for a summary of inspections conducted in 2018.

2.4.2.2 Photo Imaging Operations

The Photo Imaging Operations COP is a regulation that applies to photo imaging operations that produce non-domestic waste containing silver. It requires wastewater pretreatment using silver recovery technology capable of reducing the concentration of silver in the liquid waste to 5 mg/L or less. Some examples of photo imaging operations include hospitals, veterinary clinics, chiropractic offices and dental offices. WSCSCP staff began inspecting photo imaging operations in early 2010 to ensure the codes were being adhered to. Refer to section 2.4.3 for a summary of inspections conducted in 2018.

2.4.2.3 Automotive Operations

The Automotive Operations is a regulation that applies to all automotive operations and requires installation of an oil-water separator to treat liquid waste. If work is limited to dry shop processes, the installation of the treatment works is not required but all other requirements under the COP will apply. Some examples of automotive operations include collision and mechanical repair shops, service stations, oil change operations, vehicle dealerships, vehicle maintenance facilities, vehicle recycling operations, radiator repair shops, and towing businesses. WSCSCP staff began inspecting automotive operations in early 2012 to ensure the codes were being adhered to. Refer to Section 2.4.3 for a summary of inspections conducted in 2018.

2.4.2.4 Vehicle Wash Operations

The Vehicle Wash Operations COP is a regulation that applies to all vehicle wash operations and requires installation of an oil-water separator for each manual and mechanical wash bays to treat liquid waste. Some examples of vehicle wash operations include any commercial, industrial, institutional, or public authority operation that conducts vehicle washing. WSCSCP staff began inspecting vehicle wash operations in early 2012 to ensure the codes were being adhered to. Refer to Section 2.4.3 for a summary of inspections conducted in 2018.

2.4.2.5 Dry Cleaning Operations

The Dry Cleaning COP is a regulation that applies to all dry cleaning operations that discharge waste that has come in contact with Tetrachloroethylene. It requires wastewater pretreatment using a Tetrachloroethylene-Water separator to ensure wastewater containing Tetrachloroethylene does not enter the sanitary sewer. In 2015, inspections revealed that most businesses use sealed dry cleaning machines thereby exempting them from the COP. Inspections are temporarily on hold and will resume in 2019.

2.4.3 COP Inspection Summary

In 2018, the WSCSCP staff continued inspections for businesses operating under the following COP's: dental operations, photo imaging operations, automotive operations, and vehicle wash operations. Focus was placed on confirming, equipment maintenance, record-keeping and retention, spill prevention of hazardous, prohibited, and restricted wastes, and off-site waste management. Businesses exempt from the COP are inspected every three years to confirm validity of exemption.

In late 2018, the WSCSCP began pilot testing an AMANDA software supported mobile device in its COP inspections. This allows remote access to the WSCSCP database and a real time collection of field data with the option of adding digital and electronic attachments. The transition period is expected to continue in 2019 and full integration into the AMANDA workflow will be completed later in the year.

Refer to Table 5 for the sector size estimates of active operations for each sector at the end of the year, Table 6 for a summary of all the inspection activities, Table 7 for a summary of exempt operations by sector, Table 8 for a summary of compliant businesses, and Table 9 for a summary of noncompliant businesses.

Table 5. Summary of Code of Practice Sector Size – 2018

	Sector Size		
Code of Practice	Abbotsford	Mission	Total
Automotive	306	38	344
Automotive & Vehicle Wash	10	0	10
Dental & Photo Imaging	64	11	75
Photo Imaging	156	12	168
Vehicle Wash	38	3	41
Total	574 (90%)	64 (10%)	638

Table 6. Summary of Code of Practice Inspection Activity by Municipality - 2018

	Initial Inspections		Follow-up Inspections	
Code of Practice	Abbotsford	Mission	Abbotsford	Mission
Automotive	198	31	46	10
Automotive & Vehicle Wash	7	0	1	0
Dental & Photo Imaging	45	8	3	1
Photo Imaging	46	7	1	0
Vehicle Wash	25	2	6	0
SUBTOTAL:	321 (87%)	48 (13%)	57 (84%)	11 (16%)
Total	369		68	

Table 7. Code of Practice Exempt Summary - 2018

	Exempt Operations		
Code of Practice	Abbotsford	Mission	Total
Automotive	50 (83%)	10 (17%)	60
Automotive & Vehicle Wash	0	0	0
Dental & Photo Imaging	13 (93%)	1 (7%)	14
Photo Imaging	40 (87%)	6 (13%)	46
Vehicle Wash	2 (100%)	0	2
Total	105 (86%)	17 (14%)	122

Table 8. Code of Practice In-Compliance Summary - 2018

	Inspections	
Code of Practice	Abbotsford	Mission
Automotive	135	22
Automotive & Vehicle Wash	7	0
Dental & Photo Imaging	39	8
Photo Imaging	15	1
Vehicle Wash	17	2
SUBTOTAL:	213	33
Total	246	

Table 9. Code of Practice Non-Compliance Summary - 2018

	Inspections	
Code of Practice	Abbotsford	Mission
Automotive	17	4
Automotive & Vehicle Wash	2	0
Dental & Photo Imaging	2	2
Photo Imaging	0	0
Vehicle Wash	3	1
SUBTOTAL:	24	7
Total	31	

2.4.4 Future Plans for Development

WSCSCP staff will continue conducting site inspections working with local business to ensure bylaw compliance requirements are met. In addition, inspections of dry cleaning operations will continue. In late 2018, dry cleaning businesses received site visit notifications of upcoming inspections planned for the second quarter of 2019.

Another future plan for development is full integration into the AMANDA application. The transition from paper-based communications to electronic and software solutions has shown many benefits such as reduced carbon footprint, increased savings in cost and resources, improved time management, streamlined document control, and shorter workflows. WSCSCP staff is working with the Information Technology and Communications departments to further enhance the AMANDA workflow experience. The main objective is flexibility in customizing inspection forms, letter shells, and table of non-compliance items from the WSCSCP's existing repository.

Development and implementation of additional COP for Food Services is planned to limit the amount of fats, oils & grease (FOG) from entering the sanitary sewer system. The main problem related to FOG and other food waste is plugged sewer lines and sewage pump lift stations. This COP will set out minimum effluent treatment, equipment maintenance and record keeping requirements for grease discharges.

2.5 Wastewater Discharge Permits

Wastewater Discharge Permits (WWDP) are documents issued to industries and businesses under the City of Abbotsford Sewer Regulations Bylaw No. 2664-2017 and the District of Mission Sewer Bylaw No. 5033-2009. WWDP's are issued to allow for the discharge of non-domestic waste and are subject to terms and conditions appropriate for the protection of sanitary sewers, wastewater treatment system, human or animal health and safety, and the environment. WWDPs are issued to industries, businesses or other operations that discharge significant volumes of non-domestic wastewater or wastewater having the potential to contain high concentrations of contaminants entering the sanitary sewer.

Permit processing activities involve thorough assessment of applications and supporting documentations (e.g. analytical data, sewer volumes, schematic flow diagrams, site layout, etc.) necessary in obtaining in-depth information about the customer's operations. Additionally, meetings and site visits are arranged to verify and supplement information presented in the application. It also provides an opportunity to share information between parties with the emphasis on meeting Bylaw requirements. After careful assessment and ensuring compliance requirements are satisfied, the WWDP is issued and valid for a maximum of 365 days and must be renewed no less than 30 days prior to expiration. Refer to Table 10 for a summary of all permits approved in 2018 and Figure 8 for the workflow of the Wastewater Discharge Permit application process.

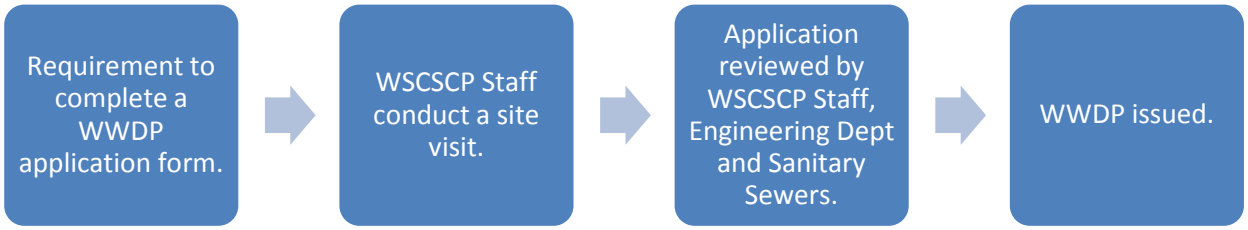


Figure 8. Wastewater Discharge Permit Application Process

New customers with wastewater that can potentially impact the conveyance system undergo an assessment process to determine whether they will be required to obtain a WWDP or not. It asks for information such as nature and type of operation carried onsite, presence of prohibited, restricted, and/or hazardous waste onsite and in the wastewater, etc. Refer to Figure 9 for the workflow of the Wastewater Discharge Assessment process.

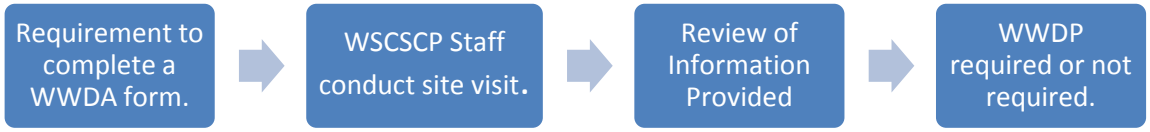


Figure 9. Wastewater Discharge Assessment Process

Table 10. Approved Wastewater Discharge Permits - 2018

Facility Type	Abbotsford	Mission
Animal Show Event	1	0
Aquatic Pool	2	0
Biotechnology	3	0
Brewery / Winery	5	4
Crematorium / Funeral Home	3	0
Dairy Product Processing	2	0
Egg Processing	1	0
Fertilizer Manufacturing Facility	1	0
Fish Hatchery	2	0
Food Services	1	0
Fruits and Vegetable Processing	6	0
Granite / Stone Cutting	2	0
Groundwater Remediation	1	0
Hospital	2	1
Industrial Laundry	1	0
Metal Finishers	3	3
Miscellaneous Food Processing	1	0
Pet Food	1	0
Poultry Hatchery	1	0
Poultry Processing	2	0
Recycling / Waste Disposal Depot	1	1
Storage	1	0
Truck Wash Facility	1	0
Subtotal	43	9
Total	52	

2.6 Contaminant Reduction

Contaminant prioritization was determined through a risk assessment (see Appendix A) of prohibited and restricted wastes listed in the Sewer Bylaw for each municipality. The initial focus of the risk assessment was on highest risk contaminants which later resulted in the identification of high-risk dischargers. Refer to Sections 2.6.1 through 2.6.4 for additional information regarding potential high-risk dischargers.

2.6.1 Hospitals

In 2018, sample monitoring of two hospitals continued. A composite sample submitted every week to an accredited external laboratory showed elevated levels of pH, Biochemical Oxygen Demand (BOD), and Total Suspended Solids (TSS). Occasionally, samples are also tested for total metals for a short period as part of the due diligence process. A grab or composite sample submitted on a random basis to an accredited external laboratory showed levels below the Bylaw limit for heavy metals. Both sample monitoring will continue in 2019. Refer to Table 11 for a summary of the monitoring program at these locations.

Table 11. Summary of Hospitals Monitoring - 2018

	Number of Samples Collected	
Parameter	Hospital #1	Hospital #2
pH	53	46
BOD		
TSS		
Total Metals	8	8
Total Collected:	99	

2.6.2 Metal Finishing Industry

In 2018, sample monitoring of metal finishing businesses continued with the addition of two new metal finishing operations to the roster of sample monitoring. A composite sample from each business was submitted on a weekly basis to an accredited external laboratory and it showed levels below the Bylaw limit for heavy metals. A reduction in monitoring at one location was achieved as a result of WSCSCP efforts in working with business to reduce their contaminant discharges.

Overall, total metals from metal finishing industries showed a decline in levels of heavy metals due to the combined efforts of businesses and the WSCSCP staff. However, pH and Total Iron continue to be contaminates of concern. WSCSCP staff will continue to work with business to reach compliance through continued monitoring and correspondence. Refer to Table 12 for a summary of samples collected and the percentage of non-compliance.

Table 12. Metal Finishing Industry Monitoring - 2018

Parameter	Number of Samples Collected	Number of Non-Compliant Samples
pH	10	8 (80%)
Total Iron	12	3 (25%)

2.6.3 Oil & Grease

Oil & Grease is a restricted waste with a Bylaw limit of 150 mg/L for total oil and grease and 15 mg/L for oil and grease hydrocarbons. A business that could potentially discharge oil and grease in their wastewater is required to install, operate, and maintain interceptors. Businesses with discharges exceeding the Bylaw limits for oil and grease are required to remove the waste immediately and submit a compliance plan outlining a remedial action and a timeline of its completion. Frequency of sample monitoring may increase until the results improve.

In 2018, WSCSCP staff continued monitoring three industrial customers identified in the 2014 study as having ongoing compliance issues with total oil and grease. Sample monitoring was reduced from weekly to an “as required” basis to minimize cost and focus on other projects that required more frequent sampling. Additionally, two other businesses were monitored after a visual examination confirmed presence of elevated levels of oil and grease. Refer to Table 13 for a summary of monitoring results.

Table 13. Oil and Grease Monitoring - 2018

Parameter	Number of Samples Collected	Range of Results
Total Oil and Grease	21	95 – 2,200 mg/L

Refer to Figure 10 for the maximum total oil and grease result from 2007 to 2018. Highest maximum concentrations were due to high grease loads from one industry. Reduction in these concentrations and others is a result of WSCSCP staff working with industry to identify and remedy the issue.

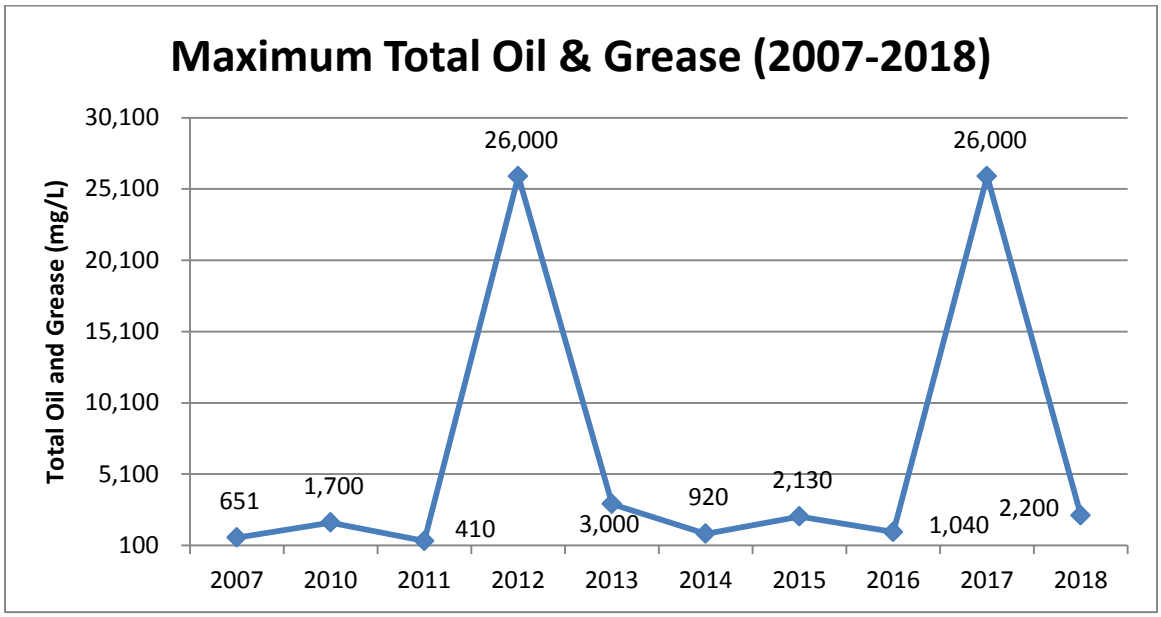


Figure 10. Maximum Total Oil and Grease from Various Industries (2007-2018)

WWDP holders included in the WSCSCP contaminant monitoring program are provided with all oil & grease monitoring data as it becomes available. Providing this data ensures the customers are aware of the quality of their wastewater discharge. Table 14 is an example of fats, oil, and grease data sent to a business in 2018.

Table 14. Example of FOG Data from a Food Processing Facility - 2018

Sample Date:	Sample Time:	Total Oil and Grease (mg/L):
21-Mar-18	11:14 AM	294
1-May-18	10:30 AM	834
8-May-18	10:50 AM	627
15-May-18	11:10 AM	128
23-May-18	9:45 AM	95
5-Jun-18	10:21 AM	343
22-Jun-18	11:42 AM	362
4-Jul-18	9:21 AM	2,200
18-Jul-18	11:24 AM	182

2.6.4 Granite & Stone Cutting Industry

In 2018, sample monitoring of two granite and stone cutting customers continued. Wastewater discharges from these businesses were analyzed for pH, TSS, and Total Metals and the results showed compliance. Sample monitoring will continue in 2019.

2.6.5 pH

The Bylaw limit for pH of wastewater is 5.5 to 9.5 pH units. This limit is designed to protect the public, municipal staff, collection system, treatment systems, and the environment. In 2018, WSCSCP staff continued to collect composite samples from businesses for pH analysis. WSCSCP staff also measured field pH on composite and grab samples at each monitoring location, and set-up continuous monitoring of pH and temperature using in-line sensors in rotation at various locations. Refer to Table 15 for a summary of the field pH compliance monitoring and Table 16 for a summary of continuous monitoring sessions completed.

Table 15. Wastewater pH Compliance Monitoring (Field Analysis) - 2018

	Number of Grab Samples Collected (for Field Analysis)	Number of Composite Samples Collected (for Field Analysis)	Number of Non-Compliant Samples
Total:	445	817	351 (28%)

Table 16. Continuous pH/Temperature Monitoring - 2018

	Number of Sessions Completed
In-line sensors (3 sensors)	84

Wastewater Discharge Permit holders included in the contaminant monitoring program receive monthly data reports from the WSCSCP that includes continuous pH monitoring data, field pH of grab and composite samples, and pH results from an external accredited laboratory along with BOD and TSS. Providing these data ensures the customers are aware of the quality of their wastewater discharge. Figure 11 is an example report from continuous monitoring completed from a business in 2018. Table 17 is an example of pH, BOD, and TSS data. All contaminant monitoring will continue in 2019.

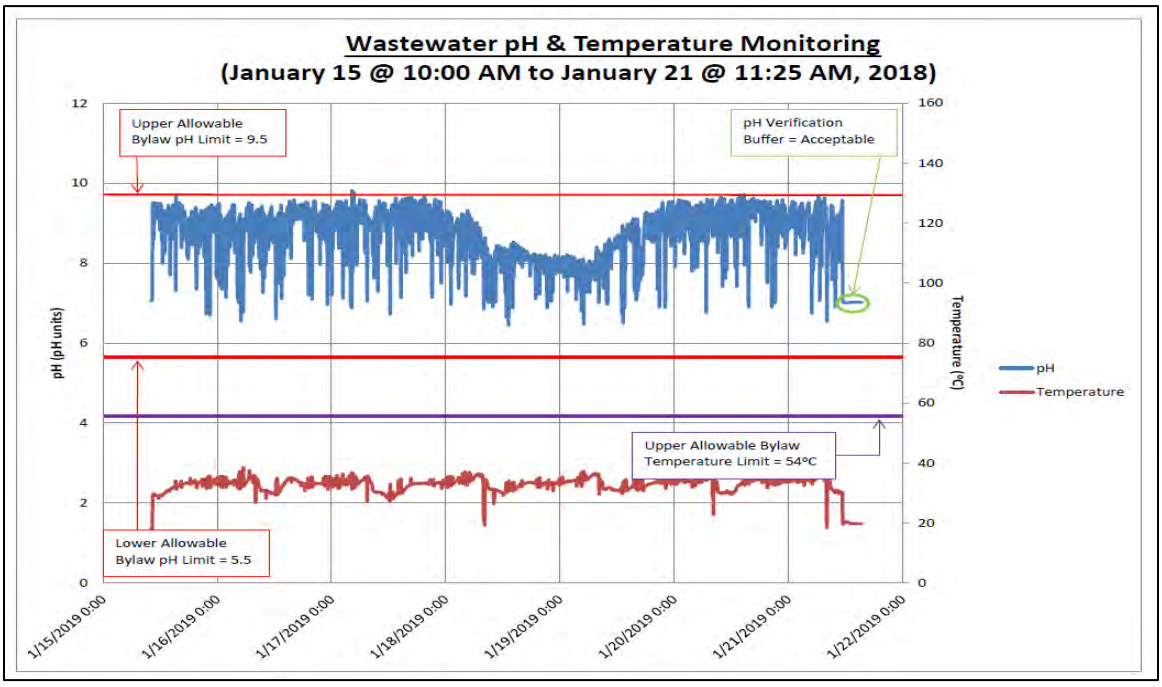


Figure 11. Example of Continuous pH and Temperature Monitoring Chart

Table 17. Example of Contaminant Monitoring at an Egg Processing Facility - 2018

Sample Date:	Data from Accredited External Laboratory			Field Data		
	pH:	BOD (mg/L):	TSS (mg/L):	Analysis Time:	Composite pH:	Grab pH:
23-Jan-18	6.3	1,730	528	11:02 AM	6.6	8.4

29-Jan-18	6.9	1,220	496	11:27 AM	8.1	11.1
5-Feb-18	3.1	980	589	11:30 AM	2.7	6.8
14-Feb-18	8.1	1,390	369	10:05 AM	9.0	9.3

Table 17. Example of Contaminant Monitoring at an Egg Processing Facility – 2018 (continued)

Sample Date:	Data from Accredited External Laboratory			Field Data		
	pH:	BOD (mg/L):	TSS (mg/L):	Analysis Time:	Composite pH:	Grab pH:
22-Feb-18	7.9	1,450	249	11:50 AM	9.1	8.2
7-Mar-18	7.3	2,090	617	8:43 AM	8.1	8.9
16-Mar-18	8.4	1,050	540	9:20 AM	9.8	11.3
20-Mar-18	6.9	1,950	588	11:35 AM	6.7	6.8
28-Mar-18	7.3	2,090	617	8:43 AM	8.1	8.9
9-Apr-18	6.9	1,950	588	11:35 AM	6.7	6.8
12-Apr-18	6.4	1,710	598	11:07 AM	6.1	11.4
16-Apr-18	6.6	1,040	957	11:16 AM	5.4	6.7
24-Jul-18	7.4	2,260	1,030	10:16 AM	6.5	9.0
7-Aug-18	6.6	1,520	754	10:58 AM	6.7	10.0
20-Aug-18	7.6	590	310	10:47 AM	8.5	11.5

2.6.6 Total Metals

There are hundreds of potentially harmful contaminants in industrial, commercial and institutional (ICI) sewer discharges if they are present in high enough concentrations. Contaminant prioritization was determined through a risk assessment of prohibited and restricted wastes listed in the sewer use bylaw for each municipality. The initial focus of the risk assessment was on highest risk contaminants first and resulted in the identification of high-risk dischargers. The WSCSCP utilizes biosolids concentrations of specific metals to determine the reduction effectiveness for these contaminants.

The effectiveness of the WSCSCP indicates 17% reduction in biosolids total metals concentrations (See Appendix B) alone since 2006. Table 18 shows the effectiveness of the WSCSCP for individual contaminants of concern is summarized in the following table.

Table 18. Effectiveness of the WSCSCP Contaminant Reduction in Biosolids (2006-2018)

Contaminant	Reduction %	2006 (mg/kg)**	2018 (mg/kg)**	Biosolids Class A Limit (mg/kg)**
Arsenic	**74%**	14.6	3.8	75
Cadmium	**42%**	2.7	1.6	20
Chromium	**58%**	80	33	1060
Cobalt	**21%**	3.5	2.7	150

Table 18. WSCSCP Contaminant Reduction in Biosolids from 2006-2018 (Continued)

Contaminant	Reduction %	2006 (mg/kg)**	2018 (mg/kg)**	Biosolids Class A Limit (mg/kg)**
Copper	**30%**	901	635	2200
Lead	**48%**	43	23	500
Mercury	**18%**	3.1	2.5	5
Molybdenum	**30%**	10.9	7.7	20
Nickel	**43%**	40	23	180
Selenium	**11%**	6.5	5.8	14
Zinc	**-1%**	996	1006	1850
Silver	**54%**	9.1	4.2	No limit

**Annual average concentration mg/kg (ppm) dry weight.

2.7 Key Manholes

In 2018, the City of Abbotsford continued to accept sanitary sewer wastewater from the City of Sumas. WSCSCP staff monitored the wastewater for Bylaw compliance purposes and for the calculation of biochemical oxygen demand (BOD) and total suspended solids (TSS) waste fees. The monitoring program consisted of weekly 24-hour composite samples collected and submitted to an accredited external laboratory for pH, BOD and TSS analysis. Sampling access was obtained through a manhole located on the trunk line running near the border on B Street near 2nd Avenue in Abbotsford. In addition to the weekly samples, one sample was collected quarterly and submitted to an accredited external laboratory for the following parameters:

- Total metals
- Hexavalent chromium
- Trivalent chromium
- Sulphide (Grab)
- Sulphate

Refer to Table 19 for a summary of the monitoring program. Monitoring of the Sumas trunk line will continue in 2019.

Table 19. Key Manhole Monitoring - 2018

Parameter	Number of Samples Collected
pH	47
BOD	
TSS	
Total Metals	4
Hexavalent Chromium	
Trivalent Chromium	
Sulphate	
Sulphide	

Total:	51

2.8 Unauthorized Discharge Events

WSCSCP staff encountered 10 separate unauthorized discharge events in 2018. Wastewater Discharge Permit holders are required to immediately notify the City as specified in Schedule "I" of the City of Abbotsford Sewer Rates and Regulations Bylaw, and to undertake appropriate remedial action. They are required to provide information such as the cause, source, and volume of the unauthorized discharge, details of the remedial action plan and timeline leading up to its completion. The quality and volume of the discharge may result in fines and penalties. Refer to Table 20 for a summary of all unauthorized discharge events that occurred in 2018.

Table 20. Unauthorized Discharge Events and Non-compliances - 2018

Discharger	Date of Event	Details of Event	Corrective Action Taken
Truck Wash Facility	January 19th	Business was informed of elevated levels of silt in their sampling manhole.	Business hired a disposal company to clean out their sampling manhole.
Poultry/Hatchery Facility	February 21st	Business was informed of elevated levels of TSS and BOD in one of their samples that showed unusual characteristics. Results from an external accredited laboratory reported TSS of 33,500 mg/L and BOD of 16,000 mg/L for the unusual sample. Customer was required to clean out their sump and to complete a compliance plan.	Business contacted WSCSCP staff immediately to inform us of their plan to comply. Their compliance plan identified the source of the high BOD & TSS as negligence in maintaining their separation tanks. They hired a disposal company to clean out the tanks and also agreed to maintain the tanks regularly. WSCSCP staff will continue to monitor this business in 2019.
Truck Wash Facility	April 20th	Business was informed of elevated levels of silt in their oil-water separator.	Business hired a disposal company to clean out their oil-water separator.
Food Processing Facility	May 10th	Business was informed of elevated levels of Molybdenum exceeding the allowable Bylaw limit of 1.0 mg/L and how it compromises the Class A biosolids produced at the JAMES Wastewater Treatment Plant. Business was required to complete a compliance plan.	Business discontinued using Molybdenum-based corrosion inhibitors in their process. WSCSCP staff will continue to monitor this business in 2019.

Table 20. Unauthorized Discharge Events and Non-compliances (continued)

Discharger	Date of Event	Details of Event	Corrective Action Taken
Fruit and Vegetable Processing Facility	July 5th	Business was informed of blocked sanitary sewer main due to grease buildup causing a sewer backup into other business properties. Business was notified of the financial repercussions of the cleanup and was required to complete a compliance plan.	Business installed an oil skimmer for their interceptor pit in September 2018. A dissolved air flotation project is scheduled for completion in 2019. WSCSCP staff will continue to monitor this business in 2019.
Food Processing Facility	August 2nd	Business was informed of an overflow of blueberries originating from their facility and discharging into the receiving environment. They were also informed that they may be contacted by a City of Abbotsford Environmental Coordinator or a conversation officer from the Ministry of Environment regarding this incident. WSCSCP staffl reminded them to manage their wastewater responsibly by ensuring that treatment works are in working order. Business was required to complete a compliance plan.	Business increased frequency of waste removal to daily instead of twice a week to avoid any possible build-up during the busy season. Their waste filter treatments are also being cleaned out once a week to avoid any blockage. WSCSCP staff will continue to monitor this business in 2019.
Poultry/Hatchery Facility	September 26th	Business was informed of pH non-compliance. Monitoring of their samples showed 27% of the samples collected in total were outside the Bylaw limit. Business was required to complete a compliance plan.	Business hired a third party that proposed using more dilute acid for pH adjustment and to avoid pH swings. WSCSCP staff will continue to monitor this business in 2019.
Food Processing Facility	November 11th	Business reported an internal plant spill due to a faulty hydraulic line resulting in ~1,380L of hydraulic fluid spill. Most of the fluid were contained and captured by their interceptor, with only <50L of waste entering the sanitary sewer. Business was required to complete a compliance plan.	Business implemented a stricter equipment maintenance and checkup by modifying their current practices. They also increased the frequency of changing hydraulic hoses.

Table 20. Unauthorized Discharge Events and Non-compliances (continued)

Discharger	Date of Event	Details of Event	Corrective Action Taken
Food Processing Facility	November 14th	Business was informed of FOG (fats, oil and grease), TSS, BOD and pH non-compliance. Monitoring of their samples showed elevated levels of FOG, TSS and BOD. It also showed that 48% of the samples collected in total were outside the Bylaw limit for pH. Customer was required to complete a compliance plan.	Business hired an engineering firm to resolve the non-compliances. They were advised to install a solids separator to accommodate the removal of FOG, TSS and BOD. In addition, pH neutralization will be added to the wastewater treatment process to meet the Bylaw's requirements. WSCSCP staff will continue to monitor this business in 2019.
Metal Finishing Facility	November 20, 2018	Business was informed of pH non-compliance. The average pH of their wastewater discharge is -8.73% outside the Bylaw limit and 80% of the samples collected in total were outside the Bylaw limit. Business was required to complete a compliance plan.	Business implemented a new pH treatment system in their process in early 2019. WSCSCP will continue to monitor this business in 2019.
Food Processing Facility	December 6, 2018	Business was informed of an accidental discharge of an estimated 50 litres of hydraulic fluid into the sanitary sewer due to a hydraulic line failure. Most of the hydraulic fluid was contained internally and received by the oil-water separator onsite.	Business implemented regular assessment of their hydraulic lines and improved their maintenance tasks. WSCSCP staff will continue to monitor this business in 2019.

3.0 Budgeting & Expenditures

Refer to Table 21 for the breakdown of the budget items and expenditures in 2018. Refer to Table 22 for the budget for 2019.

Table 21. Source Control Budgeting & Expenditures - 2018

	Budgeted Amount	Actual Expenditure
Labor	$270,479	$274,157
Equipment & Installation Costs	$23,000	$23,381
Analytical Costs	$49,000	$25,976
Total:	$342,479	$323,514

Table 22. Source Control Budget – 2019

Budget Item	Budgeted Amount
Labor	$280,226
Equipment & Installation Costs	$23,000
Analytical Costs	$49,000
Total:	$352,226

4.0 Program Planning & Development

The following is a summary of the main activities and achievements related to the management, planning, and administration of the WSCSCP in 2018:

- Continued reduction in residuals contaminants (metals) through COP inspections;
- Continued working with industries and commercial businesses to reduce oil and grease discharges;
- Continued participation with BC Wastewater Association Source Control Community of Practice meetings;
- Identified items within the Sewer Regulations Bylaw No. 2664-2017 that need to be removed, added, or amended;
- Integrated into AMANDA software for automation, management, and document control of Codes of Practice inspections; and

- Identified workplace hazards and developed and implemented the following Safe Work Procedures (SWPs):
    - Inspection of Amalgam Separators
    - Inspection of Oil-water Separators
    - Inspection of Prohibited & Restricted Wastes in Automotive, Vehicle Wash, and Photo Imaging Operations

5.0 Next Steps - 2019

- Bylaw amendments (Sewer Bylaw and Ticketing Bylaw);
- Development and implementation of the Code of Practice for Food Services;
- Adding required and recommended PPE controls based on biohazard risk assessment; and
- Integration into AMANDA software for automation, management, and document control of Wastewater Discharge Permits.

B. JAMES WWTP Laboratory

1.0 Introduction

The Joint Abbotsford Mission Environment System (JAMES) Wastewater Treatment Plant (WWTP) is co-owned by the City of Abbotsford and the District of Mission. Governance is provided through the Abbotsford/Mission Water and Sewer Commission (WSC), which is comprised of elected representatives and employees of the City of Abbotsford and the District of Mission. The City of Abbotsford is the operator of the JAMES WWTP including the laboratory. The laboratory is part of the Utilities Environment division within the Engineering / Project Management / Solid Waste and Environmental Services department of the City of Abbotsford.

The JAMES WWTP operates and monitors liquid and solid discharges under the federal Wastewater Systems Effluent Regulations (WSER), the provincial Municipal Wastewater Regulation (MWR), and the provincial Organic Matter Recycling Regulations (OMRR). In addition, the JAMES WWTP is required to report data annually to the National Pollutant Release Inventory (NPRI) under the Canadian Environmental Protection Act, 1999 (CEPA 1999). The laboratory performs Quality Assurance / Quality Control (QA/QC) testing as required by each regulation and performs a variety of sampling and analysis for special projects and other plant performance requirements. Customers for the JAMES WWTP Laboratory include, but are not limited to, the JAMES WWTP Operations, City of Abbotsford, District of Mission, British Columbia Ministry of Environment, and Environment Canada.

Samples are collected and analyzed in the laboratory for the following objectives:

- To monitor plant performance;
- To monitor plant influent and effluent quality;
- To monitor quality of biosolids produced; and
- To meet WSER, MWR, OMRR and NPRI requirements.

1.1 CALA Proficiency

Proficiency testing (PT) is a special type of inter-laboratory comparison study; a quality assurance tool that enables laboratories to monitor their performance and compare their results against similar laboratories. CALA's Proficiency Testing Program consists of four samples per study, two studies per year. The analyte concentrations in these samples are unknown to the participating laboratory, which analyses the samples and reports the results for evaluation. Successful participation is also used as one of the surveillance tools in support of laboratory accreditation to ISO/IEC 17025.

The CALA PT program is accredited by the American Association for Laboratory Accreditation (A2LA) and has recently been acknowledged to be fully conformant to the new international PT standard ISO/IEC 17043:2010. In June 2018, the laboratory's Pathogen and Toxin license was cancelled after an internal pathogen risk assessment showed that the new biosafety requirements are outside the operational and technical capacity of the laboratory. As a result, the JAMES Laboratory stopped participating in the Fecal Coliform proficiency testing.

Here is a summary of all parameters the JAMES WWTP Laboratory participates in:

- Ammonia
- Biochemical Oxygen Demand
- Total Suspended Solids
- pH

In March 2018, the results for Ammonia were unacceptable due to an error in the calculation of the reported Nitrogen content. As a corrective action, an excel spreadsheet with a predefined formula was developed to verify manual calculation.

Refer to Table 23 for a summary of the results from the PT studies completed in 2018.

Table 23. Proficiency Testing (PT) Results – 2018

Parameter:	March	October
Ammonia	Unacceptable	Acceptable
TSS	Acceptable	Acceptable
BOD	Acceptable	Acceptable
pH	Acceptable	Acceptable
Fecal Coliforms	Acceptable	Not applicable

2.0 Laboratory Activities & Accomplishments – 2018

2.1 Internal Laboratory Analysis

Internal laboratory analysis performed at the JAMES WWTP Laboratory included the following parameters in 2018:

- Acids/Alkalinity of Digested Sludge;
- Ammonia;
- Biochemical Oxygen Demand (BOD);
- Carbonaceous Biochemical Oxygen Demand (cBOD);
- Chemical Oxygen Demand (COD);
- Fecal Coliforms *(until June 2018)*;
- pH;
- Settleable Solids (SS);
- Total Chlorine;
- Total Solids (TS);
- Total Suspended Solids (TSS); and
- Volatile Solids (VS).

Table 24 provides a summary of the overall number of tests performed in the JAMES WWTP Laboratory in 2018. The significant increase in non-routine samples ensures that the laboratory meets the operational needs of the JAMES Plant. The frequency of Acids/Alkalinity testing of the digester samples increased to daily from three times weekly.

Table 24. Annual Laboratory Analysis Summaries – 2018

Type of Sample:	# of Tests Performed:	% Change (2017 vs 2018):
Routine	12,860	+12.9%
Non-Routine	310	+101.3%
Quality Control (QA/QC)	8,564	+34.8%
CALA PT	36	-10%
Total:	21,770	+21.1%

JAMES Laboratory staff continued to follow test methods documented in the JAMES WWTP Methods Manual for all analyses performed in the JAMES WWTP Laboratory. Table 25 provides a summary of the test methods followed in 2018.

Table 25. Summary of Test Methods at the JAMES WWTP Laboratory - 2018

SOP Name:	Document #:
Test Method for the Determination of pH	TM2014-01-V3
Test Method for the Determination of Ammonia by SIE	TM2014-02-V3
Test Method for the Determination of Total Suspended Solids	TM2014-03-V3
Test Method for the Determination of Total Solids	TM2014-04-V4
Test Method for the Determination of Settleable Solids	TM2014-05-V1
Test Method for the Determination of Volatile Solids	TM2014-06-V3
Test Method for the Determination of Biochemical Oxygen Demand	TM2014-07-V3
Test Method for the Determination of Chemical Oxygen Demand	TM2014-08-V2
Test Method for the Determination of Fecal Coliforms by Membrane Filtration	TM2014-09-V5
Test Method for the Determination of Total Chlorine	TM2014-10-V3
Test Method for the Determination of Acid/Alkalinity of Digested Sludges Using Manual Titration	TM2014-11-V5
Method for the Calibration of Thermometers for Incubators and Water Baths	TM2014-12-V1
Method for the Use of Automatic Pipettes	TM2014-13-V1
Method for the Sample Collection and Acceptance Criteria for Composite Samples	TM2014-14-V1

Table 25. Summary of Test Methods at the JAMES WWTP Laboratory (continued)

SOP Name:	Document #:
Method for the Operation and Maintenance for the ELGA Purelab Unit	TM2014-15-V2
Method for the Use and Maintenance of the Emergency Shower and Eyewash Station	TM2014-16-V1
Method for Biosolids and Sludge Grab Sample Collection for Microbiological Analysis	TM2014-17-V1
Method for Effluent & Reclaim Grab Sample Collection for Microbiological Analysis	TM2014-18-V1
Method for Biofilter Sample Collection for Total Solids Analysis	TM2014-19-V1
Method for SCT MLSS Sample Collection for Total Suspended Solids Analysis	TM 2014-20-V1

2.1.1 Acid/Alkalinity of Digested Sludge Analysis

Volatile Acids/Alkalinity analysis is an indicator for potential upset in the digester. Volatile acids are short chain organics produced by the breakdown of various substances such as carbohydrates, proteins, and fats in the digestion process at a wastewater treatment plant. Alkalinity is the measure of the ability of a sample to neutralize acids. Excessive concentrations of volatile acids in a digester can have a negative effect on treatment processes. Too low of concentrations of alkalinity in a digester can also negatively affect the treatment processes. The "Test Method for the Determination of Acid/Alkalinity of Digested Sludge" (TM2014-11-V5) is followed for this analysis. Refer to Tables 26 and 27 for the summaries of the annual Acid/Alkalinity analysis performed in the JAMES WWTP Laboratory in 2018.

Table 26. JAMES WWTP Laboratory Total Alkalinity Analysis Summaries – 2018

Sample Location:	# Tests Performed:	% Change in # of Tests Performed (2017 vs 2018):	Average Result (mg/L):
Digester #1	249	+9.7%	3,463
Digester #2	249	+9.7%	3,510
Digester #3	249	+77.9%	3,260
SBR Initial	52	+1.9%	3,330
SBR Final	54	+17.4%	372
QC Samples	263	+20.6%	-
Total Samples Analyzed:	911	-	-

Table 27. JAMES WWTP Laboratory Volatile Acids Analysis Summary – 2018

Sample Location:	# Tests Performed:	Average Result (mg/L):
Digester #1	249	342
Digester #2	249	348
Digester #3	249	391
Total # of Volatile Acids Tests Performed:	747	-

2.1.2 Ammonia Analysis

Ammonia is naturally present in wastewaters and produced by the deamination of organic nitrogen-containing compounds and by hydrolysis of urea. This method is applicable to wastewater samples with a concentration up to 100 mg/L. Ammonia analysis is performed in the JAMES WWTP Laboratory using a Thermo Scientific Ammonia Ion Selective Electrode and an Accumet XL250 pH/Ion Meter. The "Test Method for the Determination of Ammonia by Selective Ion Electrode" (TM2014-02-V3) is followed for this analysis and is based on Method 4500-NH3 D. Ammonia-Selective Electrode in the Standard Methods for the Examination of Water and Wastewater, 22nd Edition. Refer to Table 28 for the summary of the annual ammonia analysis performed in the JAMES WWTP Laboratory.

Table 28. JAMES WWTP Laboratory Ammonia Analysis Summaries – 2018

Sample Location / Type:	# Tests Performed:	Average Result (mg/L):
Combined Influent	307	31.8
Abbotsford Influent	296	31.2
Mission Influent	311	26.8
Primary Effluent	86	41.0
Trickling Filter Effluent	90	15.9
Final Effluent	318	12.9
SBR Initial	83	1,097.7
SBR Final	77	459.4
Final Effluent Grab	3	15.5
CALA PT Samples	8	-
QC Samples	704	-
Total # of Ammonia Tests Performed:	2,283	-

2.1.3 BOD & cBOD Analysis

The Biochemical Oxygen Demand (BOD) test is an empirical test used to determine the oxygen requirements of wastewaters and effluents using standardized laboratory procedures. The test has its widest application in measuring waste loadings to treatment plants and in evaluating the BOD-removal efficiency of such treatments systems. BOD analysis is performed in the JAMES WWTP Laboratory using an Accumet Self-Stirring DO Probe and an Accumet XL600 Dissolved Oxygen Meter. Samples are placed in a Fisher Scientific Brand incubator at 20^{o}C. The "Test Method for the Determination of Biochemical Oxygen Demand" (TM2014-07-V5) is followed for this analysis and is based on Method 5210 B. 5-Day BOD Test in the Standard Methods for the Examination of Water and Wastewater, 22nd Edition.

In 2018, the requirement for BOD tests was limited to the Sequence Batch Reactor samples (SBR Initial & SBR Final), Seed (Primary Effluent Grab), CALA Proficiency Testing samples and its accompanying Quality Control samples. Oxidation of reduced forms of nitrogen, such as ammonia and organic nitrogen, can be used by microorganisms and exert nitrogenous demand. Some BOD analyses completed in the JAMES WWTP Laboratory involve the use of nitrification inhibitors and are reported as Carbonaceous Biochemical Oxygen Demand (cBOD) to differentiate from uninhibited BOD results. Refer to Tables 29 and 30 for the summaries of annual BOD and cBOD analysis performed in the JAMES WWTP Laboratory.

Table 29. JAMES WWTP Laboratory cBOD Analysis Summaries – 2018

Sample Location / Type:	# Tests Performed:	Average Result (mg/L):
Combined Influent	258	262
Combined Influent (Soluble)	57	89
Abbotsford Influent	248	289
Mission Influent	261	168
Primary Effluent	75	236
Primary Effluent (Soluble)	53	128
Trickling Filter Effluent	73	48
Trickling Filter Effluent (Soluble)	53	4
Final Effluent	266	5
Final Effluent (Soluble)	57	2
SBR Initial	58	89
SBR Final	43	84
QC Samples	397	-
Total # of Tests Performed:	1,899	-

Table 30. JAMES WWTP Laboratory BOD Analysis Summaries – 2018

Sample Location / Type:	# Tests Performed:	Average Result (mg/L):
SBR Initial	53	122
SBR Final	43	84
Seed	103	250
CALA PT Samples	8	-
QC Samples	668	-
Total # of Tests Performed:	867	-

2.1.4 COD Analysis

The Chemical Oxygen Demand (COD) test is a measure of the oxygen equivalent of the organic matter content of a sample that is susceptible to oxidation by a strong chemical oxidant. COD analysis is performed in the JAMES WWTP Laboratory using a HACH COD reactor, HACH COD2 Mercury-Free COD Reagent (0-1500ppm range) and a HACH D/R 2000 Direct Reading Spectrophotometer. The "Test Method for the Determination of Chemical Oxygen Demand" (TM2014-08-V1) is followed for this analysis and is based on Method 5220 D. Closed Reflux, Colorimetric Method in the Standard Methods for the Examination of Water and Wastewater, 22nd Edition. In 2018, only CALA Proficiency Testing samples and its accompanying Quality Control samples undergo COD analysis. Refer to Table 31 for the summary of annual COD analysis performed in the JAMES WWTP Laboratory.

Table 31. JAMES WWTP Laboratory COD Analysis Summaries – 2018

Sample Location / Type:	# Tests Performed:
CALA PT Samples	8
QC Samples	6
Total # of COD Tests Performed:	14

2.1.5 Fecal Coliforms Analysis

Fecal Coliforms are facultative anaerobic, rod-shaped, non-sporulating bacteria. Membrane filtration is the method of choice for the analysis of fecal coliforms in water. Fecal Coliform analysis is performed in the JAMES WWTP Laboratory using 0.45um, white, 47mm, gridded, sterile filters in combination with a sterilized filtering apparatus. The "Test Method for the Determination of Fecal Coliforms by Membrane Filtration" (TM2014-09-V5) is followed for this analysis and is based on Method 9222 D. Fecal Coliform Membrane Filter in the Standard Methods for the Examination of Water and Wastewater, 22nd Edition. In June 2018, the laboratory's Pathogen and Toxin license was cancelled after an internal pathogen risk assessment showed that the new biosafety requirements are outside the operational and technical capacity of the laboratory. As a result, the JAMES WWTP Laboratory submitted all fecal coliform samples to external laboratory and discontinued all in-house fecal coliform testing. Refer to Table 32 for the summary of the annual Fecal Coliforms analysis performed in the JAMES WWTP Laboratory.

Table 32. JAMES WWTP Laboratory Fecal Coliforms Analysis Summaries – 2018

Sample Location:	# Tests Performed:	Average Result (CFU/100mL):
Final Effluent	18	6
Reclaim	18	0
QC Samples	91	-
Total # of Fecal Coliforms Tests Performed:	127	-

2.1.6 pH Analysis

Measurement of pH is one of the most important and frequently used tests in water chemistry. Practically every phase of water supply and wastewater treatment is pH dependent. pH is defined as the negative log of the concentration of hydrogen ions, or pH = -log [H+]. pH Analysis is performed in the JAMES WWTP Laboratory using a ROSS Sure-flow pH Electrode (Orion 9109WP) and an Accumet Model 25 pH/ion meter. Calibration of the electrode uses three buffers (pH 4, 7 and 10) and a pH 8 control standard validates the calibration. The "Test Method for the Determination of pH" (TM2014-01-V3) is followed for this analysis and is based on Method 4500-H+ pH Value in the Standard Methods for the Examination of Water and Wastewater, 22nd Edition. Refer to Table 33 for the summary of the annual pH analysis performed in the JAMES WWTP Laboratory.

Table 33. JAMES WWTP Laboratory pH Analysis Summaries – 2018

Sample Location / Type:	# Tests Performed:	Average Result (mg/L):
Combined Influent	310	7.2
Abbotsford Influent	299	7.3
Mission Influent	314	7.1
Primary Effluent	87	7.0
Trickling Filter Effluent	91	7.3
Final Effluent	322	7.3
Final Effluent Grab	326	6.9
SBR Initial	84	7.8
SBR Final	80	6.4
Digester #1	230	7.4

Table 33. JAMES WWTP Laboratory pH Analysis Summaries (continued)

Sample Location / Type:	# Tests Performed:	Average Result (mg/L):
Digester #2	230	7.4
Digester #3	230	7.4
Seed (for BOD)	114	6.7
QC Samples	2,284	-
CALA PT Samples	8	-
Total # of pH Tests Performed:	5,009	-

2.1.7 Settleable Solids Analysis

Settleable Solids is the material in a sample that settles out of suspension within a defined period. Settleable Solids analysis is performed in the JAMES WWTP Laboratory using Imhoff glass cones. The "Test Method for the Determination of Settleable Solids" (TM2014-05-V1) is followed for this analysis and is based on Method 2540 F. Settleable Solids in the Standard Methods for the Examination of Water and Wastewater, 22nd Edition. Refer to Table 34 for the summary of the annual Settleable Solids analysis performed in the JAMES WWTP Laboratory.

Table 34. JAMES WWTP Laboratory Settleable Solids Analysis Summaries - 2018

Sample Location / Type:	# Tests Performed:	Average Result (mg/L):
Combined Influent	311	17.2
Final Effluent	323	0.0
Total # of SS Tests Performed:	634	-

2.1.8 Total Chlorine Analysis

Chlorine is a disinfectant at the JAMES WWTP to treat the plant effluent prior to discharging to the Fraser River. Chlorine disinfects the effluent by destroying target organisms through oxidizing cellular material. Maintaining sufficient levels of chlorine during the chlorination process is important in order to ensure successful treatment of the effluent. At the end of the chlorination process, the addition of sulphur dioxide (SO_2) to the effluent stream removes any remaining chlorine before the effluent is discharged to the Fraser River. Total Chlorine analysis is performed in the JAMES WWTP Laboratory using the HACH AutoCAT 9000. The HACH AutoCAT 9000 is an automated chlorine amperometric end point titration instrument. The "Test Method for the Determination of Total Chlorine" (TM2014-10-V3) is followed for this analysis.
Refer to Table 35 for the summary of the annual Total Chlorine analysis performed in the JAMES WWTP Laboratory.

Table 35. JAMES WWTP Laboratory Total Chlorine Analysis Summaries - 2018

Sample Location / Type:	# Tests Performed:	Average Result (mg/L):
Final Effluent – Before SO_2	731	0.200
Final Effluent – After SO_2	731	BDL
Reclaim	368	0.630
QC Samples	100	-
Total # of Total Chlorine Tests Performed:	1,930	-

Note: "BDL" means result is below the detection limit of the instrument.

2.1.9 Total Solids Analysis

Total Solids (TS) is the residue left in the vessel after evaporation of a sample and its subsequent drying in an oven at a defined temperature. Total Solids analysis is performed in the JAMES Treatment Plant Laboratory using disposable aluminum pans. The "Test Method for the Determination of Total Solids" (TM2014-04-V4) is followed for this analysis and is based on Method 2540 B. Total Solids Dried at 103-105^{o}C in the Standard Methods for the Examination of Water and Wastewater, 22nd Edition. Refer to Table 36 for the summary of the annual Total Solids analysis performed in the JAMES WWTP Laboratory.

Table 36. JAMES WWTP Laboratory Total Solids Analysis Summary - 2018

Sample Location / Type:	# Total Solids Tests Performed:	Average Result (%):
Digester #1	73	1.36
Digester #2	73	1.31
Digester #3	74	1.45
Raw Sludge	73	3.43
Waste Solids Thickener (WST)	72	4.34
Waste Bottom Sludge (WBS)	72	0.56
WST Filtrate	72	0.056
Polymer	71	0.56
Bottom Center	70	1.39
Centrifuge Biosolids	70	23.82
Centrate	70	0.18

Table 36. JAMES WWTP Laboratory Total Solids Analysis Summary (continued)

Sample Location / Type:	# Total Solids Tests Performed:	Average Result (%):
Biofilter #1	50	28.97
Biofilter #2	49	42.29
Biofilter #3	49	33.24
QC Samples	455	-
Total Solids Tests Performed:	1,393	-

2.1.10 Volatile Solids Analysis

The residue obtained from the *Test Method for the Determination of Total Solids (TS)* (TM2014-04-V1) is ignited to constant weight at 550°C. The remaining solids represent the fixed total, dissolved or suspended solids while the weight lost on ignition is the volatile solids. The determination is useful in control of wastewater treatment plant operation because it offers a rough approximation of the amount of organic matter present in the solid function of wastewater, activated sludge, and industrial waste. The JAMES WWTP Laboratory uses the *Standard Methods for the Examination of Water and Wastewater, 22nd edition, Method 2540 E Fixed and Volatile Solids Ignited at 550°C.* Refer to Table 37 for the summary of annual Volatile Solids analysis performed in the JAMES WWTP Laboratory.

Table 37. JAMES WWTP Laboratory Volatile Solids Analysis Summary – 2018

Sample Location / Type:	# Volatile Solids Tests Performed:	Average Result (%):
Digester #1	73	76.3
Digester #2	73	76.0
Digester #3	74	77.8
Raw Sludge	73	91.7
Waste Bottom Sludge (WBS)	72	83.7
QC Samples	449	-
Total Tests Performed:	814	-

2.1.11 Total Suspended Solids (TSS) Analysis

The type of filter holder, the pore size, porosity, area, and thickness of the filter and the physical nature, particle size, and amount of material deposited on the filter are the principal factors affecting separation of suspended from dissolved solids. Total Suspended Solids (TSS) is the portion that is retained on the filter. TSS analysis is performed in the JAMES WWTP Laboratory using Fisher brand Glass Fiber Filter Circles G6. The "Test Method for the Determination of Total Suspended Solids (TM2014-03-V3)" is followed for this analysis and is based on Method 2540 D. Total Suspended Solids Dried at 103-105°C in the Standard Methods for the Examination of Water and Wastewater, 22nd Edition. Refer to Table 38 for the summary of the annual TSS analysis performed in the JAMES WWTP Laboratory.

Table 38. JAMES WWTP Laboratory TSS Analysis Summary - 2018

Sample Location / Type:	# Tests Performed:	Average Result (mg/L):
Combined Influent	301	312
Abbotsford Influent	290	325
Mission Influent	304	201
Primary Effluent	88	213
Trickling Filter Effluent	91	179
Final Effluent	311	9
SCT #1	40	2,130
SCT #2	40	2,115
QC Samples	777	-
CALA PT Samples	8	-
Total # of TSS Tests Performed:	2,250	-

2.1.12 Additional Analysis Projects

JAMES WWTP Laboratory receives requests for additional analysis from the JAMES WWTP Operations and Drainage & Wastewater engineers. The data is used for future planning and project management at the JAMES Wastewater Treatment Plant. In 2018, the JAMES WWTP Laboratory completed two additional analysis projects. Project 2018-042 eventually turned into a permanent routine test performed weekly as requested by the JAMES Plant's manager. Refer to Table 39 for a summary of all the additional analyses performed in the JAMES WWTP Laboratory.

Table 39. JAMES WWTP Laboratory Additional Analysis Project Summary - 2018

Additional Analysis Project Name:	Additional Analysis:	# Tests Performed:	Period and Length of Project:
2018-042 Total Alkalinity	Total Alkalinity	16	January (4 weeks)
2018-043 Secondary Clarifier	Total Alkalinity and pH	18	January (1 day)
Total Additional Analyses Performed:	-	34	-

2.2 External Laboratory Projects

External laboratory analyses performed by an accredited external laboratory in 2018 include the following projects:

- Project #1 - Weekly Influent / Effluent
- Project #2 - Bi-Monthly Influent / Effluent
- Project #3 - Effluent Toxicity (LC50)
- Project #4 – JAMES Laboratory Water
- Project #5 – Total Dissolved Solids
- Project #6 – WSER Samples
- Project #7 – Weekly Biosolids
- Project #8 – Monthly Biosolids
- Project #9 – Key Manhole Project
- Project #10 – Metal Finishers
- Project #11 – Granite / Stone Cutting
- Project #12 – BOD & TSS Waste Program
- Project #13 – Biosolids Quality Control
- Project #14 – Total Oil & Grease
- Project #15 – Total Metals
- Project #16 – Weekly Fecal Coliform

Refer to Sections 2.2.1 to 2.2.9 for detailed information regarding the above-listed projects. Table 40 gives an overall summary of the number of samples submitted to an external laboratory in 2018.

Table 40. Annual External Laboratory Sample Submission Summary – 2018

Samples Submitted to:	# of Samples Submitted in:	% Change (2017 vs 2018):
Source Control Samples	1,406	+2.93%
JAMES WWTP Samples	428	+2.39%

2.2.1 Project #1 - Weekly Influent & Effluent Project

On a weekly basis, samples of the combined influent flow entering the JAMES WWTP and of the final effluent leaving the JAMES WWTP are collected. These samples are submitted to an external laboratory for total metals analysis. Refer to Table 41 for the summary of the annual Weekly Influent and Effluent Project. Sampling for this project will continue in 2019.

Table 41. Weekly Influent & Effluent Project Summary (External Lab Data) – 2018

	Annual Average Result (mg/L)	
Analyte:	Combined Influent	Final Effluent
Total Hardness ($CaCO_3$)	68.0	62.9
Ortho-Phosphate (P)	-	5.4
Aluminum	0.4	0.06
Antimony	0.0004	0.0003
Arsenic	0.001	0.0008
Barium	0.03	0.01
Beryllium	<0.0001	0.002
Bismuth	0.003	0.0005
Boron	0.1	0.1
Cadmium	0.0001	0.00004
Calcium	19.2	17.5
Chromium	0.003	0.0008
Cobalt	0.0005	0.0003
Copper	0.09	0.04
Iron	0.9	0.3
Lead	0.002	0.001
Lithium	0.002	0.002
Magnesium	4.8	4.7
Manganese	0.09	0.07
Mercury	0.0001	0.00003
Molybdenum	0.002	0.001
Nickel	0.004	0.003
Phosphorus	7.0	6.2
Potassium	19.6	19.9
Selenium	0.001	0.0003
Silicon	5.3	5.0
Silver	0.0003	0.00008
Sodium	53.0	61.0
Strontium	0.08	0.07
Sulphur	9.0	9.2

Table 41. Weekly Influent and Effluent Project Summary (continued)

Analyte:	Combined Influent	Final Effluent
Tellurium	0.0004	<0.0005
Thallium	0.00003	0.00005
Thorium	<0.0001	<0.0001
Tin	0.002	0.0009
Titanium	0.03	0.004
Uranium	0.00009	0.0002
Vanadium	0.001	0.0007
Zinc	0.1	0.06
Zirconium	0.002	0.0009
Total # of Samples Submitted:	52	52

2.2.2 Project #2 - Bi-Monthly Influent & Effluent Project

Every two months composite and grab samples of the JAMES WWTP Combined Influent and the JAMES WWTP Final Effluent are collected. These samples are submitted to an external laboratory for an extended list of analysis including total metals, dissolved metals, nutrients and other inorganic and organic parameters. This analysis is completed as part of the requirements under the MWR. Refer to Table 42 for the summary of the annual Bimonthly Influent & Effluent Project. Sampling for this project will continue in 2019.

Table 42. Bimonthly Project Summary (External Laboratory Data) – 2018

	Annual Average Result (mg/L)	
Analyte:	Combined Influent	Final Effluent
Total Kjeldahl Nitrogen (TKN)	43.1	15.6
Nitrate	<0.001	10.8
Nitrite	<0.005	0.8
Total Phosphorus	5.9	5.7
Total Hardness (Dissolved, as $CaCO_3$)	52.3	60.3
Dissolved Phosphorus	3.7	5.7
Dissolved Aluminum	0.1	0.1
Dissolved Antimony	0.0002	0.0003
Dissolved Arsenic	0.0007	0.0007
Dissolved Barium	0.2	0.3
Dissolved Beryllium	<0.0001	<0.0001
Dissolved Bismuth	0.0003	0.0008
Dissolved Boron	0.1	0.1
Dissolved Cadmium	0.0001	0.0001
Dissolved Calcium	14.4	16.9
Dissolved Chromium	0.001	0.0008

Table 42. Bimonthly Project Summary (continued)

	Annual Average Result (mg/L)	
Analyte:	Combined Influent	Final Effluent
Dissolved Cobalt	0.0002	0.0003
Dissolved Copper	0.05	0.07
Dissolved Iron	0.3	0.2
Dissolved Lead	0.001	0.005
Dissolved Lithium	0.002	0.002
Dissolved Magnesium	4.0	4.4
Dissolved Manganese	0.06	0.06
Dissolved Mercury	<0.00001	<0.00001
Dissolved Molybdenum	0.001	0.001
Dissolved Nickel	0.002	0.002
Dissolved Phosphorus	3.7	5.7
Dissolved Potassium	18.3	20.0
Dissolved Selenium	0.0003	0.0003
Dissolved Silicon	4.5	4.7
Dissolved Silver	0.0001	0.0001
Dissolved Sodium	48.8	50.5
Dissolved Strontium	0.06	0.07
Dissolved Sulfur	7.3	8.5
Dissolved Tellurium	<0.0005	<0.0005
Dissolved Thallium	<0.00002	<0.00002
Dissolved Tin	0.0009	0.0008
Dissolved Titanium	0.008	0.01
Dissolved Uranium	<0.00002	<0.00002
Dissolved Vanadium	<0.001	<0.001
Dissolved Zinc	0.1	0.2
Dissolved Zirconium	0.002	0.0007
Total # of Samples Submitted	6	6

2.2.3 Project #3 - Effluent Toxicity Project

Effluent Toxicity Project involves collecting 40 litres of composite sample of the JAMES WWTP Final Effluent and submitting it to an external laboratory for LC50 analysis every two months. An LC50 analysis determines the concentration of JAMES WWTP Final Effluent that will kill 50% of the test subjects (usually rainbow trout) when administered as a single exposure. LC50 analysis determines the relative acute toxicity of the JAMES WWTP Final Effluent when discharged to the Fraser River. This analysis is completed as part of the requirements under the provincial Municipal Sewage Regulations (MSR).

A grab sample of the Final Effluent with pH stabilization is also included in the project. The procedure for pH stabilization during the testing of acute lethality of wastewater effluent to rainbow trout "EPS 1/RM/50" by Environment Canada is the reference method used for this analysis. This test addresses the potential for residual ammonia toxicity in wastewater effluent due to pH drift. Refer to Table 43 for the summary of the annual Effluent Toxicity Project. Sampling for this project will continue in 2019.

Table 43. Effluent Toxicity Project Summary (External Laboratory Data) – 2018

Analyte:	Final Effluent – Average Results (@ 100% vol.)	
LC50 (rainbow trout)	Failed	Passed
Total # of Samples Submitted:	0	10

2.2.4 Project #4 - JAMES WWTP Lab Water Project

Samples of the JAMES WWTP Laboratory reagent water are collected and submitted to an external laboratory for analysis on a monthly basis. The reagent water is analyzed to confirm the supply meets "high quality" specifications given in Table 1080 II of the latest edition of Standard Methods for the Determination of Water and Wastewater. Refer to Table 44 for the summary of the annual JAMES WWTP Laboratory Water Project. Sampling for this project will continue in 2019.

Table 44. Laboratory Water Project Summary (External Laboratory Data) – 2018

Parameter:	Units:	Average Result:	Limit Specified in Standard Methods:
Conductivity	umho/cm	<0.1	<0.1 umho/cm at 25°C
Silica	mg/L	<0.05	<0.05 mg/L
Resistivity	megohm-cm	15	>10 megohm-cm at 25°C
Total # of Samples Submitted:	-	12	-

2.2.5 Project #5 - Total Dissolved Solids (TDS) Project:

On a weekly basis, a grab sample of the JAMES WWTP Centrate is collected and submitted to an external laboratory for TDS analysis. Refer to Table 45 for a summary of the annual TDS Centrate Project. Sampling for this project will continue in 2019.

Table 45. Total Dissolved Solids Project Summary (External Laboratory Data) – 2018

	Annual Average Result (mg/L)
Parameter	SBR Initial (Centrate)
TDS	957
Total # of Samples Submitted:	51

2.2.6 Project #6 - WSER Effluent Sample Project

On a weekly basis, a total of three composite samples of the JAMES WWTP Final Effluent are collected and submitted to an external laboratory for cBOD, TSS, Total Ammonia, Unionized Ammonia, and pH analyses as required under the Wastewater Systems Effluent Regulations. Refer to Table 46 for a summary of the annual WSER Effluent Project. Sampling for this project will continue in 2019.

Table 46. WSER Effluent Project Summary (External Laboratory Data) – 2018

	Annual Average Result (mg/L)
Parameter	Final Effluent
cBOD	5.3
TSS	9.6
Total Ammonia	10.2
Unionized Ammonia	0.1
pH	7.4
Total # of Samples Submitted:	150

2.2.7 Project #7 - Weekly Biosolids Project

Biosolids composite samples are collected each week and submitted to an external laboratory for total metals analysis. The analytical data is reviewed to ensure all total metals concentrations meet the “Class A” biosolids requirements set out under the provincial Organic Matter Recycling Regulations (OMRR). Refer to Table 47 for the summary of the annual Weekly Biosolids Project.

Table 47. Weekly Biosolids Project Summary (External Laboratory Data) – 2018

Analyte:	Average Results (mg/kg):	OMRR Limit (mg/kg):
Arsenic	3.99	75
Cadmium	1.56	20
Chromium	33.4	1060
Cobalt	2.72	150
Copper	634	2200
Lead	22.8	500
Mercury	2.55	5
Molybdenum	7.67	20
Nickel	22.7	180
Selenium	5.78	14
Silver	4.22	-
Zinc	1,005	1850
Total # of Samples Submitted:	50	-

Refer to Figures 12 through 24 for summaries of metals monitoring data for the biosolids produced at the JAMES WWTP in 2018. Sampling for this project will continue in 2019.

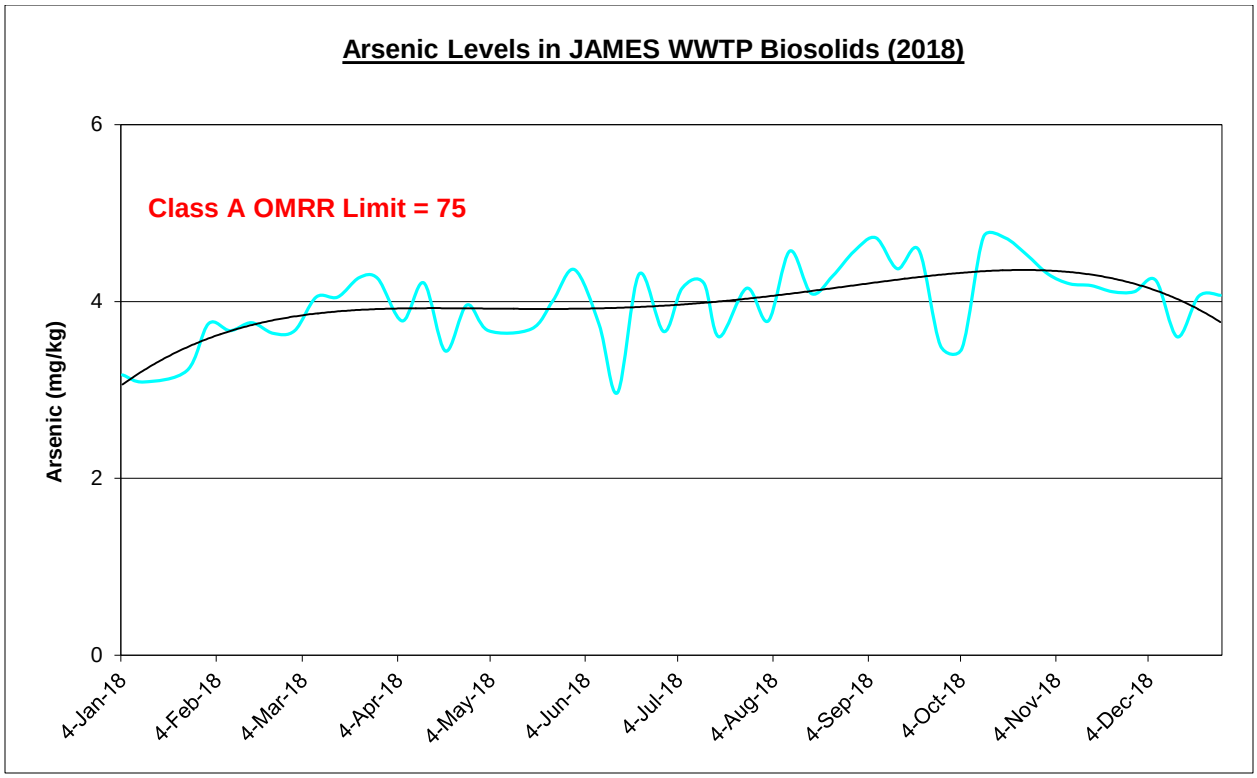


Figure 12. Arsenic Levels in JAMES WWTP Biosolids – 2018

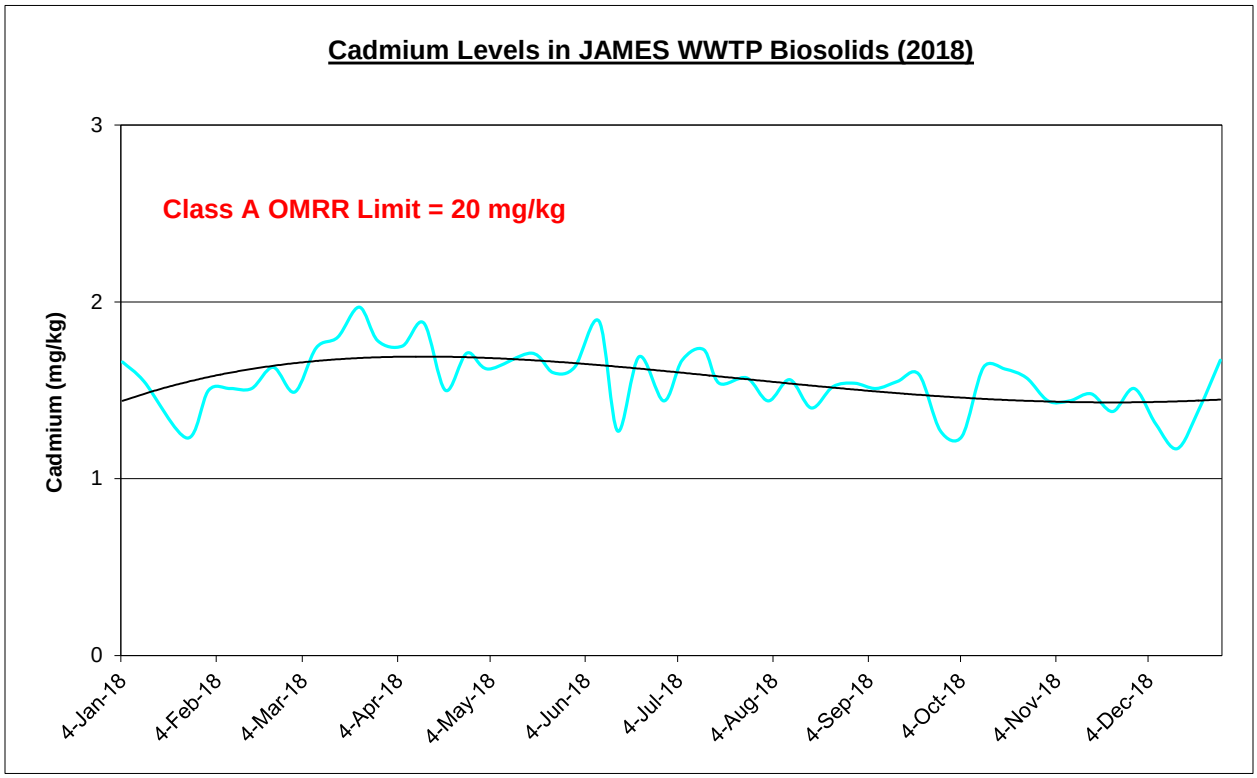


Figure 13. Cadmium Levels in JAMES WWTP Biosolids – 2018

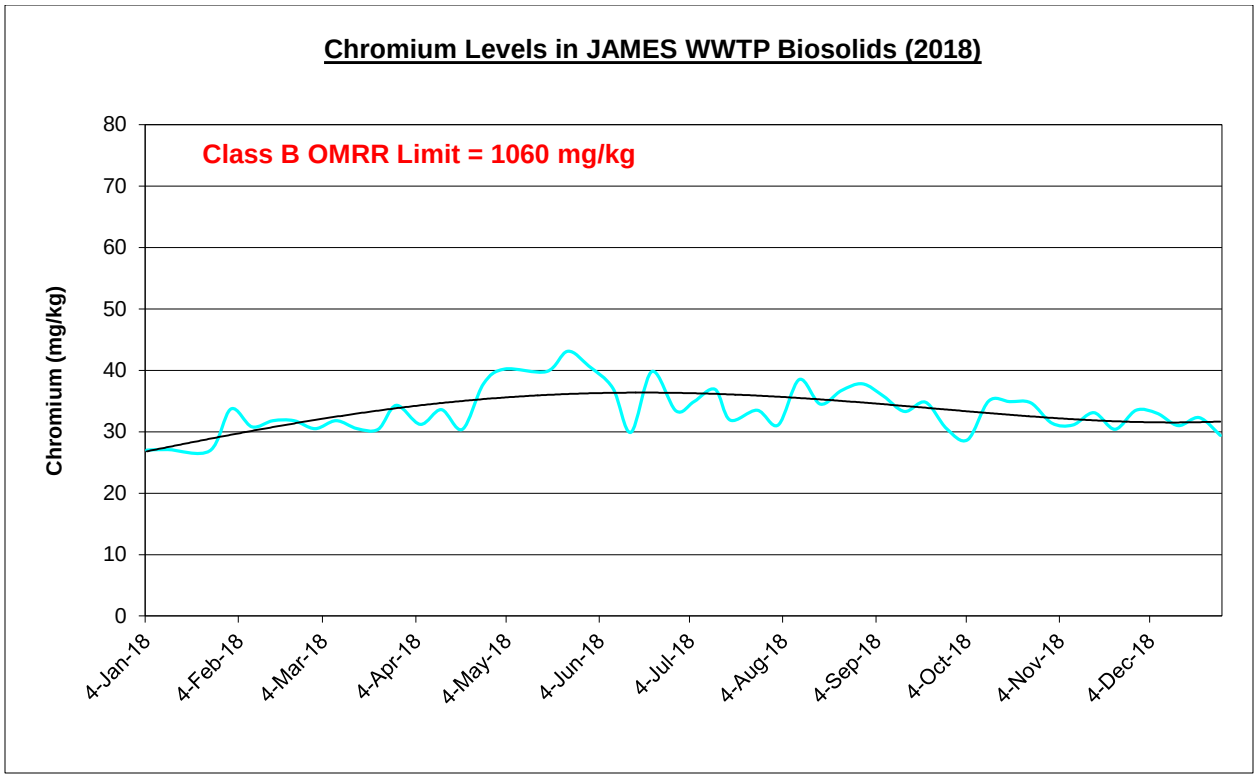


Figure 14. Chromium Levels in JAMES WWTP Biosolids – 2018

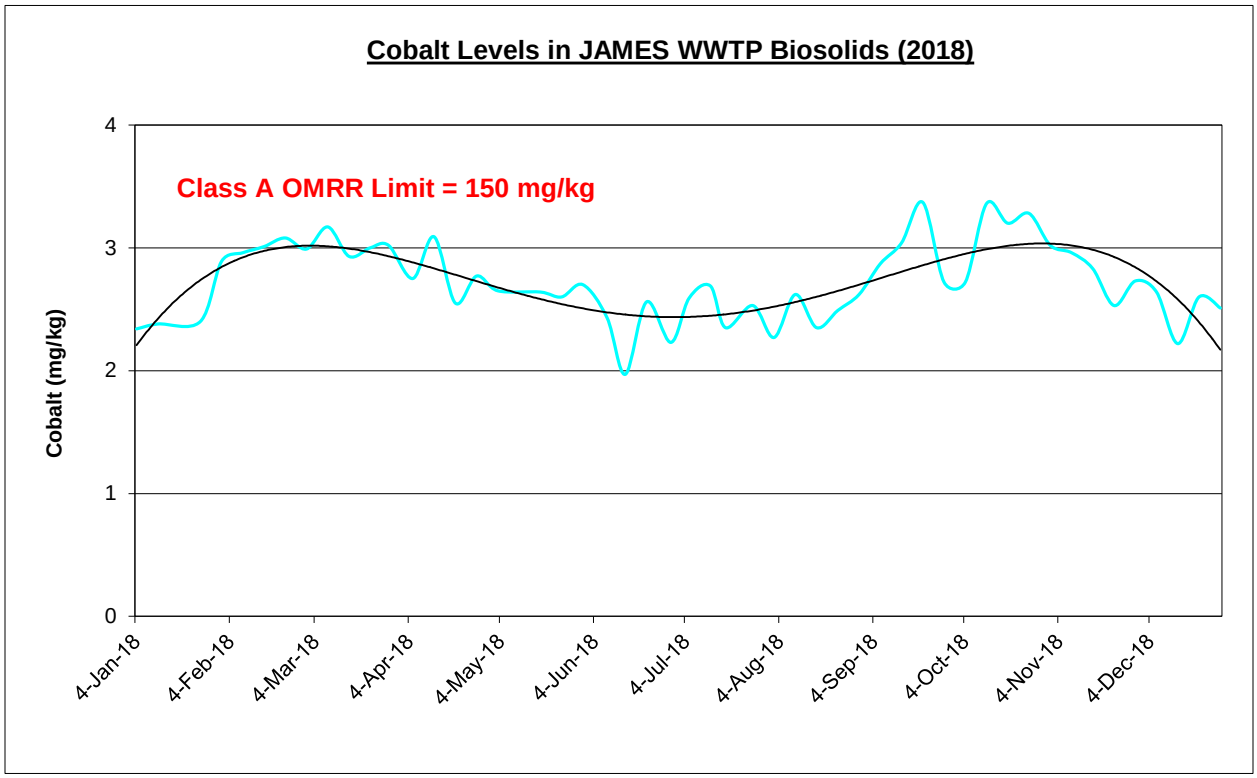


Figure 15. Cobalt Levels in JAMES WWTP Biosolids – 2018

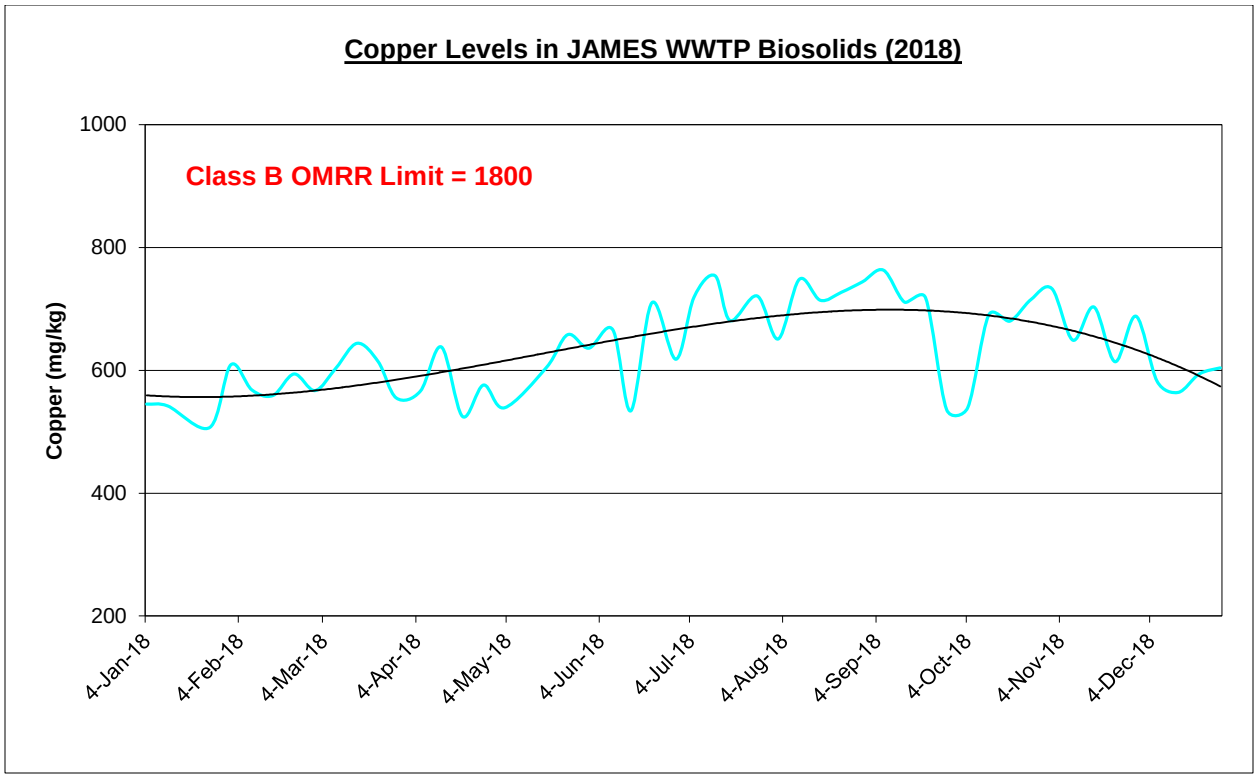


Figure 16. Copper Levels in JAMES WWTP Biosolids – 2018

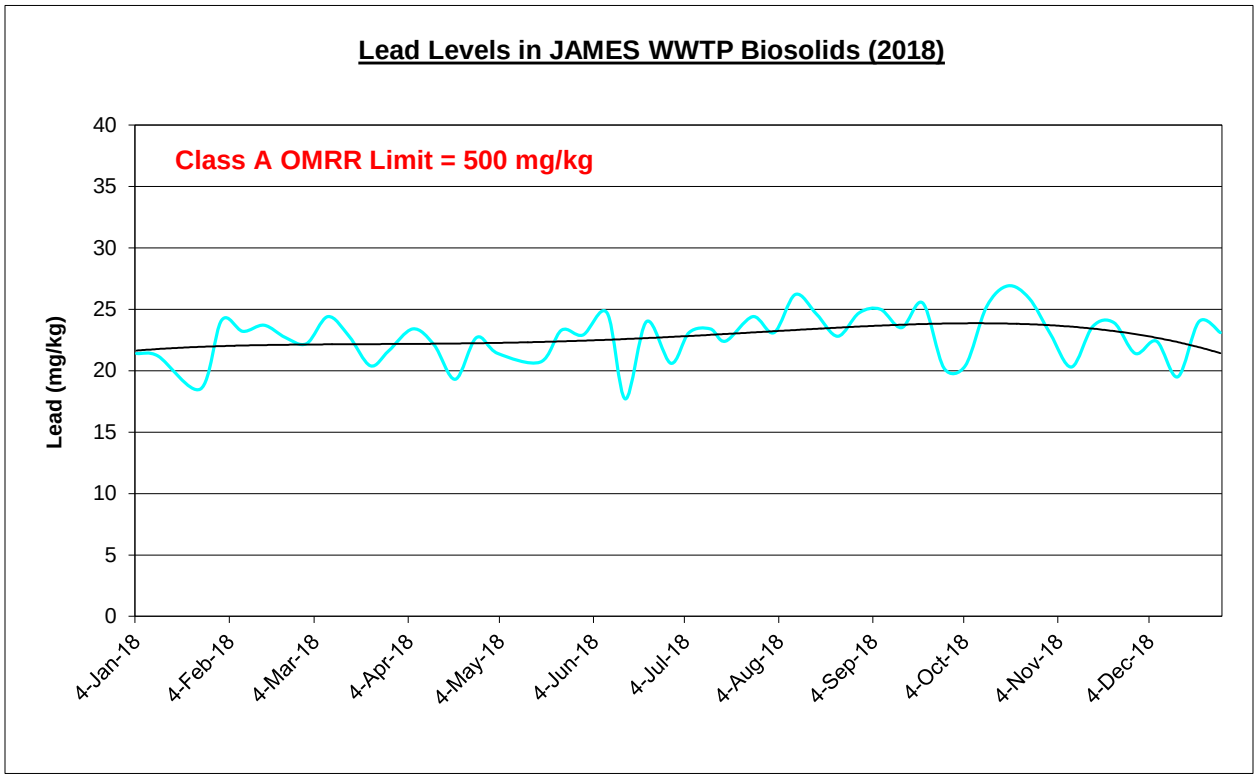


Figure 17. Lead Levels in JAMES WWTP Biosolids – 2018

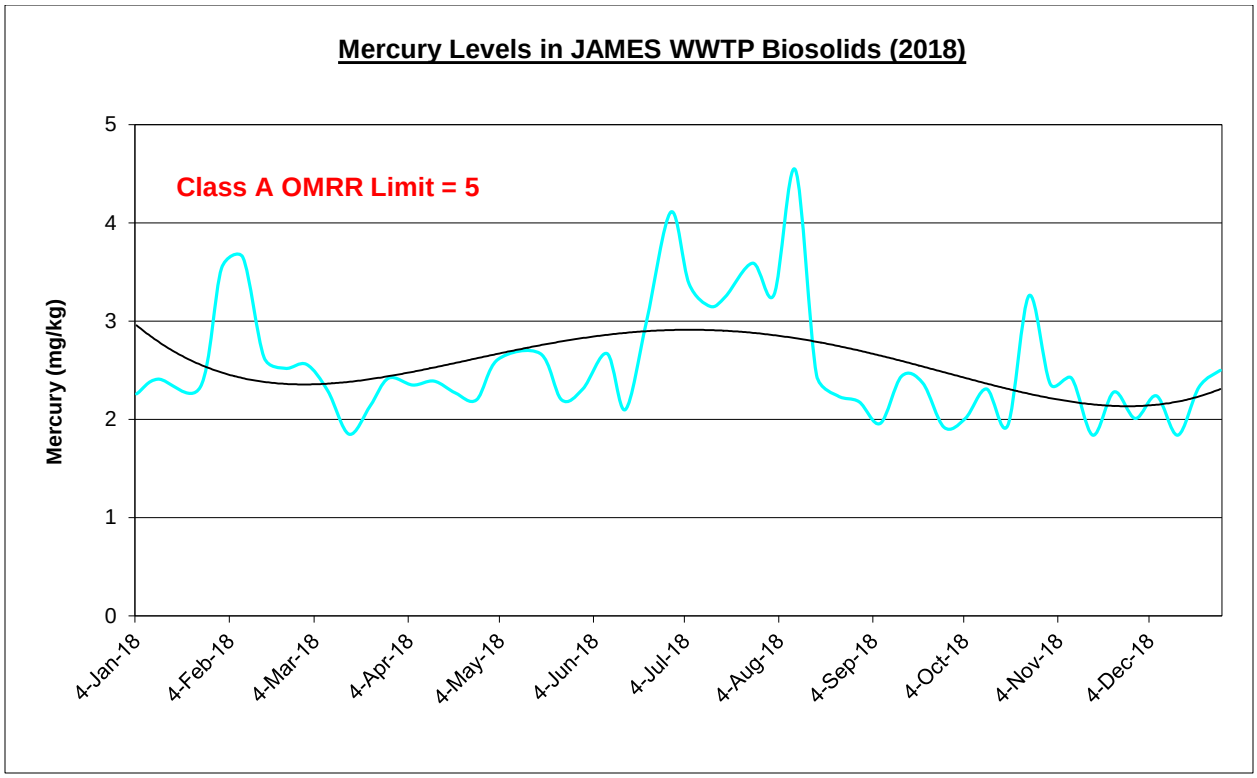


Figure 18. Mercury Levels in JAMES WWTP Biosolids – 2018

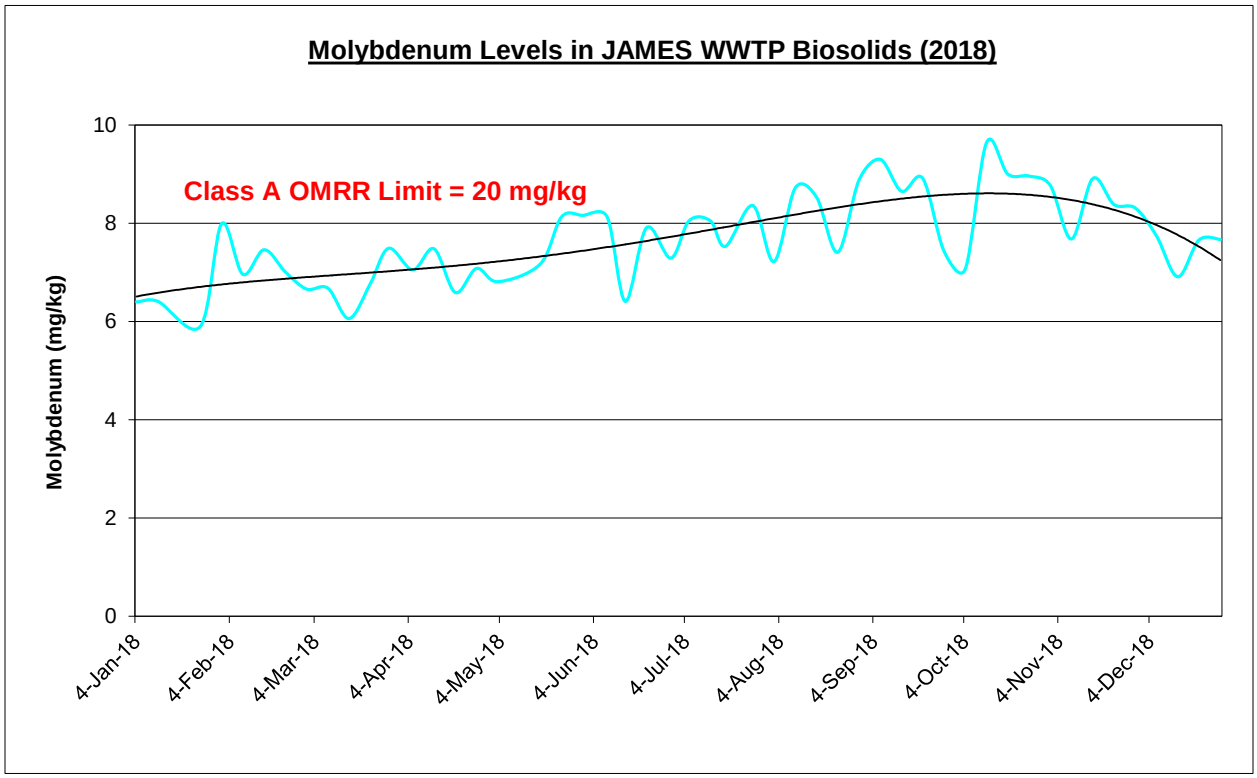


Figure 19. Molybdenum Levels in JAMES WWTP Biosolids – 2018

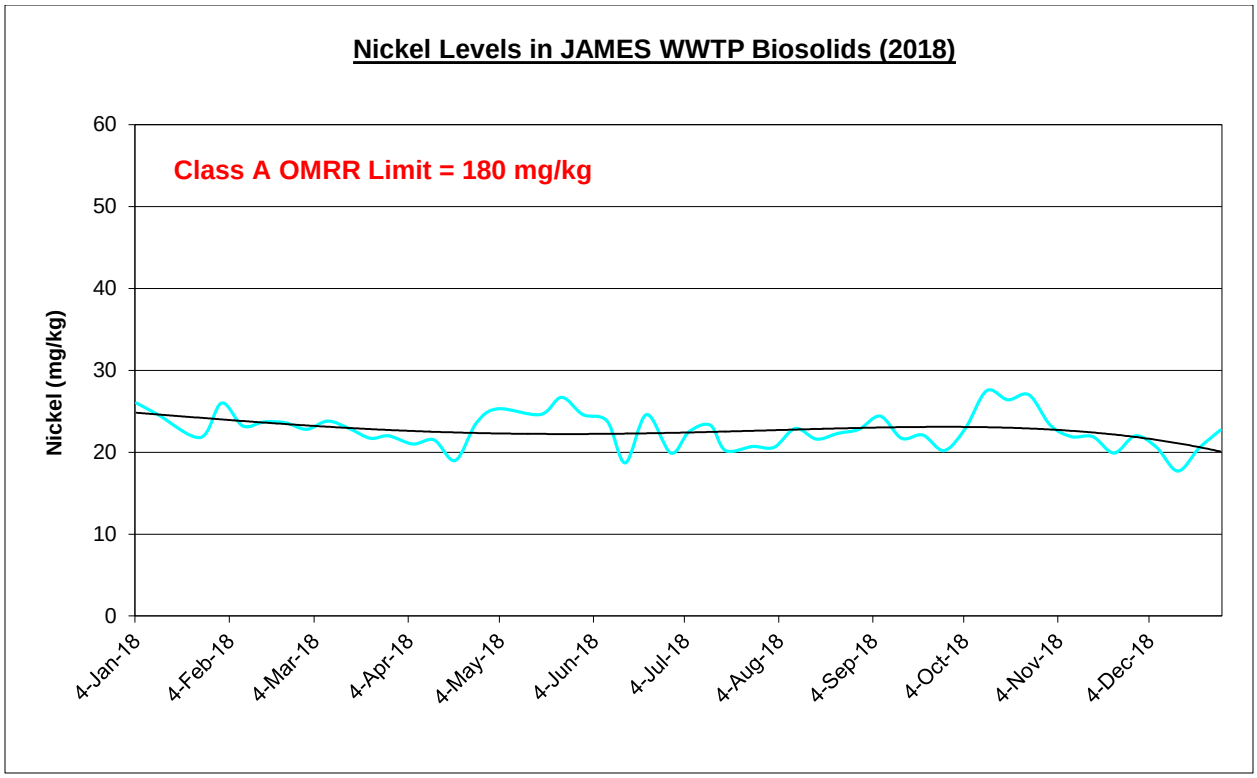


Figure 20. Nickel Levels in JAMES WWTP Biosolids – 2018

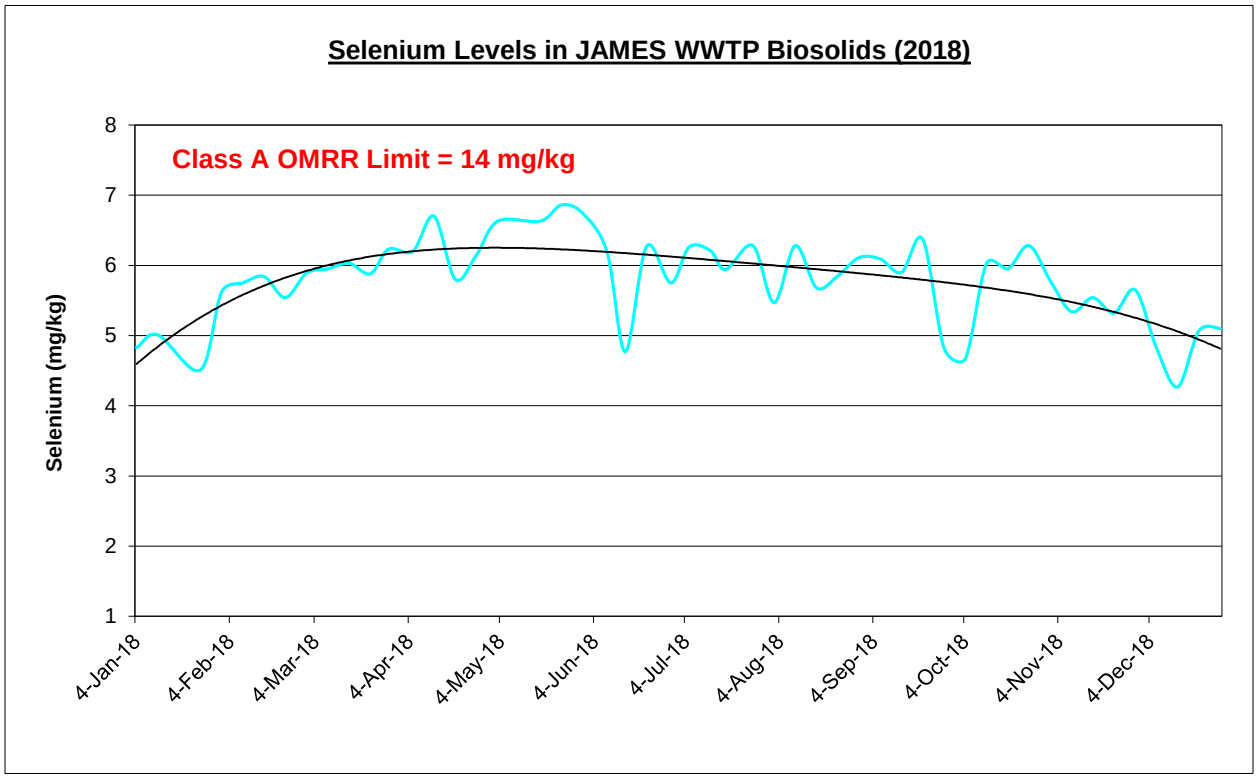


Figure 21. Selenium Levels in JAMES WWTP Biosolids – 2018

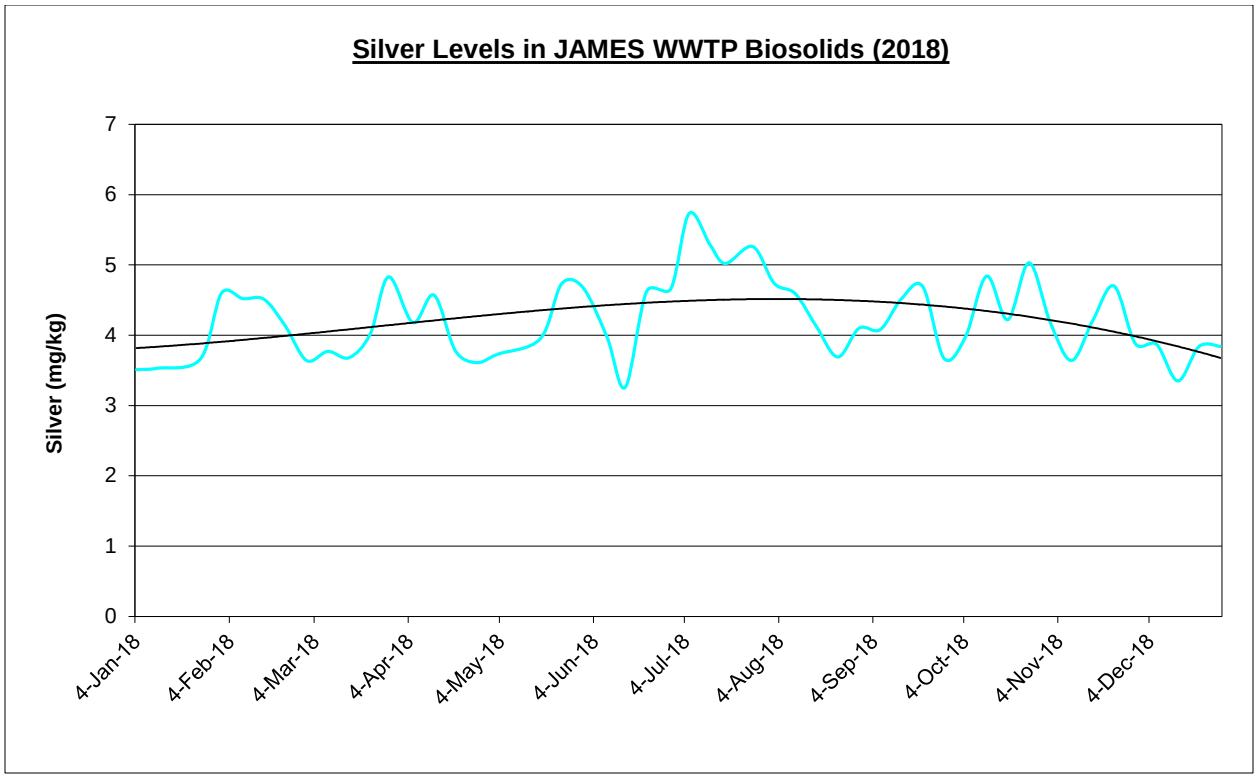


Figure 22. Silver Levels in JAMES WWTP Biosolids – 2018

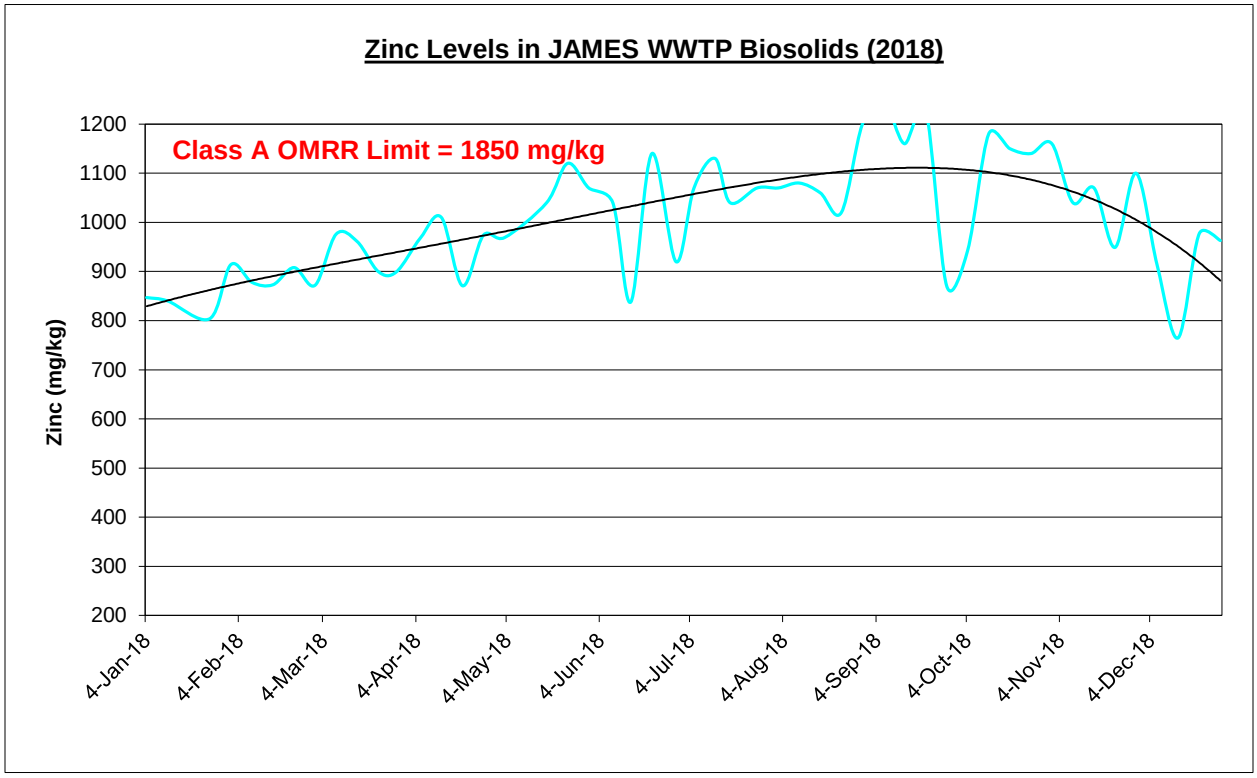


Figure 23. Zinc Levels in JAMES WWTP Biosolids – 2018

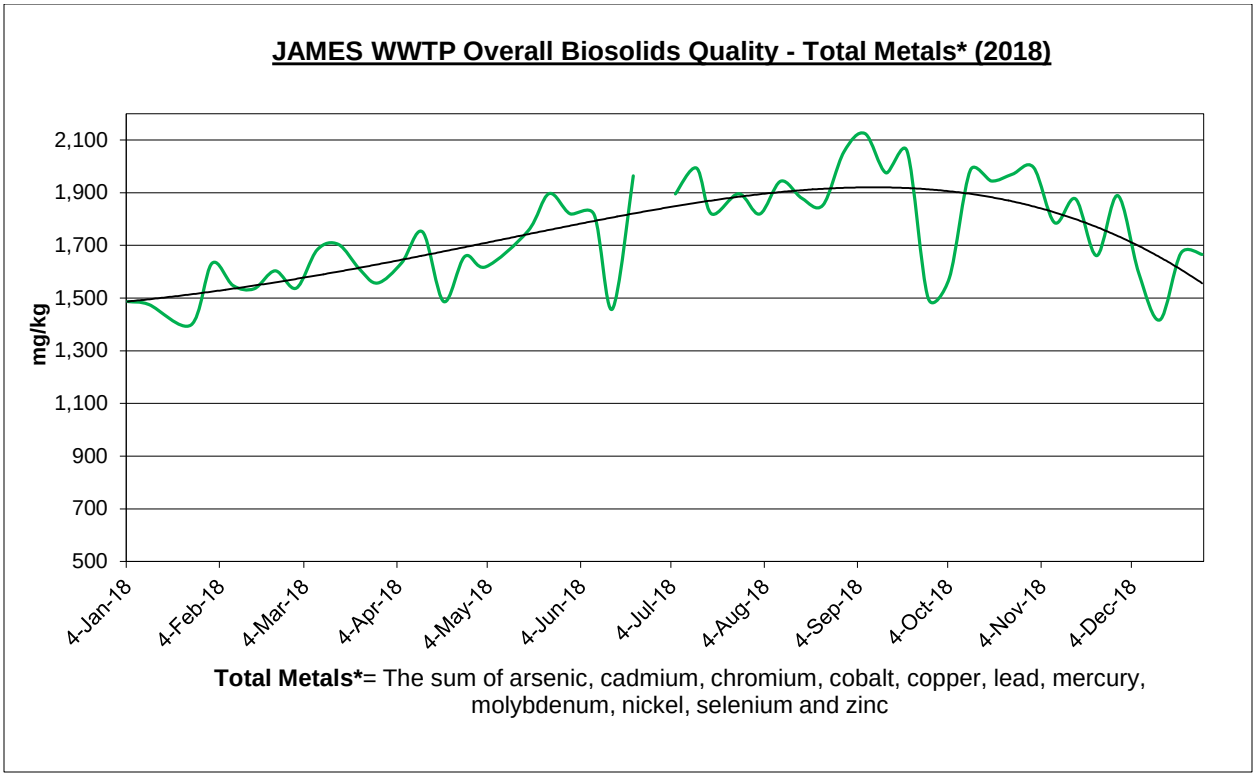


Figure 24. JAMES WWTP Overall Biosolids Quality – 2018

2.2.8 Project #8 - Monthly Biosolids Project

The collection of biosolids composite samples occur monthly and submitted to an external laboratory for an extended list of analysis including total metals, nutrients and other inorganic parameters. The analytical data was reviewed to monitor the quality of the biosolids. Refer to Table 48 for the summary of the annual Monthly Biosolids Project. Sampling for this project will continue in 2019.

Table 48. Monthly Biosolids Project (External Laboratory Data) – 2018

Analyte:	Units:	Average Result:	OMRR Limit:
Total Nitrogen	%	5.87	-
Total Phosphorus, P	%	1.49	-
Total Sulphur	%	0.92	-
Total Carbon	%	40.1	-
Organic Matter	%	62.2	-
Moisture	%	76.1	-
Ammonium – N (available)	mg/kg	5,485	-
Nitrate – N (available)	mg/kg	6.2	-
pH	pH units	6.92	-
C:N Ratio	-	6.7	-
Arsenic	mg/kg	4.19	75
Cadmium	mg/kg	1.61	20
Chromium	mg/kg	35.8	1,060

Table 48. Monthly Biosolids Project (continued)

Analyte:	Units:	Average Result:	OMRR Limit:
Cobalt	mg/kg	2.87	150
Copper	mg/kg	661	2,200
Lead	mg/kg	23.5	500
Mercury	mg/kg	2.51	5
Molybdenum	mg/kg	8.19	20
Nickel	mg/kg	23.3	180
Selenium	mg/kg	6.00	14
Zinc	mg/kg	1,077	1,850
Total # of Samples Submitted:	-	12	-

2.2.9 Project #9 – Key Manhole

This project monitors a municipal customer on a quarterly basis for Total Metals, Hexavalent Chromium, Trivalent Chromium, Total Cyanide, Sulfate, and Sulfide. Refer to Table 40 for the summary of the results in 2018. Sampling for this project will continue in 2019.

Table 49. Key Manhole Project (External Laboratory Data) – 2018

	Annual Average Result (mg/L)	
Analyte:	Composite Sample	Bylaw Limits
Sulphate (Dissolved)	57.9	-
Hexavalent Chromium	0.0012	-
Total Cyanide	0.0071	-
Sulphide	0.108	-
Trivalent Chromium	0.003	-
Total Hardness	184.3	-
Aluminum	0.60	50.0
Arsenic	0.007	1.0
Boron	0.1	50.0
Cadmium	0.0004	0.20
Chromium	0.004	4.0
Cobalt	0.0006	5.0
Copper	0.027	2.0
Iron	1.27	10.0
Lead	0.0001	1.0
Manganese	0.102	5.0
Mercury	<0.00001	0.1
Molybdenum	0.002	1.0
Nickel	0.004	2.0
Selenium	0.001	1.0
Silver	0.0001	1.0
Zinc	0.1	3.0
Total # of Samples Submitted	4	

2.2.10 Project #10 – Metals Finishers

In 2018, sample monitoring of metal finishing customers continued. One of the customers expanded its operations and started using technology that eliminated contaminants of concern such as polycyclic aromatic hydrocarbons (PAHs), suspended solids, BTEX (benzene, toluene, ethylbenzene, and xylenes), and other hydrocarbons. For this reason, sample monitoring for this business will be reduced to quarterly in 2019.

In 2018, WSCSCP added two new metal finishing customers to the roster of sample monitoring. A composite sample from each customer was submitted on a weekly basis to an accredited external laboratory and it showed levels below the Bylaw limit for heavy metals.

Overall, total metals from metal finishing industries showed a decline in levels of heavy metals due to efforts by the businesses and the WSCSCP. The only concerns are pH and Total Iron. The business that contributed to majority of the pH non-compliance ordered a new pH treatment system in late 2018 for immediate implementation in 2019. The business that had high Iron levels in their wastewater discharge was informed of the non-compliance. Sample monitoring will continue in 2019. Refer to Table 50 for a summary of samples collected and the percentage of non-compliance.

Table 50. Metals Industry Monitoring - 2018

Parameter	Number of Samples Collected	Number of Non-Compliant Samples
pH	10	8 (80%)
Total Iron	12	3 (25%)

2.2.11 Project #11 - Granite & Stone

In 2018, sample monitoring of two granite and stone cutting customers continued. Wastewater discharges from these businesses were analyzed for total suspended solids and total metals and the results showed compliance. Sample monitoring will continue in 2019. Refer to Table 51 for a summary of samples collected from the granite and stone industry.

Table 51. Granite & Stone Industry Monitoring - 2018

Parameter	Number of Samples Collected
Total Suspended Solids	9
Total Metals	9

2.2.12 Project #12 – BOD, TSS, pH (Extra Strength Project)

In 2018, WSCSCP staff routinely monitored thirty-one industrial customers as part of the BOD and TSS Waste Program (two located within the District of Mission and twenty-nine located within the City of Abbotsford). The monitoring program consisted of 24-hour composite samples collected on a random schedule, one to ten times per month. Industrial customers with larger discharge volumes were monitored on a more frequent basis than customers with smaller discharge volumes. These samples were submitted to an accredited external laboratory for pH, BOD and TSS analysis. Refer to Table 52 for a summary of all the extra strength samples collected in 2018.

Table 52. Extra Strength Monitoring - 2018

Parameter	Number of Samples Collected
BOD, TSS, and pH	1,042

2.2.13 Project #13 - Biosolids Coliforms Project

Biosolids and feed sludge grab samples are collected each week and submitted to an external laboratory for Fecal Coliforms, Salmonella, and Total Metals analyses. The analytical data is reviewed to monitor the effectiveness of the pasteurization system as well as to ensure fecal coliform requirements were met for "Class A" biosolids under OMRR. Refer to Table 53 for the summary of the annual Biosolids Coliforms Project. Sampling for this project will continue in 2019.

Table 53. Biosolids Coliforms Project (External Laboratory Data) – 2018

Analyte:	Feed Sludge Grab	OMRR Limit
Fecal Coliforms (MPN/dry g)	60	<1000
Salmonella (Positive or Negative)	Negative	No Limit
Total # of Samples Submitted:	50	-

3.0 Budgeting & Expenditures

The total amount budgeted for the JAMES WWTP Laboratory was $206,506 in 2017. Refer to Tables 54 for the breakdown of the 2018 budget items and expenditures, and refer to Table 55 for the 2019 budget.

Table 54. JAMES WWTP Laboratory Budgeting & Expenditures – 2018

Budget Item:	Budgeted Amount:	Actual Expenditure:
Labor	$189,828	$189,828
Laboratory Supplies & Equipment	$30,000	$29,996
External Analytical Costs	$43,000	$32,984
Total:	$262,828	$252,808

Table 55. JAMES WWTP Laboratory Budgeting & Expenditures – 2019

Budget Item:	Budgeted Amount:
Labor	$191,644
Laboratory Supplies & Equipment	$30,000
External Analytical Costs	$43,000
Total:	$264,644

4.0 Program Planning & Development

The following is a summary of the main activities and achievements related to the management, planning, and administration of the JAMES WWTP Laboratory in 2018.

- Continued development and implementation of the QA/QC program;
- Continued conformance through improvement and corrective action reports (ICAR);
- Continued identification of workplace hazards through monthly workplace inspections;
- Continued review and training of Safe Work Procedures;
- Development and implementation of the Safe Work Procedure for the Operation and Use of the Automated Titrator;
- Cost savings via procurement of a new contract with for metrology, certification, and calibration services; and
- Successful completion of CALA Proficiency Testing and continued participation in the CALA Proficiency Test Program.

C. Biosolids Residuals Management

1.0 Introduction

Biosolids are the end product of wastewater treatment. The JAMES Wastewater Treatment Plant (WWTP) currently produces approximately 5,200 wet tonnes of Class "A" biosolids per year. Historically, biosolids produced at the JAMES WWTP have been beneficially utilized for poplar tree plantations, mine reclamation and production of a biosolids based growing medium.

1.1 Process Overview

The JAMES WWTP comprises the following wastewater treatment processes:

- Headwork's screens to remove coarse solids (screening product is sent to landfill for disposal);
- Settling chambers for grit removal (grit is sent to landfill for disposal);
- Primary clarifiers for removal of primary sludge (sludge removed is sent to pasteurization process);
- Trickling filters for removal of organic loading;
- Aeration tanks for removal of organic loading; and
- Secondary clarifiers for removal and recycling of activated sludge (activated sludge is sent to sludge thickener and then pasteurization process).

Refer to Figure 25 for an illustration showing the biosolids processing path within the JAMES WWTP.

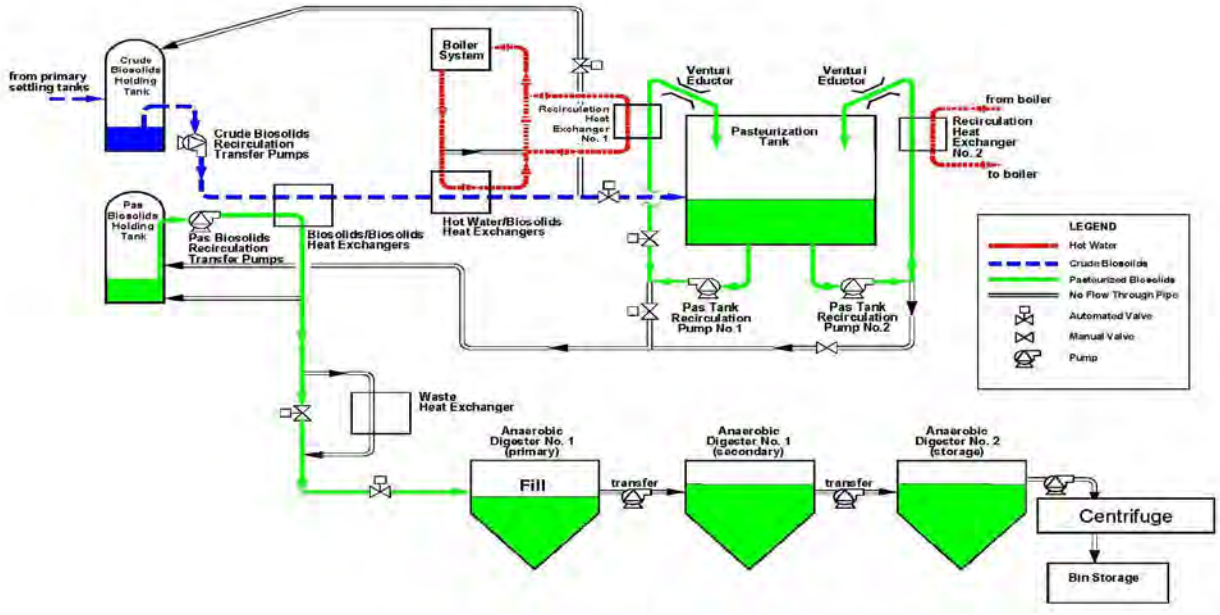


Figure 25. JAMES WWTP Biosolids Processing Path

Primary and secondary sludge is collected in the crude biosolids holding tank (approx. 60% primary settled solids and 40% secondary solids), before being sent to the pasteurization process. In the pasteurization process, the sludge is circulated and heated using steam, and air is inducted using a venturi system to maintain aerobic conditions throughout the pasteurization tank. Sludge is retained in this process for sufficient time to achieve pathogen kill. This process is the key step enabling the JAMES WWTP to produce "Class A" biosolids.

Following the pasteurization process, sludge is sent to the digesters. Three mesophilic anaerobic digesters in series are used to treat the combined primary and secondary sludge. After treatment, solids are categorized as "biosolids" and produced at an approximate rate of 400 m^3/d with a solids content of 1.5%. From the digesters, biosolids are pumped to centrifuges which remove water and increase the biosolids content from 1.5% to 23% solids on average. Dewatered "Class A" biosolids are then conveyed to storage bins and stored prior to transport for their ultimate end use.

2.0 Organic Matter Recycling Regulation (OMRR)

The Provincial Organic Matter Recycling Regulation (OMRR), created under the Environmental Management Act, applies to the construction and operation of composting facilities, and the production, distribution, storage, sale and use or land application of biosolids and compost. OMRR also sets minimum standards for products based on the following criteria:

- Pathogen Reduction - The reduction of organisms such as bacteria, protozoa, viruses, and parasites that can cause disease in humans and animals;

- Vector attraction reduction - The reduction of the characteristic in biosolids that attracts rodents, flies, mosquitoes, or other organisms capable of transporting infectious agents, such as pathogens;

- Maximum allowable pathogen limits - The function of fecal coliform counts per gram of total solids (Note: Fecal coliforms are bacteria that typically originate from human or animal feces); and

- Maximum allowable concentrations of heavy metals - Sets limits of heavy metals concentrations for the biosolids products. The maximum concentration is dependent on the class of biosolids ("Class A" / "Class A" compost, "Class B" / "Class B" compost, biosolids growing media).

OMRR also stipulates how the various products can be used and/or distributed, as those with less stringent quality restrictions typically have greater restrictions on their end uses. Figure 26 illustrates how the various requirements of OMRR affect the different products for biosolids usage. Table 56 provides a summary of the permitted uses for each of the four products.

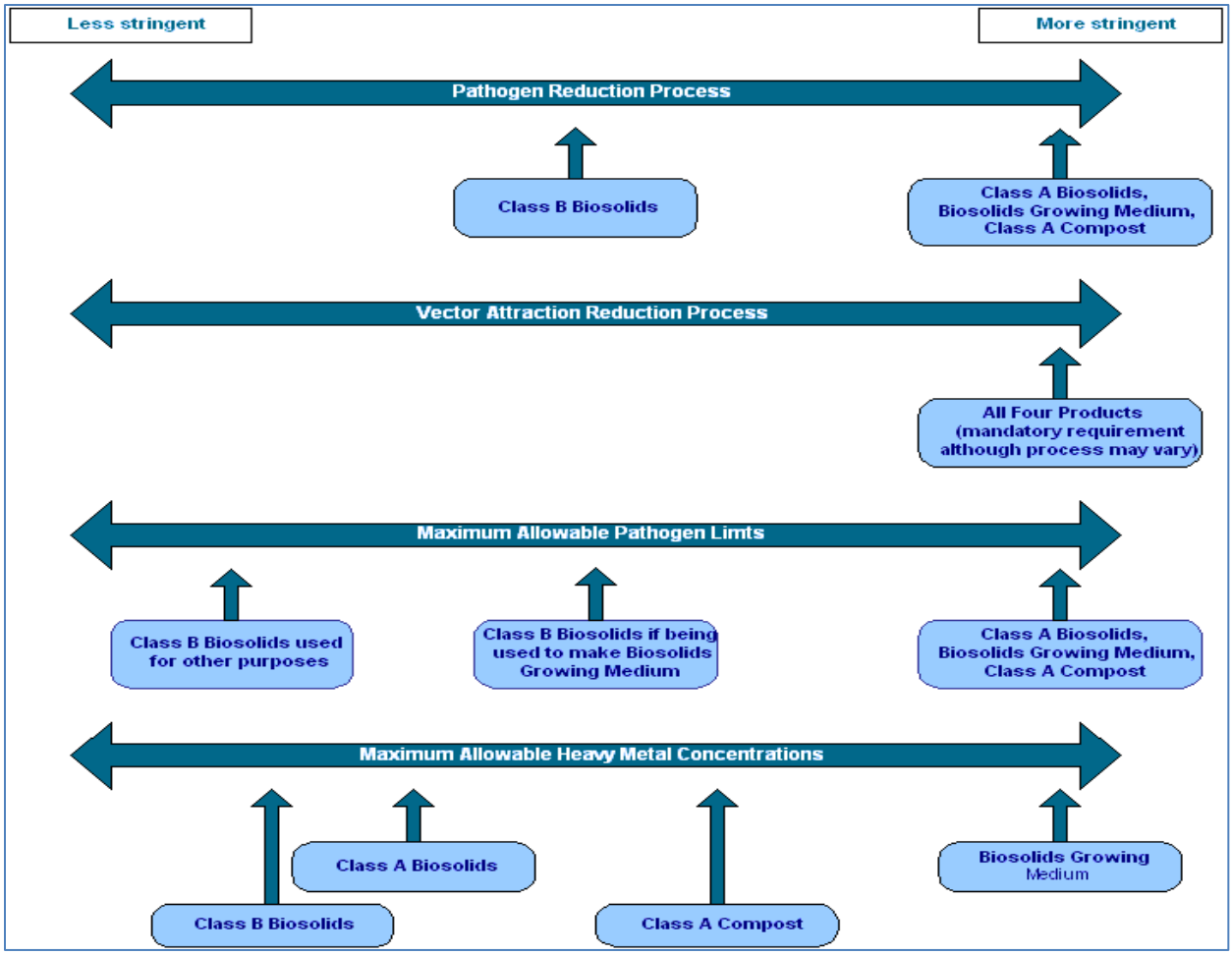


Figure 26. OMRR Product Requirements

Table 56. OMRR Permitted Uses for Biosolids

"Class A" Biosolids:	"Class B" Biosolids:	Growing Medium:	"Class A" Compost:
• Can be land applied, with limits on quantities • Land application plan required • Distribution volumes must be: ➢ <5 m^3 per vehicle per day ➢ in sealed bags (<5 m^3) • Compost or biosolids growing medium facilities only for quantities >5 m^3	• Can be land applied, with limits on quantities • Land application plan required • No land application in watershed used for drinking water • Can be distributed without restriction to compost facilities	No restrictions	No restrictions

As previously mentioned, the JAMES WWTP produces “Class A” biosolids that meet the criteria outlined under OMRR. Weekly composite biosolids samples are collected and analyzed for total metals, and monthly grab samples are analyzed for nutrients and fecal coliforms content. Refer to Appendix C for a summary of biosolids quality data for 2018. Additional Quality control measures are in place to monitor fecal coliform levels of stored biosolids at the James Plant just prior to distribution. This provides and additional level of quality assurance.

3.0 Beneficial End Uses for Biosolids

Since 2000, biosolids produced at the JAMES WWTP have been utilized for poplar tree plantations, mine reclamation and production of a biosolids based growing medium. In 2015, the City of Abbotsford started a biosolids management agreement with a third party contractor to land apply the biosolids under a Land Application Plan. Refer to table 57 for quantities of biosolids distributed and stored from the James Plant in 2018.

Table 57. Annual Wet Tonnes of JAMES Treatment Plant Biosolids by End Use (2018)

Year:	Biosolids Produced (wet tonnes/year):	Stored Carry Over 2017 to 2018 (wet tonnes/year):	Biosolids Hauled Off-Site (wet tonnes/year):	Stored Carry Over 2018 to 2019 (wet tonnes/year):
2018	5,154	1218	4,123	2,091

Note: Biosolids tonnage balances from produced / hauled to stored can vary depending on moisture loss during storage

3.1 Land Application

3.1.1 Background

The specific objectives of land application plans are to ensure that the Class A biosolids are stored and applied in a beneficial manner that provides the greatest benefit for the crop grown on the properties, while minimizing risk to the environment. The plans consider the specific crops that are growing on each property, the trace element concentrations in the soil, as well as any other nutrient input that is used for growing crops or improving the soil. The focus for the land application is on properties that normally import either inorganic fertilizer or poultry litter as nutrient sources for either forage corn or forage grass production.

Farms in the Fraser Valley have been selected for a number of reasons including:

1. Increased public concern over biosolids application in other areas in B.C.
2. Less costly to transport poultry litter to other areas in British Columbia, and poultry litter appears to be more readily accepted than biosolids.
3. Biosolids, with their low potassium concentration, is better suited for forage production where high potassium such as found in poultry litter may result in animal health concerns.

3.1.2 Land Application Summary - 2018

In 2018 the contractor obtained authorization from the Ministry of Environment (MOE) for seven sites (7) as per OMRR requirements. The process of obtaining authorizations for Land Application included providing a Notification as per the requirements of OMRR Part 4 Division 2 Section 22. The Notifications were provided to the MOE Permit Registration office in Victoria, the local MOE officer, the ALC planner for the region, and the Health Authority for the Region (Fraser Health).

Figure 27. Post Application Class A Biosolids

In 2018, the contractor hauled 4,123 wt of Class A biosolids from the James WWTP for beneficial end use. In addition, 2,611 wt stored at application sites in 2017 is scheduled for application in 2018. A total of 3,292 wt (2,611 from 2017 & 681 from 2018) was applied to seven locations under seven different LAPS'. An additional 909 wt from 2018 was used for the production of a Biosolids Growing Medium (BGM).

2,533 wt was stored by the contractor in 2018 at four different application sites for application in 2019. 2,091 wt of biosolids produced in 2018 remain in storage at James WWTP carried over for beneficial use in 2019. These biosolids are being stored in accordance with the OMRR Part 4, Division1, particularly Section 20. See Appendix D for 2018 Land Application Report.

Table 58. Amount of Biosolids Applied and Stored in 2018

	2018 Biosolids Applied			2018 Stored at Sites		
Site Application Address	Tonnes	Date	Authorization #	Tonnes	Date	Authorization #
1995 Fir Rd, Agassiz	239.17	Apr 19	109233	-	-	-
3954 Hotsprings Rd, Agassiz	877.07	May 17	109232	1101.57	Sep	Spring
3628 Hotsprings Rd, Agassiz	295.00	May 25	109234	-	-	-
1401 Kennedy Rd, Harrison Mills	751.70 148.15	Apr 23 May 4	109235	689.88	Sep	Spring
1750 School Rd, Harrison Mills	372.43	Apr 19	109216	-	-	-
4506 Glenmore Rd, Abbotsford	532.61	May 3	109109	-	-	
1280 Hamilton Rd, Agassiz	76.00	May 17	109300	-	-	-
1233 Kilby Rd, Harrison Mills	-	-	-	441.86	Oct	Spring
1025 Kennedy Rd, Harrison Mills	-	-	-	299.90	Oct	Spring
48192 Chilliwack Central Rd, Chilliwack	909.44	Oct	Not Required (BGM)	-	-	-
Total	4,201.57[1]			2,533.21		

[1] Land application total 4,201.57 does not include the 909.44 wt used for the production of BGM.

Figure 28. Land Application of Stored Biosolids

4.0 Budgeting & Expenditures

Land application costs to utilize JAMES WWTP biosolids in land application activities are at the expense of the biosolids producer and include transportation, application, quality control, and professional services. Table 59 summaries the budget and expenditures in 2018 and Table 60 summaries the expenditure breakdown in 2018.

Table 59. Biosolids Management Budgeting & Expenditures – 2018

Budget Item:	2018 Budget:	2018 Actual Expenditure:
Biosolids Beneficial End Use	$495,500	$332,376

Table 60. Biosolids Management Expenditure Summary – 2018

Expenditure Summary	2018
Hauling & Application	$322,976
Annual Bond	$5,500
Quality Control Analysis	$3,900
Total:	$332,376

5.0 Program Planning & Development

The following is a summary of the main activities and achievements related to the planning and development of biosolids management program in 2018.

- Developed strategies to meet logistical issues between storage and production, quality control measures and application site availability.
- Regular meetings conducted with contractor to ensure contract services / requirements are being met and that biosolids beneficial use is achieved.

6.0 Next Steps – 2019

- Continued strategic and logistical planning with Biocentral for the distribution, storage and hauling of biosolids in 2019.
- Develop RFP for Biosolids Utilization agreement. Existing agreement ends Dec 31, 2019.
- Develop RFP for Biosolids Master Plan.

Appendix A

RISK ASSESSMENT OF WASTEWATER SOURCES

Risk No. 4
Risk Name: Mercury (Total)
Risk Description: Wastewater mercury concentration of >0.05mg/L as per Bylaw 1361-2004
High Score **49** **High Risk**
Average 25

Rating	(A) Health & Safety of Workers & Public	(B) Demand for Service	(C) Infrastructure	(D) Treatment Processes	(E) Receiving Environment	(F) Quality of Biosolids	Practically Impossible	Not Likely to Occur	Could Occur or I've Heard of it Happening	It is Known to Occur or it has Happened	Common or Occurs Frequently
	CONSEQUENCES						LIKELYHOOD				
							1	3	5	7	10
1	First Aid Injury	Increased Maintenance	Slight Damage (<$1,000)	Slight Impact	Slight Impact	No Impact	1	3	5	8	10
		1	1								
3	Medical treatment Injury w/ Lost time < 7 days	Advances minor Capital projects	Component Level Replacement / Repair ($1 K - $10 K)	Minor Impact	Minor Impact	Minor increase in Contaminant Level	3	9	15	21	30
5	Lost Time Injury > 7 days	Advances significant projects more than 1 year	Equipment Level Replacement / Repair ($10 K - $100 K)	Moderate impact	Localised Impact	Contamination results in close to not meeting Class A	5	15	25	35	50
7	Lost Time Injury > 30 days	Advances several Project in a Process area < 5years	Process Facility Damage ($100 K - $1 M)	Major impact results in plant upsets > 1 day	Major Impact	Contamination results in not meeting Class A, but meeting Class B	7	21	35	49	70
	30			35	35	49					
10	Multiple Fatalities	Advances Projects in several Process areas > 5 years	Severe Damage to Multiple Areas (> $1 M)	Extreme impact results in plant upsets > 7 days	Massive Impact	Contamination results in not meeting Class B	10	30	50	70	100

Guide

Low Risk	1-9	**LOW**	Monitored and Managed by Plant No restriction on Customer
Medium Risk	10-25	**MEDIUM**	Additional Charges by WSC Mitigation may be required by the Customer
High Risk	26-60	**HIGH**	Second level additonal fees, charges or penalities, mitigation management plans in place by WSC Damage and Safety issue must be mitigated by Customer,
Extreme Risk	61-100	**EXTREME**	Must not be allowed. May discontect sewer if violated Customers must find alternate disposal methods

Notes:

(A) Routes of harmful human exposure include ingestion, inhalation and skin contact
(A) Mercury accumulates in the liver, spleen, kidneys and bone
(A) Methyl mercury also accumulates in the brain
(A) Mercury is a significant teratogen
(A) Mercury is considered extremely toxic to humans
(A,E) Organic compounds of mercury are generally more toxic than the inorganic compounds; organic methyl mercury being the most toxic
(E) Mercury is harmful to aquatic organisms at very low concentrations
(E,F) Inorganic forms can be methylated in sediments and withn the food chain
(F) Mercury levels have been above OMRR limits in the past
(F) Mercury is listed under OMRR with a limit of 5ug/g for Class A Biosolids

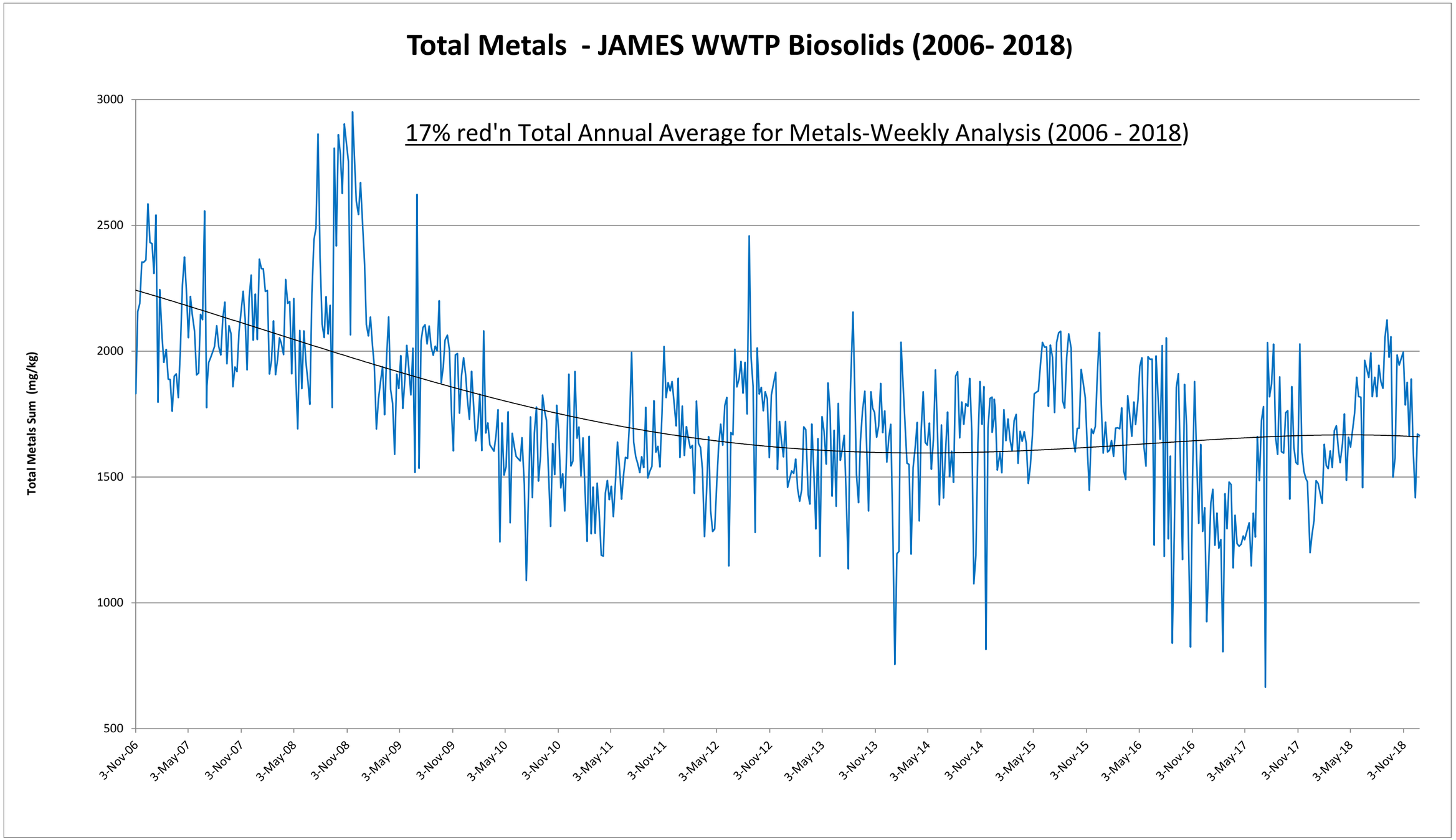
Possible Industrial & Commercial Sources:

Automobile Repair (incl. Body Shops and Radiator Shops)
Battery Manufacturing
Pharmaceutical Industry
Laundry and Dry Cleaning Industry
Dental Offices
Hospitals
Laboratories

References:

City of Abbotsford Consolidated Sewer Rates and Regulations Bylaw (Bylaw No. 1361-2004)
Sewer Use Control for Fraser River Basin and Burrard Inlet Drainage Basin (Environment Canada - July 1993)
Enviromental Management Act (BC Government - 2003)
Municipal Sewage Regulation (BC Government - 2004)
Organic Matter Recycling Regulation (BC Government - 2002)
Anaerobic Sludge Digestion (Water Pollution Control Federation - 1987)
Canadian Water & Wastewater Association Directory of Contaminants
Source Control staff personal professional experiences

Appendix B


Total Metals - JAMES WWTP Biosolids (2006- 2018)
17% red'n Total Annual Average for Metals-Weekly Analysis (2006 - 2018)
Total Metals Sum (mg/kg)
3000
2500
2000
1500
1000
500
3-Nov-06
3-May-07
3-Nov-07
3-May-08
3-Nov-08
3-May-09
3-Nov-09
3-May-10
3-Nov-10
3-May-11
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3-Nov-14
3-May-15
3-Nov-15
3-May-16
3-Nov-16
3-May-17
3-Nov-17
3-May-18
3-Nov-18

Appendix C

JAMES WWTP BIOSOLIDS QUALITY DATA (2018)

Parameter concentrations are expressed on dry weight basis unless otherwise stated.
All data obtained from the analysis of a monthly composite sample.

Sampling Date:	-															
Parameters (Dried Basis)	**Units**	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**	**OCT**	**NOV**	**DEC**	**MAX**	**AVG**	**OMRR**
Total Nitrogen	%	7.76	6.1	6.21	5.41	5.14	5.73	5.84	5.29	5.59	5.43	5.87	6.01	7.76	5.87	-
Total Phosphorus (as P)	%	1.20	1.40	1.52	1.46	1.53	1.64	1.59	1.60	1.60	1.50	1.46	1.36	1.64	1.49	-
Total Potassium	%	0.08	0.1	0.25	0.28	0.22	0.24	0.22	0.21	0.23	0.23	0.25	0.36	0.36	0.22	-
Total Sulphur	%	0.77	0.36	0.34	1.02	0.97	1.12	1.06	1.12	1.04	1.13	0.87	1.19	1.19	0.92	-
Total Carbon	%	32.5	40.8	40.8	41.1	40.1	40.3	41.2	40.4	38.3	40.4	42.6	42.7	42.7	40.1	-
Organic Matter	%	79.2	60.1	59.1	61.0	60.4	60.5	61.1	60.8	60.9	60.2	61.4	61.1	79.2	62.2	-
Moisture	%	76.1	75.1	75.6	75.0	75.3	76.2	75.9	77.2	76.9	76.7	77.0	76.4	77.2	76.1	-
Ammonium- N (available)	mg/kg	6480	6200	6160	3170	5930	5070	4640	3770	6010	6770	6130	1510	6770	5153	-
Nitrate - N (available)	mg/kg	5.7	6.1	<3.0	<3	<11	<3.0	<5	<4	<3	<5	6.9	21.3	21.3	10.0	-
pH	pH units	6.7	6.82	6.76	6.92	6.81	6.84	6.78	7.78	6.85	7.10	6.76	6.97	7.78	6.92	-
EC - Conductivity	dS/m	4.39	3.32	3.62	4.1	4.22	4.26	4.15	4.6	4.69	3.94	3.95	4.3	4.69	4.13	-
C/N Ratio	-	4.2	6.7	6.6	7.6	7.8	7.0	7.1	7.6	6.9	7.4	4.3	7.1	7.8	6.7	-
Arsenic	ug/g	2.93	3.57	4.23	4.97	4.2	3.34	4.17	5.02	4.66	4.59	4.17	4.42	5.02	4.19	75
Cadmium	ug/g	1.21	1.57	1.73	2.13	1.69	1.53	1.64	1.72	1.59	1.61	1.47	1.4	2.13	1.61	20
Chromium	ug/g	27.6	45.8	32.0	41.3	43.4	31.3	35.2	35.0	37.3	34.9	30.7	35.5	45.8	35.8	1060
Cobalt	ug/g	2.31	2.99	3.1	3.65	2.94	2.15	2.52	2.77	3.4	3.24	2.73	2.61	3.65	2.87	150
Copper	ug/g	515	590	563	731	609	602	749	838	751	710	649	629	838	661	2200
Lead	ug/g	19.2	22.6	23.4	25.4	22.1	21.2	24.1	27.6	24.7	25.8	21.1	24.2	27.6	23.5	500
Mercury	ug/g	2.04	2.94	2.2	2.75	2.45	2.29	3.29	2.80	2.15	2.28	2.98	1.98	3.29	2.51	5
Molybdenum	ug/g	6.01	9.82	7.13	8.63	7.79	7.12	7.84	9.56	9.37	8.89	8.59	7.53	9.82	8.19	20
Nickel	ug/g	23.8	24.5	22.1	26.2	27	19.8	21.3	23.1	23.7	26.8	20.7	20.5	27.0	23.3	180
Selenium	ug/g	4.72	5.59	6.13	7.95	6.36	5.26	6.36	6.75	6.39	6.16	5.09	5.19	7.95	6.00	14
Zinc	ug/g	817	894	905	1270	1110	958	1110	1370	1250	1150	1090	1000	1370	1077	1850

Appendix D

2018 ANNUAL REPORT JAMES PLANT (CITY OF ABBOTSFORD) BIOSOLIDS BENEFICIAL USE

Prepared by:
G. Andres Murillo, P.Eng.
BioCentral General Manager

February 1st, 2019

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Appendix

Summary

BioCentral Green Depot Ltd. (BioCentral) has met and exceeded all of the OMRR requirements for Biosolids Growing Medium production and land application of Class A biosolids from JAMES Plant (City of Abbotsford). A total of 4,123.41 wet tonnes of Class A biosolids were received from the City of Abbotsford in 2018. The Class A biosolids provided an excellent source of organic matter and nutrients for farms in British Columbia.

BioCentral obtained seven (7) authorizations from the Ministry of the Environment for application of Class A biosolids for beneficial reuse in agriculture. The focus for the land application was on properties that normally import either inorganic fertilizer or poultry litter as nutrient sources for either forage corn or forage grass production.

BioCentral hauled 95% of the material available in the three (3) storage tents at JAMES plant during 2018. 39% of the hauled biosolids (1,590.2 WT) were applied along the 2018 year, meanwhile, the remnant amount of biosolids, 2,533.21 WT, were stored at the authorized properties for 2019 spring application. 730 WT of biosolids remained in the medium tent were hauled during the last week of January 2019.

909.44 WT of the total 1,590.2 WT applied during 2018, were turned into Biosolids Growing Medium, also know as BGM. BGM production and distribution followed OMRR requirements.

Farms in the Fraser Valley have been selected because biosolids, with their low potassium concentration, are better suited for forage production where high potassium such as found in poultry litter may result in animal health concerns.

Introduction

BioCentral issues this annual report as per contract requirement with the City of Abbotsford. The four year contract started on January 1st, 2015, where BioCentral has proved high competency and efficiency dealing with the undertaken biosolids from JAMES Plant.

BioCentral is responsible for meeting the Organic Matter Recycling Regulation (OMRR) requirements for land application of the Class A biosolids and BGM production, whereas the City of Abbotsford is responsible to ensure that the biosolids meet Class A biosolids requirements as per the OMRR.

1. Monthly Volumes

In total, BioCentral hauled from JAMES plant 4,123.41 wet tonnes (WT) of Class A biosolids. The summary of quantities is showing in Table 1.

Table 1 Monthly Volumes Summary

Month	Wet Tonnes	JAMES Plant Storage	Application site	Wet Tonnes
Jan	-	-		-
Feb	-	-		-
Mar	-	-		-
April	-	-		-
May	680.76	Small Tent	4506 Glenmore Rd	532.61
			1401 Kennedy Rd	148.15
June	909.44	Medium Tent	48192 Chilliwack Central Rd (BGM)	909.44
July	-	-	-	-
Aug	-	-	-	-
Sep	1791.45	Small Tent	1401 Kennedy Rd	78.29
			3954 Hotsprings Rd	594.81
		Large Tent	1401 Kennedy Rd	611.59
			3954 Hotsprings Rd	506.76
Oct	741.76	Large Tent	1233 Kilby Rd	441.86
			1025 Kennedy Rd	299.90
Nov	-	-		-
Dec	-	-	-	-

From the small tent, BioCentral removed two batches equivalents to 1,353.86 WT with an average of 677 WT per batch. The medium tent was partially caught off (730 WT) by November in order to have more material cure for 2019 Spring. On December 6th, BioCentral received confirmation that medium tent material was cured, however, due to weather issues this material could not be removed until last week of January 2019.

Figure 1 shows the biosolids monthly volume trend during the 2018 year.

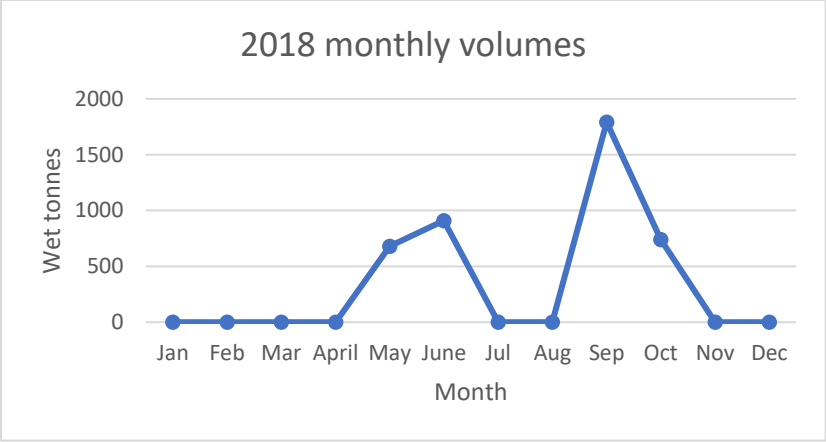

Figure 1 2018 Monthly Volumes Trend

2. Authorizations for Land Application

During 2018, BioCentral obtained authorization from the Ministry of Environment (MOE) for seven (7) properties as per OMRR requirements. Table 2 shows the summary of 2018 authorizations.

Table 2 2018 Authorizations for Land Application

Authorization #	Year	Site Application Address	Applied 2018 (tonnes)	Stored for 2019 (tonnes)
109233	2018	1995 Fir Rd, Agassiz	239.17	
109232	2018	3954 Hotsprings Rd, Agassiz	877.07	1101.57
109234	2018	3628 Hotsprings Rd, Agassiz	295.00	
109235	2018	1401 Kennedy Rd, Harrison Mills	899.85	689.88
109216	2018	1750 School Rd, Harrison Mills	372.43	
109109	2018	4506 Glenmore Rd, Abbotsford	532.61	
109300	2018	1280 Hamilton Rd, Agassiz	76.00	
BGM - No required	2018	48192 Chilliwack Central Rd, Chilliwack	909.44	
109635	2018	1233 Kilby Rd, Harrison Mills	0	441.86
109632	2018	1025 Kennedy Rd, Harrison Mills	0	299.90

According to the aforementioned table, two of the properties, 1233 Kilby Rd and 1025 Kennedy Rd, did not receive any application of biosolids during 2018, the material hauled to this location were stockpiled for 2019 Spring application.

Under an OMRR approved disposal alternative of biosolids, BioCentral produced BGM at 48192 Chilliwack Central Rd. property in Chilliwack. This alternative does not require any notification nor authorization to any authority. Nevertheless, OMRR has standards for the final product as per Schedule 11.

The process of obtaining authorizations for Land Application included providing a Notification as per the requirements of OMRR Part 4 Division 2 Section 22. The Notifications were provided to the MOE Permit Registration office in Victoria, the local MOE officer, the ALC planner for the region, and the Health Authority for the Region (Fraser Health).

The Notifications were followed up with the Land Application Plan, a comprehensive document providing details of the land application, the results of the biosolids testing, soil testing results, and the expected change in trace element concentrations resulting from the Land Application.

All Land Application Plans were provided to City of Abbotsford Engineering staff as well as to Ministry of the Environment, Fraser Health and the Agricultural Land Commission.

2.1 Actual Land Application of Biosolids in 2018

In total, 4,201.57 WT of class A biosolids were applied during 2018 as follow; 2,611.37 WT were applied during April and May, from material stockpiled since 2017 in six (6) properties. Whereas the remnant 1,590.20 WT, were hauled from the small and medium tent between May and June 2018; small tent

material (680.76 WT) were land applied in two properties, meanwhile, medium tent material (909.44 WT) were turned into BGM. Table 3 has a summary of the material distribution during 2018.

Table 3 2018 Biosolids Distribution

2018	Wet Tonnes	JAMES Plant Storage	Wet Tonnes	Application Site	Status	Application Date
April	Stored in 2017	Large tent 2017	372.43	1750 School Rd, Harrison Mills	Applied	19-Apr-18
		Medium tent 2017	751.70	1401 Kennedy Rd, Harrison Mills	Applied	23-Apr-18
May	680.76	Small tent	532.61	4506 Glenmore Rd, Abbotsford	Applied	03-May-18
			148.15	1401 Kennedy Rd, Harrison Mills	Applied	04-May-18
	Stored in 2017	Med-small tent 2017	877.07	3954 Hotsprings Rd, Agassiz	Applied	17-May-18
		Large tent 2017 (Dec)	239.17	1995 Fir Rd, Agassiz	Applied	17-May-18
		Large tent 2017 (Dec)	76.00	1280 Hamilton Rd, Agassiz	Applied	17-May-18
		Large tent 2017 (June)	295.00	3628 Hotsprings Rd, Agassiz	Applied	25-May-18
June	909.44	Medium tent	909.44	48192 Chilliwack Central Rd, Chilliwack	BGM	October
Sep	673.1	Small tent	78.29	1401 Kennedy Rd, Harrison Mills	Stored	Spring 2019
			594.81	3954 Hotsprings Rd, Agassiz	Stored	Spring 2019
	1118.35	Large tent	611.59	1401 Kennedy Rd, Harrison Mills	Stored	Spring 2019
			506.76	3954 Hotsprings Rd, Agassiz	Stored	Spring 2019
Oct	741.76	Large tent	441.86	1233 Kilby Rd, Harrison Mills	Stored	Spring 2019
			299.90	1025 Kennedy Rd, Harrison Mills	Stored	Spring 2019

A total of 2,533.21 WT of Class A biosolids remain currently in storage at four (4) of the nine (9) properties with active MOE authorizations for further application in 2019 Spring. These biosolids are being stored in accordance with the OMRR Part 4, Division 1, particularly Section 20, as shows in Photo 1.

Photo 1 Class A biosolids stockpile at 1233 Kilby Rd.

Biosolids Growing Medium production was based on a volume ratio of 1 biosolids, 1.5 sand, and 2 sawdust. That mix (S7 sample) was found after several tests done by BioCentral, lab data for these experimental mixes can be found in *Appendix A. BGM Results*. Table 4, presents the analysis results for the chosen mix.

Table 4 Lab results BGM selected mix

Parameter	Unit	Selected mix	OMRR limits[1]
Organic Matter	%	9.8	<15
Total Kjeldahl Nitrogen	%	0.178	0.6
C:N Ratio		23.5	>15
Arsenic (As)	mg/kg	3.75	13
Cadmium (Cd)	mg/kg	0.157	1.5
Chromium (Cr)	mg/kg	26.8	100
Cobalt (Co)	mg/kg	6.35	34
Copper (Cu)	mg/kg	44.8	150
Lead (Pb)	mg/kg	3.08	150
Mercury (Hg)	mg/kg	0.083	0.8
Molybdenum (Mo)	mg/kg	0.71	5
Nickel (Ni)	mg/kg	23.8	62
Selenium (Se)	mg/kg	0.33	2
Zinc (Zn)	mg/kg	69.5	150

[1] Schedule 4 (column 2) and schedule 11, OMRR

BioCentral BGM production was done between July and August 2018. As a way to optimize the recycled organic matter and reduce the carbon footprint, BioCentral ground up residual trees at the nursery, in order to use this product as a carbon feedstock; in others scenarios, this material would be burned. Sand was supplied for authorized pits.

The feedstock was mixed with a mixer wagon, in order to get a homogeneous product, following the chose mix ratio, as shows in Photo 2.

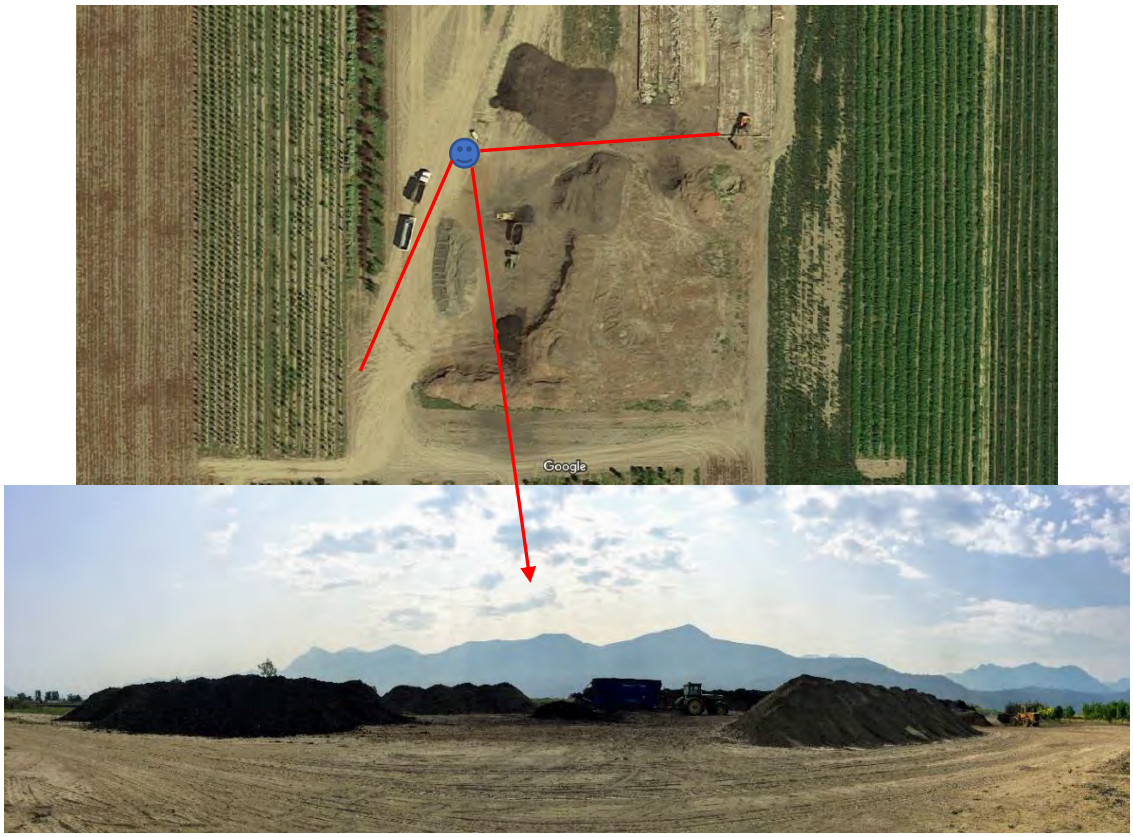

Photo 2 BGM production layout

Approximately, BioCentral produced 4056 m^3 of BGM that was applied on 48192 Chilliwack Central Rd. (Cannor Nurseries Ltd.) during August to October, as a growing medium for nursery trees. This material was incorporated to land through plowing.

In August 3, 2018, BioCentral tested the BGM pile, samples were sent for analysis to ALS Environmental lab in Burnaby BC. Table 5 shows analysis results. *Appendix A. BGM Results,* has the original report from the lab.

Table 5 Lab results BGM production at Cannor Nursery

Parameter	Unit	Sample	OMRR limits[1]
Organic Matter	%	6.9	<15
Total Kjeldahl Nitrogen	%	0.39	0.6
C:N Ratio		12.92	>15
Arsenic (As)	mg/kg	8.62	13
Cadmium (Cd)	mg/kg	0.325	1.5
Chromium (Cr)	mg/kg	43.1	100
Cobalt (Co)	mg/kg	9.55	34
Copper (Cu)	mg/kg	80.5	150

Parameter	Unit	Sample	OMRR limits[1]
Lead (Pb)	mg/kg	5.7	150
Mercury (Hg)	mg/kg	0.150	0.8
Molybdenum (Mo)	mg/kg	1.22	5
Nickel (Ni)	mg/kg	43.1	62
Selenium (Se)	mg/kg	0.57	2
Zinc (Zn)	mg/kg	138	150

[1] Schedule 4 (column 2) and schedule 11, OMRR

As per Table 5 data, all parameters met requirements of schedules 4 and 11 of OMRR. Just one of the parameters, carbon to nitrogen ratio, is slightly below the OMRR standards. This parameter is at 86% of the required value, however, this concentration does not cause any harmful effect on the soil. Once the BGM is placed on the soil and plowed, the C:N ratio tends to increase due to the soil dilutes the nitrogen concentration.

3. Land Application Plans

Appendix B. LAP contained all the Land Application Plans (LAP) for the seven (7) properties where biosolids were applied during 2018. Those LAP's were prepared by BioCentral's Qualify Professional, John Paul, PhD, P.Ag., following the requirements of OMRR Part 3 Division 1 and Schedule 7.

After the land application of biosolids in each property, Dr. John Paul in behalf of BioCentral, prepared a written certification of land application, confirming that applications were done accordingly with the Land Application Plan. These letters were delivered to each landowner in order to notify them in regards the application including dates, amounts, and rates. Copy of these letters can be found in *Appendix C. Written Certifications*.

4. JAMES Plant Biosolids Data

"The biosolids produced at the JAMES Plant are sampled on a daily basis, with weekly and monthly composite samples being submitted to an external lab for analysis. The extra sampling allows the City of Abbotsford to monitor the quality of the biosolids and to ensure the biosolids produced at the JAMES Plant are consistently of exceptional quality" (City of Abbotsford, Biosolids Management 2018).

The Land Application Plans for 2018 were based on the data provided by the City of Abbotsford for 2017. Analysis of this data, compared with previous years, demonstrated that the quality and characteristics of the Class A biosolids did not change appreciably within the year or between years.

The 2017 biosolids quality data provided for the Land Application Plans required verification based on the 2018 biosolids characteristics, as these more accurately reflect the material that was land applied. The 2018 JAMES Treatment Plant data is found in *Appendix D. JAMES Plant quality data*.

Class A biosolids were approved for release by the City of Abbotsford following extensive fecal coliform testing to ensure that the biosolids met the Class A requirements. BioCentral, tested for fecal coliform to verify that the biosolids are in compliance with Class A requirements. A summary of the data testing results performed by BioCentral is presented in Table 6.

Table 6 BioCentral Quality Control Data 2018

Parameter	Sampling Date		CLASS A (OMRR)	CANADA T-4-93
	March 15th	Sept 28th		
	mg/Kg	mg/Kg	mg/Kg	mg/Kg
Arsenic (As)	3.9	4.4	75	75
Cadmium (Cd)	1.5	1.8	20	20
Chromium (Cr)	74	45	1060	not included
Cobalt (Co)	3.2	3.3	150	150
Copper (Cu)	820	680	2200	not included
Lead (Pb)	26	24	500	500
Mercury (Hg)	2.1	2.7	5	5
Molybdenum (Mo)	9.5	8.2	20	20
Nickel (Ni)	41	25	180	180
Selenium (Se)	6.3	7.7	14	14
Zinc (Zn)	1200	1200	1850	1850
Fecal coliform (MPN/g)	<16 / <14 / <14	<13	<1000	-

During 2018, BioCentral took four (4) samples as per its Control Quality routine; three (3) of them were taken from a material stockpiled at 3954 Hotsprings Rd, which had concentrations over OMRR limits for fecal coliforms in 2017. March sampling, confirmed that fecal coliforms met OMRR requirements for Class A biosolids, prior its land application. (Metals analysis of this material was done in September 2017). The fourth sample was taken from the large tent on September 28, 2018. Results proved that biosolids were in compliance with OMRR standards.

Prepared by:

Andres Murillo, P.Eng.
General Manager

Appendix A

BGM Results

BIOCENTRAL GREEN DEPOT LTD.
ATTN: Andres Moreno
7357 Pioneer Avenue
Agassiz BC V0M 1A0

Date Received: 14-NOV-17
Report Date: 22-NOV-17 13:36 (MT)
Version: FINAL

Client Phone: 604-845-2487

Certificate of Analysis

Lab Work Order #: L2022168

Project P.O. #: 13218
Job Reference: 13218
C of C Numbers: 17-677976
Legal Site Desc:

Carla Fuginski
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L2022168-1	L2022168-2	L2022168-3	L2022168-4	
Description	SOIL	SOIL	SOIL	SOIL	
Sampled Date	14-NOV-17	14-NOV-17	14-NOV-17	14-NOV-17	
Sampled Time	14:10	14:12	14:16	14:18	
Client ID	S7	S8	S9	S10	
Grouping / **Analyte**					
SOIL					
Physical Tests Conductivity (dS/m)	0.969	0.972	0.731	0.927	
Loss on Ignition @ 375 C (%)	12.2	33.6	22.7	20.8	
Moisture (%)	25.0	42.1	39.0	40.4	
Organic Matter (%)	9.8	26.5	18.0	16.5	
pH (1:2 soil:water) (pH)	6.83	7.24	7.28	7.57	
Leachable Anions & Nutrients Total Kjeldahl Nitrogen (%)	0.178 DLM	0.81 DLHC	0.87 DLHC	0.629 DLM	
Organic / Inorganic Carbon C:N Ratio	23.5:1	14.5:1	13.1:1	15.4:1	
Total Carbon by Combustion (%)	4.18	11.8	11.4	9.71	
Metals Aluminum (Al) (mg/kg)	8660	18300	20600	21200	
Antimony (Sb) (mg/kg)	0.46	0.74	0.69	0.71	
Arsenic (As) (mg/kg)	3.75	4.64	4.81	5.02	
Barium (Ba) (mg/kg)	52.4	117	126	128	
Beryllium (Be) (mg/kg)	0.16	0.32	0.38	0.38	
Bismuth (Bi) (mg/kg)	1.40	4.53	3.43	3.23	
Boron (B) (mg/kg)	<5.0	<5.0	<5.0	<5.0	
Cadmium (Cd) (mg/kg)	0.157	0.360	0.334	0.320	
Calcium (Ca) (mg/kg)	6670	5300	4990	5000	
Chromium (Cr) (mg/kg)	26.8	41.3	45.3	46.7	
Cobalt (Co) (mg/kg)	6.35	8.94	9.92	10.3	
Copper (Cu) (mg/kg)	44.8	98.5	82.0	79.6	
Iron (Fe) (mg/kg)	16200	22100	24100	24900	
Lead (Pb) (mg/kg)	3.08	10.7	10.4	10.2	
Lithium (Li) (mg/kg)	8.2	12.8	14.2	14.5	
Magnesium (Mg) (mg/kg)	5620	5510	5800	6020	
Manganese (Mn) (mg/kg)	348	348	358	359	
Mercury (Hg) (mg/kg)	0.083	0.197	0.264	0.184	
Molybdenum (Mo) (mg/kg)	0.71	1.63	1.47	1.44	
Nickel (Ni) (mg/kg)	23.8	35.3	38.0	39.0	
Phosphorus (P) (mg/kg)	1060	2660	2130	2060	
Potassium (K) (mg/kg)	610	810	810	800	
Selenium (Se) (mg/kg)	0.33	0.85	0.78	0.81	
Silver (Ag) (mg/kg)	0.24	0.53	0.45	0.37	
Sodium (Na) (mg/kg)	284	353	266	255	
Strontium (Sr) (mg/kg)	29.8	27.9	28.0	29.1	
Sulfur (S) (mg/kg)	<1000	1600	1300	1200	
Thallium (Tl) (mg/kg)	<0.050	0.088	0.100	0.095	

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L2022168-1	L2022168-2	L2022168-3	L2022168-4	
Description	SOIL	SOIL	SOIL	SOIL	
Sampled Date	14-NOV-17	14-NOV-17	14-NOV-17	14-NOV-17	
Sampled Time	14:10	14:12	14:16	14:18	
Client ID	S7	S8	S9	S10	
Grouping **Analyte**					
SOIL					
Metals Tin (Sn) (mg/kg)	<2.0	4.4	3.4	3.2	
Titanium (Ti) (mg/kg)	646	479	618	651	
Tungsten (W) (mg/kg)	<0.50	<0.50	<0.50	<0.50	
Uranium (U) (mg/kg)	0.210	0.691	0.790	0.733	
Vanadium (V) (mg/kg)	36.7	50.3	54.9	58.5	
Zinc (Zn) (mg/kg)	69.5	164	143	142	
Zirconium (Zr) (mg/kg)	1.8	3.1	2.3	2.6	

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

Reference Information

QC Samples with Qualifiers & Comments:

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

Qualifiers for Individual Parameters Listed:

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

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
C-TOT-LECO-SK	Soil	Total Carbon by combustion method	CSSS (2008) 21.2
The sample is ignited in a combustion analyzer where carbon in the reduced CO2 gas is determined using a thermal conductivity detector.			
EC-LEACH-VA	Soil	Conductivity on Soil leach (1:10, dS/m)	BC MINISTRY OF ENERGY AND MINES
Leachable Anions in Sediment/Soil Method analysis is carried out using a leaching procedure which involves the gentle tumbling of the sample in a specified leaching solution (typically deionized water) for a specific length of time. The resulting extract is then analysed using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.			
ETL-C:N-RATIO-SK	Soil	Carbon:Nitrogen Ratio - Calculation	Calculation
HG-200.2-CVAF-VA	Soil	Mercury in Soil by CVAFS	EPA 200.2/1631E (mod)
Soil samples are digested with nitric and hydrochloric acids, followed by analysis by CVAFS.			
MET-200.2-CCMS-VA	Soil	Metals in Soil by CRC ICPMS	EPA 200.2/6020A (mod)
This method uses a heated strong acid digestion with HNO3 and HCl and is intended to liberate metals that may be environmentally available. Silicate minerals are not solubilized. Dependent on sample matrix, some metals may be only partially recovered, including Al, Ba, Be, Cr, Sr, Ti, Tl, V, W, and Zr. Volatile forms of sulfur (including sulfide) may not be captured, as they may be lost during sampling, storage, or digestion. Analysis is by Collision/Reaction Cell ICPMS.			
MOISTURE-VA	Soil	Moisture content	CWS for PHC in Soil - Tier 1
This analysis is carried out gravimetrically by drying the sample at 105 C for a minimum of six hours.			
N-TOTKJ-COL-SK	Soil	Total Kjeldahl Nitrogen	CSSS (2008) 22.2.3
The soil is digested with sulfuric acid in the presence of CuSO4 and K2SO4 catalysts. Ammonia in the soil extract is determined colrimetrically at 660 nm.			
OM-LOI-SK	Soil	Organic Matter by LOI at 375 deg C.	CSSS (1978) p. 160
The dry-ash method involves the removal of organic matter by combustion at 375 degrees C for a minimum of 16 hours. Samples are dried prior to combustion.			
Reference: McKeague, J.A. Soil Sampling and Methods of Analysis. Can. Soc. Soil Sci.(1978) method 4.23			
PH-1:2-VA	Soil	pH in Soil (1:2 Soil:Water Extraction)	BC WLAP METHOD: PH, ELECTROMETRIC, SOIL
This analysis is carried out in accordance with procedures described in the pH, Electrometric in Soil and Sediment method - Section B Physical/Inorganic and Misc. Constituents, BC Environmental Laboratory Manual 2007. The procedure involves mixing the dried (at <60°C) and sieved (No. 10 / 2mm) sample with deionized/distilled water at a 1:2 ratio of sediment to water. The pH of the solution is then measured using a standard pH probe.			

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

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

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

Chain of Custody Numbers:

17-677976

Reference Information

GLOSSARY OF REPORT TERMS

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

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

ALS Environmental
www.alsglobal.com

Chain of Custody (COC) / Analytical Request Form

Canada Toll Free: 1 800 668 9878

L2022168-COFC

COC Number: 17 - 677976

Page of

Report To	Contact and company name below will appear on the final report
Company:	BioCentral
Contact:	Andres Marcio
Phone:	6049971630
	Company address below will appear on the final report
Street:	7357 Pioneer Ave.
City/Province:	Agassiz, B.C
Postal Code:	V0M 1A0
Invoice To	Same as Report To [x] YES [ ] NO
	Copy of Invoice with Report [x] YES [ ] NO
Company:	
Contact:	

Report Format / Distribution	
Select Report Format:	[x] PDF [x] EXCEL | | EDD (DIGITAL)
Quality Control (QC) Report with Report	[x] YES [ ] NO
	[ ] Compare Results to Criteria on Report - provide details below if box checked
Select Distribution:	[x] EMAIL | | MAIL [ ] FAX
Email 1 or Fax	andres m@biocentral.ca
Email 2	frank@timbroconstruction.com
Email 3	

Invoice Distribution	
Select Invoice Distribution:	[x] EMAIL [ ] MAIL [ ] FAX
Email 1 or Fax	info@timbroconstruction.com
Email 2	andresm@biocentral.ca

Project Information		Oil and Gas Required Fields (client use)	
ALS Account # / Quote #:	Q64851 | Q64866	AFE/Cost Center:	PO#:
Job #:	13218-7 P.O.	Major/Minor Code:	Routing Code:
PO / AFE:		Requisitioner:	
LSD:		Location:	
ALS Lab Work Order # (lab use only):		ALS Contact: Carla	Sampler: Andres

Select Service Level Below - Contact your AM to confirm all E&P TATs (surcharges may apply)

Regular [R] [x] Standard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days): 4 day [P4-20%] [ ]; 3 day [P3-25%] [ ]; 2 day [P2-50%] [ ]

EMERGENCY: 1 Business day [E-100%] [ ]; Same Day, Weekend or Statutory holiday [E2-200% (Laboratory opening fees may apply)] [ ]

Date and Time Required for all E&P TATs: dd-mmm-yy hh:mm

For tests that can not be performed according to the service level selected, you will be contacted.

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	E.C	PH	Metals	TKN	C.N (Cyanide-Tot-SK)	O.M (COM-COK-SK)	SAMPLES ON HOLD	Sample is hazardous (please provide further details)	NUMBER OF CONTAINERS
	S7	14-11-2017	14:10	Soil	✓	✓	✓	✓	✓	✓			1
	S8	"	14:12	"	✓	✓	✓	✓	✓	✓			1
	S9	"	14:16	"	✓	✓	✓	✓	✓	✓			1
	S10	"	14:19	"	✓	✓	✓	✓	✓	✓			1

Drinking Water (DW) Samples[1] (client use)	Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)
Are samples taken from a Regulated DW System? [ ] YES [ ] NO	
Are samples for human consumption/ use? [ ] YES [ ] NO	

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen [ ] SIF Observations Yes [ ] No [ ]

Ice Packs [x] Ice Cubes [ ] Custody seal intact Yes [ ] No [ ]

Cooling Initiated [ ]

INITIAL COOLER TEMPERATURES °C	FINAL COOLER TEMPERATURES °C
	6

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: Andres Marcio	Date: 14-11-2017	Time:	Received by:	Date:	Time:	Received by:	Date: 11/14/17	Time: 15:55

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

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JULY 2017 FRONT

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.

BIOCENTRAL GREEN DEPOT LTD.
ATTN: Andres Moreno
7357 Pioneer Avenue
Agassiz BC V0M 1A0

Date Received: 07-AUG-18
Report Date: 15-AUG-18 13:59 (MT)
Version: FINAL REV. 4

Client Phone: 604-845-2487

Certificate of Analysis

Lab Work Order #: L2141866

Project P.O. #: 580
Job Reference: 601
C of C Numbers: 17-665533
Legal Site Desc:

Comments: Split report; L2141866-3 only

Carla Fuginski
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2141866-3				
	Description	Soil				
	Sampled Date	03-AUG-18				
	Sampled Time					
	Client ID	BGM CANNOR				
Grouping	**Analyte**					
SOIL						
Physical Tests	Loss on Ignition @ 375 C (%)	8.5				
	Moisture (%)	27.3				
	Organic Matter (%)	6.9				
	pH (1:2 soil:water) (pH)	7.56				
Leachable Anions & Nutrients	Total Kjeldahl Nitrogen (%)	0.39 DLHC				
	Total Kjeldahl Nitrogen (mg/kg)	3900 DLHC				
Organic / Inorganic Carbon	C:N Ratio	12.9:1				
	Total Carbon by Combustion (%)	5.04				
Metals	Aluminum (Al) (mg/kg)	12800				
	Antimony (Sb) (mg/kg)	0.60				
	Arsenic (As) (mg/kg)	8.62				
	Barium (Ba) (mg/kg)	94.7				
	Beryllium (Be) (mg/kg)	0.23				
	Bismuth (Bi) (mg/kg)	2.69				
	Boron (B) (mg/kg)	<5.0				
	Cadmium (Cd) (mg/kg)	0.325				
	Calcium (Ca) (mg/kg)	9360				
	Chromium (Cr) (mg/kg)	43.1				
	Cobalt (Co) (mg/kg)	9.55				
	Copper (Cu) (mg/kg)	80.5				
	Iron (Fe) (mg/kg)	23500				
	Lead (Pb) (mg/kg)	5.70				
	Lithium (Li) (mg/kg)	12.2				
	Magnesium (Mg) (mg/kg)	8640				
	Manganese (Mn) (mg/kg)	442				
	Mercury (Hg) (mg/kg)	0.150				
	Molybdenum (Mo) (mg/kg)	1.22				
	Nickel (Ni) (mg/kg)	43.1				
	Phosphorus (P) (mg/kg)	1910				
	Potassium (K) (mg/kg)	1080				
	Selenium (Se) (mg/kg)	0.57				
	Silver (Ag) (mg/kg)	0.41				
	Sodium (Na) (mg/kg)	184				
	Strontium (Sr) (mg/kg)	43.4				
	Sulfur (S) (mg/kg)	<1000				
	Thallium (Tl) (mg/kg)	0.067				

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2141866-3				
	Description	Soil				
	Sampled Date	03-AUG-18				
	Sampled Time					
	Client ID	BGM CANNOR				
Grouping	**Analyte**					
SOIL						
Metals	Tin (Sn) (mg/kg)	2.7				
	Titanium (Ti) (mg/kg)	792				
	Tungsten (W) (mg/kg)	<0.50				
	Uranium (U) (mg/kg)	0.402				
	Vanadium (V) (mg/kg)	48.4				
	Zinc (Zn) (mg/kg)	138				
	Zirconium (Zr) (mg/kg)	1.3				

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

Reference Information

QC Samples with Qualifiers & Comments:

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

Qualifiers for Individual Parameters Listed:

Qualifier	Description
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
C-TOT-LECO-SK	Soil	Total Carbon by combustion method	CSSS (2008) 21.2
The sample is ignited in a combustion analyzer where carbon in the reduced CO2 gas is determined using a thermal conductivity detector.			
ETL-C:N-RATIO-SK	Soil	Carbon:Nitrogen Ratio - Calculation	Calculation
HG-200.2-CVAF-VA	Soil	Mercury in Soil by CVAAS	EPA 200.2/1631E (mod)
Soil samples are digested with hot nitric and hydrochloric acids, followed by CVAAS analysis. This method is fully compliant with the BC SALM strong acid leachable metals digestion method.			
MET-200.2-CCMS-VA	Soil	Metals in Soil by CRC ICPMS	EPA 200.2/6020A (mod)
This method uses a heated strong acid digestion with HNO3 and HCl and is intended to liberate metals that may be environmentally available. Silicate minerals are not solubilized. Dependent on sample matrix, some metals may be only partially recovered, including Al, Ba, Be, Cr, Sr, Ti, Tl, V, W, and Zr. Volatile forms of sulfur (including sulfide) may not be captured, as they may be lost during sampling, storage, or digestion. Analysis is by Collision/Reaction Cell ICPMS.			
MOISTURE-VA	Soil	Moisture content	CWS for PHC in Soil - Tier 1
This analysis is carried out gravimetrically by drying the sample at 105 C for a minimum of six hours.			
N-TOTKJ-COL-SK	Soil	Total Kjeldahl Nitrogen	CSSS (2008) 22.2.3
The soil is digested with sulfuric acid in the presence of CuSO4 and K2SO4 catalysts. Ammonia in the soil extract is determined colrimetrically at 660 nm.			
OM-LOI-SK	Soil	Organic Matter by LOI at 375 deg C.	CSSS (1978) p. 160
The dry-ash method involves the removal of organic matter by combustion at 375 degrees C for a minimum of 16 hours. Samples are dried prior to combustion.			
Reference: McKeague, J.A. Soil Sampling and Methods of Analysis. Can. Soc. Soil Sci.(1978) method 4.23			
PH-1:2-VA	Soil	pH in Soil (1:2 Soil:Water Extraction)	BC WLAP METHOD: PH, ELECTROMETRIC, SOIL
This analysis is carried out in accordance with procedures described in the pH, Electrometric in Soil and Sediment method - Section B Physical/Inorganic and Misc. Constituents, BC Environmental Laboratory Manual 2007. The procedure involves mixing the dried (at <60°C) and sieved (No. 10 / 2mm) sample with deionized/distilled water at a 1:2 ratio of sediment to water. The pH of the solution is then measured using a standard pH probe.			

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

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

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

Chain of Custody Numbers:

17-665533

Reference Information

GLOSSARY OF REPORT TERMS

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

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

ALS Environmental
www.alsglobal.com

Chain of Custody (COC) / Analytical Request Form

Canada Toll Free: 1 800 668 9878

L2141866-COFC

COC Number: 17 - 665533

Page of

Report To	Contact and company name below will appear on the final report
Company:	BioContral
Contact:	Andres Marno
Phone:	604-997-1630
Company address below will appear on the final report	
Street:	7357 Pioneer Ave.
City/Province:	Agassiz, B.C
Postal Code:	V0M 1A0

Report Format / Distribution	
Select Report Format:	[x] PDF [x] EXCEL [ ] EDD (DIGITAL)
Quality Control (QC) Report with Report	[x] YES [ ] NO
[ ] Compare Results to Criteria on Report - provide details below if box checked	
Select Distribution:	[x] EMAIL [ ] MAIL [ ] FAX
Email 1 or Fax	andresm@biocontral.ca
Email 2	frank@timbroconstruction.com
Email 3	

Select Service Level Below - Contact your AM to confirm all E&P TATs (surcharges may apply)

Regular [R]	[x] Standard TAT if received by 3 pm - business days - no surcharges apply
PRIORITY (Business Days) 4 day [P4-20%] [ ]	EMERGENCY 1 Business day [E-100%] [ ]
3 day [P3-25%] [ ]	Same Day, Weekend or Statutory holiday [E2-200% (Laboratory opening fees may apply)] [ ]
2 day [P2-50%] [ ]	
Date and Time Required for all E&P TATs:	dd-mmm-yy hh:mm

For tests that can not be performed according to the service level selected, you will be contacted.

Invoice To	
Same as Report To	[x] YES [ ] NO
Copy of Invoice with Report	[ ] YES [ ] NO
Company:	
Contact:	

Invoice Distribution	
Select Invoice Distribution:	[x] EMAIL [ ] MAIL [ ] FAX
Email 1 or Fax	info@timbroconstruction.com
Email 2	andresm@biocentral.ca

Project Information	
ALS Account # / Quote #:	B10600 / Q64857
Job #:	601
PO / AFE:	580
LSD:	
ALS Lab Work Order # (lab use only):	

Oil and Gas Required Fields (client use)	
AFE/Cost Center:	PO#
Major/Minor Code:	Routing Code:
Requisitioner:	
Location:	
ALS Contact: Carla	Sampler: Andres M.

Analysis Request — Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	TKN	TOC	TIC	Metals	SAMPLES ON HOLD	Sample is hazardous (please provide further details)	NUMBER OF CONTAINERS
	BGM- Medium tent	03-08-18		Soil	✓	✓	✓	✓			1
	BGM- MIX	[illegible]		"	✓	✓	✓	✓			1
	BGM Cannor	"		"	✓	✓	✓	✓			1

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System?

[ ] YES [ ] NO

Are samples for human consumption/ use?

[ ] YES [ ] NO

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

Separate reports for each sample

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen [ ]	SIF Observations	Yes [ ]	No [ ]
Ice Packs [ ] Ice Cubes [ ]	Custody seal intact	Yes [ ]	No [ ]
Cooling Initiated [ ]			
INITIAL COOLER TEMPERATURES °C		FINAL COOLER TEMPERATURES °C 23.2	

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: Andres M.	Date: 2018.08.07	Time: 8:50	Received by:	Date:	Time:	Received by: [signature]	Date: Aug 7/2018	Time: 9am

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1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.

Appendix B

Land Application Plans

1280 Hamilton Rd, Agassiz, BC

Class A Biosolids Application Plan: 2018

April 30, 2018

MOE Authorization # 109300

Prepared by:

John Paul, PhD PAg
Transform Compost Systems Ltd
3911 Mt Lehman Rd
Abbotsford, BC V2T 5W5
Ph: 604-302-4367
Email: transform@telus.net

1280 Hamilton Rd Class A Biosolids Application Plan 2018

Introduction

This Land Application Plan for the application of Class A biosolids provides the guidance and information required under British Columbia's Organic Matter Recycling Regulation (OMRR), a regulation enacted to ensure that biosolids are managed in a manner that protects human health and the environment.

Class A biosolids are considered a valuable source of both plant nutrients and organic matter. Class A biosolids are the highest quality biosolids achievable under the OMRR, particularly regarding fecal coliform counts (< 1,000 most probable number per gram), and trace element (metal) concentrations. The land application plan must be prepared by a qualified professional as defined in the OMRR.

Class A biosolids will be land applied in 2018 as a source of nutrients and organic matter for the soil on a 32 ha farm in Agassiz, BC, of which approximately 15 ha will be included in a land application area for growing forage for cattle. The total amount of Class A biosolids that will be land applied is up to 825 tonnes. This Land Application Plan (LAP) provides guidance in the beneficial reuse of a portion of the Class A biosolids from the JAMES Treatment Plant, a wastewater treatment facility that processes wastewater from the communities of Abbotsford and Mission.
(http://www.abbotsford.ca/city_services/wastewater/biosolids_management.htm#JAMES).

This land application plan utilizes the biosolids quality data for 2017, provided by the City of Abbotsford. The Class A biosolids used for this land application was generated by the JAMES wastewater treatment plant late 2017 and early 2018.

The Land Application Plan follows the Notification dated February 20, 2018 (Appendix A).

Qualifications of the Qualified Professional

The professional agrologist preparing this report has extensive training and experience with soil, waste and agricultural land in particular. John Paul, PhD is a registered professional agrologist, who obtained his MSc and PhD in soil biochemistry from the University of Guelph in 1991. He has acted as a professional agrologist for many sites requiring soil deposit and removal reports, nutrient management and waste management plans. He has extensive experience with the various Acts and Regulations regarding agricultural land use and agricultural and industrial wastes.

Land Application Objectives

The specific objectives of this land application plan are to ensure that the Class A biosolids are stored and applied in a manner that provides the greatest benefit for the crop grown on this

property, while minimizing risk of environmental pollution. The plan will consider the specific crops that are growing on this property, as well as any other nutrient input that is used for growing crops or improving the soil.

Site Characteristics

Location

The Land Application Plan is for Class A biosolids application on a farm located at 1280 Hamilton Rd., Agassiz, BC. The legal description for the three properties included in this address is:

1. Lot 2, except firstly: the west 15.38 chains, secondly parcel "A" (reference plan 5524), Section 23, Township 3, Range 29, west of 6th Meridian NWD Plan 3156 – PID 006-549-900
2. West 15.38 Chains Lot 2, Except Parcel "B: (reference plan 5536), sections of 23 Township 3, Range 29, west of 6th Meridian Yale Division of Yale District Plan 3156 – PID 010-889-574
3. Lot 1, Section 23, Township 3, Meridian 6, Plan NWP3156 Meridian W6 – PID 010-889-523

Figure 1. Location of the land application area at 1280 Hamilton Rd relative to the Fraser River and the community of Agassiz.

This farm is located approximately 7 km southwest of the Town of Agassiz, BC.

The location is zoned agricultural and is within the Agricultural Land Reserve. The property is surrounded by agricultural lands in forage production to the north, south and west, and the mountain to the east.

The coordinates of the site are

Longitude: 121° 48’ 37” W

Latitude: 49° 13’ 42” N

Figure 2. Aerial view of the property and land application area at 1280 Hamilton Rd. The property is depicted with a yellow border and the land application area depicted with a red border.

Climate

Agassiz has a wet but moderate to mild climate in the wintertime with dry summers. The annual mean total rainfall is 1440 mm, with an average of 230 mm in January, and 60 mm in July. The annual mean total snowfall is 940 mm. The annual mean daily temperature in July is 23°C, and in January is 2.5 °C. The wind direction is generally from the southeast to the northwest. Source of weather information: http://www.climate-charts.com/Locations/c/CN71113011001200.php

Soil Properties

The soil at this farm is described as a Monroe Clay Loam (Kelly and Spilsbury 1939), which is a very common soil type along the lower Fraser River. Typically these soils have 15-25 cm of clay loam over approximately 30 cm of compacted clay loam. Based on soil sampling, the depth of the surface clay loam is approximately 25 cm above compacted lighter- colored clay. Towards the east, the topsoil changes to more organic soil.

Four soil samples were taken from the area used for land application in March 2018. The location of the soil samples are identified in Appendix B. The complete soil analysis information is found in Appendix C.

Figure 3. Soil profile showing approximately 25 cm of clay loam overlying a compacted clay subsoil in the land application area of 1280 Hamilton Rd.

The soil organic matter content averaged 9.2 % in the top 15 cm. The soil has a slightly lower pH of 5.9 (Figure 4), a base saturation of 59%, mostly from calcium (48.8%), magnesium (8.5%), and sodium (1.4%).

The soil characteristics were variable on this property due to slight elevation changes. It appears that some of the area had a history of manure application because of the high concentrations of phosphorus and potassium.

	Soil Characteristics		
Organic matter		%	9.2
Nitrogen		%	1.1
pH			5.9
EC		dS/m	0.2
Nitrate			5.0
Phosphorus			36->80
Potassium			94.3
Base Saturation		%	58.7
	Calcium	%	48.8
	Magnesium	%	8.5
	Potassium	%	<0.9
	Sodium	%	1.4

Figure 4. Soil characteristics (March 2018)

Slope and Topography

The topography of the field is almost level with a few slight undulations.

Depth to Groundwater Table

The elevation of the property is approximately 13 m above sea level, and approximately 0.5-2 m above the level of the Fraser River, depending on the time of year. The depth to groundwater fluctuates with the water level in the Fraser River and is generally within 0.5-2 m of the surface.

Figure 5. View of the land application area looking from the south east corner at 1280 Hamilton Rd (March 22, 2018 photo).

Soil Nutrients

Most of the four individual soil samples showed that the soil was marginal in available nitrogen, which is normal for soil sampled in the spring in the Fraser Valley. Available potassium was deficient in all of the soil samples. Phosphorus concentrations varied from deficient to optimal. Sulphur concentrations were deficient to marginal. This is characteristic of soils in the Fraser Valley that have had little history of application of manure or other organic matter.

Soil Trace Element

A total of four individual soil samples were obtained from 0-15 cm depth in the land application area on the property. The complete laboratory soil analysis data is found in Appendix C.

All of the trace element concentrations are below the limits for agricultural soil as documented in the OMRR (OMRR Schedules 9 and 10, limits used for livestock ingesting soil and fodder are used where applicable), with the exception of chromium. The limits as per OMRR represent the most conservative of all uses on either agricultural or residential soils.

Soil Trace Element Concentrations (mg/kg)		
		2018
Arsenic		4.48
Cadmium		0.25
Chromium		67.25
Cobalt		10.53
Copper		29.75
Lead		7.90
Mercury		0.047
Molybdenum		0.40
Nickel		34.50
Selenium		<.5
Zinc		81.00

Figure 6. Soil trace element concentrations in the 0-15 cm depth in the soil in the land application area.

It will be important to track the soil chromium concentrations. All of the soil analyses of the various land application sites in 2018 showed significantly increased chromium concentrations, despite either no, or very little application of biosolids. In addition, as will be demonstrated later in the land application plan, there is very little chromium added with the biosolids application. The elevated chromium concentrations appear to be characteristic of the Fraser River sediments, and are significantly higher for the 2018 samples than soil samples taken in previous years.

Biosolids Source and Characteristics

The Class A biosolids are produced at the JAMES Treatment Plant, a wastewater treatment plant that processes wastewater from the communities of Abbotsford and Mission.

JAMES Wastewater Treatment Plant, 5959 Gladwin Rd, Abbotsford B.C. V4X 1V9

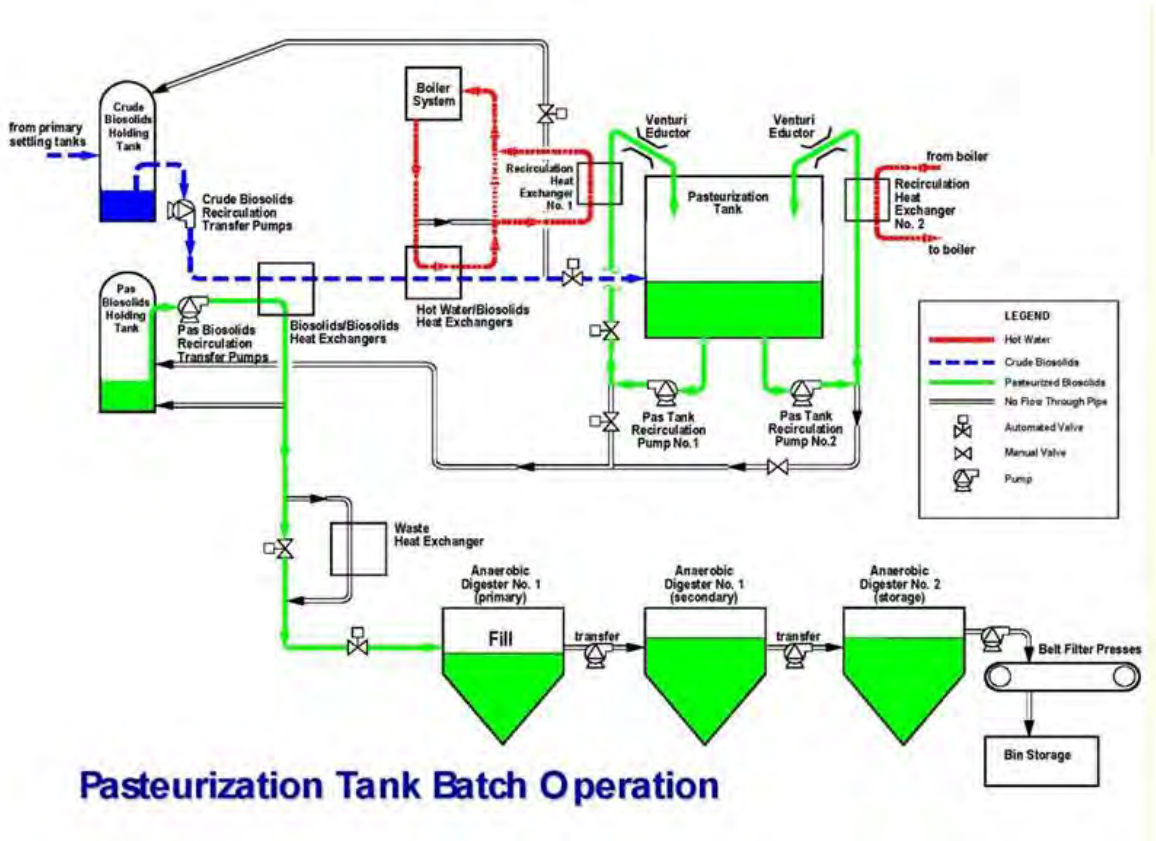


Figure 7. Biosolids processing flowsheet at the James Wastewater Treatment Plant
*(*http://www.abbotsford.ca/Assets/2014+Abbotsford/Engineering/Wastewater/Biosolids+Flow+Chart.pdf)

Pathogen Reduction Processes and Limits

The pathogen reduction process conforms with Schedule 1, Section 2 (f) of the Organic Matter Recycling Regulation, where it states:

"2. One of the following pathogen reduction methods is required for Class A biosolids or biosolids to produce biosolids growing medium: (f) the heat treatment of the biosolids must be 50 C or higher, and the time period must be 30 minutes or longer"

The process used at the JAMES Wastewater Treatment Plant is as follows (Appendix D). *"The pasteurization reactor operates at a temperature of 65 C and is batch-fed to maintain a retention time of at least one hour between sludge transfers. The volume of the tank provides approximately 18-24 hours retention time for pasteurization and conditioning of the sludge in advance of the anaerobic digestion process."*

Analyses of fecal coliforms are conducted by the City of Abbotsford on the biosolids before it is released from the wastewater plant (example in Appendix E). Biocentral as well as the

professional agrologist reserves the right to conduct any of its own testing of the biosolids to ensure that meets Class A requirements.

The average moisture content of the biosolids measured at time of discharge was 75.8% in 2017 (Figure 8). The moisture content at time of field application is usually higher than at time of discharge because the polymers in the biosolids tend to attract additional moisture.

Vector Attraction Reduction Processes and Limits

The vector attraction reduction process conforms with Schedule 2, Section 1 (a) of the Organic Matter Recycling Regulation, where it states:

"1. One of the following vector attraction reduction processes is required for Class A biosolids or Class B biosolids used to produce biosolids growing medium: (a) a digestion process (aerobic or anaerobic) resulting in the mass of volatile solids being reduced by more than 38 percent"

The process used at the JAMES Wastewater Treatment Plant is as follows (Appendix D). *"The anaerobic mesophilic digestion system at the JAMES Plant includes three digesters, with a total volume of 11,460 m3. Pasteurized and conditioned sludge from the pasteurized sludge holding tank is pump to the largest anaerobic digester and then is passed to the remaining two digesters in series."*

The volatile solids reduction results from the JAMES plant averaged 64% in 2017 (Appendix F).

Trace Elements and Nutrients

The general characteristics of the biosolids are noted in Figure 8. The biosolids are an excellent source of organic matter, as well as nitrogen and phosphorus, whereas the potassium concentration is low. Trace element concentrations meet OMRR Class A limits (Figure 9).

Characteristics of the Class A Biosolids		
Characteristic	**Unit**	**Value**
Moisture Content	%	75.8
Organic Matter	%	79.1
pH		6.4
EC	dS/m	3.56
C/N Ratio		5.4
Nitrogen (total)	%	7.69
Ammonium	mg/kg	7586
Phosphorus	%	1.11
Potassium	%	0.08
Sulphur	%	0.72

Figure 8. Characteristics of the Class A biosolids (2017 data)

Schedule 4 of the Organic Matter Recycling Regulation (OMRR) provides the guidance for the trace elements in the biosolids. Figure 9 shows the trace elements in the biosolids (including both the maximum and average concentrations monthly in 2017 analysis (Appendix G), compared with the standards (OMRR, and Trade Memorandum T-4-93). For the land application calculations, we have used the average concentration for 2017.

Trace Element Concentrations in the Class A Biosolids				
Element	Biosolids		Class A (OMRR)	Canada
	Max 2017	Avg 2017		T-4-93
	(mg/kg)		(mg/kg)	(mg/kg)
Arsenic	3.5	2.8	75	75
Cadmium	1.76	1.41	20	20
Chromium	60.1	30.2	1060	*not included*
Cobalt	3.27	2.3	150	150
Copper	655	528	2200	*not included*
Lead	22.9	19.5	500	500
Mercury	3.22	1.95	5	5
Molybdenum	7.82	6.2	20	20
Nickel	41.8	24.6	180	180
Selenium	5.31	4.46	14	14
Zinc	1050	828	1850	1850

Figure 9. Trace element concentrations in the Class A biosolids from the JAMES Wastewater Treatment Plant (maximums and averages for 2017. The limits for Class A biosolids (OMRR requirement) and the Canadian standards are also shown.

Figure 8 shows additional characteristics of the biosolids that are used for the land application plan, including and especially the nitrogen, phosphorus and potassium concentrations, which are important when considering the fertilizer value of the biosolids.

Foreign Matter

The Class A biosolids are free of foreign matter. Foreign matter is screened when the wastewater enters the treatment plant. According to Schedule 4 of the OMRR, Class A biosolids may not contain foreign matter greater than 1% dry weight and no sharp foreign matter, such as glass or metal shards, in a size and shape that may cause injury.

Biosolids Storage

The biosolids will be stored in compliance with OMRR Part 4, Division 1, Part 17 - 19, where it states:

"17. (1). If managed organic matter, which is to be applied to land under a land application plan, is stored on a farm or at some other site, it must be stored

a. in a storage facility in accordance with the requirements of section 18, or

b. at a storage site in accordance with the requirements of section 19.

(2) Managed organic matter must only be stored on a farm if all of the managed organic matter is used on that farm.

18. A storage facility must

a. be of sufficient capacity to store all the managed organic matter to be used on the land application site for the period of time needed for its application as a fertilizer or soil conditioner,

b. be located at least 15 m from any watercourse and at 30 m from any source of water for domestic purposes, and

c. maintained in such a manner to prevent escape of the managed organic matter.

19. (1). Managed organic matter may only be stored at a storage site as follows:

a. for not more than 2 weeks if it is (i) used within 2 weeks, and (ii) stored in a manner that prevents the escape of managed organic matter:

b. for more than 2 weeks if it is (i) stored for no longer than 9 months, (ii) located at least 30 meters from any watercourse or any source of water used for domestic purposes, and (iii) stored in a manner that prevents the escape of managed organic matter.

2. Berms or other works must be constructed around the storage site if necessary to prevent the escape of managed organic matter. "

The Class A biosolids will be stored in a manner that prevents the escape of the managed organic matter.

The transport of the biosolids will be managed in such a way as to prevent any biosolids being deposited on any public roadways. Although odour is not expected to be a concern, the biosolids will covered with a layer of wood chips or compost if required.

Biosolids Application

Season of Application

The biosolids will be applied during the spring of 2018 to allow optimal uptake of plant available nutrients during the growing season. The total amount of biosolids to be applied during 2018 will be a maximum of 55 wet tonnes per hectare. A total of up to 825 wet tonnes of Class A biosolids will be spread at this location in 2018.

Buffers

A 3 m buffer will be maintained around the perimeter of the spreading area.

Crop Nutrient Uptake

The crops grown on this farm will be forage corn grown for cattle feed in 2018. The Class A biosolids will be land applied to optimize their value as a fertilizer and a soil conditioner.

The land application plan will be based on nitrogen for the forage corn. Phosphorus and potassium application will also be addressed.

Nitrogen Requirements

Table 12 of the "Land Application Guidelines for the Organic Matter Recycling Regulation and the Soil Amendment Code of Practice" (Ministry of the Environment 2008), provides the guidance for nitrogen requirements for forages on soils of varying fertility in various areas of the province.

Based on an average yield of 20 tonnes of dry matter per hectare of corn on a high (normal) fertility site, the nitrogen requirement is 260 kg ha^{-1} per year.

Nitrogen Based Application Rate						
Yield Expectation and Nitrogen Uptake	Total		Available	Available N		
20 tonnes dry matter/ha yield of corn[a]	260	kg N/ha				
Nitrogen Availability in Biosolids						
Ammonium in biosolids	7.9	kg/tonne	60%	4.74		
Total N in biosolids	83.6	kg/tonne				
Organic N in Biosolids	75.7	kg/tonne	30%	22.71		
				27.45	kg/tonne available	
Amount of dry biosolids	9.5	dry tonnes per hectare				
	47.4	tonnes per hectare wet application				
[a] from Table 12 of the Land Application Guide (Ministry of Environment 2008)						
from page 174 of Land Application Guide (Ministry of Environment 2008)						

Figure 10 Estimated contribution of nitrogen with the biosolids application.

The total nitrogen content of the biosolids averages 7.69 % or 76.9 kg per dry tonne (2017 JAMES Plant Biosolids Quality Data). The amount of nitrogen available in the year of application ranges from 20 to 40%. Using an average availability of 30%, each dry tonne of biosolids provides almost 25 kg of nitrogen per hectare. An application rate of 12 tonnes of dry biosolids per hectare then provides an estimated 300 kg N per hectare, which is approximately the nitrogen requirements of the crop. Our experience is that with biosolids, the nitrogen availability is less than 30%.

Phosphorus Requirements

Guidelines for the application of phosphorous are provided in Sections 10.4.1.2 and Section 13.4.3 of the "Land Application Guidelines for the Organic Matter Recycling Regulation and the Soil Amendment Code of Practice".

The phosphorus content of the Class A biosolids averages 1.11 P (Figure 8). The application of 12 tonnes of Class A biosolids will provide approximately 305 kg P_2O_5 per hectare.

The soil analyses indicated that the phosphorus content of this farm was variable, with some areas being deficient, and other areas optimal. The soil phosphorus concentrations will continue to be monitored with subsequent biosolids applications.

Potassium

The total potassium in the biosolids were measured to be 0.08 ug/g (Appendix E in the Land Application Plan March 31, 2017). The plant available fraction of the potassium in biosolids is assumed to be 100% (Washington State Department of Ecology 2007)

Biosolids Application Rate

The application rate for the Class A biosolids is 55 wet tonnes per hectare, or 12 tonnes of dry matter per hectare based on an average moisture content of 78%. This application rate will provide an estimated 925 kg of total N per hectare. An estimated 30% of the total nitrogen is estimated to become available to the crop in the first year. Subsequent application rates of biosolids will be adjusted as required according to the amount of soluble N remaining in the soil in the fall.

Trace Metal Applications

The application rate of 55 tonnes (12 tonnes of dry matter) per hectare of Class A biosolids will provide the following amounts of trace elements as per Figure 11 below.

		Addition	**Post**	Limits
	Metals in Soil	**from Biosolids**	**Application**	OMRR[b]
	(mg/kg)[a]	(mg/kg)	(mg/kg)	(mg/kg)
Arsenic	4.48	0.017	4.49	15
Cadmium	0.25	0.009	0.26	9
Chromium	67.25	0.186	67.44	60
Cobalt	10.53	0.014	10.54	40
Copper	29.75	3.25	33.00	150
Lead	7.90	0.120	8.02	350
Mercury	0.047	0.012	0.059	0.6
Molybdenum	0.40	0.038	0.43	5
Nickel	34.50	0.151	34.65	100
Selenium	<.5	0.027	0.50	2
Zinc	81.00	5.10	86.10	200
[a] average of 4 samples				
[b] OMRR Schedules 9 and 10 using most conservative limits				
[c] plant uptake not included in calculation				

Figure 11. Effect of a 12 tonne DM application of Class A biosolids on trace elements in the soil.

As mentioned in a previous section, it will be important to track the soil chromium concentrations. All of the soil analyses of the various land application sites in 2018 showed significantly increased chromium concentrations, despite either no, or very little application of biosolids (i.e Figure 8). In addition, there is very little chromium added with the biosolids application. The elevated chromium concentrations appear to be characteristic of the Fraser River sediments, and are significantly higher for the 2018 samples than soil samples taken in previous years.

Other Inputs to the Farm

There are no other inputs of organic matter to the land on this farm. Additional fertilizer nitrogen may be required depending on the availability of the nitrogen in the biosolids. Additional potassium may be required as well.

The post application soil sampling of the fields will determine the amount of soluble nitrogen remaining in the soil before the fall rains. Future land application plans for this property will also be adjusted for post harvest soil nutrient contents.

Post Application Monitoring of the Site

Crop yields will be estimated during the growing season to verify the amount of forage harvested from the property. Post application soil samples will be taken in the fall to estimate accumulation of trace elements as well as residual nitrate in the soil. This soil information will be used to determine additional Class A biosolids applications in subsequent years.

The post application report will also provide information on actual application rates, including moisture contents of the biosolids at the time of application.

Minimizing Potential for Adverse Environmental Impacts

There are two potential adverse environmental impacts from the land application:

1. Risk of the biosolids not meeting Class A requirements

   Each batch of biosolids produced at the JAMES Treatment Plant is tested for fecal coliform before release for land application, as per OMRR requirements. This means that the biosolids are stored for 1-4 months at the JAMES Treatment Plant in order for the biosolids to meet Class A requirements for fecal coliform.

   There is little or no risk of the Class A biosolids becoming Class B due to microbial regrowth, as the biosolids are very stable before being released from the facility. In the potential event that the biosolids were actually Class B. the biosolids would be stored for a longer period of time, and retested before application to ensure that Class A requirements were met. In the potential event that the biosolids were actually Class B following spreading, the requirements of OMRR Schedule 8 would apply.

2. Risk of over application of biosolids

   The risk of over application of Class A biosolids has limited potential negative environmental effect. In the Land Application Plans, the biosolids are applied on the basis of optimizing the nitrogen value of the biosolids. Although it is possible that a higher rate of biosolids application may increase the potential for nitrogen leaching,

the nitrogen in biosolids has limited availability. This must also be understood in the context of Class A biosolids growing medium, which can be applied without volume restrictions and is not applied on the basis of agronomic utilization of the nitrogen or phosphorous contained in the biosolids.

In summary, the potential adverse effects of land application of Class A biosolids are minimal, and are controlled by appropriate testing, storage and application.

Sampling and Analysis

Schedule 5 of OMRR requires that the Class A biosolids be analyzed at least every 1000 tonnes of dry weight of organic matter, or once per year. Schedule 5 also states that "All analysis must be in accordance with the procedures described in "British Columbia Laboratory Methods Manual: 2003 – for the Analysis of Water, Wastewater, Sediment, Biological Material and Discrete Ambient Air Samples""

The City of Abbotsford follows the requirements of Schedule 5 of OMRR: The following represents their sampling schedule:

JAMES Biosolids Testing Schedule (Biosolids prior to centrifugation)

Weekly Testing:

- *Total Metals (including total Mercury)*
- *Fecal Coliform (reported as MPN/g dry weight)*
- *Salmonella*

Monthly Testing:

- *Total Metals (including total Mercury)*
- *Total Phosphorus (%)*
- *Total Kjeldahl Nitrogen (%)*
- *Total Potassium (%)*
- *Total Sulphur (%)*
- *Total Carbon (%)*
- *Total Organic Matter (%)*
- *Moisture (%)*
- *Ammonia (available - %)*
- *Nitrate (available – mg/kg)*
- *pH*
- *Conductivity*
- *C/N Ratio*

JAMES Biosolids Testing Schedule (Biosolids after centrifugation - Stored)

Monthly Testing:

- *Fecal Coliform (reported as MPN/g dry weight)*

Additional testing (Fecal Coliform only) will be done on the biosolids after storage and before it is released to ensure that it meets Class A.

Biocentral will be taking random sampling to ensure that the biosolids meet Class A standards.

Record Keeping

The City of Abbotsford records temperatures and retention times for the production of Class A biosolids, as per Schedule 6 (1) of the OMRR. All records for the production of the Class A biosolids will be stored at the JAMES Wastewater Treatment Plant for a minimum of 36 months, as per Schedule 6 (2) and (3).

The Land Application Plan, and all associated information will be kept at the Land Application Site, and will also be stored at the offices of the Qualified Professional, as well as at Biocentral's offices.

Role of the Qualified Professional

The qualified professional will oversee the storage and land application of the biosolids, including site inspections of the actual land application. He may also request plant yield data, as well as direct post harvest soil sampling to determine the post sampling soil concentrations of nutrients and trace elements. The qualified professional reserves the right to request verification of the Class A status of the biosolids at any time. The qualified professional will provide a post application report in early 2018.

Summary

This Land Application Plan provides a beneficial reuse of Class A biosolids, which are a valuable source of nitrogen, phosphorus, micronutrients and organic matter. The risk of environmental concern at this location is very low because of the quality of the Class A biosolids being applied and the proximity to water bodies and water sources.

Storage and transportation of the Class A biosolids is also not considered a concern because of the low fecal coliform count and the lack of significant odour in the biosolids.

This Land Application Plan was prepared by:

John Paul, PhD PAg

References

British Columbia Ministry of the Environment. 2008. Land Application Guidelines for the Organic Matter Recycling Regulation and the Soil Amendment Code of Practice, Best Management Practices. Document # 758-08, Sylvis Environmental.

Kelly, C.C and R.H. Spilsbury. 1939. Soil Survey of the Lower Fraser Valley. British Columbia Department of Agriculture. Publication 650, Technical Bulletin 20.

Oregon State University. 2007. Fertilizing with Biosolids. PNW 508-E, Revised June 2007 http://www.ecy.wa.gov/programs/swfa/biosolids/pdf/Fertilizing.pdf

BRITISH COLUMBIA | Ministry of Environment

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 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 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 of Environment 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 Branch PO Box 9377 Stn Prov Govt Victoria, BC V8W 9M1 **Email:** PermitAdministration.VictoriaEPD@gov.bc.ca	Ministry of Environment Environmental Protection Division Business Services Branch 3rd Floor, 2975 Jutland Road Victoria, BC V8T 5J9

Section 1: Purpose of Notification

***Application Type** (check one)	☒ New notification ☐ Change in information to an existing notification (provide authorization #)	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*	Limbert Mountain View Farms Ltd			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)*	BC1135460			5
***Contact Numbers** *e.g. (999) 999-9999*	Phone 604-796-3851	Mobile 604-991-0108		6
***Email Address** *generic company email address*	andres@timbroconstruction.com			7
***Legal Address** *as registered with BC Registrar of Companies*	Unit # / Street 7357 Pioneer Ave			8
	City Agassiz	Province BC	Postal Code V0M 1A0	9

***Mailing Address** *if different from above*	☐ Same as Legal Address			10
	Unit # / Street PO Box 95			11
	City Agassiz	Province BC	Postal Code V0M 1A0	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*	info@timbroconstruction.com			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	Murillo			1
Contact's First Name	Andres			2
Contact's Title	Partner			3
Mailing Address	☒ Mailing address is the same as Section 2 above			4
	Unit # / Street			5
	City	Province	Postal Code	6
Contact Numbers *e.g. (999) 999-9999*	Phone 604-796-3851	Mobile 604-991-0180		7
Email Address	andres@timbroconstruction.com			8

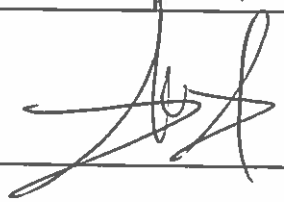
Section 4: Authorized Agent ("the Agent")

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*	Transform Compost Systems Ltd.			1
Doing Business As *if different than above*				2
Agent's Last Name	Paul			3
Agent's First Name	John			4
Agent's Title	President			5
Mailing Address	Unit # / Street 3911 Mt. Lehman Rd			6
	City Abbotsford	Province BC	Postal Code V2T 5W5	7
Contact Numbers *e.g. (999) 999-9999*	Phone 604-856-2722	Mobile 604-302-4367		8
Email Address	transform@telus.net			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*	G. Andres Munllo	10
Date signed	February 5th, 2018	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 solids
- Waste Discharge Regulation Schedule: 2 "soil enhancement using wastes"

***Regional District**	Fraser Valley Regional District		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 49.2281	Longitude (e.g., 116.8177) W 121.8092	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)	1. Lot 2, except firstly: the west 15.38 chains, secondly parcel "A" (reference plan 5524), Section 23, Township 3, Range 29, west of 6th Meridian NWD Plan 3156 2. West 15.38 Chains Lot 2, Except Parcel "B" (Reference Plan 5536), sections of 23 Township 3, Range 29, west of 6th Meridian Yale Division of Yale District Plan 3156		4
PID/PIN/Crown File No.	PID 006-549-900, PID 010-889-574, PID 010-889-523		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)* 1280 Hamilton Rd, Agassiz, BC V0M 1A3		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	Andres Murillo	5

Legal Land Owner Contact Numbers *e.g. (999) 999-9999*	Phone: 604-796-3658	Mobile: 604-991-0108	6
Legal Land Owner Email Address	andres@timbroconstruction.com		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**	no	12
***Description of the managed organic matter to be applied**	Class A biosolids	13

***Intended date(s) for land application for that year**	2018-03 to 2018-05 (yyyy-mm-dd)	14
***Application rates**	12 dt/hectare	15
	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	0.017
Cadmium	0.009
Chromium	0.186
Cobalt	0.014
Copper	3.25
Lead	0.12
Mercury	0.012
Molybdenum	0.038
Nickel	0.151
Selenium	0.027
Zinc	5.095

***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 Ministry of Environment 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
John Paul		February 20, 2018


1280 Hamilton Rd
Google Earth


1280 Hamilton Rd
Soil sampling March 2018
Legend
Sample point
S1
S2
S3
S4
S5
S6
S7
S8
S9
S10
S11
S12
N
300 m
Google Earth
©2018 Google

Appendix B

Exova
#104, 19575-55 A Ave.
Surrey, British Columbia
V3S 8P8, Canada

T: +1 (604) 514-3322
F: +1 (604) 514-3323
E: Surrey@exova.com
W: www.exova.com

Report Transmission Cover Page

Bill To:	Timbro Contracting (A	Project ID:	James	Lot ID:	**1260261**
	P.O. Box 95	Project Name:	1280 Hamilton Rd	Control Number:	C117485
	7357 Pioneer Avenue	Project Location:	Aggassiz	Date Received:	Mar 17, 2018
	Agassiz, BC, Canada	LSD:		Date Reported:	Mar 28, 2018
	V0M 1A0	P.O.:		Report Number:	2274117
Attn:	Accounts Payable	Proj. Acct. code:			
Sampled By:	Andres M.				
Company:	Biocentral				

Contact	Company	Address
Accounts Payable	**Timbro Contracting (A Partnership)**	P.O. Box 95, 7357 Pioneer Avenue Agassiz, BC V0M 1A0 Phone: (604) 796-3851 Fax: (604) 796-0554 Email: info@timbroconstruction.com

Delivery	Format	Deliverables
Email - Single Report	PDF	Invoice

Contact	Company	Address
Andres Moreno	**Timbro Contracting (A Partnership)**	P.O. Box 95, 7357 Pioneer Avenue Agassiz, BC V0M 1A0 Phone: (604) 796-3851 Fax: (604) 796-0554 Email: andresm@biocentral.ca

Delivery	Format	Deliverables
Email - Merge Reports	PDF	COC / Test Report
Email - Single Report	Standard Crosstab	Test Report

Contact	Company	Address
Frank Trevr	**Timbro Contracting (A Partnership)**	P.O. Box 95, 7357 Pioneer Avenue Agassiz, BC V0M 1A0 Phone: (604) 991-3782 Fax: Email: frank@timbroconstruction.com

Delivery	Format	Deliverables
Email - Merge Reports	PDF	COC / Test Report
Email - Single Report	Standard Crosstab	Test Report

Notes To Clients:

- Mar 28, 2018 - Report was issued to correct for missing metal analysis on samples 1260261-1 to 12. Previous report 2271759.

Exova
#104, 19575-55 A Ave.
Surrey, British Columbia
V3S 8P8, Canada

T: +1 (604) 514-3322
F: +1 (604) 514-3323
E: Surrey@exova.com
W: www.exova.com

Analytical Report

Bill To:	Timbro Contracting (A	Project ID:	James	Lot ID:	**1260261**
	P.O. Box 95	Project Name:	1280 Hamilton Rd	Control Number:	C117485
	7357 Pioneer Avenue	Project Location:	Aggassiz	Date Received:	Mar 17, 2018
	Agassiz, BC, Canada	LSD:		Date Reported:	Mar 28, 2018
	V0M 1A0	P.O.:		Report Number:	2274117
Attn:	Accounts Payable	Proj. Acct. code:			
Sampled By:	Andres M.				
Company:	Biocentral				

Reference Number	1260261-19731	1260261-19732	1260261-19733
Sample Date	Mar 16, 2018	Mar 16, 2018	Mar 16, 2018
Sample Time	NA	NA	NA
Sample Location			
Sample Description	James - 1280 Hamilton Rd / S1 / 0 / 5 / E / 1	James - 1280 Hamilton Rd / S2 / 0 / 5 / E / 1	James - 1280 Hamilton Rd / S3 / 0 / 5 / E / 1
Matrix	Farm Soil	Farm Soil	Farm Soil

Analyte		Units	Results	Results	Results	Nominal Detection Limit
Aggregate Organic Constituents						
Organic Matter	LOI	% by weight	16.7	9.2	34.8	0.1
Available Nutrients						
Nitrate - N	Farmsoil	ppm	9	4	14	2
Phosphorus	Farmsoil	ppm	68	36	7	5
Potassium	Farmsoil	ppm	134	60	68	25
Sulfate-S	Farmsoil	ppm	9	4	7	1
Copper	FS Micro-nutrients	ppm	4.2	2.2	1.5	0.1
Iron	FS Micro-nutrients	ppm	317	254	427	2
Manganese	FS Micro-nutrients	ppm	4.2	4.2	3.4	0.1
Zinc	FS Micro-nutrients	ppm	5.3	2.1	1.9	0.5
Base saturation	FS Base Saturation	%	54.1	52.8	51.8	
Calcium	FS Base Saturation	%	45.8	44.9	49.9	
Magnesium	FS Base Saturation	%	6.8	7.0	1.2	
Sodium	FS Base Saturation	%	<0.6	<0.7	<0.6	
Potassium	FS Base Saturation	%	1.5	0.9	0.8	
TEC	FS Base Saturation	meq/100 g	22.4	17.6	23.0	
Calcium	FS Macro-nutrients	ppm	2060	1580	2300	30
Magnesium	FS Macro-nutrients	ppm	184	150	32	5
Sodium	FS Macro-nutrients	ppm	<30	<30	<30	30
Boron	FS Micro-nutrients	ppm	0.4	0.3	0.3	0.1
Classification						
C:N Ratio			13	12	15.1	0.1
Nitrogen	Total	%	0.71	0.39	1.16	0.02
Organic Matter	Calculated Value	%	18.9	9.30	34.9	0.04
Carbon	Total Organic	%	9.44	4.65	17.46	0.04
Hot Water Soluble						
Boron	FS Micro-nutrients	ppm	0.4	0.3	0.3	0.1
Metals Strong Acid Digestion						
Antimony	Strong Acid Extractable	µg/g	3	2	3	1.5
Arsenic	Strong Acid Extractable	µg/g	5.6	2.2	5.4	0.35
Barium	Strong Acid Extractable	µg/g	140	140	170	0.2
Beryllium	Strong Acid Extractable	µg/g	0.43	0.31	0.46	0.01
Cadmium	Strong Acid Extractable	µg/g	0.4	0.1	0.60	0.05
Chromium	Strong Acid Extractable	µg/g	64	61	62	0.1
Cobalt	Strong Acid Extractable	µg/g	10	8.1	9.4	0.1
Copper	Strong Acid Extractable	µg/g	38	21	33	0.1

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Analytical Report

Bill To:	Timbro Contracting (A	Project ID:	James	Lot ID:	**1260261**
	P.O. Box 95	Project Name:	1280 Hamilton Rd	Control Number:	C117485
	7357 Pioneer Avenue	Project Location:	Aggassiz	Date Received:	Mar 17, 2018
	Agassiz, BC, Canada	LSD:		Date Reported:	Mar 28, 2018
	V0M 1A0	P.O.:		Report Number:	2274117
Attn:	Accounts Payable	Proj. Acct. code:			
Sampled By:	Andres M.				
Company:	Biocentral				

Reference Number	1260261-19731	1260261-19732	1260261-19733
Sample Date	Mar 16, 2018	Mar 16, 2018	Mar 16, 2018
Sample Time	NA	NA	NA
Sample Location			
Sample Description	James - 1280 Hamilton Rd / S1 / 0 / 5 / E / 1	James - 1280 Hamilton Rd / S2 / 0 / 5 / E / 1	James - 1280 Hamilton Rd / S3 / 0 / 5 / E / 1
Matrix	Farm Soil	Farm Soil	Farm Soil

Analyte		Units	Results	Results	Results	Nominal Detection Limit
Metals Strong Acid Digestion - Continued						
Lead	Strong Acid Extractable	µg/g	9.0	7.8	12	0.5
Mercury	Strong Acid Extractable	µg/g	0.069	0.039	0.10	0.003
Molybdenum	Strong Acid Extractable	µg/g	0.58	0.2	0.73	0.1
Nickel	Strong Acid Extractable	µg/g	33	27	31	0.25
Phosphorus	Strong Acid Extractable	µg/g	1600	620	1200	0.5
Potassium	Strong Acid Extractable	µg/g	790	640	800	2
Selenium	Strong Acid Extractable	µg/g	0.9	<0.5	<0.5	0.5
Silver	Strong Acid Extractable	µg/g	<0.4	<0.4	<0.4	0.4
Strontium	Strong Acid Extractable	µg/g	40	30	43	0.05
Thallium	Strong Acid Extractable	µg/g	0.6	<0.5	<0.5	0.5
Tin	Strong Acid Extractable	µg/g	1	<0.5	<0.5	0.5
Vanadium	Strong Acid Extractable	µg/g	66	62	68	0.2
Zinc	Strong Acid Extractable	µg/g	77	58	69	0.05
Soil Acidity						
pH	1:2 Soil:Water	pH	5.7	5.9	5.6	
Electrical Conductivity	Sat. Paste equiv based on 1:2	dS/m at 25 °C	0.25	0.2	0.28	0.02
Water Soluble Parameters						
Chloride	Available	mg/kg	6.0	4	5.8	0.5
Lime Requirement						
pH	SMP	pH	6.0	6.2	5.9	
Lime		T/ac	4	3	4.6	

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Analytical Report

Bill To:	Timbro Contracting (A	Project ID:	James	Lot ID:	**1260261**
	P.O. Box 95	Project Name:	1280 Hamilton Rd	Control Number:	C117485
	7357 Pioneer Avenue	Project Location:	Aggassiz	Date Received:	Mar 17, 2018
	Agassiz, BC, Canada	LSD:		Date Reported:	Mar 28, 2018
	V0M 1A0	P.O.:		Report Number:	2274117
Attn:	Accounts Payable	Proj. Acct. code:			
Sampled By:	Andres M.				
Company:	Biocentral				

Reference Number	1260261-19734	1260261-19735	1260261-19736
Sample Date	Mar 16, 2018	Mar 16, 2018	Mar 16, 2018
Sample Time	NA	NA	NA
Sample Location			
Sample Description	James - 1280 Hamilton Rd / S4 / 0 / 5 / E / 1	James - 1280 Hamilton Rd / S5 / 0 / 5 / E / 1	James - 1280 Hamilton Rd / S6 / 0 / 5 / E / 1
Matrix	Farm Soil	Farm Soil	Farm Soil

Analyte		Units	Results	Results	Results	Nominal Detection Limit
Aggregate Organic Constituents						
Organic Matter	LOI	% by weight	44.7	33.9	50.5	0.1
Available Nutrients						
Nitrate - N	Farmsoil	ppm	9	9	4	2
Phosphorus	Farmsoil	ppm	17	7	61	5
Potassium	Farmsoil	ppm	87	118	33	25
Sulfate-S	Farmsoil	ppm	5	4	2	1
Copper	FS Micro-nutrients	ppm	0.4	1.1	0.3	0.1
Iron	FS Micro-nutrients	ppm	421	413	327	2
Manganese	FS Micro-nutrients	ppm	1.5	2.3	0.7	0.1
Zinc	FS Micro-nutrients	ppm	2	2	0.9	0.5
Base saturation	FS Base Saturation	%	37.3	41.9	44.7	
Calcium	FS Base Saturation	%	34.0	38.1	43.5	
Magnesium	FS Base Saturation	%	2.3	2.6	0.9	
Sodium	FS Base Saturation	%	<0.5	<0.5	<0.5	
Potassium	FS Base Saturation	%	0.9	1.2	0.3	
TEC	FS Base Saturation	meq/100 g	24.4	26.2	26.2	
Calcium	FS Macro-nutrients	ppm	1660	2000	2290	30
Magnesium	FS Macro-nutrients	ppm	69	84	28	5
Sodium	FS Macro-nutrients	ppm	<30	<30	<30	30
Boron	FS Micro-nutrients	ppm	0.2	0.3	<0.2	0.1
Classification						
C:N Ratio			16.5	15.1	18.7	0.1
Nitrogen	Total	%	1.52	1.28	1.81	0.02
Organic Matter	Calculated Value	%	50.0	38.6	67.7	0.04
Carbon	Total Organic	%	25.02	19.28	33.85	0.04
Hot Water Soluble						
Boron	FS Micro-nutrients	ppm	0.2	0.3	<0.2	0.1
Metals Strong Acid Digestion						
Antimony	Strong Acid Extractable	µg/g	2	3	2	1.5
Arsenic	Strong Acid Extractable	µg/g	5.3	5.4	4.4	0.35
Barium	Strong Acid Extractable	µg/g	92	160	120	0.2
Beryllium	Strong Acid Extractable	µg/g	0.29	0.47	0.29	0.01
Cadmium	Strong Acid Extractable	µg/g	0.4	0.48	0.3	0.05
Chromium	Strong Acid Extractable	µg/g	48	62	33	0.1
Cobalt	Strong Acid Extractable	µg/g	5.6	8.9	4.1	0.1
Copper	Strong Acid Extractable	µg/g	21	36	14	0.1

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Analytical Report

Bill To:	Timbro Contracting (A	Project ID:	James	Lot ID:	**1260261**
	P.O. Box 95	Project Name:	1280 Hamilton Rd	Control Number:	C117485
	7357 Pioneer Avenue	Project Location:	Aggassiz	Date Received:	Mar 17, 2018
	Agassiz, BC, Canada	LSD:		Date Reported:	Mar 28, 2018
	V0M 1A0	P.O.:		Report Number:	2274117
Attn:	Accounts Payable	Proj. Acct. code:			
Sampled By:	Andres M.				
Company:	Biocentral				

Reference Number	1260261-19734	1260261-19735	1260261-19736
Sample Date	Mar 16, 2018	Mar 16, 2018	Mar 16, 2018
Sample Time	NA	NA	NA
Sample Location			
Sample Description	James - 1280 Hamilton Rd / S4 / 0 / 5 / E / 1	James - 1280 Hamilton Rd / S5 / 0 / 5 / E / 1	James - 1280 Hamilton Rd / S6 / 0 / 5 / E / 1
Matrix	Farm Soil	Farm Soil	Farm Soil

Analyte		Units	Results	Results	Results	Nominal Detection Limit
Metals Strong Acid Digestion - Continued						
Lead	Strong Acid Extractable	µg/g	9.5	10	8.0	0.5
Mercury	Strong Acid Extractable	µg/g	0.080	0.099	0.046	0.003
Molybdenum	Strong Acid Extractable	µg/g	0.50	1.0	0.78	0.1
Nickel	Strong Acid Extractable	µg/g	21	30	14	0.25
Phosphorus	Strong Acid Extractable	µg/g	1300	1200	1200	0.5
Potassium	Strong Acid Extractable	µg/g	630	770	430	2
Selenium	Strong Acid Extractable	µg/g	<0.5	0.7	<0.5	0.5
Silver	Strong Acid Extractable	µg/g	<0.4	<0.4	<0.4	0.4
Strontium	Strong Acid Extractable	µg/g	32	38	29	0.05
Thallium	Strong Acid Extractable	µg/g	<0.5	<0.5	<0.5	0.5
Tin	Strong Acid Extractable	µg/g	<0.5	<0.5	<0.5	0.5
Vanadium	Strong Acid Extractable	µg/g	47	66	37	0.2
Zinc	Strong Acid Extractable	µg/g	43	64	22	0.05
Soil Acidity						
pH	1:2 Soil:Water	pH	5.3	5.4	5.6	
Electrical Conductivity	Sat. Paste equiv based on 1:2	dS/m at 25 °C	0.26	0.22	0.1	0.02
Water Soluble Parameters						
Chloride	Available	mg/kg	6.6	5.2	7.0	0.5
Lime Requirement						
pH	SMP	pH	5.5	5.5	5.6	
Lime		T/ac	7.7	7.6	7.1	

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Analytical Report

Bill To:	Timbro Contracting (A	Project ID:	James	Lot ID:	**1260261**
	P.O. Box 95	Project Name:	1280 Hamilton Rd	Control Number:	C117485
	7357 Pioneer Avenue	Project Location:	Aggassiz	Date Received:	Mar 17, 2018
	Agassiz, BC, Canada	LSD:		Date Reported:	Mar 28, 2018
	V0M 1A0	P.O.:		Report Number:	2274117
Attn:	Accounts Payable	Proj. Acct. code:			
Sampled By:	Andres M.				
Company:	Biocentral				

Reference Number	1260261-19737	1260261-19738	1260261-19739
Sample Date	Mar 16, 2018	Mar 16, 2018	Mar 16, 2018
Sample Time	NA	NA	NA
Sample Location			
Sample Description	James - 1280 Hamilton Rd / S7 / 0 / 5 / E / 1	James - 1280 Hamilton Rd / S8 / 0 / 5 / E / 1	James - 1280 Hamilton Rd / S9 / 0 / 5 / E / 1
Matrix	Farm Soil	Farm Soil	Farm Soil

Analyte		Units	Results	Results	Results	Nominal Detection Limit
Aggregate Organic Constituents						
Organic Matter	LOI	% by weight	5.2	5.7	18.2	0.1
Available Nutrients						
Nitrate - N	Farmsoil	ppm	4	3	5	2
Phosphorus	Farmsoil	ppm	>80	>80	23	5
Potassium	Farmsoil	ppm	90	93	108	25
Sulfate-S	Farmsoil	ppm	3	3	12	1
Copper	FS Micro-nutrients	ppm	4.4	2.0	3.2	0.1
Iron	FS Micro-nutrients	ppm	245	159	322	2
Manganese	FS Micro-nutrients	ppm	3.1	1.9	14.6	0.1
Zinc	FS Micro-nutrients	ppm	3.8	3.4	2.5	0.5
Base saturation	FS Base Saturation	%	70.0	57.8	47.7	
Calcium	FS Base Saturation	%	57.6	46.9	42.0	
Magnesium	FS Base Saturation	%	11.0	9.3	4.3	
Sodium	FS Base Saturation	%	<0.8	<0.9	<0.6	
Potassium	FS Base Saturation	%	1.5	1.6	1.3	
TEC	FS Base Saturation	meq/100 g	15.7	14.7	21.2	
Calcium	FS Macro-nutrients	ppm	1810	1380	1790	30
Magnesium	FS Macro-nutrients	ppm	209	166	112	5
Sodium	FS Macro-nutrients	ppm	<30	<30	<30	30
Boron	FS Micro-nutrients	ppm	0.5	0.4	0.3	0.1
Classification						
C:N Ratio			10	9.5	15	0.1
Nitrogen	Total	%	0.28	0.30	0.69	0.02
Organic Matter	Calculated Value	%	5.73	5.79	20.6	0.04
Carbon	Total Organic	%	2.87	2.90	10.31	0.04
Hot Water Soluble						
Boron	FS Micro-nutrients	ppm	0.5	0.4	0.3	0.1
Metals Strong Acid Digestion						
Antimony	Strong Acid Extractable	µg/g	3	3	3	1.5
Arsenic	Strong Acid Extractable	µg/g	6.5	3.6	8.1	0.35
Barium	Strong Acid Extractable	µg/g	150	120	140	0.2
Beryllium	Strong Acid Extractable	µg/g	0.39	0.36	0.43	0.01
Cadmium	Strong Acid Extractable	µg/g	0.3	0.2	0.3	0.05
Chromium	Strong Acid Extractable	µg/g	74	70	75	0.1
Cobalt	Strong Acid Extractable	µg/g	13	11	10	0.1
Copper	Strong Acid Extractable	µg/g	35	25	30	0.1

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W: www.exova.com

Analytical Report

Bill To:	Timbro Contracting (A	Project ID:	James	Lot ID:	**1260261**
	P.O. Box 95	Project Name:	1280 Hamilton Rd	Control Number:	C117485
	7357 Pioneer Avenue	Project Location:	Aggassiz	Date Received:	Mar 17, 2018
	Agassiz, BC, Canada	LSD:		Date Reported:	Mar 28, 2018
	V0M 1A0	P.O.:		Report Number:	2274117
Attn:	Accounts Payable	Proj. Acct. code:			
Sampled By:	Andres M.				
Company:	Biocentral				

Reference Number	1260261-19737	1260261-19738	1260261-19739
Sample Date	Mar 16, 2018	Mar 16, 2018	Mar 16, 2018
Sample Time	NA	NA	NA
Sample Location			
Sample Description	James - 1280 Hamilton Rd / S7 / 0 / 5 / E / 1	James - 1280 Hamilton Rd / S8 / 0 / 5 / E / 1	James - 1280 Hamilton Rd / S9 / 0 / 5 / E / 1
Matrix	Farm Soil	Farm Soil	Farm Soil

Analyte		Units	Results	Results	Results	Nominal Detection Limit
Metals Strong Acid Digestion - Continued						
Lead	Strong Acid Extractable	µg/g	7.5	7.3	10	0.5
Mercury	Strong Acid Extractable	µg/g	0.051	0.028	0.084	0.003
Molybdenum	Strong Acid Extractable	µg/g	0.5	0.3	0.51	0.1
Nickel	Strong Acid Extractable	µg/g	42	36	34	0.25
Phosphorus	Strong Acid Extractable	µg/g	1200	1000	1100	0.5
Potassium	Strong Acid Extractable	µg/g	1000	950	970	2
Selenium	Strong Acid Extractable	µg/g	<0.5	<0.5	0.7	0.5
Silver	Strong Acid Extractable	µg/g	<0.4	<0.4	<0.4	0.4
Strontium	Strong Acid Extractable	µg/g	46	35	48	0.05
Thallium	Strong Acid Extractable	µg/g	<0.5	<0.5	<0.5	0.5
Tin	Strong Acid Extractable	µg/g	<0.5	<0.5	<0.5	0.5
Vanadium	Strong Acid Extractable	µg/g	75	73	76	0.2
Zinc	Strong Acid Extractable	µg/g	89	100	65	0.05
Soil Acidity						
pH	1:2 Soil:Water	pH	6.1	6.0	5.6	
Electrical Conductivity	Sat. Paste equiv based on 1:2	dS/m at 25 °C	0.1	0.1	0.23	0.02
Water Soluble Parameters						
Chloride	Available	mg/kg	4.8	5.8	4.8	0.5
Lime Requirement						
pH	SMP	pH	6.5	6.4	5.9	
Lime		T/ac	1	2	4.6	

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Analytical Report

Bill To:	Timbro Contracting (A	Project ID:	James	Lot ID:	**1260261**
	P.O. Box 95	Project Name:	1280 Hamilton Rd	Control Number:	C117485
	7357 Pioneer Avenue	Project Location:	Aggassiz	Date Received:	Mar 17, 2018
	Agassiz, BC, Canada	LSD:		Date Reported:	Mar 28, 2018
	V0M 1A0	P.O.:		Report Number:	2274117
Attn:	Accounts Payable	Proj. Acct. code:			
Sampled By:	Andres M.				
Company:	Biocentral				

Reference Number	1260261-19740	1260261-19741	1260261-19742
Sample Date	Mar 16, 2018	Mar 16, 2018	Mar 16, 2018
Sample Time	NA	NA	NA
Sample Location			
Sample Description	James - 1280 Hamilton Rd / S10 / 0 / 5 / E / 1	James - 1280 Hamilton Rd / S11 / 0 / 5 / E / 1	James - 1280 Hamilton Rd / S12 / 0 / 5 / E / 1
Matrix	Farm Soil	Farm Soil	Farm Soil

Analyte		Units	Results	Results	Results	Nominal Detection Limit
Aggregate Organic Constituents						
Organic Matter	LOI	% by weight	29.3	52.9	52.8	0.1
Available Nutrients						
Nitrate - N	Farmsoil	ppm	7	5	10	2
Phosphorus	Farmsoil	ppm	<5	<5	<5	5
Potassium	Farmsoil	ppm	75	80	55	25
Sulfate-S	Farmsoil	ppm	12	6	9	1
Copper	FS Micro-nutrients	ppm	1.6	0.3	0.5	0.1
Iron	FS Micro-nutrients	ppm	408	337	432	2
Manganese	FS Micro-nutrients	ppm	7.6	0.5	1.7	0.1
Zinc	FS Micro-nutrients	ppm	1	1	0.7	0.5
Base saturation	FS Base Saturation	%	56.7	19.5	62.6	
Calcium	FS Base Saturation	%	54.2	16.8	60.6	
Magnesium	FS Base Saturation	%	1.7	1.9	1.7	
Sodium	FS Base Saturation	%	<0.5	<0.5	<0.4	
Potassium	FS Base Saturation	%	0.8	0.8	0.4	
TEC	FS Base Saturation	meq/100 g	24.5	25.5	35.0	
Calcium	FS Macro-nutrients	ppm	2660	858	4250	30
Magnesium	FS Macro-nutrients	ppm	51	57	70	5
Sodium	FS Macro-nutrients	ppm	<30	<30	<30	30
Boron	FS Micro-nutrients	ppm	0.3	0.2	0.3	0.1
Classification						
C:N Ratio			16.3	19.2	16.7	0.1
Nitrogen	Total	%	1.18	1.71	1.78	0.02
Organic Matter	Calculated Value	%	38.4	65.6	59.6	0.04
Carbon	Total Organic	%	19.19	32.81	29.81	0.04
Hot Water Soluble						
Boron	FS Micro-nutrients	ppm	0.3	0.2	0.3	0.1
Metals Strong Acid Digestion						
Antimony	Strong Acid Extractable	µg/g	2	2	<1	1.5
Arsenic	Strong Acid Extractable	µg/g	4.6	3.1	2.9	0.35
Barium	Strong Acid Extractable	µg/g	150	91	120	0.2
Beryllium	Strong Acid Extractable	µg/g	0.42	0.29	0.34	0.01
Cadmium	Strong Acid Extractable	µg/g	0.4	0.3	0.3	0.05
Chromium	Strong Acid Extractable	µg/g	55	33	37	0.1
Cobalt	Strong Acid Extractable	µg/g	6.8	3.7	4.4	0.1
Copper	Strong Acid Extractable	µg/g	23	20	20	0.1

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Analytical Report

Bill To:	Timbro Contracting (A	Project ID:	James	Lot ID:	**1260261**
	P.O. Box 95	Project Name:	1280 Hamilton Rd	Control Number:	C117485
	7357 Pioneer Avenue	Project Location:	Aggassiz	Date Received:	Mar 17, 2018
	Agassiz, BC, Canada	LSD:		Date Reported:	Mar 28, 2018
	V0M 1A0	P.O.:		Report Number:	2274117
Attn:	Accounts Payable	Proj. Acct. code:			
Sampled By:	Andres M.				
Company:	Biocentral				

Reference Number	1260261-19740	1260261-19741	1260261-19742
Sample Date	Mar 16, 2018	Mar 16, 2018	Mar 16, 2018
Sample Time	NA	NA	NA
Sample Location			
Sample Description	James - 1280 Hamilton Rd / S10 / 0 / 5 / E / 1	James - 1280 Hamilton Rd / S11 / 0 / 5 / E / 1	James - 1280 Hamilton Rd / S12 / 0 / 5 / E / 1
Matrix	Farm Soil	Farm Soil	Farm Soil

Analyte		Units	Results	Results	Results	Nominal Detection Limit
Metals Strong Acid Digestion - Continued						
Lead	Strong Acid Extractable	µg/g	11	13	8.4	0.5
Mercury	Strong Acid Extractable	µg/g	0.097	0.083	0.093	0.003
Molybdenum	Strong Acid Extractable	µg/g	0.85	0.49	0.64	0.1
Nickel	Strong Acid Extractable	µg/g	23	15	17	0.25
Phosphorus	Strong Acid Extractable	µg/g	1000	930	940	0.5
Potassium	Strong Acid Extractable	µg/g	660	510	450	2
Selenium	Strong Acid Extractable	µg/g	0.7	<0.5	1	0.5
Silver	Strong Acid Extractable	µg/g	<0.4	<0.4	<0.4	0.4
Strontium	Strong Acid Extractable	µg/g	55	19	62	0.05
Thallium	Strong Acid Extractable	µg/g	<0.5	<0.5	0.7	0.5
Tin	Strong Acid Extractable	µg/g	<0.5	<0.5	<0.5	0.5
Vanadium	Strong Acid Extractable	µg/g	62	32	41	0.2
Zinc	Strong Acid Extractable	µg/g	39	27	25	0.05
Soil Acidity						
pH	1:2 Soil:Water	pH	5.6	4.7	5.6	
Electrical Conductivity	Sat. Paste equiv based on 1:2	dS/m at 25 °C	0.27	0.23	0.30	0.02
Water Soluble Parameters						
Chloride	Available	mg/kg	5.8	6.6	8.0	0.5
Lime Requirement						
pH	SMP	pH	5.9	5.0	5.7	
Lime		T/ac	4	13	6.0	

Approved by:

Mathieu Simoneau
Operations Manager

Data have been validated by Analytical Quality Control and Exova's Integrated Data Validation System (IDVS).
Generation and distribution of the report, and approval by the digitized signature above, are performed through a secure and controlled automatic process.

Exova
#104, 19575-55 A Ave.
Surrey, British Columbia
V3S 8P8, Canada

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Quality Control

Bill To:	Timbro Contracting (A	Project ID:	James	Lot ID:	**1260261**
	P.O. Box 95	Project Name:	1280 Hamilton Rd	Control Number:	C117485
	7357 Pioneer Avenue	Project Location:	Aggassiz	Date Received:	Mar 17, 2018
	Agassiz, BC, Canada	LSD:		Date Reported:	Mar 28, 2018
	V0M 1A0	P.O.:		Report Number:	2274117
Attn:	Accounts Payable	Proj. Acct. code:			
Sampled By:	Andres M.				
Company:	Biocentral				

Aggregate Organic Constituents

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Organic Matter	% by weight	3.8	3.7	10	0.1	yes
Date Acquired:	March 21, 2018					

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Organic Matter	% by weight	4.9	4.2	5.7	yes
Date Acquired:	March 21, 2018				

Available Nutrients

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Nitrate - N	mg/L	0.085	-1	1	yes
Phosphorus	mg/L	0.056	-4	5	yes
Potassium	mg/L	-0.225	-3	10	yes
Sulfate-S	mg/L	0.449	-1	1	yes
Copper	mg/L	0.0132	-0.1	0.1	yes
Iron	mg/L	0.0868	-2.0	2.0	yes
Manganese	mg/L	0.0039	-0.1	0.1	yes
Zinc	mg/L	0.0104	-0.5	0.5	yes
Calcium	mg/L	0.7181	-1	3	yes
Magnesium	mg/L	0.1219	-0	0	yes
Sodium	mg/L	1.418	-1	3	yes
Boron	mg/L	0.0168297	-0.2	0.2	yes
Date Acquired:	March 21, 2018				

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Nitrate - N	ppm	5	4	10	2	yes
Phosphorus	ppm	57	56	10	5	yes
Potassium	ppm	95	87	10	10	yes
Sulfate-S	ppm	<1	<1	15	2	yes
Copper	ppm	4.6	4.5	10	0.1	yes
Iron	ppm	204	203	10	0.1	yes
Manganese	ppm	5.6	5.5	10	0.0	yes
Zinc	ppm	4.0	4.0	10	0.0	yes
Calcium	ppm	2300	2250	10	3	yes
Magnesium	ppm	32	31	10	3	yes
Sodium	ppm	<30	<30	10	18	yes
Boron	ppm	0.5	0.5	10	0.1	yes
Date Acquired:	March 21, 2018					

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Nitrate - N	ppm	36	29	40	yes
Phosphorus	ppm	30	27	34	yes
Potassium	ppm	201	168	224	yes
Sulfate-S	ppm	729	620	770	yes
Copper	ppm	1.8	1.5	1.9	yes
Iron	ppm	197	154.3	213.7	yes
Manganese	ppm	46.9	35.8	52.1	yes

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#104, 19575-55 A Ave.
Surrey, British Columbia
V3S 8P8, Canada

T: +1 (604) 514-3322
F: +1 (604) 514-3323
E: Surrey@exova.com
W: www.exova.com

Quality Control

Bill To:	Timbro Contracting (A	Project ID:	James	Lot ID:	**1260261**
	P.O. Box 95	Project Name:	1280 Hamilton Rd	Control Number:	C117485
	7357 Pioneer Avenue	Project Location:	Aggassiz	Date Received:	Mar 17, 2018
	Agassiz, BC, Canada	LSD:		Date Reported:	Mar 28, 2018
	V0M 1A0	P.O.:		Report Number:	2274117
Attn:	Accounts Payable	Proj. Acct. code:			
Sampled By:	Andres M.				
Company:	Biocentral				

Available Nutrients - Continued

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Zinc	ppm	3.4	2.8	3.8	yes
Calcium	ppm	6310	5530	6752	yes
Magnesium	ppm	596	495	670	yes
Sodium	ppm	88	68	94	yes
Date Acquired:	March 21, 2018				
Nitrate - N	ppm	4	3	4	yes
Phosphorus	ppm	3	2	4	yes
Potassium	ppm	31	24	36	yes
Sulfate-S	ppm	1	1	1	yes
Copper	ppm	0.5	0.4	0.6	yes
Iron	ppm	5.2	4.5	5.5	yes
Manganese	ppm	1.0	0.9	1.1	yes
Zinc	ppm	0.5	0.4	0.6	yes
Calcium	ppm	11	9	11	yes
Magnesium	ppm	10	9	11	yes
Sodium	ppm	10	9	11	yes
Boron	ppm	0.1	0.1	0.1	yes
Date Acquired:	March 21, 2018				
Sulfate-S	ppm	53	40	60	yes
Date Acquired:	March 21, 2018				

Classification

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Carbon	%	0.0017	-0.020	0.020	yes
Nitrogen		0.00751	-0.020	0.020	yes
Date Acquired:	March 20, 2018				

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Carbon	%	10.38	10.72	20	6.000	yes
Nitrogen	%	0.24	0.23	0	2.500	yes
Loss on Ignition @ 500C	%	23.42	23.41	20	0.10	yes
Carbon	%	10.31	10.65	20	0.100	yes
Date Acquired:	March 20, 2018					

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Carbon	%	5.92	5.500	6.280	yes
Nitrogen	%	0.52	0.465	0.551	yes
Carbon	%	0.31	0.231	0.591	yes
Date Acquired:	March 20, 2018				

Hot Water Soluble

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Boron	ppm	0.4	0.4	10	0.1	yes
Date Acquired:	March 21, 2018					

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#104, 19575-55 A Ave.
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Quality Control

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	P.O. Box 95	Project Name:	1280 Hamilton Rd	Control Number:	C117485
	7357 Pioneer Avenue	Project Location:	Aggassiz	Date Received:	Mar 17, 2018
	Agassiz, BC, Canada	LSD:		Date Reported:	Mar 28, 2018
	V0M 1A0	P.O.:		Report Number:	2274117
Attn:	Accounts Payable	Proj. Acct. code:			
Sampled By:	Andres M.				
Company:	Biocentral				

Hot Water Soluble - Continued

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Boron	ppm	1.2	0.8	1.5	yes
Date Acquired:	March 21, 2018				
Boron	ppm	0.1	0.1	0.1	yes
Date Acquired:	March 21, 2018				

Lime Requirement

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
pH	pH	7.3	7.2	7.3	yes
Date Acquired:	March 21, 2018				

Metals Strong Acid Digestion

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Antimony	mg/L	-0.000457259	-0.030	0.030	yes
Arsenic	mg/L	-0.00681021	-0.007	0.007	yes
Barium	mg/L	0.000364058	-0.004	0.004	yes
Beryllium	mg/L	8.8897e-006	-0.000	0.000	yes
Cadmium	mg/L	0.000506602	-0.001	0.001	yes
Chromium	mg/L	0.00121838	-0.002	0.002	yes
Cobalt	mg/L	0.00018497	-0.002	0.002	yes
Copper	mg/L	0.000561406	-0.002	0.002	yes
Lead	mg/L	0.00031064	-0.010	0.010	yes
Mercury	µg/L	-0.009	-0.030	0.030	yes
Molybdenum	mg/L	-0.00165603	-0.002	0.002	yes
Nickel	mg/L	0.00163925	-0.005	0.005	yes
Phosphorus	mg/L	0.00141149	-0.010	0.010	yes
Selenium	mg/L	0.00427062	-0.010	0.010	yes
Silver	mg/L	0.000747588	-0.008	0.008	yes
Strontium	mg/L	9.63792e-005	-0.000	0.000	yes
Thallium	mg/L	-0.00544639	-0.010	0.010	yes
Tin	mg/L	-0.00101922	-0.010	0.010	yes
Vanadium	mg/L	-0.000491746	-0.004	0.004	yes
Zinc	mg/L	0.000670545	-0.001	0.001	yes
Date Acquired:	March 21, 2018				

Calibration Check	Units	% Recovery	Lower Limit	Upper Limit	Passed QC
Antimony	mg/L	92.75	90	110	yes
Arsenic	mg/L	99.77	90	110	yes
Barium	mg/L	100.62	90	110	yes
Beryllium	mg/L	95.64	90	110	yes
Cadmium	mg/L	98.42	90	110	yes
Chromium	mg/L	99.43	90	110	yes
Cobalt	mg/L	97.78	90	110	yes
Copper	mg/L	100.17	90	110	yes
Lead	mg/L	95.05	90	110	yes

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Quality Control

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	P.O. Box 95	Project Name:	1280 Hamilton Rd	Control Number:	C117485
	7357 Pioneer Avenue	Project Location:	Aggassiz	Date Received:	Mar 17, 2018
	Agassiz, BC, Canada	LSD:		Date Reported:	Mar 28, 2018
	V0M 1A0	P.O.:		Report Number:	2274117
Attn:	Accounts Payable	Proj. Acct. code:			
Sampled By:	Andres M.				
Company:	Biocentral				

Metals Strong Acid Digestion - Continued

Calibration Check	Units	% Recovery	Lower Limit	Upper Limit	Passed QC
Molybdenum	mg/L	97.38	90	110	yes
Nickel	mg/L	95.39	90	110	yes
Phosphorus	mg/L	99.62	90	110	yes
Selenium	mg/L	99.53	90	110	yes
Silver	mg/L	96.35	90	110	yes
Thallium	mg/L	94.80	90	110	yes
Tin	mg/L	92.47	90	110	yes
Vanadium	mg/L	100.00	90	110	yes
Zinc	mg/L	93.78	90	110	yes
Date Acquired:	March 21, 2018				
Antimony	mg/L	91.35	90	110	yes
Arsenic	mg/L	101.01	90	110	yes
Barium	mg/L	100.35	90	110	yes
Beryllium	mg/L	94.49	90	110	yes
Cadmium	mg/L	100.38	90	110	yes
Chromium	mg/L	100.00	90	110	yes
Cobalt	mg/L	99.21	90	110	yes
Copper	mg/L	101.15	90	110	yes
Lead	mg/L	98.13	90	110	yes
Mercury	µg/L	92.60	90	110	yes
Molybdenum	mg/L	98.05	90	110	yes
Nickel	mg/L	98.98	90	110	yes
Phosphorus	mg/L	99.88	90	110	yes
Selenium	mg/L	106.38	90	110	yes
Silver	mg/L	93.29	90	110	yes
Strontium	mg/L	97.60	90	110	yes
Thallium	mg/L	96.23	90	110	yes
Tin	mg/L	93.02	90	110	yes
Vanadium	mg/L	99.75	90	110	yes
Zinc	mg/L	94.61	90	110	yes
Date Acquired:	March 21, 2018				

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Antimony	µg/g	2	2	30	3.000	yes
Arsenic	µg/g	5.5	5.6	30	1.750	yes
Barium	µg/g	120	120	30	1.000	yes
Beryllium	µg/g	0.35	0.35	30	0.050	yes
Cadmium	µg/g	0.3	0.4	30	0.250	yes
Chromium	µg/g	66	66	30	0.500	yes
Cobalt	µg/g	14	14	30	0.500	yes
Copper	µg/g	29	29	30	0.500	yes
Lead	µg/g	5.2	5.3	30	2.500	yes
Mercury	µg/g	0.042	0.035	30	0.500	yes
Molybdenum	µg/g	0.4	0.4	30	0.500	yes

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V3S 8P8, Canada

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Quality Control

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	P.O. Box 95	Project Name:	1280 Hamilton Rd	Control Number:	C117485
	7357 Pioneer Avenue	Project Location:	Aggassiz	Date Received:	Mar 17, 2018
	Agassiz, BC, Canada	LSD:		Date Reported:	Mar 28, 2018
	V0M 1A0	P.O.:		Report Number:	2274117
Attn:	Accounts Payable	Proj. Acct. code:			
Sampled By:	Andres M.				
Company:	Biocentral				

Metals Strong Acid Digestion - Continued

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Nickel	µg/g	42	41	30	1.250	yes
Selenium	µg/g	1	<0.5	30	2.500	yes
Silver	µg/g	<0.4	<0.4	30	2.000	yes
Strontium	µg/g	40	41	30	0.250	yes
Thallium	µg/g	<0.5	<0.5	30	2.500	yes
Tin	µg/g	<0.5	<0.5	30	2.500	yes
Vanadium	µg/g	69	68	30	1.000	yes
Zinc	µg/g	81	78	30	0.250	yes
Date Acquired:	March 21, 2018					

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Antimony	µg/g	<1	0.040	2.080	yes
Arsenic	µg/g	4.8	2.940	5.520	yes
Barium	µg/g	170	139.210	174.790	yes
Beryllium	µg/g	0.53	0.405	0.603	yes
Cadmium	µg/g	0.2	0.101	0.341	yes
Chromium	µg/g	32	19.940	36.620	yes
Cobalt	µg/g	7.1	4.970	8.870	yes
Copper	µg/g	16	12.330	17.430	yes
Lead	µg/g	7.4	5.500	11.320	yes
Mercury	µg/g	0.024	0.012	0.034	yes
Molybdenum	µg/g	0.4	0.252	0.828	yes
Nickel	µg/g	20	16.430	23.720	yes
Phosphorus	µg/g	620	489.000	693.000	yes
Strontium	µg/g	74	59.580	83.220	yes
Tin	µg/g	<0.5	0.104	0.938	yes
Vanadium	µg/g	37	25.800	48.600	yes
Zinc	µg/g	60	46.370	66.830	yes
Date Acquired:	March 21, 2018				

Soil Acidity

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
pH	pH	6.18	5.6	7.2	yes
Electrical Conductivity	dS/m at 25 °C	0.0161	-0.04	0.08	yes
Date Acquired:	March 21, 2018				

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
pH	pH	5.3	5.4	0	0.3	yes
Electrical Conductivity	dS/m at 25 °C	0.1	0.1	10	0.04	yes
Date Acquired:	March 21, 2018					

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
pH	pH	7.3	6.3	8.6	yes
Electrical Conductivity	dS/m at 25 °C	2.65	2.13	3.09	yes
Date Acquired:	March 21, 2018				

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Surrey, British Columbia
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Quality Control

Bill To:	Timbro Contracting (A	Project ID:	James	Lot ID:	**1260261**
	P.O. Box 95	Project Name:	1280 Hamilton Rd	Control Number:	C117485
	7357 Pioneer Avenue	Project Location:	Aggassiz	Date Received:	Mar 17, 2018
	Agassiz, BC, Canada	LSD:		Date Reported:	Mar 28, 2018
	V0M 1A0	P.O.:		Report Number:	2274117
Attn:	Accounts Payable	Proj. Acct. code:			
Sampled By:	Andres M.				
Company:	Biocentral				

Water Soluble Parameters

Blanks	**Units**	**Measured**	**Lower Limit**	**Upper Limit**		**Passed QC**
Chloride	mg/L	0.38	-0.0	0.6		yes
Date Acquired:	March 21, 2018					
Client Sample Replicates	**Units**	**Replicate 1**	**Replicate 2**	**% RSD Criteria**	**Absolute Criteria**	**Passed QC**
Chloride	mg/kg	5.2	5.2	10	1.0	yes
Date Acquired:	March 21, 2018					
Control Sample	**Units**	**Measured**	**Lower Limit**	**Upper Limit**		**Passed QC**
Chloride	mg/kg	37	30.0	40.8		yes
Date Acquired:	March 21, 2018					
Chloride	mg/kg	4.6	4.4	5.6		yes
Date Acquired:	March 21, 2018					

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Methodology and Notes

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	P.O. Box 95	Project Name:	1280 Hamilton Rd	Control Number:	C117485
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Sampled By:	Andres M.				
Company:	Biocentral				

Method of Analysis

Method Name	Reference		Method	Date Analysis Started	Location
Boron in farm soil	McKeague	*	Hot Water Soluble Boron - Azomethine-H Method, 4.61	Mar 21, 2018	Exova Edmonton
Chloride in farmsoil	SSSA Book Series, no. 3	*	Testing Soils for Sulfur, Boron, Molybdenum, and Chlorine, Chapter 10	Mar 21, 2018	Exova Edmonton
Macronutrients in Farm Soils	McKeague	*	Ammonium Acetate Extractable Cations, 4.51	Mar 21, 2018	Exova Edmonton
Metals (Strong Acid Leachable) in soils (Surrey)	B.C.M.O.E	*	Strong Acid Leachable Metals (SALM) in Soil, V 1.0, SALM	Mar 20, 2018	Exova Surrey
Metals (Strong Acid Leachable) in soils (Surrey)	US EPA	*	Mercury in Solid and Semi-Solid Wastes (Cold Vapour), 7471B	Mar 20, 2018	Exova Surrey
Micronutrients in Farm Soil	APHA	*	Inductively Coupled Plasma (ICP) Method, 3120 B	Mar 21, 2018	Exova Edmonton
Micronutrients in Farm Soil	McKeague	*	DTPA-TEA Extractable Elements, 4.65	Mar 21, 2018	Exova Edmonton
Nutrients in Farm Soil	Comm. Soil Sci. Pl. Anal.	*	Modified Kelowna Soil Test, Vol 26, 1995	Mar 21, 2018	Exova Edmonton
Organic Matter by Ignition	McKeague	*	Loss on Ignition (LOI), 3.8	Mar 21, 2018	Exova Edmonton
pH and Conductivity in farm soil	McKeague	*	1:2 Soil:Water Ratio, 4.12	Mar 21, 2018	Exova Edmonton
SMP Lime Requirements	Carter	*	Shoemaker-Mclean-Pratt Single-Buffer Method, 12.2	Mar 21, 2018	Exova Edmonton
Sulfate in Farm Soil	McKeague	*	Sulfate Extractable by 0.1M CaCl2, 4.47	Mar 21, 2018	Exova Edmonton
Total Carbon, Nitrogen & Sulfur by Leco Combustion (Surrey)	SSSA Book Series 5	*	Nitrogen-Total, Ch 37	Mar 20, 2018	Exova Surrey
Total Carbon, Nitrogen & Sulfur by Leco Combustion (Surrey)	SSSA Book Series 5	*	Total Carbon, Organic Carbon, and Organic Matter, Ch 34	Mar 20, 2018	Exova Surrey

** Reference Method Modified*

References

APHA	Standard Methods for the Examination of Water and Wastewater
B.C.M.O.E	B.C. Ministry of Environment
Carter	Soil Sampling and Methods of Analysis.
Comm. Soil Sci. Pl.	Communications in Soil Science and Plant Analysis
McKeague	Manual on Soil Sampling and Methods of Analysis
SSSA Book Series 5	Methods of Soil Analysis, Part 3
SSSA Book Series,	Soil Testing and Plant Analysis
US EPA	US Environmental Protection Agency Test Methods

Guidelines

Guideline Description	General Soil Comments
	Plant Nutrients in Soil
	Soil test for Crop Unknown
Guideline Source	Exova Canada Inc.,
Guideline Comments	

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	P.O. Box 95	Project Name:	1280 Hamilton Rd	Control Number:	C117485
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	V0M 1A0	P.O.:		Report Number:	2274117
Attn:	Accounts Payable	Proj. Acct. code:			
Sampled By:	Andres M.				
Company:	Biocentral				

Guidelines

Guideline Description	General Soil Comments
	Plant Nutrients in Soil
	Soil test for Crop Unknown
Guideline Source	Exova Canada Inc.,
Guideline Comments	

Comments:

- Mar 28, 2018 - Report was issued to correct for missing metal analysis on samples 1260261-1 to 12. Previous report 2271759.

Exova Testing, calibrating, advising

www.exova.com ED 120-02

Project Information

Project ID:	JAMES
Project Name:	1280 Hamilton Rd
Project Location:	Agassiz
Legal Location:	
PO/AFE#:	14132
Proj. Acct. Code:	
Quote #	23983

Invoice to:

Company:	Timbro contracting
Address:	
Attention:	
Phone:	
Cell:	
Fax:	
E-mail:	
Agreement ID:	
Copy of report:	

Report To:

Company:	BioCentral
Address:	Same as Timbro
Attention:	Andres Moreno
Phone:	604 997 1630
Cell:	
Fax:	
E-mail 1:	andresm@biocentral.ca
E-mail 2:	Frank@timbroconstruction.com
Copy of invoice:	info@timbroconstruction.com

Report Results		Regulatory Requirement	
E-Mail	X	HCDWQG	
Mail		Ab Tier 1	
Online		SPIGEC	
Fax		BCCSR	
PDF	X	Other (list below)	
Excel	X		
QA/QC	X		

Sample Custody (please print)

Sampled by: Andres M.

Company: Biocentral

RUSH Priority

- [ ] Emergency (contact lab for turnaround and pricing)
- [ ] Priority 1-2 working days (100% surcharge)
- [ ] Urgent 2-3 working days (50% surcharge)

When "ASAP" is requested, turn around will default to a 100% RUSH priority, with pricing and turn around time to match. Please contact the lab prior to submitting RUSH samples. If not all samples require RUSH, please indicate in the special instructions.

Date Required: ______ Signature: ______

Special Instructions/Comments (please include contact information including ph. # if different from above).

Regular Delivery

This section for Lab use only

Date/Time stamp: MAR 17'18 12:47

	Site I.D.	Sample Description	Depth start (in)	Depth end	Date/Time Sampled	Matrix	Sampling Method	Number of Containers	OYSR Metals	CMPT	C:N Ratio
1	S1	Farm soil	6		2018.03.16	Soil		1	√	√	√
2	S2	"	"		"	"		"	√	√	√
3	S3	"	"		"	"		"	√	√	√
4	S4	"	"		"	"		"	√	√	√
5	S5	"	"		"	"		"	√	√	√
6	S6	"	"		"	"		"	√	√	√
7	S7	"	"		"	"		"	√	√	√
8	S8	"	"		"	"		"	√	√	√
9	S9	"	"		"	"		"	√	√	√
10	S10	"	"		"	"		"	√	√	√
11	S11	"	"		"	"		"	√	√	√
12	S12	"	"		"	"		"	√	√	√
13											
14											
15											

Enter tests above (√ relevant samples below)

Indicate in the space allotted any deficiencies by the corresponding number.

1. Indicate any samples that were not packaged well
2. Indicate any samples not received in Exova supplies
3. Indicate any samples that were not clearly labeled
4. Indicate any samples not received within the required hold time or temp.
5. Indicate any missing or extra samples
6. Indicate any samples that were received broken
7. Indicate any samples where sufficient volume was not received
8. Indicate any samples received in an inappropriate container

Please indicate any potentially hazardous samples

Lot: 1260261 COC

Shipping: COD Y/ N

and size of coolers

Temp. received: 11.7°C

Delivery Method: H

Waybill:

Received by: LC

Page ___ of ___ Control # C 117485

ED 120-02

ABBOTSFORD

April 10, 2017

File: 5550-70

Andres Murillo, P.Eng
BioCentral Green Depot Ltd.
Box 95-7357 Pioneer Avenue
Agassiz, BC V0M 1A0

Dear Mr. Murillo:

Re: Organic Matters Recycling Regulation (OMRR) Section 6 – Process and Quality Criteria

As requested, this letter provides confirmation and supporting information that the JAMES Wastewater Treatment Plant (JAMES Plant) meets Section 6 of the OMRR for producing Class A biosolids.

The pasteurization system at the JAMES Plant meets the time-temperature requirements for production of Class A biosolids according to Section 2(f) in OMRR Schedule 1.

The sludge pasteurization system includes the following main components:

- crude and pasteurized sludge holding tanks;
- heat exchangers to heat raw sludge and cool pasteurized sludge;
- pasteurization tank; and
- miscellaneous transfer and recirculation pumps.

The pasteurization reactor operates at a temperature of 65°C and is batch-fed to maintain a retention time of at least one hour between sludge transfers. The volume of the tank provides approximately 18 to 24 hours retention time for pasteurization and conditioning of the sludge in advance of the anaerobic digestion process. The pasteurization process is followed by anaerobic mesophilic digestion, which meets the vector attraction reduction requirements (for details please see below).

The anaerobic mesophilic digestion system at the JAMES Plant meets the vector attraction reduction requirements according to Section 1(a) in OMRR Schedule 2.

The anaerobic mesophilic digestion system at the JAMES Plant includes three digesters, with a total volume of 11,460 m^3. Pasteurized and conditioned sludge from the pasteurized sludge holding tank is pumped to the largest anaerobic digester and then is passed to the remaining two digesters in series. The volatile solids reduction of the biosolids typically ranges between 60-70% and is higher than the required 38% under OMRR.

We trust the above provides the information you requested. Please contact me if you need any additional information or clarification.

Yours truly,

Rob Isaac, Eng.L.
Director, Project Management Office

c. John Paul, Transform Compost Systems Ltd.
Peter Sparanese, General Manager, Engineering and Regional Utilities
Tim Henry, Director, Utility Operations and Asset Management

SC/rb

Biosolids Sampling - Small Tent (March 8, 2018)

BACK OF TENT

A3 Time = 9:50 AM FC < 200	**A2** Time = 9:40 AM FC < 200	**A1** Time = 9:30 AM FC < 200
B6 Time = 10:20 AM FC < 200	**B5** Time = 10: 10 AM FC < 200	**B4** Time = 10:00 AM FC < 200
C9 Time = 10:50 AM FC < 200	**C8** Time = 10:40 AM FC < 200	**C7** Time = 10:30 AM FC < 200
D12 Time = 11:20 AM FC < 200	**D11** Time = 11:10 AM FC < 200	**D10** Time = 11:00 AM FC < 200

FRONT OF TENT

NOTE: Units for Fecal Coliforms (FC) are MPN/g dry weight.

CITY OF ABBOTSFORD
ATTN: Mounia Sassi
6011 Gladwin Rd
Abbotsford BC V4X 1V9

Date Received: 08-MAR-18
Report Date: 20-MAR-18 14:17 (MT)
Version: FINAL

Client Phone: 604-864-5593

Certificate of Analysis

Lab Work Order #: L2065527

Project P.O. #: 176044
Job Reference: PROJECT#13 BIOSOLIDS QC
C of C Numbers:
Legal Site Desc:

Heather McKenzie
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2065527-1	L2065527-2	L2065527-3	L2065527-4	L2065527-5
	Description	GRAB	GRAB	GRAB	GRAB	GRAB
	Sampled Date	08-MAR-18	08-MAR-18	08-MAR-18	08-MAR-18	08-MAR-18
	Sampled Time	09:30	09:40	09:50	10:00	10:10
	Client ID	A1 (SMALL TENT)	A2 (SMALL TENT)	A3 (SMALL TENT)	B4 (SMALL TENT)	B5 (SMALL TENT)
Grouping	**Analyte**					
SOIL						
Physical Tests	Moisture (%)	78.6	78.2	78.2	78.4	79.2
Bacteriological Tests	Coliform Bacteria - Fecal (MPN/g)	<200	<200	<200	<200	<200

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2065527-6	L2065527-7	L2065527-8	L2065527-9	L2065527-10
	Description	GRAB	GRAB	GRAB	GRAB	GRAB
	Sampled Date	08-MAR-18	08-MAR-18	08-MAR-18	08-MAR-18	08-MAR-18
	Sampled Time	10:20	10:30	10:40	10:50	11:00
	Client ID	B6 (SMALL TENT)	C7 (SMALL TENT)	C8 (SMALL TENT)	C9 (SMALL TENT)	D10 (SMALL TENT)
Grouping	**Analyte**					
SOIL						
Physical Tests	Moisture (%)	78.8	78.6	77.2	77.5	76.5
Bacteriological Tests	Coliform Bacteria - Fecal (MPN/g)	<200	<200	<200	<200	<200

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2065527-11	L2065527-12			
	Description	GRAB	GRAB			
	Sampled Date	08-MAR-18	08-MAR-18			
	Sampled Time	11:10	11:20			
	Client ID	D11 (SMALL TENT)	D12 (SMALL TENT)			
Grouping	**Analyte**					
SOIL						
Physical Tests	Moisture (%)	77.6	78.1			
Bacteriological Tests	Coliform Bacteria - Fecal (MPN/g)	<200	<200			

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
FCOLI-DRY-MTF-VA	Soil	Fecal coliform by MPN	EPA Method 1680

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

MOISTURE-VA	Soil	Moisture content	CWS for PHC in Soil - Tier 1

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

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

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

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

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

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

Chain of Custody (COC) / Analytical Request Form

ALS Environmental

Canada Toll Free: 1 800 668 9878

www.alsglobal.com

L2065527-COFC

COC Number: 15 -

Page of

Report To	Contact and company name below will appear on the final report
Company:	City of Abbotsford - Source Control
Contact:	Mounia Sassi
Phone:	604-864-5593
	Company address below will appear on the final report
Street:	6011 Gladwin Road
City/Province:	Abbotsford, BC
Postal Code:	V4X 1V9
Invoice To	Same as Report To ☐ ☑ NO
	Copy of Invoice with Report ☐ ☑ NO
Company:	City of Abbotsford
Contact:	Joe Vurzinger

Report Format / Distribution

Select Report Format: ☑ ☑ EXCEL ☐ EDD (DIGITAL)

Quality Control (QC) Report with Report ☑ ☐ NO

☑ Compare Results to Criteria on Report - provide details below if box checked

Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax msassi@abbotsford.ca

Email 2 ssubido@abbotsford.ca

Email 3 jvurzinger@abbotsford.ca

Invoice Distribution

Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax james_clerical@abbotsford.ca

Email 2 jvurzinger@abbotsford.ca, ssubido@abbotsford.ca

Project Information

ALS Account # / Quote #: COA200-UTILITIES-VA

Job #: Project #13 Biosolids QC

PO / AFE:

LSD:

Oil and Gas Required Fields (client use)

AFE/Cost Center: PO#

Major/Minor Code: Routing Code:

Requisitioner:

Location:

ALS Lab Work Order # (lab use only)

ALS Contact: **Sampler:**

Select Service Level Below - Please confirm all E&P TATs with your AM - surcharges will apply

Regular [R] ☐ Standard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days): 4 day [P4] ☐ | 3 day [P3] ☐ | 2 day [P2] ☐

EMERGENCY: 1 Business day [E1] ☐ | Same Day, Weekend or Statutory holiday [E0] ☐

Date and Time Required for all E&P TATs:

For tests that can not be performed according to the service level selected, you will be contacted.

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Fecal Coliforms (MPN/dry gram)	Moisture	Number of Containers
	A1 (Small Tent)	8-Mar-18	9:30	Grab	R	R	
	A2 (Small Tent)	8-Mar-18	9:40	Grab	R	R	
	A3 (Small Tent)	8-Mar-18	9:50	Grab	R	R	
	B4 (Small Tent)	8-Mar-18	10:00	Grab	R	R	
	B5 (Small Tent)	8-Mar-18	10:10	Grab	R	R	
	B6 (Small Tent)	8-Mar-18	10:20	Grab	R	R	
	C7 (Small Tent)	8-Mar-18	10:30	Grab	R	R	
	C8 (Small Tent)	8-Mar-18	10:40	Grab	R	R	
	C9 (Small Tent)	8-Mar-18	10:50	Grab	R	R	
	D10 (Small Tent)	8-Mar-18	11:00	Grab	R	R	
	D11 (Small Tent)	8-Mar-18	11:10	Grab	R	R	
	D12 (Small Tent)	8-Mar-18	11:20	Grab	R	R	

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System? ☐ ☑ NO

Are samples for human drinking water use? ☐ ☑ NO

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐

Ice Packs ☐ Ice Cubes ☐ Custody seal intact Yes ☐ No ☐

Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C			FINAL COOLER TEMPERATURES °C		
		9.8			

SHIPMENT RELEASE (client use)		
Released by: Mounia Sassi	Date: 08 March 2018	Time:

INITIAL SHIPMENT RECEPTION (lab use only)		
Received by: TP	Date: Mar 8	Time: 15:14

FINAL SHIPMENT RECEPTION (lab use only)		
Received by:	Date:	Time:

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

OCTOBER 2015 FRONT

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form**.

Appendix F

% Volatile Solids Reduction - JAMES PLANT- 2017

Month	% V.S Red'n
Jan	58
Feb	64
Mar	56
Apr	61
May	58
Jun	67
Jul	69
Aug	66
Sep	64
Oct	70
Nov	64
Dec	67
Annual	**64**

Monthly average from weekly testing

OMRR Limit -38%

Volatile Solids Reduction Calculation:

$$\% \text{ Red'n} = \frac{(\text{In} - \text{Out})}{\text{In} - (\text{In} \times \text{Out})} \times 100$$

Where:

In = Volatile solids for raw, decimal format.

Out = Volatile solids of last Dig in series, decimal format.

JAMES WWTP BIOSOLIDS QUALITY DATA (2017)

Parameter concentrations are expressed on dry weight basis unless otherwise stated.
All data obtained from the analysis of a monthly composite sample.

Sampling Date:	-															
Parameters (Dried Basis)	**Units**	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**	**OCT**	**NOV**	**DEC**	**MAX**	**AVG**	**OMRR***
Total Nitrogen	%	6.99	8.14	9.04	7.19	8.65	8.1	7.74	8.13	5.74	5.36	6.71	10.5	10.50	7.69	-
Total Phosphorus (as P)	%	1.10	1.02	1.14	1.02	1.15	1.23	1.07	1.14	1.33	1.01	1.02	1.09	1.33	1.11	-
Total Potassium	%	0.071	0.11	0.11	0.103	0.0669	0.077	0.0727	0.0755	0.0632	0.0563	0.071	0.0628	0.11	0.08	-
Total Sulphur	%	0.58	0.74	0.79	0.96	0.517	0.682	0.768	0.83	0.868	0.60	0.69	0.603	0.96	0.72	-
Total Carbon	%	33.6	41.7	40.9	41.5	41.3	40.3	40.5	40.9	40	40.5	42.0	43.2	43.2	40.5	-
Organic Matter	%	80.3	79.6	79.7	80.1	80	79.2	79.5	78.9	76.8	77.9	78.3	78.9	80.3	79.1	-
Moisture	%	75.7	74.9	75.6	75.2	76.6	76.9	76.4	76.7	76.1	72.4	76.6	76.5	76.9	75.8	-
Ammonia- N (available)	mg/kg	7810	8100	8460	8390	7530	7480	8400	8750	7370	5920	6220	6600	8750	7586	-
Nitrate - N (available)	mg/kg	5.4	4.4	5.25	5.85	2.65	3.52	7.77	3.43	3.72	15.6	3.05	4.52	15.6	5.43	-
pH	pH units	6.5	6.7	5.6	6.6	6.3	5.8	6	6.46	6.43	6.75	6.71	6.77	6.77	6.4	-
EC - Conductivity	dS/m	2.73	3.39	2.58	2.94	3.83	3.66	2.58	3.73	5.83	3.25	4.09	4.12	5.83	3.56	-
C/N Ratio	-	4.8	5.1	4.5	5.8	4.8	5.0	5.2	5.0	7.0	7.6	6.26	4.1	7.6	5.4	-
Arsenic	ug/g	2	2.8	N/A	2.95	2.25	2.87	2.83	2.84	3.5	2.88	3.1	2.51	3.5	2.8	75
Cadmium	ug/g	0.86	1.5	N/A	1.49	1.24	1.44	1.63	1.53	1.76	1.23	1.59	1.29	1.76	1.41	20
Chromium	ug/g	18	24	N/A	28.1	20.4	25.4	35.6	60.1	37.4	29.4	32.1	22	60.1	30.2	1060
Cobalt	ug/g	1.6	2.5	N/A	2.57	1.99	2.27	2.2	2.69	3.27	2.21	2.14	1.85	3.27	2.30	150
Copper	ug/g	360	520	N/A	483	438	568	600	655	636	531	561	453	655	528	2200
Lead	ug/g	13	20	N/A	20.8	17.2	20.3	21.4	20.7	22.8	17.3	22.9	17.7	22.9	19.5	500
Mercury	ug/g	1.3	1.5	N/A	1.98	1.67	1.73	3.22	1.78	2.08	1.52	2.2	2.39	3.22	1.95	5
Molybdenum	ug/g	3.9	6.4	N/A	6.34	5.91	6.94	6.05	6.77	7.82	6.21	6.76	5.14	7.82	6.20	20
Nickel	ug/g	11	15	N/A	17.8	13.9	18.1	31.4	41.8	32.9	27.1	35.5	26.5	41.8	24.6	180
Selenium	ug/g	3	4.5	N/A	4.84	4.37	4.88	4.72	4.7	5.31	4.18	4.79	3.75	5.31	4.46	14
Zinc	ug/g	530	800	N/A	700	732	924	922	1050	983	887	874	707	1050	828	1850

Rancho el Rio del Sol Farms Ltd.

Class A Biosolids Application Plan: 2018

April 11, 2018

MOE Authorization # 109235

Prepared by:

John Paul, PhD PAg
Transform Compost Systems Ltd
3911 Mt Lehman Rd
Abbotsford, BC V2T 5W5
Ph: 604-302-4367
Email: transform@telus.net

Rancho el Rio del Sol Farms Ltd. – Class A Biosolids Application Plan: 2018

Introduction

This Land Application Plan for the application of Class A biosolids provides the guidance and information required under British Columbia's Organic Matter Recycling Regulation (OMRR), a regulation enacted to ensure that biosolids are managed in a manner that protects human health and the environment.

Class A biosolids are considered a valuable source of both plant nutrients and organic matter. Class A biosolids are the highest quality biosolids achievable under the OMRR, particularly regarding fecal coliform counts (< 1,000 most probable number per gram), and trace element (metal) concentrations. The land application plan must be prepared by a qualified professional as defined in the OMRR.

Class A biosolids will be land applied primarily during the spring of 2018 as a source of nutrients and organic matter for the soil on a minimum of 50 ha of a farm in Harrison Mills, BC that is growing forage for cattle. This Land Application Plan (LAP) provides guidance in the beneficial reuse of a portion of the Class A biosolids from the James Treatment Plant, a wastewater treatment facility that processes an average of 48,000 m^3 of wastewater daily from the communities of Abbotsford and Mission. (http://www.abbotsford.ca/city_services/wastewater/biosolids_management.htm#JAMES).

This land application plan utilizes the biosolids quality data for 2017, provided by the City of Abbotsford.

The Land Application Plan follows the Notification dated December 27, 2017 (Appendix A).

Qualifications of the Qualified Professional

The professional agrologist preparing this report has extensive training and experience with soil, waste and agricultural land in particular. John Paul, PhD is a registered professional agrologist, who obtained his MSc and PhD in soil biochemistry from the University of Guelph in 1991. He has acted as a professional agrologist for many sites requiring soil deposit and removal reports, nutrient management and waste management plans. He has extensive experience with the various Acts and Regulations regarding agricultural land use and agricultural and industrial wastes.

Land Application Objectives

The specific objectives of this land application plan are to ensure that the Class A biosolids are stored and applied in a manner that provides the greatest benefit for the crop grown on this property, while minimizing risk of environmental pollution. The plan will consider the specific

crops that are growing on this property, as well as any other nutrient input that is used for growing crops or improving the soil.

Site Characteristics

Location

This Land Application Plan is for Class A biosolids application for a farm on Hwy # 7 in Harrison Mills, BC, 34 km east of Mission, and 20 km west of Agassiz, BC. The farm is located in the District of Kent, which is part of the Fraser Valley Regional District. It is part of the Agricultural Land Reserve.

The parcel identifiers for the properties include: PID 013-185-616, 003-577-651, 013-177-761, 001-129-902, 001-129-783, 013-186-078, 013-185-756, 013-185-471, 003-577-660

The land has been farmed to provide forage for cattle for many years.

Figure 1. Aerial view of the farm where the Class A biosolids will be applied (Numbers on photograph refer to the parcels that are part of the farm, and do not necessarily correspond to field numbers).

The coordinates of the site are

Longitude: 49º 14’ 31” North

Latitude: 121º 55’ 5” West

The farm is bordered by agricultural land to the south and west, forest to the east, and the Harrison River to the north. The Kilby General Store and park is located 2 km to the southwest, and Rowena's golf course is located 1.25 km from the site on the other side of the Harrison River.

Figure 2. Aerial view of Harrison Mills and the surrounding area (Google Earth, distances from various locations can easily be measured and verified using Google Earth.

Climate

Harrison Mills has a similar climate as nearby Agassiz. It has a wet but moderate to mild climate in the wintertime with dry summers. The annual mean total rainfall is 1440 mm, with an average of 230 mm in January, and 60 mm in July. The annual mean total snowfall is 940 mm. The annual mean daily temperature in July is 23°C, and in January is 2.5 °C. The wind direction is generally from the southeast to the northwest. Source of weather information: http://www.climate-charts.com/Locations/c/CN71113011001200.php

Soil Properties

The soil at this farm is described as a Monroe Clay Loam (Kelly and Spilsbury 1939), which is a very common soil type along the lower Fraser River. Typically these soils have 30 to 40 cm of a fine textured soil overlying coarse sands.

Figure 3. Soil pit showing the clay loam soils typical of the soils on this farm.

The Land Application Plan covers 5 of the 6 fields noted on Figure 4. Some of the fields are subdivided depending on whether the section of the field is cropped to corn or grass. Field 6 is not yet in full production. The soil organic matter content averaged 4.7 %. The soil pH averaged 5.8 (Figure 5).

Figure 4. The biosolids will be applied to six fields at the farm.

Soil Characteristics					
			2014	2017	2018
Organic matter		%	3.1	4.2	4.7
Nitrogen		%			0.25
pH			7.7	5.8	5.8
EC		dS/m	0.30	0.15	0.25
Nitrate		mg/L	5.2	6.0	4.1
Phosphorus		mg/L	6.0	23.0	38.1
Potassium		mg/L	78	58	54
Base Saturation		%	100	52	57.2
	Calcium	%	76.3	43.5	48.6
	Magnesium	%	21.0	7.6	7.2
	Potassium	%	1.1	1.7	0.9
	Sodium	%	1.8	<1	1.0

Figure 5. Soil characteristics on the farm before addition of biosolids in 2015 and following applications (2015, 2016 and 2017).

Slope and Topography

All of the fields on this property are level. Fields 1 through 4 are protected by the dyke along the Harrison River, whereas Fields 5 and 6 are outside of the dyke. Application of biosolids to the land outside of the dyke will occur only in the early spring to fertilize the field before the first harvest (early May), and in July following the freshet.

Figure 6. View of Field 2 looking northward (April 17, 2017 photo).

Depth to Groundwater Table

Depth to the groundwater table ranges from 3 meters during the winter, to less than 1 meter during freshet in late May and June.

There will be no biosolids applied during the two months before the freshet period, to allow the vegetation to take up the soluble nutrients in the biosolids.

Figure 7. View of Fields 3 and 4, showing the depth of the water in the slough (similar to groundwater depth, 2014 photo).

Soil Sampling

A total of nine soil samples were taken from the 0-15 cm depth on the various fields on this farm. The sample locations are shown in Appendix B. The soil analyses results are shown in Appendix C. General soil characteristics have been reported in an earlier section.

Soil Nutrients

All of the nine soil samples showed deficiencies in nitrogen, which was expected in south coastal of British Columbia in the spring before manure or fertilizer application. All of the samples showed deficiencies in potassium, and three showed deficiencies in phosphorus. Some of the fields had Class A biosolids applied in 2015, 2016 and 2017, and some had a history of some poultry manure application.

Soil Metals

The trace element concentrations of the soil in the various fields are summarized in Figure 8. The complete laboratory soil analysis data can be found in Appendix C.

All of the trace element concentrations are below the limits for agricultural soil as documented in the OMRR (OMRR Schedules 9 and 10, limits used for livestock ingesting soil and fodder are used where applicable).

It is important to note that the trace element concentrations have changed only slightly since the previous soil sampling in October 2014, despite application of biosolids in 2015 and 2016. Some of the concentrations have increased slightly, whereas most have decreased slightly, some of which can be attributed to sample variability.

It will be important to track the soil chromium concentrations. All of the soil analyses of the various land application sites in 2018 showed significantly increased chromium concentrations, despite either no, or very little application of biosolids. In addition, as will be demonstrated later in the land application plan, there is very little chromium added with the biosolids application. The elevated chromium concentrations appear to be characteristic of the Fraser River sediments, and are significantly higher for the 2018 samples than soil samples taken in previous years.

Soil Trace Element Concentrations (mg/kg)				
	2014	2017	2018	change
Arsenic	6.08	5.61	6.37	0.75
Cadmium	0.56	0.56	0.45	-0.11
Chromium	49.3	55.4	86.33	30.93
Cobalt	15.69	14.96	16.89	1.93
Copper	36.25	38.78	42.67	3.89
Lead	17.25	12.15	10.64	-1.51
Mercury	0.061	0.049	0.06	0.01
Molybdenum	1.00	0.55	0.75	0.20
Nickel	48.48	46.30	47.33	1.03
Selenium	0.56	0.50	1.23	0.73
Zinc	118.88	106.64	117.22	10.58

Figure 8. Soil trace element concentrations in the 0-15 cm depth in the soil on the farm in 2014, 2017 and 2018.

Biosolids Source and Characteristics

The Class A biosolids are produced at the JAMES Treatment Plant, a wastewater treatment plant that processes wastewater from the communities of Abbotsford and Mission.

JAMES Wastewater Treatment Plant, 5959 Gladwin Rd, Abbotsford B.C. V4X 1V9

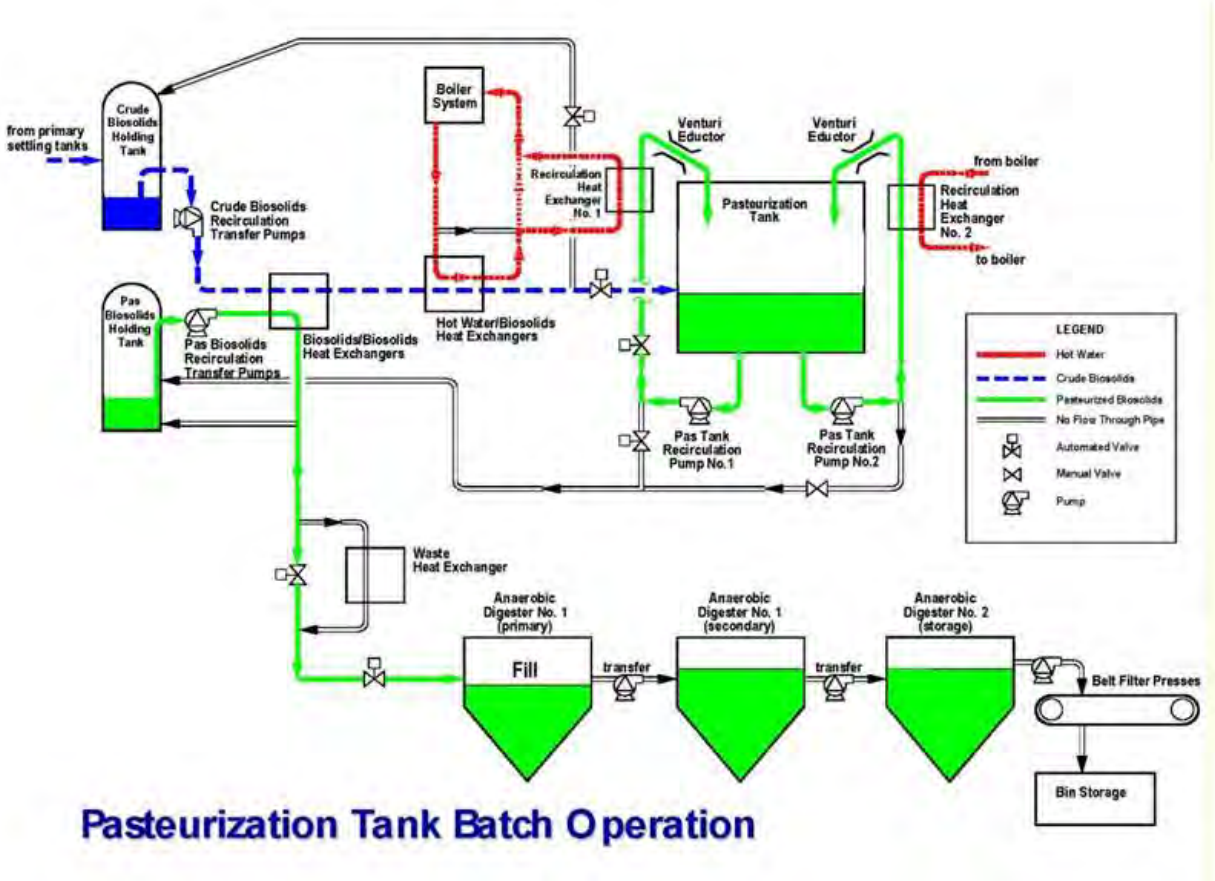


Figure 9. Biosolids processing flowsheet at the James Wastewater Treatment Plant
*(*http://www.abbotsford.ca/Assets/2014+Abbotsford/Engineering/Wastewater/Biosolids+Flow+Chart.pdf)

Pathogen Reduction Processes and Limits

The pathogen reduction process conforms with Schedule 1, Section 2 (f) of the Organic Matter Recycling Regulation, where it states:

"2. One of the following pathogen reduction methods is required for Class A biosolids or biosolids to produce biosolids growing medium: (f) the heat treatment of the biosolids must be 50 C or higher, and the time period must be 30 minutes or longer"

The process used at the JAMES Wastewater Treatment Plant is as follows (Appendix D). *"The pasteurization reactor operates at a temperature of 65 C and is batch-fed to maintain a*

retention time of at least one hour between sludge transfers. The volume of the tank provides approximately 18-24 hours retention time for pasteurization and conditioning of the sludge in advance of the anaerobic digestion process."

Analyses of fecal coliforms are conducted by the City of Abbotsford on the biosolids before it is released from the wastewater plant (Appendix E). Biocentral as well as the professional agrologist reserves the right to conduct any of its own testing of the biosolids to ensure that meets Class A requirements.

The average moisture content of the biosolids measured at time of discharge was 75.8% in 2017 (Figure 10, Appendix G) and 76.9% in the batch that was shipped to this property (Appendix E). The moisture content at time of field application may change somewhat, either from the biosolids taking on more moisture, or from biosolids drying during storage.

Vector Attraction Reduction Processes and Limits

The vector attraction reduction process conforms with Schedule 2, Section 1 (a) of the Organic Matter Recycling Regulation, where it states:

"1. One of the following vector attraction reduction processes is required for Class A biosolids or Class B biosolids used to produce biosolids growing medium: (a) a digestion process (aerobic or anaerobic) resulting in the mass of volatile solids being reduced by more than 38 percent"

The process used at the JAMES Wastewater Treatment Plant is as follows (Appendix D). *"The anaerobic mesophilic digestion system at the JAMES Plant includes three digesters, with a total volume of 11,460 m3. Pasteurized and conditioned sludge from the pasteurized sludge holding tank is pump to the largest anaerobic digester and then is passed to the remaining two digesters in series."*

The volatile solids reduction results from the JAMES plant averaged 64% in 2017 (Appendix F).

Trace Elements and Nutrients

The general characteristics of the biosolids are noted in Figure 10. The biosolids are an excellent source of organic matter, as well as nitrogen and phosphorus, whereas the potassium concentration is low. Trace element concentrations meet OMRR Class A limits (Figure 11).

Characteristics of the Class A Biosolids		
Characteristic	**Unit**	**Value**
Moisture Content	%	75.8
Organic Matter	%	79.1
pH		6.4
EC	dS/m	3.56
C/N Ratio		5.4
Nitrogen (total)	%	7.69
Ammonium	mg/kg	7586
Phosphorus	%	1.11
Potassium	%	0.08
Sulphur	%	0.72

Figure 10. Characteristics of the Class A biosolids (2017 data)

Schedule 4 of the Organic Matter Recycling Regulation (OMRR) provides the guidance for the trace elements in the biosolids. Figure 11 shows the trace elements in the biosolids (including both the maximum and average concentrations monthly in 2017 analysis (Appendix G), compared with the standards (OMRR, and Trade Memorandum T-4-93). For the land application calculations, we have used the average concentration for 2017.

Trace Element Concentrations in the Class A Biosolids				
Element	Biosolids		Class A (OMRR)	Canada
	Max 2017	Avg 2017		T-4-93
	(mg/kg)		(mg/kg)	(mg/kg)
Arsenic	3.5	2.8	75	75
Cadmium	1.76	1.41	20	20
Chromium	60.1	30.2	1060	*not included*
Cobalt	3.27	2.3	150	150
Copper	655	528	2200	*not included*
Lead	22.9	19.5	500	500
Mercury	3.22	1.95	5	5
Molybdenum	7.82	6.2	20	20
Nickel	41.8	24.6	180	180
Selenium	5.31	4.46	14	14
Zinc	1050	828	1850	1850

Figure 11. Trace element concentrations in the Class A biosolids from the JAMES Wastewater Treatment Plant (maximums and averages for 2017. The limits for Class A biosolids (OMRR requirement) and the Canadian standards are also shown.

Figure 10 shows additional characteristics of the biosolids that are used for the land application plan, including and especially the nitrogen, phosphorus and potassium concentrations, which are important when considering the fertilizer value of the biosolids.

Foreign Matter

The Class A biosolids are free of foreign matter. Foreign matter is screened when the wastewater enters the treatment plant. According to Schedule 4 of the OMRR, Class A biosolids may not contain foreign matter greater than 1% dry weight and no sharp foreign matter, such as glass or metal shards, in a size and shape that may cause injury.

Biosolids Storage

The biosolids will be stored in compliance with OMRR Part 4, Division 1, Part 17 - 19, where it states:

"17. (1). If managed organic matter, which is to be applied to land under a land application plan, is stored on a farm or at some other site, it must be stored

a. in a storage facility in accordance with the requirements of section 18, or

b. at a storage site in accordance with the requirements of section 19.

(2) Managed organic matter must only be stored on a farm if all of the managed organic matter is used on that farm.

18. A storage facility must

a. be of sufficient capacity to store all the managed organic matter to be used on the land application site for the period of time needed for its application as a fertilizer or soil conditioner,

b. be located at least 15 m from any watercourse and at 30 m from any source of water for domestic purposes, and

c. maintained in such a manner to prevent escape of the managed organic matter.

19. (1). Managed organic matter may only be stored at a storage site as follows:

a. for not more than 2 weeks if it is (i) used within 2 weeks, and (ii) stored in a manner that prevents the escape of managed organic matter:

b. for more than 2 weeks if it is (i) stored for no longer than 9 months, (ii) located at least 30 meters from any watercourse or any source of water used for domestic purposes, and (iii) stored in a manner that prevents the escape of managed organic matter.

2. Berms or other works must be constructed around the storage site if necessary to prevent the escape of managed organic matter. "

The Class A biosolids will be stored in a manner that prevents the escape of the managed organic matter.

The transport of the biosolids will be managed in such a way as to prevent any biosolids being deposited on any public roadways. Although odour is not expected to be a concern, the biosolids will covered with a layer of wood chips or compost if required.

Biosolids Application

Season of Application

The biosolids will be applied primarily during the spring of 2018 to allow optimal uptake of plant available nutrients during the growing season. The total amount of biosolids to be applied during 2018 will be a maximum of 12 dry tonnes per hectare (55 tonnes wet weight).

Class A biosolids can be applied to established grassland up to September 30, Biosolids application rates cannot exceed 4 dry tonnes per hectare if applied after July 30 and before September 30.

There will be no biosolids application outside of the dykes within two months of the expected freshet.

Buffers

The Class A biosolids will be land applied to optimize their value as a fertilizer and a soil conditioner. A buffer of 2 m is recommended to the edge of the field, where the edge of the field is close to a waterway. Most of the waterways on this property are vegetated and already have a natural buffer between the waterway and the field.

Crop Nutrient Uptake

The crops grown on this farm will include forage corn and forage grass grown for cattle feed in 2018. The Class A biosolids will be land applied to optimize their value as a fertilizer and a soil conditioner. Based on the soil analyses, some of the variability suggests that some of the fields at this farm have a history of manure or other organic matter application, which includes biosolids.

To be conservative, the land application plan will be based on nitrogen for the forage corn, as the nitrogen requirements are slightly lower for corn than for grass. Phosphorus and potassium application will also be addressed.

Nitrogen Requirements

Table 12 of the "Land Application Guidelines for the Organic Matter Recycling Regulation and the Soil Amendment Code of Practice" (Ministry of the Environment 2008), provides the guidance for nitrogen requirements for forages on soils of varying fertility in various areas of the province.

Based on an average yield of 20 tonnes of dry matter per hectare of corn on a high (normal) fertility site, the nitrogen requirement is 260 kg ha^{-1} per year.

Nitrogen Based Application Rate						
Yield Expectation and Nitrogen Uptake	Total		Available	Available N		
20 tonnes dry matter/ha yield of corn[a]	260	kg N/ha				
Nitrogen Availability in Biosolids						
Ammonium in biosolids	7.6	kg/tonne	60%	4.56		
Total N in biosolids	76.9	kg/tonne				
Organic N in Biosolids	69.3	kg/tonne	30%	20.79		
				25.35	kg/tonne available	
Amount of dry biosolids	10.3	dry tonnes per hectare				
	46.6	tonnes per hectare wet application				
[a] from Table 12 of the Land Application Guide (Ministry of Environment 2008)						
from page 174 of Land Application Guide (Ministry of Environment 2008)						

Figure 12. Estimated contribution of nitrogen with the biosolids application.

The total nitrogen content of the biosolids averages 7.69 % or 76.9 kg per dry tonne (2017 JAMES Plant Biosolids Quality Data). The amount of nitrogen available in the year of application ranges from 20 to 40%. Using an average availability of 30%, each dry tonne of biosolids provides almost 25 kg of nitrogen per hectare. An application rate of 12 tonnes of dry biosolids per hectare then provides an estimated 300 kg N per hectare, which is approximately the nitrogen requirement of the crop. Our experience is that with biosolids, the nitrogen availability is less than 30%.

The biosolids will also be applied to this farm in subsequent years. The land application plan will be adjusted to allow for residual nitrogen availability from previous biosolids applications during the fall.

Phosphorus Requirements

Guidelines for the application of phosphorous are provided in Sections 10.4.1.2 and Section 13.4.3 of the "Land Application Guidelines for the Organic Matter Recycling Regulation and the Soil Amendment Code of Practice".

The phosphorus content of the Class A biosolids averages 1.11% P (Figure 8), or 2.54% P_2O_5. The application of 12 tonnes of Class A biosolids will provide approximately 305 kg P_2O_5 per hectare.

The soil analyses indicated that the phosphorus content of this farm was variable, with some areas being deficient, and other areas optimal. The soil phosphorus concentrations will continue to be monitored with subsequent biosolids applications.

Potassium

The total potassium in the biosolids were measured to be 0.08% (Figure 8), or 9.6 kg/ha. The plant available fraction of the potassium in biosolids is assumed to be 100% (Washington State Department of Ecology 2007)

Biosolids Application Rate

The application rate for the Class A biosolids is 55 wet tonnes per hectare, or 12 tonnes of dry matter per hectare based on an average moisture content of 78%. This application rate will provide an estimated 1000 kg of total N per hectare. An estimated 30% of the total nitrogen is estimated to become available to the crop in the first year. Subsequent application rates of biosolids will be adjusted as required according to the amount of soluble N remaining in the soil in the fall.

Trace Metal Applications

The application rate of 55 tonnes (12 tonnes of dry matter) per hectare of Class A biosolids will provide the following amounts of trace elements as per Figure 13.

As mentioned in a previous section, it will be important to track the soil chromium concentrations. All of the soil analyses of the various land application sites in 2018 showed significantly increased chromium concentrations, despite either no, or very little

		Addition	**Post**	Limits
	Metals in Soil	**from Biosolids**	**Application**	OMRR[b]
	(mg/kg)[a]	(mg/kg)	(mg/kg)	(mg/kg)
Arsenic	6.37	0.017	6.38	15
Cadmium	0.45	0.009	0.46	9
Chromium	86.33	0.186	86.52	60
Cobalt	16.89	0.014	16.90	40
Copper	42.67	3.25	45.92	150
Lead	10.64	0.120	10.76	350
Mercury	0.06	0.012	0.07	0.6
Molybdenum	0.75	0.038	0.79	5
Nickel	47.33	0.151	47.48	100
Selenium	1.23	0.027	1.25	2
Zinc	117.2	5.10	122.3	200
[a] average of 9 samples				
[b] OMRR Schedules 9 and 10 using most conservative limits				
[c] plant uptake not included in calculation				

Figure 13. Effect of a 12 tonne DM application of Class A biosolids on trace elements in the soil.

application of biosolids (i.e Figure 8). In addition, there is very little chromium added with the biosolids application. The elevated chromium concentrations appear to be characteristic of the Fraser River sediments, and are significantly higher for the 2018 samples than soil samples taken in previous years.

Other Inputs to the Farm

There are no other inputs of organic matter to the land on this farm. Additional fertilizer nitrogen may be required depending on the availability of the nitrogen in the biosolids. Additional potassium may be required as well.

The post application soil sampling of the fields will determine the amount of soluble nitrogen remaining in the soil before the fall rains. Future land application plans for this property will also be adjusted for post harvest soil nutrient contents.

Post Application Monitoring of the Site

Crop yields will be estimated during the growing season to verify the amount of forage harvested from the property. Post application soil samples will be taken in the fall to estimate accumulation of trace elements as well as residual nitrate in the soil. This soil information will be used to determine additional Class A biosolids applications in subsequent years.

The post application report will also provide information on actual application rates, including moisture contents of the biosolids at the time of application.

Minimizing Potential for Adverse Environmental Impacts

There are two potential adverse environmental impacts from the land application:

1. Risk of the biosolids not meeting Class A requirements

   Each batch of biosolids produced at the JAMES Treatment Plant is tested for fecal coliform before release for land application, as per OMRR requirements. This means that the biosolids are stored for 1-4 months at the JAMES Treatment Plant in order for the biosolids to meet Class A requirements for fecal coliform. For this land application plan, the biosolids met Class A requirements in November before they were delivered to the site, and have been stored for five months.

2. Risk of over application of biosolids

   The risk of over application of Class A biosolids has limited potential negative environmental effect. In the Land Application Plans, the biosolids are applied on the

basis of optimizing the nitrogen value of the biosolids. Although it is possible that a higher rate of biosolids application may increase the potential for nitrogen leaching, the nitrogen in biosolids has limited availability. This must also be understood in the context of Class A biosolids growing medium, which can be applied without volume restrictions and is not applied on the basis of agronomic utilization of the nitrogen or phosphorous contained in the biosolids.

In summary, the potential adverse effects of land application of Class A biosolids are minimal, and are controlled by appropriate testing, storage and application.

Sampling and Analysis

Schedule 5 of OMRR requires that the Class A biosolids be analyzed at least every 1000 tonnes of dry weight of organic matter, or once per year. Schedule 5 also states that "All analysis must be in accordance with the procedures described in "British Columbia Laboratory Methods Manual: 2003 – for the Analysis of Water, Wastewater, Sediment, Biological Material and Discrete Ambient Air Samples""

The City of Abbotsford follows the requirements of Schedule 5 of OMRR: The following represents their sampling schedule:

JAMES Biosolids Testing Schedule (Biosolids prior to centrifugation)

Weekly Testing:

- *Total Metals (including total Mercury)*
- *Fecal Coliform (reported as MPN/g dry weight)*
- *Salmonella*

Monthly Testing:

- *Total Metals (including total Mercury)*
- *Total Phosphorus (%)*
- *Total Kjeldahl Nitrogen (%)*
- *Total Potassium (%)*
- *Total Sulphur (%)*
- *Total Carbon (%)*
- *Total Organic Matter (%)*
- *Moisture (%)*
- *Ammonia (available - %)*
- *Nitrate (available – mg/kg)*
- *pH*
- *Conductivity*

- *C/N Ratio*

JAMES Biosolids Testing Schedule (Biosolids after centrifugation - Stored)

Monthly Testing:

- *Fecal Coliform (reported as MPN/g dry weight)*

Additional testing (Fecal Coliform only) will be done on the biosolids after storage and before it is released to ensure that it meets Class A.

Biocentral will be taking random sampling to ensure that the biosolids meet Class A standards.

Record Keeping

The City of Abbotsford records temperatures and retention times for the production of Class A biosolids, as per Schedule 6 (1) of the OMRR. All records for the production of the Class A biosolids will be stored at the JAMES Wastewater Treatment Plant for a minimum of 36 months, as per Schedule 6 (2) and (3).

The Land Application Plan, and all associated information will be kept at the Land Application Site, and will also be stored at the offices of the Qualified Professional, as well as at Biocentral's offices.

Role of the Qualified Professional

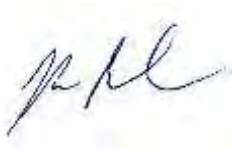
The qualified professional will oversee the storage and land application of the biosolids, including site inspections of the actual land application. He may also request plant yield data, as well as direct post harvest soil sampling to determine the post sampling soil concentrations of nutrients and trace elements. The qualified professional reserves the right to request verification of the Class A status of the biosolids at any time.

Summary

This Land Application Plan provides a beneficial reuse of Class A biosolids, which are a valuable source of nitrogen, phosphorus, micronutrients and organic matter. The risk of environmental concern at this location is very low because of the quality of the Class A biosolids being applied and the proximity to water bodies and water sources.

Storage and transportation of the Class A biosolids is also not considered a concern because of the low fecal coliform count and the lack of significant odour in the biosolids.

This Land Application Plan was prepared by:



John Paul, PhD PAg

References

British Columbia Ministry of the Environment. 2008. Land Application Guidelines for the Organic Matter Recycling Regulation and the Soil Amendment Code of Practice, Best Management Practices. Document # 758-08, Sylvis Environmental.

Kelly, C.C and R.H. Spilsbury. 1939. Soil Survey of the Lower Fraser Valley. British Columbia Department of Agriculture. Publication 650, Technical Bulletin 20.

Oregon State University. 2007. Fertilizing with Biosolids. PNW 508-E, Revised June 2007 http://www.ecy.wa.gov/programs/swfa/biosolids/pdf/Fertilizing.pdf

BRITISH COLUMBIA | Ministry of Environment

Notification of Land Application Form

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

Organic Matter Recycling Regulation

FORM REFERENCE CODE: EPD-OMR-04.1

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 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 of Environment 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 Branch PO Box 9377 Stn Prov Govt Victoria, BC V8W 9M1 **Email:** PermitAdministration.VictoriaEPD@gov.bc.ca	Ministry of Environment Environmental Protection Division Business Services Branch 3rd Floor, 2975 Jutland Road Victoria, BC V8T 5J9

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*	Rancho el Rio del Sol Farms Ltd.			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)*	689999			5
***Contact Numbers** *e.g. (999) 999-9999*	Phone	Mobile 604-835-3682		6
***Email Address** *generic company email address*	wentworthbuilder@gmail.com			7
***Legal Address** *as registered with BC Registrar of Companies*	Unit # / Street 1401 Kennedy Rd			8
	City Harrison Mills	Province BC	Postal Code V0M 1A0	9

***Mailing Address** *if different from above*	☐ Same as Legal Address			10
	Unit # / Street Box 34, Harrison Mills, BC V0M 1L0			11
	City Harrison Mills	Province BC	Postal Code V0M 1L0	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*				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	Moreno			1
Contact's First Name	Andres			2
Contact's Title	Division Manager			3
Mailing Address	☐ Mailing ddress is the same as Section 2 above			4
	Unit # / Street 7357 Pioneer Ave			5
	City Agassiz	Province BC	Postal Code V0M 1A0	6
Contact Numbers *e.g. (999) 999-9999*	Phone 604-997-0515	Mobile 604-997-1630		7
Email Address	andresm@biocentral.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*	Transform Compost Systems Ltd			1
Doing Business As *if different than above*				2
Agent's Last Name	Paul			3
Agent's First Name	John			4
Agent's Title	PhD. PAg			5
Mailing Address	Unit # / Street 3911 Mt Lehman Rd			6
	City Abbotsford	Province BC	Postal Code V2T 5W5	7
Contact Numbers *e.g. (999) 999-9999*	Phone 604-856-2722	Mobile 604-302-4367		8
Email Address	transform@telus.net			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*	Wentworth Bjarnason	10
Date signed	Dec 19 / 2017	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**	Fraser Valley Regional District		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 49.2421	Longitude (e.g., 116.8177) W 121.9339	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)	PID 013-185-616, 003-577-651, 013-177-761, 001-129-902, 001-129-783, 013-186-078, 013-185-756, 013-185-471, 003-577-660		4
PID/PIN/Crown File No.	see above		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)* 1401 Kennedy Rd, Harrison Mills, BC V0M 1A0		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	Wentworth Bjarnason	5

Legal Land Owner Contact Numbers *e.g. (999) 999-9999*	Phone:	Mobile: 604-835-3682	6
Legal Land Owner Email Address	wentworthbuilder@gmail.com		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**	Tracking # 360445	12
***Description of the managed organic matter to be applied**	Class A biosolids	13

***Intended date(s) for land application for that year**	2018-04-15 through 2018-09-30 (yyyy-mm-dd)		14
***Application rates**	12 dt/hectare		15
	dt/hectare		16
	dt/hectare		17
***Cumulative additions for that year of substances listed in Schedule 4 of the Organic Matter Recycling Regulation**	**Substance**	**Concentration (µg/g dry weight)**	18
	Arsenic	0.02	
	Cadmium	0.009	
	Chromium	0.173	
	Cobalt	0.013	
	Copper	3.37	
	Lead	0.125	
	Mercury	0.011	
	Molybdenum	0.051	
	Nickel	0.102	
	Selenium	0.027	
	Zinc	5.32	
***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 Ministry of Environment 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
John Paul	JPC	Dec 27, 2017


Rancho el Rio del Sol Farms Ltd
Field 1
Field 2
Field 3a
Field 3b
Field 4a
Field 4b
Field 5a
Field 5b
Field 6
Image © 2014 IMTCAN
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1401 Kennedy Rd
Soil sampling March 2018
Legend
Sample point
S1
S2
S3
S4
S5
S6
S7
S8
S9
School-Rd
Harrison Mills
Cartier-Rd
Dyke-Rd
7
Lougheed-Hwy
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#104, 19575-55 A Ave.
Surrey, British Columbia
V3S 8P8, Canada

T: +1 (604) 514-3322
F: +1 (604) 514-3323
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Report Transmission Cover Page

Bill To:	Timbro Contracting (A	Project ID:	James	Lot ID:	**1260233**
	P.O. Box 95	Project Name:	1401 Kennedy Rd	Control Number:	C117482
	7357 Pioneer Avenue	Project Location:	Harrison Mills	Date Received:	Mar 17, 2018
	Agassiz, BC, Canada	LSD:		Date Reported:	Mar 28, 2018
	V0M 1A0	P.O.:	14132	Report Number:	2274115
Attn:	Accounts Payable	Proj. Acct. code:			
Sampled By:	Andres M.				
Company:	Biocentral				

Contact	Company	Address
Accounts Payable	**Timbro Contracting (A Partnership)**	P.O. Box 95, 7357 Pioneer Avenue Agassiz, BC V0M 1A0 Phone: (604) 796-3851 Fax: (604) 796-0554 Email: info@timbroconstruction.com

Delivery	Format	Deliverables
Email - Single Report	PDF	Invoice

Contact	Company	Address
Andres Moreno	**Timbro Contracting (A Partnership)**	P.O. Box 95, 7357 Pioneer Avenue Agassiz, BC V0M 1A0 Phone: (604) 796-3851 Fax: (604) 796-0554 Email: andresm@biocentral.ca

Delivery	Format	Deliverables
Email - Merge Reports	PDF	COC / Test Report
Email - Single Report	Standard Crosstab	Test Report

Contact	Company	Address
Frank Trevr	**Timbro Contracting (A Partnership)**	P.O. Box 95, 7357 Pioneer Avenue Agassiz, BC V0M 1A0 Phone: (604) 991-3782 Fax: Email: frank@timbroconstruction.com

Delivery	Format	Deliverables
Email - Merge Reports	PDF	COC / Test Report
Email - Single Report	Standard Crosstab	Test Report

Notes To Clients:

- Mar 28, 2018 - Report was issued to correct for missing metal analysis on samples 1260233-1 to 9. Previous report 2271690.

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#104, 19575-55 A Ave.
Surrey, British Columbia
V3S 8P8, Canada

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Analytical Report

Bill To:	Timbro Contracting (A	Project ID:	James	Lot ID:	**1260233**
	P.O. Box 95	Project Name:	1401 Kennedy Rd	Control Number:	C117482
	7357 Pioneer Avenue	Project Location:	Harrison Mills	Date Received:	Mar 17, 2018
	Agassiz, BC, Canada	LSD:		Date Reported:	Mar 28, 2018
	V0M 1A0	P.O.:	14132	Report Number:	2274115
Attn:	Accounts Payable	Proj. Acct. code:			
Sampled By:	Andres M.				
Company:	Biocentral				

Reference Number	1260233-19722	1260233-19723	1260233-19724
Sample Date	Mar 16, 2018	Mar 16, 2018	Mar 16, 2018
Sample Time	NA	NA	NA
Sample Location			
Sample Description	James - 1401 Kennedy Rd / S1 / 0 / 5 / E / 1	James - 1401 Kennedy Rd / S2 / 0 / 5 / E / 1	James - 1401 Kennedy Rd / S3 / 0 / 5 / E / 1
Matrix	Farm Soil	Farm Soil	Farm Soil

Analyte		Units	Results	Results	Results	Nominal Detection Limit
Aggregate Organic Constituents						
Organic Matter	LOI	% by weight	3.3	3.0	3.4	0.1
Available Nutrients						
Nitrate - N	Farmsoil	ppm	3	3	2	2
Phosphorus	Farmsoil	ppm	34	48	>80	5
Potassium	Farmsoil	ppm	36	28	28	25
Sulfate-S	Farmsoil	ppm	1	<1	1	1
Copper	FS Micro-nutrients	ppm	4.6	3.3	5.9	0.1
Iron	FS Micro-nutrients	ppm	204	113	156	2
Manganese	FS Micro-nutrients	ppm	5.6	3.5	3.8	0.1
Zinc	FS Micro-nutrients	ppm	4.0	2.1	3.5	0.5
Base saturation	FS Base Saturation	%	49.6	55.5	51.3	
Calcium	FS Base Saturation	%	42.8	48.9	42.3	
Magnesium	FS Base Saturation	%	6.2	6.1	8.5	
Sodium	FS Base Saturation	%	<1.0	<1.0	<0.9	
Potassium	FS Base Saturation	%	0.7	0.5	0.5	
TEC	FS Base Saturation	meq/100 g	12.9	13.0	14.2	
Calcium	FS Macro-nutrients	ppm	1110	1280	1200	30
Magnesium	FS Macro-nutrients	ppm	97	97	146	5
Sodium	FS Macro-nutrients	ppm	<30	<30	<30	30
Boron	FS Micro-nutrients	ppm	0.3	0.3	0.3	0.1
Classification						
Nitrogen	Total	%	0.19	0.19	0.24	0.02
Hot Water Soluble						
Boron	FS Micro-nutrients	ppm	0.3	0.3	0.3	0.1
Metals Strong Acid Digestion						
Antimony	Strong Acid Extractable	µg/g	3	2	3	1.5
Arsenic	Strong Acid Extractable	µg/g	6.4	6.8	6.6	0.35
Barium	Strong Acid Extractable	µg/g	140	140	140	0.2
Beryllium	Strong Acid Extractable	µg/g	0.43	0.44	0.41	0.01
Cadmium	Strong Acid Extractable	µg/g	0.5	0.3	0.5	0.05
Chromium	Strong Acid Extractable	µg/g	79	75	77	0.1
Cobalt	Strong Acid Extractable	µg/g	16	16	16	0.1
Copper	Strong Acid Extractable	µg/g	36	38	44	0.1
Lead	Strong Acid Extractable	µg/g	9.5	7.9	7.1	0.5
Mercury	Strong Acid Extractable	µg/g	0.053	0.047	0.042	0.003
Molybdenum	Strong Acid Extractable	µg/g	0.52	0.52	0.63	0.1

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W: www.exova.com

Analytical Report

Bill To:	Timbro Contracting (A	Project ID:	James	Lot ID:	**1260233**
	P.O. Box 95	Project Name:	1401 Kennedy Rd	Control Number:	C117482
	7357 Pioneer Avenue	Project Location:	Harrison Mills	Date Received:	Mar 17, 2018
	Agassiz, BC, Canada	LSD:		Date Reported:	Mar 28, 2018
	V0M 1A0	P.O.:	14132	Report Number:	2274115
Attn:	Accounts Payable	Proj. Acct. code:			
Sampled By:	Andres M.				
Company:	Biocentral				

		Reference Number	1260233-19722	1260233-19723	1260233-19724
		Sample Date	Mar 16, 2018	Mar 16, 2018	Mar 16, 2018
		Sample Time	NA	NA	NA
		Sample Location			
		Sample Description	James - 1401 Kennedy Rd / S1 / 0 / 5 / E / 1	James - 1401 Kennedy Rd / S2 / 0 / 5 / E / 1	James - 1401 Kennedy Rd / S3 / 0 / 5 / E / 1
		Matrix	Farm Soil	Farm Soil	Farm Soil
Analyte		**Units**	**Results**	**Results**	**Results**	Nominal Detection Limit
Metals Strong Acid Digestion - Continued						
Nickel	Strong Acid Extractable	µg/g	41	43	47	0.25
Phosphorus	Strong Acid Extractable	µg/g	1000	900	1300	0.5
Potassium	Strong Acid Extractable	µg/g	930	820	790	2
Selenium	Strong Acid Extractable	µg/g	<0.5	0.9	<0.5	0.5
Silver	Strong Acid Extractable	µg/g	<0.4	<0.4	<0.4	0.4
Strontium	Strong Acid Extractable	µg/g	37	38	37	0.05
Thallium	Strong Acid Extractable	µg/g	<0.5	<0.5	<0.5	0.5
Tin	Strong Acid Extractable	µg/g	<0.5	<0.5	<0.5	0.5
Vanadium	Strong Acid Extractable	µg/g	77	78	74	0.2
Zinc	Strong Acid Extractable	µg/g	97	88	100	0.05
Soil Acidity						
pH	1:2 Soil:Water	pH	5.5	5.9	5.6	
Electrical Conductivity	Sat. Paste equiv based on 1:2	dS/m at 25 °C	0.1	0.08	0.09	0.02
Water Soluble Parameters						
Chloride	Available	mg/kg	4	4	5.2	0.5
Lime Requirement						
pH	SMP	pH	6.4	6.4	6.3	
Lime		T/ac	2	2	2	

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Analytical Report

Bill To:	Timbro Contracting (A	Project ID:	James	Lot ID:	**1260233**
	P.O. Box 95	Project Name:	1401 Kennedy Rd	Control Number:	C117482
	7357 Pioneer Avenue	Project Location:	Harrison Mills	Date Received:	Mar 17, 2018
	Agassiz, BC, Canada	LSD:		Date Reported:	Mar 28, 2018
	V0M 1A0	P.O.:	14132	Report Number:	2274115
Attn:	Accounts Payable	Proj. Acct. code:			
Sampled By:	Andres M.				
Company:	Biocentral				

Reference Number	1260233-19725	1260233-19726	1260233-19727
Sample Date	Mar 16, 2018	Mar 16, 2018	Mar 16, 2018
Sample Time	NA	NA	NA
Sample Location			
Sample Description	James - 1401 Kennedy Rd / S4 / 0 / 5 / E / 1	James - 1401 Kennedy Rd / S5 / 0 / 5 / E / 1	James - 1401 Kennedy Rd / S6 / 0 / 5 / E / 1
Matrix	Farm Soil	Farm Soil	Farm Soil

Analyte		Units	Results	Results	Results	Nominal Detection Limit
Aggregate Organic Constituents						
Organic Matter	LOI	% by weight	2.9	5.5	9.2	0.1
Available Nutrients						
Nitrate - N	Farmsoil	ppm	3	6	10	2
Phosphorus	Farmsoil	ppm	28	>80	40	5
Potassium	Farmsoil	ppm	27	49	115	25
Sulfate-S	Farmsoil	ppm	<1	2	3	1
Copper	FS Micro-nutrients	ppm	3.7	9.5	5.6	0.1
Iron	FS Micro-nutrients	ppm	144	255	308	2
Manganese	FS Micro-nutrients	ppm	2.8	21.3	11.8	0.1
Zinc	FS Micro-nutrients	ppm	2	16	3.7	0.5
Base saturation	FS Base Saturation	%	55.1	54.0	52.4	
Calcium	FS Base Saturation	%	49.0	47.8	37.8	
Magnesium	FS Base Saturation	%	5.5	5.2	12.6	
Sodium	FS Base Saturation	%	<1.0	<0.9	<0.9	
Potassium	FS Base Saturation	%	0.6	0.9	2.0	
TEC	FS Base Saturation	meq/100 g	12.7	14.3	14.5	
Calcium	FS Macro-nutrients	ppm	1250	1370	1100	30
Magnesium	FS Macro-nutrients	ppm	84	91	223	5
Sodium	FS Macro-nutrients	ppm	<30	<30	<30	30
Boron	FS Micro-nutrients	ppm	0.3	0.5	0.3	0.1
Classification						
Nitrogen	Total	%	0.21	0.36	0.38	0.02
Hot Water Soluble						
Boron	FS Micro-nutrients	ppm	0.3	0.5	0.3	0.1
Metals Strong Acid Digestion						
Antimony	Strong Acid Extractable	µg/g	4	3	3	1.5
Arsenic	Strong Acid Extractable	µg/g	7.5	6.6	4.5	0.35
Barium	Strong Acid Extractable	µg/g	150	160	200	0.2
Beryllium	Strong Acid Extractable	µg/g	0.51	0.48	0.62	0.01
Cadmium	Strong Acid Extractable	µg/g	0.57	0.52	0.4	0.05
Chromium	Strong Acid Extractable	µg/g	91	86	88	0.1
Cobalt	Strong Acid Extractable	µg/g	19	16	17	0.1
Copper	Strong Acid Extractable	µg/g	41	69	40	0.1
Lead	Strong Acid Extractable	µg/g	9.3	11	15	0.5
Mercury	Strong Acid Extractable	µg/g	0.055	0.10	0.070	0.003
Molybdenum	Strong Acid Extractable	µg/g	0.72	0.79	0.4	0.1

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Bill To:	Timbro Contracting (A	Project ID:	James	Lot ID:	**1260233**
	P.O. Box 95	Project Name:	1401 Kennedy Rd	Control Number:	C117482
	7357 Pioneer Avenue	Project Location:	Harrison Mills	Date Received:	Mar 17, 2018
	Agassiz, BC, Canada	LSD:		Date Reported:	Mar 28, 2018
	V0M 1A0	P.O.:	14132	Report Number:	2274115
Attn:	Accounts Payable	Proj. Acct. code:			
Sampled By:	Andres M.				
Company:	Biocentral				

		Reference Number	1260233-19725	1260233-19726	1260233-19727	
		Sample Date	Mar 16, 2018	Mar 16, 2018	Mar 16, 2018	
		Sample Time	NA	NA	NA	
		Sample Location				
		Sample Description	James - 1401 Kennedy Rd / S4 / 0 / 5 / E / 1	James - 1401 Kennedy Rd / S5 / 0 / 5 / E / 1	James - 1401 Kennedy Rd / S6 / 0 / 5 / E / 1	
		Matrix	Farm Soil	Farm Soil	Farm Soil	
Analyte		**Units**	**Results**	**Results**	**Results**	Nominal Detection Limit
Metals Strong Acid Digestion - Continued						
Nickel	Strong Acid Extractable	µg/g	50	45	50	0.25
Phosphorus	Strong Acid Extractable	µg/g	1100	1800	1100	0.5
Potassium	Strong Acid Extractable	µg/g	1100	1100	1400	2
Selenium	Strong Acid Extractable	µg/g	<0.5	<0.5	1	0.5
Silver	Strong Acid Extractable	µg/g	0.68	<0.4	<0.4	0.4
Strontium	Strong Acid Extractable	µg/g	39	40	44	0.05
Thallium	Strong Acid Extractable	µg/g	<0.5	<0.5	<0.5	0.5
Tin	Strong Acid Extractable	µg/g	0.5	1	0.7	0.5
Vanadium	Strong Acid Extractable	µg/g	87	81	93	0.2
Zinc	Strong Acid Extractable	µg/g	120	160	130	0.05
Soil Acidity						
pH	1:2 Soil:Water	pH	5.8	5.3	5.5	
Electrical Conductivity	Sat. Paste equiv based on 1:2	dS/m at 25 °C	0.08	0.1	0.21	0.02
Water Soluble Parameters						
Chloride	Available	mg/kg	4	4	5.2	0.5
Lime Requirement						
pH	SMP	pH	6.4	6.3	6.3	
Lime		T/ac	2	2	2	

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Analytical Report

Bill To:	Timbro Contracting (A	Project ID:	James	Lot ID:	**1260233**
	P.O. Box 95	Project Name:	1401 Kennedy Rd	Control Number:	C117482
	7357 Pioneer Avenue	Project Location:	Harrison Mills	Date Received:	Mar 17, 2018
	Agassiz, BC, Canada	LSD:		Date Reported:	Mar 28, 2018
	V0M 1A0	P.O.:	14132	Report Number:	2274115
Attn:	Accounts Payable	Proj. Acct. code:			
Sampled By:	Andres M.				
Company:	Biocentral				

Reference Number	1260233-19728	1260233-19729	1260233-19730
Sample Date	Mar 16, 2018	Mar 16, 2018	Mar 16, 2018
Sample Time	NA	NA	NA
Sample Location			
Sample Description	James - 1401 Kennedy Rd / S7 / 0 / 5 / E / 1	James - 1401 Kennedy Rd / S8 / 0 / 5 / E / 1	James - 1401 Kennedy Rd / S9 / 0 / 5 / E / 1
Matrix	Farm Soil	Farm Soil	Farm Soil

Analyte		Units	Results	Results	Results	Nominal Detection Limit
Aggregate Organic Constituents						
Organic Matter	LOI	% by weight	3.8	5.5	5.5	0.1
Available Nutrients						
Nitrate - N	Farmsoil	ppm	4	2	<2	2
Phosphorus	Farmsoil	ppm	5	9	19	5
Potassium	Farmsoil	ppm	100	43	57	25
Sulfate-S	Farmsoil	ppm	2	2	4	1
Copper	FS Micro-nutrients	ppm	3.0	2.7	3.0	0.1
Iron	FS Micro-nutrients	ppm	175	171	178	2
Manganese	FS Micro-nutrients	ppm	11.8	3.4	5.2	0.1
Zinc	FS Micro-nutrients	ppm	1	1	2.0	0.5
Base saturation	FS Base Saturation	%	91.8	48.0	57.3	
Calcium	FS Base Saturation	%	78.9	41.0	48.5	
Magnesium	FS Base Saturation	%	7.3	6.1	7.7	
Sodium	FS Base Saturation	%	4.6	<1.0	<0.9	
Potassium	FS Base Saturation	%	1.0	0.9	1.0	
TEC	FS Base Saturation	meq/100 g	26.9	12.7	13.8	
Calcium	FS Macro-nutrients	ppm	4250	1040	1340	30
Magnesium	FS Macro-nutrients	ppm	240	94	130	5
Sodium	FS Macro-nutrients	ppm	284	<30	<30	30
Boron	FS Micro-nutrients	ppm	0.4	0.2	0.2	0.1
Classification						
Nitrogen	Total	%	0.23	0.22	0.23	0.02
Hot Water Soluble						
Boron	FS Micro-nutrients	ppm	0.4	0.2	0.2	0.1
Metals Strong Acid Digestion						
Antimony	Strong Acid Extractable	µg/g	3	4	3	1.5
Arsenic	Strong Acid Extractable	µg/g	5.9	6.3	6.7	0.35
Barium	Strong Acid Extractable	µg/g	190	190	170	0.2
Beryllium	Strong Acid Extractable	µg/g	0.63	0.64	0.61	0.01
Cadmium	Strong Acid Extractable	µg/g	0.5	0.4	0.4	0.05
Chromium	Strong Acid Extractable	µg/g	94	93	94	0.1
Cobalt	Strong Acid Extractable	µg/g	17	17	18	0.1
Copper	Strong Acid Extractable	µg/g	39	38	39	0.1
Lead	Strong Acid Extractable	µg/g	14	12	10	0.5
Mercury	Strong Acid Extractable	µg/g	0.062	0.054	0.054	0.003
Molybdenum	Strong Acid Extractable	µg/g	0.56	1.3	1.3	0.1

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Analytical Report

Bill To:	Timbro Contracting (A	Project ID:	James	Lot ID:	**1260233**
	P.O. Box 95	Project Name:	1401 Kennedy Rd	Control Number:	C117482
	7357 Pioneer Avenue	Project Location:	Harrison Mills	Date Received:	Mar 17, 2018
	Agassiz, BC, Canada	LSD:		Date Reported:	Mar 28, 2018
	V0M 1A0	P.O.:	14132	Report Number:	2274115
Attn:	Accounts Payable	Proj. Acct. code:			
Sampled By:	Andres M.				
Company:	Biocentral				

Reference Number	1260233-19728	1260233-19729	1260233-19730
Sample Date	Mar 16, 2018	Mar 16, 2018	Mar 16, 2018
Sample Time	NA	NA	NA
Sample Location			
Sample Description	James - 1401 Kennedy Rd / S7 / 0 / 5 / E / 1	James - 1401 Kennedy Rd / S8 / 0 / 5 / E / 1	James - 1401 Kennedy Rd / S9 / 0 / 5 / E / 1
Matrix	Farm Soil	Farm Soil	Farm Soil

Analyte		Units	Results	Results	Results	Nominal Detection Limit
Metals Strong Acid Digestion - Continued						
Nickel	Strong Acid Extractable	µg/g	50	50	50	0.25
Phosphorus	Strong Acid Extractable	µg/g	840	760	790	0.5
Potassium	Strong Acid Extractable	µg/g	1300	1300	1400	2
Selenium	Strong Acid Extractable	µg/g	2	<0.5	1	0.5
Silver	Strong Acid Extractable	µg/g	<0.4	<0.4	<0.4	0.4
Strontium	Strong Acid Extractable	µg/g	44	38	41	0.05
Thallium	Strong Acid Extractable	µg/g	<0.5	<0.5	<0.5	0.5
Tin	Strong Acid Extractable	µg/g	<0.5	<0.5	0.9	0.5
Vanadium	Strong Acid Extractable	µg/g	97	97	97	0.2
Zinc	Strong Acid Extractable	µg/g	110	130	120	0.05
Soil Acidity						
pH	1:2 Soil:Water	pH	6.9	5.7	6.1	
Electrical Conductivity	Sat. Paste equiv based on 1:2	dS/m at 25 °C	1.4	0.1	0.1	0.02
Water Soluble Parameters						
Chloride	Available	mg/kg	4	4.8	4	0.5
Lime Requirement						
pH	SMP	pH	6.8	6.3	6.4	
Lime		T/ac	0	2	2	

Approved by:

Mathieu Simoneau
Operations Manager

Data have been validated by Analytical Quality Control and Exova's Integrated Data Validation System (IDVS).
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Exova
#104, 19575-55 A Ave.
Surrey, British Columbia
V3S 8P8, Canada

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Quality Control

Bill To:	Timbro Contracting (A	Project ID:	James	Lot ID:	**1260233**
	P.O. Box 95	Project Name:	1401 Kennedy Rd	Control Number:	C117482
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	V0M 1A0	P.O.:	14132	Report Number:	2274115
Attn:	Accounts Payable	Proj. Acct. code:			
Sampled By:	Andres M.				
Company:	Biocentral				

Aggregate Organic Constituents

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Organic Matter	% by weight	17.0	17.1	10	0.1	yes
Date Acquired:	March 21, 2018					

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Organic Matter	% by weight	4.9	4.2	5.7	yes
Date Acquired:	March 21, 2018				

Available Nutrients

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Nitrate - N	mg/L	0.085	-1	1	yes
Phosphorus	mg/L	0.056	-4	5	yes
Potassium	mg/L	-0.225	-3	10	yes
Sulfate-S	mg/L	0.449	-1	1	yes
Copper	mg/L	0.0132	-0.1	0.1	yes
Iron	mg/L	0.0868	-2.0	2.0	yes
Manganese	mg/L	0.0039	-0.1	0.1	yes
Zinc	mg/L	0.0104	-0.5	0.5	yes
Calcium	mg/L	0.7181	-1	3	yes
Magnesium	mg/L	0.1219	-0	0	yes
Sodium	mg/L	1.418	-1	3	yes
Boron	mg/L	0.0168297	-0.2	0.2	yes
Date Acquired:	March 21, 2018				

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Nitrate - N	ppm	5	4	10	2	yes
Phosphorus	ppm	57	56	10	5	yes
Potassium	ppm	95	87	10	10	yes
Sulfate-S	ppm	<1	<1	15	2	yes
Copper	ppm	4.6	4.5	10	0.1	yes
Iron	ppm	204	203	10	0.1	yes
Manganese	ppm	5.6	5.5	10	0.0	yes
Zinc	ppm	4.0	4.0	10	0.0	yes
Calcium	ppm	2300	2250	10	3	yes
Magnesium	ppm	32	31	10	3	yes
Sodium	ppm	<30	<30	10	18	yes
Boron	ppm	0.5	0.5	10	0.1	yes
Date Acquired:	March 21, 2018					

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Nitrate - N	ppm	36	29	40	yes
Phosphorus	ppm	30	27	34	yes
Potassium	ppm	201	168	224	yes
Sulfate-S	ppm	729	620	770	yes
Copper	ppm	1.8	1.5	1.9	yes
Iron	ppm	197	154.3	213.7	yes
Manganese	ppm	46.9	35.8	52.1	yes

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Quality Control

Bill To:	Timbro Contracting (A	Project ID:	James	Lot ID:	**1260233**
	P.O. Box 95	Project Name:	1401 Kennedy Rd	Control Number:	C117482
	7357 Pioneer Avenue	Project Location:	Harrison Mills	Date Received:	Mar 17, 2018
	Agassiz, BC, Canada	LSD:		Date Reported:	Mar 28, 2018
	V0M 1A0	P.O.:	14132	Report Number:	2274115
Attn:	Accounts Payable	Proj. Acct. code:			
Sampled By:	Andres M.				
Company:	Biocentral				

Available Nutrients - Continued

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Zinc	ppm	3.4	2.8	3.8	yes
Calcium	ppm	6310	5530	6752	yes
Magnesium	ppm	596	495	670	yes
Sodium	ppm	88	68	94	yes
Date Acquired:	March 21, 2018				
Nitrate - N	ppm	4	3	4	yes
Phosphorus	ppm	3	2	4	yes
Potassium	ppm	31	24	36	yes
Sulfate-S	ppm	1	1	1	yes
Copper	ppm	0.5	0.4	0.6	yes
Iron	ppm	5.2	4.5	5.5	yes
Manganese	ppm	1.0	0.9	1.1	yes
Zinc	ppm	0.5	0.4	0.6	yes
Calcium	ppm	11	9	11	yes
Magnesium	ppm	10	9	11	yes
Sodium	ppm	10	9	11	yes
Boron	ppm	0.1	0.1	0.1	yes
Date Acquired:	March 21, 2018				
Sulfate-S	ppm	53	40	60	yes
Date Acquired:	March 21, 2018				

Classification

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Nitrogen		0.01141	-0.020	0.020	yes
Date Acquired:	March 20, 2018				

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Nitrogen	%	0.81	0.76	0	2.500	yes
Date Acquired:	March 20, 2018					

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Nitrogen	%	0.52	0.465	0.551	yes
Date Acquired:	March 20, 2018				

Hot Water Soluble

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Boron	ppm	0.4	0.4	10	0.1	yes
Date Acquired:	March 21, 2018					

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Boron	ppm	1.2	0.8	1.5	yes
Date Acquired:	March 21, 2018				

Lime Requirement

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC

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Quality Control

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	P.O. Box 95	Project Name:	1401 Kennedy Rd	Control Number:	C117482
	7357 Pioneer Avenue	Project Location:	Harrison Mills	Date Received:	Mar 17, 2018
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	V0M 1A0	P.O.:	14132	Report Number:	2274115
Attn:	Accounts Payable	Proj. Acct. code:			
Sampled By:	Andres M.				
Company:	Biocentral				

Lime Requirement

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
pH	pH	7.3	7.2	7.3	yes
Date Acquired:	March 21, 2018				

Metals Strong Acid Digestion

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Antimony	mg/L	-0.000457259	-0.030	0.030	yes
Arsenic	mg/L	-0.00681021	-0.007	0.007	yes
Barium	mg/L	0.000364058	-0.004	0.004	yes
Beryllium	mg/L	8.8897e-006	-0.000	0.000	yes
Cadmium	mg/L	0.000506602	-0.001	0.001	yes
Chromium	mg/L	0.00121838	-0.002	0.002	yes
Cobalt	mg/L	0.00018497	-0.002	0.002	yes
Copper	mg/L	0.000561406	-0.002	0.002	yes
Lead	mg/L	0.00031064	-0.010	0.010	yes
Mercury	µg/L	-0.009	-0.030	0.030	yes
Molybdenum	mg/L	-0.00165603	-0.002	0.002	yes
Nickel	mg/L	0.00163925	-0.005	0.005	yes
Phosphorus	mg/L	0.00141149	-0.010	0.010	yes
Selenium	mg/L	0.00427062	-0.010	0.010	yes
Silver	mg/L	0.000747588	-0.008	0.008	yes
Strontium	mg/L	9.63792e-005	-0.000	0.000	yes
Thallium	mg/L	-0.00544639	-0.010	0.010	yes
Tin	mg/L	-0.00101922	-0.010	0.010	yes
Vanadium	mg/L	-0.000491746	-0.004	0.004	yes
Zinc	mg/L	0.000670545	-0.001	0.001	yes
Date Acquired:	March 21, 2018				

Calibration Check	Units	% Recovery	Lower Limit	Upper Limit	Passed QC
Antimony	mg/L	92.75	90	110	yes
Arsenic	mg/L	99.77	90	110	yes
Barium	mg/L	100.62	90	110	yes
Beryllium	mg/L	95.64	90	110	yes
Cadmium	mg/L	98.42	90	110	yes
Chromium	mg/L	99.43	90	110	yes
Cobalt	mg/L	97.78	90	110	yes
Copper	mg/L	100.17	90	110	yes
Lead	mg/L	95.05	90	110	yes
Molybdenum	mg/L	97.38	90	110	yes
Nickel	mg/L	95.39	90	110	yes
Phosphorus	mg/L	99.62	90	110	yes
Selenium	mg/L	99.53	90	110	yes
Silver	mg/L	96.35	90	110	yes
Thallium	mg/L	94.80	90	110	yes
Tin	mg/L	92.47	90	110	yes
Vanadium	mg/L	100.00	90	110	yes

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Quality Control

Bill To:	Timbro Contracting (A	Project ID:	James	Lot ID:	**1260233**
	P.O. Box 95	Project Name:	1401 Kennedy Rd	Control Number:	C117482
	7357 Pioneer Avenue	Project Location:	Harrison Mills	Date Received:	Mar 17, 2018
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	V0M 1A0	P.O.:	14132	Report Number:	2274115
Attn:	Accounts Payable	Proj. Acct. code:			
Sampled By:	Andres M.				
Company:	Biocentral				

Metals Strong Acid Digestion - Continued

Calibration Check	Units	% Recovery	Lower Limit	Upper Limit	Passed QC
Zinc	mg/L	93.78	90	110	yes
Date Acquired:	March 21, 2018				
Antimony	mg/L	91.35	90	110	yes
Arsenic	mg/L	101.01	90	110	yes
Barium	mg/L	100.35	90	110	yes
Beryllium	mg/L	94.49	90	110	yes
Cadmium	mg/L	100.38	90	110	yes
Chromium	mg/L	100.00	90	110	yes
Cobalt	mg/L	99.21	90	110	yes
Copper	mg/L	101.15	90	110	yes
Lead	mg/L	98.13	90	110	yes
Mercury	µg/L	92.60	90	110	yes
Molybdenum	mg/L	98.05	90	110	yes
Nickel	mg/L	98.98	90	110	yes
Phosphorus	mg/L	99.88	90	110	yes
Selenium	mg/L	106.38	90	110	yes
Silver	mg/L	93.29	90	110	yes
Strontium	mg/L	97.60	90	110	yes
Thallium	mg/L	96.23	90	110	yes
Tin	mg/L	93.02	90	110	yes
Vanadium	mg/L	99.75	90	110	yes
Zinc	mg/L	94.61	90	110	yes
Date Acquired:	March 21, 2018				

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Antimony	µg/g	2	2	30	3.000	yes
Arsenic	µg/g	5.5	5.6	30	1.750	yes
Barium	µg/g	120	120	30	1.000	yes
Beryllium	µg/g	0.35	0.35	30	0.050	yes
Cadmium	µg/g	0.3	0.4	30	0.250	yes
Chromium	µg/g	66	66	30	0.500	yes
Cobalt	µg/g	14	14	30	0.500	yes
Copper	µg/g	29	29	30	0.500	yes
Lead	µg/g	5.2	5.3	30	2.500	yes
Mercury	µg/g	0.042	0.035	30	0.500	yes
Molybdenum	µg/g	0.4	0.4	30	0.500	yes
Nickel	µg/g	42	41	30	1.250	yes
Selenium	µg/g	1	<0.5	30	2.500	yes
Silver	µg/g	<0.4	<0.4	30	2.000	yes
Strontium	µg/g	40	41	30	0.250	yes
Thallium	µg/g	<0.5	<0.5	30	2.500	yes
Tin	µg/g	<0.5	<0.5	30	2.500	yes
Vanadium	µg/g	69	68	30	1.000	yes
Zinc	µg/g	81	78	30	0.250	yes
Date Acquired:	March 21, 2018					

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Quality Control

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	P.O. Box 95	Project Name:	1401 Kennedy Rd	Control Number:	C117482
	7357 Pioneer Avenue	Project Location:	Harrison Mills	Date Received:	Mar 17, 2018
	Agassiz, BC, Canada	LSD:		Date Reported:	Mar 28, 2018
	V0M 1A0	P.O.:	14132	Report Number:	2274115
Attn:	Accounts Payable	Proj. Acct. code:			
Sampled By:	Andres M.				
Company:	Biocentral				

Metals Strong Acid Digestion - Continued

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Antimony	µg/g	<1	0.040	2.080	yes
Arsenic	µg/g	4.8	2.940	5.520	yes
Barium	µg/g	170	139.210	174.790	yes
Beryllium	µg/g	0.53	0.405	0.603	yes
Cadmium	µg/g	0.2	0.101	0.341	yes
Chromium	µg/g	32	19.940	36.620	yes
Cobalt	µg/g	7.1	4.970	8.870	yes
Copper	µg/g	16	12.330	17.430	yes
Lead	µg/g	7.4	5.500	11.320	yes
Mercury	µg/g	0.024	0.012	0.034	yes
Molybdenum	µg/g	0.4	0.252	0.828	yes
Nickel	µg/g	20	16.430	23.720	yes
Phosphorus	µg/g	620	489.000	693.000	yes
Strontium	µg/g	74	59.580	83.220	yes
Tin	µg/g	<0.5	0.104	0.938	yes
Vanadium	µg/g	37	25.800	48.600	yes
Zinc	µg/g	60	46.370	66.830	yes

Date Acquired: March 21, 2018

Soil Acidity

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
pH	pH	6.18	5.6	7.2	yes
Electrical Conductivity	dS/m at 25 °C	0.0161	-0.04	0.08	yes

Date Acquired: March 21, 2018

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
pH	pH	6.5	6.5	0	0.3	yes
Electrical Conductivity	dS/m at 25 °C	0.2	0.2	10	0.04	yes

Date Acquired: March 21, 2018

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
pH	pH	7.3	6.3	8.6	yes
Electrical Conductivity	dS/m at 25 °C	2.65	2.13	3.09	yes

Date Acquired: March 21, 2018

Water Soluble Parameters

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Chloride	mg/L	0.38	-0.0	0.6	yes

Date Acquired: March 21, 2018

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Chloride	mg/kg	4	4	10	1.0	yes

Date Acquired: March 21, 2018

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Chloride	mg/kg	37	30.0	40.8	yes

Date Acquired: March 21, 2018

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Quality Control

Bill To:	Timbro Contracting (A	Project ID:	James	Lot ID:	**1260233**
	P.O. Box 95	Project Name:	1401 Kennedy Rd	Control Number:	C117482
	7357 Pioneer Avenue	Project Location:	Harrison Mills	Date Received:	Mar 17, 2018
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	V0M 1A0	P.O.:	14132	Report Number:	2274115
Attn:	Accounts Payable	Proj. Acct. code:			
Sampled By:	Andres M.				
Company:	Biocentral				

Water Soluble Parameters - Continued

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Chloride	mg/kg	4.6	4.4	5.6	yes
Date Acquired:	March 21, 2018				

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Methodology and Notes

Bill To:	Timbro Contracting (A	Project ID:	James	Lot ID:	**1260233**
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Sampled By:	Andres M.				
Company:	Biocentral				

Method of Analysis

Method Name	Reference		Method	Date Analysis Started	Location
Boron in farm soil	McKeague	*	Hot Water Soluble Boron - Azomethine-H Method, 4.61	Mar 21, 2018	Exova Edmonton
Chloride in farmsoil	SSSA Book Series, no. 3	*	Testing Soils for Sulfur, Boron, Molybdenum, and Chlorine, Chapter 10	Mar 21, 2018	Exova Edmonton
Macronutrients in Farm Soils	McKeague	*	Ammonium Acetate Extractable Cations, 4.51	Mar 21, 2018	Exova Edmonton
Metals (Strong Acid Leachable) in soils (Surrey)	B.C.M.O.E	*	Strong Acid Leachable Metals (SALM) in Soil, V 1.0, SALM	Mar 20, 2018	Exova Surrey
Metals (Strong Acid Leachable) in soils (Surrey)	US EPA	*	Mercury in Solid and Semi-Solid Wastes (Cold Vapour), 7471B	Mar 20, 2018	Exova Surrey
Micronutrients in Farm Soil	APHA	*	Inductively Coupled Plasma (ICP) Method, 3120 B	Mar 21, 2018	Exova Edmonton
Micronutrients in Farm Soil	McKeague	*	DTPA-TEA Extractable Elements, 4.65	Mar 21, 2018	Exova Edmonton
Nutrients in Farm Soil	Comm. Soil Sci. Pl. Anal.	*	Modified Kelowna Soil Test, Vol 26, 1995	Mar 21, 2018	Exova Edmonton
Organic Matter by Ignition	McKeague	*	Loss on Ignition (LOI), 3.8	Mar 21, 2018	Exova Edmonton
pH and Conductivity in farm soil	McKeague	*	1:2 Soil:Water Ratio, 4.12	Mar 21, 2018	Exova Edmonton
SMP Lime Requirements	Carter	*	Shoemaker-Mclean-Pratt Single-Buffer Method, 12.2	Mar 21, 2018	Exova Edmonton
Sulfate in Farm Soil	McKeague	*	Sulfate Extractable by 0.1M CaCl2, 4.47	Mar 21, 2018	Exova Edmonton
Total Carbon, Nitrogen & Sulfur by Leco Combustion (Surrey)	SSSA Book Series 5	*	Nitrogen-Total, Ch 37	Mar 20, 2018	Exova Surrey

** Reference Method Modified*

References

APHA	Standard Methods for the Examination of Water and Wastewater
B.C.M.O.E	B.C. Ministry of Environment
Carter	Soil Sampling and Methods of Analysis.
Comm. Soil Sci. Pl.	Communications in Soil Science and Plant Analysis
McKeague	Manual on Soil Sampling and Methods of Analysis
SSSA Book Series 5	Methods of Soil Analysis, Part 3
SSSA Book Series,	Soil Testing and Plant Analysis
US EPA	US Environmental Protection Agency Test Methods

Guidelines

Guideline Description	General Soil Comments
	Plant Nutrients in Soil
	Soil test for Crop Unknown
Guideline Source	Exova Canada Inc.,
Guideline Comments	

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Surrey, British Columbia
V3S 8P8, Canada

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Methodology and Notes

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	Agassiz, BC, Canada	LSD:		Date Reported:	Mar 28, 2018
	V0M 1A0	P.O.:	14132	Report Number:	2274115
Attn:	Accounts Payable	Proj. Acct. code:			
Sampled By:	Andres M.				
Company:	Biocentral				

Comments:

- Mar 28, 2018 - Report was issued to correct for missing metal analysis on samples 1260233-1 to 9. Previous report 2271690.

Exova — Testing, calibrating, advising

www.exova.com ED 120-02

Invoice to:

Company: Timbro contracting
Address:
Attention:
Phone:
Cell:
Fax:
E-mail:
Agreement ID:
Copy of report:

Report To:

Company: BioCentral
Address: Same as Timbro
Attention: Andres Moreno
Phone: 6049971630
Cell:
Fax:
E-mail 1: andresm@biocentral.ca
E-mail 2: frank@timbroconstruction.com
Copy of invoice: info@timbroconstruction.com

Report Results		Regulatory Requirement	
E-Mail	X	HCDWQG	
Mail		Ab Tier 1	
Online		SPIGEC	
Fax		BCCSR	
PDF	X	Other (list below)	
Excel	X		
QA/QC	X		

Project Information

Project ID: JAMES
Project Name: 1401 Kennedy Rd
Project Location: Harrison Hills
Legal Location:
PO/AFE#: 14132
Proj. Acct. Code:
Quote # 23983

Sample Custody (please print)

Sampled by: Andrs M.
Company: BioCentral

RUSH Priority

- Emergency (contact lab for turnaround and pricing)
- Priority 1-2 working days (100% surcharge)
- Urgent 2-3 working days (50% surcharge)

When "ASAP" is requested, turn around will default to a 100% RUSH priority, with pricing and turn around time to match. Please contact the lab prior to submitting RUSH samples. If not all samples require RUSH, please indicate in the special instructions.

Date Required: _____ Signature: _____

This section for Lab use only

Date/Time stamp: MAR 17 '18 12:47

Special Instructions/Comments (please include contact information including ph. # if different from above).

Regular Delivery

	Site I.D.	Sample Description	Depth start (m)	Depth start (cm)	Depth end (m)	Date/Time Sampled	Matrix	Sampling Method	Number of Containers	OMEE Metals	CMPT	Enter tests above (√ relevant samples below)
1	S1	Farm soil	6			2018.03.16	soil					
2	S2											
3	S3											
4	S4											
5	S5											
6	S6											
7	S7											
8	S8											
9	S9											
10												
11												
12												
13												
14												
15												

Indicate in the space allotted any deficiencies by the corresponding number.

1. Indicate any samples that were not packaged well
2. Indicate any samples not received in Exova supplies
3. Indicate any samples that were not clearly labeled
4. Indicate any samples not received within the required hold time or temp.
5. Indicate any missing or extra samples
6. Indicate any samples that were received broken
7. Indicate any samples where sufficient volume was not received
8. Indicate any samples received in an inappropriate container

Submission of this form acknowledges acceptance of Exova's Standard Terms and Conditions (http://www.exova.com/about/terms-and-conditions/)

Lot: 1260233 COC

Shipping: COD Y/ N
and size of coolers
Temp. received: 11.7°C
Delivery Method: H
Waybill:
Received by: LC

Please indicate any potentially hazardous samples

Page _____ of _____ Control # C 117482

ED 120-02

ABBOTSFORD

April 10, 2017

File: 5550-70

Andres Murillo, P.Eng
BioCentral Green Depot Ltd.
Box 95-7357 Pioneer Avenue
Agassiz, BC V0M 1A0

Dear Mr. Murillo:

Re: Organic Matters Recycling Regulation (OMRR) Section 6 – Process and Quality Criteria

As requested, this letter provides confirmation and supporting information that the JAMES Wastewater Treatment Plant (JAMES Plant) meets Section 6 of the OMRR for producing Class A biosolids.

The pasteurization system at the JAMES Plant meets the time-temperature requirements for production of Class A biosolids according to Section 2(f) in OMRR Schedule 1.

The sludge pasteurization system includes the following main components:

- crude and pasteurized sludge holding tanks;
- heat exchangers to heat raw sludge and cool pasteurized sludge;
- pasteurization tank; and
- miscellaneous transfer and recirculation pumps.

The pasteurization reactor operates at a temperature of 65°C and is batch-fed to maintain a retention time of at least one hour between sludge transfers. The volume of the tank provides approximately 18 to 24 hours retention time for pasteurization and conditioning of the sludge in advance of the anaerobic digestion process. The pasteurization process is followed by anaerobic mesophilic digestion, which meets the vector attraction reduction requirements (for details please see below).

The anaerobic mesophilic digestion system at the JAMES Plant meets the vector attraction reduction requirements according to Section 1(a) in OMRR Schedule 2.

The anaerobic mesophilic digestion system at the JAMES Plant includes three digesters, with a total volume of 11,460 m^3. Pasteurized and conditioned sludge from the pasteurized sludge holding tank is pumped to the largest anaerobic digester and then is passed to the remaining two digesters in series. The volatile solids reduction of the biosolids typically ranges between 60-70% and is higher than the required 38% under OMRR.

We trust the above provides the information you requested. Please contact me if you need any additional information or clarification.

Yours truly,

Rob Isaac, Eng.L.
Director, Project Management Office

c. John Paul, Transform Compost Systems Ltd.
Peter Sparanese, General Manager, Engineering and Regional Utilities
Tim Henry, Director, Utility Operations and Asset Management

SC/rb

Biosolids Sampling - Medium Tent (July 19, 2017)

BACK OF TENT

A3 Time = 8:40AM FC = <9.10	**A2** Time = 8:35AM FC = 42.31	**A1** Time = 8:30AM FC = <7.41
B6 Time = 8:55AM FC = <9.10	**B5** Time = 8:50AM FC = <8.70	**B4** Time = 8:45AM FC = 31.82
C9 Time = 9:10AM FC = <8.70	**C8** Time = 9:05AM FC = <9.09	**C7** Time = 9:00AM FC = <9.10
D12 Time = 9:25AM FC = <8.33	**D11** Time = 9:20AM FC = <9.10	**D10** Time = 9:15AM FC = <8.70
E15 Time = 9:40AM FC = 31.82	**E14** Time = 9:35AM FC = <8.69	**E13** Time = 9:30AM FC = <8.33

FRONT OF TENT

NOTE: Units for Fecal Coliforms (FC) are MPN/g dry weight.

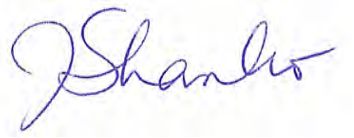
CERTIFICATE OF ANALYSIS

REPORTED TO	Abbotsford, City of - Utilities Environment 6011 Gladwin Road Abbotsford, BC V4X 1V9	**TEL** **FAX**	(604) 557-1452 (604) 557-1457
ATTENTION	Sharon Subido	**WORK ORDER**	7071657
PO NUMBER	PO 170554	**RECEIVED / TEMP**	2017-07-20 10:15 / 17°C
PROJECT	#13 - Biosolids QC	**REPORTED**	2017-07-25
PROJECT INFO		**COC NUMBER**	UE-P13-03

General Comments:

CARO Analytical Services employs methods which are conducted according to procedures accepted by appropriate regulatory agencies, and/or are conducted in accordance with recognized professional standards using accepted testing methodologies and quality control efforts, except where otherwise agreed to by the client.

The results in this report apply to the samples analyzed in accordance with the Chain of Custody or Sample Requisition document. This analytical report must be reproduced in its entirety. CARO is not responsible for any loss or damage resulting directly or indirectly from error or omission in the conduct of testing. Liability is limited to the cost of analysis. Samples will be disposed of 30 days after the test report has been issued unless otherwise agreed to in writing.



Authorized By: **Jennifer Shanko, A.Sc.T.**
Account Manager

If you have any questions or concerns, please contact me at jshanko@caro.ca

Locations:

#110 4011 Viking Way
Richmond, BC V6V 2K9
Tel: 604-279-1499

#102 3677 Highway 97N
Kelowna, BC V1X 5C3
Tel: 250-765-9646

17225 109 Avenue
Edmonton, AB T5S 1H7
Tel: 780-489-9100

www.caro.ca

ANALYSIS INFORMATION

REPORTED TO	Abbotsford, City of - Utilities Environment	**WORK ORDER**	7071657
PROJECT	#13 - Biosolids QC	**REPORTED**	2017-07-25

Analysis Description	Method Reference	Technique	Location
Coliforms, Fecal (MPN) in Solid	MFHPB-19	Most Probable Number	Sublet
Moisture in Solid	ASTM D2216-10	Gravimetry (Dried at 105C)	Sublet

Method Reference Descriptions:

ASTM	ASTM International Test Methods
MFHPB	HPB Methods for the Microbiological Analysis of Foods, Health Canada

Glossary of Terms:

MRL	Method Reporting Limit
<	Less than the Reported Detection Limit (RDL) - the RDL may be higher than the MRL due to various factors such as dilutions, limited sample volume, high moisture, or interferences
% wet	Percent (as received basis)

Standards / Guidelines Referenced in this Report:

Organic Matter Recycling Regulation -Schedule 4 (2002)
Website: http://www.bclaws.ca/EPLibraries/bclaws_new/document/ID/freeside/18_2002

Note: In some cases, the values displayed on the report represent the lowest guideline and are to be verified by the end user

SAMPLE ANALYTICAL DATA

REPORTED TO	Abbotsford, City of - Utilities Environment	**WORK ORDER**	7071657
PROJECT	#13 - Biosolids QC	**REPORTED**	2017-07-25

Analyte	Result / *Recovery*	Standard / Guideline	MRL / *Limits*	Units	Prepared	Analyzed	Notes
Sample ID: A1 Medium Tent (7071657-01) [Biosolids] Sampled: 2017-07-19 08:30							
General Parameters							
Moisture	**72.56**	N/A	0.1	% wet		2017-07-20	
Microbiological Parameters							
Coliforms, Fecal	<7.41	N/A	2	MPN/g dry		2017-07-20	
Sample ID: A2 Medium Tent (7071657-02) [Biosolids] Sampled: 2017-07-19 08:35							
General Parameters							
Moisture	**73.73**	N/A	0.1	% wet		2017-07-20	
Microbiological Parameters							
Coliforms, Fecal	**42.31**	N/A	2	MPN/g dry		2017-07-20	
Sample ID: A3 Medium Tent (7071657-03) [Biosolids] Sampled: 2017-07-19 08:40							
General Parameters							
Moisture	**77.82**	N/A	0.1	% wet		2017-07-20	
Microbiological Parameters							
Coliforms, Fecal	<9.10	N/A	2	MPN/g dry		2017-07-20	
Sample ID: B4 Medium Tent (7071657-04) [Biosolids] Sampled: 2017-07-19 08:45							
General Parameters							
Moisture	**78.35**	N/A	0.1	% wet		2017-07-20	
Microbiological Parameters							
Coliforms, Fecal	**31.82**	N/A	2	MPN/g dry		2017-07-20	
Sample ID: B5 Medium Tent (7071657-05) [Biosolids] Sampled: 2017-07-19 08:50							
General Parameters							
Moisture	**77.18**	N/A	0.1	% wet		2017-07-20	
Microbiological Parameters							
Coliforms, Fecal	<8.70	N/A	2	MPN/g dry		2017-07-20	
Sample ID: B6 Medium Tent (7071657-06) [Biosolids] Sampled: 2017-07-19 08:55							
General Parameters							
Moisture	**78.35**	N/A	0.1	% wet		2017-07-20	
Microbiological Parameters							
Coliforms, Fecal	<9.10	N/A	2	MPN/g dry		2017-07-20	
Sample ID: C7 Medium Tent (7071657-07) [Biosolids] Sampled: 2017-07-19 09:00							
General Parameters							
Moisture	**78.47**	N/A	0.1	% wet		2017-07-20	

REPORTED TO	Abbotsford, City of - Utilities Environment	**WORK ORDER**	7071657
PROJECT	#13 - Biosolids QC	**REPORTED**	2017-07-25

Analyte	Result / *Recovery*	Standard / Guideline	MRL / *Limits*	Units	Prepared	Analyzed	Notes
Sample ID: C7 Medium Tent (7071657-07) [Biosolids] Sampled: 2017-07-19 09:00, Continued							
Microbiological Parameters							
Coliforms, Fecal	<9.10	N/A	2	MPN/g dry		2017-07-20	
Sample ID: C9 Medium Tent (7071657-08) [Biosolids] Sampled: 2017-07-19 09:10							
General Parameters							
Moisture	**76.59**	N/A	0.1	% wet		2017-07-20	
Microbiological Parameters							
Coliforms, Fecal	<8.70	N/A	2	MPN/g dry		2017-07-20	
Sample ID: D10 Medium Tent (7071657-09) [Biosolids] Sampled: 2017-07-19 09:15							
General Parameters							
Moisture	**76.72**	N/A	0.1	% wet		2017-07-20	
Microbiological Parameters							
Coliforms, Fecal	<8.70	N/A	2	MPN/g dry		2017-07-20	
Sample ID: D11 Medium Tent (7071657-10) [Biosolids] Sampled: 2017-07-19 09:20							
General Parameters							
Moisture	**77.90**	N/A	0.1	% wet		2017-07-20	
Microbiological Parameters							
Coliforms, Fecal	<9.10	N/A	2	MPN/g dry		2017-07-20	
Sample ID: D12 Medium Tent (7071657-11) [Biosolids] Sampled: 2017-07-19 09:25							
General Parameters							
Moisture	**75.96**	N/A	0.1	% wet		2017-07-20	
Microbiological Parameters							
Coliforms, Fecal	<8.33	N/A	2	MPN/g dry		2017-07-20	
Sample ID: E13 Medium Tent (7071657-12) [Biosolids] Sampled: 2017-07-19 09:30							
General Parameters							
Moisture	**76.17**	N/A	0.1	% wet		2017-07-20	
Microbiological Parameters							
Coliforms, Fecal	<8.33	N/A	2	MPN/g dry		2017-07-20	
Sample ID: E14 Medium Tent (7071657-13) [Biosolids] Sampled: 2017-07-19 09:35							
General Parameters							
Moisture	**77.23**	N/A	0.1	% wet		2017-07-20	
Microbiological Parameters							
Coliforms, Fecal	<8.69	N/A	2	MPN/g dry		2017-07-20	

SAMPLE ANALYTICAL DATA

REPORTED TO	Abbotsford, City of - Utilities Environment	**WORK ORDER**	7071657
PROJECT	#13 - Biosolids QC	**REPORTED**	2017-07-25

Analyte	Result / *Recovery*	Standard / Guideline	MRL / *Limits*	Units	Prepared	Analyzed	Notes
Sample ID: E15 Medium Tent (7071657-14) [Biosolids] Sampled: 2017-07-19 09:40							
General Parameters							
Moisture	**78.35**	N/A	0.1	% wet		2017-07-20	
Microbiological Parameters							
Coliforms, Fecal	**31.82**	N/A	2	MPN/g dry		2017-07-20	
Sample ID: C8 Medium Tent (7071657-15) [Biosolids] Sampled: 2017-07-19 09:00							
General Parameters							
Moisture	**77.58**	N/A	0.1	% wet		2017-07-20	
Microbiological Parameters							
Coliforms, Fecal	<9.09	N/A	2	MPN/g dry		2017-07-20	

Client Information	Project Information	Laboratory Information	COC Information
Abbotsford, City of - Utilities Environment 6011 Gladwin Road Abbotsford BC V4X 1V9 Phone: (604) 557-1452 Fax: (604) 557-1457	#13 - Biosolids QC Number: [none] Sample count: 14 TAT: 5	CARO Analytical Services #110 - 4011 Viking Way Richmond BC V6V 2K9 Phone: (604) 279-1499 Fax: (604) 279-1599	Number: UE-P13-03 Shipped via: IG Micromed

		Analyses	Containers
#1	A1 Medium Tent (Template: 13) 07/19/2017 08:30 - 07/19/2017 08:30 Grab / Solid	!AUE Project #13 Grab PKG (SUB) TAT: 5 Coliforms, Fecal in Solids (SUB) TAT: 5 Coliforms, Total & Fecal in Solids (KEL) TAT: 5	C01_125 mL Glass (General Soil) (1)
#2	A2 Medium Tent (Template: 13) 07/19/2017 08:35 - 07/19/2017 08:35 Grab / Solid	!AUE Project #13 Grab PKG (SUB) TAT: 5 Coliforms, Fecal in Solids (SUB) TAT: 5 Coliforms, Total & Fecal in Solids (KEL) TAT: 5	C01_125 mL Glass (General Soil) (1)
#3	A3 Medium Tent (Template: 13) 07/19/2017 08:40 - 07/19/2017 08:40 Grab / Solid	!AUE Project #13 Grab PKG (SUB) TAT: 5 Coliforms, Fecal in Solids (SUB) TAT: 5 Coliforms, Total & Fecal in Solids (KEL) TAT: 5	C01_125 mL Glass (General Soil) (1)
#4	B4 Medium Tent (Template: 13) 07/19/2017 08:45 - 07/19/2017 08:45 Grab / Solid	!AUE Project #13 Grab PKG (SUB) TAT: 5 Coliforms, Fecal in Solids (SUB) TAT: 5 Coliforms, Total & Fecal in Solids (KEL) TAT: 5	C01_125 mL Glass (General Soil) (1)
#5	B5 Medium Tent (Template: 13) 07/19/2017 08:50 - 07/19/2017 08:50 Grab / Solid	!AUE Project #13 Grab PKG (SUB) TAT: 5 Coliforms, Fecal in Solids (SUB) TAT: 5 Coliforms, Total & Fecal in Solids (KEL) TAT: 5	C01_125 mL Glass (General Soil) (1)
#6	B6 Medium Tent (Template: 13) 07/19/2017 08:55 - 07/19/2017 08:55 Grab / Solid	!AUE Project #13 Grab PKG (SUB) TAT: 5 Coliforms, Fecal in Solids (SUB) TAT: 5 Coliforms, Total & Fecal in Solids (KEL) TAT: 5	C01_125 mL Glass (General Soil) (1)
#7	C7 Medium Tent (Template: 13) 07/19/2017 09:00 - 07/19/2017 09:00 Grab / Solid	!AUE Project #13 Grab PKG (SUB) TAT: 5 Coliforms, Fecal in Solids (SUB) TAT: 5 Coliforms, Total & Fecal in Solids (KEL) TAT: 5	C01_125 mL Glass (General Soil) (1)
#8	C9 Medium Tent (Template: 13) 07/19/2017 09:10 - 07/19/2017 09:10 Grab / Solid	!AUE Project #13 Grab PKG (SUB) TAT: 5 Coliforms, Fecal in Solids (SUB) TAT: 5 Coliforms, Total & Fecal in Solids (KEL) TAT: 5	C01_125 mL Glass (General Soil) (1)
#9	D10 Medium Tent (Template: 13) 07/19/2017 09:15 - 07/19/2017 09:15 Grab / Solid	!AUE Project #13 Grab PKG (SUB) TAT: 5 Coliforms, Fecal in Solids (SUB) TAT: 5 Coliforms, Total & Fecal in Solids (KEL) TAT: 5	C01_125 mL Glass (General Soil) (1)
#10	D11 Medium Tent (Template: 13) 07/19/2017 09:20 - 07/19/2017 09:20 Grab / Solid	!AUE Project #13 Grab PKG (SUB) TAT: 5 Coliforms, Fecal in Solids (SUB) TAT: 5 Coliforms, Total & Fecal in Solids (KEL) TAT: 5	C01_125 mL Glass (General Soil) (1)
#11	D12 Medium Tent (Template: 13) 07/19/2017 09:25 - 07/19/2017 09:25 Grab / Solid	!AUE Project #13 Grab PKG (SUB) TAT: 5 Coliforms, Fecal in Solids (SUB) TAT: 5 Coliforms, Total & Fecal in Solids (KEL) TAT: 5	C01_125 mL Glass (General Soil) (1)
#12	E13 Medium Tent (Template: 13) 07/19/2017 09:30 - 07/19/2017 09:30 Grab / Solid	!AUE Project #13 Grab PKG (SUB) TAT: 5 Coliforms, Fecal in Solids (SUB) TAT: 5 Coliforms, Total & Fecal in Solids (KEL) TAT: 5	C01_125 mL Glass (General Soil) (1)
#13	E14 Medium Tent (Template: 13) 07/19/2017 09:35 - 07/19/2017 09:35 Grab / Solid	!AUE Project #13 Grab PKG (SUB) TAT: 5 Coliforms, Fecal in Solids (SUB) TAT: 5 Coliforms, Total & Fecal in Solids (KEL) TAT: 5	C01_125 mL Glass (General Soil) (1)
#14	E15 Medium Tent (Template: 13)	Analyses	

	07/19/2017 09:40 - 07/19/2017 09:40 Grab / Solid	!AUE Project #13 Grab PKG (SUB) TAT: 5 Coliforms, Fecal in Solids (SUB) TAT: 5 Coliforms, Total & Fecal in Solids (KEL) TAT: 5	C01_125 mL Glass (General Soil) (1)

Relinquished by	Date/Time	Accepted by	Date/Time

Appendix F

% Volatile Solids Reduction - JAMES PLANT- 2017

Month	% V.S Red'n
Jan	58
Feb	64
Mar	56
Apr	61
May	58
Jun	67
Jul	69
Aug	66
Sep	64
Oct	70
Nov	64
Dec	67
Annual	**64**

Monthly average from weekly testing

OMRR Limit -38%

Volatile Solids Reduction Calculation:

$$\% \text{ Red'n} = \frac{(\text{In} - \text{Out})}{\text{In} - (\text{In} \times \text{Out})} \times 100$$

Where:

In = Volatile solids for raw, decimal format.

Out = Volatile solids of last Dig in series, decimal format.

JAMES WWTP BIOSOLIDS QUALITY DATA (2017)

Parameter concentrations are expressed on dry weight basis unless otherwise stated.
All data obtained from the analysis of a monthly composite sample.

Sampling Date:	-															
Parameters (Dried Basis)	**Units**	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**	**OCT**	**NOV**	**DEC**	**MAX**	**AVG**	**OMRR***
Total Nitrogen	%	6.99	8.14	9.04	7.19	8.65	8.1	7.74	8.13	5.74	5.36	6.71	10.5	10.50	7.69	-
Total Phosphorus (as P)	%	1.10	1.02	1.14	1.02	1.15	1.23	1.07	1.14	1.33	1.01	1.02	1.09	1.33	1.11	-
Total Potassium	%	0.071	0.11	0.11	0.103	0.0669	0.077	0.0727	0.0755	0.0632	0.0563	0.071	0.0628	0.11	0.08	-
Total Sulphur	%	0.58	0.74	0.79	0.96	0.517	0.682	0.768	0.83	0.868	0.60	0.69	0.603	0.96	0.72	-
Total Carbon	%	33.6	41.7	40.9	41.5	41.3	40.3	40.5	40.9	40	40.5	42.0	43.2	43.2	40.5	-
Organic Matter	%	80.3	79.6	79.7	80.1	80	79.2	79.5	78.9	76.8	77.9	78.3	78.9	80.3	79.1	-
Moisture	%	75.7	74.9	75.6	75.2	76.6	76.9	76.4	76.7	76.1	72.4	76.6	76.5	76.9	75.8	-
Ammonia- N (available)	mg/kg	7810	8100	8460	8390	7530	7480	8400	8750	7370	5920	6220	6600	8750	7586	-
Nitrate - N (available)	mg/kg	5.4	4.4	5.25	5.85	2.65	3.52	7.77	3.43	3.72	15.6	3.05	4.52	15.6	5.43	-
pH	pH units	6.5	6.7	5.6	6.6	6.3	5.8	6	6.46	6.43	6.75	6.71	6.77	6.77	6.4	-
EC - Conductivity	dS/m	2.73	3.39	2.58	2.94	3.83	3.66	2.58	3.73	5.83	3.25	4.09	4.12	5.83	3.56	-
C/N Ratio	-	4.8	5.1	4.5	5.8	4.8	5.0	5.2	5.0	7.0	7.6	6.26	4.1	7.6	5.4	-
Arsenic	ug/g	2	2.8	N/A	2.95	2.25	2.87	2.83	2.84	3.5	2.88	3.1	2.51	3.5	2.8	75
Cadmium	ug/g	0.86	1.5	N/A	1.49	1.24	1.44	1.63	1.53	1.76	1.23	1.59	1.29	1.76	1.41	20
Chromium	ug/g	18	24	N/A	28.1	20.4	25.4	35.6	60.1	37.4	29.4	32.1	22	60.1	30.2	1060
Cobalt	ug/g	1.6	2.5	N/A	2.57	1.99	2.27	2.2	2.69	3.27	2.21	2.14	1.85	3.27	2.30	150
Copper	ug/g	360	520	N/A	483	438	568	600	655	636	531	561	453	655	528	2200
Lead	ug/g	13	20	N/A	20.8	17.2	20.3	21.4	20.7	22.8	17.3	22.9	17.7	22.9	19.5	500
Mercury	ug/g	1.3	1.5	N/A	1.98	1.67	1.73	3.22	1.78	2.08	1.52	2.2	2.39	3.22	1.95	5
Molybdenum	ug/g	3.9	6.4	N/A	6.34	5.91	6.94	6.05	6.77	7.82	6.21	6.76	5.14	7.82	6.20	20
Nickel	ug/g	11	15	N/A	17.8	13.9	18.1	31.4	41.8	32.9	27.1	35.5	26.5	41.8	24.6	180
Selenium	ug/g	3	4.5	N/A	4.84	4.37	4.88	4.72	4.7	5.31	4.18	4.79	3.75	5.31	4.46	14
Zinc	ug/g	530	800	N/A	700	732	924	922	1050	983	887	874	707	1050	828	1850

1750 School Rd,

Harrison Mills, BC

Class A Biosolids Application Plan: 2018

April 4, 2018

MOE Authorization # 109216

Prepared by:

John Paul, PhD PAg
Transform Compost Systems Ltd
3911 Mt Lehman Rd
Abbotsford, BC V2T 5W5
Ph: 604-302-4367
Email: transform@telus.net

1750 School Rd Class A Biosolids Application Plan 2018

Introduction

This Land Application Plan for the application of Class A biosolids provides the guidance and information required under British Columbia's Organic Matter Recycling Regulation (OMRR), a regulation enacted to ensure that biosolids are managed in a manner that protects human health and the environment.

Class A biosolids are considered a valuable source of both plant nutrients and organic matter. Class A biosolids are the highest quality biosolids achievable under the OMRR, particularly regarding fecal coliform counts (< 1,000 most probable number per gram), and trace element (metal) concentrations. The land application plan must be prepared by a qualified professional as defined in the OMRR.

Class A biosolids will be land applied in 2018 as a source of nutrients and organic matter for 6.82 ha of a 13 ha farm in Harrison Mills, BC, which will be cropped to forage for cattle. The total amount of Class A biosolids that will be land applied is approximately 375 wet tonnes. This Land Application Plan (LAP) provides guidance in the beneficial reuse of a portion of the Class A biosolids from the JAMES Treatment Plant, a wastewater treatment facility that processes wastewater from the communities of Abbotsford and Mission. (http://www.abbotsford.ca/city_services/wastewater/biosolids_management.htm#JAMES).

This land application plan utilizes the biosolids quality data for 2017, provided by the City of Abbotsford. The Class A biosolids used for this land application was generated by the JAMES wastewater treatment plant in 2017.

The Land Application Plan follows the Notification dated November 30, 2017 (Appendix A).

Qualifications of the Qualified Professional

The professional agrologist preparing this report has extensive training and experience with soil, waste and agricultural land in particular. John Paul, PhD is a registered professional agrologist, who obtained his MSc and PhD in soil biochemistry from the University of Guelph in 1991. He has acted as a professional agrologist for many sites requiring soil deposit and removal reports, nutrient management and waste management plans. He has extensive experience with the various Acts and Regulations regarding agricultural land use and agricultural and industrial wastes.

Land Application Objectives

The specific objectives of this land application plan are to ensure that the Class A biosolids are stored and applied in a manner that provides the greatest benefit for the crop grown on this property, while minimizing risk of environmental pollution. The plan will consider the specific

crops that are growing on this property, as well as any other nutrient input that is used for growing crops or improving the soil.

Site Characteristics

Location

The Land Application Plan is for Class A biosolids application on a farm located at 1750 School Rd, Harrison Mills, BC. The legal description is Lot D, New Westminster District, Plan NWP4294 Scowlitz IR #1.

Figure 1. Aerial view of land application area at 1750 School Rd, Harrison Mills, relative to areas used by the public.

This farm is located 12 km directly west of the town of Agassiz BC.

The land application area is zoned agricultural and is within the Agricultural Land Reserve. The property is surrounded by agricultural lands in forage production in all directions.

The coordinates of the site are

Longitude: 121.9433 W

Latitude : 49.2365 N

Figure 2. Aerial photograph of the property at 1750 School Rd where the Class A biosolids will be applied (Google Earth, 2016. Land application area is within the red lines on the aerial photo. The yellow lines depict the property boundaries.

Climate

Agassiz has a wet but moderate to mild climate in the wintertime with dry summers. The annual mean total rainfall is 1440 mm, with an average of 230 mm in January, and 60 mm in July. The annual mean total snowfall is 940 mm. The annual mean daily temperature in July is 23°C, and in January is 2.5 °C. The wind direction is generally from the southeast to the northwest. Source of weather information: http://www.climate-charts.com/Locations/c/CN71113011001200.php

Soil Properties

The soil at this farm is described as a Monroe Silt Loam (Kelly and Spilsbury 1939), which is a very common soil type along the lower Fraser River. Typically these soils have 30 to 40 cm of a fine textured soil overlying coarse sands. In this field, the depth of the silt loam ranges from 30-40 cm. A layer of coarser textured sand underlies the silt loam.

Six soil samples were taken from the field in March 2018. The location of the soil samples are identified in Appendix B. The complete soil analysis information is found in Appendix C.

Figure 3. Soil profile showing > 30-40 cm of silt loam overlying a coarse textured subsoil.

The soil organic matter content averaged 3.4 % in the top 15 cm. The soil has a near neutral pH of 6.0 (Figure 4), a base saturation of 91%, mostly from calcium (82%), magnesium (6%), and potassium (3.2%).

The soil characteristics were variable on this property due to slight elevation changes. The phosphorus and potassium concentrations are characteristic of a site that has not had a history of application of organic matter.

	Soil Characteristics		
Organic matter		%	3.4
Nitrogen		%	0.2
pH			6.8
EC		dS/m	0.2
Nitrate			4.0
Phosphorus			37.5
Potassium			136
Base Saturation		%	90.7
	Calcium	%	81.6
	Magnesium	%	6.0
	Potassium	%	3.2
	Sodium	%	<1.5

Figure 4. Soil characteristics (March 2018)

Slope and Topography

The topography of the field is almost level with a few slight undulations.

Depth to Groundwater Table

The elevation of the property is approximately 15 m above sea level, and approximately 1-2 m above the level of the Fraser River, depending on the time of year. The depth to groundwater fluctuates with the water level in the Fraser River and is generally within 1-2 m of the surface.

Figure 5. View of the property looking east from School Rd (March 22, 2018 photo).

Soil Nutrients

Most of the six individual soil samples showed that the soil was marginal in available nitrogen, which is normal for soil sampled in the spring in the Fraser Valley. Available potassium was marginal in all of the soil samples. Phosphorus concentrations varied from deficient to optimal. Sulphur concentrations were deficient to marginal. This is characteristic of soils in the Fraser Valley that have had little history of application of manure or other organic matter.

Soil Metals

A total of six individual soil samples were obtained from 0-15 cm depth in the land application area on the property. The complete laboratory soil analysis data is found in Appendix C.

Soil Trace Elements (OMRR)		
	Soil Test	**Limits OMRR**
Element	**(mg/kg)**	**(mg/kg)**
Arsenic	6.6	15
Cadmium	0.4	9
Chromium	75.7	60
Cobalt	14.8	40
Copper	31.3	150
Lead	6.4	350
Mercury	0.04	0.6
Molybdenum	0.6	5
Nickel	42.2	100
Selenium	0.8	2
Zinc	80.0	200

Figure 6. Soil trace element concentrations in the 0-15 cm depth in the soil in the land application area.

All of the trace element concentrations are below the limits for agricultural soil as documented in the OMRR (OMRR Schedules 9 and 10, limits used for livestock ingesting soil and fodder are used where applicable), with the exception of chromium. The limits as per OMRR represent the most conservative of all uses on either agricultural or residential soils.

It will be important to track the soil chromium concentrations. All of the soil analyses of the various land application sites in 2018 showed significantly increased chromium concentrations, despite either no, or very little application of biosolids. In addition, as will be demonstrated later in the land application plan, there is very little chromium added with the biosolids application. The elevated chromium concentrations appear to be characteristic of the Fraser River sediments, and are significantly higher for the 2018 samples than soil samples taken in previous years.

Biosolids Source and Characteristics

The Class A biosolids are produced at the JAMES Treatment Plant, a wastewater treatment plant that processes wastewater from the communities of Abbotsford and Mission.

JAMES Wastewater Treatment Plant, 5959 Gladwin Rd, Abbotsford B.C. V4X 1V9

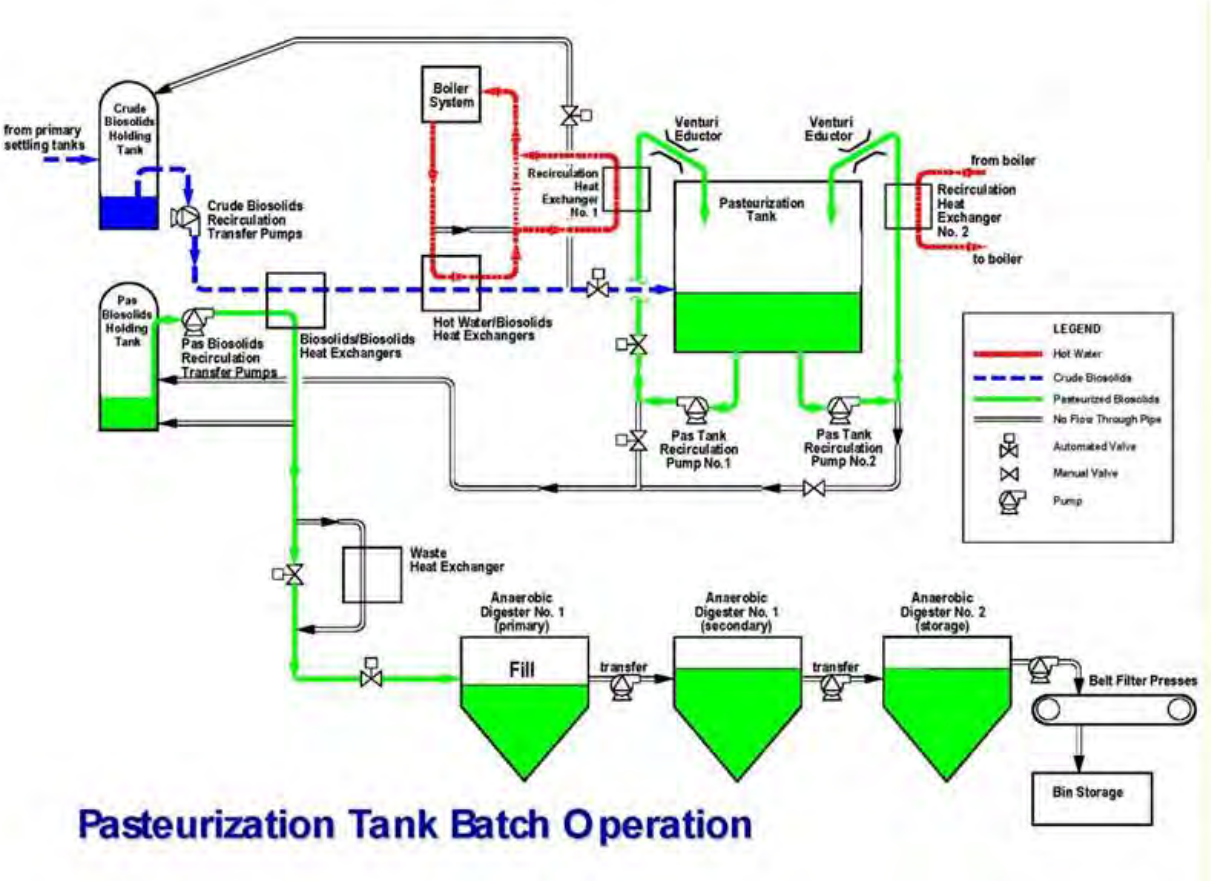


*Figure 7. Biosolids processing flowsheet at the James Wastewater Treatment Plant (*http://www.abbotsford.ca/Assets/2014+Abbotsford/Engineering/Wastewater/Biosolids+Flow+Chart.pdf)

Pathogen Reduction Processes and Limits

The pathogen reduction process conforms with Schedule 1, Section 2 (f) of the Organic Matter Recycling Regulation, where it states:

"2. One of the following pathogen reduction methods is required for Class A biosolids or biosolids to produce biosolids growing medium: (f) the heat treatment of the biosolids must be 50 C or higher, and the time period must be 30 minutes or longer"

The process used at the JAMES Wastewater Treatment Plant is as follows (Appendix D). *"The pasteurization reactor operates at a temperature of 65 C and is batch-fed to maintain a*

retention time of at least one hour between sludge transfers. The volume of the tank provides approximately 18-24 hours retention time for pasteurization and conditioning of the sludge in advance of the anaerobic digestion process."

Analyses of fecal coliforms are conducted by the City of Abbotsford on the biosolids before it is released from the wastewater plant (Appendix E). Biocentral as well as the professional agrologist reserves the right to conduct any of its own testing of the biosolids to ensure that meets Class A requirements.

The average moisture content of the biosolids measured at time of discharge was 75.8% in 2017 (Figure 8) and 76.7% in the batch that was shipped to this property (Appendix E). The moisture content at time of field application may change somewhat, either from the biosolids taking on more moisture, or from biosolids drying during storage.

Vector Attraction Reduction Processes and Limits

The vector attraction reduction process conforms with Schedule 2, Section 1 (a) of the Organic Matter Recycling Regulation, where it states:

"1. One of the following vector attraction reduction processes is required for Class A biosolids or Class B biosolids used to produce biosolids growing medium: (a) a digestion process (aerobic or anaerobic) resulting in the mass of volatile solids being reduced by more than 38 percent"

The process used at the JAMES Wastewater Treatment Plant is as follows (Appendix D). *"The anaerobic mesophilic digestion system at the JAMES Plant includes three digesters, with a total volume of 11,460 m3. Pasteurized and conditioned sludge from the pasteurized sludge holding tank is pump to the largest anaerobic digester and then is passed to the remaining two digesters in series."*

The volatile solids reduction results from the JAMES plant averaged 64% in 2017 (Appendix F).

Trace Elements and Nutrients

The general characteristics of the biosolids are noted in Figure 8. The biosolids are an excellent source of organic matter, as well as nitrogen and phosphorus, whereas the potassium concentration is low. Trace element concentrations meet OMRR Class A limits (Figure 9).

Characteristics of the Class A Biosolids		
Characteristic	**Unit**	**Value**
Moisture Content	%	75.8
Organic Matter	%	79.1
pH		6.4
EC	dS/m	3.56
C/N Ratio		5.4
Nitrogen (total)	%	7.69
Ammonium	mg/kg	7586
Phosphorus	%	1.11
Potassium	%	0.08
Sulphur	%	0.72

Figure 8. Characteristics of the Class A biosolids (2017 data)

Schedule 4 of the Organic Matter Recycling Regulation (OMRR) provides the guidance for the trace elements in the biosolids. Figure 9 shows the trace elements in the biosolids (including both the maximum and average concentrations monthly in 2017 analysis (Appendix G), compared with the standards (OMRR, and Trade Memorandum T-4-93). For the land application calculations, we have used the average concentration for 2017.

Trace Element Concentrations in the Class A Biosolids				
Element	Biosolids		Class A (OMRR)	Canada
	Max 2017	Avg 2017		T-4-93
	(mg/kg)		(mg/kg)	(mg/kg)
Arsenic	3.5	2.8	75	75
Cadmium	1.76	1.41	20	20
Chromium	60.1	30.2	1060	*not included*
Cobalt	3.27	2.3	150	150
Copper	655	528	2200	*not included*
Lead	22.9	19.5	500	500
Mercury	3.22	1.95	5	5
Molybdenum	7.82	6.2	20	20
Nickel	41.8	24.6	180	180
Selenium	5.31	4.46	14	14
Zinc	1050	828	1850	1850

Figure 9. Trace element concentrations in the Class A biosolids from the JAMES Wastewater Treatment Plant (maximums and averages for 2017. The limits for Class A biosolids (OMRR requirement) and the Canadian standards are also shown.

Figure 8 shows additional characteristics of the biosolids that are used for the land application plan, including and especially the nitrogen, phosphorus and potassium concentrations, which are important when considering the fertilizer value of the biosolids.

Foreign Matter

The Class A biosolids are free of foreign matter. Foreign matter is screened when the wastewater enters the treatment plant. According to Schedule 4 of the OMRR, Class A biosolids may not contain foreign matter greater than 1% dry weight and no sharp foreign matter, such as glass or metal shards, in a size and shape that may cause injury.

Biosolids Storage

The biosolids will be stored in compliance with OMRR Part 4, Division 1, Part 17 - 19, where it states:

"17. (1). If managed organic matter, which is to be applied to land under a land application plan, is stored on a farm or at some other site, it must be stored

a. in a storage facility in accordance with the requirements of section 18, or

b. at a storage site in accordance with the requirements of section 19.

(2) Managed organic matter must only be stored on a farm if all of the managed organic matter is used on that farm.

18. A storage facility must

a. be of sufficient capacity to store all the managed organic matter to be used on the land application site for the period of time needed for its application as a fertilizer or soil conditioner,

b. be located at least 15 m from any watercourse and at 30 m from any source of water for domestic purposes, and

c. maintained in such a manner to prevent escape of the managed organic matter.

19. (1). Managed organic matter may only be stored at a storage site as follows:

a. for not more than 2 weeks if it is (i) used within 2 weeks, and (ii) stored in a manner that prevents the escape of managed organic matter:

b. for more than 2 weeks if it is (i) stored for no longer than 9 months, (ii) located at least 30 meters from any watercourse or any source of water used for domestic purposes, and (iii) stored in a manner that prevents the escape of managed organic matter.

2. Berms or other works must be constructed around the storage site if necessary to prevent the escape of managed organic matter. "

The Class A biosolids will be stored in a manner that prevents the escape of the managed organic matter.

Figure 10. Storage pile of biosolids for spring 2018 application.

The transport of the biosolids will be managed in such a way as to prevent any biosolids being deposited on any public roadways. Although odour is not expected to be a concern, the biosolids will covered with a layer of wood chips or compost if required.

Biosolids Application

Season of Application

The biosolids will be applied during the spring of 2018 to allow optimal uptake of plant available nutrients during the growing season. The total amount of biosolids to be applied during 2018 will be a maximum of 55 wet tonnes per hectare. A total of approximately 375 tonnes of Class A biosolids will be applied at this location in 2018.

Buffers

A 3 m buffer will be maintained around the perimeter of the spreading area. There is a well used for irrigation on the property. There are also domestic wells in the area.

Figure 11. Location of irrigation well on the property.

Crop Nutrient Uptake

The crops grown on this farm will be forage corn grown for cattle feed in 2018. The Class A biosolids will be land applied to optimize their value as a fertilizer and a soil conditioner.

The land application plan will be based on nitrogen for the forage corn. Phosphorus and potassium application will also be addressed.

Figure 12. Aerial view of land application site, showing the location of the biosolids spreading area.

Nitrogen Requirements

Table 12 of the "Land Application Guidelines for the Organic Matter Recycling Regulation and the Soil Amendment Code of Practice" (Ministry of the Environment 2008), provides the guidance for nitrogen requirements for forages on soils of varying fertility in various areas of the province.

Based on an average yield of 20 tonnes of dry matter per hectare of corn on a high (normal) fertility site, the nitrogen requirement is 260 kg ha^{-1} per year.

Nitrogen Based Application Rate						
Yield Expectation and Nitrogen Uptake	Total		Available	Available N		
20 tonnes dry matter/ha yield of corn[a]	260	kg N/ha				
Nitrogen Availability in Biosolids						
Ammonium in biosolids	7.6	kg/tonne	60%	4.56		
Total N in biosolids	76.9	kg/tonne				
Organic N in Biosolids	69.3	kg/tonne	30%	20.79		
				25.35	kg/tonne available	
Amount of dry biosolids	10.3	dry tonnes per hectare				
	46.6	tonnes per hectare wet application				
[a] from Table 12 of the Land Application Guide (Ministry of Environment 2008)						
from page 174 of Land Application Guide (Ministry of Environment 2008)						

Figure 13. Estimated contribution of nitrogen with the biosolids application.

The total nitrogen content of the biosolids averages 7.69 % or 76.9 kg per dry tonne (2017 JAMES Plant Biosolids Quality Data). The amount of nitrogen available in the year of application ranges from 20 to 40%. Using an average availability of 30%, each dry tonne of biosolids provides almost 25 kg of nitrogen per hectare. An application rate of 12 tonnes of dry biosolids per hectare then provides an estimated 300 kg N per hectare, which is approximately the nitrogen requirements of the crop. Our experience is that with biosolids, the nitrogen availability is less than 30%.

The biosolids will also be applied to this farm in subsequent years. The land application plan will be adjusted to allow for residual nitrogen availability from previous biosolids applications during the fall.

Phosphorus Requirements

Guidelines for the application of phosphorous are provided in Sections 10.4.1.2 and Section 13.4.3 of the "Land Application Guidelines for the Organic Matter Recycling Regulation and the Soil Amendment Code of Practice".

The phosphorus content of the Class A biosolids averages 1.11% P (Figure 8), or 2.54% P_2O_5. The application of 12 tonnes of Class A biosolids will provide approximately 305 kg P_2O_5 per hectare.

The soil analyses indicated that the phosphorus content of this farm was variable, with some areas being deficient, and other areas optimal. The soil phosphorus concentrations will continue to be monitored with subsequent biosolids applications.

Potassium

The total potassium in the biosolids were measured to be 0.08% (Figure 8), or 9.6 kg/ha. The plant available fraction of the potassium in biosolids is assumed to be 100% (Washington State Department of Ecology 2007)

Biosolids Application Rate

The application rate for the Class A biosolids is 55 wet tonnes per hectare, or 12 tonnes of dry matter per hectare based on an average moisture content of 78%. This application rate will provide an estimated 1000 kg of total N per hectare. An estimated 30% of the total nitrogen is estimated to become available to the crop in the first year. Subsequent application rates of biosolids will be adjusted as required according to the amount of soluble N remaining in the soil in the fall.

Trace Metal Applications

The application rate of 55 tonnes (12 tonnes of dry matter) per hectare of Class A biosolids will provide the following amounts of trace elements as per Figure 14 below.

		Addition	**Post**	Limits
	Metals in Soil	**from Biosolids**	**Application**	OMRR[b]
	(mg/kg)[a]	(mg/kg)	(mg/kg)	(mg/kg)
Arsenic	6.58	0.017	6.60	15
Cadmium	0.35	0.009	0.36	9
Chromium	75.67	0.186	75.85	60
Cobalt	14.83	0.014	14.85	40
Copper	31.33	3.25	34.58	150
Lead	6.42	0.120	6.54	350
Mercury	0.04	0.012	0.05	0.6
Molybdenum	0.57	0.038	0.61	5
Nickel	42.17	0.151	42.32	100
Selenium	0.83	0.027	0.85	2
Zinc	80.00	5.10	85.10	200
[a] average of 6 samples				
[b] OMRR Schedules 9 and 10 using most conservative limits				
[c] plant uptake not included in calculation				

Figure 14. Effect of a 12 tonne DM application of Class A biosolids on trace elements in the soil.

Other Inputs to the Farm

There are no other inputs of organic matter to the land on this farm. Additional fertilizer nitrogen may be required depending on the availability of the nitrogen in the biosolids. Additional potassium may be required as well.

The post application soil sampling of the fields will determine the amount of soluble nitrogen remaining in the soil before the fall rains. Future land application plans for this property will also be adjusted for post harvest soil nutrient contents.

Post Application Monitoring of the Site

Crop yields will be estimated during the growing season to verify the amount of forage harvested from the property. Post application soil samples will be taken in the fall to estimate accumulation of trace elements as well as residual nitrate in the soil. This soil information will be used to determine additional Class A biosolids applications in subsequent years.

The post application report will also provide information on actual application rates, including moisture contents of the biosolids at the time of application.

Minimizing Potential for Adverse Environmental Impacts

There are two potential adverse environmental impacts from the land application:

1. Risk of the biosolids not meeting Class A requirements

   Each batch of biosolids produced at the JAMES Treatment Plant is tested for fecal coliform before release for land application, as per OMRR requirements. This means that the biosolids are stored for 1-4 months at the JAMES Treatment Plant in order for the biosolids to meet Class A requirements for fecal coliform. For this land application plan, the biosolids met Class A requirements in November before they were delivered to the site, and have been stored for five months.

2. Risk of over application of biosolids

   The risk of over application of Class A biosolids has limited potential negative environmental effect. In the Land Application Plans, the biosolids are applied on the basis of optimizing the nitrogen value of the biosolids. Although it is possible that a higher rate of biosolids application may increase the potential for nitrogen leaching, the nitrogen in biosolids has limited availability. This must also be understood in the context of Class A biosolids growing medium, which can be applied without volume restrictions and is not applied on the basis of agronomic utilization of the nitrogen or phosphorous contained in the biosolids.

In summary, the potential adverse effects of land application of Class A biosolids are minimal, and are controlled by appropriate testing, storage and application.

Sampling and Analysis

Schedule 5 of OMRR requires that the Class A biosolids be analyzed at least every 1000 tonnes of dry weight of organic matter, or once per year. Schedule 5 also states that "All analysis must be in accordance with the procedures described in "British Columbia Laboratory Methods Manual: 2003 – for the Analysis of Water, Wastewater, Sediment, Biological Material and Discrete Ambient Air Samples""

The City of Abbotsford follows the requirements of Schedule 5 of OMRR: The following represents their sampling schedule:

JAMES Biosolids Testing Schedule (Biosolids prior to centrifugation)

Weekly Testing:

- *Total Metals (including total Mercury)*
- *Fecal Coliform (reported as MPN/g dry weight)*
- *Salmonella*

Monthly Testing:

- *Total Metals (including total Mercury)*
- *Total Phosphorus (%)*
- *Total Kjeldahl Nitrogen (%)*
- *Total Potassium (%)*
- *Total Sulphur (%)*
- *Total Carbon (%)*
- *Total Organic Matter (%)*
- *Moisture (%)*
- *Ammonia (available - %)*
- *Nitrate (available – mg/kg)*
- *pH*
- *Conductivity*
- *C/N Ratio*

JAMES Biosolids Testing Schedule (Biosolids after centrifugation - Stored)

Monthly Testing:

- *Fecal Coliform (reported as MPN/g dry weight)*

Additional testing (Fecal Coliform only) will be done on the biosolids after storage and before it is released to ensure that it meets Class A.

Biocentral will be taking random sampling to ensure that the biosolids meet Class A standards.

Record Keeping

The City of Abbotsford records temperatures and retention times for the production of Class A biosolids, as per Schedule 6 (1) of the OMRR. All records for the production of the Class A biosolids will be stored at the JAMES Wastewater Treatment Plant for a minimum of 36 months, as per Schedule 6 (2) and (3).

The Land Application Plan, and all associated information will be kept at the Land Application Site, and will also be stored at the offices of the Qualified Professional, as well as at Biocentral's offices.

Role of the Qualified Professional

The qualified professional will oversee the storage and land application of the biosolids, including site inspections of the actual land application. He may also request plant yield data, as well as direct post harvest soil sampling to determine the post sampling soil concentrations of nutrients and trace elements. The qualified professional reserves the right to request verification of the Class A status of the biosolids at any time.

Summary

This Land Application Plan provides a beneficial reuse of Class A biosolids, which are a valuable source of nitrogen, phosphorus, micronutrients and organic matter. The risk of environmental concern at this location is very low because of the quality of the Class A biosolids being applied and the proximity to water bodies and water sources.

Storage and transportation of the Class A biosolids is also not considered a concern because of the low fecal coliform count and the lack of significant odour in the biosolids.

This Land Application Plan was prepared by:

John Paul, PhD PAg

References

British Columbia Ministry of the Environment. 2008. Land Application Guidelines for the Organic Matter Recycling Regulation and the Soil Amendment Code of Practice, Best Management Practices. Document # 758-08, Sylvis Environmental.

Kelly, C.C and R.H. Spilsbury. 1939. Soil Survey of the Lower Fraser Valley. British Columbia Department of Agriculture. Publication 650, Technical Bulletin 20.

Oregon State University. 2007. Fertilizing with Biosolids. PNW 508-E, Revised June 2007 http://www.ecy.wa.gov/programs/swfa/biosolids/pdf/Fertilizing.pdf

BRITISH COLUMBIA Ministry of Environment

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 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 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 of Environment 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 Branch PO Box 9377 Stn Prov Govt Victoria, BC V8W 9M1 **Email:** PermitAdministration.VictoriaEPD@gov.bc.ca	Ministry of Environment Environmental Protection Division Business Services Branch 3rd Floor, 2975 Jutland Road Victoria, BC V8T 5J9

Section 1: Purpose of Notification

***Application Type** (check one)	☒ New notification ☐ Change in information to an existing notification (provide authorization #)	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*				2
OR * **Individual's Full Legal Name**	Bill Klop			3
Doing Business As *if applicable*	Bileena Holsteins			4
Incorporation Number *as registered with the BC Registrar of Companies (if applicable)*				5
***Contact Numbers** *e.g. (999) 999-9999*	Phone: 604 799 3242	Mobile:		6
***Email Address** *generic company email address*	bileena@telus.net			7
***Legal Address** *as registered with BC Registrar of Companies*	Unit # / Street: 1750 School Rd			8
	City: Harrison Mills (Agassiz)	Province: BC	Postal Code: V0M 1L0	9

***Mailing Address** *if different from above*	☐ Same as Legal Address			10
	Unit # / Street 1953 Cameron Rd			11
	City Agassiz	Province BC	Postal Code V0M 1A3	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*				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	Klop			1
Contact's First Name	Bill			2
Contact's Title				3
Mailing Address	☒ Mailing address is the same as Section 2 above			4
	Unit # / Street			5
	City	Province	Postal Code	6
Contact Numbers *e.g. (999) 999-9999*	Phone	Mobile 604-799-3242		7
Email Address	bileena@telus.net			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*	Transform Compost Systems Ltd.			1
Doing Business As *if different than above*				2
Agent's Last Name	Paul			3
Agent's First Name	John			4
Agent's Title	President			5
Mailing Address	Unit # / Street 3911 Mt. Lehman Rd			6
	City Abbotsford	Province BC	Postal Code V2T 5W5	7
Contact Numbers *e.g. (999) 999-9999*	Phone 604-856-2722	Mobile 604-302-4367		8
Email Address	transform@telus.net			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*	Bill W. Klop	10
Date signed	Sept 25/2017	11
Signature of the Registrant	Bill Klop	12

Section 5: Schedule 13 - Land Application Location

FOR INTERNAL USE ONLY:
- Use Primary BCENIC of 569990 – Waste treatment – land application of solids
- Waste Discharge Regulation Schedule: 2 "soil enhancement using wastes"

***Regional District**	Fraser Valley Regional District		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 49.2365	Longitude (e.g., 116.8177) W 121.9433	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 D, New Westminster District Plan NWP4294 Scowlitz IR # 1		4
PID/PIN/Crown File No.	PID 009-539-026		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)* 1750 School Rd, Harrison Mills BC V0M 1A0		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	Bill Klop	5

Legal Land Owner Contact Numbers *e.g. (999) 999-9999*	Phone: Bill Klop	Mobile: 604-799-3242	6
Legal Land Owner Email Address	bileena@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**	No	12
***Description of the managed organic matter to be applied**	Class A biosolids	13

***Intended date(s) for land application for that year**	2018-04-15 (yyyy-mm-dd)		14
***Application rates**	12 dt/hectare		15
	dt/hectare		16
	dt/hectare		17
***Cumulative additions for that year of substances listed in Schedule 4 of the Organic Matter Recycling Regulation**	**Substance**	**Concentration (µg/g dry weight)**	18
	Arsenic	0.02	
	Cadmium	0.009	
	Chromium	0.173	
	Cobalt	0.013	
	Copper	3.37	
	Lead	0.125	
	Mercury	0.011	
	Molybdenum	0.051	
	Nickel	0.102	
	Selenium	0.027	
	Zinc	5.32	
***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:

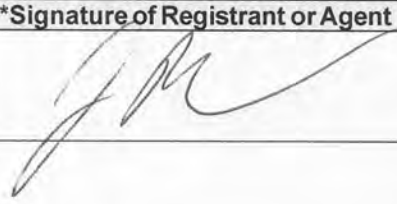
   a) this registration form,
   b) any document that the Registrant submits or causes to be submitted to the Province or the Director in support of this registration, and
   c) any document that the Registrant submits or causes to be submitted to the Director or the Province pursuant to
      i. any regulation 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.

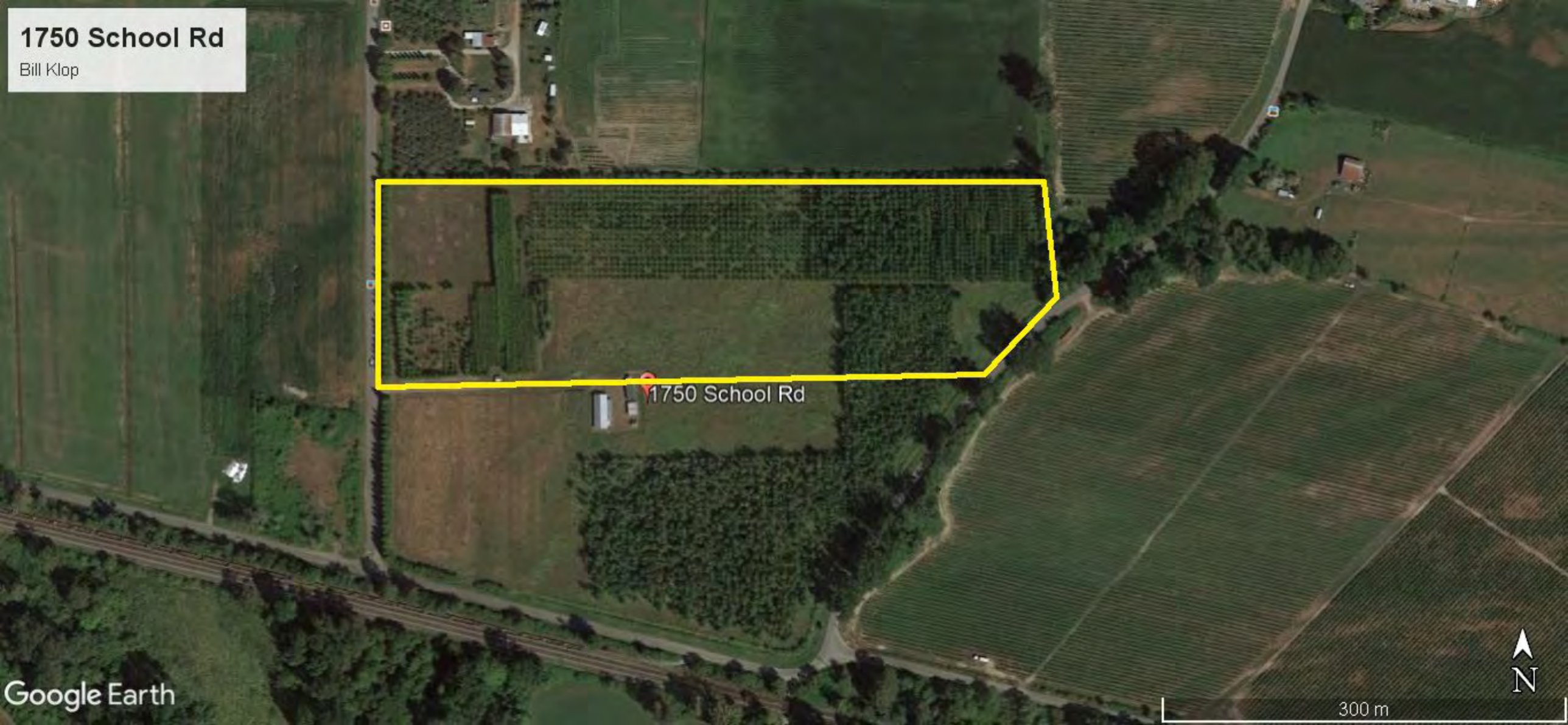
2. In consideration of the Province receiving this registration form, subject to paragraph 3, the Registrant hereby irrevocably authorizes the Province to publish on the Ministry of Environment website the entirety of any Regulatory Document.

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
John Paul		November 30 2017


1750 School Rd
Bill Klop
1750 School Rd
Google Earth
300 m
N


1750 School Rd
Soil sampling March 2018
Legend
Crop perimeter
Sampling point
S1
S2
S3
S4
S5
S6
School Rd
Mill Rd
Google Earth
© 2018 Google
200 m
N

Appendix B

Exova
#104, 19575-55 A Ave.
Surrey, British Columbia
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T: +1 (604) 514-3322
F: +1 (604) 514-3323
E: Surrey@exova.com
W: www.exova.com

Report Transmission Cover Page

Bill To:	Timbro Contracting (A	Project ID:	James	Lot ID:	**1260221**
	P.O. Box 95	Project Name:	1750 School Rd	Control Number:	C117483
	7357 Pioneer Avenue	Project Location:	Harrison Mills	Date Received:	Mar 17, 2018
	Agassiz, BC, Canada	LSD:		Date Reported:	Mar 28, 2018
	V0M 1A0	P.O.:	14132	Report Number:	2274100
Attn:	Accounts Payable	Proj. Acct. code:			
Sampled By:	Andres M.				
Company:	Biocentral				

Contact	Company	Address
Accounts Payable	**Timbro Contracting (A Partnership)**	P.O. Box 95, 7357 Pioneer Avenue Agassiz, BC V0M 1A0 Phone: (604) 796-3851 Fax: (604) 796-0554 Email: info@timbroconstruction.com

Delivery	Format	Deliverables
Email - Single Report	PDF	Invoice

Contact	Company	Address
Andres Moreno	**Timbro Contracting (A Partnership)**	P.O. Box 95, 7357 Pioneer Avenue Agassiz, BC V0M 1A0 Phone: (604) 796-3851 Fax: (604) 796-0554 Email: andresm@biocentral.ca

Delivery	Format	Deliverables
Email - Merge Reports	PDF	COC / Test Report
Email - Single Report	Standard Crosstab	Test Report

Contact	Company	Address
Frank Trevr	**Timbro Contracting (A Partnership)**	P.O. Box 95, 7357 Pioneer Avenue Agassiz, BC V0M 1A0 Phone: (604) 991-3782 Fax: Email: frank@timbroconstruction.com

Delivery	Format	Deliverables
Email - Merge Reports	PDF	COC / Test Report
Email - Single Report	Standard Crosstab	Test Report

Notes To Clients:

- Mar 28, 2018 - Report was issued to correct for missing metal analysis on samples 1260221-1 to 6. Previous report 2271666.

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V3S 8P8, Canada

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E: Surrey@exova.com
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Analytical Report

Bill To:	Timbro Contracting (A	Project ID:	James	Lot ID:	**1260221**
	P.O. Box 95	Project Name:	1750 School Rd	Control Number:	C117483
	7357 Pioneer Avenue	Project Location:	Harrison Mills	Date Received:	Mar 17, 2018
	Agassiz, BC, Canada	LSD:		Date Reported:	Mar 28, 2018
	V0M 1A0	P.O.:	14132	Report Number:	2274100
Attn:	Accounts Payable	Proj. Acct. code:			
Sampled By:	Andres M.				
Company:	Biocentral				

Reference Number	1260221-19716	1260221-19717	1260221-19718
Sample Date	Mar 16, 2018	Mar 16, 2018	Mar 16, 2018
Sample Time	NA	NA	NA
Sample Location			
Sample Description	James - 1750 School Rd / S1 / 0 / 5 / E / 1	James - 1750 School Rd / S2 / 0 / 5 / E / 1	James - 1750 School Rd / S3 / 0 / 5 / E / 1
Matrix	Farm Soil	Farm Soil	Farm Soil

Analyte		Units	Results	Results	Results	Nominal Detection Limit
Aggregate Organic Constituents						
Organic Matter	LOI	% by weight	2.3	2.8	5.0	0.1
Available Nutrients						
Nitrate - N	Farmsoil	ppm	3	4	5	2
Phosphorus	Farmsoil	ppm	70	76	9	5
Potassium	Farmsoil	ppm	143	104	184	25
Sulfate-S	Farmsoil	ppm	<1	2	3	1
Copper	FS Micro-nutrients	ppm	1.0	1.2	2.2	0.1
Iron	FS Micro-nutrients	ppm	67.5	82.4	167	2
Manganese	FS Micro-nutrients	ppm	1.5	2.0	5.6	0.1
Zinc	FS Micro-nutrients	ppm	0.7	<0.5	0.5	0.5
Base saturation	FS Base Saturation	%	60	100.0	84.4	
Calcium	FS Base Saturation	%	50	92.9	75.1	
Magnesium	FS Base Saturation	%	5.8	4.5	5.6	
Sodium	FS Base Saturation	%	<1.5	<1.3	<1.0	
Potassium	FS Base Saturation	%	4.1	2.7	3.7	
TEC	FS Base Saturation	meq/100 g	8.9	10.1	12.8	
Calcium	FS Macro-nutrients	ppm	891	1880	1940	30
Magnesium	FS Macro-nutrients	ppm	63	55	88	5
Sodium	FS Macro-nutrients	ppm	<30	<30	<30	30
Boron	FS Micro-nutrients	ppm	0.2	0.2	0.3	0.1
Classification						
Nitrogen	Total	%	0.15	0.14	0.23	0.02
Hot Water Soluble						
Boron	FS Micro-nutrients	ppm	0.2	0.2	0.3	0.1
Metals Strong Acid Digestion						
Antimony	Strong Acid Extractable	µg/g	2	3	3	1.5
Arsenic	Strong Acid Extractable	µg/g	4.7	6.3	9.0	0.35
Barium	Strong Acid Extractable	µg/g	88	110	160	0.2
Beryllium	Strong Acid Extractable	µg/g	0.32	0.39	0.53	0.01
Cadmium	Strong Acid Extractable	µg/g	0.3	0.4	0.4	0.05
Chromium	Strong Acid Extractable	µg/g	58	71	89	0.1
Cobalt	Strong Acid Extractable	µg/g	12	14	16	0.1
Copper	Strong Acid Extractable	µg/g	23	29	37	0.1
Lead	Strong Acid Extractable	µg/g	4	5.8	8.1	0.5
Mercury	Strong Acid Extractable	µg/g	0.026	0.031	0.049	0.003
Molybdenum	Strong Acid Extractable	µg/g	0.5	0.4	0.90	0.1
Nickel	Strong Acid Extractable	µg/g	35	40	46	0.25

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Analytical Report

Bill To:	Timbro Contracting (A	Project ID:	James	Lot ID:	**1260221**
	P.O. Box 95	Project Name:	1750 School Rd	Control Number:	C117483
	7357 Pioneer Avenue	Project Location:	Harrison Mills	Date Received:	Mar 17, 2018
	Agassiz, BC, Canada	LSD:		Date Reported:	Mar 28, 2018
	V0M 1A0	P.O.:	14132	Report Number:	2274100
Attn:	Accounts Payable	Proj. Acct. code:			
Sampled By:	Andres M.				
Company:	Biocentral				

Reference Number	1260221-19716	1260221-19717	1260221-19718
Sample Date	Mar 16, 2018	Mar 16, 2018	Mar 16, 2018
Sample Time	NA	NA	NA
Sample Location			
Sample Description	James - 1750 School Rd / S1 / 0 / 5 / E / 1	James - 1750 School Rd / S2 / 0 / 5 / E / 1	James - 1750 School Rd / S3 / 0 / 5 / E / 1
Matrix	Farm Soil	Farm Soil	Farm Soil

Analyte		Units	Results	Results	Results	Nominal Detection Limit
Metals Strong Acid Digestion - Continued						
Phosphorus	Strong Acid Extractable	µg/g	770	870	800	0.5
Potassium	Strong Acid Extractable	µg/g	830	860	1200	2
Selenium	Strong Acid Extractable	µg/g	1	<0.5	0.7	0.5
Silver	Strong Acid Extractable	µg/g	<0.4	0.91	<0.4	0.4
Strontium	Strong Acid Extractable	µg/g	25	31	37	0.05
Thallium	Strong Acid Extractable	µg/g	<0.5	<0.5	<0.5	0.5
Tin	Strong Acid Extractable	µg/g	<0.5	<0.5	<0.5	0.5
Vanadium	Strong Acid Extractable	µg/g	63	75	89	0.2
Zinc	Strong Acid Extractable	µg/g	59	69	93	0.05
Soil Acidity						
pH	1:2 Soil:Water	pH	6.2	7.0	6.8	
Electrical Conductivity	Sat. Paste equiv based on 1:2	dS/m at 25 °C	0.08	0.2	0.2	0.02
Water Soluble Parameters						
Chloride	Available	mg/kg	4	18	0.8	0.5
Lime Requirement						
pH	SMP	pH	6.6	Not Required	6.8	
Lime		T/ac	1	0	0	

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Analytical Report

Bill To:	Timbro Contracting (A	Project ID:	James	Lot ID:	**1260221**
	P.O. Box 95	Project Name:	1750 School Rd	Control Number:	C117483
	7357 Pioneer Avenue	Project Location:	Harrison Mills	Date Received:	Mar 17, 2018
	Agassiz, BC, Canada	LSD:		Date Reported:	Mar 28, 2018
	V0M 1A0	P.O.:	14132	Report Number:	2274100
Attn:	Accounts Payable	Proj. Acct. code:			
Sampled By:	Andres M.				
Company:	Biocentral				

Reference Number	1260221-19719	1260221-19720	1260221-19721
Sample Date	Mar 16, 2018	Mar 16, 2018	Mar 16, 2018
Sample Time	NA	NA	NA
Sample Location			
Sample Description	James - 1750 School Rd / S4 / 0 / 5 / E / 1	James - 1750 School Rd / S5 / 0 / 5 / E / 1	James - 1750 School Rd / S6 / 0 / 5 / E / 1
Matrix	Farm Soil	Farm Soil	Farm Soil

Analyte		Units	Results	Results	Results	Nominal Detection Limit
Aggregate Organic Constituents						
Organic Matter	LOI	% by weight	3.9	3.8	2.7	0.1
Available Nutrients						
Nitrate - N	Farmsoil	ppm	4	3	5	2
Phosphorus	Farmsoil	ppm	8	9	53	5
Potassium	Farmsoil	ppm	102	102	180	25
Sulfate-S	Farmsoil	ppm	2	<1	3	1
Copper	FS Micro-nutrients	ppm	1.6	1.6	1.6	0.1
Iron	FS Micro-nutrients	ppm	105	90.6	83.8	2
Manganese	FS Micro-nutrients	ppm	1.5	2.5	5.4	0.1
Zinc	FS Micro-nutrients	ppm	<0.5	0.6	2.0	0.5
Base saturation	FS Base Saturation	%	100	100	100.0	
Calcium	FS Base Saturation	%	93.5	90.8	87.2	
Magnesium	FS Base Saturation	%	4.3	6.9	8.7	
Sodium	FS Base Saturation	%	<1.1	<1.2	<1.2	
Potassium	FS Base Saturation	%	2.2	2.4	4.1	
TEC	FS Base Saturation	meq/100 g	12.0	11.1	11.3	
Calcium	FS Macro-nutrients	ppm	2260	2010	1980	30
Magnesium	FS Macro-nutrients	ppm	63	92	120	5
Sodium	FS Macro-nutrients	ppm	<30	<30	<30	30
Boron	FS Micro-nutrients	ppm	0.3	0.3	0.3	0.1
Classification						
Nitrogen	Total	%	0.19	0.18	0.18	0.02
Hot Water Soluble						
Boron	FS Micro-nutrients	ppm	0.3	0.3	0.3	0.1
Metals Strong Acid Digestion						
Antimony	Strong Acid Extractable	µg/g	3	3	2	1.5
Arsenic	Strong Acid Extractable	µg/g	7.3	6.7	5.5	0.35
Barium	Strong Acid Extractable	µg/g	150	160	120	0.2
Beryllium	Strong Acid Extractable	µg/g	0.50	0.48	0.35	0.01
Cadmium	Strong Acid Extractable	µg/g	0.3	0.4	0.3	0.05
Chromium	Strong Acid Extractable	µg/g	85	85	66	0.1
Cobalt	Strong Acid Extractable	µg/g	16	17	14	0.1
Copper	Strong Acid Extractable	µg/g	35	35	29	0.1
Lead	Strong Acid Extractable	µg/g	8.0	7.4	5.2	0.5
Mercury	Strong Acid Extractable	µg/g	0.047	0.047	0.042	0.003
Molybdenum	Strong Acid Extractable	µg/g	0.83	0.4	0.4	0.1
Nickel	Strong Acid Extractable	µg/g	45	45	42	0.25

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Analytical Report

Bill To:	Timbro Contracting (A	Project ID:	James	Lot ID:	**1260221**
	P.O. Box 95	Project Name:	1750 School Rd	Control Number:	C117483
	7357 Pioneer Avenue	Project Location:	Harrison Mills	Date Received:	Mar 17, 2018
	Agassiz, BC, Canada	LSD:		Date Reported:	Mar 28, 2018
	V0M 1A0	P.O.:	14132	Report Number:	2274100
Attn:	Accounts Payable	Proj. Acct. code:			
Sampled By:	Andres M.				
Company:	Biocentral				

Reference Number	1260221-19719	1260221-19720	1260221-19721
Sample Date	Mar 16, 2018	Mar 16, 2018	Mar 16, 2018
Sample Time	NA	NA	NA
Sample Location			
Sample Description	James - 1750 School Rd / S4 / 0 / 5 / E / 1	James - 1750 School Rd / S5 / 0 / 5 / E / 1	James - 1750 School Rd / S6 / 0 / 5 / E / 1
Matrix	Farm Soil	Farm Soil	Farm Soil

Analyte		Units	Results	Results	Results	Nominal Detection Limit
Metals Strong Acid Digestion - Continued						
Phosphorus	Strong Acid Extractable	µg/g	700	780	920	0.5
Potassium	Strong Acid Extractable	µg/g	1000	1100	970	2
Selenium	Strong Acid Extractable	µg/g	0.6	<0.5	1	0.5
Silver	Strong Acid Extractable	µg/g	<0.4	<0.4	<0.4	0.4
Strontium	Strong Acid Extractable	µg/g	41	48	40	0.05
Thallium	Strong Acid Extractable	µg/g	<0.5	<0.5	<0.5	0.5
Tin	Strong Acid Extractable	µg/g	<0.5	<0.5	<0.5	0.5
Vanadium	Strong Acid Extractable	µg/g	86	84	69	0.2
Zinc	Strong Acid Extractable	µg/g	85	93	81	0.05
Soil Acidity						
pH	1:2 Soil:Water	pH	7.0	7.0	7.0	
Electrical Conductivity	Sat. Paste equiv based on 1:2	dS/m at 25 °C	0.21	0.1	0.2	0.02
Water Soluble Parameters						
Chloride	Available	mg/kg	5	4	4	0.5
Lime Requirement						
pH	SMP	pH	Not Required	Not Required	Not Required	
Lime		T/ac	0	0	0	

Approved by:

Mathieu Simoneau
Operations Manager

Data have been validated by Analytical Quality Control and Exova's Integrated Data Validation System (IDVS).
Generation and distribution of the report, and approval by the digitized signature above, are performed through a secure and controlled automatic process.

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Surrey, British Columbia
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F: +1 (604) 514-3323
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W: www.exova.com

Quality Control

Bill To:	Timbro Contracting (A	Project ID:	James	Lot ID:	**1260221**
	P.O. Box 95	Project Name:	1750 School Rd	Control Number:	C117483
	7357 Pioneer Avenue	Project Location:	Harrison Mills	Date Received:	Mar 17, 2018
	Agassiz, BC, Canada	LSD:		Date Reported:	Mar 28, 2018
	V0M 1A0	P.O.:	14132	Report Number:	2274100
Attn:	Accounts Payable	Proj. Acct. code:			
Sampled By:	Andres M.				
Company:	Biocentral				

Aggregate Organic Constituents

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Organic Matter	% by weight	17.0	17.1	10	0.1	yes
Date Acquired:	March 21, 2018					

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Organic Matter	% by weight	4.9	4.2	5.7	yes
Date Acquired:	March 21, 2018				

Available Nutrients

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Nitrate - N	mg/L	0.085	-1	1	yes
Phosphorus	mg/L	0.056	-4	5	yes
Potassium	mg/L	-0.225	-3	10	yes
Sulfate-S	mg/L	0.449	-1	1	yes
Copper	mg/L	0.0132	-0.1	0.1	yes
Iron	mg/L	0.0868	-2.0	2.0	yes
Manganese	mg/L	0.0039	-0.1	0.1	yes
Zinc	mg/L	0.0104	-0.5	0.5	yes
Calcium	mg/L	0.7181	-1	3	yes
Magnesium	mg/L	0.1219	-0	0	yes
Sodium	mg/L	1.418	-1	3	yes
Boron	mg/L	0.0168297	-0.2	0.2	yes
Date Acquired:	March 21, 2018				

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Nitrate - N	ppm	5	4	10	2	yes
Phosphorus	ppm	57	56	10	5	yes
Potassium	ppm	95	87	10	10	yes
Sulfate-S	ppm	<1	<1	15	2	yes
Copper	ppm	4.6	4.5	10	0.1	yes
Iron	ppm	204	203	10	0.1	yes
Manganese	ppm	5.6	5.5	10	0.0	yes
Zinc	ppm	4.0	4.0	10	0.0	yes
Calcium	ppm	2300	2250	10	3	yes
Magnesium	ppm	32	31	10	3	yes
Sodium	ppm	<30	<30	10	18	yes
Boron	ppm	0.5	0.5	10	0.1	yes
Date Acquired:	March 21, 2018					

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Nitrate - N	ppm	36	29	40	yes
Phosphorus	ppm	30	27	34	yes
Potassium	ppm	201	168	224	yes
Sulfate-S	ppm	729	620	770	yes
Copper	ppm	1.8	1.5	1.9	yes
Iron	ppm	197	154.3	213.7	yes
Manganese	ppm	46.9	35.8	52.1	yes

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Quality Control

Bill To:	Timbro Contracting (A	Project ID:	James	Lot ID:	**1260221**
	P.O. Box 95	Project Name:	1750 School Rd	Control Number:	C117483
	7357 Pioneer Avenue	Project Location:	Harrison Mills	Date Received:	Mar 17, 2018
	Agassiz, BC, Canada	LSD:		Date Reported:	Mar 28, 2018
	V0M 1A0	P.O.:	14132	Report Number:	2274100
Attn:	Accounts Payable	Proj. Acct. code:			
Sampled By:	Andres M.				
Company:	Biocentral				

Available Nutrients - Continued

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Zinc	ppm	3.4	2.8	3.8	yes
Calcium	ppm	6310	5530	6752	yes
Magnesium	ppm	596	495	670	yes
Sodium	ppm	88	68	94	yes
Boron	ppm	1.1	0.8	1.5	yes
Date Acquired:	March 21, 2018				
Nitrate - N	ppm	4	3	4	yes
Phosphorus	ppm	3	2	4	yes
Potassium	ppm	31	24	36	yes
Sulfate-S	ppm	1	1	1	yes
Copper	ppm	0.5	0.4	0.6	yes
Iron	ppm	5.2	4.5	5.5	yes
Manganese	ppm	1.0	0.9	1.1	yes
Zinc	ppm	0.5	0.4	0.6	yes
Calcium	ppm	11	9	11	yes
Magnesium	ppm	10	9	11	yes
Sodium	ppm	10	9	11	yes
Boron	ppm	0.1	0.1	0.1	yes
Date Acquired:	March 21, 2018				
Sulfate-S	ppm	53	40	60	yes
Date Acquired:	March 21, 2018				

Classification

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Nitrogen		0.01141	-0.020	0.020	yes
Date Acquired:	March 20, 2018				

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Nitrogen	%	0.81	0.76	0	2.500	yes
Date Acquired:	March 20, 2018					

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Nitrogen	%	0.52	0.465	0.551	yes
Date Acquired:	March 20, 2018				

Hot Water Soluble

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Boron	mg/L	0.0173536	-0.2	0.2	yes
Date Acquired:	March 21, 2018				

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Boron	ppm	0.4	0.4	10	0.1	yes
Date Acquired:	March 21, 2018					

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Boron	ppm	1.2	0.8	1.5	yes
Date Acquired:	March 21, 2018				

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W: www.exova.com

Quality Control

Bill To:	Timbro Contracting (A	Project ID:	James	Lot ID:	**1260221**
	P.O. Box 95	Project Name:	1750 School Rd	Control Number:	C117483
	7357 Pioneer Avenue	Project Location:	Harrison Mills	Date Received:	Mar 17, 2018
	Agassiz, BC, Canada	LSD:		Date Reported:	Mar 28, 2018
	V0M 1A0	P.O.:	14132	Report Number:	2274100
Attn:	Accounts Payable	Proj. Acct. code:			
Sampled By:	Andres M.				
Company:	Biocentral				

Hot Water Soluble - Continued

Lime Requirement

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
pH	pH	7.3	7.2	7.3	yes
Date Acquired:	March 21, 2018				

Metals Strong Acid Digestion

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Antimony	mg/L	-0.000457259	-0.030	0.030	yes
Arsenic	mg/L	-0.00681021	-0.007	0.007	yes
Barium	mg/L	0.000364058	-0.004	0.004	yes
Beryllium	mg/L	8.8897e-006	-0.000	0.000	yes
Cadmium	mg/L	0.000506602	-0.001	0.001	yes
Chromium	mg/L	0.00121838	-0.002	0.002	yes
Cobalt	mg/L	0.00018497	-0.002	0.002	yes
Copper	mg/L	0.000561406	-0.002	0.002	yes
Lead	mg/L	0.00031064	-0.010	0.010	yes
Mercury	µg/L	-0.009	-0.030	0.030	yes
Molybdenum	mg/L	-0.00165603	-0.002	0.002	yes
Nickel	mg/L	0.00163925	-0.005	0.005	yes
Phosphorus	mg/L	0.00141149	-0.010	0.010	yes
Selenium	mg/L	0.00427062	-0.010	0.010	yes
Silver	mg/L	0.000747588	-0.008	0.008	yes
Strontium	mg/L	9.63792e-005	-0.000	0.000	yes
Thallium	mg/L	-0.00544639	-0.010	0.010	yes
Tin	mg/L	-0.00101922	-0.010	0.010	yes
Vanadium	mg/L	-0.000491746	-0.004	0.004	yes
Zinc	mg/L	0.000670545	-0.001	0.001	yes
Date Acquired:	March 21, 2018				

Calibration Check	Units	% Recovery	Lower Limit	Upper Limit	Passed QC
Antimony	mg/L	92.75	90	110	yes
Arsenic	mg/L	99.77	90	110	yes
Barium	mg/L	100.62	90	110	yes
Beryllium	mg/L	95.64	90	110	yes
Cadmium	mg/L	98.42	90	110	yes
Chromium	mg/L	99.43	90	110	yes
Cobalt	mg/L	97.78	90	110	yes
Copper	mg/L	100.17	90	110	yes
Lead	mg/L	95.05	90	110	yes
Molybdenum	mg/L	97.38	90	110	yes
Nickel	mg/L	95.39	90	110	yes
Phosphorus	mg/L	99.62	90	110	yes
Selenium	mg/L	99.53	90	110	yes
Silver	mg/L	96.35	90	110	yes
Thallium	mg/L	94.80	90	110	yes

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Quality Control

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	P.O. Box 95	Project Name:	1750 School Rd	Control Number:	C117483
	7357 Pioneer Avenue	Project Location:	Harrison Mills	Date Received:	Mar 17, 2018
	Agassiz, BC, Canada	LSD:		Date Reported:	Mar 28, 2018
	V0M 1A0	P.O.:	14132	Report Number:	2274100
Attn:	Accounts Payable	Proj. Acct. code:			
Sampled By:	Andres M.				
Company:	Biocentral				

Metals Strong Acid Digestion - Continued

Calibration Check	Units	% Recovery	Lower Limit	Upper Limit	Passed QC
Tin	mg/L	92.47	90	110	yes
Vanadium	mg/L	100.00	90	110	yes
Zinc	mg/L	93.78	90	110	yes
Date Acquired:	March 21, 2018				
Antimony	mg/L	91.35	90	110	yes
Arsenic	mg/L	101.01	90	110	yes
Barium	mg/L	100.35	90	110	yes
Beryllium	mg/L	94.49	90	110	yes
Cadmium	mg/L	100.38	90	110	yes
Chromium	mg/L	100.00	90	110	yes
Cobalt	mg/L	99.21	90	110	yes
Copper	mg/L	101.15	90	110	yes
Lead	mg/L	98.13	90	110	yes
Mercury	µg/L	92.60	90	110	yes
Molybdenum	mg/L	98.05	90	110	yes
Nickel	mg/L	98.98	90	110	yes
Phosphorus	mg/L	99.88	90	110	yes
Selenium	mg/L	106.38	90	110	yes
Silver	mg/L	93.29	90	110	yes
Strontium	mg/L	97.60	90	110	yes
Thallium	mg/L	96.23	90	110	yes
Tin	mg/L	93.02	90	110	yes
Vanadium	mg/L	99.75	90	110	yes
Zinc	mg/L	94.61	90	110	yes
Date Acquired:	March 21, 2018				

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Antimony	µg/g	3	4	30	3.000	yes
Arsenic	µg/g	6.0	6.4	30	1.750	yes
Barium	µg/g	130	130	30	1.000	yes
Beryllium	µg/g	0.47	0.48	30	0.050	yes
Cadmium	µg/g	0.4	0.4	30	0.250	yes
Chromium	µg/g	80	81	30	0.500	yes
Cobalt	µg/g	13	15	30	0.500	yes
Copper	µg/g	42	43	30	0.500	yes
Lead	µg/g	7.8	8.1	30	2.500	yes
Mercury	µg/g	0.049	0.060	30	0.500	yes
Molybdenum	µg/g	0.58	0.59	30	0.500	yes
Nickel	µg/g	40	43	30	1.250	yes
Selenium	µg/g	0.8	<0.5	30	2.500	yes
Silver	µg/g	<0.4	<0.4	30	2.000	yes
Strontium	µg/g	26	26	30	0.250	yes
Thallium	µg/g	<0.5	<0.5	30	2.500	yes
Tin	µg/g	<0.5	0.5	30	2.500	yes

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Quality Control

Bill To:	Timbro Contracting (A	Project ID:	James	Lot ID:	**1260221**
	P.O. Box 95	Project Name:	1750 School Rd	Control Number:	C117483
	7357 Pioneer Avenue	Project Location:	Harrison Mills	Date Received:	Mar 17, 2018
	Agassiz, BC, Canada	LSD:		Date Reported:	Mar 28, 2018
	V0M 1A0	P.O.:	14132	Report Number:	2274100
Attn:	Accounts Payable	Proj. Acct. code:			
Sampled By:	Andres M.				
Company:	Biocentral				

Metals Strong Acid Digestion - Continued

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Vanadium	µg/g	83	85	30	1.000	yes
Zinc	µg/g	97	100	30	0.250	yes
Date Acquired:	March 21, 2018					

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Antimony	µg/g	<1	0.040	2.080	yes
Arsenic	µg/g	4.8	2.940	5.520	yes
Barium	µg/g	170	139.210	174.790	yes
Beryllium	µg/g	0.53	0.405	0.603	yes
Cadmium	µg/g	0.2	0.101	0.341	yes
Chromium	µg/g	32	19.940	36.620	yes
Cobalt	µg/g	7.1	4.970	8.870	yes
Copper	µg/g	16	12.330	17.430	yes
Lead	µg/g	7.4	5.500	11.320	yes
Mercury	µg/g	0.024	0.012	0.034	yes
Molybdenum	µg/g	0.4	0.252	0.828	yes
Nickel	µg/g	20	16.430	23.720	yes
Phosphorus	µg/g	620	489.000	693.000	yes
Strontium	µg/g	74	59.580	83.220	yes
Tin	µg/g	<0.5	0.104	0.938	yes
Vanadium	µg/g	37	25.800	48.600	yes
Zinc	µg/g	60	46.370	66.830	yes
Date Acquired:	March 21, 2018				

Soil Acidity

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
pH	pH	6.18	5.6	7.2	yes
Electrical Conductivity	dS/m at 25 °C	0.0161	-0.04	0.08	yes
Date Acquired:	March 21, 2018				

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
pH	pH	6.5	6.5	0	0.3	yes
Electrical Conductivity	dS/m at 25 °C	0.2	0.2	10	0.04	yes
Date Acquired:	March 21, 2018					

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
pH	pH	7.3	6.3	8.6	yes
Electrical Conductivity	dS/m at 25 °C	2.65	2.13	3.09	yes
Date Acquired:	March 21, 2018				

Water Soluble Parameters

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Chloride	mg/L	0.38	-0.0	0.6	yes
Date Acquired:	March 21, 2018				

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Chloride	mg/kg	4	4	10	1.0	yes

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Quality Control

Bill To:	Timbro Contracting (A	Project ID:	James	Lot ID:	**1260221**
	P.O. Box 95	Project Name:	1750 School Rd	Control Number:	C117483
	7357 Pioneer Avenue	Project Location:	Harrison Mills	Date Received:	Mar 17, 2018
	Agassiz, BC, Canada	LSD:		Date Reported:	Mar 28, 2018
	V0M 1A0	P.O.:	14132	Report Number:	2274100
Attn:	Accounts Payable	Proj. Acct. code:			
Sampled By:	Andres M.				
Company:	Biocentral				

Water Soluble Parameters - Continued

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Date Acquired: March 21, 2018						
Control Sample	**Units**	**Measured**	**Lower Limit**	**Upper Limit**		**Passed QC**
Chloride	mg/kg	37	30.0	40.8		yes
Date Acquired: March 21, 2018						
Chloride	mg/kg	4.6	4.4	5.6		yes
Date Acquired: March 21, 2018						

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Methodology and Notes

Bill To:	Timbro Contracting (A	Project ID:	James	Lot ID:	**1260221**
	P.O. Box 95	Project Name:	1750 School Rd	Control Number:	C117483
	7357 Pioneer Avenue	Project Location:	Harrison Mills	Date Received:	Mar 17, 2018
	Agassiz, BC, Canada	LSD:		Date Reported:	Mar 28, 2018
	V0M 1A0	P.O.:	14132	Report Number:	2274100
Attn:	Accounts Payable	Proj. Acct. code:			
Sampled By:	Andres M.				
Company:	Biocentral				

Method of Analysis

Method Name	Reference		Method	Date Analysis Started	Location
Boron in farm soil	McKeague	*	Hot Water Soluble Boron - Azomethine-H Method, 4.61	Mar 21, 2018	Exova Edmonton
Chloride in farmsoil	SSSA Book Series, no. 3	*	Testing Soils for Sulfur, Boron, Molybdenum, and Chlorine, Chapter 10	Mar 21, 2018	Exova Edmonton
Macronutrients in Farm Soils	McKeague	*	Ammonium Acetate Extractable Cations, 4.51	Mar 21, 2018	Exova Edmonton
Metals (Strong Acid Leachable) in soils (Surrey)	B.C.M.O.E	*	Strong Acid Leachable Metals (SALM) in Soil, V 1.0, SALM	Mar 20, 2018	Exova Surrey
Metals (Strong Acid Leachable) in soils (Surrey)	US EPA	*	Mercury in Solid and Semi-Solid Wastes (Cold Vapour), 7471B	Mar 20, 2018	Exova Surrey
Micronutrients in Farm Soil	APHA	*	Inductively Coupled Plasma (ICP) Method, 3120 B	Mar 21, 2018	Exova Edmonton
Micronutrients in Farm Soil	McKeague	*	DTPA-TEA Extractable Elements, 4.65	Mar 21, 2018	Exova Edmonton
Nutrients in Farm Soil	Comm. Soil Sci. Pl. Anal.	*	Modified Kelowna Soil Test, Vol 26, 1995	Mar 21, 2018	Exova Edmonton
Organic Matter by Ignition	McKeague	*	Loss on Ignition (LOI), 3.8	Mar 21, 2018	Exova Edmonton
pH and Conductivity in farm soil	McKeague	*	1:2 Soil:Water Ratio, 4.12	Mar 21, 2018	Exova Edmonton
SMP Lime Requirements	Carter	*	Shoemaker-Mclean-Pratt Single-Buffer Method, 12.2	Mar 21, 2018	Exova Edmonton
Sulfate in Farm Soil	McKeague	*	Sulfate Extractable by 0.1M CaCl2, 4.47	Mar 21, 2018	Exova Edmonton
Total Carbon, Nitrogen & Sulfur by Leco Combustion (Surrey)	SSSA Book Series 5	*	Nitrogen-Total, Ch 37	Mar 20, 2018	Exova Surrey

** Reference Method Modified*

References

APHA	Standard Methods for the Examination of Water and Wastewater
B.C.M.O.E	B.C. Ministry of Environment
Carter	Soil Sampling and Methods of Analysis.
Comm. Soil Sci. Pl.	Communications in Soil Science and Plant Analysis
McKeague	Manual on Soil Sampling and Methods of Analysis
SSSA Book Series 5	Methods of Soil Analysis, Part 3
SSSA Book Series,	Soil Testing and Plant Analysis
US EPA	US Environmental Protection Agency Test Methods

Guidelines

Guideline Description	General Soil Comments
	Plant Nutrients in Soil
	Soil test for Crop Unknown
Guideline Source	Exova Canada Inc.,
Guideline Comments	

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Methodology and Notes

Bill To:	Timbro Contracting (A	Project ID:	James	Lot ID:	**1260221**
	P.O. Box 95	Project Name:	1750 School Rd	Control Number:	C117483
	7357 Pioneer Avenue	Project Location:	Harrison Mills	Date Received:	Mar 17, 2018
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	V0M 1A0	P.O.:	14132	Report Number:	2274100
Attn:	Accounts Payable	Proj. Acct. code:			
Sampled By:	Andres M.				
Company:	Biocentral				

Comments:

- Mar 28, 2018 - Report was issued to correct for missing metal analysis on samples 1260221-1 to 6. Previous report 2271666.

CC Moreno

Exova Testing, calibrating, advising

www.exova.com ED 120-02

Invoice to:

Company: Timbro contracting
Address:
Attention:
Phone:
Cell:
Fax:
E-mail:
Agreement ID:
Copy of report:

Report To:

Company: Biocentral
Address: Same as Timbro
Attention: Andres Moreno
Phone: 6049971630
Cell:
Fax:
E-mail 1: andresm@biocentral.ca
E-mail 2: frank@timbroconstruction.com
Copy of invoice: info@timbroconstruction.com

Report Results		Regulatory Requirement	
E-Mail	X	HCDWQG	
Mail		Ab Tier 1	
Online		SPIGEC	
Fax		BCCSR	
PDF	X	Other (list below)	
Excel	X		
QA/QC	X		

Project Information

Project ID: JAMES
Project Name: 1750 school Rd
Project Location: Harrison Mills
Legal Location:
PO/AFE#: 14132
Proj. Acct. Code:
Quote # 28983

Sample Custody (please print)

Sampled by: Andres M
Company: Biocentral

This section for Lab use only

Date/Time stamp: MAR 17 '18 12:46

RUSH Priority

- Emergency (contact lab for turnaround and pricing)
- Priority 1-2 working days (100% surcharge)
- Urgent 2-3 working days (50% surcharge)

When "ASAP" is requested, turn around will default to a 100% RUSH priority, with pricing and turn around time to match. Please contact the lab prior to submitting RUSH samples. If not all samples require RUSH, please indicate in the special instructions.

Date Required: _____ Signature: _____

Special Instructions/Comments (please include contact information including ph. # if different from above).

Recovery Delivery

	Site I.D.	Sample Description	Depth start (m)	Depth end (cm m)	Date/Time Sampled	Matrix	Sampling Method	Number of Containers	OMRR Metals	CMPT	Indicate in the space allotted any deficiencies by the corresponding number.
1	S1	Farm soil	0		2018.03.16	soil		1			
2	S2										
3	S3										
4	S4										
5	S5										
6	S6										
7											
8											
9											
10											
11											
12											
13											
14											
15											

Enter tests above (√ relevant samples below)

1. Indicate any samples that were not packaged well
2. Indicate any samples not received in Exova supplies
3. Indicate any samples that were not clearly labeled
4. Indicate any samples not received within the required hold time or temp.
5. Indicate any missing or extra samples
6. Indicate any samples that were received broken
7. Indicate any samples where sufficient volume was not received
8. Indicate any samples received in an inappropriate container

ED 120-02

Submission of this form acknowledges acceptance of Exova's Standard Terms and Conditions (http://www.exova.com/about/terms-and-conditions/)

Please indicate any potentially hazardous samples

Page _____ of _____ Control # C 117483

Lot: 1260221 COC

Shipping: COD Y/ N
and size of coolers
Temp. received: 11.7°C
Delivery Method: H
Waybill:
Received by: LC

ABBOTSFORD

April 10, 2017

File: 5550-70

Andres Murillo, P.Eng
BioCentral Green Depot Ltd.
Box 95-7357 Pioneer Avenue
Agassiz, BC V0M 1A0

Dear Mr. Murillo:

Re: Organic Matters Recycling Regulation (OMRR) Section 6 – Process and Quality Criteria

As requested, this letter provides confirmation and supporting information that the JAMES Wastewater Treatment Plant (JAMES Plant) meets Section 6 of the OMRR for producing Class A biosolids.

The pasteurization system at the JAMES Plant meets the time-temperature requirements for production of Class A biosolids according to Section 2(f) in OMRR Schedule 1.

The sludge pasteurization system includes the following main components:

- crude and pasteurized sludge holding tanks;
- heat exchangers to heat raw sludge and cool pasteurized sludge;
- pasteurization tank; and
- miscellaneous transfer and recirculation pumps.

The pasteurization reactor operates at a temperature of 65°C and is batch-fed to maintain a retention time of at least one hour between sludge transfers. The volume of the tank provides approximately 18 to 24 hours retention time for pasteurization and conditioning of the sludge in advance of the anaerobic digestion process. The pasteurization process is followed by anaerobic mesophilic digestion, which meets the vector attraction reduction requirements (for details please see below).

The anaerobic mesophilic digestion system at the JAMES Plant meets the vector attraction reduction requirements according to Section 1(a) in OMRR Schedule 2.

The anaerobic mesophilic digestion system at the JAMES Plant includes three digesters, with a total volume of 11,460 m^3. Pasteurized and conditioned sludge from the pasteurized sludge holding tank is pumped to the largest anaerobic digester and then is passed to the remaining two digesters in series. The volatile solids reduction of the biosolids typically ranges between 60-70% and is higher than the required 38% under OMRR.

We trust the above provides the information you requested. Please contact me if you need any additional information or clarification.

Yours truly,

Rob Isaac, Eng.L.
Director, Project Management Office

c. John Paul, Transform Compost Systems Ltd.
Peter Sparanese, General Manager, Engineering and Regional Utilities
Tim Henry, Director, Utility Operations and Asset Management

SC/rb

CERTIFICATE OF ANALYSIS

REPORTED TO	Abbotsford, City of - Utilities Environment 6011 Gladwin Road Abbotsford, BC V4X 1V9		
ATTENTION	Sharon Subido	**WORK ORDER**	7110302
PO NUMBER	PO 170554	**RECEIVED / TEMP**	2017-11-02 18:30 / 5°C
PROJECT	#13 - Biosolids QC	**REPORTED**	2017-11-14
PROJECT INFO		**COC NUMBER**	UE-P13-05

Introduction:

CARO Analytical Services is a testing laboratory full of smart, engaged scientists driven to make the world a safer and healthier place. Through our clients' projects we become an essential element for a better world. We employ methods conducted in accordance with recognized professional standards using accepted testing methodologies and quality control efforts. CARO is accredited by the Canadian Association for Laboratories Accreditation (CALA) to ISO 17025:2005 for specific tests listed in the scope of accreditation approved by CALA.

Big Picture Sidekicks

You know that the sample you collected after snowshoeing to site, digging 5 meters, and racing to get it on a plane so you can submit it to the lab for time sensitive results needed to make important and expensive decisions (whew) is VERY important. We know that too.

We've Got Chemistry

It's simple. We figure the more you enjoy working with our fun and engaged team members; the more likely you are to give us continued opportunities to support you.

Ahead of the Curve

Through research, regulation knowledge, and instrumentation, we are your analytical centre for the technical knowledge you need, BEFORE you need it, so you can stay up to date and in the know.

If you have any questions or concerns, please contact me at jshanko@caro.ca

Authorized By:

Jennifer Shanko, A.Sc.T.
Account Manager

CARO ANALYTICAL SERVICES

TEST RESULTS

REPORTED TO Abbotsford, City of - Utilities Environment
PROJECT #13 - Biosolids QC

CARO WO# 7110302
REPORTED 2017-11-14

Analyte	Result	Guideline	RL	Units	Analyzed	Qualifier
A1 Large Tent (7110302-01) | Matrix: Solid | Sampled: 2017-11-02 10:26						
General Parameters						
Moisture	**76.64**	N/A	0.1	% wet	2017-11-04	
Microbiological Parameters						
Coliforms, Fecal	<8.6	N/A	2	MPN/g dry	2017-11-04	
A2 Large Tent (7110302-02) | Matrix: Solid | Sampled: 2017-11-02 10:27						
General Parameters						
Moisture	**75.47**	N/A	0.1	% wet	2017-11-04	
Microbiological Parameters						
Coliforms, Fecal	<8.1	N/A	2	MPN/g dry	2017-11-04	
A3 Large Tent (7110302-03) | Matrix: Solid | Sampled: 2017-11-02 10:27						
General Parameters						
Moisture	**77.03**	N/A	0.1	% wet	2017-11-04	
Microbiological Parameters						
Coliforms, Fecal	<8.7	N/A	2	MPN/g dry	2017-11-04	
B4 Large Tent (7110302-04) | Matrix: Solid | Sampled: 2017-11-02 10:28						
General Parameters						
Moisture	**74.67**	N/A	0.1	% wet	2017-11-04	
Microbiological Parameters						
Coliforms, Fecal	<7.9	N/A	2	MPN/g dry	2017-11-04	
B5 Large Tent (7110302-05) | Matrix: Solid | Sampled: 2017-11-02 10:28						
General Parameters						
Moisture	**77.6**	N/A	0.1	% wet	2017-11-04	
Microbiological Parameters						
Coliforms, Fecal	<8.9	N/A	2	MPN/g dry	2017-11-04	
B6 Large Tent (7110302-06) | Matrix: Solid | Sampled: 2017-11-02 10:28						
General Parameters						
Moisture	**77.76**	N/A	0.1	% wet	2017-11-04	
Microbiological Parameters						
Coliforms, Fecal	<8.9	N/A	2	MPN/g dry	2017-11-04	
C7 Large Tent (7110302-07) | Matrix: Solid | Sampled: 2017-11-02 10:29						

TEST RESULTS

REPORTED TO	Abbotsford, City of - Utilities Environment	**CARO WO#**	7110302
PROJECT	#13 - Biosolids QC	**REPORTED**	2017-11-14

Analyte	Result	Guideline	RL	Units	Analyzed	Qualifier
C7 Large Tent (7110302-07) | Matrix: Solid | Sampled: 2017-11-02 10:29, Continued						
General Parameters						
Moisture	**77.19**	N/A	0.1	% wet	2017-11-04	
Microbiological Parameters						
Coliforms, Fecal	<8.8	N/A	2	MPN/g dry	2017-11-04	
C8 Large Tent (7110302-08) | Matrix: Solid | Sampled: 2017-11-02 10:29						
General Parameters						
Moisture	**76.94**	N/A	0.1	% wet	2017-11-04	
Microbiological Parameters						
Coliforms, Fecal	**34**	N/A	2	MPN/g dry	2017-11-04	
C9 Large Tent (7110302-09) | Matrix: Solid | Sampled: 2017-11-02 10:29						
General Parameters						
Moisture	**76.73**	N/A	0.1	% wet	2017-11-04	
Microbiological Parameters						
Coliforms, Fecal	<8.6	N/A	2	MPN/g dry	2017-11-04	

APPENDIX 1: SUPPORTING INFORMATION

REPORTED TO	Abbotsford, City of - Utilities Environment	**CARO WO#**	7110302
PROJECT	#13 - Biosolids QC	**REPORTED**	2017-11-14

Analysis Description	Method Ref.	Technique	Location
Coliforms, Fecal in Solid	MFHPB-19	Most Probable Number	Sublet
Moisture in Solid	ASTM D2216-10	Gravimetry (Dried at 105C)	Sublet

Glossary of Terms:

RL	Reporting Limit (default)
% wet	Percent (as received basis)
ASTM	ASTM International Test Methods
MFHPB	HPB Methods for the Microbiological Analysis of Foods, Health Canada

Guidelines Referenced in this Report:

Organic Matter Recycling Regulation -Schedule 4 (2002)

General Comments:

The results in this report apply to the samples analyzed in accordance with the Chain of Custody document. This analytical report must be reproduced in its entirety. CARO is not responsible for any loss or damage resulting directly or indirectly from error or omission in the conduct of testing. Liability is limited to the cost of analysis. Samples will be disposed of 30 days after the test report has been issued unless otherwise agreed to in writing.

APPENDIX 2: QUALITY CONTROL RESULTS

REPORTED TO	Abbotsford, City of - Utilities Environment	**CARO WO#**	7110302
PROJECT	#13 - Biosolids QC	**REPORTED**	2017-11-14

Client Information	Project Information	Laboratory Information	COC Information
Abbotsford, City of - Utilities Environment 6011 Gladwin Road Abbotsford BC V4X 1V9 Phone: (604) 557-1452 Fax: (604) 557-1457	#13 - Biosolids QC Number: [none] Sample count: 9 TAT: 5	CARO Analytical Services #110 - 4011 Viking Way Richmond BC V6V 2K9 Phone: (604) 279-1499 Fax: (604) 279-1599	Number: UE-P13-05 Shipped via: IG Micromed

		Analyses	Containers
#1	A1 Large Tent (Template: 28) 11/02/2017 10:26 - 11/02/2017 10:26 Grab / Solid	!AUE Project #13 Grab PKG (SUB) TAT: 5 Coliforms, Fecal in Solids (SUB) TAT: 5 Coliforms, Total & Fecal in Solids (KEL) TAT: 5	C01_125 mL Glass (General Soil) (1)
#2	A2 Large Tent (Template: 29) 11/02/2017 10:27 - 11/02/2017 10:27 Grab / Solid	!AUE Project #13 Grab PKG (SUB) TAT: 5 Coliforms, Fecal in Solids (SUB) TAT: 5 Coliforms, Total & Fecal in Solids (KEL) TAT: 5	C01_125 mL Glass (General Soil) (1)
#3	A3 Large Tent (Template: 30) 11/02/2017 10:27 - 11/02/2017 10:27 Grab / Solid	!AUE Project #13 Grab PKG (SUB) TAT: 5 Coliforms, Fecal in Solids (SUB) TAT: 5 Coliforms, Total & Fecal in Solids (KEL) TAT: 5	C01_125 mL Glass (General Soil) (1)
#4	B4 Large Tent (Template: 31) 11/02/2017 10:28 - 11/02/2017 10:28 Grab / Solid	!AUE Project #13 Grab PKG (SUB) TAT: 5 Coliforms, Fecal in Solids (SUB) TAT: 5 Coliforms, Total & Fecal in Solids (KEL) TAT: 5	C01_125 mL Glass (General Soil) (1)
#5	B5 Large Tent (Template: 32) 11/02/2017 10:28 - 11/02/2017 10:28 Grab / Solid	!AUE Project #13 Grab PKG (SUB) TAT: 5 Coliforms, Fecal in Solids (SUB) TAT: 5 Coliforms, Total & Fecal in Solids (KEL) TAT: 5	C01_125 mL Glass (General Soil) (1)
#6	B6 Large Tent (Template: 33) 11/02/2017 10:28 - 11/02/2017 10:28 Grab / Solid	!AUE Project #13 Grab PKG (SUB) TAT: 5 Coliforms, Fecal in Solids (SUB) TAT: 5 Coliforms, Total & Fecal in Solids (KEL) TAT: 5	C01_125 mL Glass (General Soil) (1)
#7	C7 Large Tent (Template: 34) 11/02/2017 10:29 - 11/02/2017 10:29 Grab / Solid	!AUE Project #13 Grab PKG (SUB) TAT: 5 Coliforms, Fecal in Solids (SUB) TAT: 5 Coliforms, Total & Fecal in Solids (KEL) TAT: 5	C01_125 mL Glass (General Soil) (1)
#8	C8 Large Tent (Template: 35) 11/02/2017 10:29 - 11/02/2017 10:29 Grab / Solid	!AUE Project #13 Grab PKG (SUB) TAT: 5 Coliforms, Fecal in Solids (SUB) TAT: 5 Coliforms, Total & Fecal in Solids (KEL) TAT: 5	C01_125 mL Glass (General Soil) (1)
#9	C9 Large Tent (Template: 36) 11/02/2017 10:29 - 11/02/2017 10:29 Grab / Solid	!AUE Project #13 Grab PKG (SUB) TAT: 5 Coliforms, Fecal in Solids (SUB) TAT: 5 Coliforms, Total & Fecal in Solids (KEL) TAT: 5	C01_125 mL Glass (General Soil) (1)

Relinquished by	Date/Time	Accepted by	Date/Time

Appendix F

% Volatile Solids Reduction - JAMES PLANT- 2017

Month	% V.S Red'n
Jan	58
Feb	64
Mar	56
Apr	61
May	58
Jun	67
Jul	69
Aug	66
Sep	64
Oct	70
Nov	64
Dec	67
Annual	**64**

Monthly average from weekly testing

OMRR Limit -38%

Volatile Solids Reduction Calculation:

$$\% \text{ Red'n} = \frac{(\text{In} - \text{Out})}{\text{In} - (\text{In} \times \text{Out})} \times 100$$

Where:

In = Volatile solids for raw, decimal format.

Out = Volatile solids of last Dig in series, decimal format.

JAMES WWTP BIOSOLIDS QUALITY DATA (2017)

Parameter concentrations are expressed on dry weight basis unless otherwise stated.
All data obtained from the analysis of a monthly composite sample.

Sampling Date:	-															
Parameters (Dried Basis)	**Units**	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**	**OCT**	**NOV**	**DEC**	**MAX**	**AVG**	**OMRR***
Total Nitrogen	%	6.99	8.14	9.04	7.19	8.65	8.1	7.74	8.13	5.74	5.36	6.71	10.5	10.50	7.69	-
Total Phosphorus (as P)	%	1.10	1.02	1.14	1.02	1.15	1.23	1.07	1.14	1.33	1.01	1.02	1.09	1.33	1.11	-
Total Potassium	%	0.071	0.11	0.11	0.103	0.0669	0.077	0.0727	0.0755	0.0632	0.0563	0.071	0.0628	0.11	0.08	-
Total Sulphur	%	0.58	0.74	0.79	0.96	0.517	0.682	0.768	0.83	0.868	0.60	0.69	0.603	0.96	0.72	-
Total Carbon	%	33.6	41.7	40.9	41.5	41.3	40.3	40.5	40.9	40	40.5	42.0	43.2	43.2	40.5	-
Organic Matter	%	80.3	79.6	79.7	80.1	80	79.2	79.5	78.9	76.8	77.9	78.3	78.9	80.3	79.1	-
Moisture	%	75.7	74.9	75.6	75.2	76.6	76.9	76.4	76.7	76.1	72.4	76.6	76.5	76.9	75.8	-
Ammonia- N (available)	mg/kg	7810	8100	8460	8390	7530	7480	8400	8750	7370	5920	6220	6600	8750	7586	-
Nitrate - N (available)	mg/kg	5.4	4.4	5.25	5.85	2.65	3.52	7.77	3.43	3.72	15.6	3.05	4.52	15.6	5.43	-
pH	pH units	6.5	6.7	5.6	6.6	6.3	5.8	6	6.46	6.43	6.75	6.71	6.77	6.77	6.4	-
EC - Conductivity	dS/m	2.73	3.39	2.58	2.94	3.83	3.66	2.58	3.73	5.83	3.25	4.09	4.12	5.83	3.56	-
C/N Ratio	-	4.8	5.1	4.5	5.8	4.8	5.0	5.2	5.0	7.0	7.6	6.26	4.1	7.6	5.4	-
Arsenic	ug/g	2	2.8	N/A	2.95	2.25	2.87	2.83	2.84	3.5	2.88	3.1	2.51	3.5	2.8	75
Cadmium	ug/g	0.86	1.5	N/A	1.49	1.24	1.44	1.63	1.53	1.76	1.23	1.59	1.29	1.76	1.41	20
Chromium	ug/g	18	24	N/A	28.1	20.4	25.4	35.6	60.1	37.4	29.4	32.1	22	60.1	30.2	1060
Cobalt	ug/g	1.6	2.5	N/A	2.57	1.99	2.27	2.2	2.69	3.27	2.21	2.14	1.85	3.27	2.30	150
Copper	ug/g	360	520	N/A	483	438	568	600	655	636	531	561	453	655	528	2200
Lead	ug/g	13	20	N/A	20.8	17.2	20.3	21.4	20.7	22.8	17.3	22.9	17.7	22.9	19.5	500
Mercury	ug/g	1.3	1.5	N/A	1.98	1.67	1.73	3.22	1.78	2.08	1.52	2.2	2.39	3.22	1.95	5
Molybdenum	ug/g	3.9	6.4	N/A	6.34	5.91	6.94	6.05	6.77	7.82	6.21	6.76	5.14	7.82	6.20	20
Nickel	ug/g	11	15	N/A	17.8	13.9	18.1	31.4	41.8	32.9	27.1	35.5	26.5	41.8	24.6	180
Selenium	ug/g	3	4.5	N/A	4.84	4.37	4.88	4.72	4.7	5.31	4.18	4.79	3.75	5.31	4.46	14
Zinc	ug/g	530	800	N/A	700	732	924	922	1050	983	887	874	707	1050	828	1850

1995 Fir Rd., Agassiz, BC

Class A Biosolids Application Plan: 2018

April 11, 2018

OMRR Authorization # 109233

Prepared by:

John Paul, PhD PAg
Transform Compost Systems Ltd
3911 Mt Lehman Rd
Abbotsford, BC V2T 5W5
Ph: 604-302-4367
Email: transform@telus.net

1995 Fir Rd Class A Biosolids Application Plan April 11, 2018

Introduction

This Land Application Plan for the application of Class A biosolids provides the guidance and information required under British Columbia's Organic Matter Recycling Regulation (OMRR), a regulation enacted to ensure that biosolids are managed in a manner that protects human health and the environment.

Class A biosolids are considered a valuable source of both plant nutrients and organic matter. Class A biosolids are the highest quality biosolids achievable under the OMRR, particularly regarding fecal coliform counts (< 1,000 most probable number per gram), and trace element (metal) concentrations. The land application plan must be prepared by a qualified professional as defined in the OMRR.

Class A biosolids will be land applied in 2018 as a source of nutrients and organic matter on a 3.4 ha area of the 4.3 ha farm in Agassiz, BC that is growing forage corn for cattle. The total amount of Class A biosolids that will be land applied is approximately 236 tonnes. This Land Application Plan (LAP) provides guidance in the beneficial reuse of a portion of the Class A biosolids from the JAMES Treatment Plant, a wastewater treatment facility that processes wastewater from the communities of Abbotsford and Mission. (http://www.abbotsford.ca/city_services/wastewater/biosolids_management.htm#JAMES).

This land application plan utilizes the biosolids quality data for 2017, provided by the City of Abbotsford. The Class A biosolids used for this land application was generated by the JAMES wastewater treatment plant in 2017.

The Land Application Plan follows the Notification dated December 27, 2017 (Appendix A).

Qualifications of the Qualified Professional

The professional agrologist preparing this report has extensive training and experience with soil, waste and agricultural land in particular. John Paul, PhD is a registered professional agrologist, who obtained his MSc and PhD in soil biochemistry from the University of Guelph in 1991. He has acted as a professional agrologist for many sites requiring soil deposit and removal reports, nutrient management and waste management plans. He has extensive experience with the various Acts and Regulations regarding agricultural land use and agricultural and industrial wastes.

Land Application Objectives

The specific objectives of this land application plan are to ensure that the Class A biosolids are stored and applied in a manner that provides the greatest benefit for the crop grown on this

property, while minimizing risk of environmental pollution. The plan will consider the specific crops that are growing on this property, as well as any other nutrient input that is used for growing crops or improving the soil.

Site Characteristics

Location

The Land Application Plan is for Class A biosolids application on a farm located at 1995 Fir Rd., Agassiz, BC. The legal description is South portion of Lot 37 GI, Section 25, Range 29, Township 3, New Westminster Plan District.

This farm is located approximately 1 km west of Agassiz, BC.

Figure 1. Aerial view of site relative to the community of Agassiz, BC (Google Earth, distancesto various places of interest can be measured directly using Google Earth).

The location is zoned agricultural and is within the Agricultural Land Reserve. Railway tracks are to the north, agricultural fields are to the south and west, and rural residential properties are to the east.

The coordinates of the site are

Longitude: 121° 47’ 11” W

Latitude: 49° 14’ 27” N

Figure 2. Aerial photograph of the property and the field (with yellow boundary) where the Class A biosolids will be applied (Google Earth, July 18, 2017).

Climate

Agassiz has a wet but moderate to mild climate in the wintertime with dry summers. The annual mean total rainfall is 1440 mm, with an average of 230 mm in January, and 60 mm in July. The annual mean total snowfall is 940 mm. The annual mean daily temperature in July is 23°C, and in January is 2.5 °C. The wind direction is generally from the southeast to the northwest. Source of weather information: http://www.climate-charts.com/Locations/c/CN71113011001200.php

Soil Properties

The soil at this farm is described as a Monroe Silt Loam (Kelly and Spilsbury 1939), which is a very common soil type along the lower Fraser River. Typically these soils have 30 to 40 cm of a

fine textured soil overlying coarse sands. On this farm, the topsoil depth is approximately 20 cm, with finer textured subsoil containing very little organic matter underneath.

Four separate soil samples were taken from the field in March 2017. The location of the soil samples are identified in Appendix B. The complete soil analysis information is found in Appendix C.

Figure 3. Soil profile showing > 15 cm of loam topsoil overlying a heavier textured subsoil.

The soil organic matter content averages 5.4% in the top 15 cm, with addition topsoil visible to approximately 18-20 cm depth. The soil has a near neutral pH of 6.6 (Figure 4), a base saturation of 72%, mostly from calcium (64%), magnesium (4.9%), and potassium (2.8%).

	Soil Characteristics				
			2015	2017	2018
Organic matter		%	4.5	5.2	5.4
Total Nitrogen		%			0.2
pH			6.6	6.2	6.6
EC		dS/m	0.11	0.12	0.09
Nitrate		mg/L	3.80	3.00	5.50
Phosphorus		mg/L	>60	>60	>80
Potassium		mg/L	270	240	111
Base Saturation		%	63	56	72
	Calcium	%	52.0	47.4	63.9
	Magnesium	%	6.0	4.3	4.9
	Potassium	%	5.1	4.2	2.8
	Sodium	%	<1	<1	<2.3

Figure 4. Soil characteristics in 2015, 2017 and 2018.

Slope and Topography

The topography of the field is level.

Depth to Groundwater Table

The elevation of the property is approximately 17 m above sea level, and approximately 2 m above the level of the Fraser River, depending on the time of year. The depth to groundwater fluctuates with the water level in the Fraser River and is generally within 1-3 m of the surface.

Figure 5. View of the field from the east, showing the stored biosolids (March 22, 2018 photo).

Soil Nutrients

All of the individual soil samples indicated that the soil was marginal in available nitrogen and sulphur. Available phosphorus was optimum. Potassium was deficient or marginal. This is characteristic of soils that had a history of biosolids application.

Trace Elements in Soil

A total of four individual soil samples were obtained from 0-15 cm depth in the field on the property. The complete laboratory soil analysis data is found in Appendix C.

Soil Trace Element Concentrations (mg/kg)				
	2015	2017	2018	change
Arsenic	5.28	5.15	6.10	0.82
Cadmium	0.23	0.28	0.40	0.17
Chromium	48.55	59.75	74.75	26.20
Cobalt	14.25	14.00	13.50	-0.75
Copper	36.45	39.00	43.75	7.30
Lead	9.13	9.63	8.43	-0.70
Mercury	0.07	0.05	0.06	-0.01
Molybdenum	0.79	0.73	0.54	-0.25
Nickel	42.98	45.50	41.00	-1.98
Selenium	0.63	<.5	0.85	0.23
Zinc	98.75	99.75	99.00	0.25

Figure 6. Trace element concentrations in the 0-15 cm layer of soil (March 2018 data, Appendix C). Data from 2015 and 2017 also included for comparison.

All of the trace element concentrations are well below the limits for agricultural soil as documented in the OMRR (OMRR Schedules 9 and 10, limits used for livestock ingesting soil and fodder are used where applicable), with the exception of chromium. The limits as per OMRR represent the most conservative of all uses on either agricultural or residential soils.

It is important to note that the trace element concentrations other than chromium have changed only slightly since the previous soil sampling in February 2015, despite application of biosolids in 2015, 2016 and 2017. Some of the concentrations have increased slightly, whereas others have decreased slightly, most of which can likely be attributed to sample variability.

It will be important to track the soil chromium concentrations. All of the soil analyses of the various land application sites in 2018 showed significantly increased chromium concentrations, despite either no, or very little application of biosolids. In addition, as will be demonstrated later in the land application plan, there is very little chromium added with the biosolids application. The elevated chromium concentrations appear to be characteristic of the Fraser River sediments, and are significantly higher for the 2018 samples than soil samples taken in previous years.

Biosolids Source and Characteristics

The Class A biosolids are produced at the JAMES Treatment Plant, a wastewater treatment plant that processes wastewater from the communities of Abbotsford and Mission.

JAMES Wastewater Treatment Plant, 5959 Gladwin Rd, Abbotsford B.C. V4X 1V9

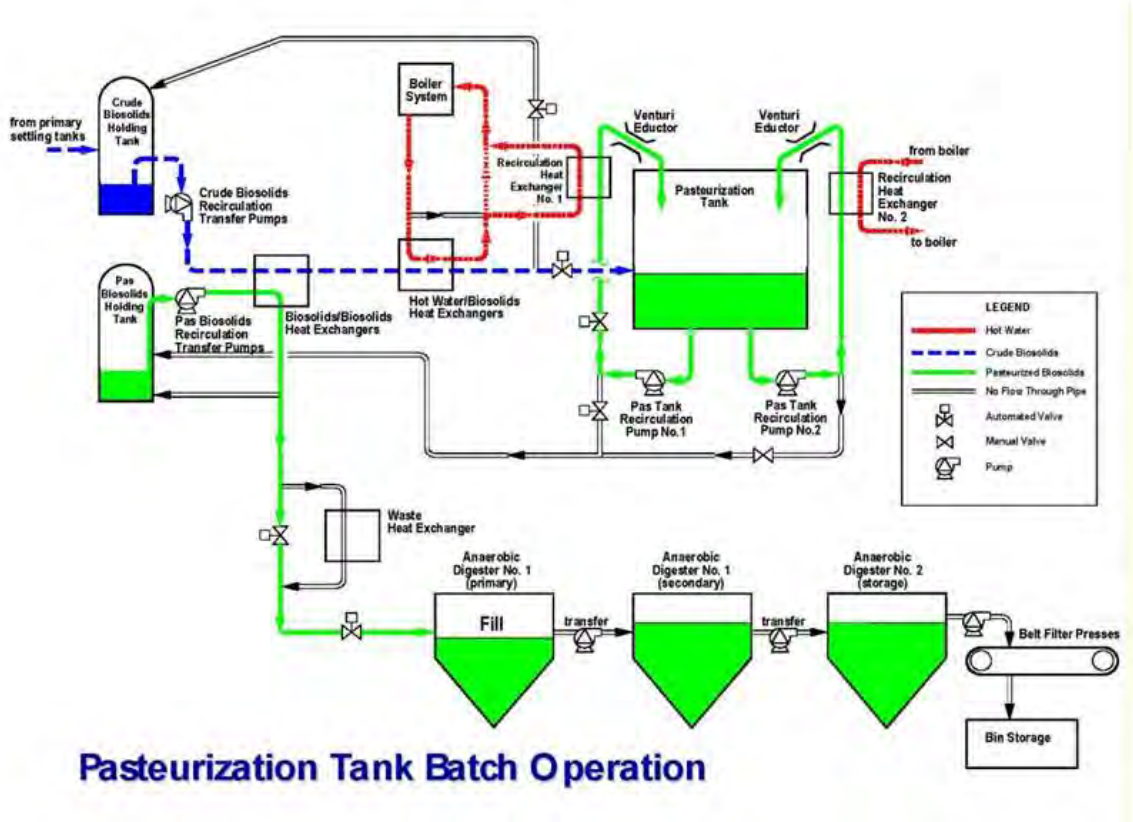


Figure 7. Biosolids processing flowsheet at the James Wastewater Treatment Plant
*(*http://www.abbotsford.ca/Assets/2014+Abbotsford/Engineering/Wastewater/Biosolids+Flow+Chart.pdf)

Pathogen Reduction Processes and Limits

The pathogen reduction process conforms with Schedule 1, Section 2 (f) of the Organic Matter Recycling Regulation, where it states:

"2. One of the following pathogen reduction methods is required for Class A biosolids or biosolids to produce biosolids growing medium: (f) the heat treatment of the biosolids must be 50 C or higher, and the time period must be 30 minutes or longer"

The process used at the JAMES Wastewater Treatment Plant is as follows (Appendix D). *"The pasteurization reactor operates at a temperature of 65 C and is batch-fed to maintain a*

retention time of at least one hour between sludge transfers. The volume of the tank provides approximately 18-24 hours retention time for pasteurization and conditioning of the sludge in advance of the anaerobic digestion process."

Analyses of fecal coliforms are conducted by the City of Abbotsford on the biosolids before it is released from the wastewater plant (Appendix E). Biocentral as well as the professional agrologist reserves the right to conduct any of its own testing of the biosolids to ensure that meets Class A requirements.

The average moisture content of the biosolids measured at time of discharge was 75.8% in 2017 (Figure 8) and 76.7% in the batch that was shipped to this property (Appendix E). The moisture content at time of field application may change somewhat, either from the biosolids taking on more moisture, or from biosolids drying during storage.

Vector Attraction Reduction Processes and Limits

The vector attraction reduction process conforms with Schedule 2, Section 1 (a) of the Organic Matter Recycling Regulation, where it states:

"1. One of the following vector attraction reduction processes is required for Class A biosolids or Class B biosolids used to produce biosolids growing medium: (a) a digestion process (aerobic or anaerobic) resulting in the mass of volatile solids being reduced by more than 38 percent"

The process used at the JAMES Wastewater Treatment Plant is as follows (Appendix D). *"The anaerobic mesophilic digestion system at the JAMES Plant includes three digesters, with a total volume of 11,460 m3. Pasteurized and conditioned sludge from the pasteurized sludge holding tank is pump to the largest anaerobic digester and then is passed to the remaining two digesters in series."*

The volatile solids reduction results from the JAMES plant averaged 64% in 2017 (Appendix F).

Trace Elements and Nutrients

The general characteristics of the biosolids are noted in Figure 8. The biosolids are an excellent source of organic matter, as well as nitrogen and phosphorus, whereas the potassium concentration is low. Trace element concentrations meet OMRR Class A limits (Figure 9).

Characteristics of the Class A Biosolids		
Characteristic	**Unit**	**Value**
Moisture Content	%	75.8
Organic Matter	%	79.1
pH		6.4
EC	dS/m	3.56
C/N Ratio		5.4
Nitrogen (total)	%	7.69
Ammonium	mg/kg	7586
Phosphorus	%	1.11
Potassium	%	0.08
Sulphur	%	0.72

Figure 8. Characteristics of the Class A biosolids (2017 data)

Schedule 4 of the Organic Matter Recycling Regulation (OMRR) provides the guidance for the trace elements in the biosolids. Figure 9 shows the trace elements in the biosolids (including both the maximum and average concentrations monthly in 2017 analysis (Appendix G), compared with the standards (OMRR, and Trade Memorandum T-4-93). For the land application calculations, we have used the average concentration for 2017.

Trace Element Concentrations in the Class A Biosolids				
Element	Biosolids		Class A (OMRR)	Canada
	Max 2017	Avg 2017		T-4-93
	(mg/kg)		(mg/kg)	(mg/kg)
Arsenic	3.5	2.8	75	75
Cadmium	1.76	1.41	20	20
Chromium	60.1	30.2	1060	*not included*
Cobalt	3.27	2.3	150	150
Copper	655	528	2200	*not included*
Lead	22.9	19.5	500	500
Mercury	3.22	1.95	5	5
Molybdenum	7.82	6.2	20	20
Nickel	41.8	24.6	180	180
Selenium	5.31	4.46	14	14
Zinc	1050	828	1850	1850

Figure 9. Trace element concentrations in the Class A biosolids from the JAMES Wastewater Treatment Plant (maximums and averages for 2017. The limits for Class A biosolids (OMRR requirement) and the Canadian standards are also shown.

Figure 8 shows additional characteristics of the biosolids that are used for the land application plan, including and especially the nitrogen, phosphorus and potassium concentrations, which are important when considering the fertilizer value of the biosolids.

Foreign Matter

The Class A biosolids are free of foreign matter. Foreign matter is screened when the wastewater enters the treatment plant. According to Schedule 4 of the OMRR, Class A biosolids may not contain foreign matter greater than 1% dry weight and no sharp foreign matter, such as glass or metal shards, in a size and shape that may cause injury.

Biosolids Storage

The biosolids will be stored in compliance with OMRR Part 4, Division 1, Part 17 - 19, where it states:

"17. (1). If managed organic matter, which is to be applied to land under a land application plan, is stored on a farm or at some other site, it must be stored

a. in a storage facility in accordance with the requirements of section 18, or

b. at a storage site in accordance with the requirements of section 19.

(2) Managed organic matter must only be stored on a farm if all of the managed organic matter is used on that farm.

18. A storage facility must

a. be of sufficient capacity to store all the managed organic matter to be used on the land application site for the period of time needed for its application as a fertilizer or soil conditioner,

b. be located at least 15 m from any watercourse and at 30 m from any source of water for domestic purposes, and

c. maintained in such a manner to prevent escape of the managed organic matter.

19. (1). Managed organic matter may only be stored at a storage site as follows:

a. for not more than 2 weeks if it is (i) used within 2 weeks, and (ii) stored in a manner that prevents the escape of managed organic matter:

b. for more than 2 weeks if it is (i) stored for no longer than 9 months, (ii) located at least 30 meters from any watercourse or any source of water used for domestic purposes, and (iii) stored in a manner that prevents the escape of managed organic matter.

2. Berms or other works must be constructed around the storage site if necessary to prevent the escape of managed organic matter. "

The Class A biosolids will be stored in a manner that prevents the escape of the managed organic matter.

The transport of the biosolids will be managed in such a way as to prevent any biosolids being deposited on any public roadways. Although odour is not expected to be a concern, the biosolids will covered with a layer of wood chips or compost if required.

Biosolids Application

Season of Application

The biosolids will be applied during the spring of 2018 to allow optimal uptake of plant available nutrients during the growing season. The total amount of biosolids to be applied during 2018 will be a maximum of 55 wet tonnes per hectare. A total of approximately 236 tonnes of Class A biosolids will be applied at this location in 2018.

Buffers

A 3 m buffer will be maintained around the perimeter of the spreading area. There are no surface water bodies on or around this property.

Crop Nutrient Uptake

The crops grown on this farm will be forage corn grown for cattle feed in 2018. The Class A biosolids will be land applied to optimize their value as a fertilizer and a soil conditioner.

The land application plan will be based on nitrogen for the forage corn. Phosphorus and potassium application will also be addressed.

Nitrogen Requirements

Table 12 of the "Land Application Guidelines for the Organic Matter Recycling Regulation and the Soil Amendment Code of Practice" (Ministry of the Environment 2008), provides the guidance for nitrogen requirements for forages on soils of varying fertility in various areas of the province.

Based on an average yield of 20 tonnes of dry matter per hectare of corn on a high (normal) fertility site, the nitrogen requirement is 260 kg ha^{-1} per year.

Nitrogen Based Application Rate						
Yield Expectation and Nitrogen Uptake	Total		Available	Available N		
20 tonnes dry matter/ha yield of corn[a]	260	kg N/ha				
Nitrogen Availability in Biosolids						
Ammonium in biosolids	7.6	kg/tonne	60%	4.56		
Total N in biosolids	76.9	kg/tonne				
Organic N in Biosolids	69.3	kg/tonne	30%	20.79		
				25.35	kg/tonne available	
Amount of dry biosolids	10.3	dry tonnes per hectare				
	46.6	tonnes per hectare wet application				
[a] from Table 12 of the Land Application Guide (Ministry of Environment 2008)						
from page 174 of Land Application Guide (Ministry of Environment 2008)						

Figure 10. Estimated contribution of nitrogen with the biosolids application.

The total nitrogen content of the biosolids averages 7.69 % or 76.9 kg per dry tonne (Appendix G). The amount of nitrogen available in the year of application ranges from 20 to 40%. Using an average availability of 30%, each dry tonne of biosolids provides almost 25 kg of nitrogen per hectare. An application rate of 12 tonnes of dry biosolids per hectare then provides an estimated 300 kg N per hectare, which is approximately the nitrogen requirements of the crop. Our experience is that with biosolids, the nitrogen availability is less than 30%.

The biosolids will also be applied to this farm in subsequent years. The land application plan will be adjusted to allow for residual nitrogen availability from previous biosolids applications during the fall.

Phosphorus Requirements

Guidelines for the application of phosphorous are provided in Sections 10.4.1.2 and Section 13.4.3 of the "Land Application Guidelines for the Organic Matter Recycling Regulation and the Soil Amendment Code of Practice".

The phosphorus content of the Class A biosolids averages 1.11% P (Figure 8), or 2.54% P_2O_5. The application of 12 tonnes of Class A biosolids will provide approximately 305 kg P_2O_5 per hectare.

The soil analyses indicated that the phosphorus content of this farm was variable, with some areas being deficient, and other areas optimal. The soil phosphorus concentrations will continue to be monitored with subsequent biosolids applications.

Potassium

The total potassium in the biosolids were measured to be 0.08% (Figure 8), or 9.6 kg/ha. The plant available fraction of the potassium in biosolids is assumed to be 100% (Washington State Department of Ecology 2007)

Biosolids Application Rate

The application rate for the Class A biosolids is 55 wet tonnes per hectare, or 12 tonnes of dry matter per hectare based on an average moisture content of 78%. This application rate will provide an estimated 1000 kg of total N per hectare. An estimated 30% of the total nitrogen is estimated to become available to the crop in the first year. Subsequent application rates of biosolids will be adjusted as required according to the amount of soluble N remaining in the soil in the fall.

Trace Metal Applications

The application rate of 55 tonnes (12 tonnes of dry matter) per hectare of Class A biosolids will provide the following amounts of trace elements as per Figure 11 below.

		Addition	**Post**	Limits
	Metals in Soil	**from Biosolids**	**Application**	OMRR[b]
	(mg/kg)[a]	(mg/kg)	(mg/kg)	(mg/kg)
Arsenic	6.10	0.017	6.12	15
Cadmium	0.40	0.009	0.41	9
Chromium	74.75	0.186	74.94	60
Cobalt	13.50	0.014	13.51	40
Copper	43.75	3.25	47.00	150
Lead	8.43	0.120	8.55	350
Mercury	0.06	0.012	0.07	0.6
Molybdenum	0.54	0.038	0.58	5
Nickel	41.00	0.151	41.15	100
Selenium	0.85	0.027	0.88	2
Zinc	99.00	5.10	104.10	200
[a] average of 4 samples				
[b] OMRR Schedules 9 and 10 using most conservative limits				
[c] plant uptake not included in calculation				

Figure 11. Effect of a 12 tonne DM application of Class A biosolids on trace elements in the soil.

As mentioned in a previous section, it will be important to track the soil chromium concentrations. All of the soil analyses of the various land application sites in 2018 showed significantly increased chromium concentrations, despite either no, or very little application of biosolids (i.e Figure 8). In addition, there is very little chromium added with the biosolids

application. The elevated chromium concentrations appear to be characteristic of the Fraser River sediments, and are significantly higher for the 2018 samples than soil samples taken in previous years.

Other Inputs to the Farm

There are no other inputs of organic matter to the land on this farm. Additional fertilizer nitrogen may be required depending on the availability of the nitrogen in the biosolids. Additional potassium may be required as well.

The post application soil sampling of the fields will determine the amount of soluble nitrogen remaining in the soil before the fall rains. Future land application plans for this property will also be adjusted for post harvest soil nutrient contents.

Post Application Monitoring of the Site

Crop yields will be estimated during the growing season to verify the amount of forage harvested from the property. Post application soil samples will be taken in the fall to estimate accumulation of trace elements as well as residual nitrate in the soil. This soil information will be used to determine additional Class A biosolids applications in subsequent years.

The post application report will also provide information on actual application rates, including moisture contents of the biosolids at the time of application.

Minimizing Potential for Adverse Environmental Impacts

There are two potential adverse environmental impacts from the land application:

1. Risk of the biosolids not meeting Class A requirements

   Each batch of biosolids produced at the JAMES Treatment Plant is tested for fecal coliform before release for land application, as per OMRR requirements. This means that the biosolids are stored for 1-4 months at the JAMES Treatment Plant in order for the biosolids to meet Class A requirements for fecal coliform. For this land application plan, the biosolids met Class A requirements in November before they were delivered to the site, and have been stored for five months.

2. Risk of over application of biosolids

   The risk of over application of Class A biosolids has limited potential negative environmental effect. In the Land Application Plans, the biosolids are applied on the basis of optimizing the nitrogen value of the biosolids. Although it is possible that a

higher rate of biosolids application may increase the potential for nitrogen leaching, the nitrogen in biosolids has limited availability. This must also be understood in the context of Class A biosolids growing medium, which can be applied without volume restrictions and is not applied on the basis of agronomic utilization of the nitrogen or phosphorous contained in the biosolids.

In summary, the potential adverse effects of land application of Class A biosolids are minimal, and are controlled by appropriate testing, storage and application.

Sampling and Analysis

Schedule 5 of OMRR requires that the Class A biosolids be analyzed at least every 1000 tonnes of dry weight of organic matter, or once per year. Schedule 5 also states that "All analysis must be in accordance with the procedures described in "British Columbia Laboratory Methods Manual: 2003 – for the Analysis of Water, Wastewater, Sediment, Biological Material and Discrete Ambient Air Samples""

The City of Abbotsford follows the requirements of Schedule 5 of OMRR: The following represents their sampling schedule:

JAMES Biosolids Testing Schedule (Biosolids prior to centrifugation)

Weekly Testing:

- *Total Metals (including total Mercury)*
- *Fecal Coliform (reported as MPN/g dry weight)*
- *Salmonella*

Monthly Testing:

- *Total Metals (including total Mercury)*
- *Total Phosphorus (%)*
- *Total Kjeldahl Nitrogen (%)*
- *Total Potassium (%)*
- *Total Sulphur (%)*
- *Total Carbon (%)*
- *Total Organic Matter (%)*
- *Moisture (%)*
- *Ammonia (available - %)*
- *Nitrate (available – mg/kg)*
- *pH*
- *Conductivity*
- *C/N Ratio*

JAMES Biosolids Testing Schedule (Biosolids after centrifugation - Stored)

Monthly Testing:

- *Fecal Coliform (reported as MPN/g dry weight)*

Additional testing (Fecal Coliform only) will be done on the biosolids after storage and before it is released to ensure that it meets Class A.

Biocentral will be taking random sampling to ensure that the biosolids meet Class A standards.

Record Keeping

The City of Abbotsford records temperatures and retention times for the production of Class A biosolids, as per Schedule 6 (1) of the OMRR. All records for the production of the Class A biosolids will be stored at the JAMES Wastewater Treatment Plant for a minimum of 36 months, as per Schedule 6 (2) and (3).

The Land Application Plan, and all associated information will be kept at the Land Application Site, and will also be stored at the offices of the Qualified Professional, as well as at Biocentral's offices.

Role of the Qualified Professional

The qualified professional will oversee the storage and land application of the biosolids, including site inspections of the actual land application. He may also request plant yield data, as well as direct post harvest soil sampling to determine the post sampling soil concentrations of nutrients and trace elements. The qualified professional reserves the right to request verification of the Class A status of the biosolids at any time.

Summary

This Land Application Plan provides a beneficial reuse of Class A biosolids, which are a valuable source of nitrogen, phosphorus, micronutrients and organic matter. The risk of environmental concern at this location is very low because of the quality of the Class A biosolids being applied and the proximity to water bodies and water sources.

Storage and transportation of the Class A biosolids is also not considered a concern because of the low fecal coliform count and the lack of significant odour in the biosolids.

This Land Application Plan was prepared by:

John Paul, PhD PAg

References

British Columbia Ministry of the Environment. 2008. Land Application Guidelines for the Organic Matter Recycling Regulation and the Soil Amendment Code of Practice, Best Management Practices. Document # 758-08, Sylvis Environmental.

Kelly, C.C and R.H. Spilsbury. 1939. Soil Survey of the Lower Fraser Valley. British Columbia Department of Agriculture. Publication 650, Technical Bulletin 20.

Oregon State University. 2007. Fertilizing with Biosolids. PNW 508-E, Revised June 2007 http://www.ecy.wa.gov/programs/swfa/biosolids/pdf/Fertilizing.pdf

BRITISH COLUMBIA | Ministry of Environment

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 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 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 of Environment 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 Branch PO Box 9377 Stn Prov Govt Victoria, BC V8W 9M1 **Email:** PermitAdministration.VictoriaEPD@gov.bc.ca	Ministry of Environment Environmental Protection Division Business Services Branch 3rd Floor, 2975 Jutland Road Victoria, BC V8T 5J9

Section 1: Purpose of Notification

***Application Type** (check one)	☒ New notification ☐ Change in information to an existing notification (provide authorization #)	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*				2
OR * Individual's Full Legal Name	Susanna Schweri Keusch, Noemi Dominique Keusch, and Guillermo Andres Murillo (contact is Andres Murillo)			3
Doing Business As *if applicable*				4
Incorporation Number *as registered with the BC Registrar of Companies (if applicable)*				5
***Contact Numbers** *e.g. (999) 999-9999*	Phone 604-796-3851	Mobile 604-991-0108		6
***Email Address** *generic company email address*	andres@timbroconstruction.com			7
***Legal Address** *as registered with BC Registrar of Companies*	Unit # / Street 1995 Fir Rd			8
	City Agassiz	Province BC	Postal Code V0M 1A3	9

***Mailing Address** *if different from above*	☒ Same as Legal Address			10
	Unit # / Street			11
	City	Province	Postal Code	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*				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	Murillo			1
Contact's First Name	Andres			2
Contact's Title	owner			3
Mailing Address	☒ Mailing address is the same as Section 2 above			4
	Unit # / Street			5
	City	Province	Postal Code	6
Contact Numbers *e.g. (999) 999-9999*	Phone	Mobile		7
Email Address				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*	Transform Compost Systems Ltd.			1
Doing Business As *if different than above*				2
Agent's Last Name	Paul			3
Agent's First Name	John			4
Agent's Title	President			5
Mailing Address	Unit # / Street 3911 Mt. Lehman Rd			6
	City Abbotsford	Province BC	Postal Code V2T 5W5	7
Contact Numbers *e.g. (999) 999-9999*	Phone 604-856-2722	Mobile 604-302-4367		8
Email Address	transform@telus.net			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*	Andres Murillo	10
Date signed	Dec. 18th 2017.	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 solids
- Waste Discharge Regulation Schedule: 2 "soil enhancement using wastes"

***Regional District**	Fraser Valley Regional District		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 49.2407	Longitude (e.g., 116.8177) W 121.7906	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)	South portion of Lot 37 GI, Section 25, Range 29, Township 3, New Westminster Plan District		4
PID/PIN/Crown File No.	013-084-143		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)* 1995 Fir Rd., Agassiz, BC V0M 1A3		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	Andres Murillo	5

Legal Land Owner Contact Numbers *e.g. (999) 999-9999*	Phone: 604-796-3658	Mobile: 604-991-0108	6
Legal Land Owner Email Address	andres@timbroconstruction.com		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**	108662	12
***Description of the managed organic matter to be applied**	Class A biosolids	13

***Intended date(s) for land application for that year**	2018-03 to 2018-05 (yyyy-mm-dd)		14
***Application rates**	12 dt/hectare		15
	dt/hectare		16
	dt/hectare		17
***Cumulative additions for that year of substances listed in Schedule 4 of the Organic Matter Recycling Regulation**	**Substance**	**Concentration (µg/g dry weight)**	18
	Arsenic	0.020	
	Cadmium	0.009	
	Chromium	0.173	
	Cobalt	0.013	
	Copper	3.37	
	Lead	0.125	
	Mercury	0.011	
	Molybdenum	0.051	
	Nickel	0.102	
	Selenium	0.027	
	Zinc	5.32	
***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:

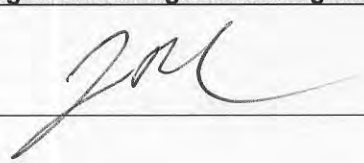
   a) this registration form,
   b) any document that the Registrant submits or causes to be submitted to the Province or the Director in support of this registration, and
   c) any document that the Registrant submits or causes to be submitted to the Director or the Province pursuant to
      i. any regulation 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 Ministry of Environment 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
John Paul		December 1, 2017


1995 Fir Rd
Google Earth


1995 Fir Rd
Soil sampling March 2018
Legend
Crop perimeter
Sampling point
Holly Rd
Pioneer Ave
Ashton Rd
S1
S2
S3
S4
N
200 m
Google Earth
©2018 Google

Appendix B

Exova
#104, 19575-55 A Ave.
Surrey, British Columbia
V3S 8P8, Canada

T: +1 (604) 514-3322
F: +1 (604) 514-3323
E: Surrey@exova.com
W: www.exova.com

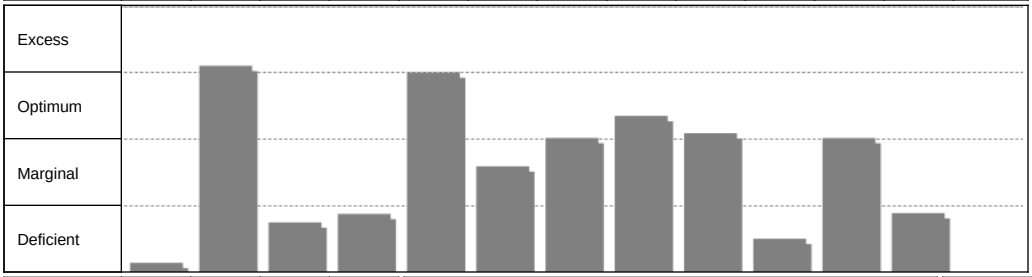
Appendix C

Farm Soil Analysis

Bill To:	Timbro Contracting (A	Grower Name:	1995 Fir Rd	Lot Number:	1259963
Report To:	Timbro Contracting (A	Client's Sample Id:		Report Number:	2271314
	P.O. Box 95	Field Id:	S1	Date Received:	Mar 15, 2018
	7357 Pioneer Avenue	Acres:		Disposal Date:	Apr 14, 2018
	Agassiz, BC., Canada	Legal Location:		Report Date:	Mar 23, 2018
	V0M 1A0	Last Crop:	Crop not provided	Arrival Condition:	
Agreement:	74556				

Nutrient analysis (ppm)

Depth	N*	P	K	S**	Ca	Mg	Fe	Cu	Zn	B	Mn	Cl	BiCarbP
0" - 6"	3	>80	56	2	1040	42	28.6	2.3	2.7	<0.2	2.9	4	



Soil Quality

pH	EC(dS/m)	OM(%)	Sample#
7.0	0.07	4.1	6042840

Alkaline	*Extreme*	*High*
Neutral	*Very High*	*Normal*
Acidic	*High*	*Low*
Very Acidic	*Good*	*Very Low*

Total lbs/acre	6	160	112	3
Estimated lbs/acre	11	160	112	7

Texture *n/a* Hand Texture *n/a*

Sand n/a Silt n/a Clay n/a

Ammonium n/a

BS 100 % CEC 5.7 meq/100 g

Ca 91.4 % Mg 6.0 % Na <2.3 % K 2.5 %

TEC 5.7 meq/100 g Na <30 ppm

Lime 0 T/ac Buffer pH Not Required Est. N Release n/a K/Mg Ratio 0.42

*Nitrate-N **Sulfate-S n/a = not analysed

RECOMMENDATIONS FOR BALANCED CROP NUTRITION

	Crop not provided				
Macro-nutrients	**Yield**	**N**	**P_2O_5**	**K_2O**	**S**
Growing Condition		To be added (lbs/acre)			
Excellent					
Average					
Your Goal					
Removal Rate (Seed/Total)					
Micro-nutrients	Iron	Copper	Zinc	Boron	Manganese
To be added (lbs/ac)					

Comments:

- Sample Information Sheet was not received.

Recommendations are based on general research consensus. They should not replace responsible judgement.

Exova
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Surrey, British Columbia
V3S 8P8, Canada

T: +1 (604) 514-3322
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E: Surrey@exova.com
W: www.exova.com

Farm Soil Analysis

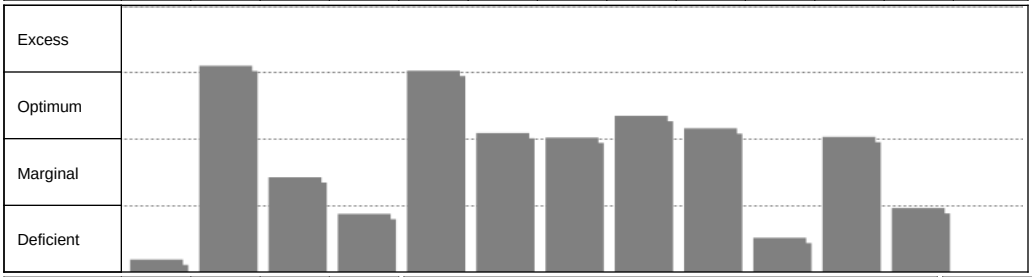
Bill To:	Timbro Contracting (A	Grower Name:	1995 Fir Rd	Lot Number:	1259963
Report To:	Timbro Contracting (A	Client's Sample Id:		Report Number:	2271315
	P.O. Box 95	Field Id:	S2	Date Received:	Mar 15, 2018
	7357 Pioneer Avenue	Acres:		Disposal Date:	Apr 14, 2018
	Agassiz, BC., Canada	Legal Location:		Report Date:	Mar 23, 2018
	V0M 1A0	Last Crop:	Crop not provided	Arrival Condition:	
Agreement:	74556				

Nutrient analysis (ppm)

Depth	N*	P	K	S**	Ca	Mg	Fe	Cu	Zn	B	Mn	Cl	BiCarbP
0" - 6"	4	>80	107	2	1270	50	33.5	2.3	4.1	0.2	3.7	4	

Soil Quality

pH	EC(dS/m)	OM(%)	Sample#
6.6	0.09	4.5	6042841



Alkaline	*Extreme*	*High*
Neutral	*Very High*	*Normal*
Acidic	*High*	*Low*
Very Acidic	*Good*	*Very Low*

Total lbs/acre	7	160	214	3
Estimated lbs/acre	15	160	214	7

Texture *n/a* Hand Texture *n/a*
Sand n/a Silt n/a Clay n/a
Ammonium n/a

BS 72 % CEC 14 meq/100 g
Ca 65 % Mg 4.2 % Na <1.3 % K 2.8 %
TEC 9.8 meq/100 g Na <30 ppm

Lime 0 T/ac Buffer pH 6.7 Est. N Release n/a K/Mg Ratio 0.66

*Nitrate-N **Sulfate-S n/a = not analysed

RECOMMENDATIONS FOR BALANCED CROP NUTRITION

	Crop not provided				
Macro-nutrients	**Yield**	**N**	**P_2O_5**	**K_2O**	**S**
Growing Condition		To be added (lbs/acre)			
Excellent					
Average					
Your Goal					
Removal Rate (Seed/Total)					
Micro-nutrients	Iron	Copper	Zinc	Boron	Manganese
To be added (lbs/ac)					

Comments:

- Sample Information Sheet was not received.

Recommendations are based on general research consensus. They should not replace responsible judgement.

Exova
#104, 19575-55 A Ave.
Surrey, British Columbia
V3S 8P8, Canada

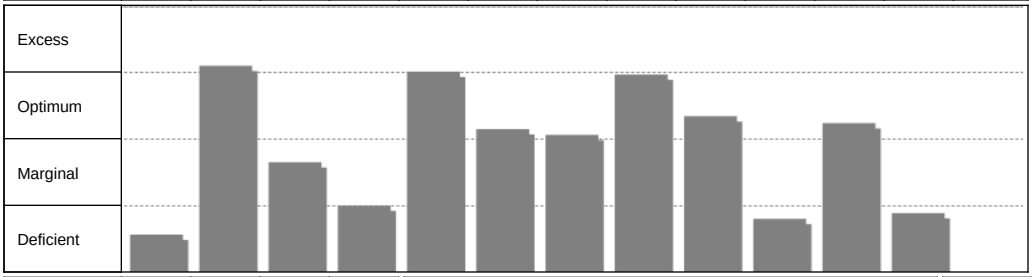
T: +1 (604) 514-3322
F: +1 (604) 514-3323
E: Surrey@exova.com
W: www.exova.com

Farm Soil Analysis

Bill To:	Timbro Contracting (A	Grower Name:	1995 Fir Rd	Lot Number:	1259963
Report To:	Timbro Contracting (A	Client's Sample Id:		Report Number:	2271316
	P.O. Box 95	Field Id:	S3	Date Received:	Mar 15, 2018
	7357 Pioneer Avenue	Acres:		Disposal Date:	Apr 14, 2018
	Agassiz, BC., Canada	Legal Location:		Report Date:	Mar 23, 2018
	V0M 1A0	Last Crop:	Crop not provided	Arrival Condition:	
Agreement:	74556				

Nutrient analysis (ppm)

Depth	N*	P	K	S**	Ca	Mg	Fe	Cu	Zn	B	Mn	Cl	BiCarbP
0" - 6"	11	>80	124	2	1150	64	73.5	4.9	7.6	0.3	13.6	4	



Total lbs/acre	22	160	248	4
Estimated lbs/acre	45	160	248	8

*Nitrate-N **Sulfate-S n/a = not analysed

Soil Quality

pH	EC(dS/m)	OM(%)	Sample#
6.4	0.1	6.6	6042842

Alkaline	*Extreme*	*High*
Neutral	*Very High*	*Normal*
Acidic	*High*	*Low*
Very Acidic	*Good*	*Very Low*

Texture *n/a* Hand Texture *n/a*

Sand n/a Silt n/a Clay n/a

Ammonium n/a

BS 59.4 % CEC 18.7 meq/100 g

Ca 51.8 % Mg 4.7 % Na <1.2 % K 2.9 %

TEC 11.1 meq/100 g Na <30 ppm

Lime 1 T/ac Buffer pH 6.6 Est. N Release n/a K/Mg Ratio 0.61

RECOMMENDATIONS FOR BALANCED CROP NUTRITION

	Crop not provided				
Macro-nutrients	**Yield**	**N**	**P_2O_5**	**K_2O**	**S**
Growing Condition		To be added (lbs/acre)			
Excellent					
Average					
Your Goal					
Removal Rate (Seed/Total)					
Micro-nutrients	Iron	Copper	Zinc	Boron	Manganese
To be added (lbs/ac)					

Comments:

- Sample Information Sheet was not received.

Recommendations are based on general research consensus. They should not replace responsible judgement.

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#104, 19575-55 A Ave.
Surrey, British Columbia
V3S 8P8, Canada

T: +1 (604) 514-3322
F: +1 (604) 514-3323
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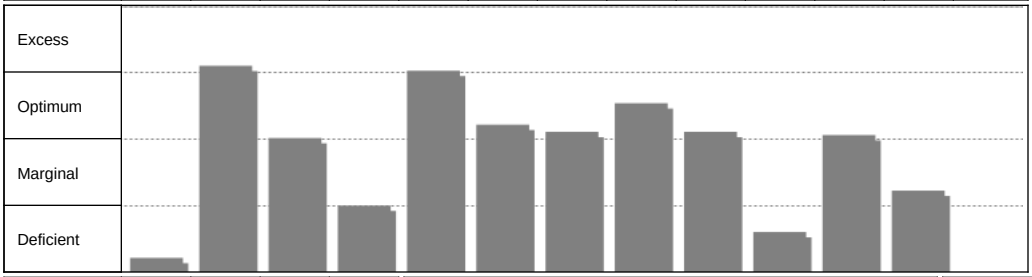
Farm Soil Analysis

Bill To:	Timbro Contracting (A	Grower Name:	1995 Fir Rd	Lot Number:	1259963
Report To:	Timbro Contracting (A	Client's Sample Id:		Report Number:	2271317
	P.O. Box 95	Field Id:	S4	Date Received:	Mar 15, 2018
	7357 Pioneer Avenue	Acres:		Disposal Date:	Apr 14, 2018
	Agassiz, BC., Canada	Legal Location:		Report Date:	Mar 23, 2018
	V0M 1A0	Last Crop:	Crop not provided	Arrival Condition:	
Agreement:	74556				

Nutrient analysis (ppm)

Depth	N*	P	K	S**	Ca	Mg	Fe	Cu	Zn	B	Mn	Cl	BiCarbP
0" - 6"	4	>80	156	2	1270	78	119	3.1	3.1	0.2	4.9	4.9	



Total lbs/acre	8	160	312	4
Estimated lbs/acre	17	160	312	8

Soil Quality

pH	EC(dS/m)	OM(%)	Sample#
6.4	0.1	6.3	6042843

Alkaline	*Extreme*	*High*
Neutral	*Very High*	*Normal*
Acidic	*High*	*Low*
Very Acidic	*Good*	*Very Low*

Texture *n/a* Hand Texture *n/a*

Sand n/a Silt n/a Clay n/a

Ammonium n/a

BS 55.2 % CEC 24.3 meq/100 g

Ca 47.4 % Mg 4.8 % Na <1.0 % K 3.0 %

TEC 13.4 meq/100 g Na <30 ppm

Lime 2 T/ac Buffer pH 6.4 Est. N Release n/a K/Mg Ratio 0.62

*Nitrate-N **Sulfate-S n/a = not analysed

RECOMMENDATIONS FOR BALANCED CROP NUTRITION

	Crop not provided				
Macro-nutrients	**Yield**	**N**	**P_2O_5**	**K_2O**	**S**
Growing Condition		To be added (lbs/acre)			
Excellent					
Average					
Your Goal					
Removal Rate (Seed/Total)					
Micro-nutrients	Iron	Copper	Zinc	Boron	Manganese
To be added (lbs/ac)					

Comments:

- Sample Information Sheet was not received.

Recommendations are based on general research consensus. They should not replace responsible judgement.

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#104, 19575-55 A Ave.
Surrey, British Columbia
V3S 8P8, Canada

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F: +1 (604) 514-3323
E: Surrey@exova.com
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Report Transmission Cover Page

Bill To:	Timbro Contracting (A	Project ID:	1995 Fir Rd	Lot ID:	**1259963**
	P.O. Box 95	Project Name:	Andres	Control Number:	
	7357 Pioneer Avenue	Project Location:	Agassiz	Date Received:	Mar 15, 2018
	Agassiz, BC, Canada	LSD:		Date Reported:	Mar 23, 2018
	V0M 1A0	P.O.:		Report Number:	2271318
Attn:	Accounts Payable	Proj. Acct. code:			
Sampled By:					
Company:					

Contact	Company	Address
Accounts Payable	**Timbro Contracting (A Partnership)**	P.O. Box 95, 7357 Pioneer Avenue Agassiz, BC V0M 1A0 Phone: (604) 796-3851 Fax: (604) 796-0554 Email: info@timbroconstruction.com

Delivery	Format	Deliverables
Email - Single Report	PDF	Invoice

Contact	Company	Address
Andres Moreno	**Timbro Contracting (A Partnership)**	P.O. Box 95, 7357 Pioneer Avenue Agassiz, BC V0M 1A0 Phone: (604) 796-3851 Fax: (604) 796-0554 Email: andresm@biocentral.ca

Delivery	Format	Deliverables
Email - Merge Reports	PDF	Test Report / Test Report / Test

Contact	Company	Address
Frank Trevr	**Timbro Contracting (A Partnership)**	P.O. Box 95, 7357 Pioneer Avenue Agassiz, BC V0M 1A0 Phone: (604) 991-3782 Fax: Email: frank@timbroconstruction.com

Delivery	Format	Deliverables
Email - Merge Reports	PDF	Test Report
Email - Single Report	Standard Crosstab	Test Report

Notes To Clients:

- Mar 16, 2018 - Sample Information Sheet was not received.

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Surrey, British Columbia
V3S 8P8, Canada

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F: +1 (604) 514-3323
E: Surrey@exova.com
W: www.exova.com

Analytical Report

Bill To:	Timbro Contracting (A	Project ID:	1995 Fir Rd	Lot ID:	**1259963**
	P.O. Box 95	Project Name:	Andres	Control Number:	
	7357 Pioneer Avenue	Project Location:	Agassiz	Date Received:	Mar 15, 2018
	Agassiz, BC, Canada	LSD:		Date Reported:	Mar 23, 2018
	V0M 1A0	P.O.:		Report Number:	2271318
Attn:	Accounts Payable	Proj. Acct. code:			
Sampled By:					
Company:					

Reference Number	1259963-19666	1259963-19667	1259963-19668
Sample Date	Mar 15, 2018	Mar 15, 2018	Mar 15, 2018
Sample Time	NA	NA	NA
Sample Location			
Sample Description	1995 Fir Rd / S1 / 0 / 5 / E / 1	1995 Fir Rd / S2 / 0 / 5 / E / 1	1995 Fir Rd / S3 / 0 / 5 / E / 1
Matrix	Farm Soil	Farm Soil	Farm Soil

Analyte		Units	Results	Results	Results	Nominal Detection Limit
Aggregate Organic Constituents						
Organic Matter	LOI	% by weight	4.1	4.5	6.6	0.1
Available Nutrients						
Nitrate - N	Farmsoil	ppm	3	4	11	2
Phosphorus	Farmsoil	ppm	>80	>80	>80	5
Potassium	Farmsoil	ppm	56	107	124	25
Sulfate-S	Farmsoil	ppm	2	2	2	1
Copper	FS Micro-nutrients	ppm	2.3	2.3	4.9	0.1
Iron	FS Micro-nutrients	ppm	28.6	33.5	73.5	2
Manganese	FS Micro-nutrients	ppm	2.9	3.7	13.6	0.1
Zinc	FS Micro-nutrients	ppm	2.7	4.1	7.6	0.5
Base saturation	FS Base Saturation	%	100	72	59.4	
Calcium	FS Base Saturation	%	91.4	65	51.8	
Magnesium	FS Base Saturation	%	6.0	4.2	4.7	
Sodium	FS Base Saturation	%	<2.3	<1.3	<1.2	
Potassium	FS Base Saturation	%	2.5	2.8	2.9	
TEC	FS Base Saturation	meq/100 g	5.7	9.8	11.1	
Calcium	FS Macro-nutrients	ppm	1040	1270	1150	30
Magnesium	FS Macro-nutrients	ppm	42	50	64	5
Sodium	FS Macro-nutrients	ppm	<30	<30	<30	30
Boron	FS Micro-nutrients	ppm	<0.2	0.2	0.3	0.1
Classification						
Nitrogen	Total	%	0.19	0.21	0.32	0.02
Hot Water Soluble						
Boron	FS Micro-nutrients	ppm	<0.2	0.2	0.3	0.1
Metals Strong Acid Digestion						
Antimony	Strong Acid Extractable	µg/g	2	2	3	1.5
Arsenic	Strong Acid Extractable	µg/g	5.4	6.0	7.0	0.35
Barium	Strong Acid Extractable	µg/g	130	120	140	0.2
Beryllium	Strong Acid Extractable	µg/g	0.34	0.36	0.48	0.01
Cadmium	Strong Acid Extractable	µg/g	0.4	0.4	0.4	0.05
Chromium	Strong Acid Extractable	µg/g	69	69	81	0.1
Cobalt	Strong Acid Extractable	µg/g	13	13	15	0.1
Copper	Strong Acid Extractable	µg/g	39	37	57	0.1
Lead	Strong Acid Extractable	µg/g	8.1	9.7	8.1	0.5
Mercury	Strong Acid Extractable	µg/g	0.074	0.045	0.069	0.003
Molybdenum	Strong Acid Extractable	µg/g	0.4	0.4	0.77	0.1
Nickel	Strong Acid Extractable	µg/g	40	40	44	0.25

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#104, 19575-55 A Ave.
Surrey, British Columbia
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F: +1 (604) 514-3323
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W: www.exova.com

Analytical Report

Bill To:	Timbro Contracting (A	Project ID:	1995 Fir Rd	Lot ID:	**1259963**
	P.O. Box 95	Project Name:	Andres	Control Number:	
	7357 Pioneer Avenue	Project Location:	Agassiz	Date Received:	Mar 15, 2018
	Agassiz, BC, Canada	LSD:		Date Reported:	Mar 23, 2018
	V0M 1A0	P.O.:		Report Number:	2271318
Attn:	Accounts Payable	Proj. Acct. code:			
Sampled By:					
Company:					

		Reference Number	1259963-19666	1259963-19667	1259963-19668	
		Sample Date	Mar 15, 2018	Mar 15, 2018	Mar 15, 2018	
		Sample Time	NA	NA	NA	
		Sample Location				
		Sample Description	1995 Fir Rd / S1 / 0 / 5 / E / 1	1995 Fir Rd / S2 / 0 / 5 / E / 1	1995 Fir Rd / S3 / 0 / 5 / E / 1	
		Matrix	Farm Soil	Farm Soil	Farm Soil	
Analyte		**Units**	**Results**	**Results**	**Results**	Nominal Detection Limit
Metals Strong Acid Digestion - Continued						
Selenium	Strong Acid Extractable	µg/g	1	0.6	1	0.5
Silver	Strong Acid Extractable	µg/g	<0.4	<0.4	<0.4	0.4
Strontium	Strong Acid Extractable	µg/g	26	27	27	0.05
Thallium	Strong Acid Extractable	µg/g	<0.5	<0.5	<0.5	0.5
Tin	Strong Acid Extractable	µg/g	<0.5	<0.5	0.8	0.5
Vanadium	Strong Acid Extractable	µg/g	77	78	88	0.2
Zinc	Strong Acid Extractable	µg/g	92	97	110	0.05
Soil Acidity						
pH	1:2 Soil:Water	pH	7.0	6.6	6.4	
Electrical Conductivity	Sat. Paste equiv based on 1:2	dS/m at 25 °C	0.07	0.09	0.1	0.02
Water Soluble Parameters						
Chloride	Available	mg/kg	4	4	4	0.5
Lime Requirement						
pH	SMP	pH	Not Required	6.7	6.6	
Lime		T/ac	0	0	1	

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Analytical Report

Bill To:	Timbro Contracting (A	Project ID:	1995 Fir Rd	Lot ID:	**1259963**
	P.O. Box 95	Project Name:	Andres	Control Number:	
	7357 Pioneer Avenue	Project Location:	Agassiz	Date Received:	Mar 15, 2018
	Agassiz, BC, Canada	LSD:		Date Reported:	Mar 23, 2018
	V0M 1A0	P.O.:		Report Number:	2271318
Attn:	Accounts Payable	Proj. Acct. code:			
Sampled By:					
Company:					

Reference Number	1259963-19669
Sample Date	Mar 15, 2018
Sample Time	NA
Sample Location	
Sample Description	1995 Fir Rd / S4 / 0 / 5 / E / 1
Matrix	Farm Soil

Analyte		Units	Results	Results	Results	Nominal Detection Limit
Aggregate Organic Constituents						
Organic Matter	LOI	% by weight	6.3			0.1
Available Nutrients						
Nitrate - N	Farmsoil	ppm	4			2
Phosphorus	Farmsoil	ppm	>80			5
Potassium	Farmsoil	ppm	156			25
Sulfate-S	Farmsoil	ppm	2			1
Copper	FS Micro-nutrients	ppm	3.1			0.1
Iron	FS Micro-nutrients	ppm	119			2
Manganese	FS Micro-nutrients	ppm	4.9			0.1
Zinc	FS Micro-nutrients	ppm	3.1			0.5
Base saturation	FS Base Saturation	%	55.2			
Calcium	FS Base Saturation	%	47.4			
Magnesium	FS Base Saturation	%	4.8			
Sodium	FS Base Saturation	%	<1.0			
Potassium	FS Base Saturation	%	3.0			
TEC	FS Base Saturation	meq/100 g	13.4			
Calcium	FS Macro-nutrients	ppm	1270			30
Magnesium	FS Macro-nutrients	ppm	78			5
Sodium	FS Macro-nutrients	ppm	<30			30
Boron	FS Micro-nutrients	ppm	0.2			0.1
Classification						
Nitrogen	Total	%	0.27			0.02
Hot Water Soluble						
Boron	FS Micro-nutrients	ppm	0.2			0.1
Metals Strong Acid Digestion						
Antimony	Strong Acid Extractable	µg/g	3			1.5
Arsenic	Strong Acid Extractable	µg/g	6.0			0.35
Barium	Strong Acid Extractable	µg/g	130			0.2
Beryllium	Strong Acid Extractable	µg/g	0.47			0.01
Cadmium	Strong Acid Extractable	µg/g	0.4			0.05
Chromium	Strong Acid Extractable	µg/g	80			0.1
Cobalt	Strong Acid Extractable	µg/g	13			0.1
Copper	Strong Acid Extractable	µg/g	42			0.1
Lead	Strong Acid Extractable	µg/g	7.8			0.5
Mercury	Strong Acid Extractable	µg/g	0.049			0.003
Molybdenum	Strong Acid Extractable	µg/g	0.58			0.1
Nickel	Strong Acid Extractable	µg/g	40			0.25

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#104, 19575-55 A Ave.
Surrey, British Columbia
V3S 8P8, Canada

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F: +1 (604) 514-3323
E: Surrey@exova.com
W: www.exova.com

Analytical Report

Bill To:	Timbro Contracting (A	Project ID:	1995 Fir Rd	Lot ID:	**1259963**
	P.O. Box 95	Project Name:	Andres	Control Number:	
	7357 Pioneer Avenue	Project Location:	Agassiz	Date Received:	Mar 15, 2018
	Agassiz, BC, Canada	LSD:		Date Reported:	Mar 23, 2018
	V0M 1A0	P.O.:		Report Number:	2271318
Attn:	Accounts Payable	Proj. Acct. code:			
Sampled By:					
Company:					

Reference Number	1259963-19669
Sample Date	Mar 15, 2018
Sample Time	NA
Sample Location	
Sample Description	1995 Fir Rd / S4 / 0 / 5 / E / 1
Matrix	Farm Soil

Analyte		Units	Results	Results	Results	Nominal Detection Limit
Metals Strong Acid Digestion - Continued						
Selenium	Strong Acid Extractable	µg/g	0.8			0.5
Silver	Strong Acid Extractable	µg/g	<0.4			0.4
Strontium	Strong Acid Extractable	µg/g	26			0.05
Thallium	Strong Acid Extractable	µg/g	<0.5			0.5
Tin	Strong Acid Extractable	µg/g	<0.5			0.5
Vanadium	Strong Acid Extractable	µg/g	83			0.2
Zinc	Strong Acid Extractable	µg/g	97			0.05
Soil Acidity						
pH	1:2 Soil:Water	pH	6.4			
Electrical Conductivity	Sat. Paste equiv based on 1:2	dS/m at 25 °C	0.1			0.02
Water Soluble Parameters						
Chloride	Available	mg/kg	4.9			0.5
Lime Requirement						
pH	SMP	pH	6.4			
Lime		T/ac	2			

Approved by:

Mathieu Simoneau
Operations Manager

Data have been validated by Analytical Quality Control and Exova's Integrated Data Validation System (IDVS).
Generation and distribution of the report, and approval by the digitized signature above, are performed through a secure and controlled automatic process.

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#104, 19575-55 A Ave.
Surrey, British Columbia
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Quality Control

Bill To:	Timbro Contracting (A	Project ID:	1995 Fir Rd	Lot ID:	**1259963**
	P.O. Box 95	Project Name:	Andres	Control Number:	
	7357 Pioneer Avenue	Project Location:	Agassiz	Date Received:	Mar 15, 2018
	Agassiz, BC, Canada	LSD:		Date Reported:	Mar 23, 2018
	V0M 1A0	P.O.:		Report Number:	2271318
Attn:	Accounts Payable	Proj. Acct. code:			
Sampled By:					
Company:					

Aggregate Organic Constituents

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Organic Matter	% by weight	2.1	2.2	10	0.1	yes
Date Acquired:	March 19, 2018					

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Organic Matter	% by weight	5.1	4.2	5.7	yes
Date Acquired:	March 19, 2018				

Available Nutrients

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Nitrate - N	mg/L	0.163	-1	1	yes
Phosphorus	mg/L	0.004	-4	5	yes
Potassium	mg/L	0.305	-3	10	yes
Sulfate-S	mg/L	0.3229	-1	1	yes
Copper	mg/L	0.0276	-0.1	0.1	yes
Iron	mg/L	0.0771	-2.0	2.0	yes
Manganese	mg/L	0.003	-0.1	0.1	yes
Zinc	mg/L	0.0103	-0.5	0.5	yes
Calcium	mg/L	0.9386	-1	3	yes
Magnesium	mg/L	0.2006	-0	0	yes
Sodium	mg/L	1.308	-1	3	yes
Boron	mg/L	0.0006	-0.2	0.2	yes
Date Acquired:	March 19, 2018				

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Nitrate - N	ppm	19	19	10	2	yes
Phosphorus	ppm	57	54	10	5	yes
Potassium	ppm	452	453	10	10	yes
Sulfate-S	ppm	5	5	15	2	yes
Copper	ppm	3.5	3.4	10	0.1	yes
Iron	ppm	204	203	10	0.1	yes
Manganese	ppm	12.6	12.7	10	0.0	yes
Zinc	ppm	3.7	3.6	10	0.0	yes
Boron	ppm	0.6	0.6	10	0.1	yes
Date Acquired:	March 19, 2018					

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Nitrate - N	ppm	36	29	40	yes
Phosphorus	ppm	28	27	34	yes
Potassium	ppm	201	168	224	yes
Sulfate-S	ppm	698	620	770	yes
Copper	ppm	1.7	1.5	1.9	yes
Iron	ppm	180	154.3	213.7	yes
Manganese	ppm	39.9	35.8	52.1	yes
Zinc	ppm	3.0	2.8	3.8	yes
Calcium	ppm	6230	5530	6752	yes
Magnesium	ppm	586	495	670	yes

Exova
#104, 19575-55 A Ave.
Surrey, British Columbia
V3S 8P8, Canada

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F: +1 (604) 514-3323
E: Surrey@exova.com
W: www.exova.com

Quality Control

Bill To:	Timbro Contracting (A	Project ID:	1995 Fir Rd	Lot ID:	**1259963**
	P.O. Box 95	Project Name:	Andres	Control Number:	
	7357 Pioneer Avenue	Project Location:	Agassiz	Date Received:	Mar 15, 2018
	Agassiz, BC, Canada	LSD:		Date Reported:	Mar 23, 2018
	V0M 1A0	P.O.:		Report Number:	2271318
Attn:	Accounts Payable	Proj. Acct. code:			
Sampled By:					
Company:					

Available Nutrients - Continued

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Sodium	ppm	88	68	94	yes
Boron	ppm	1.1	0.8	1.5	yes
Date Acquired:	March 19, 2018				
Nitrate - N	ppm	4	3	4	yes
Phosphorus	ppm	3	2	4	yes
Potassium	ppm	31	24	36	yes
Sulfate-S	ppm	1	1	1	yes
Copper	ppm	0.5	0.4	0.6	yes
Iron	ppm	5.1	4.5	5.5	yes
Manganese	ppm	1.0	0.9	1.1	yes
Zinc	ppm	0.5	0.4	0.6	yes
Calcium	ppm	10	9	11	yes
Magnesium	ppm	10	9	11	yes
Sodium	ppm	10	9	11	yes
Boron	ppm	0.1	0.1	0.1	yes
Date Acquired:	March 19, 2018				
Sulfate-S	ppm	52	40	60	yes
Date Acquired:	March 19, 2018				

Classification

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Nitrogen		0.00168	-0.020	0.020	yes
Date Acquired:	March 19, 2018				

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Nitrogen	%	2.11	2.04	0	2.500	yes
Date Acquired:	March 19, 2018					

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Nitrogen	%	0.49	0.465	0.551	yes
Date Acquired:	March 19, 2018				

Hot Water Soluble

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Boron	mg/L	0.0124	-0.2	0.2	yes
Date Acquired:	March 19, 2018				

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Boron	ppm	<0.2	<0.2	10	0.1	yes
Date Acquired:	March 19, 2018					

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Boron	ppm	1.1	0.8	1.5	yes
Date Acquired:	March 19, 2018				

Lime Requirement

Exova
#104, 19575-55 A Ave.
Surrey, British Columbia
V3S 8P8, Canada

T: +1 (604) 514-3322
F: +1 (604) 514-3323
E: Surrey@exova.com
W: www.exova.com

Quality Control

Bill To:	Timbro Contracting (A	Project ID:	1995 Fir Rd	Lot ID:	**1259963**
	P.O. Box 95	Project Name:	Andres	Control Number:	
	7357 Pioneer Avenue	Project Location:	Agassiz	Date Received:	Mar 15, 2018
	Agassiz, BC, Canada	LSD:		Date Reported:	Mar 23, 2018
	V0M 1A0	P.O.:		Report Number:	2271318
Attn:	Accounts Payable	Proj. Acct. code:			
Sampled By:					
Company:					

Lime Requirement

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
pH	pH	7.3	7.2	7.3	yes
Date Acquired:	March 19, 2018				

Metals Strong Acid Digestion

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Antimony	mg/L	-0.000457259	-0.030	0.030	yes
Arsenic	mg/L	-0.00681021	-0.007	0.007	yes
Barium	mg/L	0.000364058	-0.004	0.004	yes
Beryllium	mg/L	8.8897e-006	-0.000	0.000	yes
Cadmium	mg/L	0.000506602	-0.001	0.001	yes
Chromium	mg/L	0.00121838	-0.002	0.002	yes
Cobalt	mg/L	0.00018497	-0.002	0.002	yes
Copper	mg/L	0.000561406	-0.002	0.002	yes
Lead	mg/L	0.00031064	-0.010	0.010	yes
Mercury	µg/L	-0.009	-0.030	0.030	yes
Molybdenum	mg/L	-0.00165603	-0.002	0.002	yes
Nickel	mg/L	0.00163925	-0.005	0.005	yes
Selenium	mg/L	0.00427062	-0.010	0.010	yes
Silver	mg/L	0.000747588	-0.008	0.008	yes
Strontium	mg/L	9.63792e-005	-0.000	0.000	yes
Thallium	mg/L	-0.00544639	-0.010	0.010	yes
Tin	mg/L	-0.00101922	-0.010	0.010	yes
Vanadium	mg/L	-0.000491746	-0.004	0.004	yes
Zinc	mg/L	0.000670545	-0.001	0.001	yes
Date Acquired:	March 21, 2018				

Calibration Check	Units	% Recovery	Lower Limit	Upper Limit	Passed QC
Antimony	mg/L	92.75	90	110	yes
Arsenic	mg/L	99.77	90	110	yes
Barium	mg/L	100.62	90	110	yes
Beryllium	mg/L	95.64	90	110	yes
Cadmium	mg/L	98.42	90	110	yes
Chromium	mg/L	99.43	90	110	yes
Cobalt	mg/L	97.78	90	110	yes
Copper	mg/L	100.17	90	110	yes
Lead	mg/L	95.05	90	110	yes
Molybdenum	mg/L	97.38	90	110	yes
Nickel	mg/L	95.39	90	110	yes
Selenium	mg/L	99.53	90	110	yes
Silver	mg/L	96.35	90	110	yes
Thallium	mg/L	94.80	90	110	yes
Tin	mg/L	92.47	90	110	yes
Vanadium	mg/L	100.00	90	110	yes
Zinc	mg/L	93.78	90	110	yes
Date Acquired:	March 21, 2018				

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#104, 19575-55 A Ave.
Surrey, British Columbia
V3S 8P8, Canada

T: +1 (604) 514-3322
F: +1 (604) 514-3323
E: Surrey@exova.com
W: www.exova.com

Quality Control

Bill To:	Timbro Contracting (A	Project ID:	1995 Fir Rd	Lot ID:	**1259963**
	P.O. Box 95	Project Name:	Andres	Control Number:	
	7357 Pioneer Avenue	Project Location:	Agassiz	Date Received:	Mar 15, 2018
	Agassiz, BC, Canada	LSD:		Date Reported:	Mar 23, 2018
	V0M 1A0	P.O.:		Report Number:	2271318
Attn:	Accounts Payable	Proj. Acct. code:			
Sampled By:					
Company:					

Metals Strong Acid Digestion - Continued

Calibration Check	Units	% Recovery	Lower Limit	Upper Limit	Passed QC
Antimony	mg/L	91.35	90	110	yes
Arsenic	mg/L	101.01	90	110	yes
Barium	mg/L	100.35	90	110	yes
Beryllium	mg/L	94.49	90	110	yes
Cadmium	mg/L	100.38	90	110	yes
Chromium	mg/L	100.00	90	110	yes
Cobalt	mg/L	99.21	90	110	yes
Copper	mg/L	101.15	90	110	yes
Lead	mg/L	98.13	90	110	yes
Mercury	µg/L	92.60	90	110	yes
Molybdenum	mg/L	98.05	90	110	yes
Nickel	mg/L	98.98	90	110	yes
Selenium	mg/L	106.38	90	110	yes
Silver	mg/L	93.29	90	110	yes
Strontium	mg/L	97.60	90	110	yes
Thallium	mg/L	96.23	90	110	yes
Tin	mg/L	93.02	90	110	yes
Vanadium	mg/L	99.75	90	110	yes
Zinc	mg/L	94.61	90	110	yes
Date Acquired:	March 21, 2018				

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Antimony	µg/g	3	3	30	3.000	yes
Arsenic	µg/g	5.3	4.9	30	1.750	yes
Barium	µg/g	72	67	30	1.000	yes
Beryllium	µg/g	0.37	0.36	30	0.050	yes
Cadmium	µg/g	0.2	0.2	30	0.250	yes
Chromium	µg/g	74	72	30	0.500	yes
Cobalt	µg/g	13	12	30	0.500	yes
Copper	µg/g	26	24	30	0.500	yes
Lead	µg/g	3	3	30	2.500	yes
Mercury	µg/g	0.030	0.029	30	0.500	yes
Molybdenum	µg/g	0.63	0.74	30	0.500	yes
Nickel	µg/g	46	45	30	1.250	yes
Selenium	µg/g	0.7	2	30	2.500	yes
Silver	µg/g	0.61	2.4	30	2.000	yes
Strontium	µg/g	20	19	30	0.250	yes
Thallium	µg/g	<0.5	<0.5	30	2.500	yes
Tin	µg/g	<0.5	<0.5	30	2.500	yes
Vanadium	µg/g	79	77	30	1.000	yes
Zinc	µg/g	56	52	30	0.250	yes
Date Acquired:	March 21, 2018					

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Antimony	µg/g	<1	0.040	2.080	yes

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Quality Control

Bill To:	Timbro Contracting (A	Project ID:	1995 Fir Rd	Lot ID:	**1259963**
	P.O. Box 95	Project Name:	Andres	Control Number:	
	7357 Pioneer Avenue	Project Location:	Agassiz	Date Received:	Mar 15, 2018
	Agassiz, BC, Canada	LSD:		Date Reported:	Mar 23, 2018
	V0M 1A0	P.O.:		Report Number:	2271318
Attn:	Accounts Payable	Proj. Acct. code:			
Sampled By:					
Company:					

Metals Strong Acid Digestion - Continued

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Arsenic	µg/g	4.8	2.940	5.520	yes
Barium	µg/g	170	139.210	174.790	yes
Beryllium	µg/g	0.53	0.405	0.603	yes
Cadmium	µg/g	0.2	0.101	0.341	yes
Chromium	µg/g	32	19.940	36.620	yes
Cobalt	µg/g	7.1	4.970	8.870	yes
Copper	µg/g	16	12.330	17.430	yes
Lead	µg/g	7.4	5.500	11.320	yes
Mercury	µg/g	0.024	0.012	0.034	yes
Molybdenum	µg/g	0.4	0.252	0.828	yes
Nickel	µg/g	20	16.430	23.720	yes
Strontium	µg/g	74	59.580	83.220	yes
Tin	µg/g	<0.5	0.104	0.938	yes
Vanadium	µg/g	37	25.800	48.600	yes
Zinc	µg/g	60	46.370	66.830	yes

Date Acquired: March 21, 2018

Soil Acidity

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
pH	pH	6.18	5.6	7.2	yes
Electrical Conductivity	dS/m at 25 °C	0.0102	-0.04	0.08	yes

Date Acquired: March 19, 2018

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
pH	pH	7.9	7.9	0	0.3	yes
Electrical Conductivity	dS/m at 25 °C	0.94	0.95	10	0.04	yes

Date Acquired: March 19, 2018

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
pH	pH	7.3	6.3	8.6	yes
Electrical Conductivity	dS/m at 25 °C	2.68	2.13	3.09	yes

Date Acquired: March 19, 2018

Water Soluble Parameters

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Chloride	mg/L	0.45	-0.0	0.6	yes

Date Acquired: March 19, 2018

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Chloride	mg/kg	6.6	6.8	10	1.0	yes

Date Acquired: March 19, 2018

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Chloride	mg/kg	36	30.0	40.8	yes

Date Acquired: March 19, 2018

Chloride	mg/kg	5.1	4.4	5.6	yes

Date Acquired: March 19, 2018

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Quality Control

Bill To:	Timbro Contracting (A	Project ID:	1995 Fir Rd	Lot ID:	**1259963**
	P.O. Box 95	Project Name:	Andres	Control Number:	
	7357 Pioneer Avenue	Project Location:	Agassiz	Date Received:	Mar 15, 2018
	Agassiz, BC, Canada	LSD:		Date Reported:	Mar 23, 2018
	V0M 1A0	P.O.:		Report Number:	2271318
Attn:	Accounts Payable	Proj. Acct. code:			
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Company:					

Water Soluble Parameters - Continued

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC

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Methodology and Notes

Bill To:	Timbro Contracting (A	Project ID:	1995 Fir Rd	Lot ID:	**1259963**
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Sampled By:					
Company:					

Method of Analysis

Method Name	Reference		Method	Date Analysis Started	Location
Boron in farm soil	McKeague	*	Hot Water Soluble Boron - Azomethine-H Method, 4.61	Mar 19, 2018	Exova Edmonton
Chloride in farmsoil	SSSA Book Series, no. 3	*	Testing Soils for Sulfur, Boron, Molybdenum, and Chlorine, Chapter 10	Mar 19, 2018	Exova Edmonton
Macronutrients in Farm Soils	McKeague	*	Ammonium Acetate Extractable Cations, 4.51	Mar 19, 2018	Exova Edmonton
Metals (Strong Acid Leachable) in soils (Surrey)	B.C.M.O.E	*	Strong Acid Leachable Metals (SALM) in Soil, V 1.0, SALM	Mar 20, 2018	Exova Surrey
Metals (Strong Acid Leachable) in soils (Surrey)	US EPA	*	Mercury in Solid and Semi-Solid Wastes (Cold Vapour), 7471B	Mar 20, 2018	Exova Surrey
Micronutrients in Farm Soil	APHA	*	Inductively Coupled Plasma (ICP) Method, 3120 B	Mar 19, 2018	Exova Edmonton
Micronutrients in Farm Soil	McKeague	*	DTPA-TEA Extractable Elements, 4.65	Mar 19, 2018	Exova Edmonton
Nutrients in Farm Soil	Comm. Soil Sci. Pl. Anal.	*	Modified Kelowna Soil Test, Vol 26, 1995	Mar 19, 2018	Exova Edmonton
Organic Matter by Ignition	McKeague	*	Loss on Ignition (LOI), 3.8	Mar 19, 2018	Exova Edmonton
pH and Conductivity in farm soil	McKeague	*	1:2 Soil:Water Ratio, 4.12	Mar 19, 2018	Exova Edmonton
SMP Lime Requirements	Carter	*	Shoemaker-Mclean-Pratt Single-Buffer Method, 12.2	Mar 19, 2018	Exova Edmonton
Sulfate in Farm Soil	McKeague	*	Sulfate Extractable by 0.1M CaCl2, 4.47	Mar 19, 2018	Exova Edmonton
Total Carbon, Nitrogen & Sulfur by Leco Combustion (Surrey)	SSSA Book Series 5	*	Nitrogen-Total, Ch 37	Mar 19, 2018	Exova Surrey

** Reference Method Modified*

References

APHA	Standard Methods for the Examination of Water and Wastewater
B.C.M.O.E	B.C. Ministry of Environment
Carter	Soil Sampling and Methods of Analysis.
Comm. Soil Sci. Pl.	Communications in Soil Science and Plant Analysis
McKeague	Manual on Soil Sampling and Methods of Analysis
SSSA Book Series 5	Methods of Soil Analysis, Part 3
SSSA Book Series,	Soil Testing and Plant Analysis
US EPA	US Environmental Protection Agency Test Methods

Guidelines

Guideline Description	General Soil Comments
	Plant Nutrients in Soil
	Soil test for Crop Unknown
Guideline Source	Exova Canada Inc.,
Guideline Comments	

Exova
#104, 19575-55 A Ave.
Surrey, British Columbia
V3S 8P8, Canada

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Methodology and Notes

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	V0M 1A0	P.O.:		Report Number:	2271318
Attn:	Accounts Payable	Proj. Acct. code:			
Sampled By:					
Company:					

Comments:

- Mar 16, 2018 - Sample Information Sheet was not received.

The comparison of test results to guideline limits is provided for information purposes only. This is not to be taken as a statement of conformance / nonconformance to any guideline, regulation or limit. The data user is responsible for all conclusions drawn with respect to the data and is advised to consult official regulatory references when evaluating compliance.

Please direct any inquiries regarding this report to our Client Services Group or to the Operations Manager at the coordinates indicated at the top left of this page.
Results relate only to samples as submitted.

ABBOTSFORD

April 10, 2017

File: 5550-70

Andres Murillo, P.Eng
BioCentral Green Depot Ltd.
Box 95-7357 Pioneer Avenue
Agassiz, BC V0M 1A0

Dear Mr. Murillo:

Re: Organic Matters Recycling Regulation (OMRR) Section 6 – Process and Quality Criteria

As requested, this letter provides confirmation and supporting information that the JAMES Wastewater Treatment Plant (JAMES Plant) meets Section 6 of the OMRR for producing Class A biosolids.

The pasteurization system at the JAMES Plant meets the time-temperature requirements for production of Class A biosolids according to Section 2(f) in OMRR Schedule 1.

The sludge pasteurization system includes the following main components:

- crude and pasteurized sludge holding tanks;
- heat exchangers to heat raw sludge and cool pasteurized sludge;
- pasteurization tank; and
- miscellaneous transfer and recirculation pumps.

The pasteurization reactor operates at a temperature of 65°C and is batch-fed to maintain a retention time of at least one hour between sludge transfers. The volume of the tank provides approximately 18 to 24 hours retention time for pasteurization and conditioning of the sludge in advance of the anaerobic digestion process. The pasteurization process is followed by anaerobic mesophilic digestion, which meets the vector attraction reduction requirements (for details please see below).

The anaerobic mesophilic digestion system at the JAMES Plant meets the vector attraction reduction requirements according to Section 1(a) in OMRR Schedule 2.

The anaerobic mesophilic digestion system at the JAMES Plant includes three digesters, with a total volume of 11,460 m^3. Pasteurized and conditioned sludge from the pasteurized sludge holding tank is pumped to the largest anaerobic digester and then is passed to the remaining two digesters in series. The volatile solids reduction of the biosolids typically ranges between 60-70% and is higher than the required 38% under OMRR.

We trust the above provides the information you requested. Please contact me if you need any additional information or clarification.

Yours truly,

Rob Isaac, Eng.L.
Director, Project Management Office

c. John Paul, Transform Compost Systems Ltd.
Peter Sparanese, General Manager, Engineering and Regional Utilities
Tim Henry, Director, Utility Operations and Asset Management

SC/rb

CERTIFICATE OF ANALYSIS

REPORTED TO	Abbotsford, City of - Utilities Environment 6011 Gladwin Road Abbotsford, BC V4X 1V9		
ATTENTION	Sharon Subido	**WORK ORDER**	7110302
PO NUMBER	PO 170554	**RECEIVED / TEMP**	2017-11-02 18:30 / 5°C
PROJECT	#13 - Biosolids QC	**REPORTED**	2017-11-14
PROJECT INFO		**COC NUMBER**	UE-P13-05

Introduction:

CARO Analytical Services is a testing laboratory full of smart, engaged scientists driven to make the world a safer and healthier place. Through our clients' projects we become an essential element for a better world. We employ methods conducted in accordance with recognized professional standards using accepted testing methodologies and quality control efforts. CARO is accredited by the Canadian Association for Laboratories Accreditation (CALA) to ISO 17025:2005 for specific tests listed in the scope of accreditation approved by CALA.

Big Picture Sidekicks

You know that the sample you collected after snowshoeing to site, digging 5 meters, and racing to get it on a plane so you can submit it to the lab for time sensitive results needed to make important and expensive decisions (whew) is VERY important. We know that too.

We've Got Chemistry

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Through research, regulation knowledge, and instrumentation, we are your analytical centre for the technical knowledge you need, BEFORE you need it, so you can stay up to date and in the know.

If you have any questions or concerns, please contact me at jshanko@caro.ca

Authorized By:

Jennifer Shanko, A.Sc.T.
Account Manager

CARO ANALYTICAL SERVICES

TEST RESULTS

REPORTED TO Abbotsford, City of - Utilities Environment
PROJECT #13 - Biosolids QC

CARO WO# 7110302
REPORTED 2017-11-14

Analyte	Result	Guideline	RL	Units	Analyzed	Qualifier
A1 Large Tent (7110302-01) | Matrix: Solid | Sampled: 2017-11-02 10:26						
General Parameters						
Moisture	**76.64**	N/A	0.1	% wet	2017-11-04	
Microbiological Parameters						
Coliforms, Fecal	<8.6	N/A	2	MPN/g dry	2017-11-04	
A2 Large Tent (7110302-02) | Matrix: Solid | Sampled: 2017-11-02 10:27						
General Parameters						
Moisture	**75.47**	N/A	0.1	% wet	2017-11-04	
Microbiological Parameters						
Coliforms, Fecal	<8.1	N/A	2	MPN/g dry	2017-11-04	
A3 Large Tent (7110302-03) | Matrix: Solid | Sampled: 2017-11-02 10:27						
General Parameters						
Moisture	**77.03**	N/A	0.1	% wet	2017-11-04	
Microbiological Parameters						
Coliforms, Fecal	<8.7	N/A	2	MPN/g dry	2017-11-04	
B4 Large Tent (7110302-04) | Matrix: Solid | Sampled: 2017-11-02 10:28						
General Parameters						
Moisture	**74.67**	N/A	0.1	% wet	2017-11-04	
Microbiological Parameters						
Coliforms, Fecal	<7.9	N/A	2	MPN/g dry	2017-11-04	
B5 Large Tent (7110302-05) | Matrix: Solid | Sampled: 2017-11-02 10:28						
General Parameters						
Moisture	**77.6**	N/A	0.1	% wet	2017-11-04	
Microbiological Parameters						
Coliforms, Fecal	<8.9	N/A	2	MPN/g dry	2017-11-04	
B6 Large Tent (7110302-06) | Matrix: Solid | Sampled: 2017-11-02 10:28						
General Parameters						
Moisture	**77.76**	N/A	0.1	% wet	2017-11-04	
Microbiological Parameters						
Coliforms, Fecal	<8.9	N/A	2	MPN/g dry	2017-11-04	
C7 Large Tent (7110302-07) | Matrix: Solid | Sampled: 2017-11-02 10:29						

TEST RESULTS

REPORTED TO	Abbotsford, City of - Utilities Environment	**CARO WO#**	7110302
PROJECT	#13 - Biosolids QC	**REPORTED**	2017-11-14

Analyte	Result	Guideline	RL	Units	Analyzed	Qualifier
C7 Large Tent (7110302-07) | Matrix: Solid | Sampled: 2017-11-02 10:29, Continued						
General Parameters						
Moisture	**77.19**	N/A	0.1	% wet	2017-11-04	
Microbiological Parameters						
Coliforms, Fecal	<8.8	N/A	2	MPN/g dry	2017-11-04	
C8 Large Tent (7110302-08) | Matrix: Solid | Sampled: 2017-11-02 10:29						
General Parameters						
Moisture	**76.94**	N/A	0.1	% wet	2017-11-04	
Microbiological Parameters						
Coliforms, Fecal	**34**	N/A	2	MPN/g dry	2017-11-04	
C9 Large Tent (7110302-09) | Matrix: Solid | Sampled: 2017-11-02 10:29						
General Parameters						
Moisture	**76.73**	N/A	0.1	% wet	2017-11-04	
Microbiological Parameters						
Coliforms, Fecal	<8.6	N/A	2	MPN/g dry	2017-11-04	

APPENDIX 1: SUPPORTING INFORMATION

REPORTED TO	Abbotsford, City of - Utilities Environment	**CARO WO#**	7110302
PROJECT	#13 - Biosolids QC	**REPORTED**	2017-11-14

Analysis Description	Method Ref.	Technique	Location
Coliforms, Fecal in Solid	MFHPB-19	Most Probable Number	Sublet
Moisture in Solid	ASTM D2216-10	Gravimetry (Dried at 105C)	Sublet

Glossary of Terms:

RL	Reporting Limit (default)
% wet	Percent (as received basis)
ASTM	ASTM International Test Methods
MFHPB	HPB Methods for the Microbiological Analysis of Foods, Health Canada

Guidelines Referenced in this Report:

Organic Matter Recycling Regulation -Schedule 4 (2002)

General Comments:

The results in this report apply to the samples analyzed in accordance with the Chain of Custody document. This analytical report must be reproduced in its entirety. CARO is not responsible for any loss or damage resulting directly or indirectly from error or omission in the conduct of testing. Liability is limited to the cost of analysis. Samples will be disposed of 30 days after the test report has been issued unless otherwise agreed to in writing.

APPENDIX 2: QUALITY CONTROL RESULTS

REPORTED TO	Abbotsford, City of - Utilities Environment	**CARO WO#**	7110302
PROJECT	#13 - Biosolids QC	**REPORTED**	2017-11-14

Client Information	Project Information	Laboratory Information	COC Information
Abbotsford, City of - Utilities Environment 6011 Gladwin Road Abbotsford BC V4X 1V9 Phone: (604) 557-1452 Fax: (604) 557-1457	#13 - Biosolids QC Number: [none] Sample count: 9 TAT: 5	CARO Analytical Services #110 - 4011 Viking Way Richmond BC V6V 2K9 Phone: (604) 279-1499 Fax: (604) 279-1599	Number: UE-P13-05 Shipped via: IG Micromed

		Analyses	Containers
#1	A1 Large Tent (Template: 28) 11/02/2017 10:26 - 11/02/2017 10:26 Grab / Solid	!AUE Project #13 Grab PKG (SUB) TAT: 5 Coliforms, Fecal in Solids (SUB) TAT: 5 Coliforms, Total & Fecal in Solids (KEL) TAT: 5	C01_125 mL Glass (General Soil) (1)
#2	A2 Large Tent (Template: 29) 11/02/2017 10:27 - 11/02/2017 10:27 Grab / Solid	!AUE Project #13 Grab PKG (SUB) TAT: 5 Coliforms, Fecal in Solids (SUB) TAT: 5 Coliforms, Total & Fecal in Solids (KEL) TAT: 5	C01_125 mL Glass (General Soil) (1)
#3	A3 Large Tent (Template: 30) 11/02/2017 10:27 - 11/02/2017 10:27 Grab / Solid	!AUE Project #13 Grab PKG (SUB) TAT: 5 Coliforms, Fecal in Solids (SUB) TAT: 5 Coliforms, Total & Fecal in Solids (KEL) TAT: 5	C01_125 mL Glass (General Soil) (1)
#4	B4 Large Tent (Template: 31) 11/02/2017 10:28 - 11/02/2017 10:28 Grab / Solid	!AUE Project #13 Grab PKG (SUB) TAT: 5 Coliforms, Fecal in Solids (SUB) TAT: 5 Coliforms, Total & Fecal in Solids (KEL) TAT: 5	C01_125 mL Glass (General Soil) (1)
#5	B5 Large Tent (Template: 32) 11/02/2017 10:28 - 11/02/2017 10:28 Grab / Solid	!AUE Project #13 Grab PKG (SUB) TAT: 5 Coliforms, Fecal in Solids (SUB) TAT: 5 Coliforms, Total & Fecal in Solids (KEL) TAT: 5	C01_125 mL Glass (General Soil) (1)
#6	B6 Large Tent (Template: 33) 11/02/2017 10:28 - 11/02/2017 10:28 Grab / Solid	!AUE Project #13 Grab PKG (SUB) TAT: 5 Coliforms, Fecal in Solids (SUB) TAT: 5 Coliforms, Total & Fecal in Solids (KEL) TAT: 5	C01_125 mL Glass (General Soil) (1)
#7	C7 Large Tent (Template: 34) 11/02/2017 10:29 - 11/02/2017 10:29 Grab / Solid	!AUE Project #13 Grab PKG (SUB) TAT: 5 Coliforms, Fecal in Solids (SUB) TAT: 5 Coliforms, Total & Fecal in Solids (KEL) TAT: 5	C01_125 mL Glass (General Soil) (1)
#8	C8 Large Tent (Template: 35) 11/02/2017 10:29 - 11/02/2017 10:29 Grab / Solid	!AUE Project #13 Grab PKG (SUB) TAT: 5 Coliforms, Fecal in Solids (SUB) TAT: 5 Coliforms, Total & Fecal in Solids (KEL) TAT: 5	C01_125 mL Glass (General Soil) (1)
#9	C9 Large Tent (Template: 36) 11/02/2017 10:29 - 11/02/2017 10:29 Grab / Solid	!AUE Project #13 Grab PKG (SUB) TAT: 5 Coliforms, Fecal in Solids (SUB) TAT: 5 Coliforms, Total & Fecal in Solids (KEL) TAT: 5	C01_125 mL Glass (General Soil) (1)

Relinquished by	Date/Time	Accepted by	Date/Time

Appendix F

% Volatile Solids Reduction - JAMES PLANT- 2017

Month	% V.S Red'n
Jan	58
Feb	64
Mar	56
Apr	61
May	58
Jun	67
Jul	69
Aug	66
Sep	64
Oct	70
Nov	64
Dec	67
Annual	**64**

Monthly average from weekly testing

OMRR Limit -38%

Volatile Solids Reduction Calculation:

$$\% \text{ Red'n} = \frac{(\text{In} - \text{Out})}{\text{In} - (\text{In} \times \text{Out})} \times 100$$

Where:

In = Volatile solids for raw, decimal format.

Out = Volatile solids of last Dig in series, decimal format.

JAMES WWTP BIOSOLIDS QUALITY DATA (2017)

Parameter concentrations are expressed on dry weight basis unless otherwise stated.
All data obtained from the analysis of a monthly composite sample.

Sampling Date:	-															
Parameters (Dried Basis)	**Units**	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**	**OCT**	**NOV**	**DEC**	**MAX**	**AVG**	**OMRR***
Total Nitrogen	%	6.99	8.14	9.04	7.19	8.65	8.1	7.74	8.13	5.74	5.36	6.71	10.5	10.50	7.69	-
Total Phosphorus (as P)	%	1.10	1.02	1.14	1.02	1.15	1.23	1.07	1.14	1.33	1.01	1.02	1.09	1.33	1.11	-
Total Potassium	%	0.071	0.11	0.11	0.103	0.0669	0.077	0.0727	0.0755	0.0632	0.0563	0.071	0.0628	0.11	0.08	-
Total Sulphur	%	0.58	0.74	0.79	0.96	0.517	0.682	0.768	0.83	0.868	0.60	0.69	0.603	0.96	0.72	-
Total Carbon	%	33.6	41.7	40.9	41.5	41.3	40.3	40.5	40.9	40	40.5	42.0	43.2	43.2	40.5	-
Organic Matter	%	80.3	79.6	79.7	80.1	80	79.2	79.5	78.9	76.8	77.9	78.3	78.9	80.3	79.1	-
Moisture	%	75.7	74.9	75.6	75.2	76.6	76.9	76.4	76.7	76.1	72.4	76.6	76.5	76.9	75.8	-
Ammonia- N (available)	mg/kg	7810	8100	8460	8390	7530	7480	8400	8750	7370	5920	6220	6600	8750	7586	-
Nitrate - N (available)	mg/kg	5.4	4.4	5.25	5.85	2.65	3.52	7.77	3.43	3.72	15.6	3.05	4.52	15.6	5.43	-
pH	pH units	6.5	6.7	5.6	6.6	6.3	5.8	6	6.46	6.43	6.75	6.71	6.77	6.77	6.4	-
EC - Conductivity	dS/m	2.73	3.39	2.58	2.94	3.83	3.66	2.58	3.73	5.83	3.25	4.09	4.12	5.83	3.56	-
C/N Ratio	-	4.8	5.1	4.5	5.8	4.8	5.0	5.2	5.0	7.0	7.6	6.26	4.1	7.6	5.4	-
Arsenic	ug/g	2	2.8	N/A	2.95	2.25	2.87	2.83	2.84	3.5	2.88	3.1	2.51	3.5	2.8	75
Cadmium	ug/g	0.86	1.5	N/A	1.49	1.24	1.44	1.63	1.53	1.76	1.23	1.59	1.29	1.76	1.41	20
Chromium	ug/g	18	24	N/A	28.1	20.4	25.4	35.6	60.1	37.4	29.4	32.1	22	60.1	30.2	1060
Cobalt	ug/g	1.6	2.5	N/A	2.57	1.99	2.27	2.2	2.69	3.27	2.21	2.14	1.85	3.27	2.30	150
Copper	ug/g	360	520	N/A	483	438	568	600	655	636	531	561	453	655	528	2200
Lead	ug/g	13	20	N/A	20.8	17.2	20.3	21.4	20.7	22.8	17.3	22.9	17.7	22.9	19.5	500
Mercury	ug/g	1.3	1.5	N/A	1.98	1.67	1.73	3.22	1.78	2.08	1.52	2.2	2.39	3.22	1.95	5
Molybdenum	ug/g	3.9	6.4	N/A	6.34	5.91	6.94	6.05	6.77	7.82	6.21	6.76	5.14	7.82	6.20	20
Nickel	ug/g	11	15	N/A	17.8	13.9	18.1	31.4	41.8	32.9	27.1	35.5	26.5	41.8	24.6	180
Selenium	ug/g	3	4.5	N/A	4.84	4.37	4.88	4.72	4.7	5.31	4.18	4.79	3.75	5.31	4.46	14
Zinc	ug/g	530	800	N/A	700	732	924	922	1050	983	887	874	707	1050	828	1850

3628 Hotsprings Rd, Agassiz, BC

Class A Biosolids Application Plan: 2018

April 18, 2018

MOE Authorization # 109234

Prepared by:

John Paul, PhD PAg
Transform Compost Systems Ltd
3911 Mt Lehman Rd
Abbotsford, BC V2T 5W5
Ph: 604-302-4367
Email: transform@telus.net

3628 Hotsprings Rd Class A Biosolids Application Plan 2018

Introduction

This Land Application Plan for the application of Class A biosolids provides the guidance and information required under British Columbia's Organic Matter Recycling Regulation (OMRR), a regulation enacted to ensure that biosolids are managed in a manner that protects human health and the environment.

Class A biosolids are considered a valuable source of both plant nutrients and organic matter. Class A biosolids are the highest quality biosolids achievable under the OMRR, particularly regarding fecal coliform counts (< 1,000 most probable number per gram), and trace element (metal) concentrations. The land application plan must be prepared by a qualified professional as defined in the OMRR.

Class A biosolids will be land applied in 2018 as a source of nutrients and organic matter for the soil on a 5.5 ha area on a 16 ha farm in Agassiz, BC, that will be growing forage for cattle. The total amount of Class A biosolids that will be land applied is approximately 303 wet tonnes. This Land Application Plan (LAP) provides guidance in the beneficial reuse of a portion of the Class A biosolids from the JAMES Treatment Plant, a wastewater treatment facility that processes wastewater from the communities of Abbotsford and Mission. (http://www.abbotsford.ca/city_services/wastewater/biosolids_management.htm#JAMES).

This land application plan utilizes the biosolids quality data for 2017, provided by the City of Abbotsford. The Class A biosolids used for this land application was generated by the JAMES wastewater treatment plant in 2017.

The Land Application Plan follows the Notification dated December 28, 2017 (Appendix A).

Qualifications of the Qualified Professional

The professional agrologist preparing this report has extensive training and experience with soil, waste and agricultural land in particular. John Paul, PhD is a registered professional agrologist, who obtained his MSc and PhD in soil biochemistry from the University of Guelph in 1991. He has acted as a professional agrologist for many sites requiring soil deposit and removal reports, nutrient management and waste management plans. He has extensive experience with the various Acts and Regulations regarding agricultural land use and agricultural and industrial wastes.

Land Application Objectives

The specific objectives of this land application plan are to ensure that the Class A biosolids are stored and applied in a manner that provides the greatest benefit for the crop grown on this property, while minimizing risk of environmental pollution. The plan will consider the specific

crops that are growing on this property, as well as any other nutrient input that is used for growing crops or improving the soil.

Site Characteristics

Location

The Land Application Plan is for Class A biosolids application on a farm located at 3628 Hotsprings Rd., Agassiz, BC. The legal description is Section 1, Township 4, Range 29, Meridian 6, New Westminster District Plan Parcel A, Part SE ¼, Meridian W6.

This farm is located 1 km south of the Village of Harrison Hotsprings BC.

Figure 1. Aerial view of land application area at 3628 Hotsprings Rd relative to the community of Harrison Hotsprings, BC (Google Earth) Distances to areas of interest can be obtained by using Google Earth).Land application area depicted by a yellow border.

The location is zoned agricultural and is within the Agricultural Land Reserve. The property is surrounded by agricultural lands in forage production to the north, south and west, and the mountain to the east.

The coordinates of the site are

Longitude: 121° 46’ 47” W

Latitude: 49° 16’ 16” N

Figure 2. Aerial photograph of the property at 3628 Hotsprings Rd where the Class A biosolids will be applied (Google Earth). Land application area is within the yellow lines on the photo.

Climate

Agassiz has a wet but moderate to mild climate in the wintertime with dry summers. The annual mean total rainfall is 1440 mm, with an average of 230 mm in January, and 60 mm in July. The annual mean total snowfall is 940 mm. The annual mean daily temperature in July is 23°C, and in January is 2.5 °C. The wind direction is generally from the southeast to the northwest. Source of weather information: http://www.climate-charts.com/Locations/c/CN71113011001200.php

Soil Properties

The soil at this farm is described as a Monroe Silt Loam (Kelly and Spilsbury 1939), which is a very common soil type along the lower Fraser River. Typically these soils have 30 to 40 cm of a fine textured soil overlying coarse sands. In this field, the depth of topsoil is > 30 cm overlying a coarser textured sand.

Five soil samples were taken from the field in March 2018. The location of the soil samples are identified in Appendix B. The complete soil analysis information is found in Appendix C.

Figure 3. Soil profile showing > 15 cm of loam topsoil overlying a heavy textured subsoil in the land application area of 3628 Hotsprings Rd..

The soil organic matter content averaged 4.3 % in the top 15 cm, with addition topsoil visible to > 30 cm depth. The soil has a near neutral pH of 6.2 (Figure 4), a base saturation of 70%, mostly from calcium (60.9%), magnesium (6.2%), and potassium (2.5%).

The soil characteristics were variable on this property due to slight elevation changes. The phosphorus and potassium concentrations are characteristic of a site that has not had a history of application of organic matter.

	Soil Characteristics			
			2017	2018
Organic matter		%	7.4	4.3
Total Nitrogen		%		0.2
pH			6.0	6.2
EC		dS/m	0.1	0.1
Nitrate		mg/L	2.0	3.5
Phosphorus		mg/L	>60	60.0
Potassium		mg/L	48.7	77.8
Base Saturation		%	42.4	69.6
	Calcium	%	37.5	60.9
	Magnesium	%	4.0	6.2
	Potassium	%	0.9	2.5
	Sodium	%	<1	<2.4

Figure 4. Soil characteristics (March 2018)

Slope and Topography

The topography of the field is almost level with a few slight undulations.

Depth to Groundwater Table

The elevation of the property is approximately 15 m above sea level, and approximately 1-2 m above the level of the Fraser River, depending on the time of year. The depth to groundwater fluctuates with the water level in the Fraser River and is generally within 1-2 m of the surface.

Figure 5. View of the property looking east from the farm yard at 3628 Hotsprings Rd (May 10, 2017 photo).

Soil Nutrients

Most of the five individual soil samples showed that the soil was marginal in available nitrogen, which is normal for soil sampled in the spring in the Fraser Valley. Available potassium was deficient in all of the soil samples. Phosphorus concentrations varied from deficient to optimal. Sulphur concentrations were deficient to marginal. This is characteristic of soils in the Fraser Valley that have had little history of application of manure or other organic matter.

Soil Metals

A total of five individual soil samples were obtained from 0-15 cm depth in the land application area on the property. The complete laboratory soil analysis data is found in Appendix C.

Soil Trace Element Concentrations (mg/kg)			
	2017	2018	change
Arsenic	3.02	5.54	2.52
Cadmium	0.16	0.30	0.14
Chromium	63.7	81.20	17.53
Cobalt	11.3	14.20	2.93
Copper	25.8	28.80	2.97
Lead	8.9	5.20	-3.68
Mercury	0.040	0.045	0.01
Molybdenum	0.43	0.45	0.02
Nickel	43.0	43.40	0.40
Selenium	0.81	0.50	-0.31
Zinc	64.7	67.80	3.13

Figure 6. Soil trace element concentrations in the 0-15 cm depth in the soil in the land application area.

All of the trace element concentrations are below the limits for agricultural soil as documented in the OMRR (OMRR Schedules 9 and 10, limits used for livestock ingesting soil and fodder are used where applicable), with the exception of chromium. The limits as per OMRR represent the most conservative of all uses on either agricultural or residential soils.

It will be important to track the soil chromium concentrations. All of the soil analyses of the various land application sites in 2018 showed significantly increased chromium concentrations, despite either no, or very little application of biosolids. In addition, as will be demonstrated later in the land application plan, there is very little chromium added with the biosolids application. The elevated chromium concentrations appear to be characteristic of the Fraser River sediments, and are significantly higher for the 2018 samples than soil samples taken in previous years.

Biosolids Source and Characteristics

The Class A biosolids are produced at the JAMES Treatment Plant, a wastewater treatment plant that processes wastewater from the communities of Abbotsford and Mission.

JAMES Wastewater Treatment Plant, 5959 Gladwin Rd, Abbotsford B.C. V4X 1V9

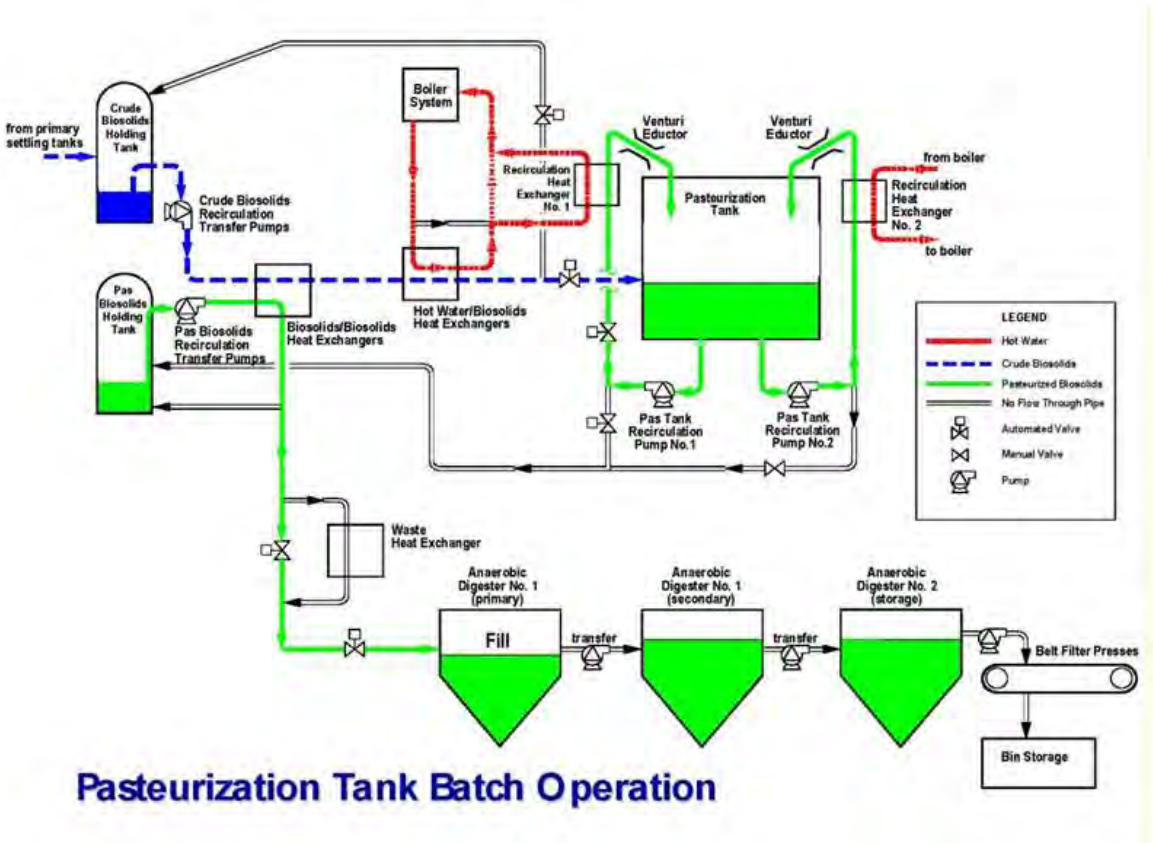


Figure 7. Biosolids processing flowsheet at the James Wastewater Treatment Plant (http://www.abbotsford.ca/Assets/2014+Abbotsford/Engineering/Wastewater/Biosolids+Flow+Chart.pdf)

Pathogen Reduction Processes and Limits

The pathogen reduction process conforms with Schedule 1, Section 2 (f) of the Organic Matter Recycling Regulation, where it states:

"2. One of the following pathogen reduction methods is required for Class A biosolids or biosolids to produce biosolids growing medium: (f) the heat treatment of the biosolids must be 50 C or higher, and the time period must be 30 minutes or longer"

The process used at the JAMES Wastewater Treatment Plant is as follows (Appendix D). *"The pasteurization reactor operates at a temperature of 65 C and is batch-fed to maintain a retention time of at least one hour between sludge transfers. The volume of the tank provides*

approximately 18-24 hours retention time for pasteurization and conditioning of the sludge in advance of the anaerobic digestion process."

Analyses of fecal coliforms are conducted by the City of Abbotsford on the biosolids before it is released from the wastewater plant. Fecal coliform counts for the biosolids being applied tat this location are found in Appendix E. Biocentral as well as the professional agrologist reserves the right to conduct any of its own testing of the biosolids to ensure that meets Class A requirements.

The average moisture content of the biosolids measured at time of discharge was 75.8% in 2017 (Figure 8) and 77.0% in the batch that was shipped to this property (Appendix E). The moisture content at time of field application may change somewhat, either from the biosolids taking on more moisture, or from biosolids drying during storage.

Vector Attraction Reduction Processes and Limits

The vector attraction reduction process conforms with Schedule 2, Section 1 (a) of the Organic Matter Recycling Regulation, where it states:

"1. One of the following vector attraction reduction processes is required for Class A biosolids or Class B biosolids used to produce biosolids growing medium: (a) a digestion process (aerobic or anaerobic) resulting in the mass of volatile solids being reduced by more than 38 percent"

The process used at the JAMES Wastewater Treatment Plant is as follows (Appendix D). *"The anaerobic mesophilic digestion system at the JAMES Plant includes three digesters, with a total volume of 11,460 m3. Pasteurized and conditioned sludge from the pasteurized sludge holding tank is pump to the largest anaerobic digester and then is passed to the remaining two digesters in series."*

The volatile solids reduction results from the JAMES plant averaged 64% in 2017 (Appendix F).

Trace Elements and Nutrients

The general characteristics of the biosolids are noted in Figure 8. The biosolids are an excellent source of organic matter, as well as nitrogen and phosphorus, whereas the potassium concentration is low. Trace element concentrations meet OMRR Class A limits (Figure 9).

Characteristics of the Class A Biosolids		
Characteristic	**Unit**	**Value**
Moisture Content	%	75.8
Organic Matter	%	79.1
pH		6.4
EC	dS/m	3.56
C/N Ratio		5.4
Nitrogen (total)	%	7.69
Ammonium	mg/kg	7586
Phosphorus	%	1.11
Potassium	%	0.08
Sulphur	%	0.72

Figure 8. Characteristics of the Class A biosolids (2017 data)

Schedule 4 of the Organic Matter Recycling Regulation (OMRR) provides the guidance for the trace elements in the biosolids. Figure 9 shows the trace elements in the biosolids (including both the maximum and average concentrations monthly in 2017 analysis (Appendix G), compared with the standards (OMRR, and Trade Memorandum T-4-93). For the land application calculations, we have used the average concentration for 2017.

Trace Element Concentrations in the Class A Biosolids				
Element	Biosolids		Class A (OMRR)	Canada
	Max 2017	Avg 2017		T-4-93
	(mg/kg)		(mg/kg)	(mg/kg)
Arsenic	3.5	2.8	75	75
Cadmium	1.76	1.41	20	20
Chromium	60.1	30.2	1060	*not included*
Cobalt	3.27	2.3	150	150
Copper	655	528	2200	*not included*
Lead	22.9	19.5	500	500
Mercury	3.22	1.95	5	5
Molybdenum	7.82	6.2	20	20
Nickel	41.8	24.6	180	180
Selenium	5.31	4.46	14	14
Zinc	1050	828	1850	1850

Figure 9. Trace element concentrations in the Class A biosolids from the JAMES Wastewater Treatment Plant (maximums and averages for 2017. The limits for Class A biosolids (OMRR requirement) and the Canadian standards are also shown.

Figure 8 shows additional characteristics of the biosolids that are used for the land application plan, including and especially the nitrogen, phosphorus and potassium concentrations, which are important when considering the fertilizer value of the biosolids.

Foreign Matter

The Class A biosolids are free of foreign matter. Foreign matter is screened when the wastewater enters the treatment plant. According to Schedule 4 of the OMRR, Class A biosolids may not contain foreign matter greater than 1% dry weight and no sharp foreign matter, such as glass or metal shards, in a size and shape that may cause injury.

Biosolids Storage

The biosolids will be stored in compliance with OMRR Part 4, Division 1, Part 17 - 19, where it states:

"17. (1). If managed organic matter, which is to be applied to land under a land application plan, is stored on a farm or at some other site, it must be stored

a. in a storage facility in accordance with the requirements of section 18, or

b. at a storage site in accordance with the requirements of section 19.

(2) Managed organic matter must only be stored on a farm if all of the managed organic matter is used on that farm.

18. A storage facility must

a. be of sufficient capacity to store all the managed organic matter to be used on the land application site for the period of time needed for its application as a fertilizer or soil conditioner,

b. be located at least 15 m from any watercourse and at 30 m from any source of water for domestic purposes, and

c. maintained in such a manner to prevent escape of the managed organic matter.

19. (1). Managed organic matter may only be stored at a storage site as follows:

a. for not more than 2 weeks if it is (i) used within 2 weeks, and (ii) stored in a manner that prevents the escape of managed organic matter:

b. for more than 2 weeks if it is (i) stored for no longer than 9 months, (ii) located at least 30 meters from any watercourse or any source of water used for domestic purposes, and (iii) stored in a manner that prevents the escape of managed organic matter.

2. Berms or other works must be constructed around the storage site if necessary to prevent the escape of managed organic matter. "

The one exemption is that the biosolids were stored approximately 10 months. The Class A biosolids are being stored in a manner that prevents the escape of the managed organic matter.

The transport of the biosolids will be managed in such a way as to prevent any biosolids being deposited on any public roadways. Although odour is not expected to be a concern, the biosolids will covered with a layer of wood chips or compost if required.

Biosolids Application

Season of Application

The biosolids will be applied during the spring of 2018 to allow optimal uptake of plant available nutrients during the growing season. The total amount of biosolids to be applied during 2018 will be a maximum of 55 wet tonnes per hectare. A total of approximately 303 tonnes of Class A biosolids will be spread at this location in 2018.

Buffers

A 3 m buffer will be maintained around the perimeter of the spreading area. There is a domestic well on the property for the home being constructed on the property.

Figure 10. Location of the domestic well on the property relative to the land application area.

Crop Nutrient Uptake

The crops grown on this farm will be forage corn grown for cattle feed in 2018. The Class A biosolids will be land applied to optimize their value as a fertilizer and a soil conditioner.

The land application plan will be based on nitrogen for the forage corn. Phosphorus and potassium application will also be addressed.

Nitrogen Requirements

Table 12 of the "Land Application Guidelines for the Organic Matter Recycling Regulation and the Soil Amendment Code of Practice" (Ministry of the Environment 2008), provides the guidance for nitrogen requirements for forages on soils of varying fertility in various areas of the province.

Based on an average yield of 20 tonnes of dry matter per hectare of corn on a high (normal) fertility site, the nitrogen requirement is 260 kg ha^{-1} per year.

Nitrogen Based Application Rate						
Yield Expectation and Nitrogen Uptake	Total		Available	Available N		
20 tonnes dry matter/ha yield of corn[a]	260	kg N/ha				
Nitrogen Availability in Biosolids						
Ammonium in biosolids	7.9	kg/tonne	60%	4.74		
Total N in biosolids	83.6	kg/tonne				
Organic N in Biosolids	75.7	kg/tonne	30%	22.71		
				27.45	kg/tonne available	
Amount of dry biosolids	9.5	dry tonnes per hectare				
	47.4	tonnes per hectare wet application				
[a] from Table 12 of the Land Application Guide (Ministry of Environment 2008)						
from page 174 of Land Application Guide (Ministry of Environment 2008)						

Figure 11 Estimated contribution of nitrogen with the biosolids application.

The total nitrogen content of the biosolids averages 7.69 % or 76.9 kg per dry tonne (2017 JAMES Plant Biosolids Quality Data). The amount of nitrogen available in the year of application ranges from 20 to 40%. Using an average availability of 30%, each dry tonne of biosolids provides almost 25 kg of nitrogen per hectare. An application rate of 12 tonnes of dry biosolids per hectare then provides an estimated 300 kg N per hectare, which is approximately the nitrogen requirements of the crop. Our experience is that with biosolids, the nitrogen availability is less than 30%.

Phosphorus Requirements

Guidelines for the application of phosphorous are provided in Sections 10.4.1.2 and Section 13.4.3 of the "Land Application Guidelines for the Organic Matter Recycling Regulation and the Soil Amendment Code of Practice".

The phosphorus content of the Class A biosolids averages 1.11 P (Figure 8). The application of 12 tonnes of Class A biosolids will provide approximately 305 kg P_2O_5 per hectare.

The soil analyses indicated that the phosphorus content of this farm was variable, with some areas being deficient, and other areas optimal. The soil phosphorus concentrations will continue to be monitored with subsequent biosolids applications.

Potassium

The total potassium in the biosolids were measured to be 0.08 ug/g (Appendix E in the Land Application Plan March 31, 2017). The plant available fraction of the potassium in biosolids is assumed to be 100% (Washington State Department of Ecology 2007)

Biosolids Application Rate

The application rate for the Class A biosolids is 55 wet tonnes per hectare, or 12 tonnes of dry matter per hectare based on an average moisture content of 78%. This application rate will provide an estimated 925 kg of total N per hectare. An estimated 30% of the total nitrogen is estimated to become available to the crop in the first year. Subsequent application rates of biosolids will be adjusted as required according to the amount of soluble N remaining in the soil in the fall.

Trace Metal Applications

The application rate of 55 tonnes (12 tonnes of dry matter) per hectare of Class A biosolids will provide the following amounts of trace elements as per Figure 12.

		Addition	**Post**	Limits
	Metals in Soil	**from Biosolids**	**Application**	OMRR[b]
	(mg/kg)[a]	(mg/kg)	(mg/kg)	(mg/kg)
Arsenic	5.54	0.017	5.56	15
Cadmium	0.30	0.009	0.31	9
Chromium	81.20	0.186	81.39	60
Cobalt	14.20	0.014	14.21	40
Copper	28.80	3.25	32.05	150
Lead	5.20	0.120	5.32	350
Mercury	0.05	0.012	0.06	0.6
Molybdenum	0.45	0.038	0.48	5
Nickel	43.40	0.151	43.55	100
Selenium	0.50	0.027	0.53	2
Zinc	67.80	5.10	72.90	200
[a] average of 5 samples				
[b] OMRR Schedules 9 and 10 using most conservative limits				
[c] plant uptake not included in calculation				

Figure 12. Effect of a 12 tonne DM application of Class A biosolids on trace elements in the soil.

As mentioned in a previous section, it will be important to track the soil chromium concentrations. All of the soil analyses of the various land application sites in 2018 showed significantly increased chromium

concentrations, despite either no, or very little application of biosolids (i.e Figure 8). In addition, there is very little chromium added with the biosolids application. The elevated chromium concentrations appear to be characteristic of the Fraser River sediments, and are significantly higher for the 2018 samples than soil samples taken in previous years.

Other Inputs to the Farm

There are no other inputs of organic matter to the land on this farm. Additional fertilizer nitrogen may be required depending on the availability of the nitrogen in the biosolids. Additional potassium may be required as well.

The post application soil sampling of the fields will determine the amount of soluble nitrogen remaining in the soil before the fall rains. Future land application plans for this property will also be adjusted for post harvest soil nutrient contents.

Post Application Monitoring of the Site

Crop yields will be estimated during the growing season to verify the amount of forage harvested from the property. Post application soil samples will be taken in the fall to estimate accumulation of trace elements as well as residual nitrate in the soil. This soil information will be used to determine additional Class A biosolids applications in subsequent years.

The post application report will also provide information on actual application rates, including moisture contents of the biosolids at the time of application.

Minimizing Potential for Adverse Environmental Impacts

There are two potential adverse environmental impacts from the land application:

1. Risk of the biosolids not meeting Class A requirements

   Each batch of biosolids produced at the JAMES Treatment Plant is tested for fecal coliform before release for land application, as per OMRR requirements. This means that the biosolids are stored for 1-4 months at the JAMES Treatment Plant in order for the biosolids to meet Class A requirements for fecal coliform.

   There is little or no risk of the Class A biosolids becoming Class B due to microbial regrowth, as the biosolids are very stable before being released from the facility. In the potential event that the biosolids were actually Class B. the biosolids would be stored for a longer period of time, and retested before application to ensure that Class A requirements were met. In the potential event that the biosolids were actually Class B following spreading, the requirements of OMRR Schedule 8 would apply.

2. Risk of over application of biosolids

   The risk of over application of Class A biosolids has limited potential negative environmental effect. In the Land Application Plans, the biosolids are applied on the basis of optimizing the nitrogen value of the biosolids. Although it is possible that a higher rate of biosolids application may increase the potential for nitrogen leaching, the nitrogen in biosolids has limited availability. This must also be understood in the context of Class A biosolids growing medium, which can be applied without volume restrictions and is not applied on the basis of agronomic utilization of the nitrogen or phosphorous contained in the biosolids.

In summary, the potential adverse effects of land application of Class A biosolids are minimal, and are controlled by appropriate testing, storage and application.

Sampling and Analysis

Schedule 5 of OMRR requires that the Class A biosolids be analyzed at least every 1000 tonnes of dry weight of organic matter, or once per year. Schedule 5 also states that "All analysis must be in accordance with the procedures described in "British Columbia Laboratory Methods Manual: 2003 – for the Analysis of Water, Wastewater, Sediment, Biological Material and Discrete Ambient Air Samples""

The City of Abbotsford follows the requirements of Schedule 5 of OMRR: The following represents their sampling schedule:

JAMES Biosolids Testing Schedule (Biosolids prior to centrifugation)

Weekly Testing:

- *Total Metals (including total Mercury)*
- *Fecal Coliform (reported as MPN/g dry weight)*
- *Salmonella*

Monthly Testing:

- *Total Metals (including total Mercury)*
- *Total Phosphorus (%)*
- *Total Kjeldahl Nitrogen (%)*
- *Total Potassium (%)*
- *Total Sulphur (%)*
- *Total Carbon (%)*
- *Total Organic Matter (%)*
- *Moisture (%)*
- *Ammonia (available - %)*

- *Nitrate (available – mg/kg)*
- *pH*
- *Conductivity*
- *C/N Ratio*

JAMES Biosolids Testing Schedule (Biosolids after centrifugation - Stored)

Monthly Testing:

- *Fecal Coliform (reported as MPN/g dry weight)*

Additional testing (Fecal Coliform only) will be done on the biosolids after storage and before it is released to ensure that it meets Class A.

Biocentral will be taking random sampling to ensure that the biosolids meet Class A standards.

Record Keeping

The City of Abbotsford records temperatures and retention times for the production of Class A biosolids, as per Schedule 6 (1) of the OMRR. All records for the production of the Class A biosolids will be stored at the JAMES Wastewater Treatment Plant for a minimum of 36 months, as per Schedule 6 (2) and (3).

The Land Application Plan, and all associated information will be kept at the Land Application Site, and will also be stored at the offices of the Qualified Professional, as well as at Biocentral's offices.

Role of the Qualified Professional

The qualified professional will oversee the storage and land application of the biosolids, including site inspections of the actual land application. He may also request plant yield data, as well as direct post harvest soil sampling to determine the post sampling soil concentrations of nutrients and trace elements. The qualified professional reserves the right to request verification of the Class A status of the biosolids at any time. The qualified professional will provide a post application report in early 2018.

Summary

This Land Application Plan provides a beneficial reuse of Class A biosolids, which are a valuable source of nitrogen, phosphorus, micronutrients and organic matter. The risk of environmental concern at this location is very low because of the quality of the Class A biosolids being applied and the proximity to water bodies and water sources.

Storage and transportation of the Class A biosolids is also not considered a concern because of the low fecal coliform count and the lack of significant odour in the biosolids.

This Land Application Plan was prepared by:

John Paul, PhD PAg

References

British Columbia Ministry of the Environment. 2008. Land Application Guidelines for the Organic Matter Recycling Regulation and the Soil Amendment Code of Practice, Best Management Practices. Document # 758-08, Sylvis Environmental.

Kelly, C.C and R.H. Spilsbury. 1939. Soil Survey of the Lower Fraser Valley. British Columbia Department of Agriculture. Publication 650, Technical Bulletin 20.

Oregon State University. 2007. Fertilizing with Biosolids. PNW 508-E, Revised June 2007 http://www.ecy.wa.gov/programs/swfa/biosolids/pdf/Fertilizing.pdf

BRITISH COLUMBIA | Ministry of Environment

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 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 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 of Environment 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 Branch PO Box 9377 Stn Prov Govt Victoria, BC V8W 9M1 **Email:** PermitAdministration.VictoriaEPD@gov.bc.ca	Ministry of Environment Environmental Protection Division Business Services Branch 3rd Floor, 2975 Jutland Road Victoria, BC V8T 5J9

Section 1: Purpose of Notification

***Application Type** (check one)	☒ New notification ☐ Change in information to an existing notification (provide authorization #)	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*	AM-2 Ventures Ltd. CT-2 Holdings Ltd. RT-2 Holdings Ltd.			2
OR * Individual's Full Legal Name				3
Doing Business As *if applicable*	TC Merritt Valley Farms (A partnership)			4
Incorporation Number *as registered with the BC Registrar of Companies (if applicable)*	AM-2 Ventures Ltd. BC0864978 CT-2 Holdings Ltd. BC0864968 RT-2 Holdings Ltd. BC0864943			5
***Contact Numbers** *e.g. (999) 999-9999*	Phone 604-796-3851	Mobile 604-991-0108		6
***Email Address** *generic company email address*	andres@timbroconstruction.com			7
***Legal Address** *as registered with BC Registrar of Companies*	Unit # / Street 7357 Pioneer Ave			8
	City Agassiz	Province BC	Postal Code V0M 1A0	9

***Mailing Address** *if different from above*	☐ Same as Legal Address			10
	Unit # / Street PO Box 95			11
	City Agassiz	Province BC	Postal Code V0M 1A0	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*	info@timbroconstruction.com			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	Murillo			1
Contact's First Name	Andres			2
Contact's Title	Partner			3
Mailing Address	☒ Mailing address is the same as Section 2 above			4
	Unit # / Street			5
	City	Province	Postal Code	6
Contact Numbers *e.g. (999) 999-9999*	Phone	Mobile		7
Email Address				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*	Transform Compost Systems Ltd.			1
Doing Business As *if different than above*				2
Agent's Last Name	Paul			3
Agent's First Name	John			4
Agent's Title	President			5
Mailing Address	Unit # / Street 3911 Mt. Lehman Rd			6
	City Abbotsford	Province BC	Postal Code V2T 5W5	7
Contact Numbers *e.g. (999) 999-9999*	Phone 604-856-2722	Mobile 604-302-4367		8
Email Address	transform@telus.net			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*	Andres Murillo	10
Date signed	Dec. 18th 2017.	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 solids • Waste Discharge Regulation Schedule: 2 "soil enhancement using wastes"			
***Regional District**	Fraser Valley Regional District		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 49.2700	Longitude (e.g., 116.8177) W 121.7828	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)	Section 1, Township 4, Range 29, Meridian 6, New Westminster District, Plan Pacrel A Part SE 1/4		4
PID/PIN/Crown File No.	PID 013-160-583		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)* 3628 Hotsprings Rd., Agassiz, BC V0M 1A3		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	Andres Murillo	5

Legal Land Owner Contact Numbers *e.g. (999) 999-9999*	Phone: 604-796-3658	Mobile: 604-991-0108	6
Legal Land Owner Email Address	andres@timbroconstruction.com		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**	108843	12
***Description of the managed organic matter to be applied**	Class A biosolids	13

***Intended date(s) for land application for that year**	2018-03 to 2018-05 (yyyy-mm-dd)		14
***Application rates**	12 dt/hectare		15
	dt/hectare		16
	dt/hectare		17
***Cumulative additions for that year of substances listed in Schedule 4 of the Organic Matter Recycling Regulation**	**Substance**	**Concentration (µg/g dry weight)**	18
	Arsenic	0.020	
	Cadmium	0.009	
	Chromium	0.173	
	Cobalt	0.013	
	Copper	3.37	
	Lead	0.125	
	Mercury	0.011	
	Molybdenum	0.051	
	Nickel	0.102	
	Selenium	0.027	
	Zinc	5.32	
***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:

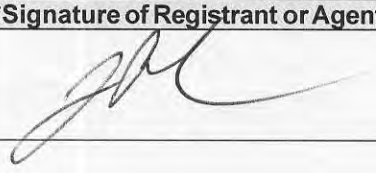
   a) this registration form,
   b) any document that the Registrant submits or causes to be submitted to the Province or the Director in support of this registration, and
   c) any document that the Registrant submits or causes to be submitted to the Director or the Province pursuant to
      i. any regulation 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 Ministry of Environment 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
John Paul		December 1, 2017


3628 Hot Springs Rd
Google Earth


3628 Hotsprings Rd
Soil sampling March 2018
Legend
Crop perimeter
Sampling point
Hot Springs Rd
9
S1
S2
S3
S4
S5
N
100 m
Google Earth
©2018 Google

Appendix B

Exova
#104, 19575-55 A Ave.
Surrey, British Columbia
V3S 8P8, Canada

T: +1 (604) 514-3322
F: +1 (604) 514-3323
E: Surrey@exova.com
W: www.exova.com

Appendix C

Farm Soil Analysis

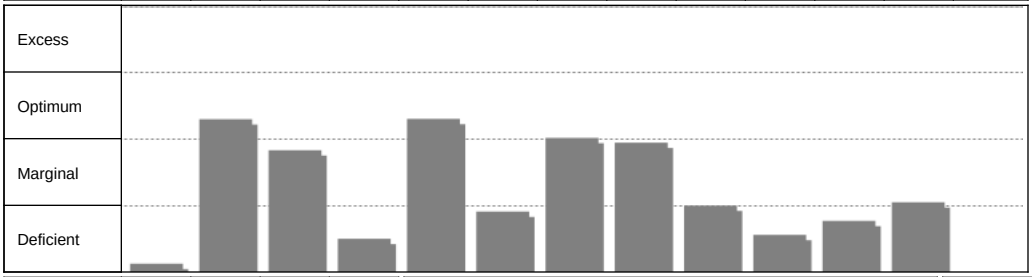
Bill To:	Timbro Contracting (A	Grower Name:	James - 3628 Hotsprings Rd	Lot Number:	1259896
Report To:	Timbro Contracting (A	Client's Sample Id:		Report Number:	2271214
	P.O. Box 95	Field Id:	S1	Date Received:	Mar 15, 2018
	7357 Pioneer Avenue	Acres:		Disposal Date:	Apr 14, 2018
	Agassiz, BC., Canada	Legal Location:		Report Date:	Mar 23, 2018
	V0M 1A0	Last Crop:	Crop not provided	Arrival Condition:	
Agreement:	74556				

Nutrient analysis (ppm)

Depth	N*	P	K	S**	Ca	Mg	Fe	Cu	Zn	B	Mn	Cl	BiCarbP
0" - 6"	2	35	137	<1	444	27	29.1	0.8	<0.5	0.2	0.8	4	

Soil Quality

pH	EC(dS/m)	OM(%)	Sample#
6.0	0.1	3.0	6042435



Alkaline	*Extreme*	*High*	
Neutral	*Very High*	*Normal*	←
Acidic	*High*	*Low*	←
Very Acidic	*Good*	*Very Low*	←

Total lbs/acre	5	71	275	2
Estimated lbs/acre	10	71	275	4

Texture *n/a* Hand Texture *n/a*

Sand n/a Silt n/a Clay n/a

Ammonium n/a

BS 51 % CEC 11 meq/100 g

Ca 40 % Mg 4.1 % Na <2.4 % K 6.4 %

TEC 5.5 meq/100 g Na <30 ppm

Lime 0.9 T/ac Buffer pH 6.7 Est. N Release n/a K/Mg Ratio 1.6

**Nitrate-N **Sulfate-S n/a = not analysed*

RECOMMENDATIONS FOR BALANCED CROP NUTRITION

	Crop not provided				
Macro-nutrients	**Yield**	**N**	**P_2O_5**	**K_2O**	**S**
Growing Condition		To be added (lbs/acre)			
Excellent					
Average					
Your Goal					
Removal Rate (Seed/Total)					
Micro-nutrients	Iron	Copper	Zinc	Boron	Manganese
To be added (lbs/ac)					

Comments:

Recommendations are based on general research consensus. They should not replace responsible judgement.

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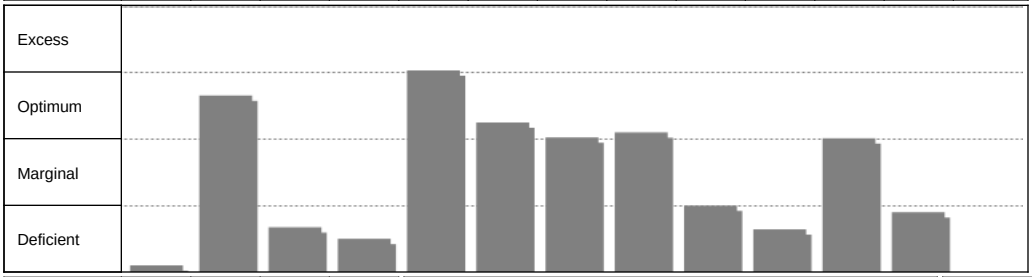
Farm Soil Analysis

Bill To:	Timbro Contracting (A	Grower Name:	James - 3628 Hotsprings Rd	Lot Number:	1259896
Report To:	Timbro Contracting (A	Client's Sample Id:		Report Number:	2271226
	P.O. Box 95	Field Id:	S2	Date Received:	Mar 15, 2018
	7357 Pioneer Avenue	Acres:		Disposal Date:	Apr 14, 2018
	Agassiz, BC., Canada	Legal Location:		Report Date:	Mar 23, 2018
	V0M 1A0	Last Crop:	Crop not provided	Arrival Condition:	
Agreement:	74556				

Nutrient analysis (ppm)

Depth	N*	P	K	S**	Ca	Mg	Fe	Cu	Zn	B	Mn	Cl	BiCarbP
0" - 6"	<2	48	51	<1	1320	85	36.3	1.2	<0.5	0.3	2.6	4	



Soil Quality

pH	EC(dS/m)	OM(%)	Sample#
6.5	0.1	2.8	6042436

Alkaline	*Extreme*	*High*	
Neutral ◆	*Very High*	*Normal* ◆	
Acidic	*High*	*Low*	
Very Acidic	*Good* ◆	*Very Low*	

Total lbs/acre	4	96	101	2
Estimated lbs/acre	8	96	101	4

Texture *n/a* Hand Texture *n/a*

Sand n/a Silt n/a Clay n/a

Ammonium n/a

BS 85 % CEC 10 meq/100 g

Ca 76 % Mg 8.1 % Na <1.5 % K 1.5 %

TEC 8.7 meq/100 g Na <30 ppm

Lime 0 T/ac Buffer pH 6.9 Est. N Release n/a K/Mg Ratio 0.19

*Nitrate-N **Sulfate-S n/a = not analysed

RECOMMENDATIONS FOR BALANCED CROP NUTRITION

	Crop not provided				
Macro-nutrients	**Yield**	**N**	**P_2O_5**	**K_2O**	**S**
Growing Condition		To be added (lbs/acre)			
Excellent					
Average					
Your Goal					
Removal Rate (Seed/Total)					
Micro-nutrients	Iron	Copper	Zinc	Boron	Manganese
To be added (lbs/ac)					

Comments:

Recommendations are based on general research consensus. They should not replace responsible judgement.

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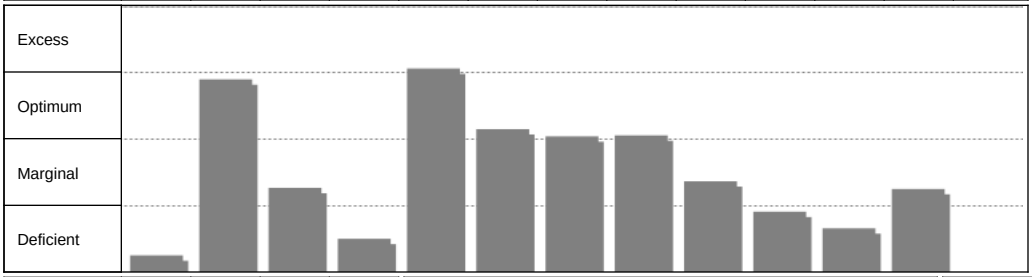
E: Surrey@exova.com
W: www.exova.com

Farm Soil Analysis

Bill To:	Timbro Contracting (A	Grower Name:	James - 3628 Hotsprings Rd	Lot Number:	1259896
Report To:	Timbro Contracting (A	Client's Sample Id:		Report Number:	2271227
	P.O. Box 95	Field Id:	S3	Date Received:	Mar 15, 2018
	7357 Pioneer Avenue	Acres:		Disposal Date:	Apr 14, 2018
	Agassiz, BC., Canada	Legal Location:		Report Date:	Mar 23, 2018
	V0M 1A0	Last Crop:	Crop not provided	Arrival Condition:	
Agreement:	74556				

Nutrient analysis (ppm)

Depth	N*	P	K	S**	Ca	Mg	Fe	Cu	Zn	B	Mn	Cl	BiCarbP
0" - 6"	5	57	95	<1	1570	63	51.6	1.0	0.7	0.4	0.7	5.0	



Soil Quality

pH	EC(dS/m)	OM(%)	Sample#
6.4	0.1	7.5	6042437

Alkaline	*Extreme*	*High*
Neutral	*Very High*	*Normal*
Acidic	*High*	*Low*
Very Acidic	*Good*	*Very Low*

Total lbs/acre	10	113	190	2
Estimated lbs/acre	20	113	190	4

Texture *n/a* Hand Texture *n/a*

Sand n/a Silt n/a Clay n/a

Ammonium n/a

BS 77.5 % CEC 14.3 meq/100 g

Ca 70.6 % Mg 4.7 % Na <1.2 % K 2.2 %

TEC 11.1 meq/100 g Na <30 ppm

Lime 0.8 T/ac Buffer pH 6.8 Est. N Release n/a K/Mg Ratio 0.47

**Nitrate-N **Sulfate-S n/a = not analysed*

RECOMMENDATIONS FOR BALANCED CROP NUTRITION

	Crop not provided				
Macro-nutrients	**Yield**	**N**	**P_2O_5**	**K_2O**	**S**
Growing Condition		To be added (lbs/acre)			
Excellent					
Average					
Your Goal					
Removal Rate (Seed/Total)					
Micro-nutrients	Iron	Copper	Zinc	Boron	Manganese
To be added (lbs/ac)					

Comments:

Recommendations are based on general research consensus. They should not replace responsible judgement.

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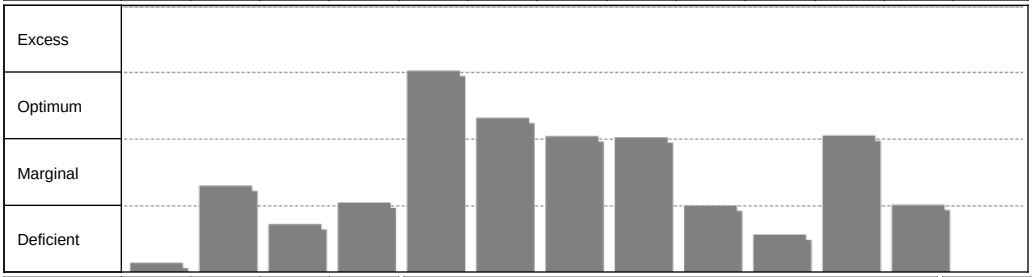
F: +1 (604) 514-3323
E: Surrey@exova.com
W: www.exova.com

Farm Soil Analysis

Bill To:	Timbro Contracting (A	Grower Name:	James - 3628 Hotsprings Rd	Lot Number:	1259896
Report To:	Timbro Contracting (A	Client's Sample Id:		Report Number:	2271228
	P.O. Box 95	Field Id:	S4	Date Received:	Mar 15, 2018
	7357 Pioneer Avenue	Acres:		Disposal Date:	Apr 14, 2018
	Agassiz, BC., Canada	Legal Location:		Report Date:	Mar 23, 2018
	V0M 1A0	Last Crop:	Crop not provided	Arrival Condition:	
Agreement:	74556				

Nutrient analysis (ppm)

Depth	N*	P	K	S**	Ca	Mg	Fe	Cu	Zn	B	Mn	Cl	BiCarbP
0" - 6"	3	18	54	2	1270	101	53.7	0.9	<0.5	0.2	4.7	4	



Soil Quality

pH	EC(dS/m)	OM(%)	Sample#
6.3	0.1	3.5	6042438

Alkaline	*Extreme*	*High*
Neutral	*Very High*	*Normal*
Acidic	*High*	*Low*
Very Acidic	*Good*	*Very Low*

Total lbs/acre	5	36	108	5
Estimated lbs/acre	11	36	108	9

Texture *n/a* Hand Texture *n/a*

Sand n/a Silt n/a Clay n/a

Ammonium n/a

BS 72.2 % CEC 14.0 meq/100 g

Ca 62.7 % Mg 8.2 % Na <1.3 % K 1.4 %

TEC 10.1 meq/100 g Na <30 ppm

Lime 0.9 T/ac Buffer pH 6.7 Est. N Release n/a K/Mg Ratio 0.17

**Nitrate-N **Sulfate-S n/a = not analysed*

RECOMMENDATIONS FOR BALANCED CROP NUTRITION

	Crop not provided				
Macro-nutrients	**Yield**	**N**	**P_2O_5**	**K_2O**	**S**
Growing Condition		To be added (lbs/acre)			
Excellent					
Average					
Your Goal					
Removal Rate (Seed/Total)					
Micro-nutrients	Iron	Copper	Zinc	Boron	Manganese
To be added (lbs/ac)					

Comments:

Recommendations are based on general research consensus. They should not replace responsible judgement.

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#104, 19575-55 A Ave.
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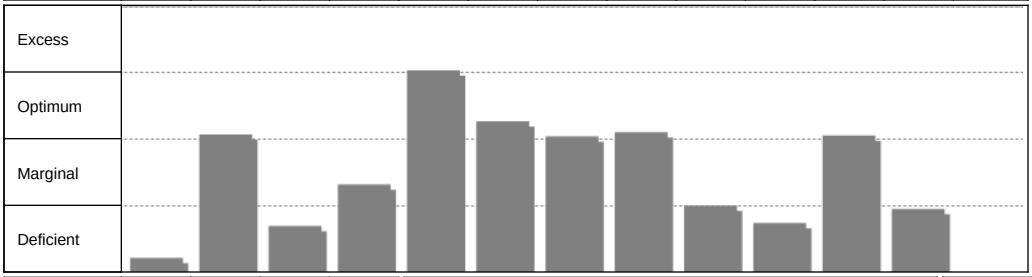
Farm Soil Analysis

Bill To:	Timbro Contracting (A	Grower Name:	James - 3628 Hotsprings Rd	Lot Number:	1259896
Report To:	Timbro Contracting (A	Client's Sample Id:		Report Number:	2271229
	P.O. Box 95	Field Id:	S5	Date Received:	Mar 15, 2018
	7357 Pioneer Avenue	Acres:		Disposal Date:	Apr 14, 2018
	Agassiz, BC., Canada	Legal Location:		Report Date:	Mar 23, 2018
	V0M 1A0	Last Crop:	Crop not provided	Arrival Condition:	
Agreement:	74556				

Nutrient analysis (ppm)

Depth	N*	P	K	S**	Ca	Mg	Fe	Cu	Zn	B	Mn	Cl	BiCarbP
0" - 6"	4	28	52	4	1330	89	51.6	1.2	<0.5	0.3	4.6	4	



Total lbs/acre	8	55	104	7
Estimated lbs/acre	17	55	104	15

*Nitrate-N **Sulfate-S n/a = not analysed

Soil Quality

pH	EC(dS/m)	OM(%)	Sample#
6.0	0.1	4.8	6042439

Alkaline	*Extreme*	*High*
Neutral	*Very High*	*Normal*
Acidic	*High*	*Low*
Very Acidic	*Good*	*Very Low*

Texture *n/a* Hand Texture *n/a*

Sand n/a Silt n/a Clay n/a

Ammonium n/a

BS 62.5 % CEC 19.2 meq/100 g

Ca 55.3 % Mg 6.1 % Na <1.1 % K 1.1 %

TEC 12.0 meq/100 g Na <30 ppm

Lime 1 T/ac Buffer pH 6.6 Est. N Release n/a K/Mg Ratio 0.18

RECOMMENDATIONS FOR BALANCED CROP NUTRITION

	Crop not provided				
Macro-nutrients	**Yield**	**N**	**P_2O_5**	**K_2O**	**S**
Growing Condition		To be added (lbs/acre)			
Excellent					
Average					
Your Goal					
Removal Rate (Seed/Total)					
Micro-nutrients	Iron	Copper	Zinc	Boron	Manganese
To be added (lbs/ac)					

Comments:

Recommendations are based on general research consensus. They should not replace responsible judgement.

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Report Transmission Cover Page

Bill To:	Timbro Contracting (A	Project ID:	James	Lot ID:	**1259896**
	P.O. Box 95	Project Name:	3628 Hotsprings Rd	Control Number:	C0065546
	7357 Pioneer Avenue	Project Location:	Agassiz	Date Received:	Mar 15, 2018
	Agassiz, BC, Canada	LSD:		Date Reported:	Mar 23, 2018
	V0M 1A0	P.O.:	14132	Report Number:	2271234
Attn:	Accounts Payable	Proj. Acct. code:			
Sampled By:	Andres M.				
Company:	Biocentral				

Contact	Company	Address
Accounts Payable	**Timbro Contracting (A Partnership)**	P.O. Box 95, 7357 Pioneer Avenue Agassiz, BC V0M 1A0 Phone: (604) 796-3851 Fax: (604) 796-0554 Email: info@timbroconstruction.com

Delivery	Format	Deliverables
Email - Single Report	PDF	Invoice

Contact	Company	Address
Andres Moreno	**Samplers Account**	7357 Pioneer Avenue Agassiz, BC V0M 1A2 Phone: (604) 796-3851 Fax: (604) 796-0554 Email: andresm@biocentral.ca

Delivery	Format	Deliverables
Email - Merge Reports	PDF	Test Report / Test Report / Test

Contact	Company	Address
Andres Murillo	**Timbro Contracting (A Partnership)**	P.O. Box 95, 7357 Pioneer Avenue Agassiz, BC V0M 1A0 Phone: (604) 796-3851 Fax: (604) 796-0554 Email: andres@timbroconstruction.com

Delivery	Format	Deliverables
Email - Single Report	PDF	COC / Test Report
Email - Single Report	PDF	COR

Contact	Company	Address
Frank Trevr	**Timbro Contracting (A Partnership)**	P.O. Box 95, 7357 Pioneer Avenue Agassiz, BC V0M 1A0 Phone: (604) 991-3782 Fax: Email: frank@timbroconstruction.com

Delivery	Format	Deliverables
Email - Merge Reports	PDF	COC / Test Report
Email - Single Report	PDF	COR
Email - Single Report	Standard Crosstab	Test Report

Notes To Clients:

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Analytical Report

Bill To:	Timbro Contracting (A	Project ID:	James	Lot ID:	**1259896**
	P.O. Box 95	Project Name:	3628 Hotsprings Rd	Control Number:	C0065546
	7357 Pioneer Avenue	Project Location:	Agassiz	Date Received:	Mar 15, 2018
	Agassiz, BC, Canada	LSD:		Date Reported:	Mar 23, 2018
	V0M 1A0	P.O.:	14132	Report Number:	2271234
Attn:	Accounts Payable	Proj. Acct. code:			
Sampled By:	Andres M.				
Company:	Biocentral				

Reference Number	1259896-19676	1259896-19677	1259896-19678
Sample Date	Mar 15, 2018	Mar 15, 2018	Mar 15, 2018
Sample Time	NA	NA	NA
Sample Location			
Sample Description	James - 3628 Hotsprings Rd / S1 / 0 / 5 / E / 1	James - 3628 Hotsprings Rd / S2 / 0 / 5 / E / 1	James - 3628 Hotsprings Rd / S3 / 0 / 5 / E / 1
Matrix	Farm Soil	Farm Soil	Farm Soil

Analyte		Units	Results	Results	Results	Nominal Detection Limit
Aggregate Organic Constituents						
Organic Matter	LOI	% by weight	3.0	2.8	7.5	0.1
Available Nutrients						
Nitrate - N	Farmsoil	ppm	2	<2	5	2
Phosphorus	Farmsoil	ppm	35	48	57	5
Potassium	Farmsoil	ppm	137	51	95	25
Sulfate-S	Farmsoil	ppm	<1	<1	<1	1
Copper	FS Micro-nutrients	ppm	0.8	1.2	1.0	0.1
Iron	FS Micro-nutrients	ppm	29.1	36.3	51.6	2
Manganese	FS Micro-nutrients	ppm	0.8	2.6	0.7	0.1
Zinc	FS Micro-nutrients	ppm	<0.5	<0.5	0.7	0.5
Base saturation	FS Base Saturation	%	51	85	77.5	
Calcium	FS Base Saturation	%	40	76	70.6	
Magnesium	FS Base Saturation	%	4.1	8.1	4.7	
Sodium	FS Base Saturation	%	<2.4	<1.5	<1.2	
Potassium	FS Base Saturation	%	6.4	1.5	2.2	
TEC	FS Base Saturation	meq/100 g	5.5	8.7	11.1	
Calcium	FS Macro-nutrients	ppm	444	1320	1570	30
Magnesium	FS Macro-nutrients	ppm	27	85	63	5
Sodium	FS Macro-nutrients	ppm	<30	<30	<30	30
Boron	FS Micro-nutrients	ppm	0.2	0.3	0.4	0.1
Classification						
Nitrogen	Total	%	0.12	0.12	0.34	0.02
Hot Water Soluble						
Boron	FS Micro-nutrients	ppm	0.2	0.3	0.4	0.1
Metals Strong Acid Digestion						
Antimony	Strong Acid Extractable	µg/g	3	3	2	1.5
Arsenic	Strong Acid Extractable	µg/g	5.3	5.7	5.0	0.35
Barium	Strong Acid Extractable	µg/g	72	120	140	0.2
Beryllium	Strong Acid Extractable	µg/g	0.37	0.45	0.46	0.01
Cadmium	Strong Acid Extractable	µg/g	0.2	0.3	0.4	0.05
Chromium	Strong Acid Extractable	µg/g	74	79	81	0.1
Cobalt	Strong Acid Extractable	µg/g	13	15	12	0.1
Copper	Strong Acid Extractable	µg/g	26	33	26	0.1
Lead	Strong Acid Extractable	µg/g	3	3	8.8	0.5
Mercury	Strong Acid Extractable	µg/g	0.030	0.044	0.049	0.003
Molybdenum	Strong Acid Extractable	µg/g	0.63	0.3	0.4	0.1

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Analytical Report

Bill To:	Timbro Contracting (A	Project ID:	James	Lot ID:	**1259896**
	P.O. Box 95	Project Name:	3628 Hotsprings Rd	Control Number:	C0065546
	7357 Pioneer Avenue	Project Location:	Agassiz	Date Received:	Mar 15, 2018
	Agassiz, BC, Canada	LSD:		Date Reported:	Mar 23, 2018
	V0M 1A0	P.O.:	14132	Report Number:	2271234
Attn:	Accounts Payable	Proj. Acct. code:			
Sampled By:	Andres M.				
Company:	Biocentral				

Reference Number	1259896-19676	1259896-19677	1259896-19678	
Sample Date	Mar 15, 2018	Mar 15, 2018	Mar 15, 2018	
Sample Time	NA	NA	NA	
Sample Location				
Sample Description	James - 3628 Hotsprings Rd / S1 / 0 / 5 / E / 1	James - 3628 Hotsprings Rd / S2 / 0 / 5 / E / 1	James - 3628 Hotsprings Rd / S3 / 0 / 5 / E / 1	
Matrix	Farm Soil	Farm Soil	Farm Soil	

Analyte		Units	Results	Results	Results	Nominal Detection Limit
Metals Strong Acid Digestion - Continued						
Nickel	Strong Acid Extractable	µg/g	46	43	40	0.25
Selenium	Strong Acid Extractable	µg/g	0.7	1	1	0.5
Silver	Strong Acid Extractable	µg/g	0.61	<0.4	<0.4	0.4
Strontium	Strong Acid Extractable	µg/g	20	25	26	0.05
Thallium	Strong Acid Extractable	µg/g	<0.5	<0.5	<0.5	0.5
Tin	Strong Acid Extractable	µg/g	<0.5	<0.5	<0.5	0.5
Vanadium	Strong Acid Extractable	µg/g	79	82	84	0.2
Zinc	Strong Acid Extractable	µg/g	56	62	80	0.05
Soil Acidity						
pH	1:2 Soil:Water	pH	6.0	6.5	6.4	
Electrical Conductivity	Sat. Paste equiv based on 1:2	dS/m at 25 °C	0.1	0.1	0.1	0.02
Water Soluble Parameters						
Chloride	Available	mg/kg	4	4	5.0	0.5
Lime Requirement						
pH	SMP	pH	6.7	6.9	6.8	
Lime		T/ac	0.9	0	0.8	

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Analytical Report

Bill To:	Timbro Contracting (A	Project ID:	James	Lot ID:	**1259896**
	P.O. Box 95	Project Name:	3628 Hotsprings Rd	Control Number:	C0065546
	7357 Pioneer Avenue	Project Location:	Agassiz	Date Received:	Mar 15, 2018
	Agassiz, BC, Canada	LSD:		Date Reported:	Mar 23, 2018
	V0M 1A0	P.O.:	14132	Report Number:	2271234
Attn:	Accounts Payable	Proj. Acct. code:			
Sampled By:	Andres M.				
Company:	Biocentral				

Reference Number	1259896-19679	1259896-19680	
Sample Date	Mar 15, 2018	Mar 15, 2018	
Sample Time	NA	NA	
Sample Location			
Sample Description	James - 3628 Hotsprings Rd / S4 / 0 / 5 / E / 1	James - 3628 Hotsprings Rd / S5 / 0 / 5 / E / 1	
Matrix	Farm Soil	Farm Soil	

Analyte		Units	Results	Results	Results	Nominal Detection Limit
Aggregate Organic Constituents						
Organic Matter	LOI	% by weight	3.5	4.8		0.1
Available Nutrients						
Nitrate - N	Farmsoil	ppm	3	4		2
Phosphorus	Farmsoil	ppm	18	28		5
Potassium	Farmsoil	ppm	54	52		25
Sulfate-S	Farmsoil	ppm	2	4		1
Copper	FS Micro-nutrients	ppm	0.9	1.2		0.1
Iron	FS Micro-nutrients	ppm	53.7	51.6		2
Manganese	FS Micro-nutrients	ppm	4.7	4.6		0.1
Zinc	FS Micro-nutrients	ppm	<0.5	<0.5		0.5
Base saturation	FS Base Saturation	%	72.2	62.5		
Calcium	FS Base Saturation	%	62.7	55.3		
Magnesium	FS Base Saturation	%	8.2	6.1		
Sodium	FS Base Saturation	%	<1.3	<1.1		
Potassium	FS Base Saturation	%	1.4	1.1		
TEC	FS Base Saturation	meq/100 g	10.1	12.0		
Calcium	FS Macro-nutrients	ppm	1270	1330		30
Magnesium	FS Macro-nutrients	ppm	101	89		5
Sodium	FS Macro-nutrients	ppm	<30	<30		30
Boron	FS Micro-nutrients	ppm	0.2	0.3		0.1
Classification						
Nitrogen	Total	%	0.16	0.19		0.02
Hot Water Soluble						
Boron	FS Micro-nutrients	ppm	0.2	0.3		0.1
Metals Strong Acid Digestion						
Antimony	Strong Acid Extractable	µg/g	3	3		1.5
Arsenic	Strong Acid Extractable	µg/g	5.8	5.9		0.35
Barium	Strong Acid Extractable	µg/g	130	150		0.2
Beryllium	Strong Acid Extractable	µg/g	0.48	0.50		0.01
Cadmium	Strong Acid Extractable	µg/g	0.3	0.3		0.05
Chromium	Strong Acid Extractable	µg/g	85	87		0.1
Cobalt	Strong Acid Extractable	µg/g	15	16		0.1
Copper	Strong Acid Extractable	µg/g	29	30		0.1
Lead	Strong Acid Extractable	µg/g	5.7	5.5		0.5
Mercury	Strong Acid Extractable	µg/g	0.047	0.056		0.003
Molybdenum	Strong Acid Extractable	µg/g	0.5	0.4		0.1

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#104, 19575-55 A Ave.
Surrey, British Columbia
V3S 8P8, Canada

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Analytical Report

Bill To:	Timbro Contracting (A	Project ID:	James	Lot ID:	**1259896**
	P.O. Box 95	Project Name:	3628 Hotsprings Rd	Control Number:	C0065546
	7357 Pioneer Avenue	Project Location:	Agassiz	Date Received:	Mar 15, 2018
	Agassiz, BC, Canada	LSD:		Date Reported:	Mar 23, 2018
	V0M 1A0	P.O.:	14132	Report Number:	2271234
Attn:	Accounts Payable	Proj. Acct. code:			
Sampled By:	Andres M.				
Company:	Biocentral				

Reference Number	1259896-19679	1259896-19680	
Sample Date	Mar 15, 2018	Mar 15, 2018	
Sample Time	NA	NA	
Sample Location			
Sample Description	James - 3628 Hotsprings Rd / S4 / 0 / 5 / E / 1	James - 3628 Hotsprings Rd / S5 / 0 / 5 / E / 1	
Matrix	Farm Soil	Farm Soil	

Analyte		**Units**	**Results**	**Results**	**Results**	Nominal Detection Limit
Metals Strong Acid Digestion - Continued						
Nickel	Strong Acid Extractable	µg/g	46	42		0.25
Selenium	Strong Acid Extractable	µg/g	<0.5	0.9		0.5
Silver	Strong Acid Extractable	µg/g	<0.4	<0.4		0.4
Strontium	Strong Acid Extractable	µg/g	26	27		0.05
Thallium	Strong Acid Extractable	µg/g	<0.5	<0.5		0.5
Tin	Strong Acid Extractable	µg/g	<0.5	<0.5		0.5
Vanadium	Strong Acid Extractable	µg/g	88	92		0.2
Zinc	Strong Acid Extractable	µg/g	69	72		0.05
Soil Acidity						
pH	1:2 Soil:Water	pH	6.3	6.0		
Electrical Conductivity	Sat. Paste equiv based on 1:2	dS/m at 25 °C	0.1	0.1		0.02
Water Soluble Parameters						
Chloride	Available	mg/kg	4	4		0.5
Lime Requirement						
pH	SMP	pH	6.7	6.6		
Lime		T/ac	0.9	1		

Approved by:

Mathieu Simoneau
Operations Manager

Data have been validated by Analytical Quality Control and Exova's Integrated Data Validation System (IDVS).
Generation and distribution of the report, and approval by the digitized signature above, are performed through a secure and controlled automatic process.

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Quality Control

Bill To:	Timbro Contracting (A	Project ID:	James	Lot ID:	**1259896**
	P.O. Box 95	Project Name:	3628 Hotsprings Rd	Control Number:	C0065546
	7357 Pioneer Avenue	Project Location:	Agassiz	Date Received:	Mar 15, 2018
	Agassiz, BC, Canada	LSD:		Date Reported:	Mar 23, 2018
	V0M 1A0	P.O.:	14132	Report Number:	2271234
Attn:	Accounts Payable	Proj. Acct. code:			
Sampled By:	Andres M.				
Company:	Biocentral				

Aggregate Organic Constituents

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Organic Matter	% by weight	17.0	17.1	10	0.1	yes
Date Acquired:	March 21, 2018					

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Organic Matter	% by weight	4.9	4.2	5.7	yes
Date Acquired:	March 21, 2018				

Available Nutrients

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Nitrate - N	mg/L	0.085	-1	1	yes
Phosphorus	mg/L	0.056	-4	5	yes
Potassium	mg/L	-0.225	-3	10	yes
Sulfate-S	mg/L	0.449	-1	1	yes
Copper	mg/L	0.0132	-0.1	0.1	yes
Iron	mg/L	0.0868	-2.0	2.0	yes
Manganese	mg/L	0.0039	-0.1	0.1	yes
Zinc	mg/L	0.0104	-0.5	0.5	yes
Calcium	mg/L	0.7181	-1	3	yes
Magnesium	mg/L	0.1219	-0	0	yes
Sodium	mg/L	1.418	-1	3	yes
Boron	mg/L	0.0168297	-0.2	0.2	yes
Date Acquired:	March 21, 2018				

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Nitrate - N	ppm	5	4	10	2	yes
Phosphorus	ppm	57	56	10	5	yes
Potassium	ppm	95	87	10	10	yes
Sulfate-S	ppm	<1	<1	15	2	yes
Copper	ppm	4.6	4.5	10	0.1	yes
Iron	ppm	204	203	10	0.1	yes
Manganese	ppm	5.6	5.5	10	0.0	yes
Zinc	ppm	4.0	4.0	10	0.0	yes
Calcium	ppm	2300	2250	10	3	yes
Magnesium	ppm	32	31	10	3	yes
Sodium	ppm	<30	<30	10	18	yes
Boron	ppm	0.5	0.5	10	0.1	yes
Date Acquired:	March 21, 2018					

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Nitrate - N	ppm	36	29	40	yes
Phosphorus	ppm	30	27	34	yes
Potassium	ppm	201	168	224	yes
Sulfate-S	ppm	729	620	770	yes
Copper	ppm	1.8	1.5	1.9	yes
Iron	ppm	197	154.3	213.7	yes
Manganese	ppm	46.9	35.8	52.1	yes

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Quality Control

Bill To:	Timbro Contracting (A	Project ID:	James	Lot ID:	**1259896**
	P.O. Box 95	Project Name:	3628 Hotsprings Rd	Control Number:	C0065546
	7357 Pioneer Avenue	Project Location:	Agassiz	Date Received:	Mar 15, 2018
	Agassiz, BC, Canada	LSD:		Date Reported:	Mar 23, 2018
	V0M 1A0	P.O.:	14132	Report Number:	2271234
Attn:	Accounts Payable	Proj. Acct. code:			
Sampled By:	Andres M.				
Company:	Biocentral				

Available Nutrients - Continued

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Zinc	ppm	3.4	2.8	3.8	yes
Calcium	ppm	6310	5530	6752	yes
Magnesium	ppm	596	495	670	yes
Sodium	ppm	88	68	94	yes
Boron	ppm	1.1	0.8	1.5	yes
Date Acquired:	March 21, 2018				
Nitrate - N	ppm	4	3	4	yes
Phosphorus	ppm	3	2	4	yes
Potassium	ppm	31	24	36	yes
Sulfate-S	ppm	1	1	1	yes
Copper	ppm	0.5	0.4	0.6	yes
Iron	ppm	5.2	4.5	5.5	yes
Manganese	ppm	1.0	0.9	1.1	yes
Zinc	ppm	0.5	0.4	0.6	yes
Calcium	ppm	11	9	11	yes
Magnesium	ppm	10	9	11	yes
Sodium	ppm	10	9	11	yes
Date Acquired:	March 21, 2018				
Sulfate-S	ppm	53	40	60	yes
Date Acquired:	March 21, 2018				

Classification

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Nitrogen		0.00168	-0.020	0.020	yes
Date Acquired:	March 19, 2018				

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Nitrogen	%	2.11	2.04	0	2.500	yes
Date Acquired:	March 19, 2018					

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Nitrogen	%	0.49	0.465	0.551	yes
Date Acquired:	March 19, 2018				

Hot Water Soluble

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Boron	mg/L	0.0173536	-0.2	0.2	yes
Date Acquired:	March 21, 2018				

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Boron	ppm	1.2	0.8	1.5	yes
Date Acquired:	March 21, 2018				
Boron	ppm	0.1	0.1	0.1	yes
Date Acquired:	March 21, 2018				

Exova
#104, 19575-55 A Ave.
Surrey, British Columbia
V3S 8P8, Canada

T: +1 (604) 514-3322
F: +1 (604) 514-3323
E: Surrey@exova.com
W: www.exova.com

Quality Control

Bill To:	Timbro Contracting (A	Project ID:	James	Lot ID:	**1259896**
	P.O. Box 95	Project Name:	3628 Hotsprings Rd	Control Number:	C0065546
	7357 Pioneer Avenue	Project Location:	Agassiz	Date Received:	Mar 15, 2018
	Agassiz, BC, Canada	LSD:		Date Reported:	Mar 23, 2018
	V0M 1A0	P.O.:	14132	Report Number:	2271234
Attn:	Accounts Payable	Proj. Acct. code:			
Sampled By:	Andres M.				
Company:	Biocentral				

Lime Requirement

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
pH	pH	7.3	7.2	7.3	yes
Date Acquired:	March 21, 2018				

Metals Strong Acid Digestion

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Antimony	mg/L	-0.000457259	-0.030	0.030	yes
Arsenic	mg/L	-0.00681021	-0.007	0.007	yes
Barium	mg/L	0.000364058	-0.004	0.004	yes
Beryllium	mg/L	8.8897e-006	-0.000	0.000	yes
Cadmium	mg/L	0.000506602	-0.001	0.001	yes
Chromium	mg/L	0.00121838	-0.002	0.002	yes
Cobalt	mg/L	0.00018497	-0.002	0.002	yes
Copper	mg/L	0.000561406	-0.002	0.002	yes
Lead	mg/L	0.00031064	-0.010	0.010	yes
Mercury	µg/L	-0.009	-0.030	0.030	yes
Molybdenum	mg/L	-0.00165603	-0.002	0.002	yes
Nickel	mg/L	0.00163925	-0.005	0.005	yes
Selenium	mg/L	0.00427062	-0.010	0.010	yes
Silver	mg/L	0.000747588	-0.008	0.008	yes
Strontium	mg/L	9.63792e-005	-0.000	0.000	yes
Thallium	mg/L	-0.00544639	-0.010	0.010	yes
Tin	mg/L	-0.00101922	-0.010	0.010	yes
Vanadium	mg/L	-0.000491746	-0.004	0.004	yes
Zinc	mg/L	0.000670545	-0.001	0.001	yes
Date Acquired:	March 21, 2018				

Calibration Check	Units	% Recovery	Lower Limit	Upper Limit	Passed QC
Antimony	mg/L	92.75	90	110	yes
Arsenic	mg/L	99.77	90	110	yes
Barium	mg/L	100.62	90	110	yes
Beryllium	mg/L	95.64	90	110	yes
Cadmium	mg/L	98.42	90	110	yes
Chromium	mg/L	99.43	90	110	yes
Cobalt	mg/L	97.78	90	110	yes
Copper	mg/L	100.17	90	110	yes
Lead	mg/L	95.05	90	110	yes
Molybdenum	mg/L	97.38	90	110	yes
Nickel	mg/L	95.39	90	110	yes
Selenium	mg/L	99.53	90	110	yes
Silver	mg/L	96.35	90	110	yes
Thallium	mg/L	94.80	90	110	yes
Tin	mg/L	92.47	90	110	yes
Vanadium	mg/L	100.00	90	110	yes
Zinc	mg/L	93.78	90	110	yes
Date Acquired:	March 21, 2018				

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Quality Control

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Attn:	Accounts Payable	Proj. Acct. code:			
Sampled By:	Andres M.				
Company:	Biocentral				

Metals Strong Acid Digestion - Continued

Calibration Check	Units	% Recovery	Lower Limit	Upper Limit	Passed QC
Antimony	mg/L	91.35	90	110	yes
Arsenic	mg/L	101.01	90	110	yes
Barium	mg/L	100.35	90	110	yes
Beryllium	mg/L	94.49	90	110	yes
Cadmium	mg/L	100.38	90	110	yes
Chromium	mg/L	100.00	90	110	yes
Cobalt	mg/L	99.21	90	110	yes
Copper	mg/L	101.15	90	110	yes
Lead	mg/L	98.13	90	110	yes
Mercury	µg/L	92.60	90	110	yes
Molybdenum	mg/L	98.05	90	110	yes
Nickel	mg/L	98.98	90	110	yes
Selenium	mg/L	106.38	90	110	yes
Silver	mg/L	93.29	90	110	yes
Strontium	mg/L	97.60	90	110	yes
Thallium	mg/L	96.23	90	110	yes
Tin	mg/L	93.02	90	110	yes
Vanadium	mg/L	99.75	90	110	yes
Zinc	mg/L	94.61	90	110	yes
Date Acquired:	March 21, 2018				

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Antimony	µg/g	3	3	30	3.000	yes
Arsenic	µg/g	5.3	4.9	30	1.750	yes
Barium	µg/g	72	67	30	1.000	yes
Beryllium	µg/g	0.37	0.36	30	0.050	yes
Cadmium	µg/g	0.2	0.2	30	0.250	yes
Chromium	µg/g	74	72	30	0.500	yes
Cobalt	µg/g	13	12	30	0.500	yes
Copper	µg/g	26	24	30	0.500	yes
Lead	µg/g	3	3	30	2.500	yes
Mercury	µg/g	0.030	0.029	30	0.500	yes
Molybdenum	µg/g	0.63	0.74	30	0.500	yes
Nickel	µg/g	46	45	30	1.250	yes
Selenium	µg/g	0.7	2	30	2.500	yes
Silver	µg/g	0.61	2.4	30	2.000	yes
Strontium	µg/g	20	19	30	0.250	yes
Thallium	µg/g	<0.5	<0.5	30	2.500	yes
Tin	µg/g	<0.5	<0.5	30	2.500	yes
Vanadium	µg/g	79	77	30	1.000	yes
Zinc	µg/g	56	52	30	0.250	yes
Date Acquired:	March 21, 2018					

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Antimony	µg/g	<1	0.040	2.080	yes

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Quality Control

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	P.O. Box 95	Project Name:	3628 Hotsprings Rd	Control Number:	C0065546
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	V0M 1A0	P.O.:	14132	Report Number:	2271234
Attn:	Accounts Payable	Proj. Acct. code:			
Sampled By:	Andres M.				
Company:	Biocentral				

Metals Strong Acid Digestion - Continued

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Arsenic	µg/g	4.8	2.940	5.520	yes
Barium	µg/g	170	139.210	174.790	yes
Beryllium	µg/g	0.53	0.405	0.603	yes
Cadmium	µg/g	0.2	0.101	0.341	yes
Chromium	µg/g	32	19.940	36.620	yes
Cobalt	µg/g	7.1	4.970	8.870	yes
Copper	µg/g	16	12.330	17.430	yes
Lead	µg/g	7.4	5.500	11.320	yes
Mercury	µg/g	0.024	0.012	0.034	yes
Molybdenum	µg/g	0.4	0.252	0.828	yes
Nickel	µg/g	20	16.430	23.720	yes
Strontium	µg/g	74	59.580	83.220	yes
Tin	µg/g	<0.5	0.104	0.938	yes
Vanadium	µg/g	37	25.800	48.600	yes
Zinc	µg/g	60	46.370	66.830	yes

Date Acquired: March 21, 2018

Soil Acidity

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
pH	pH	6.18	5.6	7.2	yes
Electrical Conductivity	dS/m at 25 °C	0.0161	-0.04	0.08	yes

Date Acquired: March 21, 2018

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
pH	pH	6.5	6.5	0	0.3	yes
Electrical Conductivity	dS/m at 25 °C	0.2	0.2	10	0.04	yes

Date Acquired: March 21, 2018

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
pH	pH	7.3	6.3	8.6	yes
Electrical Conductivity	dS/m at 25 °C	2.65	2.13	3.09	yes

Date Acquired: March 21, 2018

Water Soluble Parameters

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Chloride	mg/L	0.38	-0.0	0.6	yes

Date Acquired: March 21, 2018

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Chloride	mg/kg	4	4	10	1.0	yes

Date Acquired: March 21, 2018

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Chloride	mg/kg	37	30.0	40.8	yes

Date Acquired: March 21, 2018

Chloride	mg/kg	4.6	4.4	5.6	yes

Date Acquired: March 21, 2018

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Quality Control

Bill To:	Timbro Contracting (A	Project ID:	James	Lot ID:	**1259896**
	P.O. Box 95	Project Name:	3628 Hotsprings Rd	Control Number:	C0065546
	7357 Pioneer Avenue	Project Location:	Agassiz	Date Received:	Mar 15, 2018
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	V0M 1A0	P.O.:	14132	Report Number:	2271234
Attn:	Accounts Payable	Proj. Acct. code:			
Sampled By:	Andres M.				
Company:	Biocentral				

Water Soluble Parameters - Continued

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC

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Methodology and Notes

Bill To:	Timbro Contracting (A	Project ID:	James	Lot ID:	**1259896**
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Sampled By:	Andres M.				
Company:	Biocentral				

Method of Analysis

Method Name	Reference		Method	Date Analysis Started	Location
Boron in farm soil	McKeague	*	Hot Water Soluble Boron - Azomethine-H Method, 4.61	Mar 21, 2018	Exova Edmonton
Chloride in farmsoil	SSSA Book Series, no. 3	*	Testing Soils for Sulfur, Boron, Molybdenum, and Chlorine, Chapter 10	Mar 21, 2018	Exova Edmonton
Macronutrients in Farm Soils	McKeague	*	Ammonium Acetate Extractable Cations, 4.51	Mar 21, 2018	Exova Edmonton
Metals (Strong Acid Leachable) in soils (Surrey)	B.C.M.O.E	*	Strong Acid Leachable Metals (SALM) in Soil, V 1.0, SALM	Mar 20, 2018	Exova Surrey
Metals (Strong Acid Leachable) in soils (Surrey)	US EPA	*	Mercury in Solid and Semi-Solid Wastes (Cold Vapour), 7471B	Mar 20, 2018	Exova Surrey
Micronutrients in Farm Soil	APHA	*	Inductively Coupled Plasma (ICP) Method, 3120 B	Mar 21, 2018	Exova Edmonton
Micronutrients in Farm Soil	McKeague	*	DTPA-TEA Extractable Elements, 4.65	Mar 21, 2018	Exova Edmonton
Nutrients in Farm Soil	Comm. Soil Sci. Pl. Anal.	*	Modified Kelowna Soil Test, Vol 26, 1995	Mar 21, 2018	Exova Edmonton
Organic Matter by Ignition	McKeague	*	Loss on Ignition (LOI), 3.8	Mar 21, 2018	Exova Edmonton
pH and Conductivity in farm soil	McKeague	*	1:2 Soil:Water Ratio, 4.12	Mar 21, 2018	Exova Edmonton
SMP Lime Requirements	Carter	*	Shoemaker-Mclean-Pratt Single-Buffer Method, 12.2	Mar 21, 2018	Exova Edmonton
Sulfate in Farm Soil	McKeague	*	Sulfate Extractable by 0.1M CaCl2, 4.47	Mar 21, 2018	Exova Edmonton
Total Carbon, Nitrogen & Sulfur by Leco Combustion (Surrey)	SSSA Book Series 5	*	Nitrogen-Total, Ch 37	Mar 19, 2018	Exova Surrey

** Reference Method Modified*

References

APHA	Standard Methods for the Examination of Water and Wastewater
B.C.M.O.E	B.C. Ministry of Environment
Carter	Soil Sampling and Methods of Analysis.
Comm. Soil Sci. Pl.	Communications in Soil Science and Plant Analysis
McKeague	Manual on Soil Sampling and Methods of Analysis
SSSA Book Series 5	Methods of Soil Analysis, Part 3
SSSA Book Series,	Soil Testing and Plant Analysis
US EPA	US Environmental Protection Agency Test Methods

Guidelines

Guideline Description	General Soil Comments
	Plant Nutrients in Soil
	Soil test for Crop Unknown
Guideline Source	Exova Canada Inc.,
Guideline Comments	

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Methodology and Notes

Bill To:	Timbro Contracting (A	Project ID:	James	Lot ID:	**1259896**
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	7357 Pioneer Avenue	Project Location:	Agassiz	Date Received:	Mar 15, 2018
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Sampled By:	Andres M.				
Company:	Biocentral				

The comparison of test results to guideline limits is provided for information purposes only. This is not to be taken as a statement of conformance / nonconformance to any guideline, regulation or limit. The data user is responsible for all conclusions drawn with respect to the data and is advised to consult official regulatory references when evaluating compliance.

Please direct any inquiries regarding this report to our Client Services Group or to the Operations Manager at the coordinates indicated at the top left of this page.
Results relate only to samples as submitted.

ABBOTSFORD

April 10, 2017

File: 5550-70

Andres Murillo, P.Eng
BioCentral Green Depot Ltd.
Box 95-7357 Pioneer Avenue
Agassiz, BC V0M 1A0

Dear Mr. Murillo:

Re: Organic Matters Recycling Regulation (OMRR) Section 6 – Process and Quality Criteria

As requested, this letter provides confirmation and supporting information that the JAMES Wastewater Treatment Plant (JAMES Plant) meets Section 6 of the OMRR for producing Class A biosolids.

The pasteurization system at the JAMES Plant meets the time-temperature requirements for production of Class A biosolids according to Section 2(f) in OMRR Schedule 1.

The sludge pasteurization system includes the following main components:

- crude and pasteurized sludge holding tanks;
- heat exchangers to heat raw sludge and cool pasteurized sludge;
- pasteurization tank; and
- miscellaneous transfer and recirculation pumps.

The pasteurization reactor operates at a temperature of 65°C and is batch-fed to maintain a retention time of at least one hour between sludge transfers. The volume of the tank provides approximately 18 to 24 hours retention time for pasteurization and conditioning of the sludge in advance of the anaerobic digestion process. The pasteurization process is followed by anaerobic mesophilic digestion, which meets the vector attraction reduction requirements (for details please see below).

The anaerobic mesophilic digestion system at the JAMES Plant meets the vector attraction reduction requirements according to Section 1(a) in OMRR Schedule 2.

The anaerobic mesophilic digestion system at the JAMES Plant includes three digesters, with a total volume of 11,460 m^3. Pasteurized and conditioned sludge from the pasteurized sludge holding tank is pumped to the largest anaerobic digester and then is passed to the remaining two digesters in series. The volatile solids reduction of the biosolids typically ranges between 60-70% and is higher than the required 38% under OMRR.

We trust the above provides the information you requested. Please contact me if you need any additional information or clarification.

Yours truly,

Rob Isaac, Eng.L.
Director, Project Management Office

c. John Paul, Transform Compost Systems Ltd.
Peter Sparanese, General Manager, Engineering and Regional Utilities
Tim Henry, Director, Utility Operations and Asset Management

SC/rb

ABBOTSFORD

Biosolids Sampling Data

		Sample Date: May 4, 2017	
Sample ID:	**Sample Location:**	**Sample Time:**	**Fecal Coliforms** (MPN/g, dry weight)**:**
A1	Large Tent	8:30AM	<8.70
A2	Large Tent	8:35AM	<9.09
A3	Large Tent	8:40AM	<8.70
B4	Large Tent	8:45AM	<8.70
B5	Large Tent	8:50AM	<8.70
B6	Large Tent	8:55AM	<9.09
C7	Large Tent	9:00AM	<8.70
C8	Large Tent	9:05AM	<8.33
C9	Large Tent	9:10AM	<8.33
D10	Large Tent	9:15AM	<8.70
D11	Large Tent	9:20AM	<8.33
D12	Large Tent	9:25AM	<8.33
E13	Large Tent	9:30 AM	<8.69
E14	Large Tent	9:35AM	152.17
E15	Large Tent	9:40AM	<8.69

NOTE: 1) Sample time was recorded in the field.
2) Fecal coliform results provided by CARO Analytical Services.

CERTIFICATE OF ANALYSIS

REPORTED TO	Abbotsford, City of - Utilities Environment 6011 Gladwin Road Abbotsford, BC V4X 1V9	**TEL** **FAX**	(604) 557-1452 (604) 557-1457
ATTENTION	Sharon Subido	**WORK ORDER**	7050535
PO NUMBER	PO 170554	**RECEIVED / TEMP**	2017-05-04 11:30 / NA
PROJECT	#13 - Biosolids QC	**REPORTED**	2017-05-11
PROJECT INFO		**COC NUMBER**	UE-P13-02

General Comments:

CARO Analytical Services employs methods which are conducted according to procedures accepted by appropriate regulatory agencies, and/or are conducted in accordance with recognized professional standards using accepted testing methodologies and quality control efforts, except where otherwise agreed to by the client.

The results in this report apply to the samples analyzed in accordance with the Chain of Custody or Sample Requisition document. This analytical report must be reproduced in its entirety. CARO is not responsible for any loss or damage resulting directly or indirectly from error or omission in the conduct of testing. Liability is limited to the cost of analysis. Samples will be disposed of 30 days after the test report has been issued unless otherwise agreed to in writing.

Authorized By: **Jeffery Lopes, B.Sc.**
Account Manager

If you have any questions or concerns, please contact me at jlopes@caro.ca

Locations:

#110 4011 Viking Way
Richmond, BC V6V 2K9
Tel: 604-279-1499

#102 3677 Highway 97N
Kelowna, BC V1X 5C3
Tel: 250-765-9646

17225 109 Avenue
Edmonton, AB T5S 1H7
Tel: 780-489-9100

www.caro.ca

ANALYSIS INFORMATION

REPORTED TO	Abbotsford, City of - Utilities Environment	**WORK ORDER**	7050535
PROJECT	#13 - Biosolids QC	**REPORTED**	2017-05-11

Analysis Description	Method Reference	Technique	Location
Coliforms, Fecal (MPN) in Solid	MFHPB-19	Most Probable Number	Sublet
Moisture in Solid	ASTM D2216-10	Gravimetry (Dried at 105C)	Sublet

Method Reference Descriptions:

ASTM	ASTM International Test Methods
MFHPB	HPB Methods for the Microbiological Analysis of Foods, Health Canada

Glossary of Terms:

MRL	Method Reporting Limit
<	Less than the Reported Detection Limit (RDL) - the RDL may be higher than the MRL due to various factors such as dilutions, limited sample volume, high moisture, or interferences
% wet	Percent (wet weight)

Standards / Guidelines Referenced in this Report:

Organic Matter Recycling Regulation -Schedule 4 (2002)
Website: http://www.bclaws.ca/EPLibraries/bclaws_new/document/ID/freeside/18_2002

Note: In some cases, the values displayed on the report represent the lowest guideline and are to be verified by the end user

SAMPLE ANALYTICAL DATA

REPORTED TO Abbotsford, City of - Utilities Environment
PROJECT #13 - Biosolids QC

WORK ORDER 7050535
REPORTED 2017-05-11

Analyte	Result / *Recovery*	Standard / Guideline	MRL / *Limits*	Units	Prepared	Analyzed	Notes
Sample ID: A1 Large Tent (7050535-01) [Biosolids] Sampled: 2017-05-04 08:30							
General Parameters							
Moisture	**77.41**	N/A	0.1	% wet		2017-05-06	
Microbiological Parameters							
Coliforms, Fecal	<8.70	N/A	2	MPN/g dry		2017-05-06	
Sample ID: A2 Large Tent (7050535-02) [Biosolids] Sampled: 2017-05-04 08:35							
General Parameters							
Moisture	**77.78**	N/A	0.1	% wet		2017-05-06	
Microbiological Parameters							
Coliforms, Fecal	<9.09	N/A	2	MPN/g dry		2017-05-06	
Sample ID: A3 Large Tent (7050535-03) [Biosolids] Sampled: 2017-05-04 08:40							
General Parameters							
Moisture	**76.92**	N/A	0.1	% wet		2017-05-06	
Microbiological Parameters							
Coliforms, Fecal	<8.70	N/A	2	MPN/g dry		2017-05-06	
Sample ID: B4 Large Tent (7050535-04) [Biosolids] Sampled: 2017-05-04 08:45							
General Parameters							
Moisture	**77.06**	N/A	0.1	% wet		2017-05-06	
Microbiological Parameters							
Coliforms, Fecal	<8.70	N/A	2	MPN/g dry		2017-05-06	
Sample ID: B5 Large Tent (7050535-05) [Biosolids] Sampled: 2017-05-04 08:50							
General Parameters							
Moisture	**77.24**	N/A	0.1	% wet		2017-05-06	
Microbiological Parameters							
Coliforms, Fecal	<8.70	N/A	2	MPN/g dry		2017-05-06	
Sample ID: B6 Large Tent (7050535-06) [Biosolids] Sampled: 2017-05-04 08:55							
General Parameters							
Moisture	**77.65**	N/A	0.1	% wet		2017-05-06	
Microbiological Parameters							
Coliforms, Fecal	<9.09	N/A	2	MPN/g dry		2017-05-06	
Sample ID: C7 Large Tent (7050535-07) [Biosolids] Sampled: 2017-05-04 09:00							
General Parameters							
Moisture	**77.32**	N/A	0.1	% wet		2017-05-06	

REPORTED TO	Abbotsford, City of - Utilities Environment	**WORK ORDER**	7050535
PROJECT	#13 - Biosolids QC	**REPORTED**	2017-05-11

Analyte	Result / *Recovery*	Standard / Guideline	MRL / *Limits*	Units	Prepared	Analyzed	Notes
Sample ID: C7 Large Tent (7050535-07) [Biosolids] Sampled: 2017-05-04 09:00, Continued							
Microbiological Parameters							
Coliforms, Fecal	<8.70	N/A	2	MPN/g dry		2017-05-06	
Sample ID: C8 Large Tent (7050535-08) [Biosolids] Sampled: 2017-05-04 09:05							
General Parameters							
Moisture	**75.91**	N/A	0.1	% wet		2017-05-06	
Microbiological Parameters							
Coliforms, Fecal	<8.33	N/A	2	MPN/g dry		2017-05-06	
Sample ID: C9 Large Tent (7050535-09) [Biosolids] Sampled: 2017-05-04 09:10							
General Parameters							
Moisture	**76.21**	N/A	0.1	% wet		2017-05-06	
Microbiological Parameters							
Coliforms, Fecal	<8.33	N/A	2	MPN/g dry		2017-05-06	
Sample ID: D10 Large Tent (7050535-10) [Biosolids] Sampled: 2017-05-04 09:15							
General Parameters							
Moisture	**77.01**	N/A	0.1	% wet		2017-05-06	
Microbiological Parameters							
Coliforms, Fecal	<8.70	N/A	2	MPN/g dry		2017-05-06	
Sample ID: D11 Large Tent (7050535-11) [Biosolids] Sampled: 2017-05-04 09:20							
General Parameters							
Moisture	**76.22**	N/A	0.1	% wet		2017-05-06	
Microbiological Parameters							
Coliforms, Fecal	<8.33	N/A	2	MPN/g dry		2017-05-06	
Sample ID: D12 Large Tent (7050535-12) [Biosolids] Sampled: 2017-05-04 09:25							
General Parameters							
Moisture	**76.15**	N/A	0.1	% wet		2017-05-06	
Microbiological Parameters							
Coliforms, Fecal	<8.33	N/A	2	MPN/g dry		2017-05-06	
Sample ID: E13 Large Tent (7050535-13) [Biosolids] Sampled: 2017-05-04 09:30							
General Parameters							
Moisture	**77.29**	N/A	0.1	% wet		2017-05-06	
Microbiological Parameters							
Coliforms, Fecal	<8.69	N/A	2	MPN/g dry		2017-05-06	

SAMPLE ANALYTICAL DATA

REPORTED TO	Abbotsford, City of - Utilities Environment	**WORK ORDER**	7050535
PROJECT	#13 - Biosolids QC	**REPORTED**	2017-05-11

Analyte	Result / *Recovery*	Standard / Guideline	MRL / *Limits*	Units	Prepared	Analyzed	Notes
Sample ID: E14 Large Tent (7050535-14) [Biosolids] Sampled: 2017-05-04 09:35							
General Parameters							
Moisture	**77.59**	N/A	0.1	% wet		2017-05-06	
Microbiological Parameters							
Coliforms, Fecal	**152.17**	N/A	2	MPN/g dry		2017-05-06	
Sample ID: E15 Large Tent (7050535-15) [Biosolids] Sampled: 2017-05-04 09:40							
General Parameters							
Moisture	**77.08**	N/A	0.1	% wet		2017-05-06	
Microbiological Parameters							
Coliforms, Fecal	<8.69	N/A	2	MPN/g dry		2017-05-06	

Client Information	Project Information	Laboratory Information	COC Information
Abbotsford, City of - Utilities Environment 6011 Gladwin Road Abbotsford BC V4X 1V9 Phone: (604) 557-1452 Fax: (604) 557-1457	#13 - Biosolids QC Number: [none] Sample count: 15 TAT: 5	CARO Analytical Services #110 - 4011 Viking Way Richmond BC V6V 2K9 Phone: (604) 279-1499 Fax: (604) 279-1599	Number: UE-P13-02 Shipped via: IG Micromed

#1	A1 Large Tent (Template: 28) 05/04/2017 08:30 - 05/11/2017 08:30 Composite / Solid	**Analyses** !AUE Project #13 Grab PKG (SUB) TAT: 5 Coliforms, Fecal in Solids (SUB) TAT: 5 Coliforms, Total & Fecal in Solids (KEL) TAT: 5	**Containers** C01_125 mL Glass (General Soil) (1)
#2	A2 Large Tent (Template: 28) 05/04/2017 08:35 - 05/11/2017 08:35 Composite / Solid	**Analyses** !AUE Project #13 Grab PKG (SUB) TAT: 5 Coliforms, Fecal in Solids (SUB) TAT: 5 Coliforms, Total & Fecal in Solids (KEL) TAT: 5	**Containers** C01_125 mL Glass (General Soil) (1)
#3	A3 Large Tent (Template: 28) 05/04/2017 08:40 - 05/11/2017 08:40 Composite / Solid	**Analyses** !AUE Project #13 Grab PKG (SUB) TAT: 5 Coliforms, Fecal in Solids (SUB) TAT: 5 Coliforms, Total & Fecal in Solids (KEL) TAT: 5	**Containers** C01_125 mL Glass (General Soil) (1)
#4	B4 Large Tent (Template: 28) 05/04/2017 08:45 - 05/11/2017 08:45 Composite / Solid	**Analyses** !AUE Project #13 Grab PKG (SUB) TAT: 5 Coliforms, Fecal in Solids (SUB) TAT: 5 Coliforms, Total & Fecal in Solids (KEL) TAT: 5	**Containers** C01_125 mL Glass (General Soil) (1)
#5	B5 Large Tent (Template: 28) 05/04/2017 08:50 - 05/11/2017 08:50 Composite / Solid	**Analyses** !AUE Project #13 Grab PKG (SUB) TAT: 5 Coliforms, Fecal in Solids (SUB) TAT: 5 Coliforms, Total & Fecal in Solids (KEL) TAT: 5	**Containers** C01_125 mL Glass (General Soil) (1)
#6	B6 Large Tent (Template: 28) 05/04/2017 08:55 - 05/11/2017 08:55 Composite / Solid	**Analyses** !AUE Project #13 Grab PKG (SUB) TAT: 5 Coliforms, Fecal in Solids (SUB) TAT: 5 Coliforms, Total & Fecal in Solids (KEL) TAT: 5	**Containers** C01_125 mL Glass (General Soil) (1)
#7	C7 Large Tent (Template: 28) 05/04/2017 09:00 - 05/11/2017 09:00 Composite / Solid	**Analyses** !AUE Project #13 Grab PKG (SUB) TAT: 5 Coliforms, Fecal in Solids (SUB) TAT: 5 Coliforms, Total & Fecal in Solids (KEL) TAT: 5	**Containers** C01_125 mL Glass (General Soil) (1)
#8	C8 Large Tent (Template: 28) 05/04/2017 09:05 - 05/11/2017 09:05 Composite / Solid	**Analyses** !AUE Project #13 Grab PKG (SUB) TAT: 5 Coliforms, Fecal in Solids (SUB) TAT: 5 Coliforms, Total & Fecal in Solids (KEL) TAT: 5	**Containers** C01_125 mL Glass (General Soil) (1)
#9	C9 Large Tent (Template: 28) 05/04/2017 09:10 - 05/11/2017 09:10 Composite / Solid	**Analyses** !AUE Project #13 Grab PKG (SUB) TAT: 5 Coliforms, Fecal in Solids (SUB) TAT: 5 Coliforms, Total & Fecal in Solids (KEL) TAT: 5	**Containers** C01_125 mL Glass (General Soil) (1)
#10	D10 Large Tent (Template: 28) 05/04/2017 09:15 - 05/11/2017 09:15 Composite / Solid	**Analyses** !AUE Project #13 Grab PKG (SUB) TAT: 5 Coliforms, Fecal in Solids (SUB) TAT: 5 Coliforms, Total & Fecal in Solids (KEL) TAT: 5	**Containers** C01_125 mL Glass (General Soil) (1)
#11	D11 Large Tent (Template: 28) 05/04/2017 09:20 - 05/11/2017 09:20 Composite / Solid	**Analyses** !AUE Project #13 Grab PKG (SUB) TAT: 5 Coliforms, Fecal in Solids (SUB) TAT: 5 Coliforms, Total & Fecal in Solids (KEL) TAT: 5	**Containers** C01_125 mL Glass (General Soil) (1)
#12	D12 Large Tent (Template: 28) 05/04/2017 09:25 - 05/11/2017 09:25 Composite / Solid	**Analyses** !AUE Project #13 Grab PKG (SUB) TAT: 5 Coliforms, Fecal in Solids (SUB) TAT: 5 Coliforms, Total & Fecal in Solids (KEL) TAT: 5	**Containers** C01_125 mL Glass (General Soil) (1)
#13	E13 Large Tent (Template: 28) 05/04/2017 09:30 - 05/11/2017 09:30 Composite / Solid	**Analyses** !AUE Project #13 Grab PKG (SUB) TAT: 5 Coliforms, Fecal in Solids (SUB) TAT: 5 Coliforms, Total & Fecal in Solids (KEL) TAT: 5	**Containers** C01_125 mL Glass (General Soil) (1)
#14	E14 Large Tent (Template: 28)	**Analyses**	

	05/04/2017 09:35 - 05/11/2017 09:35 Composite / Solid	!AUE Project #13 Grab PKG (SUB) TAT: 5 Coliforms, Fecal in Solids (SUB) TAT: 5 Coliforms, Total & Fecal in Solids (KEL) TAT: 5	C01_125 mL Glass (General Soil) (1)
#15	E15 Large Tent (Template: 28) 05/04/2017 09:40 - 05/11/2017 09:40 Composite / Solid	**Analyses** !AUE Project #13 Grab PKG (SUB) TAT: 5 Coliforms, Fecal in Solids (SUB) TAT: 5 Coliforms, Total & Fecal in Solids (KEL) TAT: 5	**Containers** C01_125 mL Glass (General Soil) (1)

Relinquished by	Date/Time	Accepted by	Date/Time

Appendix F

% Volatile Solids Reduction - JAMES PLANT- 2017

Month	% V.S Red'n
Jan	58
Feb	64
Mar	56
Apr	61
May	58
Jun	67
Jul	69
Aug	66
Sep	64
Oct	70
Nov	64
Dec	67
Annual	**64**

Monthly average from weekly testing

OMRR Limit -38%

Volatile Solids Reduction Calculation:

$$\% \text{ Red'n} = \frac{(\text{In} - \text{Out})}{\text{In} - (\text{In} \times \text{Out})} \times 100$$

Where:

In = Volatile solids for raw, decimal format.

Out = Volatile solids of last Dig in series, decimal format.

JAMES WWTP BIOSOLIDS QUALITY DATA (2017)

Parameter concentrations are expressed on dry weight basis unless otherwise stated.
All data obtained from the analysis of a monthly composite sample.

Sampling Date:	-															
Parameters (Dried Basis)	**Units**	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**	**OCT**	**NOV**	**DEC**	**MAX**	**AVG**	**OMRR***
Total Nitrogen	%	6.99	8.14	9.04	7.19	8.65	8.1	7.74	8.13	5.74	5.36	6.71	10.5	10.50	7.69	-
Total Phosphorus (as P)	%	1.10	1.02	1.14	1.02	1.15	1.23	1.07	1.14	1.33	1.01	1.02	1.09	1.33	1.11	-
Total Potassium	%	0.071	0.11	0.11	0.103	0.0669	0.077	0.0727	0.0755	0.0632	0.0563	0.071	0.0628	0.11	0.08	-
Total Sulphur	%	0.58	0.74	0.79	0.96	0.517	0.682	0.768	0.83	0.868	0.60	0.69	0.603	0.96	0.72	-
Total Carbon	%	33.6	41.7	40.9	41.5	41.3	40.3	40.5	40.9	40	40.5	42.0	43.2	43.2	40.5	-
Organic Matter	%	80.3	79.6	79.7	80.1	80	79.2	79.5	78.9	76.8	77.9	78.3	78.9	80.3	79.1	-
Moisture	%	75.7	74.9	75.6	75.2	76.6	76.9	76.4	76.7	76.1	72.4	76.6	76.5	76.9	75.8	-
Ammonia- N (available)	mg/kg	7810	8100	8460	8390	7530	7480	8400	8750	7370	5920	6220	6600	8750	7586	-
Nitrate - N (available)	mg/kg	5.4	4.4	5.25	5.85	2.65	3.52	7.77	3.43	3.72	15.6	3.05	4.52	15.6	5.43	-
pH	pH units	6.5	6.7	5.6	6.6	6.3	5.8	6	6.46	6.43	6.75	6.71	6.77	6.77	6.4	-
EC - Conductivity	dS/m	2.73	3.39	2.58	2.94	3.83	3.66	2.58	3.73	5.83	3.25	4.09	4.12	5.83	3.56	-
C/N Ratio	-	4.8	5.1	4.5	5.8	4.8	5.0	5.2	5.0	7.0	7.6	6.26	4.1	7.6	5.4	-
Arsenic	ug/g	2	2.8	N/A	2.95	2.25	2.87	2.83	2.84	3.5	2.88	3.1	2.51	3.5	2.8	75
Cadmium	ug/g	0.86	1.5	N/A	1.49	1.24	1.44	1.63	1.53	1.76	1.23	1.59	1.29	1.76	1.41	20
Chromium	ug/g	18	24	N/A	28.1	20.4	25.4	35.6	60.1	37.4	29.4	32.1	22	60.1	30.2	1060
Cobalt	ug/g	1.6	2.5	N/A	2.57	1.99	2.27	2.2	2.69	3.27	2.21	2.14	1.85	3.27	2.30	150
Copper	ug/g	360	520	N/A	483	438	568	600	655	636	531	561	453	655	528	2200
Lead	ug/g	13	20	N/A	20.8	17.2	20.3	21.4	20.7	22.8	17.3	22.9	17.7	22.9	19.5	500
Mercury	ug/g	1.3	1.5	N/A	1.98	1.67	1.73	3.22	1.78	2.08	1.52	2.2	2.39	3.22	1.95	5
Molybdenum	ug/g	3.9	6.4	N/A	6.34	5.91	6.94	6.05	6.77	7.82	6.21	6.76	5.14	7.82	6.20	20
Nickel	ug/g	11	15	N/A	17.8	13.9	18.1	31.4	41.8	32.9	27.1	35.5	26.5	41.8	24.6	180
Selenium	ug/g	3	4.5	N/A	4.84	4.37	4.88	4.72	4.7	5.31	4.18	4.79	3.75	5.31	4.46	14
Zinc	ug/g	530	800	N/A	700	732	924	922	1050	983	887	874	707	1050	828	1850

3954 Hotsprings Rd, Agassiz, BC

Class A Biosolids Application Plan: 2018

April 16, 2018

MOE Authorization # 109232

Prepared by:

John Paul, PhD PAg
Transform Compost Systems Ltd
3911 Mt Lehman Rd
Abbotsford, BC V2T 5W5
Ph: 604-302-4367
Email: transform@telus.net

3954 Hotsprings Rd Class A Biosolids Application Plan 2018

Introduction

This Land Application Plan for the application of Class A biosolids provides the guidance and information required under British Columbia's Organic Matter Recycling Regulation (OMRR), a regulation enacted to ensure that biosolids are managed in a manner that protects human health and the environment.

Class A biosolids are considered a valuable source of both plant nutrients and organic matter. Class A biosolids are the highest quality biosolids achievable under the OMRR, particularly regarding fecal coliform counts (< 1,000 most probable number per gram), and trace element (metal) concentrations. The land application plan must be prepared by a qualified professional as defined in the OMRR.

Class A biosolids will be land applied in 2018 as a source of nutrients and organic matter for the soil on a 25 ha farm in Agassiz, BC that is growing forage for cattle. The total amount of Class A biosolids that will be land applied is up to 1200 wet tonnes. This Land Application Plan (LAP) provides guidance in the beneficial reuse of a portion of the Class A biosolids from the JAMES Treatment Plant, a wastewater treatment facility that processes wastewater from the communities of Abbotsford and Mission. (http://www.abbotsford.ca/city_services/wastewater/biosolids_management.htm#JAMES).

This land application plan utilizes the biosolids quality data for 2017, provided by the City of Abbotsford. The Class A biosolids used for this land application was generated by the JAMES wastewater treatment plant in 2017.

The Land Application Plan follows the Notification dated December 27, 2017 (Appendix A).

Qualifications of the Qualified Professional

The professional agrologist preparing this report has extensive training and experience with soil, waste and agricultural land in particular. John Paul, PhD is a registered professional agrologist, who obtained his MSc and PhD in soil biochemistry from the University of Guelph in 1991. He has acted as a professional agrologist for many sites requiring soil deposit and removal reports, nutrient management and waste management plans. He has extensive experience with the various Acts and Regulations regarding agricultural land use and agricultural and industrial wastes.

Land Application Objectives

The specific objectives of this land application plan are to ensure that the Class A biosolids are stored and applied in a manner that provides the greatest benefit for the crop grown on this property, while minimizing risk of environmental pollution. The plan will consider the specific

crops that are growing on this property, as well as any other nutrient input that is used for growing crops or improving the soil.

Site Characteristics

Location

The Land Application Plan is for Class A biosolids application on a farm located at 3954 Hotsprings Rd., Agassiz, BC. The legal description is Lot A, Section 1, Range 29, Meridian 6, Plan Number NWP100707, District 36, Township 4.

This farm is located approximately 250 m from the southern (nearest) side of the Village of Harrison Hotsprings BC.

Figure 1. Aerial view of site relative to the community of Harrison Hotsprings, BC (Google Earth) Distances to areas of interest can be obtained by using Google Earth).

The location is zoned agricultural and is within the Agricultural Land Reserve. The property is surrounded by agricultural lands in forage production to the north, south and east, and a golf course across the road to the west.

The coordinates of the site are

Longitude: 121° 46’ 50” W

Latitude: 49° 16’ 34” N

Figure 2. Aerial photograph of the property where the Class A biosolids will be applied (Google Earth, July 28, 2017)

Climate

Agassiz has a wet but moderate to mild climate in the wintertime with dry summers. The annual mean total rainfall is 1440 mm, with an average of 230 mm in January, and 60 mm in July. The annual mean total snowfall is 940 mm. The annual mean daily temperature in July is 23°C, and in January is 2.5 °C. The wind direction is generally from the southeast to the northwest. Source of weather information: http://www.climate-charts.com/Locations/c/CN71113011001200.php

Soil Properties

The soil at this farm is described as a Monroe Silt Loam (Kelly and Spilsbury 1939), which is a very common soil type along the lower Fraser River. Typically these soils have 30 to 40 cm of a

fine textured soil overlying coarse sands. In this field, the depth of topsoil is approximately 20 cm, with a minimum of very fine textured soil below it.

Six soil samples were taken from the field in March 2018. The location of the soil samples are identified in Appendix B. The complete soil analysis information is found in Appendix C.

Figure 3. Soil profile showing > 15 cm of loam topsoil overlying a heavy textured subsoil.

The soil organic matter content averaged 6.3 % in the top 15 cm, with addition topsoil visible to approximately 20 cm depth. The soil has a near neutral pH of 6.2 (Figure 4), a base saturation of 49%, mostly from calcium (41%), magnesium (6.7%), and potassium (1.3%).

The soil organic matter content and the soil phosphorus concentrations have increased slightly from 2015 to 2018. Potassium concentrations have decreased slightly.

	Soil Characteristics				
			2015	2017	2018
Organic matter		%	5.8	6.3	6.3
Total Nitrogen		%			0.3
pH			6.1	5.9	6.2
EC		dS/m	0.1	0.1	0.1
Nitrate		mg/L	5.6	3.7	4.8
Phosphorus		mg/L	45	37	60
Potassium		mg/L	125	161	65
Base Saturation		%	44	35	49
	Calcium	%	36.1	28.9	40.7
	Magnesium	%	6.6	3.9	6.7
	Potassium	%	1.6	2.6	1.3
	Sodium	%	<1	<1	<1.6

Figure 4. Soil characteristics from March 2018, with data from 2015, 2017 and 2018 for comparison

Slope and Topography

The topography of the field is almost level with a few slight undulations.

Depth to Groundwater Table

The elevation of the property is approximately 15 m above sea level, and approximately 1-2 m above the level of the Fraser River, depending on the time of year. The depth to groundwater fluctuates with the water level in the Fraser River and is generally within 1-2 m of the surface.

Figure 5. View of the property looking northward from the farmyard at 3954 Hotsprings Rd (March 20, 2017 photo).

Soil Nutrients

Most of the six individual soil samples showed that the soil was marginal in available nitrogen, which is normal for soil sampled in the early spring in the Fraser Valley. Available potassium, phosphorus and sulphur ranged from marginal to optimum. This is characteristic of soils in the Fraser Valley that have a history of manure application.

Soil Metals

A total of six individual soil samples were obtained from 0-15 cm depth in the field on the property. The complete laboratory soil analysis data is found in Appendix C.

Soil Trace Element Concentrations (mg/kg)				
	2015	2017	2018	change
Arsenic	5.81	5.50	6.77	0.96
Cadmium	0.21	0.40	0.38	0.17
Chromium	55.2	56.0	84.5	29.3
Cobalt	13.65	13.30	15.33	1.68
Copper	26.5	32.1	37.3	10.8
Lead	7.43	7.19	6.83	-0.60
Mercury	0.048	0.043	0.067	0.018
Molybdenum	0.59	0.74	0.53	-0.06
Nickel	43.4	42.8	41.3	-2.09
Selenium	0.50	0.63	0.50	0.00
Zinc	79.8	92.0	88.3	8.5

Figure 6. Soil trace element concentrations in the 0-15 cm depth in the soil on the farm.

All of the trace element concentrations are below the limits for agricultural soil as documented in the OMRR (OMRR Schedules 9 and 10, limits used for livestock ingesting soil and fodder are used where applicable), with the exception of chromium. The limits as per OMRR represent the most conservative of all uses on either agricultural or residential soils.

It will be important to track the soil chromium concentrations. All of the soil analyses of the various land application sites in 2018 showed significantly increased chromium concentrations, despite either no, or very little application of biosolids. In addition, as will be demonstrated later in the land application plan, there is very little chromium added with the biosolids application. The elevated chromium concentrations appear to be characteristic of the Fraser River sediments, and are significantly higher for the 2018 samples than soil samples taken in previous years.

Biosolids Source and Characteristics

The Class A biosolids are produced at the JAMES Treatment Plant, a wastewater treatment plant that processes wastewater from the communities of Abbotsford and Mission.

JAMES Wastewater Treatment Plant, 5959 Gladwin Rd, Abbotsford B.C. V4X 1V9

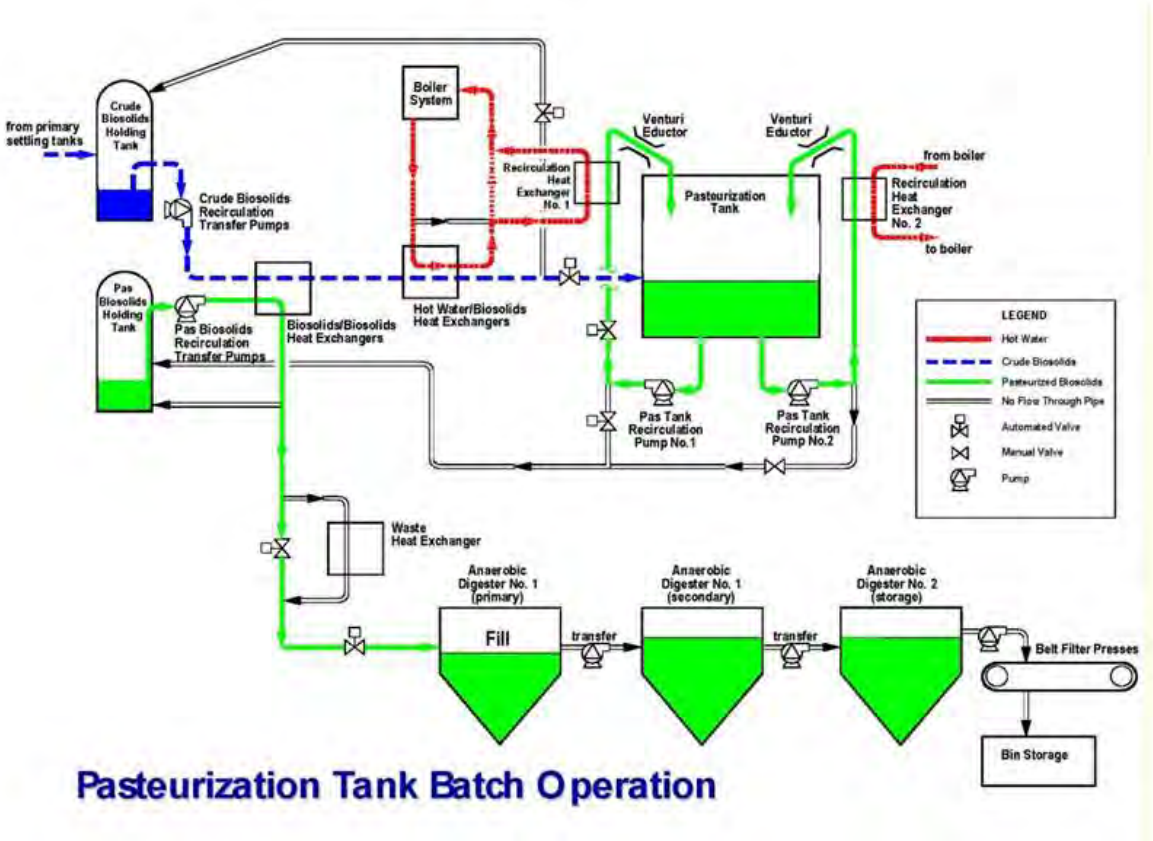


Figure 7. Biosolids processing flowsheet at the James Wastewater Treatment Plant
(http://www.abbotsford.ca/Assets/2014+Abbotsford/Engineering/Wastewater/Biosolids+Flow+Chart.pdf)

Pathogen Reduction Processes and Limits

The pathogen reduction process conforms with Schedule 1, Section 2 (f) of the Organic Matter Recycling Regulation, where it states:

"2. One of the following pathogen reduction methods is required for Class A biosolids or biosolids to produce biosolids growing medium: (f) the heat treatment of the biosolids must be 50 C or higher, and the time period must be 30 minutes or longer"

The process used at the JAMES Wastewater Treatment Plant is as follows (Appendix D). *"The pasteurization reactor operates at a temperature of 65 C and is batch-fed to maintain a*

retention time of at least one hour between sludge transfers. The volume of the tank provides approximately 18-24 hours retention time for pasteurization and conditioning of the sludge in advance of the anaerobic digestion process."

Analyses of fecal coliforms are conducted by the City of Abbotsford on the biosolids before it is released from the wastewater plant. Fecal coliform in the biosolids is provided (Appendix E). Biocentral as well as the professional agrologist reserves the right to conduct any of its own testing of the biosolids to ensure that meets Class A requirements.

The average moisture content of the biosolids measured at time of discharge was 75.8% in 2017 (Figure 8) and 76.7% in the batch that was shipped to this property (Appendix E). The moisture content at time of field application may change somewhat, either from the biosolids taking on more moisture, or from biosolids drying during storage.

Vector Attraction Reduction Processes and Limits

The vector attraction reduction process conforms with Schedule 2, Section 1 (a) of the Organic Matter Recycling Regulation, where it states:

"1. One of the following vector attraction reduction processes is required for Class A biosolids or Class B biosolids used to produce biosolids growing medium: (a) a digestion process (aerobic or anaerobic) resulting in the mass of volatile solids being reduced by more than 38 percent"

The process used at the JAMES Wastewater Treatment Plant is as follows (Appendix D). *"The anaerobic mesophilic digestion system at the JAMES Plant includes three digesters, with a total volume of 11,460 m3. Pasteurized and conditioned sludge from the pasteurized sludge holding tank is pump to the largest anaerobic digester and then is passed to the remaining two digesters in series."*

The volatile solids reduction results from the JAMES plant averaged 64% in 2017 (Appendix F).

Trace Elements and Nutrients

The general characteristics of the biosolids are noted in Figure 8. The biosolids are an excellent source of organic matter, as well as nitrogen and phosphorus, whereas the potassium concentration is low. Trace element concentrations meet OMRR Class A limits (Figure 9).

Characteristics of the Class A Biosolids		
Characteristic	**Unit**	**Value**
Moisture Content	%	75.8
Organic Matter	%	79.1
pH		6.4
EC	dS/m	3.56
C/N Ratio		5.4
Nitrogen (total)	%	7.69
Ammonium	mg/kg	7586
Phosphorus	%	1.11
Potassium	%	0.08
Sulphur	%	0.72

Figure 8. Characteristics of the Class A biosolids (2017 data)

Schedule 4 of the Organic Matter Recycling Regulation (OMRR) provides the guidance for the trace elements in the biosolids. Figure 9 shows the trace elements in the biosolids (including both the maximum and average concentrations monthly in 2017 analysis (Appendix G), compared with the standards (OMRR, and Trade Memorandum T-4-93). For the land application calculations, we have used the average concentration for 2017.

Trace Element Concentrations in the Class A Biosolids				
Element	Biosolids		Class A (OMRR)	Canada
	Max 2017	Avg 2017		T-4-93
	(mg/kg)		(mg/kg)	(mg/kg)
Arsenic	3.5	2.8	75	75
Cadmium	1.76	1.41	20	20
Chromium	60.1	30.2	1060	*not included*
Cobalt	3.27	2.3	150	150
Copper	655	528	2200	*not included*
Lead	22.9	19.5	500	500
Mercury	3.22	1.95	5	5
Molybdenum	7.82	6.2	20	20
Nickel	41.8	24.6	180	180
Selenium	5.31	4.46	14	14
Zinc	1050	828	1850	1850

Figure 9. Trace element concentrations in the Class A biosolids from the JAMES Wastewater Treatment Plant (maximums and averages for 2017. The limits for Class A biosolids (OMRR requirement) and the Canadian standards are also shown.

Figure 8 shows additional characteristics of the biosolids that are used for the land application plan, including and especially the nitrogen, phosphorus and potassium concentrations, which are important when considering the fertilizer value of the biosolids.

Foreign Matter

The Class A biosolids are free of foreign matter. Foreign matter is screened when the wastewater enters the treatment plant. According to Schedule 4 of the OMRR, Class A biosolids may not contain foreign matter greater than 1% dry weight and no sharp foreign matter, such as glass or metal shards, in a size and shape that may cause injury.

Biosolids Storage

The biosolids will be stored in compliance with OMRR Part 4, Division 1, Part 17 - 19, where it states:

"17. (1). If managed organic matter, which is to be applied to land under a land application plan, is stored on a farm or at some other site, it must be stored

a. in a storage facility in accordance with the requirements of section 18, or

b. at a storage site in accordance with the requirements of section 19.

(2) Managed organic matter must only be stored on a farm if all of the managed organic matter is used on that farm.

18. A storage facility must

a. be of sufficient capacity to store all the managed organic matter to be used on the land application site for the period of time needed for its application as a fertilizer or soil conditioner,

b. be located at least 15 m from any watercourse and at 30 m from any source of water for domestic purposes, and

c. maintained in such a manner to prevent escape of the managed organic matter.

19. (1). Managed organic matter may only be stored at a storage site as follows:

a. for not more than 2 weeks if it is (i) used within 2 weeks, and (ii) stored in a manner that prevents the escape of managed organic matter:

b. for more than 2 weeks if it is (i) stored for no longer than 9 months, (ii) located at least 30 meters from any watercourse or any source of water used for domestic purposes, and (iii) stored in a manner that prevents the escape of managed organic matter.

2. Berms or other works must be constructed around the storage site if necessary to prevent the escape of managed organic matter. "

The Class A biosolids will be stored in a manner that prevents the escape of the managed organic matter.

The transport of the biosolids will be managed in such a way as to prevent any biosolids being deposited on any public roadways. Although odour is not expected to be a concern, the biosolids will covered with a layer of wood chips or compost if required.

Biosolids Application

Season of Application

The biosolids will be applied during the spring of 2018 to allow optimal uptake of plant available nutrients during the growing season. The total amount of biosolids to be applied during 2018 will be a maximum of 55 wet tonnes per hectare. A total of approximately 1200 tonnes of Class A biosolids will be applied at this location in 2018.

Figure 10. Aerial view of land application site, showing the location of the biosolids spreading area.

Buffers

A 3 m buffer will be maintained around the perimeter of the spreading area. A 10 m buffer will be maintained along the creek that runs through the property. There is no known active well on the property, and the nearest well is likely to be approximately 30 m from the field on the neighbouring property.

Figure 11. Photos showing stream running through property, with buffer areas on either side.

Crop Nutrient Uptake

The crops grown on this farm will be forage corn grown for cattle feed in 2018. The Class A biosolids will be land applied to optimize their value as a fertilizer and a soil conditioner.

The land application plan will be based on nitrogen for the forage corn. Phosphorus and potassium application will also be addressed.

Nitrogen Requirements

Table 12 of the "Land Application Guidelines for the Organic Matter Recycling Regulation and the Soil Amendment Code of Practice" (Ministry of the Environment 2008), provides the guidance for nitrogen requirements for forages on soils of varying fertility in various areas of the province.

Based on an average yield of 20 tonnes of dry matter per hectare of corn on a high (normal) fertility site, the nitrogen requirement is 260 kg ha^{-1} per year.

Nitrogen Based Application Rate						
Yield Expectation and Nitrogen Uptake	Total		Available	Available N		
20 tonnes dry matter/ha yield of corn[a]	260	kg N/ha				
Nitrogen Availability in Biosolids						
Ammonium in biosolids	7.6	kg/tonne	60%	4.56		
Total N in biosolids	76.9	kg/tonne				
Organic N in Biosolids	69.3	kg/tonne	30%	20.79		
				25.35	kg/tonne	available
Amount of dry biosolids	10.3	dry tonnes per hectare				
	46.6	tonnes per hectare wet application				
[a] from Table 12 of the Land Application Guide (Ministry of Environment 2008)						
from page 174 of Land Application Guide (Ministry of Environment 2008)						

Figure 12. Estimated contribution of nitrogen with the biosolids application.

The total nitrogen content of the biosolids averages 7.69 % or 76.9 kg per dry tonne (2017 JAMES Plant Biosolids Quality Data). The amount of nitrogen available in the year of application ranges from 20 to 40%. Using an average availability of 30%, each dry tonne of biosolids provides almost 25 kg of nitrogen per hectare. An application rate of 12 tonnes of dry biosolids per hectare then provides an estimated 300 kg N per hectare, which is approximately the nitrogen requirements of the crop. Our experience is that with biosolids, the nitrogen availability is less than 30%.

The biosolids will also be applied to this farm in subsequent years. The land application plan will be adjusted to allow for residual nitrogen availability from previous biosolids applications during the fall.

Phosphorus Requirements

Guidelines for the application of phosphorous are provided in Sections 10.4.1.2 and Section 13.4.3 of the "Land Application Guidelines for the Organic Matter Recycling Regulation and the Soil Amendment Code of Practice".

The phosphorus content of the Class A biosolids averages 1.11% P (Figure 8), or 2.54% P_2O_5. The application of 12 tonnes of Class A biosolids will provide approximately 305 kg P_2O_5 per hectare.

The soil analyses indicated that the phosphorus content of this farm was variable, with most areas containing adequate phosphorus. The soil phosphorus concentrations will continue to be monitored with subsequent biosolids applications.

Potassium

The total potassium in the biosolids were measured to be 0.08% (Figure 8), or 9.6 kg/ha. The plant available fraction of the potassium in biosolids is assumed to be 100% (Washington State Department of Ecology 2007)

Biosolids Application Rate

The application rate for the Class A biosolids is 55 wet tonnes per hectare, or 12 tonnes of dry matter per hectare based on an average moisture content of 78%. This application rate will provide an estimated 925 kg of total N per hectare. An estimated 30% of the total nitrogen is estimated to become available to the crop in the first year. Subsequent application rates of biosolids will be adjusted as required according to the amount of soluble N remaining in the soil in the fall.

Trace Metal Applications

The application rate of 55 tonnes (12 tonnes of dry matter) per hectare of Class A biosolids will provide the following amounts of trace elements as per Figure 13 below.

		Addition	**Post**	Limits
	Metals in Soil	**from Biosolids**	**Application**	OMRR[b]
	(mg/kg)[a]	(mg/kg)	(mg/kg)	(mg/kg)
Arsenic	6.77	0.017	6.78	15
Cadmium	0.38	0.009	0.39	9
Chromium	84.50	0.186	84.69	60
Cobalt	15.33	0.014	15.35	40
Copper	37.33	3.25	40.58	150
Lead	6.83	0.120	6.95	350
Mercury	0.07	0.012	0.08	0.6
Molybdenum	0.53	0.038	0.57	5
Nickel	41.33	0.151	41.48	100
Selenium	0.50	0.027	0.53	2
Zinc	88.33	5.10	93.43	200
[a] average of 6 samples				
[b] OMRR Schedules 9 and 10 using most conservative limits				
[c] plant uptake not included in calculation				

Figure 13. Effect of a 12 tonne DM application of Class A biosolids on trace elements in the soil.

As mentioned in a previous section, it will be important to track the soil chromium concentrations. All of the soil analyses of the various land application sites in 2018 showed significantly increased chromium concentrations, despite either no, or very little application of biosolids (i.e Figure 8). In addition, there is very little chromium added with the biosolids

application. The elevated chromium concentrations appear to be characteristic of the Fraser River sediments, and are significantly higher for the 2018 samples than soil samples taken in previous years.

Other Inputs to the Farm

There are no other inputs of organic matter to the land on this farm. Additional fertilizer nitrogen may be required depending on the availability of the nitrogen in the biosolids. Additional potassium may be required as well.

The post application soil sampling of the fields will determine the amount of soluble nitrogen remaining in the soil before the fall rains. Future land application plans for this property will also be adjusted for post harvest soil nutrient contents.

Post Application Monitoring of the Site

Crop yields will be estimated during the growing season to verify the amount of forage harvested from the property. Post application soil samples will be taken in the fall to estimate accumulation of trace elements as well as residual nitrate in the soil. This soil information will be used to determine additional Class A biosolids applications in subsequent years.

The post application report will also provide information on actual application rates, including moisture contents of the biosolids at the time of application.

Minimizing Potential for Adverse Environmental Impacts

There are two potential adverse environmental impacts from the land application:

1. Risk of the biosolids not meeting Class A requirements

   Each batch of biosolids produced at the JAMES Treatment Plant is tested for fecal coliform before release for land application, as per OMRR requirements. This means that the biosolids are stored for 1-4 months at the JAMES Treatment Plant in order for the biosolids to meet Class A requirements for fecal coliform. For this land application plan, the biosolids met Class A requirements in November before they were delivered to the site, and have been stored for five months.

2. Risk of over application of biosolids

   The risk of over application of Class A biosolids has limited potential negative environmental effect. In the Land Application Plans, the biosolids are applied on the basis of optimizing the nitrogen value of the biosolids. Although it is possible that a

higher rate of biosolids application may increase the potential for nitrogen leaching, the nitrogen in biosolids has limited availability. This must also be understood in the context of Class A biosolids growing medium, which can be applied without volume restrictions and is not applied on the basis of agronomic utilization of the nitrogen or phosphorous contained in the biosolids.

In summary, the potential adverse effects of land application of Class A biosolids are minimal, and are controlled by appropriate testing, storage and application.

Sampling and Analysis

Schedule 5 of OMRR requires that the Class A biosolids be analyzed at least every 1000 tonnes of dry weight of organic matter, or once per year. Schedule 5 also states that "All analysis must be in accordance with the procedures described in "British Columbia Laboratory Methods Manual: 2003 – for the Analysis of Water, Wastewater, Sediment, Biological Material and Discrete Ambient Air Samples""

The City of Abbotsford follows the requirements of Schedule 5 of OMRR: The following represents their sampling schedule:

JAMES Biosolids Testing Schedule (Biosolids prior to centrifugation)

Weekly Testing:

- *Total Metals (including total Mercury)*
- *Fecal Coliform (reported as MPN/g dry weight)*
- *Salmonella*

Monthly Testing:

- *Total Metals (including total Mercury)*
- *Total Phosphorus (%)*
- *Total Kjeldahl Nitrogen (%)*
- *Total Potassium (%)*
- *Total Sulphur (%)*
- *Total Carbon (%)*
- *Total Organic Matter (%)*
- *Moisture (%)*
- *Ammonia (available - %)*
- *Nitrate (available – mg/kg)*
- *pH*
- *Conductivity*
- *C/N Ratio*

JAMES Biosolids Testing Schedule (Biosolids after centrifugation - Stored)

Monthly Testing:

- *Fecal Coliform (reported as MPN/g dry weight)*

Additional testing (Fecal Coliform only) will be done on the biosolids after storage and before it is released to ensure that it meets Class A.

Biocentral will be taking random sampling to ensure that the biosolids meet Class A standards.

Record Keeping

The City of Abbotsford records temperatures and retention times for the production of Class A biosolids, as per Schedule 6 (1) of the OMRR. All records for the production of the Class A biosolids will be stored at the JAMES Wastewater Treatment Plant for a minimum of 36 months, as per Schedule 6 (2) and (3).

The Land Application Plan, and all associated information will be kept at the Land Application Site, and will also be stored at the offices of the Qualified Professional, as well as at Biocentral's offices.

Role of the Qualified Professional

The qualified professional will oversee the storage and land application of the biosolids, including site inspections of the actual land application. He may also request plant yield data, as well as direct post harvest soil sampling to determine the post sampling soil concentrations of nutrients and trace elements. The qualified professional reserves the right to request verification of the Class A status of the biosolids at any time.

Summary

This Land Application Plan provides a beneficial reuse of Class A biosolids, which are a valuable source of nitrogen, phosphorus, micronutrients and organic matter. The risk of environmental concern at this location is very low because of the quality of the Class A biosolids being applied and the proximity to water bodies and water sources.

Storage and transportation of the Class A biosolids is also not considered a concern because of the low fecal coliform count and the lack of significant odour in the biosolids.

This Land Application Plan was prepared by:

John Paul, PhD PAg

References

British Columbia Ministry of the Environment. 2008. Land Application Guidelines for the Organic Matter Recycling Regulation and the Soil Amendment Code of Practice, Best Management Practices. Document # 758-08, Sylvis Environmental.

Kelly, C.C and R.H. Spilsbury. 1939. Soil Survey of the Lower Fraser Valley. British Columbia Department of Agriculture. Publication 650, Technical Bulletin 20.

Oregon State University. 2007. Fertilizing with Biosolids. PNW 508-E, Revised June 2007 http://www.ecy.wa.gov/programs/swfa/biosolids/pdf/Fertilizing.pdf

BRITISH COLUMBIA Ministry of Environment

Appendix A

Notification of Land Application Form

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

Organic Matter Recycling Regulation

FORM REFERENCE CODE: EPD-OMR-04.1

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 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 of Environment 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 Branch PO Box 9377 Stn Prov Govt Victoria, BC V8W 9M1 **Email:** PermitAdministration.VictoriaEPD@gov.bc.ca	Ministry of Environment Environmental Protection Division Business Services Branch 3rd Floor, 2975 Jutland Road Victoria, BC V8T 5J9

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*				2
OR * Individual's Full Legal Name	Walter Dyck			3
Doing Business As *if applicable*				4
Incorporation Number *as registered with the BC Registrar of Companies (if applicable)*				5
***Contact Numbers** *e.g. (999) 999-9999*	Phone 604-795-7461	Mobile		6
***Email Address** *generic company email address*				7
***Legal Address** *as registered with BC Registrar of Companies*	Unit # / Street 7610 Prest Rd.			8
	City Chilliwack	Province BC	Postal Code V4Z 1C5	9

***Mailing Address** *if different from above*	☒ Same as Legal Address			10
	Unit # / Street			11
	City	Province	Postal Code	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*				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	Moreno			1
Contact's First Name	Andres			2
Contact's Title	Division Manager			3
Mailing Address	☐ Mailing ddress is the same as Section 2 above			4
	Unit # / Street 7357 Pioneer Ave			5
	City Agassiz	Province BC	Postal Code V0M 1A0	6
Contact Numbers *e.g. (999) 999-9999*	Phone 604-997-0515	Mobile 604-997-1630		7
Email Address	andresm@biocentral.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*	Transform Compost Systems Ltd			1
Doing Business As *if different than above*				2
Agent's Last Name	Paul			3
Agent's First Name	John			4
Agent's Title	PhD. PAg			5
Mailing Address	Unit # / Street 3911 Mt Lehman Rd			6
	City Abbotsford	Province BC	Postal Code V2T 5W5	7
Contact Numbers *e.g. (999) 999-9999*	Phone 604-853-2722	Mobile 604-302-4367		8
Email Address	transform@telus.net			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*	Walter Dyck	10
Date signed	Dec 22, 2017	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**	Fraser Valley Regional District		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 49.2761	Longitude (e.g., 116.8177) W 121.7827	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 A, Section 1, Range 29, Meridian 6, Plan Number NWP100707, District 36, Township 4		4
PID/PIN/Crown File No.	009-379-649		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)* 3954 Hotsprings Rd, Agassiz, BC.		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	Walter Dyck	5

Legal Land Owner Contact Numbers *e.g. (999) 999-9999*	Phone: 604-795-7461	Mobile:	6
Legal Land Owner Email Address	N/a		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**	108806		12
***Description of the managed organic matter to be applied**	Class A biosolids		13

***Intended date(s) for land application for that year**	2018-03 to 2018-05 (yyyy-mm-dd)		14
***Application rates**	12 dt/hectare		15
	dt/hectare		16
	dt/hectare		17
***Cumulative additions for that year of substances listed in Schedule 4 of the Organic Matter Recycling Regulation**	**Substance**	**Concentration (µg/g dry weight)**	18
	Arsenic	0.02	
	Cadmium	0.009	
	Chromium	0.173	
	Cobalt	0.013	
	Copper	3.37	
	Lead	0.125	
	Mercury	0.011	
	Molybdenum	0.051	
	Nickel	0.102	
	Selenium	0.027	
	Zinc	5.32	
***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.

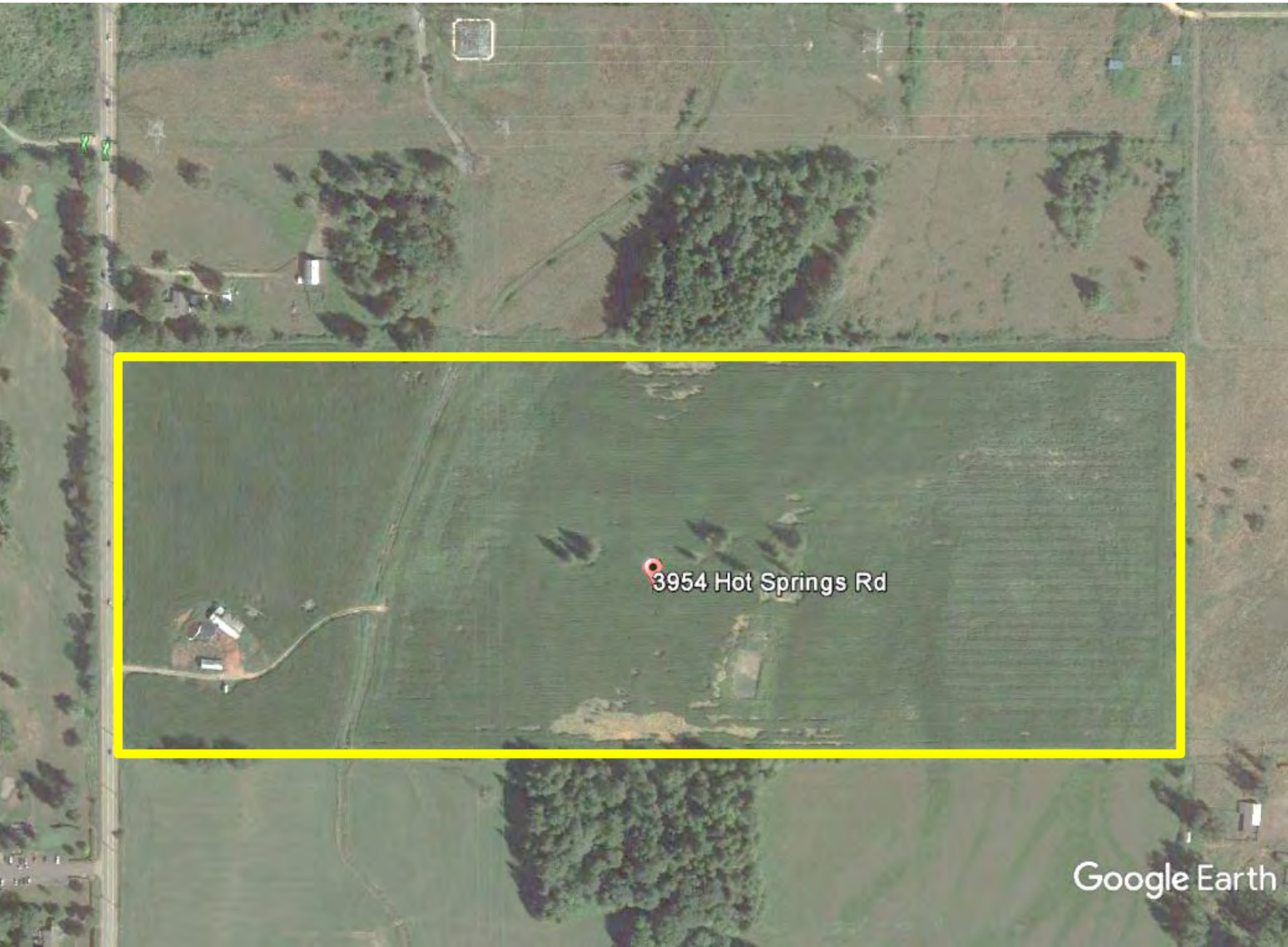
2. In consideration of the Province receiving this registration form, subject to paragraph 3, the Registrant hereby irrevocably authorizes the Province to publish on the Ministry of Environment website the entirety of any Regulatory Document.

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.

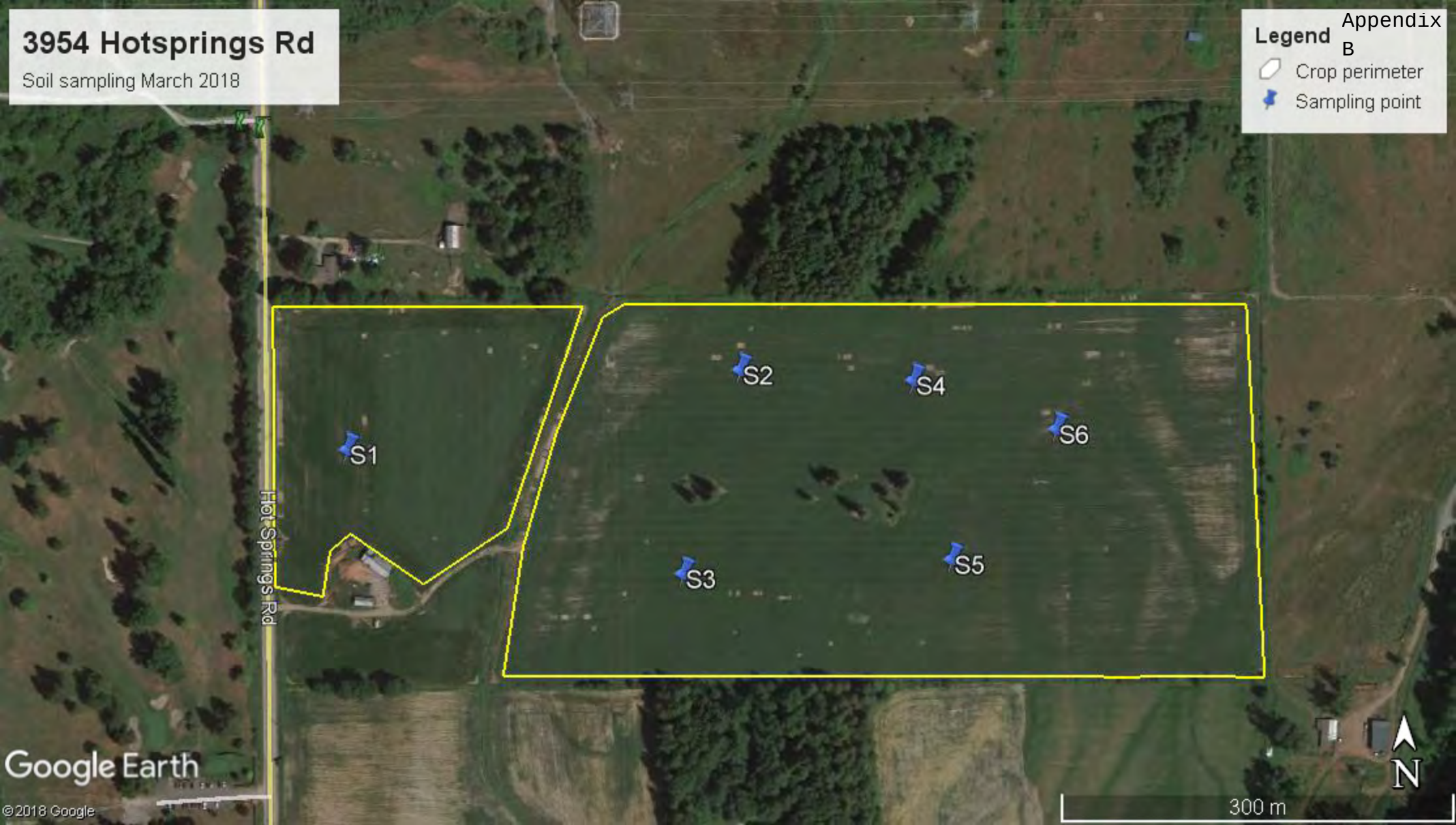
4. In consideration of the Province receiving this application, the Registrant agrees that it will indemnify and save harmless the Province and the Province's employees and agents from any claim for infringement of copyright or other intellectual property rights that the Province or any of the Province's 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
John Paul		Dec 27, 2017


3954 Hot Springs Rd
Google Earth

Appendix B


3954 Hotsprings Rd
Soil sampling March 2018
Legend
Crop perimeter
Sampling point
S1
S2
S3
S4
S5
S6
Hot Springs Rd
Google Earth
© 2018 Google
N
300 m

Exova
#104, 19575-55 A Ave.
Surrey, British Columbia
V3S 8P8, Canada

T: +1 (604) 514-3322
F: +1 (604) 514-3323
E: Surrey@exova.com
W: www.exova.com

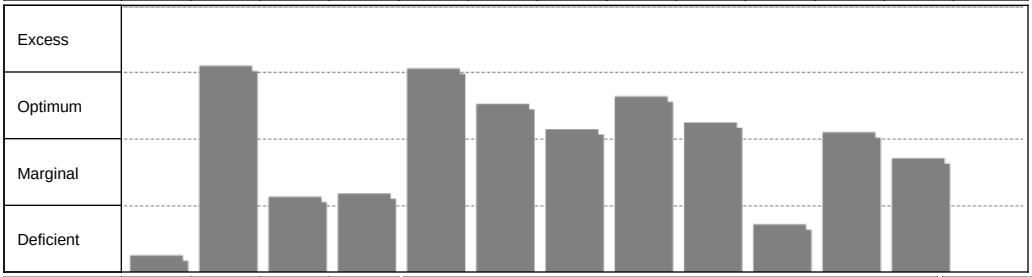
Appendix C

Farm Soil Analysis

Bill To:	Timbro Contracting (A	Grower Name:	James - 3954 Hotsprings Rd	Lot Number:	1259921
Report To:	Timbro Contracting (A	Client's Sample Id:		Report Number:	2271243
	P.O. Box 95	Field Id:	S1	Date Received:	Mar 15, 2018
	7357 Pioneer Avenue	Acres:		Disposal Date:	Apr 14, 2018
	Agassiz, BC., Canada	Legal Location:		Report Date:	Mar 23, 2018
	V0M 1A0	Last Crop:	Crop not provided	Arrival Condition:	
Agreement:	74556				

Nutrient analysis (ppm)

Depth	N*	P	K	S**	Ca	Mg	Fe	Cu	Zn	B	Mn	Cl	BiCarbP
0" - 6"	5	>80	85	3	1580	146	158	3.5	5.8	0.3	7.0	6.8	



Soil Quality

pH	EC(dS/m)	OM(%)	Sample#
6.2	0.1	5.6	6042689

Alkaline	*Extreme*	*High*
Neutral	*Very High*	*Normal*
Acidic	*High*	*Low*
Very Acidic	*Good*	*Very Low*

Total lbs/acre	10	160	170	6
Estimated lbs/acre	20	160	170	12

Texture *n/a* Hand Texture *n/a*

Sand n/a Silt n/a Clay n/a

Ammonium n/a

BS 56.7 % CEC 28.9 meq/100 g

Ca 48.0 % Mg 7.3 % Na <0.8 % K 1.3 %

TEC 16.4 meq/100 g Na <30 ppm

Lime 2 T/ac Buffer pH 6.3 Est. N Release n/a K/Mg Ratio 0.18

**Nitrate-N **Sulfate-S n/a = not analysed*

RECOMMENDATIONS FOR BALANCED CROP NUTRITION

	Crop not provided				
Macro-nutrients	**Yield**	**N**	**P_2O_5**	**K_2O**	**S**
Growing Condition		To be added (lbs/acre)			
Excellent					
Average					
Your Goal					
Removal Rate (Seed/Total)					
Micro-nutrients	Iron	Copper	Zinc	Boron	Manganese
To be added (lbs/ac)					

Comments:

Recommendations are based on general research consensus. They should not replace responsible judgement.

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#104, 19575-55 A Ave.
Surrey, British Columbia
V3S 8P8, Canada

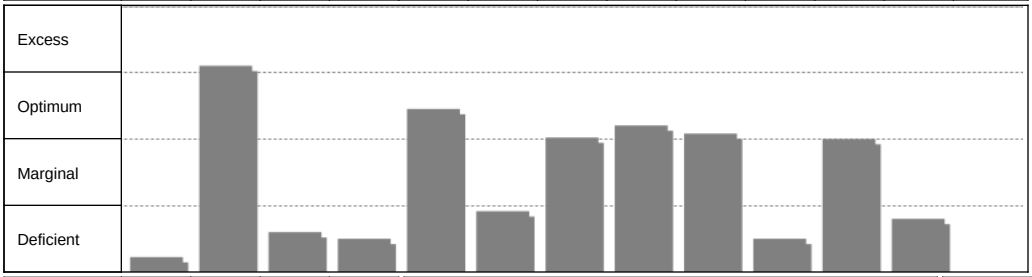
T: +1 (604) 514-3322
F: +1 (604) 514-3323
E: Surrey@exova.com
W: www.exova.com

Farm Soil Analysis

Bill To:	Timbro Contracting (A	Grower Name:	James - 3954 Hotsprings Rd	Lot Number:	1259921
Report To:	Timbro Contracting (A	Client's Sample Id:		Report Number:	2271244
	P.O. Box 95	Field Id:	S2	Date Received:	Mar 15, 2018
	7357 Pioneer Avenue	Acres:		Disposal Date:	Apr 14, 2018
	Agassiz, BC., Canada	Legal Location:		Report Date:	Mar 23, 2018
	V0M 1A0	Last Crop:	Crop not provided	Arrival Condition:	
Agreement:	74556				

Nutrient analysis (ppm)

Depth	N*	P	K	S**	Ca	Mg	Fe	Cu	Zn	B	Mn	Cl	BiCarbP
0" - 6"	4	>80	45	1	564	27	34.3	1.7	2.6	<0.2	2.1	3	



Soil Quality

pH	EC(dS/m)	OM(%)	Sample#
6.2	0.09	5.4	6042690

Alkaline	*Extreme*	*High*
Neutral	*Very High*	*Normal*
Acidic	*High*	*Low*
Very Acidic	*Good*	*Very Low*

	N	P	K	S
Total lbs/acre	9	160	90	2
Estimated lbs/acre	18	160	90	4

Texture *n/a* Hand Texture *n/a*

Sand n/a Silt n/a Clay n/a

Ammonium n/a

BS 38 % CEC 22 meq/100 g

Ca 34 % Mg 2.7 % Na <1.6 % K 1.4 %

TEC 8.3 meq/100 g Na <30 ppm

Lime 2 T/ac Buffer pH 6.5 Est. N Release n/a K/Mg Ratio 0.51

**Nitrate-N **Sulfate-S n/a = not analysed*

RECOMMENDATIONS FOR BALANCED CROP NUTRITION

	Crop not provided				
Macro-nutrients	**Yield**	**N**	**P_2O_5**	**K_2O**	**S**
Growing Condition		To be added (lbs/acre)			
Excellent					
Average					
Your Goal					
Removal Rate (Seed/Total)					
Micro-nutrients	Iron	Copper	Zinc	Boron	Manganese
To be added (lbs/ac)					

Comments:

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Surrey, British Columbia
V3S 8P8, Canada

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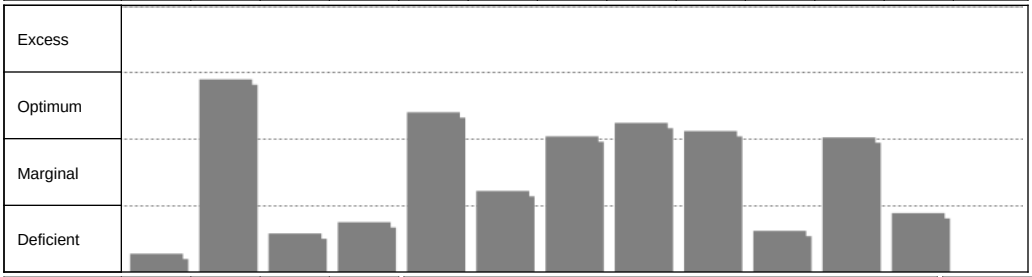
F: +1 (604) 514-3323
E: Surrey@exova.com
W: www.exova.com

Farm Soil Analysis

Bill To:	Timbro Contracting (A	Grower Name:	James - 3954 Hotsprings Rd	Lot Number:	1259921
Report To:	Timbro Contracting (A	Client's Sample Id:		Report Number:	2271245
	P.O. Box 95	Field Id:	S3	Date Received:	Mar 15, 2018
	7357 Pioneer Avenue	Acres:		Disposal Date:	Apr 14, 2018
	Agassiz, BC., Canada	Legal Location:		Report Date:	Mar 23, 2018
	V0M 1A0	Last Crop:	Crop not provided	Arrival Condition:	
Agreement:	74556				

Nutrient analysis (ppm)

Depth	N*	P	K	S**	Ca	Mg	Fe	Cu	Zn	B	Mn	Cl	BiCarbP
0" - 6"	5	57	43	1	523	34	51.1	1.8	3.3	0.2	3.2	4	



Total lbs/acre	11	113	87	3
Estimated lbs/acre	22	113	87	6

*Nitrate-N **Sulfate-S n/a = not analysed

Soil Quality

pH	EC(dS/m)	OM(%)	Sample#
5.9	0.08	7.0	6042691

Alkaline	*Extreme*	*High*
Neutral	*Very High*	*Normal*
Acidic	*High*	*Low*
Very Acidic	*Good*	*Very Low*

Texture *n/a* Hand Texture *n/a*

Sand n/a Silt n/a Clay n/a

Ammonium n/a

BS 29.2 % CEC 35.3 meq/100 g

Ca 25.3 % Mg 2.7 % Na <1.3 % K 1.1 %

TEC 10.3 meq/100 g Na <30 ppm

Lime 2 T/ac Buffer pH 6.3 Est. N Release n/a K/Mg Ratio 0.39

RECOMMENDATIONS FOR BALANCED CROP NUTRITION

	Crop not provided				
Macro-nutrients	**Yield**	**N**	**P_2O_5**	**K_2O**	**S**
Growing Condition		To be added (lbs/acre)			
Excellent					
Average					
Your Goal					
Removal Rate (Seed/Total)					
Micro-nutrients	Iron	Copper	Zinc	Boron	Manganese
To be added (lbs/ac)					

Comments:

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#104, 19575-55 A Ave.
Surrey, British Columbia
V3S 8P8, Canada

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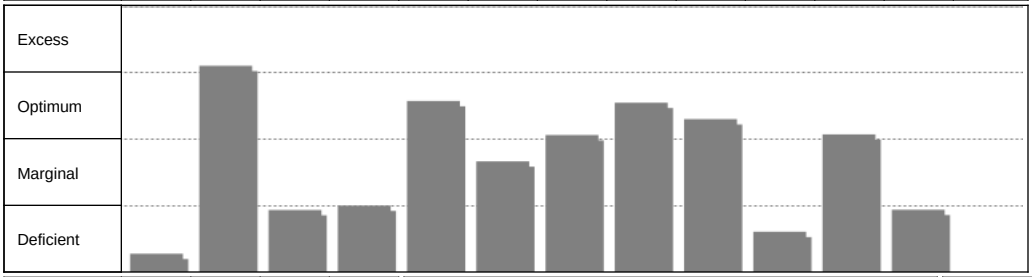
F: +1 (604) 514-3323
E: Surrey@exova.com
W: www.exova.com

Farm Soil Analysis

Bill To:	Timbro Contracting (A	Grower Name:	James - 3954 Hotsprings Rd	Lot Number:	1259921
Report To:	Timbro Contracting (A	Client's Sample Id:		Report Number:	2271246
	P.O. Box 95	Field Id:	S4	Date Received:	Mar 15, 2018
	7357 Pioneer Avenue	Acres:		Disposal Date:	Apr 14, 2018
	Agassiz, BC., Canada	Legal Location:		Report Date:	Mar 23, 2018
	V0M 1A0	Last Crop:	Crop not provided	Arrival Condition:	
Agreement:	74556				

Nutrient analysis (ppm)

Depth	N*	P	K	S**	Ca	Mg	Fe	Cu	Zn	B	Mn	Cl	BiCarbP
0" - 6"	5	>80	70	2	660	43	71.1	3.1	6.7	0.2	5.5	4	



Soil Quality

pH	EC(dS/m)	OM(%)	Sample#
5.9	0.09	9.1	6042692

Alkaline	*Extreme*	*High*
Neutral	*Very High*	*Normal*
Acidic	*High*	*Low*
Very Acidic	*Good*	*Very Low*

Total lbs/acre	11	160	140	4
Estimated lbs/acre	22	160	140	8

Texture *n/a* Hand Texture *n/a*

Sand n/a Silt n/a Clay n/a

Ammonium n/a

BS 26.4 % CEC 55.1 meq/100 g

Ca 22.7 % Mg 2.5 % Na <0.9 % K 1.2 %

TEC 14.5 meq/100 g Na <30 ppm

Lime 4 T/ac Buffer pH 5.9 Est. N Release n/a K/Mg Ratio 0.50

**Nitrate-N **Sulfate-S n/a = not analysed*

RECOMMENDATIONS FOR BALANCED CROP NUTRITION

	Crop not provided				
Macro-nutrients	**Yield**	**N**	**P_2O_5**	**K_2O**	**S**
Growing Condition		To be added (lbs/acre)			
Excellent					
Average					
Your Goal					
Removal Rate (Seed/Total)					
Micro-nutrients	Iron	Copper	Zinc	Boron	Manganese
To be added (lbs/ac)					

Comments:

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F: +1 (604) 514-3323
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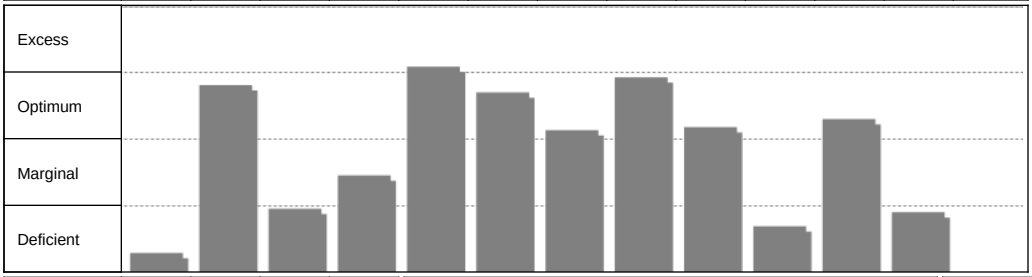
Farm Soil Analysis

Bill To:	Timbro Contracting (A	Grower Name:	James - 3954 Hotsprings Rd	Lot Number:	1259921
Report To:	Timbro Contracting (A	Client's Sample Id:		Report Number:	2271247
	P.O. Box 95	Field Id:	S5	Date Received:	Mar 15, 2018
	7357 Pioneer Avenue	Acres:		Disposal Date:	Apr 14, 2018
	Agassiz, BC., Canada	Legal Location:		Report Date:	Mar 23, 2018
	V0M 1A0	Last Crop:	Crop not provided	Arrival Condition:	
Agreement:	74556				

Nutrient analysis (ppm)

Depth	N*	P	K	S**	Ca	Mg	Fe	Cu	Zn	B	Mn	Cl	BiCarbP
0" - 6"	6	54	72	4	1820	185	145	4.7	4.4	0.3	16.5	4	



Soil Quality

pH	EC(dS/m)	OM(%)	Sample#
6.4	0.2	4.9	6042693

Alkaline	*Extreme*	*High*
Neutral	*Very High*	*Normal*
Acidic	*High*	*Low*
Very Acidic	*Good*	*Very Low*

	N*	P	K	S**
Total lbs/acre	11	107	143	9
Estimated lbs/acre	23	107	143	18

Texture *n/a* Hand Texture *n/a*

Sand n/a Silt n/a Clay n/a

Ammonium n/a

BS 72.5 % CEC 20.6 meq/100 g

Ca 61.1 % Mg 10.2 % Na <0.9 % K 1.2 %

TEC 14.9 meq/100 g Na <30 ppm

Lime 1 T/ac Buffer pH 6.6 Est. N Release n/a K/Mg Ratio 0.12

**Nitrate-N **Sulfate-S n/a = not analysed*

RECOMMENDATIONS FOR BALANCED CROP NUTRITION

	Crop not provided				
Macro-nutrients	**Yield**	**N**	**P_2O_5**	**K_2O**	**S**
Growing Condition		To be added (lbs/acre)			
Excellent					
Average					
Your Goal					
Removal Rate (Seed/Total)					
Micro-nutrients	Iron	Copper	Zinc	Boron	Manganese
To be added (lbs/ac)					

Comments:

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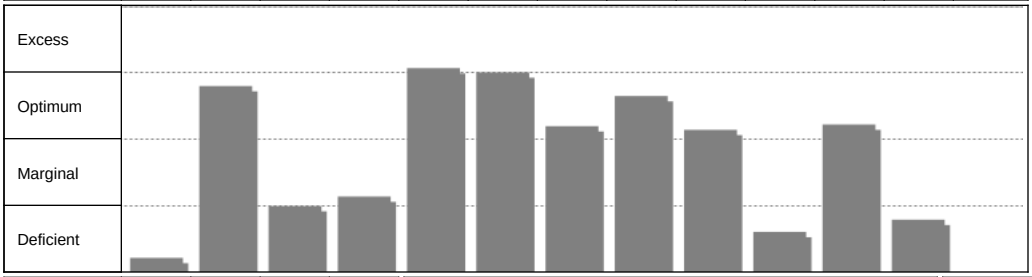
Farm Soil Analysis

Bill To:	Timbro Contracting (A	Grower Name:	James - 3954 Hotsprings Rd	Lot Number:	1259921
Report To:	Timbro Contracting (A	Client's Sample Id:		Report Number:	2271249
	P.O. Box 95	Field Id:	S6	Date Received:	Mar 15, 2018
	7357 Pioneer Avenue	Acres:		Disposal Date:	Apr 14, 2018
	Agassiz, BC., Canada	Legal Location:		Report Date:	Mar 23, 2018
	V0M 1A0	Last Crop:	Crop not provided	Arrival Condition:	
Agreement:	74556				

Nutrient analysis (ppm)

Depth	N*	P	K	S**	Ca	Mg	Fe	Cu	Zn	B	Mn	Cl	BiCarbP
0" - 6"	4	53	75	3	1620	271	204	3.5	3.7	0.2	12.6	3	



Total lbs/acre	8	106	149	5
Estimated lbs/acre	17	106	149	11

*Nitrate-N **Sulfate-S n/a = not analysed

Soil Quality

pH	EC(dS/m)	OM(%)	Sample#
6.3	0.1	5.5	6042694

Alkaline	*Extreme*	*High*
Neutral	*Very High*	*Normal*
Acidic	*High*	*Low*
Very Acidic	*Good*	*Very Low*

Texture *n/a* Hand Texture *n/a*

Sand n/a Silt n/a Clay n/a

Ammonium n/a

BS 69.1 % CEC 22.0 meq/100 g

Ca 53.2 % Mg 14.6 % Na <0.9 % K 1.3 %

TEC 15.2 meq/100 g Na <30 ppm

Lime 1 T/ac Buffer pH 6.5 Est. N Release n/a K/Mg Ratio 0.09

RECOMMENDATIONS FOR BALANCED CROP NUTRITION

	Crop not provided				
Macro-nutrients	**Yield**	**N**	**P_2O_5**	**K_2O**	**S**
Growing Condition		To be added (lbs/acre)			
Excellent					
Average					
Your Goal					
Removal Rate (Seed/Total)					
Micro-nutrients	Iron	Copper	Zinc	Boron	Manganese
To be added (lbs/ac)					

Comments:

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#104, 19575-55 A Ave.
Surrey, British Columbia
V3S 8P8, Canada

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F: +1 (604) 514-3323
E: Surrey@exova.com
W: www.exova.com

Report Transmission Cover Page

Bill To:	Timbro Contracting (A	Project ID:	James	Lot ID:	**1259921**
	P.O. Box 95	Project Name:	3954 Hotsprings Rd	Control Number:	C0065547
	7357 Pioneer Avenue	Project Location:	Agassiz	Date Received:	Mar 15, 2018
	Agassiz, BC, Canada	LSD:		Date Reported:	Mar 23, 2018
	V0M 1A0	P.O.:	14132	Report Number:	2271251
Attn:	Accounts Payable	Proj. Acct. code:			
Sampled By:	Andres M.				
Company:	Biocentral				

Contact	Company	Address
Accounts Payable	**Timbro Contracting (A Partnership)**	P.O. Box 95, 7357 Pioneer Avenue Agassiz, BC V0M 1A0 Phone: (604) 796-3851 Fax: (604) 796-0554 Email: info@timbroconstruction.com

Delivery	Format	Deliverables
Email - Single Report	PDF	Invoice

Contact	Company	Address
Andres Moreno	**Samplers Account**	7357 Pioneer Avenue Agassiz, BC V0M 1A2 Phone: (604) 796-3851 Fax: (604) 796-0554 Email: andresm@biocentral.ca

Delivery	Format	Deliverables
Email - Merge Reports	PDF	COC / Test Report / Test Report /

Contact	Company	Address
Andres Murillo	**Timbro Contracting (A Partnership)**	P.O. Box 95, 7357 Pioneer Avenue Agassiz, BC V0M 1A0 Phone: (604) 796-3851 Fax: (604) 796-0554 Email: andres@timbroconstruction.com

Delivery	Format	Deliverables
Email - Single Report	PDF	COC / Test Report
Email - Single Report	PDF	COR

Contact	Company	Address
Frank Trevr	**Timbro Contracting (A Partnership)**	P.O. Box 95, 7357 Pioneer Avenue Agassiz, BC V0M 1A0 Phone: (604) 991-3782 Fax: Email: frank@timbroconstruction.com

Delivery	Format	Deliverables
Email - Merge Reports	PDF	COC / Test Report
Email - Single Report	PDF	COR
Email - Single Report	Standard Crosstab	Test Report

Notes To Clients:

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#104, 19575-55 A Ave.
Surrey, British Columbia
V3S 8P8, Canada

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F: +1 (604) 514-3323
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Analytical Report

Bill To:	Timbro Contracting (A	Project ID:	James	Lot ID:	**1259921**
	P.O. Box 95	Project Name:	3954 Hotsprings Rd	Control Number:	C0065547
	7357 Pioneer Avenue	Project Location:	Agassiz	Date Received:	Mar 15, 2018
	Agassiz, BC, Canada	LSD:		Date Reported:	Mar 23, 2018
	V0M 1A0	P.O.:	14132	Report Number:	2271251
Attn:	Accounts Payable	Proj. Acct. code:			
Sampled By:	Andres M.				
Company:	Biocentral				

Reference Number	1259921-19670	1259921-19671	1259921-19672
Sample Date			
Sample Time			
Sample Location			
Sample Description	James - 3954 Hotsprings Rd / S1 / 0 / 5 / E / 1	James - 3954 Hotsprings Rd / S2 / 0 / 5 / E / 1	James - 3954 Hotsprings Rd / S3 / 0 / 5 / E / 1
Matrix	Farm Soil	Farm Soil	Farm Soil

Analyte		Units	Results	Results	Results	Nominal Detection Limit
Aggregate Organic Constituents						
Organic Matter	LOI	% by weight	5.6	5.4	7.0	0.1
Available Nutrients						
Nitrate - N	Farmsoil	ppm	5	4	5	2
Phosphorus	Farmsoil	ppm	>80	>80	57	5
Potassium	Farmsoil	ppm	85	45	43	25
Sulfate-S	Farmsoil	ppm	3	1	1	1
Copper	FS Micro-nutrients	ppm	3.5	1.7	1.8	0.1
Iron	FS Micro-nutrients	ppm	158	34.3	51.1	2
Manganese	FS Micro-nutrients	ppm	7.0	2.1	3.2	0.1
Zinc	FS Micro-nutrients	ppm	5.8	2.6	3.3	0.5
Base saturation	FS Base Saturation	%	56.7	38	29.2	
Calcium	FS Base Saturation	%	48.0	34	25.3	
Magnesium	FS Base Saturation	%	7.3	2.7	2.7	
Sodium	FS Base Saturation	%	<0.8	<1.6	<1.3	
Potassium	FS Base Saturation	%	1.3	1.4	1.1	
TEC	FS Base Saturation	meq/100 g	16.4	8.3	10.3	
Calcium	FS Macro-nutrients	ppm	1580	564	523	30
Magnesium	FS Macro-nutrients	ppm	146	27	34	5
Sodium	FS Macro-nutrients	ppm	<30	<30	<30	30
Boron	FS Micro-nutrients	ppm	0.3	<0.2	0.2	0.1
Classification						
Nitrogen	Total	%	0.22	0.23	0.30	0.02
Hot Water Soluble						
Boron	FS Micro-nutrients	ppm	0.3	<0.2	0.2	0.1
Metals Strong Acid Digestion						
Antimony	Strong Acid Extractable	µg/g	3	2	3	1.5
Arsenic	Strong Acid Extractable	µg/g	10	5.0	5.2	0.35
Barium	Strong Acid Extractable	µg/g	180	99	130	0.2
Beryllium	Strong Acid Extractable	µg/g	0.52	0.40	0.42	0.01
Cadmium	Strong Acid Extractable	µg/g	0.4	0.4	0.4	0.05
Chromium	Strong Acid Extractable	µg/g	89	78	77	0.1
Cobalt	Strong Acid Extractable	µg/g	15	14	15	0.1
Copper	Strong Acid Extractable	µg/g	36	31	29	0.1
Lead	Strong Acid Extractable	µg/g	7.1	5	7.2	0.5
Mercury	Strong Acid Extractable	µg/g	0.053	0.088	0.079	0.003
Molybdenum	Strong Acid Extractable	µg/g	0.63	0.4	0.5	0.1

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V3S 8P8, Canada

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F: +1 (604) 514-3323
E: Surrey@exova.com
W: www.exova.com

Analytical Report

Bill To:	Timbro Contracting (A	Project ID:	James	Lot ID:	**1259921**
	P.O. Box 95	Project Name:	3954 Hotsprings Rd	Control Number:	C0065547
	7357 Pioneer Avenue	Project Location:	Agassiz	Date Received:	Mar 15, 2018
	Agassiz, BC, Canada	LSD:		Date Reported:	Mar 23, 2018
	V0M 1A0	P.O.:	14132	Report Number:	2271251
Attn:	Accounts Payable	Proj. Acct. code:			
Sampled By:	Andres M.				
Company:	Biocentral				

		Reference Number	1259921-19670	1259921-19671	1259921-19672	
		Sample Date				
		Sample Time				
		Sample Location				
		Sample Description	James - 3954 Hotsprings Rd / S1 / 0 / 5 / E / 1	James - 3954 Hotsprings Rd / S2 / 0 / 5 / E / 1	James - 3954 Hotsprings Rd / S3 / 0 / 5 / E / 1	
		Matrix	Farm Soil	Farm Soil	Farm Soil	
Analyte		**Units**	**Results**	**Results**	**Results**	Nominal Detection Limit
Metals Strong Acid Digestion - Continued						
Nickel	Strong Acid Extractable	µg/g	40	41	42	0.25
Selenium	Strong Acid Extractable	µg/g	<0.5	<0.5	0.8	0.5
Silver	Strong Acid Extractable	µg/g	<0.4	<0.4	<0.4	0.4
Strontium	Strong Acid Extractable	µg/g	30	19	22	0.05
Thallium	Strong Acid Extractable	µg/g	<0.5	<0.5	<0.5	0.5
Tin	Strong Acid Extractable	µg/g	<0.5	<0.5	<0.5	0.5
Vanadium	Strong Acid Extractable	µg/g	90	83	83	0.2
Zinc	Strong Acid Extractable	µg/g	89	83	89	0.05
Soil Acidity						
pH	1:2 Soil:Water	pH	6.2	6.2	5.9	
Electrical Conductivity	Sat. Paste equiv based on 1:2	dS/m at 25 °C	0.1	0.09	0.08	0.02
Water Soluble Parameters						
Chloride	Available	mg/kg	6.8	3	4	0.5
Lime Requirement						
pH	SMP	pH	6.3	6.5	6.3	
Lime		T/ac	2	2	2	

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Analytical Report

Bill To:	Timbro Contracting (A	Project ID:	James	Lot ID:	**1259921**
	P.O. Box 95	Project Name:	3954 Hotsprings Rd	Control Number:	C0065547
	7357 Pioneer Avenue	Project Location:	Agassiz	Date Received:	Mar 15, 2018
	Agassiz, BC, Canada	LSD:		Date Reported:	Mar 23, 2018
	V0M 1A0	P.O.:	14132	Report Number:	2271251
Attn:	Accounts Payable	Proj. Acct. code:			
Sampled By:	Andres M.				
Company:	Biocentral				

Reference Number	1259921-19673	1259921-19674	1259921-19675
Sample Date			
Sample Time			
Sample Location			
Sample Description	James - 3954 Hotsprings Rd / S4 / 0 / 5 / E / 1	James - 3954 Hotsprings Rd / S5 / 0 / 5 / E / 1	James - 3954 Hotsprings Rd / S6 / 0 / 5 / E / 1
Matrix	Farm Soil	Farm Soil	Farm Soil

Analyte		Units	Results	Results	Results	Nominal Detection Limit
Aggregate Organic Constituents						
Organic Matter	LOI	% by weight	9.1	4.9	5.5	0.1
Available Nutrients						
Nitrate - N	Farmsoil	ppm	5	6	4	2
Phosphorus	Farmsoil	ppm	>80	54	53	5
Potassium	Farmsoil	ppm	70	72	75	25
Sulfate-S	Farmsoil	ppm	2	4	3	1
Copper	FS Micro-nutrients	ppm	3.1	4.7	3.5	0.1
Iron	FS Micro-nutrients	ppm	71.1	145	204	2
Manganese	FS Micro-nutrients	ppm	5.5	16.5	12.6	0.1
Zinc	FS Micro-nutrients	ppm	6.7	4.4	3.7	0.5
Base saturation	FS Base Saturation	%	26.4	72.5	69.1	
Calcium	FS Base Saturation	%	22.7	61.1	53.2	
Magnesium	FS Base Saturation	%	2.5	10.2	14.6	
Sodium	FS Base Saturation	%	<0.9	<0.9	<0.9	
Potassium	FS Base Saturation	%	1.2	1.2	1.3	
TEC	FS Base Saturation	meq/100 g	14.5	14.9	15.2	
Calcium	FS Macro-nutrients	ppm	660	1820	1620	30
Magnesium	FS Macro-nutrients	ppm	43	185	271	5
Sodium	FS Macro-nutrients	ppm	<30	<30	<30	30
Boron	FS Micro-nutrients	ppm	0.2	0.3	0.2	0.1
Classification						
Nitrogen	Total	%	0.37	0.20	0.22	0.02
Hot Water Soluble						
Boron	FS Micro-nutrients	ppm	0.2	0.3	0.2	0.1
Metals Strong Acid Digestion						
Antimony	Strong Acid Extractable	µg/g	2	3	3	1.5
Arsenic	Strong Acid Extractable	µg/g	4.4	7.6	8.4	0.35
Barium	Strong Acid Extractable	µg/g	110	150	180	0.2
Beryllium	Strong Acid Extractable	µg/g	0.39	0.51	0.61	0.01
Cadmium	Strong Acid Extractable	µg/g	0.47	0.3	0.3	0.05
Chromium	Strong Acid Extractable	µg/g	77	90	96	0.1
Cobalt	Strong Acid Extractable	µg/g	11	18	19	0.1
Copper	Strong Acid Extractable	µg/g	38	46	44	0.1
Lead	Strong Acid Extractable	µg/g	8.5	5.9	7.3	0.5
Mercury	Strong Acid Extractable	µg/g	0.060	0.064	0.055	0.003
Molybdenum	Strong Acid Extractable	µg/g	0.66	0.59	0.4	0.1

Exova
#104, 19575-55 A Ave.
Surrey, British Columbia
V3S 8P8, Canada

T: +1 (604) 514-3322
F: +1 (604) 514-3323
E: Surrey@exova.com
W: www.exova.com

Analytical Report

Bill To:	Timbro Contracting (A	Project ID:	James	Lot ID:	**1259921**
	P.O. Box 95	Project Name:	3954 Hotsprings Rd	Control Number:	C0065547
	7357 Pioneer Avenue	Project Location:	Agassiz	Date Received:	Mar 15, 2018
	Agassiz, BC, Canada	LSD:		Date Reported:	Mar 23, 2018
	V0M 1A0	P.O.:	14132	Report Number:	2271251
Attn:	Accounts Payable	Proj. Acct. code:			
Sampled By:	Andres M.				
Company:	Biocentral				

	Reference Number	1259921-19673	1259921-19674	1259921-19675	
	Sample Date				
	Sample Time				
	Sample Location				
	Sample Description	James - 3954 Hotsprings Rd / S4 / 0 / 5 / E / 1	James - 3954 Hotsprings Rd / S5 / 0 / 5 / E / 1	James - 3954 Hotsprings Rd / S6 / 0 / 5 / E / 1	
	Matrix	Farm Soil	Farm Soil	Farm Soil	
Analyte		**Units**	**Results**	**Results**	**Results**	Nominal Detection Limit
Metals Strong Acid Digestion - Continued						
Nickel	Strong Acid Extractable	µg/g	34	44	47	0.25
Selenium	Strong Acid Extractable	µg/g	<0.5	<0.5	<0.5	0.5
Silver	Strong Acid Extractable	µg/g	0.52	<0.4	<0.4	0.4
Strontium	Strong Acid Extractable	µg/g	21	36	36	0.05
Thallium	Strong Acid Extractable	µg/g	<0.5	<0.5	<0.5	0.5
Tin	Strong Acid Extractable	µg/g	0.6	0.6	<0.5	0.5
Vanadium	Strong Acid Extractable	µg/g	76	90	95	0.2
Zinc	Strong Acid Extractable	µg/g	100	82	87	0.05
Soil Acidity						
pH	1:2 Soil:Water	pH	5.9	6.4	6.3	
Electrical Conductivity	Sat. Paste equiv based on 1:2	dS/m at 25 °C	0.09	0.2	0.1	0.02
Water Soluble Parameters						
Chloride	Available	mg/kg	4	4	3	0.5
Lime Requirement						
pH	SMP	pH	5.9	6.6	6.5	
Lime		T/ac	4	1	1	

Approved by:

Mathieu Simoneau
Operations Manager

Data have been validated by Analytical Quality Control and Exova's Integrated Data Validation System (IDVS).
Generation and distribution of the report, and approval by the digitized signature above, are performed through a secure and controlled automatic process.

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#104, 19575-55 A Ave.
Surrey, British Columbia
V3S 8P8, Canada

T: +1 (604) 514-3322
F: +1 (604) 514-3323
E: Surrey@exova.com
W: www.exova.com

Methodology and Notes

Bill To:	Timbro Contracting (A	Project ID:	James	Lot ID:	**1259921**
	P.O. Box 95	Project Name:	3954 Hotsprings Rd	Control Number:	C0065547
	7357 Pioneer Avenue	Project Location:	Agassiz	Date Received:	Mar 15, 2018
	Agassiz, BC, Canada	LSD:		Date Reported:	Mar 23, 2018
	V0M 1A0	P.O.:	14132	Report Number:	2271251
Attn:	Accounts Payable	Proj. Acct. code:			
Sampled By:	Andres M.				
Company:	Biocentral				

Method of Analysis

Method Name	Reference		Method	Date Analysis Started	Location
Boron in farm soil	McKeague	*	Hot Water Soluble Boron - Azomethine-H Method, 4.61	Mar 19, 2018	Exova Edmonton
Chloride in farmsoil	SSSA Book Series, no. 3	*	Testing Soils for Sulfur, Boron, Molybdenum, and Chlorine, Chapter 10	Mar 19, 2018	Exova Edmonton
Macronutrients in Farm Soils	McKeague	*	Ammonium Acetate Extractable Cations, 4.51	Mar 19, 2018	Exova Edmonton
Metals (Strong Acid Leachable) in soils (Surrey)	B.C.M.O.E	*	Strong Acid Leachable Metals (SALM) in Soil, V 1.0, SALM	Mar 20, 2018	Exova Surrey
Metals (Strong Acid Leachable) in soils (Surrey)	US EPA	*	Mercury in Solid and Semi-Solid Wastes (Cold Vapour), 7471B	Mar 20, 2018	Exova Surrey
Micronutrients in Farm Soil	APHA	*	Inductively Coupled Plasma (ICP) Method, 3120 B	Mar 19, 2018	Exova Edmonton
Micronutrients in Farm Soil	McKeague	*	DTPA-TEA Extractable Elements, 4.65	Mar 19, 2018	Exova Edmonton
Nutrients in Farm Soil	Comm. Soil Sci. Pl. Anal.	*	Modified Kelowna Soil Test, Vol 26, 1995	Mar 19, 2018	Exova Edmonton
Organic Matter by Ignition	McKeague	*	Loss on Ignition (LOI), 3.8	Mar 19, 2018	Exova Edmonton
pH and Conductivity in farm soil	McKeague	*	1:2 Soil:Water Ratio, 4.12	Mar 19, 2018	Exova Edmonton
SMP Lime Requirements	Carter	*	Shoemaker-Mclean-Pratt Single-Buffer Method, 12.2	Mar 19, 2018	Exova Edmonton
Sulfate in Farm Soil	McKeague	*	Sulfate Extractable by 0.1M CaCl2, 4.47	Mar 19, 2018	Exova Edmonton
Total Carbon, Nitrogen & Sulfur by Leco Combustion (Surrey)	SSSA Book Series 5	*	Nitrogen-Total, Ch 37	Mar 19, 2018	Exova Surrey

** Reference Method Modified*

References

APHA	Standard Methods for the Examination of Water and Wastewater
B.C.M.O.E	B.C. Ministry of Environment
Carter	Soil Sampling and Methods of Analysis.
Comm. Soil Sci. Pl.	Communications in Soil Science and Plant Analysis
McKeague	Manual on Soil Sampling and Methods of Analysis
SSSA Book Series 5	Methods of Soil Analysis, Part 3
SSSA Book Series,	Soil Testing and Plant Analysis
US EPA	US Environmental Protection Agency Test Methods

Guidelines

Guideline Description	General Soil Comments
	Plant Nutrients in Soil
	Soil test for Crop Unknown
Guideline Source	Exova Canada Inc.,
Guideline Comments	

Exova
#104, 19575-55 A Ave.
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V3S 8P8, Canada

T: +1 (604) 514-3322
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Methodology and Notes

Bill To:	Timbro Contracting (A	Project ID:	James	Lot ID:	**1259921**
	P.O. Box 95	Project Name:	3954 Hotsprings Rd	Control Number:	C0065547
	7357 Pioneer Avenue	Project Location:	Agassiz	Date Received:	Mar 15, 2018
	Agassiz, BC, Canada	LSD:		Date Reported:	Mar 23, 2018
	V0M 1A0	P.O.:	14132	Report Number:	2271251
Attn:	Accounts Payable	Proj. Acct. code:			
Sampled By:	Andres M.				
Company:	Biocentral				

The comparison of test results to guideline limits is provided for information purposes only. This is not to be taken as a statement of conformance / nonconformance to any guideline, regulation or limit. The data user is responsible for all conclusions drawn with respect to the data and is advised to consult official regulatory references when evaluating compliance.

Please direct any inquiries regarding this report to our Client Services Group or to the Operations Manager at the coordinates indicated at the top left of this page.
Results relate only to samples as submitted.

Exova — Testing, calibrating, advising

www.exova.com ED 120-02

Invoice to:

Company: Timbro Contracting
Address:
Attention:
Phone:
Cell:
Fax:
E-mail:
Agreement ID:
Copy of report:

Report To:

Company: BioCentral
Address: Same as Timbro
Attention: Andres Marcno
Phone: 604 997 1630
Cell:
Fax:
E-mail 1: andresm@biocentral.ca
E-mail 2: Frank@timbroconstruction.com
Copy of invoice: info@timbroconstruction.com

Report Results / Regulatory Requirement

E-Mail	X	HCDWQG	
Mail		Ab Tier 1	
Online		SPIGEC	
Fax		BCCSR	
PDF	X	Other (list below)	
Excel	X		
QA/QC	X		

Project Information

Project ID: JAMES
Project Name: 3954 Hotsprings
Project Location: Agassiz
Legal Location:
PO/AFE#: 14132
Proj. Acct. Code:
Quote # 23983

Sample Custody (please print)

Sampled by: Andres M.
Company: BioContract

RUSH Priority

- [ ] Emergency (contact lab for turnaround and pricing)
- [ ] Priority 1-2 working days (100% surcharge)
- [ ] Urgent 2-3 working days (50% surcharge)

When "ASAP" is requested, turn around will default to a 100% RUSH priority, with pricing and turn around time to match. Please contact the lab prior to submitting RUSH samples. If not all samples require RUSH, please indicate in the special instructions.

Date Required: _____ Signature: _____

This section for Lab use only

Date/Time stamp: MAR 15 '18 16:51

Special Instructions/Comments (please include contact information including ph. # if different from above).

Regular Delivery

	Site I.D.	Sample Description	Depth start (in)	Depth start cm	Depth end m	Date/Time Sampled	Matrix	Sampling Method	Number of Containers	OMER Metals	CMPT
1	S1	Farm Soil	6			2018.03.15	Soil		1	✓	✓
2	S2								1	✓	✓
3	S3								1	✓	✓
4	S4								1	✓	✓
5	S5								1	✓	✓
6	S6								1	✓	✓
7											
8											
9											
10											
11											
12											
13											
14											
15											

Enter tests above (√ relevant samples below)

Indicate in the space allotted any deficiencies by the corresponding number.

1. Indicate any samples that were not packaged well
2. Indicate any samples not received in Exova supplies
3. Indicate any samples that were not clearly labeled
4. Indicate any samples not received within the required hold time or temp.
5. Indicate any missing or extra samples
6. Indicate any samples that were received broken
7. Indicate any samples where sufficient volume was not received
8. Indicate any samples received in an inappropriate container

ED 120-02

Submission of this form acknowledges acceptance of Exova's Standard Terms and Conditions (http://www.exova.com/about/terms-and-conditions/)

Please indicate any potentially hazardous samples

Page _____ of _____ Control # C 0065547

Lot: 1259921 COC

Shipping: COD Y/ N

and size of coolers

Temp. received: 14.6°C

Delivery Method: HP

Waybill:

Received by: RC

ABBOTSFORD

April 10, 2017

File: 5550-70

Andres Murillo, P.Eng
BioCentral Green Depot Ltd.
Box 95-7357 Pioneer Avenue
Agassiz, BC V0M 1A0

Dear Mr. Murillo:

Re: Organic Matters Recycling Regulation (OMRR) Section 6 – Process and Quality Criteria

As requested, this letter provides confirmation and supporting information that the JAMES Wastewater Treatment Plant (JAMES Plant) meets Section 6 of the OMRR for producing Class A biosolids.

The pasteurization system at the JAMES Plant meets the time-temperature requirements for production of Class A biosolids according to Section 2(f) in OMRR Schedule 1.

The sludge pasteurization system includes the following main components:

- crude and pasteurized sludge holding tanks;
- heat exchangers to heat raw sludge and cool pasteurized sludge;
- pasteurization tank; and
- miscellaneous transfer and recirculation pumps.

The pasteurization reactor operates at a temperature of 65°C and is batch-fed to maintain a retention time of at least one hour between sludge transfers. The volume of the tank provides approximately 18 to 24 hours retention time for pasteurization and conditioning of the sludge in advance of the anaerobic digestion process. The pasteurization process is followed by anaerobic mesophilic digestion, which meets the vector attraction reduction requirements (for details please see below).

The anaerobic mesophilic digestion system at the JAMES Plant meets the vector attraction reduction requirements according to Section 1(a) in OMRR Schedule 2.

The anaerobic mesophilic digestion system at the JAMES Plant includes three digesters, with a total volume of 11,460 m^3. Pasteurized and conditioned sludge from the pasteurized sludge holding tank is pumped to the largest anaerobic digester and then is passed to the remaining two digesters in series. The volatile solids reduction of the biosolids typically ranges between 60-70% and is higher than the required 38% under OMRR.

We trust the above provides the information you requested. Please contact me if you need any additional information or clarification.

Yours truly,

Rob Isaac, Eng.L.
Director, Project Management Office

c. John Paul, Transform Compost Systems Ltd.
Peter Sparanese, General Manager, Engineering and Regional Utilities
Tim Henry, Director, Utility Operations and Asset Management

SC/rb

CERTIFICATE OF ANALYSIS

REPORTED TO	Abbotsford, City of - Utilities Environment 6011 Gladwin Road Abbotsford, BC V4X 1V9		
ATTENTION	Sharon Subido	**WORK ORDER**	7110302
PO NUMBER	PO 170554	**RECEIVED / TEMP**	2017-11-02 18:30 / 5°C
PROJECT	#13 - Biosolids QC	**REPORTED**	2017-11-14
PROJECT INFO		**COC NUMBER**	UE-P13-05

Introduction:

CARO Analytical Services is a testing laboratory full of smart, engaged scientists driven to make the world a safer and healthier place. Through our clients' projects we become an essential element for a better world. We employ methods conducted in accordance with recognized professional standards using accepted testing methodologies and quality control efforts. CARO is accredited by the Canadian Association for Laboratories Accreditation (CALA) to ISO 17025:2005 for specific tests listed in the scope of accreditation approved by CALA.

Big Picture Sidekicks

You know that the sample you collected after snowshoeing to site, digging 5 meters, and racing to get it on a plane so you can submit it to the lab for time sensitive results needed to make important and expensive decisions (whew) is VERY important. We know that too.

We've Got Chemistry

It's simple. We figure the more you enjoy working with our fun and engaged team members; the more likely you are to give us continued opportunities to support you.

Ahead of the Curve

Through research, regulation knowledge, and instrumentation, we are your analytical centre for the technical knowledge you need, BEFORE you need it, so you can stay up to date and in the know.

If you have any questions or concerns, please contact me at jshanko@caro.ca

Authorized By:

Jennifer Shanko, A.Sc.T.
Account Manager

CARO ANALYTICAL SERVICES

TEST RESULTS

REPORTED TO Abbotsford, City of - Utilities Environment
PROJECT #13 - Biosolids QC

CARO WO# 7110302
REPORTED 2017-11-14

Analyte	Result	Guideline	RL	Units	Analyzed	Qualifier
A1 Large Tent (7110302-01) | Matrix: Solid | Sampled: 2017-11-02 10:26						
General Parameters						
Moisture	**76.64**	N/A	0.1	% wet	2017-11-04	
Microbiological Parameters						
Coliforms, Fecal	<8.6	N/A	2	MPN/g dry	2017-11-04	
A2 Large Tent (7110302-02) | Matrix: Solid | Sampled: 2017-11-02 10:27						
General Parameters						
Moisture	**75.47**	N/A	0.1	% wet	2017-11-04	
Microbiological Parameters						
Coliforms, Fecal	<8.1	N/A	2	MPN/g dry	2017-11-04	
A3 Large Tent (7110302-03) | Matrix: Solid | Sampled: 2017-11-02 10:27						
General Parameters						
Moisture	**77.03**	N/A	0.1	% wet	2017-11-04	
Microbiological Parameters						
Coliforms, Fecal	<8.7	N/A	2	MPN/g dry	2017-11-04	
B4 Large Tent (7110302-04) | Matrix: Solid | Sampled: 2017-11-02 10:28						
General Parameters						
Moisture	**74.67**	N/A	0.1	% wet	2017-11-04	
Microbiological Parameters						
Coliforms, Fecal	<7.9	N/A	2	MPN/g dry	2017-11-04	
B5 Large Tent (7110302-05) | Matrix: Solid | Sampled: 2017-11-02 10:28						
General Parameters						
Moisture	**77.6**	N/A	0.1	% wet	2017-11-04	
Microbiological Parameters						
Coliforms, Fecal	<8.9	N/A	2	MPN/g dry	2017-11-04	
B6 Large Tent (7110302-06) | Matrix: Solid | Sampled: 2017-11-02 10:28						
General Parameters						
Moisture	**77.76**	N/A	0.1	% wet	2017-11-04	
Microbiological Parameters						
Coliforms, Fecal	<8.9	N/A	2	MPN/g dry	2017-11-04	
C7 Large Tent (7110302-07) | Matrix: Solid | Sampled: 2017-11-02 10:29						

TEST RESULTS

REPORTED TO	Abbotsford, City of - Utilities Environment	**CARO WO#**	7110302
PROJECT	#13 - Biosolids QC	**REPORTED**	2017-11-14

Analyte	Result	Guideline	RL	Units	Analyzed	Qualifier
C7 Large Tent (7110302-07) | Matrix: Solid | Sampled: 2017-11-02 10:29, Continued						
General Parameters						
Moisture	**77.19**	N/A	0.1	% wet	2017-11-04	
Microbiological Parameters						
Coliforms, Fecal	<8.8	N/A	2	MPN/g dry	2017-11-04	
C8 Large Tent (7110302-08) | Matrix: Solid | Sampled: 2017-11-02 10:29						
General Parameters						
Moisture	**76.94**	N/A	0.1	% wet	2017-11-04	
Microbiological Parameters						
Coliforms, Fecal	**34**	N/A	2	MPN/g dry	2017-11-04	
C9 Large Tent (7110302-09) | Matrix: Solid | Sampled: 2017-11-02 10:29						
General Parameters						
Moisture	**76.73**	N/A	0.1	% wet	2017-11-04	
Microbiological Parameters						
Coliforms, Fecal	<8.6	N/A	2	MPN/g dry	2017-11-04	

APPENDIX 1: SUPPORTING INFORMATION

REPORTED TO	Abbotsford, City of - Utilities Environment	**CARO WO#**	7110302
PROJECT	#13 - Biosolids QC	**REPORTED**	2017-11-14

Analysis Description	Method Ref.	Technique	Location
Coliforms, Fecal in Solid	MFHPB-19	Most Probable Number	Sublet
Moisture in Solid	ASTM D2216-10	Gravimetry (Dried at 105C)	Sublet

Glossary of Terms:

RL	Reporting Limit (default)
% wet	Percent (as received basis)
ASTM	ASTM International Test Methods
MFHPB	HPB Methods for the Microbiological Analysis of Foods, Health Canada

Guidelines Referenced in this Report:

Organic Matter Recycling Regulation -Schedule 4 (2002)

General Comments:

The results in this report apply to the samples analyzed in accordance with the Chain of Custody document. This analytical report must be reproduced in its entirety. CARO is not responsible for any loss or damage resulting directly or indirectly from error or omission in the conduct of testing. Liability is limited to the cost of analysis. Samples will be disposed of 30 days after the test report has been issued unless otherwise agreed to in writing.

APPENDIX 2: QUALITY CONTROL RESULTS

REPORTED TO	Abbotsford, City of - Utilities Environment	**CARO WO#**	7110302
PROJECT	#13 - Biosolids QC	**REPORTED**	2017-11-14

Client Information	Project Information	Laboratory Information	COC Information
Abbotsford, City of - Utilities Environment 6011 Gladwin Road Abbotsford BC V4X 1V9 Phone: (604) 557-1452 Fax: (604) 557-1457	#13 - Biosolids QC Number: [none] Sample count: 9 TAT: 5	CARO Analytical Services #110 - 4011 Viking Way Richmond BC V6V 2K9 Phone: (604) 279-1499 Fax: (604) 279-1599	Number: UE-P13-05 Shipped via: IG Micromed

		Analyses	Containers
#1	A1 Large Tent (Template: 28) 11/02/2017 10:26 - 11/02/2017 10:26 Grab / Solid	!AUE Project #13 Grab PKG (SUB) TAT: 5 Coliforms, Fecal in Solids (SUB) TAT: 5 Coliforms, Total & Fecal in Solids (KEL) TAT: 5	C01_125 mL Glass (General Soil) (1)
#2	A2 Large Tent (Template: 29) 11/02/2017 10:27 - 11/02/2017 10:27 Grab / Solid	!AUE Project #13 Grab PKG (SUB) TAT: 5 Coliforms, Fecal in Solids (SUB) TAT: 5 Coliforms, Total & Fecal in Solids (KEL) TAT: 5	C01_125 mL Glass (General Soil) (1)
#3	A3 Large Tent (Template: 30) 11/02/2017 10:27 - 11/02/2017 10:27 Grab / Solid	!AUE Project #13 Grab PKG (SUB) TAT: 5 Coliforms, Fecal in Solids (SUB) TAT: 5 Coliforms, Total & Fecal in Solids (KEL) TAT: 5	C01_125 mL Glass (General Soil) (1)
#4	B4 Large Tent (Template: 31) 11/02/2017 10:28 - 11/02/2017 10:28 Grab / Solid	!AUE Project #13 Grab PKG (SUB) TAT: 5 Coliforms, Fecal in Solids (SUB) TAT: 5 Coliforms, Total & Fecal in Solids (KEL) TAT: 5	C01_125 mL Glass (General Soil) (1)
#5	B5 Large Tent (Template: 32) 11/02/2017 10:28 - 11/02/2017 10:28 Grab / Solid	!AUE Project #13 Grab PKG (SUB) TAT: 5 Coliforms, Fecal in Solids (SUB) TAT: 5 Coliforms, Total & Fecal in Solids (KEL) TAT: 5	C01_125 mL Glass (General Soil) (1)
#6	B6 Large Tent (Template: 33) 11/02/2017 10:28 - 11/02/2017 10:28 Grab / Solid	!AUE Project #13 Grab PKG (SUB) TAT: 5 Coliforms, Fecal in Solids (SUB) TAT: 5 Coliforms, Total & Fecal in Solids (KEL) TAT: 5	C01_125 mL Glass (General Soil) (1)
#7	C7 Large Tent (Template: 34) 11/02/2017 10:29 - 11/02/2017 10:29 Grab / Solid	!AUE Project #13 Grab PKG (SUB) TAT: 5 Coliforms, Fecal in Solids (SUB) TAT: 5 Coliforms, Total & Fecal in Solids (KEL) TAT: 5	C01_125 mL Glass (General Soil) (1)
#8	C8 Large Tent (Template: 35) 11/02/2017 10:29 - 11/02/2017 10:29 Grab / Solid	!AUE Project #13 Grab PKG (SUB) TAT: 5 Coliforms, Fecal in Solids (SUB) TAT: 5 Coliforms, Total & Fecal in Solids (KEL) TAT: 5	C01_125 mL Glass (General Soil) (1)
#9	C9 Large Tent (Template: 36) 11/02/2017 10:29 - 11/02/2017 10:29 Grab / Solid	!AUE Project #13 Grab PKG (SUB) TAT: 5 Coliforms, Fecal in Solids (SUB) TAT: 5 Coliforms, Total & Fecal in Solids (KEL) TAT: 5	C01_125 mL Glass (General Soil) (1)

Relinquished by	Date/Time	Accepted by	Date/Time

JAMES WWTP BIOSOLIDS QUALITY DATA (2017)

Parameter concentrations are expressed on dry weight basis unless otherwise stated.
All data obtained from the analysis of a monthly composite sample.

Sampling Date:	-															
Parameters (Dried Basis)	**Units**	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**	**OCT**	**NOV**	**DEC**	**MAX**	**AVG**	**OMRR***
Total Nitrogen	%	6.99	8.14	9.04	7.19	8.65	8.1	7.74	8.13	5.74	5.36	6.71	10.5	10.50	7.69	-
Total Phosphorus (as P)	%	1.10	1.02	1.14	1.02	1.15	1.23	1.07	1.14	1.33	1.01	1.02	1.09	1.33	1.11	-
Total Potassium	%	0.071	0.11	0.11	0.103	0.0669	0.077	0.0727	0.0755	0.0632	0.0563	0.071	0.0628	0.11	0.08	-
Total Sulphur	%	0.58	0.74	0.79	0.96	0.517	0.682	0.768	0.83	0.868	0.60	0.69	0.603	0.96	0.72	-
Total Carbon	%	33.6	41.7	40.9	41.5	41.3	40.3	40.5	40.9	40	40.5	42.0	43.2	43.2	40.5	-
Organic Matter	%	80.3	79.6	79.7	80.1	80	79.2	79.5	78.9	76.8	77.9	78.3	78.9	80.3	79.1	-
Moisture	%	75.7	74.9	75.6	75.2	76.6	76.9	76.4	76.7	76.1	72.4	76.6	76.5	76.9	75.8	-
Ammonia- N (available)	mg/kg	7810	8100	8460	8390	7530	7480	8400	8750	7370	5920	6220	6600	8750	7586	-
Nitrate - N (available)	mg/kg	5.4	4.4	5.25	5.85	2.65	3.52	7.77	3.43	3.72	15.6	3.05	4.52	15.6	5.43	-
pH	pH units	6.5	6.7	5.6	6.6	6.3	5.8	6	6.46	6.43	6.75	6.71	6.77	6.77	6.4	-
EC - Conductivity	dS/m	2.73	3.39	2.58	2.94	3.83	3.66	2.58	3.73	5.83	3.25	4.09	4.12	5.83	3.56	-
C/N Ratio	-	4.8	5.1	4.5	5.8	4.8	5.0	5.2	5.0	7.0	7.6	6.26	4.1	7.6	5.4	-
Arsenic	ug/g	2	2.8	N/A	2.95	2.25	2.87	2.83	2.84	3.5	2.88	3.1	2.51	3.5	2.8	75
Cadmium	ug/g	0.86	1.5	N/A	1.49	1.24	1.44	1.63	1.53	1.76	1.23	1.59	1.29	1.76	1.41	20
Chromium	ug/g	18	24	N/A	28.1	20.4	25.4	35.6	60.1	37.4	29.4	32.1	22	60.1	30.2	1060
Cobalt	ug/g	1.6	2.5	N/A	2.57	1.99	2.27	2.2	2.69	3.27	2.21	2.14	1.85	3.27	2.30	150
Copper	ug/g	360	520	N/A	483	438	568	600	655	636	531	561	453	655	528	2200
Lead	ug/g	13	20	N/A	20.8	17.2	20.3	21.4	20.7	22.8	17.3	22.9	17.7	22.9	19.5	500
Mercury	ug/g	1.3	1.5	N/A	1.98	1.67	1.73	3.22	1.78	2.08	1.52	2.2	2.39	3.22	1.95	5
Molybdenum	ug/g	3.9	6.4	N/A	6.34	5.91	6.94	6.05	6.77	7.82	6.21	6.76	5.14	7.82	6.20	20
Nickel	ug/g	11	15	N/A	17.8	13.9	18.1	31.4	41.8	32.9	27.1	35.5	26.5	41.8	24.6	180
Selenium	ug/g	3	4.5	N/A	4.84	4.37	4.88	4.72	4.7	5.31	4.18	4.79	3.75	5.31	4.46	14
Zinc	ug/g	530	800	N/A	700	732	924	922	1050	983	887	874	707	1050	828	1850

4506 Glenmore Rd, Abbotsford, BC

Class A Biosolids Application Plan: 2018

April 25, 2018

MOE Authorization # 109109

Prepared by:

John Paul, PhD PAg
Transform Compost Systems Ltd
3911 Mt Lehman Rd
Abbotsford, BC V2T 5W5
Ph: 604-302-4367
Email: transform@telus.net

4506 Glenmore Rd Class A Biosolids Application Plan 2018

Introduction

This Land Application Plan for the application of Class A biosolids provides the guidance and information required under British Columbia's Organic Matter Recycling Regulation (OMRR), a regulation enacted to ensure that biosolids are managed in a manner that protects human health and the environment.

Class A biosolids are considered a valuable source of both plant nutrients and organic matter. Class A biosolids are the highest quality biosolids achievable under the OMRR, particularly regarding fecal coliform counts (< 1,000 most probable number per gram), and trace element (metal) concentrations. The land application plan must be prepared by a qualified professional as defined in the OMRR.

Class A biosolids will be land applied in 2018 as a source of nutrients and organic matter for the soil on a 12 ha farm in Abbotsford, BC, of which 10 ha is growing forage for cattle. The total amount of Class A biosolids that will be land applied is approximately 550 wet tonnes. This Land Application Plan (LAP) provides guidance in the beneficial reuse of a portion of the Class A biosolids from the JAMES Treatment Plant, a wastewater treatment facility that processes wastewater from the communities of Abbotsford and Mission. (http://www.abbotsford.ca/city_services/wastewater/biosolids_management.htm#JAMES).

This land application plan utilizes the biosolids quality data for 2017, provided by the City of Abbotsford. The Class A biosolids used for this land application was generated by the JAMES wastewater treatment plant in 2017.

The Land Application Plan follows the Notification dated September 15, 2017 (Appendix A).

Qualifications of the Qualified Professional

The professional agrologist preparing this report has extensive training and experience with soil, waste and agricultural land in particular. John Paul, PhD is a registered professional agrologist, who obtained his MSc and PhD in soil biochemistry from the University of Guelph in 1991. He has acted as a professional agrologist for many sites requiring soil deposit and removal reports, nutrient management and waste management plans. He has extensive experience with the various Acts and Regulations regarding agricultural land use and agricultural and industrial wastes.

Land Application Objectives

The specific objectives of this land application plan are to ensure that the Class A biosolids are stored and applied in a manner that provides the greatest benefit for the crop grown on this property, while minimizing risk of environmental pollution. The plan will consider the specific

crops that are growing on this property, as well as any other nutrient input that is used for growing crops or improving the soil.

Site Characteristics

Location

The Land Application Plan is for Class A biosolids application on a farm located at 4506 Glenmore Rd., Abbotsford, BC. The legal description is Lot 8 Plan NWP03829 NWD District Lot 402 Group 2, PID 011-014-491.

This farm is located approximately 1 km north of residential areas in Abbotsford and 3.5 km west of Highway 11.

Figure 1. Aerial view of property at 4506 Glenmore Rd relative to the surrounding floodplain and the residential areas in Abbotsford, BC (Google Earth)

The location is zoned agricultural and is within the Agricultural Land Reserve. The property is surrounded by agricultural lands in forage production in all directions.

The coordinates of the site are

Longitude: 122° 20’ 70” W

Latitude: 49° 05’ 2.87” N

Figure 2. Aerial photograph of the property at 4506 Glenmore Rd where the Class A biosolids will be applied (Google Earth, 2017. Property boundaries delineated by the red lines. Land application area is within the yellow line.

Climate

Abbotsford has a wet but moderate to mild climate in the wintertime with dry summers. The annual mean total rainfall is 1780 mm, with an average of 260 mm in November, and 66 mm in July. The annual mean total snowfall is 86 cm. The annual mean daily temperature in July is 18°C, and in January is 2.3 °C. The wind direction is generally from the southwest to the northeast. Source of weather information: https://www.theweathernetwork.com/ca/api/sitewrapper/index?b=%2Fstatistics%2F&p=%2Fforecasts%2Fstatistics%2Findex&url=%2Fstatistics%2Fcabc0006%2Fabbotsford%2F%2F%2F%3F

Soil Properties

The soil at this farm is described as a Hazelwood soil (Luttmerding 1980), which is a common soil type in the eastern portion of the Matsqui floodplain. Typically these soils have a very dark friable clayey surface layer that is about 20 cm thick, underlain by a clayey layer (Luttmerding 1981. In this field, the depth of topsoil is 20-25 cm overlying clay.

Six soil samples were taken from the area used for land application in March 2018. The location of the soil samples are identified in Appendix B. The complete soil analysis information is found in Appendix C.

Figure 3. Soil profile showing approximately 20-25 cm of clay loam topsoil overlying a clay subsoil in the land application area of 4506 Glenmore Rd.

The soil organic matter content averaged 13.2 % in the top 15 cm. The soil has a slightly lower pH at 5.6 (Figure 4), a base saturation of 42%, mostly from calcium (30.6%), magnesium (9.1%), and sodium (2.6%).

The soil is high in potassium and lower in phosphorus. This soil does not appear to have a long history of manure or other organic material application.

Slope and Topography

The topography of the field is almost level with a few slight undulations.

Soil Characteristics			
Organic matter		%	13.2
Total Nitrogen		%	0.6
pH			5.6
EC		dS/m	0.2
Nitrate		mg/L	4.8
Phosphorus		mg/L	39.2
Potassium		mg/L	171.7
Base Saturation		%	42.3
	Calcium	%	30.6
	Magnesium	%	9.1
	Potassium	%	<0.9
	Sodium	%	2.6

Figure 4. Soil characteristics (March 2018)

Depth to Groundwater Table

The elevation of the property is approximately 5 m above sea level, and approximately 1-2 m above the level of the Fraser River, depending on the time of year. The depth to groundwater fluctuates with the water level in the Fraser River and is generally within 1-2 m of the surface.

Figure 5. View of the property looking east from Glenmore Rd at 4506 Glenmore Rd (April 25, 2018 photo).

Soil Nutrients

The six individual soil samples showed that the soil was marginal in available nitrogen, which is normal for soil sampled in the spring in the Fraser Valley. Available potassium ranged from marginal to optimal in the soil samples. Phosphorus concentrations varied from marginal to optimal. Sulphur concentrations were deficient to marginal. This is characteristic of soils in the Fraser Valley that have had little history of application of manure or other organic matter.

Soil Trace Elements

A total of six individual soil samples were obtained from 0-15 cm depth in the land application area on the property. The complete laboratory soil analysis data is found in Appendix C.

All of the trace element concentrations are below the limits for agricultural soil as documented in the OMRR (OMRR Schedules 9 and 10, limits used for livestock ingesting soil and fodder are used where applicable), with the exception of chromium. The limits as per OMRR represent the most conservative of all uses on either agricultural or residential soils.

Soil Trace Elements (OMRR)		
	Soil Test	**Limits OMRR**
Element	**(mg/kg)**	**(mg/kg)**
Arsenic	11.10	15
Cadmium	0.62	9
Chromium	97.00	60
Cobalt	15.97	40
Copper	52.83	150
Lead	12.75	350
Mercury	0.067	0.6
Molybdenum	0.99	5
Nickel	48.83	100
Selenium	1.04	2
Zinc	113.0	200

Figure 6. Soil trace element concentrations in the 0-15 cm depth in the soil in the land application area.

It will be important to track the soil chromium concentrations. All of the soil analyses of the various land application sites in 2018 showed significantly increased chromium concentrations, despite either no, or very little application of biosolids. In addition, as will be demonstrated later in the land application plan, there is very little chromium added with the biosolids application. The elevated chromium concentrations appear to be characteristic of the Fraser River sediments, and are significantly higher for the 2018 samples than soil samples taken in previous years.

Biosolids Source and Characteristics

The Class A biosolids are produced at the JAMES Treatment Plant, a wastewater treatment plant that processes wastewater from the communities of Abbotsford and Mission.

JAMES Wastewater Treatment Plant, 5959 Gladwin Rd, Abbotsford B.C. V4X 1V9

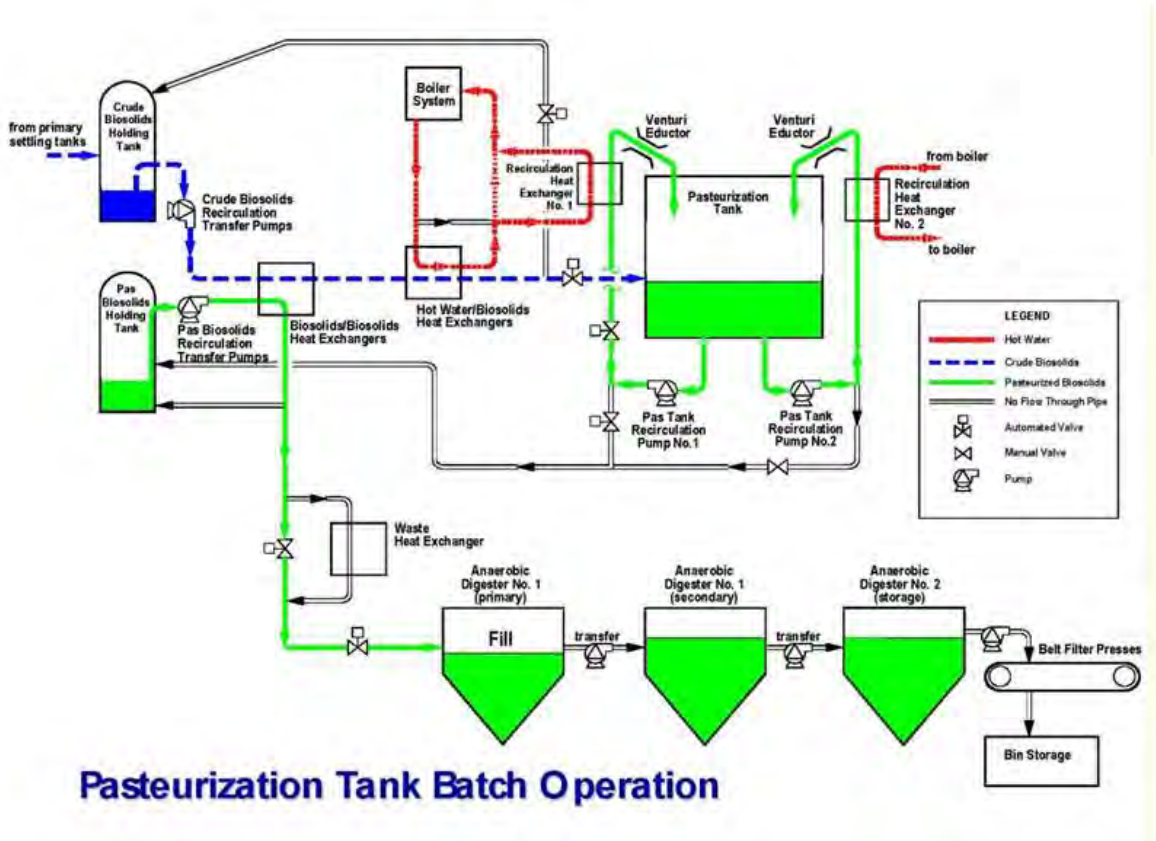

Figure 7. Biosolids processing flowsheet at the James Wastewater Treatment Plant
*(*http://www.abbotsford.ca/Assets/2014+Abbotsford/Engineering/Wastewater/Biosolids+Flow+Chart.pdf)

Pathogen Reduction Processes and Limits

The pathogen reduction process conforms with Schedule 1, Section 2 (f) of the Organic Matter Recycling Regulation, where it states:

"2. One of the following pathogen reduction methods is required for Class A biosolids or biosolids to produce biosolids growing medium: (f) the heat treatment of the biosolids must be 50 C or higher, and the time period must be 30 minutes or longer"

The process used at the JAMES Wastewater Treatment Plant is as follows (Appendix D). *"The pasteurization reactor operates at a temperature of 65 C and is batch-fed to maintain a retention time of at least one hour between sludge transfers. The volume of the tank provides approximately 18-24 hours retention time for pasteurization and conditioning of the sludge in advance of the anaerobic digestion process."*

Analyses of fecal coliforms are conducted by the City of Abbotsford on the biosolids before it is released from the wastewater plant (Appendix E). Biocentral as well as the professional

agrologist reserves the right to conduct any of its own testing of the biosolids to ensure that meets Class A requirements.

The average moisture content of the biosolids measured at time of production was 75.8% in 2017 (Figure 8) and 78.1% in the batch when it was shipped to this property (Appendix E). The moisture content at time of field application may change somewhat, either from the biosolids taking on more moisture, or from biosolids drying during storage.

Vector Attraction Reduction Processes and Limits

The vector attraction reduction process conforms with Schedule 2, Section 1 (a) of the Organic Matter Recycling Regulation, where it states:

"1. One of the following vector attraction reduction processes is required for Class A biosolids or Class B biosolids used to produce biosolids growing medium: (a) a digestion process (aerobic or anaerobic) resulting in the mass of volatile solids being reduced by more than 38 percent"

The process used at the JAMES Wastewater Treatment Plant is as follows (Appendix D). *"The anaerobic mesophilic digestion system at the JAMES Plant includes three digesters, with a total volume of 11,460 m3. Pasteurized and conditioned sludge from the pasteurized sludge holding tank is pump to the largest anaerobic digester and then is passed to the remaining two digesters in series."*

The volatile solids reduction results from the JAMES plant averaged 64% in 2017 (Appendix F).

Trace Elements and Nutrients

The general characteristics of the biosolids are noted in Figure 8. The biosolids are an excellent source of organic matter, as well as nitrogen and phosphorus, whereas the potassium concentration is low. Trace element concentrations meet OMRR Class A limits (Figure 9).

Characteristics of the Class A Biosolids		
Characteristic	**Unit**	**Value**
Moisture Content	%	75.8
Organic Matter	%	79.1
pH		6.4
EC	dS/m	3.56
C/N Ratio		5.4
Nitrogen (total)	%	7.69
Ammonium	mg/kg	7586
Phosphorus	%	1.11
Potassium	%	0.08
Sulphur	%	0.72

Figure 8. Characteristics of the Class A biosolids (2017 data)

Schedule 4 of the Organic Matter Recycling Regulation (OMRR) provides the guidance for the trace elements in the biosolids. Figure 9 shows the trace elements in the biosolids (including both the maximum and average concentrations monthly in 2017 analysis (Appendix G), compared with the standards (OMRR, and Trade Memorandum T-4-93). For the land application calculations, we have used the average concentration for 2017.

Trace Element Concentrations in the Class A Biosolids				
Element	Biosolids		Class A (OMRR)	Canada
	Max 2017	Avg 2017		T-4-93
	(mg/kg)		(mg/kg)	(mg/kg)
Arsenic	3.5	2.8	75	75
Cadmium	1.76	1.41	20	20
Chromium	60.1	30.2	1060	*not included*
Cobalt	3.27	2.3	150	150
Copper	655	528	2200	*not included*
Lead	22.9	19.5	500	500
Mercury	3.22	1.95	5	5
Molybdenum	7.82	6.2	20	20
Nickel	41.8	24.6	180	180
Selenium	5.31	4.46	14	14
Zinc	1050	828	1850	1850

Figure 9. Trace element concentrations in the Class A biosolids from the JAMES Wastewater Treatment Plant (maximums and averages for 2017. The limits for Class A biosolids (OMRR requirement) and the Canadian standards are also shown.

Figure 8 shows additional characteristics of the biosolids that are used for the land application plan, including and especially the nitrogen, phosphorus and potassium concentrations, which are important when considering the fertilizer value of the biosolids.

Foreign Matter

The Class A biosolids are free of foreign matter. Foreign matter is screened when the wastewater enters the treatment plant. According to Schedule 4 of the OMRR, Class A biosolids may not contain foreign matter greater than 1% dry weight and no sharp foreign matter, such as glass or metal shards, in a size and shape that may cause injury.

Biosolids Storage

The biosolids will be stored in compliance with OMRR Part 4, Division 1, Part 17 - 19, where it states:

"17. (1). If managed organic matter, which is to be applied to land under a land application plan, is stored on a farm or at some other site, it must be stored

a. in a storage facility in accordance with the requirements of section 18, or

b. at a storage site in accordance with the requirements of section 19.

(2) Managed organic matter must only be stored on a farm if all of the managed organic matter is used on that farm.

18. A storage facility must

a. be of sufficient capacity to store all the managed organic matter to be used on the land application site for the period of time needed for its application as a fertilizer or soil conditioner,

b. be located at least 15 m from any watercourse and at 30 m from any source of water for domestic purposes, and

c. maintained in such a manner to prevent escape of the managed organic matter.

19. (1). Managed organic matter may only be stored at a storage site as follows:

a. for not more than 2 weeks if it is (i) used within 2 weeks, and (ii) stored in a manner that prevents the escape of managed organic matter:

b. for more than 2 weeks if it is (i) stored for no longer than 9 months, (ii) located at least 30 meters from any watercourse or any source of water used for domestic purposes, and (iii) stored in a manner that prevents the escape of managed organic matter.

2. Berms or other works must be constructed around the storage site if necessary to prevent the escape of managed organic matter. "

The Class A biosolids will be stored in a manner that prevents the escape of the managed organic matter.

The transport of the biosolids will be managed in such a way as to prevent any biosolids being deposited on any public roadways. Although odour is not expected to be a concern, the biosolids will covered with a layer of wood chips or compost if required.

Biosolids Application

Season of Application

The biosolids will be applied during the spring of 2018 to allow optimal uptake of plant available nutrients during the growing season. The total amount of biosolids to be applied during 2018 will be a maximum of 55 wet tonnes per hectare. A total of up to 550 tonnes of Class A biosolids will be spread at this location in 2018.

Buffers

A 3 m buffer will be maintained around the perimeter of the spreading area. There are no domestic wells that we are aware of in the Matsqui floodplain.

Crop Nutrient Uptake

The crops grown on this farm will be forage corn grown for cattle feed in 2018. The Class A biosolids will be land applied to optimize their value as a fertilizer and a soil conditioner.

The land application plan will be based on nitrogen for the forage corn. Phosphorus and potassium application will also be addressed.

Nitrogen Requirements

Table 12 of the "Land Application Guidelines for the Organic Matter Recycling Regulation and the Soil Amendment Code of Practice" (Ministry of the Environment 2008), provides the guidance for nitrogen requirements for forages on soils of varying fertility in various areas of the province.

Based on an average yield of 20 tonnes of dry matter per hectare of corn on a high (normal) fertility site, the nitrogen requirement is 260 kg ha^{-1} per year.

Nitrogen Based Application Rate						
Yield Expectation and Nitrogen Uptake	Total		Available	Available N		
20 tonnes dry matter/ha yield of corn[a]	260	kg N/ha				
Nitrogen Availability in Biosolids						
Ammonium in biosolids	7.9	kg/tonne	60%	4.74		
Total N in biosolids	83.6	kg/tonne				
Organic N in Biosolids	75.7	kg/tonne	30%	22.71		
				27.45	kg/tonne available	
Amount of dry biosolids	9.5	dry tonnes per hectare				
	47.4	tonnes per hectare wet application				
[a] from Table 12 of the Land Application Guide (Ministry of Environment 2008)						
from page 174 of Land Application Guide (Ministry of Environment 2008)						

Figure 10 Estimated contribution of nitrogen with the biosolids application.

The total nitrogen content of the biosolids averages 7.69 % or 76.9 kg per dry tonne (2017 JAMES Plant Biosolids Quality Data). The amount of nitrogen available in the year of application ranges from 20 to 40%. Using an average availability of 30%, each dry tonne of biosolids provides almost 25 kg of nitrogen per hectare. An application rate of 12 tonnes of dry biosolids per hectare then provides an estimated 300 kg N per hectare, which is approximately the nitrogen requirements of the crop. Our experience is that with biosolids, the nitrogen availability is less than 30%.

Phosphorus Requirements

Guidelines for the application of phosphorous are provided in Sections 10.4.1.2 and Section 13.4.3 of the "Land Application Guidelines for the Organic Matter Recycling Regulation and the Soil Amendment Code of Practice".

The phosphorus content of the Class A biosolids averages 1.11 P (Figure 8). The application of 12 tonnes of Class A biosolids will provide approximately 305 kg P_2O_5 per hectare.

The soil analyses indicated that the phosphorus content of this farm was variable, with some areas being deficient, and other areas optimal. The soil phosphorus concentrations will continue to be monitored with subsequent biosolids applications.

Potassium

The total potassium in the biosolids were measured to be 0.08 ug/g (Appendix E in the Land Application Plan March 31, 2017). The plant available fraction of the potassium in biosolids is assumed to be 100% (Washington State Department of Ecology 2007)

Biosolids Application Rate

The application rate for the Class A biosolids is 55 wet tonnes per hectare, or 12 tonnes of dry matter per hectare based on an average moisture content of 78%. This application rate will provide an estimated 925 kg of total N per hectare. An estimated 30% of the total nitrogen is estimated to become available to the crop in the first year. Subsequent application rates of biosolids will be adjusted as required according to the amount of soluble N remaining in the soil in the fall.

Trace Metal Applications

The application rate of 55 tonnes (12 tonnes of dry matter) per hectare of Class A biosolids will provide the following amounts of trace elements as per Figure 11 below.

		Addition	**Post**	Limits
	Metals in Soil	**from Biosolids**	**Application**	OMRR[b]
	(mg/kg)[a]	(mg/kg)	(mg/kg)	(mg/kg)
Arsenic	11.10	0.017	11.12	15
Cadmium	0.62	0.009	0.63	9
Chromium	97.00	0.186	97.19	60
Cobalt	15.97	0.014	15.98	40
Copper	52.83	3.25	56.08	150
Lead	12.75	0.120	12.87	350
Mercury	0.067	0.012	0.08	0.6
Molybdenum	0.99	0.038	1.03	5
Nickel	48.83	0.151	48.98	100
Selenium	1.04	0.027	1.07	2
Zinc	113.00	5.10	118.10	200
[a] average of 6 samples				
[b] OMRR Schedules 9 and 10 using most conservative limits				
[c] plant uptake not included in calculation				

Figure 11. Effect of a 12 tonne DM application of Class A biosolids on trace elements in the soil.

As mentioned in a previous section, it will be important to track the soil chromium concentrations. All of the soil analyses of the various land application sites in 2018 showed significantly increased chromium concentrations, despite either no, or very little application of biosolids (i.e Figure 8). In addition, there is very little chromium added with the biosolids application. The elevated chromium concentrations appear to be characteristic of the Fraser River sediments, and are significantly higher for the 2018 samples than soil samples taken in previous years.

Other Inputs to the Farm

There are no other inputs of organic matter to the land on this farm. Additional fertilizer nitrogen may be required depending on the availability of the nitrogen in the biosolids. Additional potassium may be required as well.

The post application soil sampling of the fields will determine the amount of soluble nitrogen remaining in the soil before the fall rains. Future land application plans for this property will also be adjusted for post harvest soil nutrient contents.

Post Application Monitoring of the Site

Crop yields will be estimated during the growing season to verify the amount of forage harvested from the property. Post application soil samples will be taken in the fall to estimate accumulation of trace elements as well as residual nitrate in the soil. This soil information will be used to determine additional Class A biosolids applications in subsequent years.

The post application report will also provide information on actual application rates, including moisture contents of the biosolids at the time of application.

Minimizing Potential for Adverse Environmental Impacts

There are two potential adverse environmental impacts from the land application:

1. Risk of the biosolids not meeting Class A requirements

   Each batch of biosolids produced at the JAMES Treatment Plant is tested for fecal coliform before release for land application, as per OMRR requirements. This means that the biosolids are stored for 1-4 months at the JAMES Treatment Plant in order for the biosolids to meet Class A requirements for fecal coliform.

   There is little or no risk of the Class A biosolids becoming Class B due to microbial regrowth, as the biosolids are very stable before being released from the facility. In the potential event that the biosolids were actually Class B. the biosolids would be stored for a longer period of time, and retested before application to ensure that Class A requirements were met. In the potential event that the biosolids were actually Class B following spreading, the requirements of OMRR Schedule 8 would apply.

2. Risk of over application of biosolids

   The risk of over application of Class A biosolids has limited potential negative environmental effect. In the Land Application Plans, the biosolids are applied on the basis of optimizing the nitrogen value of the biosolids. Although it is possible that a higher rate of biosolids application may increase the potential for nitrogen leaching,

the nitrogen in biosolids has limited availability. This must also be understood in the context of Class A biosolids growing medium, which can be applied without volume restrictions and is not applied on the basis of agronomic utilization of the nitrogen or phosphorous contained in the biosolids.

In summary, the potential adverse effects of land application of Class A biosolids are minimal, and are controlled by appropriate testing, storage and application.

Sampling and Analysis

Schedule 5 of OMRR requires that the Class A biosolids be analyzed at least every 1000 tonnes of dry weight of organic matter, or once per year. Schedule 5 also states that "All analysis must be in accordance with the procedures described in "British Columbia Laboratory Methods Manual: 2003 – for the Analysis of Water, Wastewater, Sediment, Biological Material and Discrete Ambient Air Samples""

The City of Abbotsford follows the requirements of Schedule 5 of OMRR: The following represents their sampling schedule:

JAMES Biosolids Testing Schedule (Biosolids prior to centrifugation)

Weekly Testing:

- *Total Metals (including total Mercury)*
- *Fecal Coliform (reported as MPN/g dry weight)*
- *Salmonella*

Monthly Testing:

- *Total Metals (including total Mercury)*
- *Total Phosphorus (%)*
- *Total Kjeldahl Nitrogen (%)*
- *Total Potassium (%)*
- *Total Sulphur (%)*
- *Total Carbon (%)*
- *Total Organic Matter (%)*
- *Moisture (%)*
- *Ammonia (available - %)*
- *Nitrate (available – mg/kg)*
- *pH*
- *Conductivity*
- *C/N Ratio*

JAMES Biosolids Testing Schedule (Biosolids after centrifugation - Stored)

Monthly Testing:

- *Fecal Coliform (reported as MPN/g dry weight)*

Additional testing (Fecal Coliform only) will be done on the biosolids after storage and before it is released to ensure that it meets Class A.

Biocentral will be taking random sampling to ensure that the biosolids meet Class A standards.

Record Keeping

The City of Abbotsford records temperatures and retention times for the production of Class A biosolids, as per Schedule 6 (1) of the OMRR. All records for the production of the Class A biosolids will be stored at the JAMES Wastewater Treatment Plant for a minimum of 36 months, as per Schedule 6 (2) and (3).

The Land Application Plan, and all associated information will be kept at the Land Application Site, and will also be stored at the offices of the Qualified Professional, as well as at Biocentral's offices.

Role of the Qualified Professional

The qualified professional will oversee the storage and land application of the biosolids, including site inspections of the actual land application. He may also request plant yield data, as well as direct post harvest soil sampling to determine the post sampling soil concentrations of nutrients and trace elements. The qualified professional reserves the right to request verification of the Class A status of the biosolids at any time. The qualified professional will provide a post application report in early 2018.

Summary

This Land Application Plan provides a beneficial reuse of Class A biosolids, which are a valuable source of nitrogen, phosphorus, micronutrients and organic matter. The risk of environmental concern at this location is very low because of the quality of the Class A biosolids being applied and the proximity to water bodies and water sources.

Storage and transportation of the Class A biosolids is also not considered a concern because of the low fecal coliform count and the lack of significant odour in the biosolids.

This Land Application Plan was prepared by:

John Paul, PhD PAg

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BRITISH COLUMBIA | Ministry of Environment

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 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 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 of Environment 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 Branch PO Box 9377 Stn Prov Govt Victoria, BC V8W 9M1 **Email:** PermitAdministration.VictoriaEPD@gov.bc.ca	Ministry of Environment Environmental Protection Division Business Services Branch 3rd Floor, 2975 Jutland Road Victoria, BC V8T 5J9

Section 1: Purpose of Notification

***Application Type** (check one)	☒ New notification ☐ Change in information to an existing notification (provide authorization #)	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*	Westview Dairy Farms Ltd			2
OR * Individual's Full Legal Name				3
Doing Business As *if applicable*	Westview Dairy Farms			4
Incorporation Number *as registered with the BC Registrar of Companies (if applicable)*	BC0355314			5
***Contact Numbers** *e.g. (999) 999-9999*	Phone 604-852-9004	Mobile 604-302-2295		6
***Email Address** *generic company email address*	westreit@shaw.ca			7
***Legal Address** *as registered with BC Registrar of Companies*	Unit # / Street 32321 Townshipline Rd			8
	City Abbotsford	Province BC	Postal Code V4X 1W5	9

***Mailing Address** *if different from above*	☒ Same as Legal Address			10
	Unit # / Street			11
	City	Province	Postal Code	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*	westreit@shaw.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	Reitsma			1
Contact's First Name	Wayne			2
Contact's Title				3
Mailing Address	☒ Mailing address is the same as Section 2 above			4
	Unit # / Street			5
	City	Province	Postal Code	6
Contact Numbers *e.g. (999) 999-9999*	Phone: 604-852-9004	Mobile: 604-302-2295		7
Email Address	westreit@shaw.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*	Transform Compost Systems Ltd.			1
Doing Business As *if different than above*				2
Agent's Last Name	Paul			3
Agent's First Name	John			4
Agent's Title	President			5
Mailing Address	Unit # / Street 3911 Mt. Lehman Rd			6
	City Abbotsford	Province BC	Postal Code V2T 5W5	7
Contact Numbers *e.g. (999) 999-9999*	Phone 604-856-2722	Mobile 604-302-4367		8
Email Address	transform@telus.net			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*	Wayne Reitsema	10
Date signed	Aug 8 / 2017	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 solids
- Waste Discharge Regulation Schedule: 2 "soil enhancement using wastes"

***Regional District**	Fraser Valley Regional District		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 49.0845	Longitude (e.g., 116.8177) W 122.3342	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 8, Plan NWP 03829 NWD District Lot 402 Group 2		4
PID/PIN/Crown File No.	PID 011-014-491		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)* 4506 Glenmore Rd, Abbotsford, BC V4X 1X6		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	Wayne and Juanita Reitsma	5

Legal Land Owner Contact Numbers *e.g. (999) 999-9999*	Phone: Wayne Reitsma	Mobile: 604-302-2295	6
Legal Land Owner Email Address	westreit@shaw.ca		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**	No	12
***Description of the managed organic matter to be applied**	Class A biosolids	13

***Intended date(s) for land application for that year**	2018-04-15 (yyyy-mm-dd)		14
***Application rates**	10 dt/hectare		15
	dt/hectare		16
	dt/hectare		17
***Cumulative additions for that year of substances listed in Schedule 4 of the Organic Matter Recycling Regulation**	**Substance**	**Concentration (µg/g dry weight)**	18
	Arsenic	0.017	
	Cadmium	0.007	
	Chromium	0.144	
	Cobalt	0.011	
	Copper	2.81	
	Lead	0.104	
	Mercury	0.009	
	Molybdenum	0.042	
	Nickel	0.085	
	Selenium	0.022	
	Zinc	4.43	
***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:

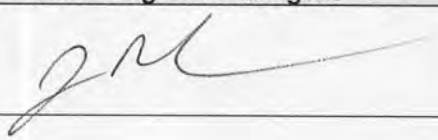
   a) this registration form,
   b) any document that the Registrant submits or causes to be submitted to the Province or the Director in support of this registration, and
   c) any document that the Registrant submits or causes to be submitted to the Director or the Province pursuant to
      i. any regulation 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 Ministry of Environment 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
John Paul		September 15, 2017


4506 Glenmore Rd
Westview Dairy Farms Ltd
4506 Glenmore Rd
Google Earth
©2017 Google
N
500 m


4506 Glenmore Rd
Soil sampling March 2018
Legend
Crop perimeter
Sampling point
S1
S2
S3
S4
S5
S6
Glenmore Rd
300 m
N
Google Earth
©2018 Google

Appendix B

Exova
#104, 19575-55 A Ave.
Surrey, British Columbia
V3S 8P8, Canada

T: +1 (604) 514-3322
F: +1 (604) 514-3323
E: Surrey@exova.com
W: www.exova.com

Appendix C

Report Transmission Cover Page

Bill To:	Timbro Contracting (A	Project ID:	James	Lot ID:	**1260211**
	P.O. Box 95	Project Name:	4506 Glenmore Rd	Control Number:	C117484
	7357 Pioneer Avenue	Project Location:	Abbotsford	Date Received:	Mar 17, 2018
	Agassiz, BC, Canada	LSD:		Date Reported:	Mar 28, 2018
	V0M 1A0	P.O.:	14132	Report Number:	2274096
Attn:	Accounts Payable	Proj. Acct. code:			
Sampled By:	Andres M.				
Company:	Biocentral				

Contact	Company	Address
Accounts Payable	**Timbro Contracting (A Partnership)**	P.O. Box 95, 7357 Pioneer Avenue Agassiz, BC V0M 1A0 Phone: (604) 796-3851 Fax: (604) 796-0554 Email: info@timbroconstruction.com

Delivery	Format	Deliverables
Email - Single Report	PDF	Invoice

Contact	Company	Address
Andres Moreno	**Timbro Contracting (A Partnership)**	P.O. Box 95, 7357 Pioneer Avenue Agassiz, BC V0M 1A0 Phone: (604) 796-3851 Fax: (604) 796-0554 Email: andresm@biocentral.ca

Delivery	Format	Deliverables
Email - Merge Reports	PDF	COC / Test Report
Email - Single Report	Standard Crosstab	Test Report

Contact	Company	Address
Andres Murillo	**Timbro Contracting (A Partnership)**	P.O. Box 95, 7357 Pioneer Avenue Agassiz, BC V0M 1A0 Phone: (604) 796-3851 Fax: (604) 796-0554 Email: andres@timbroconstruction.com

Delivery	Format	Deliverables
Email - Single Report	PDF	COR

Contact	Company	Address
Frank Trevr	**Timbro Contracting (A Partnership)**	P.O. Box 95, 7357 Pioneer Avenue Agassiz, BC V0M 1A0 Phone: (604) 991-3782 Fax: Email: frank@timbroconstruction.com

Delivery	Format	Deliverables
Email - Merge Reports	PDF	COC / Test Report
Email - Single Report	PDF	COR
Email - Single Report	Standard Crosstab	Test Report

Notes To Clients:

- Mar 28, 2018 - Report was issued to correct for missing metal analysis on samples 1260211-1 to 6. Previous report 2274096.

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V3S 8P8, Canada

T: +1 (604) 514-3322
F: +1 (604) 514-3323
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Analytical Report

Bill To:	Timbro Contracting (A	Project ID:	James	Lot ID:	**1260211**
	P.O. Box 95	Project Name:	4506 Glenmore Rd	Control Number:	C117484
	7357 Pioneer Avenue	Project Location:	Abbotsford	Date Received:	Mar 17, 2018
	Agassiz, BC, Canada	LSD:		Date Reported:	Mar 28, 2018
	V0M 1A0	P.O.:	14132	Report Number:	2274096
Attn:	Accounts Payable	Proj. Acct. code:			
Sampled By:	Andres M.				
Company:	Biocentral				

Reference Number	1260211-19710	1260211-19711	1260211-19712
Sample Date	Mar 16, 2018	Mar 16, 2018	Mar 16, 2018
Sample Time	NA	NA	NA
Sample Location			
Sample Description	James - 4506 Glenmore Rd / S1 / 0 / 5 / E / 1	James - 4506 Glenmore Rd / S2 / 0 / 5 / E / 1	James - 4506 Glenmore Rd / S3 / 0 / 5 / E / 1
Matrix	Farm Soil	Farm Soil	Farm Soil

Analyte		Units	Results	Results	Results	Nominal Detection Limit
Aggregate Organic Constituents						
Organic Matter	LOI	% by weight	19.3	3.0	13.0	0.1
Available Nutrients						
Nitrate - N	Farmsoil	ppm	6	2	6	2
Phosphorus	Farmsoil	ppm	63	29	37	5
Potassium	Farmsoil	ppm	89	525	148	25
Sulfate-S	Farmsoil	ppm	6	3	2	1
Copper	FS Micro-nutrients	ppm	1.9	5.7	3.0	0.1
Iron	FS Micro-nutrients	ppm	339	202	390	2
Manganese	FS Micro-nutrients	ppm	1.4	11.8	1.8	0.1
Zinc	FS Micro-nutrients	ppm	2.7	2	1	0.5
Base saturation	FS Base Saturation	%	29.5	87.7	39.4	
Calcium	FS Base Saturation	%	24.1	51.9	28.6	
Magnesium	FS Base Saturation	%	4.3	26.6	8.9	
Sodium	FS Base Saturation	%	<0.6	<0.9	<0.7	
Potassium	FS Base Saturation	%	1.1	9.2	1.9	
TEC	FS Base Saturation	meq/100 g	21.0	14.7	20.0	
Calcium	FS Macro-nutrients	ppm	1020	1520	1150	30
Magnesium	FS Macro-nutrients	ppm	109	475	216	5
Sodium	FS Macro-nutrients	ppm	<30	<30	<30	30
Boron	FS Micro-nutrients	ppm	0.5	0.4	0.4	0.1
Classification						
Nitrogen	Total	%	0.81	0.25	0.52	0.02
Hot Water Soluble						
Boron	FS Micro-nutrients	ppm	0.5	0.4	0.4	0.1
Metals Strong Acid Digestion						
Antimony	Strong Acid Extractable	µg/g	2	3	3	1.5
Arsenic	Strong Acid Extractable	µg/g	11	5.9	20	0.35
Barium	Strong Acid Extractable	µg/g	220	200	270	0.2
Beryllium	Strong Acid Extractable	µg/g	0.82	0.57	0.96	0.01
Cadmium	Strong Acid Extractable	µg/g	0.67	0.3	0.88	0.05
Chromium	Strong Acid Extractable	µg/g	87	88	110	0.1
Cobalt	Strong Acid Extractable	µg/g	9.8	18	15	0.1
Copper	Strong Acid Extractable	µg/g	46	43	51	0.1
Lead	Strong Acid Extractable	µg/g	14	6.5	13	0.5
Mercury	Strong Acid Extractable	µg/g	0.088	0.052	0.077	0.003
Molybdenum	Strong Acid Extractable	µg/g	0.58	0.88	0.2	0.1

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#104, 19575-55 A Ave.
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Analytical Report

Bill To:	Timbro Contracting (A	Project ID:	James	Lot ID:	**1260211**
	P.O. Box 95	Project Name:	4506 Glenmore Rd	Control Number:	C117484
	7357 Pioneer Avenue	Project Location:	Abbotsford	Date Received:	Mar 17, 2018
	Agassiz, BC, Canada	LSD:		Date Reported:	Mar 28, 2018
	V0M 1A0	P.O.:	14132	Report Number:	2274096
Attn:	Accounts Payable	Proj. Acct. code:			
Sampled By:	Andres M.				
Company:	Biocentral				

Reference Number	1260211-19710	1260211-19711	1260211-19712
Sample Date	Mar 16, 2018	Mar 16, 2018	Mar 16, 2018
Sample Time	NA	NA	NA
Sample Location			
Sample Description	James - 4506 Glenmore Rd / S1 / 0 / 5 / E / 1	James - 4506 Glenmore Rd / S2 / 0 / 5 / E / 1	James - 4506 Glenmore Rd / S3 / 0 / 5 / E / 1
Matrix	Farm Soil	Farm Soil	Farm Soil

Analyte		Units	Results	Results	Results	Nominal Detection Limit
Metals Strong Acid Digestion - Continued						
Nickel	Strong Acid Extractable	µg/g	35	50	46	0.25
Phosphorus	Strong Acid Extractable	µg/g	2000	910	1500	0.5
Potassium	Strong Acid Extractable	µg/g	1100	2000	1200	2
Selenium	Strong Acid Extractable	µg/g	1	2	0.7	0.5
Silver	Strong Acid Extractable	µg/g	<0.4	<0.4	<0.4	0.4
Strontium	Strong Acid Extractable	µg/g	35	43	42	0.05
Thallium	Strong Acid Extractable	µg/g	<0.5	<0.5	<0.5	0.5
Tin	Strong Acid Extractable	µg/g	<0.5	<0.5	<0.5	0.5
Vanadium	Strong Acid Extractable	µg/g	110	90	120	0.2
Zinc	Strong Acid Extractable	µg/g	83	86	99	0.05
Soil Acidity						
pH	1:2 Soil:Water	pH	5.3	6.5	5.4	
Electrical Conductivity	Sat. Paste equiv based on 1:2	dS/m at 25 °C	0.2	0.2	0.2	0.02
Water Soluble Parameters						
Chloride	Available	mg/kg	5	4	5	0.5
Lime Requirement						
pH	SMP	pH	5.5	6.8	5.8	
Lime		T/ac	7.3	0.7	5.2	

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Analytical Report

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	P.O. Box 95	Project Name:	4506 Glenmore Rd	Control Number:	C117484
	7357 Pioneer Avenue	Project Location:	Abbotsford	Date Received:	Mar 17, 2018
	Agassiz, BC, Canada	LSD:		Date Reported:	Mar 28, 2018
	V0M 1A0	P.O.:	14132	Report Number:	2274096
Attn:	Accounts Payable	Proj. Acct. code:			
Sampled By:	Andres M.				
Company:	Biocentral				

Reference Number	1260211-19713	1260211-19714	1260211-19715
Sample Date	Mar 16, 2018	Mar 16, 2018	Mar 16, 2018
Sample Time	NA	NA	NA
Sample Location			
Sample Description	James - 4506 Glenmore Rd / S4 / 0 / 5 / E / 1	James - 4506 Glenmore Rd / S5 / 0 / 5 / E / 1	James - 4506 Glenmore Rd / S6 / 0 / 5 / E / 1
Matrix	Farm Soil	Farm Soil	Farm Soil

Analyte		Units	Results	Results	Results	Nominal Detection Limit
Aggregate Organic Constituents						
Organic Matter	LOI	% by weight	17.0	11.9	15.1	0.1
Available Nutrients						
Nitrate - N	Farmsoil	ppm	4	5	6	2
Phosphorus	Farmsoil	ppm	41	43	22	5
Potassium	Farmsoil	ppm	117	86	65	25
Sulfate-S	Farmsoil	ppm	1	1	<1	1
Copper	FS Micro-nutrients	ppm	3.5	4.7	2.3	0.1
Iron	FS Micro-nutrients	ppm	182	212	143	2
Manganese	FS Micro-nutrients	ppm	13.2	5.9	4.1	0.1
Zinc	FS Micro-nutrients	ppm	5.3	3.4	3.5	0.5
Base saturation	FS Base Saturation	%	38.0	28.5	30.7	
Calcium	FS Base Saturation	%	30.1	22.4	26.5	
Magnesium	FS Base Saturation	%	6.6	4.9	3.4	
Sodium	FS Base Saturation	%	<0.6	<0.7	<0.7	
Potassium	FS Base Saturation	%	1.3	1.1	0.8	
TEC	FS Base Saturation	meq/100 g	22.7	19.3	19.8	
Calcium	FS Macro-nutrients	ppm	1370	867	1050	30
Magnesium	FS Macro-nutrients	ppm	182	115	82	5
Sodium	FS Macro-nutrients	ppm	<30	<30	<30	30
Boron	FS Micro-nutrients	ppm	0.6	0.5	0.5	0.1
Classification						
Nitrogen	Total	%	0.72	0.49	0.63	0.02
Hot Water Soluble						
Boron	FS Micro-nutrients	ppm	0.6	0.5	0.5	0.1
Metals Strong Acid Digestion						
Antimony	Strong Acid Extractable	µg/g	3	3	3	1.5
Arsenic	Strong Acid Extractable	µg/g	11	10	8.7	0.35
Barium	Strong Acid Extractable	µg/g	260	220	210	0.2
Beryllium	Strong Acid Extractable	µg/g	0.93	0.79	0.80	0.01
Cadmium	Strong Acid Extractable	µg/g	0.64	0.58	0.64	0.05
Chromium	Strong Acid Extractable	µg/g	100	99	98	0.1
Cobalt	Strong Acid Extractable	µg/g	20	16	17	0.1
Copper	Strong Acid Extractable	µg/g	64	58	55	0.1
Lead	Strong Acid Extractable	µg/g	15	14	14	0.5
Mercury	Strong Acid Extractable	µg/g	0.073	0.060	0.054	0.003
Molybdenum	Strong Acid Extractable	µg/g	1.9	1.1	1.3	0.1

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Analytical Report

Bill To:	Timbro Contracting (A	Project ID:	James	Lot ID:	**1260211**
	P.O. Box 95	Project Name:	4506 Glenmore Rd	Control Number:	C117484
	7357 Pioneer Avenue	Project Location:	Abbotsford	Date Received:	Mar 17, 2018
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	V0M 1A0	P.O.:	14132	Report Number:	2274096
Attn:	Accounts Payable	Proj. Acct. code:			
Sampled By:	Andres M.				
Company:	Biocentral				

Reference Number	1260211-19713	1260211-19714	1260211-19715
Sample Date	Mar 16, 2018	Mar 16, 2018	Mar 16, 2018
Sample Time	NA	NA	NA
Sample Location			
Sample Description	James - 4506 Glenmore Rd / S4 / 0 / 5 / E / 1	James - 4506 Glenmore Rd / S5 / 0 / 5 / E / 1	James - 4506 Glenmore Rd / S6 / 0 / 5 / E / 1
Matrix	Farm Soil	Farm Soil	Farm Soil

Analyte		Units	Results	Results	Results	Nominal Detection Limit
Metals Strong Acid Digestion - Continued						
Nickel	Strong Acid Extractable	µg/g	54	50	58	0.25
Phosphorus	Strong Acid Extractable	µg/g	2000	1800	1800	0.5
Potassium	Strong Acid Extractable	µg/g	1400	1400	1500	2
Selenium	Strong Acid Extractable	µg/g	0.7	0.8	<0.5	0.5
Silver	Strong Acid Extractable	µg/g	<0.4	<0.4	<0.4	0.4
Strontium	Strong Acid Extractable	µg/g	36	36	33	0.05
Thallium	Strong Acid Extractable	µg/g	<0.5	<0.5	<0.5	0.5
Tin	Strong Acid Extractable	µg/g	<0.5	<0.5	<0.5	0.5
Vanadium	Strong Acid Extractable	µg/g	120	110	100	0.2
Zinc	Strong Acid Extractable	µg/g	140	130	140	0.05
Soil Acidity						
pH	1:2 Soil:Water	pH	5.5	5.3	5.4	
Electrical Conductivity	Sat. Paste equiv based on 1:2	dS/m at 25 °C	0.1	0.1	0.1	0.02
Water Soluble Parameters						
Chloride	Available	mg/kg	5	4	4	0.5
Lime Requirement						
pH	SMP	pH	5.6	5.6	5.6	
Lime		T/ac	6.7	6.5	6.4	

Approved by:

Mathieu Simoneau
Operations Manager

Data have been validated by Analytical Quality Control and Exova's Integrated Data Validation System (IDVS).
Generation and distribution of the report, and approval by the digitized signature above, are performed through a secure and controlled automatic process.

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#104, 19575-55 A Ave.
Surrey, British Columbia
V3S 8P8, Canada

T: +1 (604) 514-3322
F: +1 (604) 514-3323
E: Surrey@exova.com
W: www.exova.com

Quality Control

Bill To:	Timbro Contracting (A	Project ID:	James	Lot ID:	**1260211**
	P.O. Box 95	Project Name:	4506 Glenmore Rd	Control Number:	C117484
	7357 Pioneer Avenue	Project Location:	Abbotsford	Date Received:	Mar 17, 2018
	Agassiz, BC, Canada	LSD:		Date Reported:	Mar 28, 2018
	V0M 1A0	P.O.:	14132	Report Number:	2274096
Attn:	Accounts Payable	Proj. Acct. code:			
Sampled By:	Andres M.				
Company:	Biocentral				

Aggregate Organic Constituents

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Organic Matter	% by weight	17.0	17.1	10	0.1	yes
Date Acquired:	March 21, 2018					

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Organic Matter	% by weight	4.9	4.2	5.7	yes
Date Acquired:	March 21, 2018				

Available Nutrients

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Nitrate - N	mg/L	0.085	-1	1	yes
Phosphorus	mg/L	0.056	-4	5	yes
Potassium	mg/L	-0.225	-3	10	yes
Sulfate-S	mg/L	0.449	-1	1	yes
Copper	mg/L	0.0132	-0.1	0.1	yes
Iron	mg/L	0.0868	-2.0	2.0	yes
Manganese	mg/L	0.0039	-0.1	0.1	yes
Zinc	mg/L	0.0104	-0.5	0.5	yes
Calcium	mg/L	0.7181	-1	3	yes
Magnesium	mg/L	0.1219	-0	0	yes
Sodium	mg/L	1.418	-1	3	yes
Boron	mg/L	0.0168297	-0.2	0.2	yes
Date Acquired:	March 21, 2018				

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Nitrate - N	ppm	5	4	10	2	yes
Phosphorus	ppm	57	56	10	5	yes
Potassium	ppm	95	87	10	10	yes
Sulfate-S	ppm	<1	<1	15	2	yes
Copper	ppm	4.6	4.5	10	0.1	yes
Iron	ppm	204	203	10	0.1	yes
Manganese	ppm	5.6	5.5	10	0.0	yes
Zinc	ppm	4.0	4.0	10	0.0	yes
Calcium	ppm	2300	2250	10	3	yes
Magnesium	ppm	32	31	10	3	yes
Sodium	ppm	<30	<30	10	18	yes
Boron	ppm	0.5	0.5	10	0.1	yes
Date Acquired:	March 21, 2018					

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Nitrate - N	ppm	36	29	40	yes
Phosphorus	ppm	30	27	34	yes
Potassium	ppm	201	168	224	yes
Sulfate-S	ppm	729	620	770	yes
Copper	ppm	1.8	1.5	1.9	yes
Iron	ppm	197	154.3	213.7	yes
Manganese	ppm	46.9	35.8	52.1	yes

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Quality Control

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	P.O. Box 95	Project Name:	4506 Glenmore Rd	Control Number:	C117484
	7357 Pioneer Avenue	Project Location:	Abbotsford	Date Received:	Mar 17, 2018
	Agassiz, BC, Canada	LSD:		Date Reported:	Mar 28, 2018
	V0M 1A0	P.O.:	14132	Report Number:	2274096
Attn:	Accounts Payable	Proj. Acct. code:			
Sampled By:	Andres M.				
Company:	Biocentral				

Available Nutrients - Continued

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Zinc	ppm	3.4	2.8	3.8	yes
Calcium	ppm	6310	5530	6752	yes
Magnesium	ppm	596	495	670	yes
Sodium	ppm	88	68	94	yes
Boron	ppm	1.1	0.8	1.5	yes
Date Acquired:	March 21, 2018				
Nitrate - N	ppm	4	3	4	yes
Phosphorus	ppm	3	2	4	yes
Potassium	ppm	31	24	36	yes
Sulfate-S	ppm	1	1	1	yes
Copper	ppm	0.5	0.4	0.6	yes
Iron	ppm	5.2	4.5	5.5	yes
Manganese	ppm	1.0	0.9	1.1	yes
Zinc	ppm	0.5	0.4	0.6	yes
Calcium	ppm	11	9	11	yes
Magnesium	ppm	10	9	11	yes
Sodium	ppm	10	9	11	yes
Date Acquired:	March 21, 2018				
Sulfate-S	ppm	53	40	60	yes
Date Acquired:	March 21, 2018				

Classification

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Nitrogen		0.01141	-0.020	0.020	yes
Date Acquired:	March 20, 2018				

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Nitrogen	%	0.81	0.76	0	2.500	yes
Date Acquired:	March 20, 2018					

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Nitrogen	%	0.52	0.465	0.551	yes
Date Acquired:	March 20, 2018				

Hot Water Soluble

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Boron	mg/L	0.0173536	-0.2	0.2	yes
Date Acquired:	March 21, 2018				

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Boron	ppm	1.2	0.8	1.5	yes
Date Acquired:	March 21, 2018				
Boron	ppm	0.1	0.1	0.1	yes
Date Acquired:	March 21, 2018				

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	P.O. Box 95	Project Name:	4506 Glenmore Rd	Control Number:	C117484
	7357 Pioneer Avenue	Project Location:	Abbotsford	Date Received:	Mar 17, 2018
	Agassiz, BC, Canada	LSD:		Date Reported:	Mar 28, 2018
	V0M 1A0	P.O.:	14132	Report Number:	2274096
Attn:	Accounts Payable	Proj. Acct. code:			
Sampled By:	Andres M.				
Company:	Biocentral				

Lime Requirement

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
pH	pH	7.3	7.2	7.3	yes
Date Acquired:	March 21, 2018				

Metals Strong Acid Digestion

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Antimony	mg/L	-0.000457259	-0.030	0.030	yes
Arsenic	mg/L	-0.00681021	-0.007	0.007	yes
Barium	mg/L	0.000364058	-0.004	0.004	yes
Beryllium	mg/L	8.8897e-006	-0.000	0.000	yes
Cadmium	mg/L	0.000506602	-0.001	0.001	yes
Chromium	mg/L	0.00121838	-0.002	0.002	yes
Cobalt	mg/L	0.00018497	-0.002	0.002	yes
Copper	mg/L	0.000561406	-0.002	0.002	yes
Lead	mg/L	0.00031064	-0.010	0.010	yes
Mercury	µg/L	-0.009	-0.030	0.030	yes
Molybdenum	mg/L	-0.00165603	-0.002	0.002	yes
Nickel	mg/L	0.00163925	-0.005	0.005	yes
Phosphorus	mg/L	0.00141149	-0.010	0.010	yes
Selenium	mg/L	0.00427062	-0.010	0.010	yes
Silver	mg/L	0.000747588	-0.008	0.008	yes
Strontium	mg/L	9.63792e-005	-0.000	0.000	yes
Thallium	mg/L	-0.00544639	-0.010	0.010	yes
Tin	mg/L	-0.00101922	-0.010	0.010	yes
Vanadium	mg/L	-0.000491746	-0.004	0.004	yes
Zinc	mg/L	0.000670545	-0.001	0.001	yes
Date Acquired:	March 21, 2018				

Calibration Check	Units	% Recovery	Lower Limit	Upper Limit	Passed QC
Antimony	mg/L	92.75	90	110	yes
Arsenic	mg/L	99.77	90	110	yes
Barium	mg/L	100.62	90	110	yes
Beryllium	mg/L	95.64	90	110	yes
Cadmium	mg/L	98.42	90	110	yes
Chromium	mg/L	99.43	90	110	yes
Cobalt	mg/L	97.78	90	110	yes
Copper	mg/L	100.17	90	110	yes
Lead	mg/L	95.05	90	110	yes
Molybdenum	mg/L	97.38	90	110	yes
Nickel	mg/L	95.39	90	110	yes
Phosphorus	mg/L	99.62	90	110	yes
Selenium	mg/L	99.53	90	110	yes
Silver	mg/L	96.35	90	110	yes
Thallium	mg/L	94.80	90	110	yes
Tin	mg/L	92.47	90	110	yes
Vanadium	mg/L	100.00	90	110	yes

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Quality Control

Bill To:	Timbro Contracting (A	Project ID:	James	Lot ID:	**1260211**
	P.O. Box 95	Project Name:	4506 Glenmore Rd	Control Number:	C117484
	7357 Pioneer Avenue	Project Location:	Abbotsford	Date Received:	Mar 17, 2018
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	V0M 1A0	P.O.:	14132	Report Number:	2274096
Attn:	Accounts Payable	Proj. Acct. code:			
Sampled By:	Andres M.				
Company:	Biocentral				

Metals Strong Acid Digestion - Continued

Calibration Check	Units	% Recovery	Lower Limit	Upper Limit	Passed QC
Zinc	mg/L	93.78	90	110	yes
Date Acquired:	March 21, 2018				
Antimony	mg/L	91.35	90	110	yes
Arsenic	mg/L	101.01	90	110	yes
Barium	mg/L	100.35	90	110	yes
Beryllium	mg/L	94.49	90	110	yes
Cadmium	mg/L	100.38	90	110	yes
Chromium	mg/L	100.00	90	110	yes
Cobalt	mg/L	99.21	90	110	yes
Copper	mg/L	101.15	90	110	yes
Lead	mg/L	98.13	90	110	yes
Mercury	µg/L	92.60	90	110	yes
Molybdenum	mg/L	98.05	90	110	yes
Nickel	mg/L	98.98	90	110	yes
Phosphorus	mg/L	99.88	90	110	yes
Selenium	mg/L	106.38	90	110	yes
Silver	mg/L	93.29	90	110	yes
Strontium	mg/L	97.60	90	110	yes
Thallium	mg/L	96.23	90	110	yes
Tin	mg/L	93.02	90	110	yes
Vanadium	mg/L	99.75	90	110	yes
Zinc	mg/L	94.61	90	110	yes
Date Acquired:	March 21, 2018				

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Antimony	µg/g	3	4	30	3.000	yes
Arsenic	µg/g	6.0	6.4	30	1.750	yes
Barium	µg/g	130	130	30	1.000	yes
Beryllium	µg/g	0.47	0.48	30	0.050	yes
Cadmium	µg/g	0.4	0.4	30	0.250	yes
Chromium	µg/g	80	81	30	0.500	yes
Cobalt	µg/g	13	15	30	0.500	yes
Copper	µg/g	42	43	30	0.500	yes
Lead	µg/g	7.8	8.1	30	2.500	yes
Mercury	µg/g	0.049	0.060	30	0.500	yes
Molybdenum	µg/g	0.58	0.59	30	0.500	yes
Nickel	µg/g	40	43	30	1.250	yes
Selenium	µg/g	0.8	<0.5	30	2.500	yes
Silver	µg/g	<0.4	<0.4	30	2.000	yes
Strontium	µg/g	26	26	30	0.250	yes
Thallium	µg/g	<0.5	<0.5	30	2.500	yes
Tin	µg/g	<0.5	0.5	30	2.500	yes
Vanadium	µg/g	83	85	30	1.000	yes
Zinc	µg/g	97	100	30	0.250	yes
Date Acquired:	March 21, 2018					

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Surrey, British Columbia
V3S 8P8, Canada

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F: +1 (604) 514-3323
E: Surrey@exova.com
W: www.exova.com

Quality Control

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	P.O. Box 95	Project Name:	4506 Glenmore Rd	Control Number:	C117484
	7357 Pioneer Avenue	Project Location:	Abbotsford	Date Received:	Mar 17, 2018
	Agassiz, BC, Canada	LSD:		Date Reported:	Mar 28, 2018
	V0M 1A0	P.O.:	14132	Report Number:	2274096
Attn:	Accounts Payable	Proj. Acct. code:			
Sampled By:	Andres M.				
Company:	Biocentral				

Metals Strong Acid Digestion - Continued

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Antimony	µg/g	<1	0.040	2.080	yes
Arsenic	µg/g	4.8	2.940	5.520	yes
Barium	µg/g	170	139.210	174.790	yes
Beryllium	µg/g	0.53	0.405	0.603	yes
Cadmium	µg/g	0.2	0.101	0.341	yes
Chromium	µg/g	32	19.940	36.620	yes
Cobalt	µg/g	7.1	4.970	8.870	yes
Copper	µg/g	16	12.330	17.430	yes
Lead	µg/g	7.4	5.500	11.320	yes
Mercury	µg/g	0.024	0.012	0.034	yes
Molybdenum	µg/g	0.4	0.252	0.828	yes
Nickel	µg/g	20	16.430	23.720	yes
Phosphorus	µg/g	620	489.000	693.000	yes
Strontium	µg/g	74	59.580	83.220	yes
Tin	µg/g	<0.5	0.104	0.938	yes
Vanadium	µg/g	37	25.800	48.600	yes
Zinc	µg/g	60	46.370	66.830	yes

Date Acquired: March 21, 2018

Soil Acidity

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
pH	pH	6.18	5.6	7.2	yes
Electrical Conductivity	dS/m at 25 °C	0.0161	-0.04	0.08	yes

Date Acquired: March 21, 2018

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
pH	pH	6.5	6.5	0	0.3	yes
Electrical Conductivity	dS/m at 25 °C	0.2	0.2	10	0.04	yes

Date Acquired: March 21, 2018

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
pH	pH	7.3	6.3	8.6	yes
Electrical Conductivity	dS/m at 25 °C	2.65	2.13	3.09	yes

Date Acquired: March 21, 2018

Water Soluble Parameters

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Chloride	mg/L	0.38	-0.0	0.6	yes

Date Acquired: March 21, 2018

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Chloride	mg/kg	4	4	10	1.0	yes

Date Acquired: March 21, 2018

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Chloride	mg/kg	37	30.0	40.8	yes

Date Acquired: March 21, 2018

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Company:	Biocentral				

Water Soluble Parameters - Continued

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Chloride	mg/kg	4.6	4.4	5.6	yes
Date Acquired:	March 21, 2018				

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Methodology and Notes

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Company:	Biocentral				

Method of Analysis

Method Name	Reference		Method	Date Analysis Started	Location
Boron in farm soil	McKeague	*	Hot Water Soluble Boron - Azomethine-H Method, 4.61	Mar 21, 2018	Exova Edmonton
Chloride in farmsoil	SSSA Book Series, no. 3	*	Testing Soils for Sulfur, Boron, Molybdenum, and Chlorine, Chapter 10	Mar 21, 2018	Exova Edmonton
Macronutrients in Farm Soils	McKeague	*	Ammonium Acetate Extractable Cations, 4.51	Mar 21, 2018	Exova Edmonton
Metals (Strong Acid Leachable) in soils (Surrey)	B.C.M.O.E	*	Strong Acid Leachable Metals (SALM) in Soil, V 1.0, SALM	Mar 20, 2018	Exova Surrey
Metals (Strong Acid Leachable) in soils (Surrey)	US EPA	*	Mercury in Solid and Semi-Solid Wastes (Cold Vapour), 7471B	Mar 20, 2018	Exova Surrey
Micronutrients in Farm Soil	APHA	*	Inductively Coupled Plasma (ICP) Method, 3120 B	Mar 21, 2018	Exova Edmonton
Micronutrients in Farm Soil	McKeague	*	DTPA-TEA Extractable Elements, 4.65	Mar 21, 2018	Exova Edmonton
Nutrients in Farm Soil	Comm. Soil Sci. Pl. Anal.	*	Modified Kelowna Soil Test, Vol 26, 1995	Mar 21, 2018	Exova Edmonton
Organic Matter by Ignition	McKeague	*	Loss on Ignition (LOI), 3.8	Mar 21, 2018	Exova Edmonton
pH and Conductivity in farm soil	McKeague	*	1:2 Soil:Water Ratio, 4.12	Mar 21, 2018	Exova Edmonton
SMP Lime Requirements	Carter	*	Shoemaker-Mclean-Pratt Single-Buffer Method, 12.2	Mar 21, 2018	Exova Edmonton
Sulfate in Farm Soil	McKeague	*	Sulfate Extractable by 0.1M CaCl2, 4.47	Mar 21, 2018	Exova Edmonton
Total Carbon, Nitrogen & Sulfur by Leco Combustion (Surrey)	SSSA Book Series 5	*	Nitrogen-Total, Ch 37	Mar 20, 2018	Exova Surrey

** Reference Method Modified*

References

APHA	Standard Methods for the Examination of Water and Wastewater
B.C.M.O.E	B.C. Ministry of Environment
Carter	Soil Sampling and Methods of Analysis.
Comm. Soil Sci. Pl.	Communications in Soil Science and Plant Analysis
McKeague	Manual on Soil Sampling and Methods of Analysis
SSSA Book Series 5	Methods of Soil Analysis, Part 3
SSSA Book Series,	Soil Testing and Plant Analysis
US EPA	US Environmental Protection Agency Test Methods

Guidelines

Guideline Description	General Soil Comments
	Plant Nutrients in Soil
	Soil test for Crop Unknown
Guideline Source	Exova Canada Inc.,
Guideline Comments	

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Attn:	Accounts Payable	Proj. Acct. code:			
Sampled By:	Andres M.				
Company:	Biocentral				

Comments:

- Mar 28, 2018 - Report was issued to correct for missing metal analysis on samples 1260211-1 to 6. Previous report 2274096.

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Invoice to:

Company: Timbro contracting
Address:
Attention:
Phone:
Cell:
Fax:
E-mail:
Agreement ID:
Copy of report:

Report To:

Company: Biocentral
Address: same as Timbro
Attention: Andres Moreno
Phone: 604 997 1630
Cell:
Fax:
E-mail 1: andres m@biocentral.ca
E-mail 2: frank@timbroconstruction.com
Copy of invoice: info@timbroconstruction.com

Report Results		Regulatory Requirement	
E-Mail	X	HCDWQG	
Mail		Ab Tier 1	
Online		SPIGEC	
Fax		BCCSR	
PDF	X	Other (list below)	
Excel	X		
QA/QC	X		

Project Information

Project ID: JAMES
Project Name: 4506 Glenmore Rd
Project Location: Abbotsford
Legal Location:
PO/AFE#: 14132
Proj. Acct. Code:
Quote # 23983

Sample Custody (please print)

Sampled by: Andres M.
Company: Biocentral

This section for Lab use only

Date/Time stamp: MAR 17 '18 12:47

RUSH Priority

- Emergency (contact lab for turnaround and pricing)
- Priority 1-2 working days (100% surcharge)
- Urgent 2-3 working days (50% surcharge)

When "ASAP" is requested, turn around will default to a 100% RUSH priority, with pricing and turn around time to match. Please contact the lab prior to submitting RUSH samples. If not all samples require RUSH, please indicate in the special instructions.

Date Required: _____ Signature: _____

Special Instructions/Comments (please include contact information including ph. # if different from above).

Regular Delivery

	Site I.D.	Sample Description	Depth start (in)	Depth start (cm)	Depth end (m)	Date/Time Sampled	Matrix	Sampling Method	Number of Containers	BMEL Metals	CMPT	Indicate in the space allotted any deficiencies by the corresponding number.
1	S1	Farm Soil	6			2018.03.16	Soil		1			
2	S2	"	"			"	"		"			
3	S3	"	"			"	"		"			
4	S4	"	"			"	"		"			
5	S5	"	"			"	"		"			
6	S6	"	"			"	"		"			
7												
8												
9												
10												
11												
12												
13												
14												
15												

Enter tests above (√ relevant samples below)

1. Indicate any samples that were not packaged well
2. Indicate any samples not received in Exova supplies
3. Indicate any samples that were not clearly labeled
4. Indicate any samples not received within the required hold time or temp.
5. Indicate any missing or extra samples
6. Indicate any samples that were received broken
7. Indicate any samples where sufficient volume was not received
8. Indicate any samples received in an inappropriate container

ED 120-02

Submission of this form acknowledges acceptance of Exova's Standard Terms and Conditions (http://www.exova.com/about/terms-and-conditions/)

Please indicate any potentially hazardous samples

Page _____ of _____ Control # C 117484

Lot: 1260211 COC

Shipping: COD Y/ N
and size of coolers
Temp. received: 11.7°C
Delivery Method: H
Waybill:
Received by: LC

ABBOTSFORD

April 10, 2017

File: 5550-70

Andres Murillo, P.Eng
BioCentral Green Depot Ltd.
Box 95-7357 Pioneer Avenue
Agassiz, BC V0M 1A0

Dear Mr. Murillo:

Re: Organic Matters Recycling Regulation (OMRR) Section 6 – Process and Quality Criteria

As requested, this letter provides confirmation and supporting information that the JAMES Wastewater Treatment Plant (JAMES Plant) meets Section 6 of the OMRR for producing Class A biosolids.

The pasteurization system at the JAMES Plant meets the time-temperature requirements for production of Class A biosolids according to Section 2(f) in OMRR Schedule 1.

The sludge pasteurization system includes the following main components:

- crude and pasteurized sludge holding tanks;
- heat exchangers to heat raw sludge and cool pasteurized sludge;
- pasteurization tank; and
- miscellaneous transfer and recirculation pumps.

The pasteurization reactor operates at a temperature of 65°C and is batch-fed to maintain a retention time of at least one hour between sludge transfers. The volume of the tank provides approximately 18 to 24 hours retention time for pasteurization and conditioning of the sludge in advance of the anaerobic digestion process. The pasteurization process is followed by anaerobic mesophilic digestion, which meets the vector attraction reduction requirements (for details please see below).

The anaerobic mesophilic digestion system at the JAMES Plant meets the vector attraction reduction requirements according to Section 1(a) in OMRR Schedule 2.

The anaerobic mesophilic digestion system at the JAMES Plant includes three digesters, with a total volume of 11,460 m^3. Pasteurized and conditioned sludge from the pasteurized sludge holding tank is pumped to the largest anaerobic digester and then is passed to the remaining two digesters in series. The volatile solids reduction of the biosolids typically ranges between 60-70% and is higher than the required 38% under OMRR.

We trust the above provides the information you requested. Please contact me if you need any additional information or clarification.

Yours truly,

Rob Isaac, Eng.L.
Director, Project Management Office

c. John Paul, Transform Compost Systems Ltd.
Peter Sparanese, General Manager, Engineering and Regional Utilities
Tim Henry, Director, Utility Operations and Asset Management

SC/rb

Biosolids Sampling - Small Tent (March 8, 2018)

BACK OF TENT

A3 Time = 9:50 AM FC < 200	**A2** Time = 9:40 AM FC < 200	**A1** Time = 9:30 AM FC < 200
B6 Time = 10:20 AM FC < 200	**B5** Time = 10: 10 AM FC < 200	**B4** Time = 10:00 AM FC < 200
C9 Time = 10:50 AM FC < 200	**C8** Time = 10:40 AM FC < 200	**C7** Time = 10:30 AM FC < 200
D12 Time = 11:20 AM FC < 200	**D11** Time = 11:10 AM FC < 200	**D10** Time = 11:00 AM FC < 200

FRONT OF TENT

NOTE: Units for Fecal Coliforms (FC) are MPN/g dry weight.

CITY OF ABBOTSFORD
ATTN: Mounia Sassi
6011 Gladwin Rd
Abbotsford BC V4X 1V9

Date Received: 08-MAR-18
Report Date: 20-MAR-18 14:17 (MT)
Version: FINAL

Client Phone: 604-864-5593

Certificate of Analysis

Lab Work Order #: L2065527

Project P.O. #: 176044
Job Reference: PROJECT#13 BIOSOLIDS QC
C of C Numbers:
Legal Site Desc:

Heather McKenzie
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2065527-1	L2065527-2	L2065527-3	L2065527-4	L2065527-5
	Description	GRAB	GRAB	GRAB	GRAB	GRAB
	Sampled Date	08-MAR-18	08-MAR-18	08-MAR-18	08-MAR-18	08-MAR-18
	Sampled Time	09:30	09:40	09:50	10:00	10:10
	Client ID	A1 (SMALL TENT)	A2 (SMALL TENT)	A3 (SMALL TENT)	B4 (SMALL TENT)	B5 (SMALL TENT)
Grouping	**Analyte**					
SOIL						
Physical Tests	Moisture (%)	78.6	78.2	78.2	78.4	79.2
Bacteriological Tests	Coliform Bacteria - Fecal (MPN/g)	<200	<200	<200	<200	<200

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2065527-6	L2065527-7	L2065527-8	L2065527-9	L2065527-10
	Description	GRAB	GRAB	GRAB	GRAB	GRAB
	Sampled Date	08-MAR-18	08-MAR-18	08-MAR-18	08-MAR-18	08-MAR-18
	Sampled Time	10:20	10:30	10:40	10:50	11:00
	Client ID	B6 (SMALL TENT)	C7 (SMALL TENT)	C8 (SMALL TENT)	C9 (SMALL TENT)	D10 (SMALL TENT)
Grouping	**Analyte**					
SOIL						
Physical Tests	Moisture (%)	78.8	78.6	77.2	77.5	76.5
Bacteriological Tests	Coliform Bacteria - Fecal (MPN/g)	<200	<200	<200	<200	<200

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2065527-11	L2065527-12			
	Description	GRAB	GRAB			
	Sampled Date	08-MAR-18	08-MAR-18			
	Sampled Time	11:10	11:20			
	Client ID	D11 (SMALL TENT)	D12 (SMALL TENT)			
Grouping	**Analyte**					
SOIL						
Physical Tests	Moisture (%)	77.6	78.1			
Bacteriological Tests	Coliform Bacteria - Fecal (MPN/g)	<200	<200			

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
FCOLI-DRY-MTF-VA	Soil	Fecal coliform by MPN	EPA Method 1680

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

MOISTURE-VA	Soil	Moisture content	CWS for PHC in Soil - Tier 1

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

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

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

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

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

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

Chain of Custody (COC) / Analytical Request Form

ALS Environmental

Canada Toll Free: 1 800 668 9878

www.alsglobal.com

L2065527-COFC

COC Number: 15 -

Page of

Report To	Contact and company name below will appear on the final report
Company:	City of Abbotsford - Source Control
Contact:	Mounia Sassi
Phone:	604-864-5593
	Company address below will appear on the final report
Street:	6011 Gladwin Road
City/Province:	Abbotsford, BC
Postal Code:	V4X 1V9
Invoice To	Same as Report To ☐ ☑ NO
	Copy of Invoice with Report ☐ ☑ NO
Company:	City of Abbotsford
Contact:	Joe Vurzinger

Report Format / Distribution

Select Report Format: ☑ ☑ EXCEL ☐ EDD (DIGITAL)

Quality Control (QC) Report with Report ☑ ☐ NO

☑ Compare Results to Criteria on Report - provide details below if box checked

Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax msassi@abbotsford.ca

Email 2 ssubido@abbotsford.ca

Email 3 jvurzinger@abbotsford.ca

Invoice Distribution

Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax james_clerical@abbotsford.ca

Email 2 jvurzinger@abbotsford.ca, ssubido@abbotsford.ca

Project Information

ALS Account # / Quote #: COA200-UTILITIES-VA

Job #: Project #13 Biosolids QC

PO / AFE:

LSD:

Oil and Gas Required Fields (client use)

AFE/Cost Center: PO#

Major/Minor Code: Routing Code:

Requisitioner:

Location:

ALS Lab Work Order # (lab use only)

ALS Contact: **Sampler:**

Select Service Level Below - Please confirm all E&P TATs with your AM - surcharges will apply

Regular [R] ☐ Standard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days): 4 day [P4] ☐ | 3 day [P3] ☐ | 2 day [P2] ☐

EMERGENCY: 1 Business day [E1] ☐ | Same Day, Weekend or Statutory holiday [E0] ☐

Date and Time Required for all E&P TATs:

For tests that can not be performed according to the service level selected, you will be contacted.

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Fecal Coliforms (MPN/dry gram)	Moisture	Number of Containers
	A1 (Small Tent)	8-Mar-18	9:30	Grab	R	R	
	A2 (Small Tent)	8-Mar-18	9:40	Grab	R	R	
	A3 (Small Tent)	8-Mar-18	9:50	Grab	R	R	
	B4 (Small Tent)	8-Mar-18	10:00	Grab	R	R	
	B5 (Small Tent)	8-Mar-18	10:10	Grab	R	R	
	B6 (Small Tent)	8-Mar-18	10:20	Grab	R	R	
	C7 (Small Tent)	8-Mar-18	10:30	Grab	R	R	
	C8 (Small Tent)	8-Mar-18	10:40	Grab	R	R	
	C9 (Small Tent)	8-Mar-18	10:50	Grab	R	R	
	D10 (Small Tent)	8-Mar-18	11:00	Grab	R	R	
	D11 (Small Tent)	8-Mar-18	11:10	Grab	R	R	
	D12 (Small Tent)	8-Mar-18	11:20	Grab	R	R	

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System? ☐ ☑ NO

Are samples for human drinking water use? ☐ ☑ NO

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐

Ice Packs ☐ Ice Cubes ☐ Custody seal intact Yes ☐ No ☐

Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C			FINAL COOLER TEMPERATURES °C		
		9.8			

SHIPMENT RELEASE (client use)		
Released by: Mounia Sassi	Date: 08 March 2018	Time:

INITIAL SHIPMENT RECEPTION (lab use only)		
Received by: TP	Date: Mar 8	Time: 15:14

FINAL SHIPMENT RECEPTION (lab use only)		
Received by:	Date:	Time:

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

OCTOBER 2015 FRONT

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form**.

Appendix F

% Volatile Solids Reduction - JAMES PLANT- 2017

Month	% V.S Red'n
Jan	58
Feb	64
Mar	56
Apr	61
May	58
Jun	67
Jul	69
Aug	66
Sep	64
Oct	70
Nov	64
Dec	67
Annual	**64**

Monthly average from weekly testing

OMRR Limit -38%

Volatile Solids Reduction Calculation:

$$\% \text{ Red'n} = \frac{(\text{In} - \text{Out})}{\text{In} - (\text{In} \times \text{Out})} \times 100$$

Where:

In = Volatile solids for raw, decimal format.

Out = Volatile solids of last Dig in series, decimal format.

JAMES WWTP BIOSOLIDS QUALITY DATA (2017)

Parameter concentrations are expressed on dry weight basis unless otherwise stated.
All data obtained from the analysis of a monthly composite sample.

Sampling Date:	-															
Parameters (Dried Basis)	**Units**	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**	**OCT**	**NOV**	**DEC**	**MAX**	**AVG**	**OMRR***
Total Nitrogen	%	6.99	8.14	9.04	7.19	8.65	8.1	7.74	8.13	5.74	5.36	6.71	10.5	10.50	7.69	-
Total Phosphorus (as P)	%	1.10	1.02	1.14	1.02	1.15	1.23	1.07	1.14	1.33	1.01	1.02	1.09	1.33	1.11	-
Total Potassium	%	0.071	0.11	0.11	0.103	0.0669	0.077	0.0727	0.0755	0.0632	0.0563	0.071	0.0628	0.11	0.08	-
Total Sulphur	%	0.58	0.74	0.79	0.96	0.517	0.682	0.768	0.83	0.868	0.60	0.69	0.603	0.96	0.72	-
Total Carbon	%	33.6	41.7	40.9	41.5	41.3	40.3	40.5	40.9	40	40.5	42.0	43.2	43.2	40.5	-
Organic Matter	%	80.3	79.6	79.7	80.1	80	79.2	79.5	78.9	76.8	77.9	78.3	78.9	80.3	79.1	-
Moisture	%	75.7	74.9	75.6	75.2	76.6	76.9	76.4	76.7	76.1	72.4	76.6	76.5	76.9	75.8	-
Ammonia- N (available)	mg/kg	7810	8100	8460	8390	7530	7480	8400	8750	7370	5920	6220	6600	8750	7586	-
Nitrate - N (available)	mg/kg	5.4	4.4	5.25	5.85	2.65	3.52	7.77	3.43	3.72	15.6	3.05	4.52	15.6	5.43	-
pH	pH units	6.5	6.7	5.6	6.6	6.3	5.8	6	6.46	6.43	6.75	6.71	6.77	6.77	6.4	-
EC - Conductivity	dS/m	2.73	3.39	2.58	2.94	3.83	3.66	2.58	3.73	5.83	3.25	4.09	4.12	5.83	3.56	-
C/N Ratio	-	4.8	5.1	4.5	5.8	4.8	5.0	5.2	5.0	7.0	7.6	6.26	4.1	7.6	5.4	-
Arsenic	ug/g	2	2.8	N/A	2.95	2.25	2.87	2.83	2.84	3.5	2.88	3.1	2.51	3.5	2.8	75
Cadmium	ug/g	0.86	1.5	N/A	1.49	1.24	1.44	1.63	1.53	1.76	1.23	1.59	1.29	1.76	1.41	20
Chromium	ug/g	18	24	N/A	28.1	20.4	25.4	35.6	60.1	37.4	29.4	32.1	22	60.1	30.2	1060
Cobalt	ug/g	1.6	2.5	N/A	2.57	1.99	2.27	2.2	2.69	3.27	2.21	2.14	1.85	3.27	2.30	150
Copper	ug/g	360	520	N/A	483	438	568	600	655	636	531	561	453	655	528	2200
Lead	ug/g	13	20	N/A	20.8	17.2	20.3	21.4	20.7	22.8	17.3	22.9	17.7	22.9	19.5	500
Mercury	ug/g	1.3	1.5	N/A	1.98	1.67	1.73	3.22	1.78	2.08	1.52	2.2	2.39	3.22	1.95	5
Molybdenum	ug/g	3.9	6.4	N/A	6.34	5.91	6.94	6.05	6.77	7.82	6.21	6.76	5.14	7.82	6.20	20
Nickel	ug/g	11	15	N/A	17.8	13.9	18.1	31.4	41.8	32.9	27.1	35.5	26.5	41.8	24.6	180
Selenium	ug/g	3	4.5	N/A	4.84	4.37	4.88	4.72	4.7	5.31	4.18	4.79	3.75	5.31	4.46	14
Zinc	ug/g	530	800	N/A	700	732	924	922	1050	983	887	874	707	1050	828	1850

Appendix C

Written Certifications

Transform Compost Systems

turning waste into an opportunity

September 10, 2018

Limbert Mountain View Farms Ltd
7357 Pioneer Ave
Agassiz, BC V0M 1A0

RE: Land Application 1280 Hamilton Rd, Agassiz, BC MOE Authorization # 109300

As required by the Organic Matter Recycling Regulation Division 1 Section 5 (2), this letter is to provide you with written certification that the land application was done in accordance with the Land Application Plan for this property.

A total of 80 wet tonnes of Class A biosolids originating from the JAMES Wastewater Treatment Plant in Abbotsford was applied to the property before May 31, 2018. The biosolids application rate was approximately 15 wet tonnes per hectare on the land planted to forage corn.

The soil samples taken in the spring of 2018 indicated that the chromium concentrations exceeded the limits outlined in OMRR.

The samples from other locations were re-analyzed and the laboratory provided corrected numbers, particularly for chromium, as the high chromium results were due to laboratory error.

Chromium concentrations on this property will be reviewed again in early 2019.

Figure 1. Photo of property at 1280 Hamilton Rd where the Class A biosolids have been applied for forage corn production (May 29, 2018 photo, smaller photo Sept 7 2018).

Transform Compost Systems Ltd.
3911 Mt. Lehman Rd.
Abbotsford, BC V2T 5W5

Phone (604) 856-2722
Email: transform@telus.net
Website: www.transformcompostsystems.com

The data for trace element application, corrected for the actual application rate on the farm field, is provided in Figure 2.

Sincerely, John

John Paul, PhD PAg

		Addition	**Post**	Limits
	Metals in Soil	**from Biosolids**	**Application**	OMRR[b]
	(mg/kg)[a]	(mg/kg)	(mg/kg)	(mg/kg)
Arsenic	5.05	0.005	5.05	15
Cadmium	0.25	0.002	0.25	9
Chromium	72.00	0.051	72.05	60
Cobalt	12.00	0.004	12.00	40
Copper	30.00	0.90	30.90	150
Lead	7.40	0.033	7.43	350
Mercury	0.04	0.003	0.04	0.6
Molybdenum	0.40	0.011	0.41	5
Nickel	39.00	0.042	39.04	100
Selenium	<.05	0.008	0.50	2
Zinc	94.50	1.41	95.91	200
[a] average of 2 samples				
[b] OMRR Schedules 9 and 10 using most conservative limits				
[c] plant uptake not included in calculation				

Figure 2. Trace element concentrations measured in soil before biosolids application and estimated concentrations following biosolids application.

Transform Compost Systems

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July 16, 2018

Rancho el Rio del Sol Farms Ltd
Box 34, 1401 Kennedy Rd
Harrison Mills, BC V0M 1L0

RE: Land Application 1401 Kennedy Rd MOE Authorization # 109235

As required by the Organic Matter Recycling Regulation Division 1 Section 5 (2), this letter is to provide you with written certification that the land application was done in accordance with the Land Application Plan for this property.

A total of 900 wet tonnes of Class A biosolids originating from the JAMES Wastewater Treatment Plant in Abbotsford was applied to the property before May 31, 2018. The Land Application Plan allowed for an application rate of up to 50 wet tonnes per hectare on approximately 20 ha of the 50 ha farm that was cropped to forage corn.

The soil samples taken in the spring of 2018 were re-analyzed as the chromium concentrations appeared to be higher than expected. The corrected data for trace element application is provided in Figure 2.

Figure 1. Photo of property at 1401 Kennedy Rd where the Class A biosolids have been applied for forage corn production (May 31, 2018 photo)

Sincerely, John

John Paul, PhD PAg

Transform Compost Systems Ltd.
3911 Mt. Lehman Rd.
Abbotsford, BC V2T 5W5

Phone (604) 856-2722
Email: transform@telus.net
Website: www.transformcompostsystems.com

		Addition	**Post**	Limits
	Metals in Soil	**from Biosolids**	**Application**	OMRR[b]
	(mg/kg)[a]	(mg/kg)	(mg/kg)	(mg/kg)
Arsenic	5.59	0.017	5.61	15
Cadmium	0.53	0.009	0.53	9
Chromium	55.78	0.186	55.96	60
Cobalt	16.56	0.014	16.57	40
Copper	42.78	3.25	46.03	150
Lead	10.69	0.120	10.81	350
Mercury	0.058	0.012	0.070	0.6
Molybdenum	0.88	0.038	0.92	5
Nickel	46.67	0.151	46.82	100
Selenium	<0.5	0.027		2
Zinc	112.3	5.10	117.4	200
[a] average of 9 samples				
[b] OMRR Schedules 9 and 10 using most conservative limits				
[c] plant uptake not included in calculation				

Figure 2. Trace element concentrations measured in soil before biosolids application and estimated concentrations following biosolids application.

Transform Compost Systems

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July 16, 2018

Bileena Holsteins
1953 Cameron Rd.
Agassiz, BC V0M 1A3

RE: Land Application 1750 School Rd, Harrison Mills MOE Authorization # 109216

As required by the Organic Matter Recycling Regulation Division 1 Section 5 (2), this letter is to provide you with written certification that the land application was done in accordance with the Land Application Plan for this property.

A total of 372 wet tonnes of Class A biosolids originating from the JAMES Wastewater Treatment Plant in Abbotsford was applied to the property before May 31, 2018. The biosolids application rate was approximately 54.5 wet tonnes per hectare on the land planted to forage grass.

The soil samples taken in the spring of 2018 were re-analyzed as the chromium concentrations appeared to be higher than expected. The corrected data for trace element application is provided in Figure 2.

Figure 1. Photo of property at 1750 School Rd where the Class A biosolids have been applied for forage grass production (May 31, 2018 photo)

Sincerely, John

John Paul, PhD PAg

Transform Compost Systems Ltd.
3911 Mt. Lehman Rd.
Abbotsford, BC V2T 5W5

Phone (604) 856-2722
Email: transform@telus.net
Website: www.transformcompostsystems.com

		Addition	**Post**	Limits
	Metals in Soil	**from Biosolids**	**Application**	OMRR[b]
	(mg/kg)[a]	(mg/kg)	(mg/kg)	(mg/kg)
Arsenic	5.80	0.017	5.82	15
Cadmium	0.39	0.009	0.40	9
Chromium	47.83	0.186	48.02	60
Cobalt	14.50	0.014	14.51	40
Copper	31.67	3.25	34.92	150
Lead	7.05	0.120	7.17	350
Mercury	0.040	0.012	0.052	0.6
Molybdenum	0.68	0.038	0.72	5
Nickel	41.50	0.151	41.65	100
Selenium	<0.5	0.027		2
Zinc	76.17	5.10	81.26	200
[a] average of 6 samples				
[b] OMRR Schedules 9 and 10 using most conservative limits				
[c] plant uptake not included in calculation				

Figure 2. Trace element concentrations measured in soil before biosolids application and estimated concentrations following biosolids application.

Transform Compost Systems

turning waste into an opportunity

August 30, 2018

Susanna Keusch, Noemi Keusch and Andres Murillo
1995 Fir Rd.
Agassiz, BC V0M 1A0

RE: Land Application 1995 Fir Rd. MOE Authorization # 109233

As required by the Organic Matter Recycling Regulation Division 1 Section 5 (2), this letter is to provide you with written certification that the land application was done in accordance with the Land Application Plan for this property.

A total of 239 wet tonnes of Class A biosolids originating from the JAMES Wastewater Treatment Plant in Abbotsford was applied before May 31, 2018. The application of biosolids was an estimated 70 wet tonnes per hectare on land cropped to forage corn. This application rate was slightly higher than outlined in the Land Application Plan.

The soil samples taken in the spring of 2018 were re-analyzed as the chromium concentrations appeared to be higher than expected. The corrected data for trace element application is provided in Figure 2

Figure 1. Photo of property at 1995 Fir Rd where the Class A biosolids have been applied for forage corn production (May 31, 2018 photo)

Sincerely, John

John Paul, PhD PAg

Transform Compost Systems Ltd.
3911 Mt. Lehman Rd.
Abbotsford, BC V2T 5W5

Phone (604) 856-2722
Email: transform@telus.net
Website: www.transformcompostsystems.com

		Addition	**Post**	Limits
	Metals in Soil	**from Biosolids**	**Application**	OMRR[b]
	(mg/kg)[a]	(mg/kg)	(mg/kg)	(mg/kg)
Arsenic	5.28	0.024	5.30	15
Cadmium	0.48	0.012	0.49	9
Chromium	53.00	0.261	53.26	60
Cobalt	14.00	0.020	14.02	40
Copper	45.25	4.57	49.82	150
Lead	8.63	0.169	8.79	350
Mercury	0.060	0.017	0.077	0.6
Molybdenum	0.71	0.054	0.76	5
Nickel	42.25	0.213	42.46	100
Selenium	<0.5	0.039		2
Zinc	103.50	7.16	110.66	200
[a] average of 4 samples				
[b] OMRR Schedules 9 and 10 using most conservative limits				
[c] plant uptake not included in calculation				

Figure 2 Trace element concentrations measured in soil before biosolids application and estimated concentrations following biosolids application.

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August 30, 2018

TC Merritt Valley Farms
7357 Pioneer Ave
Agassiz, BC V0M 1A0

RE: Land Application 3628 Hotsprings Rd. MOE Authorization # 109234

As required by the Organic Matter Recycling Regulation Division 1 Section 5 (2), this letter is to provide you with written certification that the land application was done in accordance with the Land Application Plan for this property.

A total of approximately 295 wet tonnes of Class A biosolids originating from the JAMES Wastewater Treatment Plant in Abbotsford was applied in May 2018. The application rate of the biosolids was 53.6 wet tonnes per hectare on land cropped to silage corn.

The soil samples taken in the spring of 2018 were re-analyzed as the chromium concentrations appeared to be higher than expected. The corrected data for trace element application is provided in Figure 2.

Figure 1. Photo of property at 3628 Hotsprings Rd where the Class A biosolids have been applied for forage corn production (May 31, 2018 photo)

Sincerely, John

John Paul, PhD PAg

Transform Compost Systems Ltd.
3911 Mt. Lehman Rd.
Abbotsford, BC V2T 5W5

Phone (604) 856-2722
Email: transform@telus.net
Website: www.transformcompostsystems.com

		Addition	**Post**	Limits
	Metals in Soil	**from Biosolids**	**Application**	OMRR[b]
	(mg/kg)[a]	(mg/kg)	(mg/kg)	(mg/kg)
Arsenic	4.98	0.018	5.00	15
Cadmium	0.35	0.009	0.36	9
Chromium	58.60	0.199	58.80	60
Cobalt	14.40	0.015	14.42	40
Copper	29.20	3.48	32.68	150
Lead	5.70	0.129	5.83	350
Mercury	0.04	0.013	0.06	0.6
Molybdenum	0.61	0.041	0.65	5
Nickel	45.60	0.162	45.76	100
Selenium	<0.5	0.029		2
Zinc	71.40	5.46	76.86	200
[a] average of 5 samples				
[b] OMRR Schedules 9 and 10 using most conservative limits				
[c] plant uptake not included in calculation				

Figure 2. Trace element concentrations measured in soil before biosolids application and estimated concentrations following biosolids application.

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August 30, 2018

Walter Dyck
7310 Prest Rd.
Chilliwack, BC V4Z 1C5

RE: Land Application 3954 Hotsprings Rd. MOE Authorization # 109232

As required by the Organic Matter Recycling Regulation Division 1 Section 5 (2), this letter is to provide you with written certification that the land application was done in accordance with the Land Application Plan for this property.

A total of 953 wet tonnes of Class A biosolids originating from the JAMES Wastewater Treatment Plant in Abbotsford was applied before May 30, 2018. The amount of biosolids applied per hectare was approximately 40 wet tonnes per hectare for the field cropped to forage corn.

The soil samples taken in the spring of 2018 were re-analyzed as the chromium concentrations appeared to be higher than expected. The corrected data for trace element application is provided in Figure 2.

Figure 1. Photo of property at 3954 Hotsprings Rd where the Class A biosolids have been applied for forage corn production (May 31, 2018 photo)

Sincerely, John

John Paul, PhD PAg

Transform Compost Systems Ltd.
3911 Mt. Lehman Rd.
Abbotsford, BC V2T 5W5

Phone (604) 856-2722
Email: transform@telus.net
Website: www.transformcompostsystems.com

		Addition	**Post**	Limits
	Metals in Soil	**from Biosolids**	**Application**	OMRR[b]
	(mg/kg)[a]	(mg/kg)	(mg/kg)	(mg/kg)
Arsenic	6.08	0.013	6.10	15
Cadmium	0.44	0.006	0.45	9
Chromium	58.67	0.136	58.80	60
Cobalt	14.17	0.010	14.18	40
Copper	37.33	2.38	39.72	150
Lead	6.98	0.088	7.07	350
Mercury	0.065	0.009	0.074	0.6
Molybdenum	0.67	0.028	0.70	5
Nickel	40.33	0.111	40.44	100
Selenium	0.50	0.020	0.52	2
Zinc	87.17	3.74	90.90	200
[a] average of 6 samples				
[b] OMRR Schedules 9 and 10 using most conservative limits				
[c] plant uptake not included in calculation				

Figure 2. Trace element concentrations measured in soil before biosolids application and estimated concentrations following biosolids application.

Transform Compost Systems

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August 27, 2018

Westview Dairy Farms Ltd.
32321 Townshipline Rd
Abbotsford, BC V4X 1W5

RE: Land Application 4506 Glenmore Rd, Abbotsford MOE Authorization # 109109

As required by the Organic Matter Recycling Regulation Division 1 Section 5 (2), this letter is to provide you with written certification that the land application was done in accordance with the Land Application Plan for this property.

A total of 532 wet tonnes of Class A biosolids originating from the JAMES Wastewater Treatment Plant in Abbotsford was applied to the property before May 31, 2018. The biosolids application rate was approximately 53 wet tonnes per hectare on the land planted to forage corn.

The soil samples taken in the spring of 2018 were re-analyzed as the chromium concentrations appeared to be higher than expected. The corrected data for trace element application is provided in Figure 2.

Figure 1. Photo of property at 4506 Glenmore Rd where the Class A biosolids have been applied for forage corn production (May 31, 2018 photo)

When the samples were reanalyzed, the chromium concentrations averaged greater than the 60 ppm limited suggested for Agricultural Land where livestock may be ingesting soil and fodder (OMRR Schedules 9 & 10, Table 3).

Transform Compost Systems Ltd.
3911 Mt. Lehman Rd.
Abbotsford, BC V2T 5W5

Phone (604) 856-2722
Email: transform@telus.net
Website: www.transformcompostsystems.com

Chromium is found primarily in two oxidation states in the environment. One is hexavalent chromium - Cr(VI) which is relatively mobile and acutely toxic. The other is trivalent chromium - Cr(III)) which is relatively immobile and has a much lower toxicity (Palmer and Puls 1994).

In Table 3 of Schedule 9 and 10 (OMRR), the chromium limit is 60 ppm and 150 ppm. The notes indicate that 6) Standard is for chromium, hexavalent,, 7) Standard has been adjusted based on 2016 reference Provincial background soil concentration for the substance, and 8). Standard is for chromium, trivalent.

Although the notes and limits are somewhat difficult to interpret, we have further sampled the soil on this property and analyzed it for total, trivalent and hexavalent chromium (Appendix A and B). The further sampling was after biosolids application, therefore any chromium provided by the biosolids would be accounted for in the additional soil sampling.

The results indicate that the average total soil chromium concentration was 51 ppm, and the more mobile and toxic hexavalent chromium concentration averaged 10.5 ppm. This indicates that there is no concern with the background concentrations of chromium on this property.

		Addition	**Post**	Limits
	Metals in Soil	**from Biosolids**	**Application**	OMRR[b]
	(mg/kg)[a]	(mg/kg)	(mg/kg)	(mg/kg)
Arsenic	9.60	0.018	9.62	15
Cadmium	0.69	0.009	0.70	9
Chromium	63.83	0.198	64.03	60
Cobalt	15.27	0.015	15.28	40
Copper	53.50	3.46	56.96	150
Lead	12.82	0.128	12.94	350
Mercury	0.064	0.013	0.077	0.6
Molybdenum	1.12	0.041	1.16	5
Nickel	47.67	0.161	47.83	100
Selenium	<0.5	0.029		2
Zinc	108.50	5.42	113.92	200
[a] average of 7 samples				
[b] OMRR Schedules 9 and 10 using most conservative limits				
[c] plant uptake not included in calculation				

Figure 2. Trace element concentrations measured in soil before biosolids application and estimated concentrations following biosolids application.

Sincerely, John

John Paul, PhD PAg

References

Palmer, C.D., and R.W. Puls. 1994. Natural attenuation of hexavalent chromium in groundwater and soils. EPA Ground Water Issue. US EPA. EPA/540/5-94/505.


4506 Glenmore Rd
Chromium (III, VI) sampling
Legend
Chromium sampling (July, 2018)
Property boundaries
Soil sampling (March, 2018)
S1
S3
S5
West half
East half
S2
S4
S6
Glenmore Rd
Google Earth
© 2018 Google
N
300 m

Exova
#104, 19575-55 A Ave.
Surrey, British Columbia
V3S 8P8, Canada

T: +1 (604) 514-3322
F: +1 (604) 514-3323
E: Surrey@exova.com
W: www.exova.com

Report Transmission Cover Page

Bill To:	Timbro Contracting (A	Project ID:	601	Lot ID:	**1286873**
	P.O. Box 95	Project Name:	James Plant	Control Number:	C117486
	7357 Pioneer Avenue	Project Location:	Abbotsford	Date Received:	Jul 24, 2018
	Agassiz, BC, Canada	LSD:	4506 Glenmore Rd.	Date Reported:	Aug 3, 2018
	V0M 1A0	P.O.:	577	Report Number:	2308050
Attn:	Accounts Payable	Proj. Acct. code:			
Sampled By:	Andres M				
Company:	Biocentral				

Contact	Company	Address
Accounts Payable	**Timbro Contracting (A Partnership)**	P.O. Box 95, 7357 Pioneer Avenue Agassiz, BC V0M 1A0 Phone: (604) 796-3851 Fax: (604) 796-0554 Email: info@timbroconstruction.com

Delivery	Format	Deliverables
Email - Single Report	PDF	Invoice

Contact	Company	Address
Andres Moreno	**Timbro Contracting (A Partnership)**	P.O. Box 95, 7357 Pioneer Avenue Agassiz, BC V0M 1A0 Phone: (604) 796-3851 Fax: (604) 796-0554 Email: andresm@biocentral.ca

Delivery	Format	Deliverables
Email - Merge Reports	PDF	COC / Test Report
Email - Single Report	Standard Crosstab	Test Report

Contact	Company	Address
Frank Trevr	**Timbro Contracting (A Partnership)**	P.O. Box 95, 7357 Pioneer Avenue Agassiz, BC V0M 1A0 Phone: (604) 991-3782 Fax: Email: frank@timbroconstruction.com

Delivery	Format	Deliverables
Email - Merge Reports	PDF	COC / Test Report
Email - Single Report	Standard Crosstab	Test Report

Notes To Clients:

- Aug 02, 2018 - Reduction of analytical volume was necessary for metals analysis due to matrix effects in samples #1286873-1 and 2. Detection limits are adjusted accordingly.

Exova
#104, 19575-55 A Ave.
Surrey, British Columbia
V3S 8P8, Canada

T: +1 (604) 514-3322
F: +1 (604) 514-3323
E: Surrey@exova.com
W: www.exova.com

Analytical Report

Bill To:	Timbro Contracting (A	Project ID:	601	Lot ID:	**1286873**
	P.O. Box 95	Project Name:	James Plant	Control Number:	C117486
	7357 Pioneer Avenue	Project Location:	Abbotsford	Date Received:	Jul 24, 2018
	Agassiz, BC, Canada	LSD:	4506 Glenmore Rd.	Date Reported:	Aug 3, 2018
	V0M 1A0	P.O.:	577	Report Number:	2308050
Attn:	Accounts Payable	Proj. Acct. code:			
Sampled By:	Andres M				
Company:	Biocentral				

Reference Number	1286873-1
Sample Date	July 24, 2018
Sample Time	08:20
Sample Location	
Sample Description	East half / 0-6 / 22.0°C / inch
Sample Matrix	Soil

Analyte		Units	Result	Nominal Detection Limit
Metals Strong Acid Digestion				
Chromium	Strong Acid Extractable	µg/g	52	0.05
Water Soluble Parameters				
Chromium (VI)	Dried Basis	µg/g	11	0.5
Chromium (III)	Calculated	µg/g	41	

Exova
#104, 19575-55 A Ave.
Surrey, British Columbia
V3S 8P8, Canada

T: +1 (604) 514-3322
F: +1 (604) 514-3323
E: Surrey@exova.com
W: www.exova.com

Analytical Report

Bill To:	Timbro Contracting (A	Project ID:	601	Lot ID:	**1286873**
	P.O. Box 95	Project Name:	James Plant	Control Number:	C117486
	7357 Pioneer Avenue	Project Location:	Abbotsford	Date Received:	Jul 24, 2018
	Agassiz, BC, Canada	LSD:	4506 Glenmore Rd.	Date Reported:	Aug 3, 2018
	V0M 1A0	P.O.:	577	Report Number:	2308050
Attn:	Accounts Payable	Proj. Acct. code:			
Sampled By:	Andres M				
Company:	Biocentral				

Reference Number	1286873-2
Sample Date	July 24, 2018
Sample Time	08:30
Sample Location	
Sample Description	West half / 0-6 / 22.0°C / inch
Sample Matrix	Soil

Analyte		Units	Result	Nominal Detection Limit
Metals Strong Acid Digestion				
Chromium	Strong Acid Extractable	µg/g	50	0.05
Water Soluble Parameters				
Chromium (VI)	Dried Basis	µg/g	10	0.5
Chromium (III)	Calculated	µg/g	40	

Approved by:

Mathieu Simoneau
Operations Manager

Data have been validated by Analytical Quality Control and Exova's Integrated Data Validation System (IDVS).
Generation and distribution of the report, and approval by the digitized signature above, are performed through a secure and controlled automatic process.

Exova
#104, 19575-55 A Ave.
Surrey, British Columbia
V3S 8P8, Canada

T: +1 (604) 514-3322
F: +1 (604) 514-3323
E: Surrey@exova.com
W: www.exova.com

Methodology and Notes

Bill To:	Timbro Contracting (A	Project ID:	601	Lot ID:	**1286873**
	P.O. Box 95	Project Name:	James Plant	Control Number:	C117486
	7357 Pioneer Avenue	Project Location:	Abbotsford	Date Received:	Jul 24, 2018
	Agassiz, BC, Canada	LSD:	4506 Glenmore Rd.	Date Reported:	Aug 3, 2018
	V0M 1A0	P.O.:	577	Report Number:	2308050
Attn:	Accounts Payable	Proj. Acct. code:			
Sampled By:	Andres M				
Company:	Biocentral				

Method of Analysis

Method Name	Reference		Method	Date Analysis Started	Location
Chromium (VI) in solids extract (Surrey)	US EPA	*	Alkaline digest for Hexavallent Chromium, 3060A	Jul 25, 2018	Exova Surrey
Trace Metals ICP-MS (BCMOE SALM) in soil (Surrey)	B.C.M.O.E	*	Strong Acid Leachable Metals (SALM) in Soil, V 1.0, SALM	Aug 2, 2018	Exova Surrey

** Reference Method Modified*

References

B.C.M.O.E	B.C. Ministry of Environment
US EPA	US Environmental Protection Agency Test Methods

Comments:

- Aug 02, 2018 - Reduction of analytical volume was necessary for metals analysis due to matrix effects in samples #1286873-1 and 2. Detection limits are adjusted accordingly.

Appendix D

JAMES Plant Quality Data

JAMES WWTP BIOSOLIDS QUALITY DATA (2017)

Parameter concentrations are expressed on dry weight basis unless otherwise stated.
All data obtained from the analysis of a monthly composite sample.

Sampling Date:	-															
Parameters (Dried Basis)	**Units**	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**	**OCT**	**NOV**	**DEC**	**MAX**	**AVG**	**OMRR***
Total Nitrogen	%	6.99	8.14	9.04	7.19	8.65	8.1	7.74	8.13	5.74	5.36	6.71	10.5	10.50	7.69	-
Total Phosphorus (as P)	%	1.10	1.02	1.14	1.02	1.15	1.23	1.07	1.14	1.33	1.01	1.02	1.09	1.33	1.11	-
Total Potassium	%	0.071	0.11	0.11	0.103	0.0669	0.077	0.0727	0.0755	0.0632	0.0563	0.071	0.0628	0.11	0.08	-
Total Sulphur	%	0.58	0.74	0.79	0.96	0.517	0.682	0.768	0.83	0.868	0.60	0.69	0.603	0.96	0.72	-
Total Carbon	%	33.6	41.7	40.9	41.5	41.3	40.3	40.5	40.9	40	40.5	42.0	43.2	43.2	40.5	-
Organic Matter	%	80.3	79.6	79.7	80.1	80	79.2	79.5	78.9	76.8	77.9	78.3	78.9	80.3	79.1	-
Moisture	%	75.7	74.9	75.6	75.2	76.6	76.9	76.4	76.7	76.1	72.4	76.6	76.5	76.9	75.8	-
Ammonia- N (available)	mg/kg	7810	8100	8460	8390	7530	7480	8400	8750	7370	5920	6220	6600	8750	7586	-
Nitrate - N (available)	mg/kg	5.4	4.4	5.25	5.85	2.65	3.52	7.77	3.43	3.72	15.6	3.05	4.52	15.6	5.43	-
pH	pH units	6.5	6.7	5.6	6.6	6.3	5.8	6	6.46	6.43	6.75	6.71	6.77	6.77	6.4	-
EC - Conductivity	dS/m	2.73	3.39	2.58	2.94	3.83	3.66	2.58	3.73	5.83	3.25	4.09	4.12	5.83	3.56	-
C/N Ratio	-	4.8	5.1	4.5	5.8	4.8	5.0	5.2	5.0	7.0	7.6	6.26	4.1	7.6	5.4	-
Arsenic	ug/g	2	2.8	N/A	2.95	2.25	2.87	2.83	2.84	3.5	2.88	3.1	2.51	3.5	2.8	75
Cadmium	ug/g	0.86	1.5	N/A	1.49	1.24	1.44	1.63	1.53	1.76	1.23	1.59	1.29	1.76	1.41	20
Chromium	ug/g	18	24	N/A	28.1	20.4	25.4	35.6	60.1	37.4	29.4	32.1	22	60.1	30.2	1060
Cobalt	ug/g	1.6	2.5	N/A	2.57	1.99	2.27	2.2	2.69	3.27	2.21	2.14	1.85	3.27	2.30	150
Copper	ug/g	360	520	N/A	483	438	568	600	655	636	531	561	453	655	528	2200
Lead	ug/g	13	20	N/A	20.8	17.2	20.3	21.4	20.7	22.8	17.3	22.9	17.7	22.9	19.5	500
Mercury	ug/g	1.3	1.5	N/A	1.98	1.67	1.73	3.22	1.78	2.08	1.52	2.2	2.39	3.22	1.95	5
Molybdenum	ug/g	3.9	6.4	N/A	6.34	5.91	6.94	6.05	6.77	7.82	6.21	6.76	5.14	7.82	6.20	20
Nickel	ug/g	11	15	N/A	17.8	13.9	18.1	31.4	41.8	32.9	27.1	35.5	26.5	41.8	24.6	180
Selenium	ug/g	3	4.5	N/A	4.84	4.37	4.88	4.72	4.7	5.31	4.18	4.79	3.75	5.31	4.46	14
Zinc	ug/g	530	800	N/A	700	732	924	922	1050	983	887	874	707	1050	828	1850