Keystone Environmental
Knowledge-Driven Results

March 2, 2018

Mr. Ivano Cecchini
Coquitlam School District No. 43
550 Poirier Street
Coquitlam, BC V3J 6A7

Dear Mr. Cecchini:

Re: Soil and Surface Water Analytical Results
Eagle Mountain Middle School, Anmore, BC
Project No. 10988-103B

1. BACKGROUND

Keystone Environmental Ltd. (Keystone Environmental) is pleased to present this letter summarizing the analytical results of soil and surface water samples collected down-gradient from a residential septic field between the Anmore Green Estates and the Eagle Mountain/ Heritage Woods schools in Anmore and Port Moody, BC (the Site). The soil and surface water samples were collected in January 2018.

A BC Ministry of Environment (MoE) letter titled *"Warning Letter, Permit, 4606"* dated March 7, 2017 (BC MoE, 2017a), reported non-compliance issues associated with the unconfirmed septic discharge associated with the Anmore Green Estates Strata Corporation LMS 3080 (Strata) septic field operating permit PE-04606, located adjacent and up-gradient of the Site. Associated Environmental Consultants Ltd. (Associated Environmental) developed an "action plan" for the Strata (AE, 2017a) to address the non-compliance issues. The action plan noted that soil and water sampling frequency would be determined by changes in precipitation, with monitoring during all seasons, and specifically, further communication with MoE if:

- *E.coli or fecal coliforms in water quality data from discharge points exceed the BC Approved Water Quality Guidelines for Primary-Contact Recreation and/or the Guidelines for Canadian Recreational Water Quality*;
- *human-sourced viruses are detected in soil where septic breakthrough is believed to have occurred*

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In September 2017, Associated Environmental (AE, 2017b) collected eight soil samples from areas south and west of the wastewater treatment system for analysis of parameters outlined in their action plan, with the exception of human-source viruses. Analytical results reported four of the six Site sample locations tested positive for *Escherichia coli*. (*E. coli*) and fecal coliforms ranging from 2.3 – 160,000 MPN/g (230 – 16,000,000 MPN/100g), in addition to the two background sample locations northwest of the Site on a recreational trail. Provincial and federal human health protection values for the parameters analyzed are specific to water samples, and not applicable to the soil samples. Water samples were not collected Associated Environmental during the September 2017 sampling event due to dry conditions.

Keystone Environmental collected surface water samples under variable weather conditions while the Eagle Mountain school was under construction from March to November 2013 (KEL, 2013) from various locations in the area where soil samples were collected by Associated Environmental in September 2017. Surface water samples were analyzed for *E. coli*, and fecal and total coliforms, but not human-source viruses. While analytical results for these parameters varied for the surface water samples collected, *E. coli*, sample results were not considered in exceedance of the BC Water Quality Guidelines (BCWQG) for Primary-Contact Recreation (PCR)[1] and Secondary-Contact Recreation (SCR)[2] activities. Soil samples were not collected as part of the Keystone Environmental sampling program, and therefore, were not compared to Associated Environmental (2017b) results.

As analytical results for human *Bacteroides* were not provided for samples collected by Associated Environmental (2017b) or previous sampling by Keystone Environmental (KEL, 2013), the Coquitlam School District No. 43 retained Keystone Environmental to conduct a sampling program at locations similar to Associated Environmental, include a human *Bacteroides* analysis in order to assess whether human-sourced viruses attributable to septic discharge could be detected on the Site, and if so, to recommend appropriate measures to protect human health.

2. APPROACH

For this sampling program, Keystone Environmental adopted a similar sampling approach as Associated Environmental (2017a; 2017b), but did not include analysis for nutrients that can be present naturally, and included parameters most relevant to septic and applicable human health protection guidelines. Keystone Environmental re-sampled those areas previously sampled by Associated Environmental (2017b) for soil to provide a comparison of the results, in addition to surface water where available. Keystone Environmental's (2017b) sampling program was conducted following rain events when the likelihood for septic discharge onto the Site would be considered highest.

[1] Primary contact: Activities in which the whole body or the face and trunk are frequently immersed or the face is frequently wetted by spray, and where it is likely that some water will be swallowed.
[2] Secondary contact: Activities in which only the limbs are regularly wetted and in which greater contact (including swallowing water) is unusual.

For this report, Keystone Environmental assumed that the public, mainly school children may be exposed to fecal coliforms in two ways:

- To fecal coliforms in surface water (resulting from groundwater seepages from the bank) through dermal skin contact, and incidental ingestion of surface water from splashes and hand mouth-transfer
- To fecal coliforms in soil through dermal skin contact and incidental ingestion of soil via hand mouth-transfer

To gauge the potential for human health risk, Keystone Environmental compared surface water results to human health based provincial and federal benchmarks; the BC MoE Approved Water Quality Guidelines for Primary-Contact Recreation (BC MoE 2017b) and Health Canada Guidelines for Canadian Recreational Water Quality (Health Canada, 2012). The 2017 BC MoE guidelines involved adopting the Health Canada guidelines, and supersede the 2001 BC MoE Water Quality Criteria for Microbiological Indicators Overview Report (BC MoE, 2001). Surface water analytical results were compared to the more conservative PCR criteria, as school children are considered to have an increased likelihood for ingesting (hand to mouth) while playing in the schoolyard adjacent to the septic field. Furthermore, the PCR criterion is used as the safety limit to trigger beach and public area closures in Metro Vancouver (Vancouver Coastal Health, 2018).

With respect to soil quality, a human health benchmark for fecal coliforms in soil has not been formally established in Canada. The BC Organic Matter Recycling Regulation specifies a limit of 1,000 MPN/100g, which is consistent with the Council of Ministers of the Environment (CCME) guideline for compost quality, but this value is specific to biosolids and compost, and is not applicable to soils alone (OMRR, 2018). CCME indicates the "use of *Escherichia coli* content as a direct indicator of pathogen levels is not yet supported by all regulatory agencies in Canada, but it may be used to help verify the reason for the high fecal coliform levels" (CCME, 2005). As such, soil results in this report were used to infer presence/absence of fecal coliforms and human *Bacteroids,* and for comparison with Associated Environmental results (AE, 2017b). Soil samples submitted for analysis of these parameters were presented as quantity detected, either Most Probable Number (MPN) or Cell Equivalent (CE).

For the purposes of this report, data supporting a potential septic discharge was inferred if Human *Bacteroides* are detected in soil or surface water down-gradient to the septic field, as total coliforms can occur naturally in the environment, and presence of *E coli.* or fecal coliforms can be associated with both human and animal feces (Health Canada, 2012).

3. METHODOLOGY

Keystone Environmental conducted the soil and surface sampling program on January 16 and 26, 2018. A review of Environment Canada climate normals indicated that the nearest weather station to the Site, Port Moody Glenayre, reported 4.0mm of precipitation on January 15 and 7.0mm on January 16; and 18.5mm on January 25 and 22.0mm on January 26 (Environment Canada, 2018).

Soil samples were collected from eight on-Site locations near the toe of slope and one background reference location (similar to Associated Environmental September 2017 location), which was not expected to be influenced by the Anmore Green Estates septic field. Soil samples were collected from two depths at each location: a) 0–5cm, and b) 5–10cm, to replicate sample collection by Associated Environmental (AE, 2017b).

Surface water samples were collected at two on-site soil sampling locations where groundwater seepage was observed, and one background reference location.

A total of 18 soil samples and four surface water samples were collected during this sampling program. Surface water and soil samples were collected in general accordance with Health Canada (Health Canada, 2012) and BC MoE (BC MoE, 2013) Field Sampling Manual procedures.

Field duplicates were not collected as part of this sampling program because coliforms are variable in the environment and the sampling program focused primarily on the determining presence / absence of faecal indicators on the Site.

Sample locations for surface soil (SS) and surface water (SW) are presented on the attached Figure 1, and summarized as follows:

- SS18-1: exposed soil slope north of baseball field
- SS18-2: steep cut bank, south of the western septic field
- SS18-3: slope where seepage was observed by Keystone Environmental at time of sampling
- SS18-4: slope up-gradient and north of gravel field
- SS18-5: south of western septic field fence, and southeast of stormwater catch basin
- SS18-6: west of western septic field fence, and north of stormwater catch basin
- SS18-7: west of fence on west side of septic field, up-gradient of school pathway
- SS18-8: moist area on side of public trail (*off-Site background location*)
- SS18-9: northeast corner of gravel field
- SW18-1: slope where seepage was observed by Keystone Environmental at time of sampling
- SW18-2: south of western septic field fence, and southeast of stormwater catch basin
- SW18-3: west of western septic field fence, and north of stormwater catch basin
- SW18-4: moist area on side of public trail (*off-Site background location*)

The samples were submitted to Maxxam Analytics for analysis of Total Coliforms, Fecal Coliforms, and *Escherichia coli.* (*E. coli*). Samples that had *E. coli* concentrations greater than the detection limits of 20 MPN/100g in soil and 10 Coliform Units (CFU)/100mL in water were submitted to EMSL Analytical Inc. for analysis of total *Bacteroides* and human *Bacteroides* to determine if the analytical results were associated wastes from wildlife/domesticated pets, and/or human sewage.

4. RESULTS

Soil and surface water samples results are presented in the attached Tables 1 and 2, with laboratory analytical reports presented in Attachment A.

4.1 Surface Water

Analytical results reported *E. coli* and fecal coliforms in two of the three on-Site surface water samples (SW18-2, SW18-3), and the one off-site background sample (SW18-4), but not at values exceeding the provincial or federal PCR guidelines. Of the two on-Site samples submitted for human *Bacteroides* analysis, one water sample (SW18-3) located at the western edge of the septic field fence near the catch basin contained human *Bacteroides* at detectable concentrations.

4.2 Soil

Analytical results reported *E. coli* and fecal coliforms concentrations were detected in eight on-Site soil samples (SS18-1b, SS18-2a, SS18-2b, SS18-3a, SS18-6a, SS18-6b, SS18-9a, SS18-19b) and one off-site soil sample (SS-18b). Soil samples with analytical results detecting *E. coli* at both sampling depths and collected from the same location, had the surface sample selected for Human *Bacteroides* analysis, based on greater probability for human contact. Human *Bacteroides* were not detected in the analyzed samples.

Regulatory criteria for *E. coli*, fecal coliforms or human *Bacteroides* are not available for soil samples.

5. CONCLUSION AND RECOMMENDATIONS

The findings of the surface water and soil sampling program did not provide evidence that the septic field is releasing discharge at levels in exceedance of applicable provincial or federal human health protection guidelines.

Potential evidence of septic field discharge beyond the septic field limits was only documented by one sample location that contained detectable human *Bacteroides* in a surface water sample at the western edge of the septic field fence (SW18-3); the closest sample location to the septic field. Analytical results for E. coli and fecal coliform at sample SW18-3 were both reported to be 10 CFU/100mL, which is also at the detectable limit for the analysis.

The soil analytical results of this January 2018 sampling event differed from results of the September 2017 Associated Environmental sampling event (AE 2017b). For some surface soil samples taken at similar sample locations where analytical results from this January 2018 Keystone Environmental study were non-detectable for *E. coli* (SS18-5a & b and SS18-7a & b), Associated Environmental (2017b) had reported results of 2,400 and 5,400 MPN/100g (SS17-4 a & b respectively); and 24,000 and 270 MPN/100g (SS17-7a & b respectively). Furthermore, the results from this January 2018 sampling event where *E. coli* was identified at values greater than detection limits at SS18-3a (45 MPU/100g) and SS18-6a (45 MPU/100g), Associated

Environmental (2017b) reported results of 16,000,000 and 160,000 MPN/100g[3] for SS17-3a and SS17-5a, respectively. It is unclear why there is such a difference in the soil sampling results.

It is not appropriate to directly compare soil results to surface water results. As Associated Environmental (2017b) did not collect surface water samples, Keystone Environmental is not providing a comparison between the January 2018 surface water samples results and the Associated Environmental (2017b) soil results.

Although evidence of septic discharge was not visually observed during sampling and surface water results were not identified exceeding the applicable guidelines for the protection of human health, it is recommended the existing fencing and signage be maintained around the affected area as a precautionary measure, based on human *Bacteroides* being detected in surface water immediately adjacent to the western edge of the septic field, and until the septic field compliance issues related to the March 7, 2017 MoE letter are resolved.

6. CLOSURE

This letter has been prepared solely for the internal use of Coquitlam School District No. 43 pursuant to the agreement between Keystone Environmental Ltd. and Coquitlam School District No. 43. By using this report, Coquitlam School District No. 43 agrees that they will review and use the letter in its entirety. Any use which other parties make of this letter, or any reliance on or decisions made based on it, are the responsibility of such parties. Keystone Environmental Ltd. accepts no responsibility for damages, if any, suffered by other parties as a result of decisions made or actions based on this letter.

If you have any questions, please do not hesitate to contact the undersigned.

Sincerely,

Keystone Environmental Ltd.

COLLEGE OF APPLIED BIOLOGY
Adam J. Radlowski
R.P. Bio.
2215
CAB

Craig Patterson, R.P.Bio.
Project Biologist

Adam Radlowski, M.Sc., R.P.Bio.
Senior Human Health Risk Assessor

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ATTACHMENTS:

- References
- Figure 1: Sample Location Plan
- Table 1: Soil Sample Analytical Results
- Table 2: Surface Water Sample Analytical Results
- Attachment A– Analytical Laboratory Reports

[3] Samples results converted from MPN/g to MPN/100g

REFERENCES

Associated Environmental Ltd. (AE). 2017a. Action Plan for the Anmore Green Estates (Permit PE 4606). Associated Environmental Ltd. October 11, 2017.

AE. 2017b. Technical Memorandum Re: Results of September 2017 Soil Testing. Associated Environmental Ltd. October 16, 2017.

BC Ministry of Environment (BC MoE). 2001. Water Quality. Water Quality Criteria for Microbiological Indicators Overview Report. BC Ministry of Environment. August 7, 2001.

BC MoE. 2013. Field Sampling Manual. BC Ministry of Environment. 2013 edition.

BC MoE. 2017a. Warning Letter, Permit, 4606. BC Ministry of Environment. March 7, 2017.

BC MoE. 2017b. Recreational Water Quality Guidelines. Guideline Summary. Ministry of Environment, Water Protection and Sustainability Branch. December 2017.

Canadian Council Ministers of the Environment (CCME). 2005. Guidelines for Compost Quality. Canadian Council Ministers of the Environment. PN 1340. 2005.

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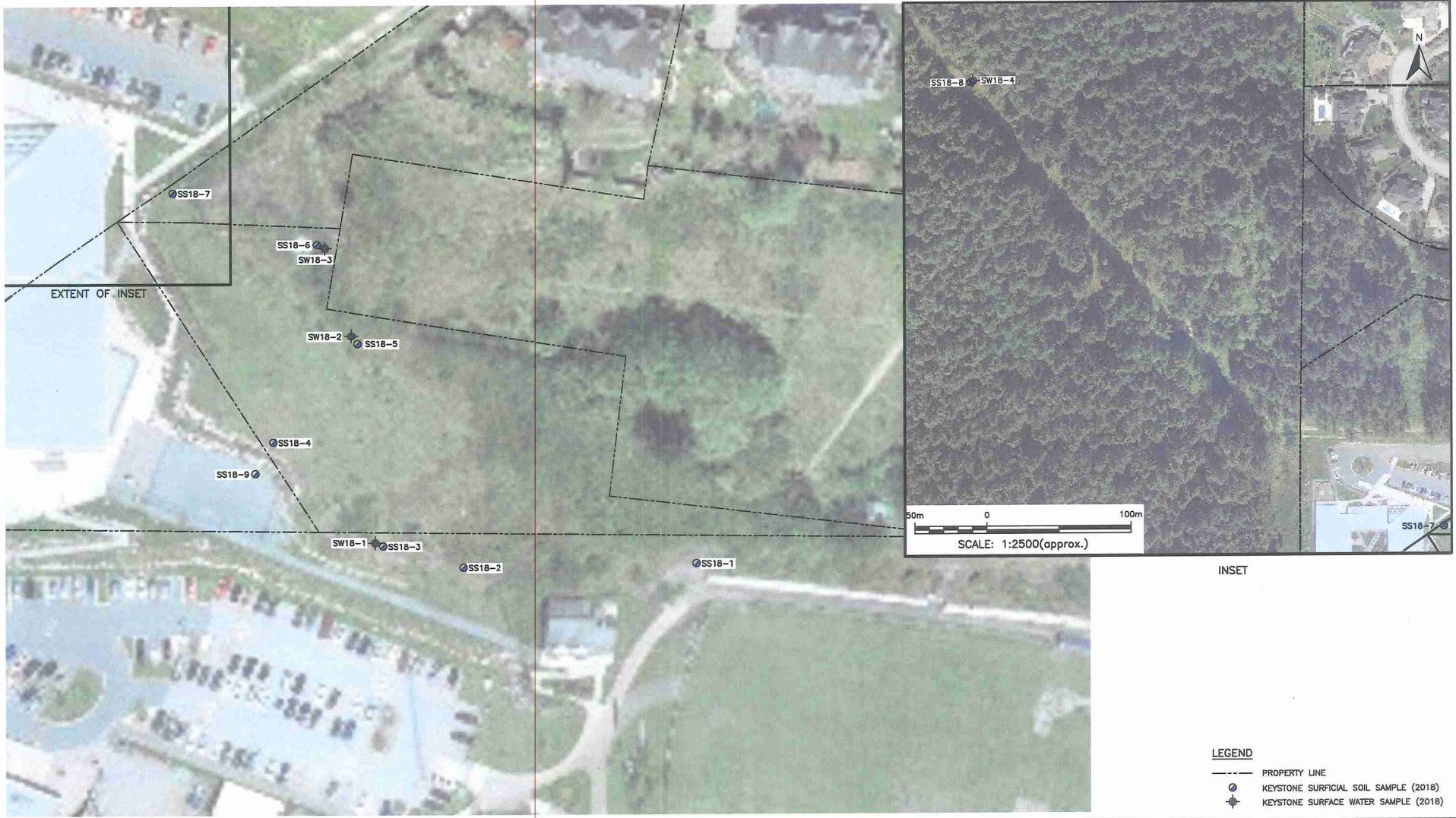
Health Canada. 2012. Guidelines for Canadian Recreational Water Quality. Third Edition. Prepared by the Federal-Provincial-Territorial Working Group on Recreational Water Quality of the Federal-Provincial-Territorial Committee on Health and the Environment. April 2012.

Keystone Environmental Ltd. (KEL). 2013. Surface Water Runoff/Seepage Sampling Results, Heritage Middle School, Anmore, BC. December 2, 2014.

Organic Matter Recycling Regulation (OMRR). 2018. Organic Matter Recycling Regulation. Includes amendments up to BC Reg. 243/2016, November 1, 2017 to February 13, 2018.

Vancouver Coastal Health. 2018. Beach Water Quality Reports. http://www.vch.ca/public-health/environmental-health-inspections/pools-beaches/beach-water-quality-reports (Accessed February 15, 2018).

FIGURE



Keystone Environmental

NOTES:
1. THIS DRAWING IS FOR GENERAL INFORMATION ONLY. LOT BOUNDARIES AND FEATURES ARE APPROXIMATE.
2. DATE OF AERIAL PHOTO IS 2015.

5m 0 25m
SCALE: 1:750(approx.)

110 Dogwood Drive
Anmore, B C
Coquitlam School District No. 43

REVISION No.	DATE	PROJECT No.
01	Feb. 2018	10988-103B

Figure 1
Sample Location Plan

PLOT SCALE: 1:1 DRAWN BY: TL CADD FILE No. I:\10900-10999\10988-Heritage School\Phase 103B\Figs\GIS_CADD\Fig1-Sample Location Plan-R1.dwg

TABLES

Table 1: Soil Sample Analytical Results

Location ID		SS18-1	SS18-1	SS18-2	SS18-2	SS18-3	SS18-3	SS18-4	SS18-4	SS18-5
Sample ID Date Sampled Lab Certificate Lab Sample ID	Units	SS18-1a 16-Jan-2018 K018970 SU8120	SS18-1b 16-Jan-2018 K018970 SU8121	SS18-2a 16-Jan-2018 K018970 SU8122	SS18-2b 16-Jan-2018 K018970 SU8123	SS18-3a 16-Jan-2018 K018970 SU8124	SS18-3b 16-Jan-2018 K018970 SU8125	SS18-4a 16-Jan-2018 K018970 SU8126	SS18-4b 16-Jan-2018 K018970 SU8127	SS18-5a 16-Jan-2018 K018970 SU8128
Microbiology										
E. coli	MPN/100g	<20	78	45	20	45	<20	<20	<20	<20
Fecal Coliforms	MPN/100g	<20	78	45	20	45	<20	<20	<20	<20
Total Coliforms	MPN/100g	5400	1300	2400	16000	1300	330	490	230000	790
Total Bacteroides	CEs/g	-	ND	ND	-	ND	-	-	155	-
Human Bacteroides	CEs/g	-	ND	ND	-	ND	-	-	ND	-

Location ID		SS18-5	SS18-6	SS18-6	SS18-7	SS18-7	SS18-8 (Background)	SS18-8 (Background)	SS18-9	SS18-9
Sample ID Date Sampled Lab Certificate Lab Sample ID	Units	SS18-5b 16-Jan-2018 K018970 SU8129	SS18-6a 16-Jan-2018 K018971 SU8130	SS18-6b 16-Jan-2018 K018971 SU8131	SS18-7a 16-Jan-2018 K018971 SU8132	SS18-7b 16-Jan-2018 K018971 SU8133	SS18-8a 16-Jan-2018 K018971 SU8134	SS18-8b 16-Jan-2018 K018971 SU8135	SS18-9a 26-Jan-2018 K018996 SW2436	SS18-9b 26-Jan-2018 K018996 SW2437
Microbiology										
E. coli	MPN/100g	<20	45	20	<20	<20	<20	20	45	20
Fecal Coliforms	MPN/100g	<20	45	20	<20	<20	<20	20	45	20
Total Coliforms	MPN/100g	2400	22000	1300	4900	4900	230	230	240000	3500
Total Bacteroides	CEs/g	-	ND	-	-	-	-	-	ND	-
Human Bacteroides	CEs/g	-	ND	-	-	-	-	-	ND	-

Notes:

MPN	Most Probable Number
CEs	Cell Equivalent, measured by Polymerase Chain Reaction using genomic DNA standards
n/g	No guideline
ND	Non-Detect

Table 2: Surface Water Sample Analytical Results

Current Guidelines							
BCWQG (2017)	Health Canada (2012)			SW18-1	SW18-2	SW18-3	SW18-4 (Background)
		Sample ID		SW18-1	SW18-2	SW18-3	SW18-4
		Date Sampled		16-Jan-2018	16-Jan-2018	16-Jan-2018	16-Jan-2018
		Lab Certificate		K018971	K018971	K018971	K018971
Primary Contact Recreation	Primary Contact Recreation	Lab Sample ID	Units	SU8136	SU8137	SU8138	SU8139
		Microbiology					
200/100 mL **(A)** 400/100 mL **(B)**	200/100 mL	E. coli	CFU/100mL	<10	160	10	10
n/g	n/g	Fecal Coliforms	CFU/100mL	<10	170	10	10
n/g	n/g	Total Coliforms	CFU/100mL	2100	4500	39000	21000
n/g	n/g	Total Bacteroides	CEs/100mL	-	ND	57036	-
n/g	n/g	Human Bacteroides	CEs/100mL	-	ND	2032	-

Notes:

BCWQG BC Water Quality Guidelines
Health Canada Health Canada Guidelines for Canadian Recreational Water Quality
(A) Recreational WQG: ≤ 200 E. coli /100 mL (geometric mean of a minimum of 5 samples in 30 days)
(B) Recreational WQG: ≤ 400 *E. coli* /100 mL (single sample maximum concentration)
CEs Cell Equivalent, measured by Polymerase Chain Reaction using genomic DNA standards
CFU Coliform Unit
n/g No guideline
ND Non-Detect

ATTACHMENT A

ANALYTICAL LABORATORY REPORTS

Keystone Environmental
Knowledge-Driven Results

Maxxam
A Bureau Veritas Group Company

Success Through Science®

Your Project #: 10988
Site Location: HERITAGE MOUNTAIN
Your C.O.C. #: K018970, K018971

Attention: Barry Warren

KEYSTONE ENVIRONMENTAL LTD
SUITE 320
4400 DOMINION STREET
BURNABY, BC
CANADA V5G 4G3

Report Date: 2018/01/22
Report #: R2504461
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B803484
Received: 2018/01/16, 10:07

Sample Matrix: Soil
Samples Received: 16

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Total Coliforms (MTF) in Soil (1)	16	N/A	2018/01/16	COR1 SOP-00019	Health Can MFHPB-19
Escherichia Coli (MTF) in Soil (1)	16	N/A	2018/01/16	COR1 SOP-00019	Health Can MFHPB-19
Fecal Coliforms (MTF) in Soil (1)	16	N/A	2018/01/16	COR1 SOP-00019	Health Can MFHPB-19

Sample Matrix: Water
Samples Received: 4

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Coliform by membrane filtration	4	N/A	2018/01/16	BBY4SOP-00001	SM 22 9222 m
E.coli by membrane filtration in Water	4	N/A	2018/01/16	BBY4SOP-00001	SM 22 9222 m
Fecal Coliform by membrane filtration	4	N/A	2018/01/16	BBY4SOP-00001	SM 22 9222 m

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested.

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

Maxxam Analytics International Corporation o/a Maxxam Analytics Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Maxxam
A Bureau Veritas Group Company

Success Through Science®

Your Project #: 10988
Site Location: HERITAGE MOUNTAIN
Your C.O.C. #: K018970, K018971

Attention: Barry Warren

KEYSTONE ENVIRONMENTAL LTD
SUITE 320
4400 DOMINION STREET
BURNABY, BC
CANADA V5G 4G3

Report Date: 2018/01/22
Report #: R2504461
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B803484
Received: 2018/01/16, 10:07

(1) The matrix is non-food and is outside of the scope of the method. Sample(s) analyzed have not been subjected to Maxxam's standard validation process for the submitted matrix and is not an accredited method.

Encryption Key

Maxxam
22 Jan 2018 10:09:36

cosign

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Nancy Niklis, Project Manager
Email: NNiklis@maxxam.ca
Phone# (604) 734 7276

==========

This report has been generated and distributed using a secure automated process.
Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

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Maxxam Job #: B803484
Report Date: 2018/01/22

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 10988
Site Location: HERITAGE MOUNTAIN
Sampler Initials: BW

MICROBIOLOGY (SOIL)

Maxxam ID		SU8120	SU8121	SU8122	SU8123	SU8124	SU8125	SU8126		
Sampling Date		2018/01/16 07:05	2018/01/16 07:05	2018/01/16 07:15	2018/01/16 07:15	2018/01/16 07:20	2018/01/16 07:20	2018/01/16 07:30		
COC Number		K018970	K018970	K018970	K018970	K018970	K018970	K018970		
	UNITS	SS18-1A	SS18-1B	SS18-2A	SS18-2B	SS18-3A	SS18-3B	SS18-4A	RDL	QC Batch
Microbiological Param.										
E. coli	MPN/100g	<20	78	45	20	45	<20	<20	20	8885945
Fecal Coliforms	MPN/100g	<20	78	45	20	45	<20	<20	20	8885948
Total Coliforms	MPN/100g	5400	1300	2400	16000	1300	330	490	20	8885943
RDL = Reportable Detection Limit										

Maxxam ID		SU8127	SU8128	SU8129	SU8130	SU8131	SU8132	SU8133		
Sampling Date		2018/01/16 07:30	2018/01/16 07:40	2018/01/16 07:40	2018/01/16 07:50	2018/01/16 07:50	2018/01/16 08:00	2018/01/16 08:00		
COC Number		K018970	K018970	K018970	K018971	K018971	K018971	K018971		
	UNITS	SS18-4B	SS18-5A	SS18-5B	SS18-6A	SS18-6B	SS18-7A	SS18-7B	RDL	QC Batch
Microbiological Param.										
E. coli	MPN/100g	<20	<20	<20	45	20	<20	<20	20	8885945
Fecal Coliforms	MPN/100g	<20	<20	<20	45	20	<20	<20	20	8885948
Total Coliforms	MPN/100g	230000	790	2400	22000	1300	4900	4900	20	8885943
RDL = Reportable Detection Limit										

Maxxam ID		SU8134	SU8135		
Sampling Date		2018/01/16 08:45	2018/01/16 08:45		
COC Number		K018971	K018971		
	UNITS	SS18-8A	SS18-8B	RDL	QC Batch
Microbiological Param.					
E. coli	MPN/100g	<20	20	20	8885945
Fecal Coliforms	MPN/100g	<20	20	20	8885948
Total Coliforms	MPN/100g	230	230	20	8885943
RDL = Reportable Detection Limit					

Maxxam Analytics International Corporation o/a Maxxam Analytics Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Maxxam Job #: B803484
Report Date: 2018/01/22

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 10988
Site Location: HERITAGE MOUNTAIN
Sampler Initials: BW

MICROBIOLOGY (WATER)

Maxxam ID		SU8136	SU8137	SU8138	SU8139		
Sampling Date		2018/01/16 07:25	2018/01/16 08:10	2018/01/16 08:15	2018/01/16 08:50		
COC Number		K018971	K018971	K018971	K018971		
	UNITS	SW18-1	SW18-2	SW18-3	SW18-4	RDL	QC Batch
Microbiological Param.							
E. coli	CFU/100mL	<10	160	10	10	10	8886138
Fecal Coliforms	CFU/100mL	<10	170	10	10	10	8886134
Total Coliforms	CFU/100mL	2100	4500	39000	21000	10	8886137
RDL = Reportable Detection Limit							

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Maxxam Job #: B803484
Report Date: 2018/01/22

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 10988
Site Location: HERITAGE MOUNTAIN
Sampler Initials: BW

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	10.0°C

Microbiology Parameters: Detection Limit increased due to sample matrix and volume provided.

Results relate only to the items tested.

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Maxxam Job #: B803484
Report Date: 2018/01/22

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 10988
Site Location: HERITAGE MOUNTAIN
Sampler Initials: BW

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

Andy Lu, Ph.D., P.Chem., Scientific Specialist

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K 018970

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CHAIN OF CUSTODY RECORD

BBY FCD-00077/07
Page 1 of 2

Burnaby: 4606 Canada Way, Burnaby, BC V5G 1K5. Toll Free (800) 665-8566

Invoice Information	Report Information (if differs from invoice)	Project Information (where applicable)	Turnaround Time (TAT) Required
Company Name: 3763 - Keystone Environmental Ltd.	Company Name:	Quotation #:	☑ Regular TAT 5 days (Most analyses)
Contact Name: Craig Patterson	Contact Name: Barry Warren	P.O. #/ AFE#:	PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS
Address: #320 - 4400 Dominion Street	Address:	Project #: B. Warren will provide	Rush TAT (Surcharges will be applied)
Burnaby, BC PC: V5G 4G3	PC:	Site Location:	☐ Same Day ☐ 2 Days
Phone: (604) 430-0671	Phone:	Site #: Heritage Mountain	☐ 1 Day ☐ 3 Days
Email: cpatterson@keystoneenviro.com	Email: bwarren@keystoneenviro.com	Sampled By: B. Warren	Date Required:
			Rush Confirmation #:

Regulatory Criteria	Special Instructions
☐ BC CSR Soil ☐ BC CSR Water	☐ Return Cooler
☐ YK CSR Soil ☐ YK CSR Water	☐ Ship Sample Bottles (Please Specify)
☐ CCME (Specify) ☐ Other (Specify)	
☐ Drinking Water ☐ BC Water Quality	

SAMPLES MUST BE KEPT COOL (< 10 °C) FROM TIME OF SAMPLING UNTIL DELIVERY TO MAXXAM

	Sample Identification	Date Sampled (YYYY/MM/DD)	Time Sampled (HH:MM)	Matrix
1	SS18-1a	2018/01/16	7:05	Soil
2	SS18-1b		7:05	
3	SS18-2a		7:15	
4	SS18-2b		7:15	
5	SS18-3a		7:20	
6	SS18-3b		7:20	
7	SS18-4a		7:30	
8	SS18-4b		7:30	
9	SS18-5a		7:40	
10	SS18-5b		7:40	

Analysis Requested: BTEX/VPH ☐, VOC/BTEX/VPH ☐, MTBE ☐, BTEX/F1 ☐, VOC/BTEX/F1 ☐, PAH ☐, LEPH/HEPH/PAH ☐, EPH ☐, TEH ☐, F2-F4 ☐, Dissolved Metals ☐, Filtered? ☐, Preserved? ☐, Dissolved Mercury ☐, Filtered? ☐, Preserved? ☐, Total Metals ☐, Field Preserved? ☐, Total Mercury ☐, Field Preserved? ☐, Chloride ☐, Fluoride ☐, Sulphate ☐, TSS ☐, BOD ☐, COD ☐, pH ☐, Conductivity ☐, Alkalinity ☐, Nitrite ☐, Nitrate ☐, Ammonia ☐, Ecoli, total coliform, Fecal Bacteroides, human biomarker

# OF CONTAINERS SUBMITTED	HOLD - DO NOT ANALYZE

LABORATORY USE ONLY

CUSTODY SEAL Y / N		COOLER TEMPERATURES
Present	Intact	
		9, 9, 12
N/A		

COOLING MEDIA PRESENT (Y) / N

COMMENTS

RELINQUISHED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	RECEIVED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)
Barry Warren	2018/01/16	10:07	Eva Sykora EVA SYKORA	2018/01/16	10:07

B803484_COC

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COC-1027 Keystone

K 018971

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CHAIN OF CUSTODY RECORD

BBY FCD-00077/07
Page 2 of 2

Burnaby: 4606 Canada Way, Burnaby, BC V5G 1K5, Toll Free (800) 665-8566

Invoice Information	Report Information (if differs from invoice)	Project Information (where applicable)	Turnaround Time (TAT) Required
Company Name: 3763 - Keystone Environmental Ltd.	Company Name:	Quotation #:	☑ Regular TAT 5 days (Most analyses)
Contact Name:	Contact Name:	P.O. #/ AFE#:	PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS
Address: #320 - 4400 Dominion Street	Address:	Project #: B. Warren will provide	Rush TAT (Surcharges will be applied)
Burnaby, BC PC: V5G 4G3	PC:	Site Location:	☐ Same Day ☐ 2 Days
Phone: (604) 430-0671	Phone:	Site #: Heritage Mountain	☐ 1 Day ☐ 3 Days
Email:	Email:	Sampled By: B. Warren	Date Required:

Regulatory Criteria	Special Instructions
☐ BC CSR Soil ☐ BC CSR Water	☐ Return Cooler
☐ YK CSR Soil ☐ YK CSR Water	☐ Ship Sample Bottles (Please Specify)
☐ CCME (Specify) ☐ Other (Specify)	
☐ Drinking Water ☐ BC Water Quality	

SAMPLES MUST BE KEPT COOL (< 10 °C) FROM TIME OF SAMPLING UNTIL DELIVERY TO MAXXAM

Rush Confirmation #:

LABORATORY USE ONLY

CUSTODY SEAL Y / N (Present / Intact) | COOLER TEMPERATURES: 9,9,12 | N/A | COOLING MEDIA PRESENT (Y) / N

	Sample Identification	Date Sampled (YYYY/MM/DD)	Time Sampled (HH:MM)	Matrix	BTEX / VPH	VOC / BTEX / F1	PAH	LEPH/HEPH/PAH	EPH	F2 - F4	TEH	MTBE	Preserved?	Filtered?	Dissolved Metals	Preserved?	Filtered?	Dissolved Mercury	Field Preserved?	Total Metals	Field Preserved?	Total Mercury	Chloride	Fluoride	Sulphate	TSS	TDS	BOD	COD	pH	Conductivity	Alkalinity	Nitrite	Nitrate	Ammonia	Ecol; Metals, total cadmium; Bacteroides human Marker	# OF CONTAINERS SUBMITTED	HOLD - DO NOT ANALYZE	COMMENTS
1	SS18-6a	2018/01/16	7:50	Soil																															X	X			
2	SS18-6b		7:50																																				
3	SS18-7a		8:00																																				
4	SS18-7b		8:00																																				
5	SS18-8a		8:45																																				
6	SS18-8b		8:45																																				
7	SW18-1		7:25	Water																																			
8	SW18-2		8:10																																				
9	SW18-3		8:15																																				
10	SW18-4		8:58																																				

RELINQUISHED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	RECEIVED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)
Barry Warren	2018/01/16	10:07	Eva Sykora EVA SYKORA	2018/01/16	10:07

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B803484_COC

COC-1027 Keystone

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Your Project #: 10988
Site Location: HERITAGE MOUNTAIN
Your C.O.C. #: K018996

Attention: CRAIG PATTERSON

KEYSTONE ENVIRONMENTAL LTD
SUITE 320
4400 DOMINION STREET
BURNABY, BC
CANADA V5G 4G3

Report Date: 2018/01/31
Report #: R2508013
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B806344
Received: 2018/01/26, 08:17

Sample Matrix: Soil
Samples Received: 2

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Total Coliforms (MTF) in Soil (1)	2	N/A	2018/01/26	COR1 SOP-00019	Health Can MFHPB-19
Escherichia Coli (MTF) in Soil (1)	2	N/A	2018/01/26	COR1 SOP-00019	Health Can MFHPB-19
Fecal Coliforms (MTF) in Soil - Wet (1)	2	N/A	2018/01/26	COR1 SOP-00019	Health Can MFHPB-19
Moisture	2	2018/01/29	2018/01/30	BBY8SOP-00017	BCMOE BCLM Dec2000 m

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

(1) The matrix is non-food and is outside of the scope of the method. Sample(s) analyzed have not been subjected to Maxxam's standard validation process for the submitted matrix and is not an accredited method.

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Your Project #: 10988
Site Location: HERITAGE MOUNTAIN
Your C.O.C. #: K018996

Attention: CRAIG PATTERSON

KEYSTONE ENVIRONMENTAL LTD
SUITE 320
4400 DOMINION STREET
BURNABY, BC
CANADA V5G 4G3

Report Date: 2018/01/31
Report #: R2508013
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B806344
Received: 2018/01/26, 08:17

Encryption Key

Maxxam
31 Jan 2018 10:16:49

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Nancy Niklis, Project Manager
Email: NNiklis@maxxam.ca
Phone# (604) 734 7276

==========

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Maxxam Job #: B806344
Report Date: 2018/01/31

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 10988
Site Location: HERITAGE MOUNTAIN
Sampler Initials: BW

PHYSICAL TESTING (SOIL)

Maxxam ID		SW2436	SW2437		
Sampling Date		2018/01/26 07:30	2018/01/26 07:35		
COC Number		K018996	K018996		
	UNITS	SS18-9A	SS18-9B	RDL	QC Batch
Physical Properties					
Moisture	%	27	10	0.30	8896717
RDL = Reportable Detection Limit					

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Maxxam Job #: B806344
Report Date: 2018/01/31

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 10988
Site Location: HERITAGE MOUNTAIN
Sampler Initials: BW

MICROBIOLOGY (SOIL)

Maxxam ID		SW2436	SW2437		
Sampling Date		2018/01/26 07:30	2018/01/26 07:35		
COC Number		K018996	K018996		
	UNITS	SS18-9A	SS18-9B	RDL	QC Batch
Microbiological Param.					
E. coli	MPN/100g	45	20	20	8895258
Fecal Coliforms Wet	MPN/100g	45	20	20	8895260
Total Coliforms	MPN/100g	240000	3500	20	8895256
RDL = Reportable Detection Limit					

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Maxxam Job #: B806344
Report Date: 2018/01/31

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 10988
Site Location: HERITAGE MOUNTAIN
Sampler Initials: BW

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	5.0°C

Results relate only to the items tested.

Maxxam Analytics International Corporation o/a Maxxam Analytics Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Maxxam Job #: B806344
Report Date: 2018/01/31

QUALITY ASSURANCE REPORT

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 10988
Site Location: HERITAGE MOUNTAIN
Sampler Initials: BW

			Method Blank		RPD	
QC Batch	Parameter	Date	Value	UNITS	Value (%)	QC Limits
8896717	Moisture	2018/01/30	<0.30	%	1.9	20

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

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Maxxam Job #: B806344
Report Date: 2018/01/31

KEYSTONE ENVIRONMENTAL LTD
Client Project #: 10988
Site Location: HERITAGE MOUNTAIN
Sampler Initials: BW

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

Andy Lu, Ph.D., P.Chem., Scientific Specialist

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K 018996

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CHAIN OF CUSTODY RECORD

BBY FCD-00077/07
Page 1 of 1

Burnaby: 4606 Canada Way, Burnaby, BC V5G 1K5. Toll Free (800) 665-8566

Invoice Information	Report Information (if differs from invoice)	Project Information (where applicable)	Turnaround Time (TAT) Required
Company Name: 3763 - Keystone Environmental Ltd.	Company Name: Keystone	Quotation #:	☐ Regular TAT 5 days (Most analyses)
Contact Name: Craig Patterson	Contact Name: Barry Warren	P.O. #/ AFE#:	PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS
Address: #320 - 4400 Dominion Street	Address:	Project #: 10988	Rush TAT (Surcharges will be applied)
Burnaby, BC PC: V5G 4G3	PC:	Site Location:	☐ Same Day ☐ 2 Days
Phone: (604) 430-0671	Phone:	Site #: Heritage Mountain	☑ 1 Day ☐ 3 Days
Email: cpatterson@keystoneenviro.com	Email: bwarren@keystoneenviro.com	Sampled By: B. Warren	Date Required:

Regulatory Criteria	Special Instructions
☐ BC CSR Soil ☐ BC CSR Water	☐ Return Cooler
☐ YK CSR Soil ☐ YK CSR Water	☐ Ship Sample Bottles (Please Specify)
☐ CCME (Specify) ☐ Other (Specify)	
☐ Drinking Water ☐ BC Water Quality	

SAMPLES MUST BE KEPT COOL (< 10 °C) FROM TIME OF SAMPLING UNTIL DELIVERY TO MAXXAM

	Sample Identification	Date Sampled (YYYY/MM/DD)	Time Sampled (HH:MM)	Matrix	BTEXS / VPH	BTEX / F1	PAH	EPH	Dissolved Metals	Dissolved Mercury	Total Metals	Total Mercury	Chloride	TSS	pH	Nitrite	E.coli, Total + Fecal Coliform	# OF CONTAINERS SUBMITTED	HOLD - DO NOT ANALYZE
1	SS18-9a	2018/01/26	07:30	Soil													X	2	
2	SS18-9b	"	7:35	Soil													X	2	
3																			
4																			
5																			
6																			
7																			
8																			
9																			
10																			

Analysis Requested: MTBE; VOC / BTEXS / VPH; VOC / BTEX / F1; LEPH/HEPH/PAH; F2 - F4; TEH; Preserved?; Filtered?; Preserved?; Filtered?; Field Preserved?; Dissolved Metals; Field Preserved?; Dissolved Mercury; Sulphate; Fluoride; COD; BOD; Alkalinity; Conductivity; Ammonia; Nitrate

LABORATORY USE ONLY

CUSTODY SEAL Y / N		COOLER TEMPERATURES
Present	Intact	
N/A		5,5,5

COOLING MEDIA PRESENT Y / N

COMMENTS

RELINQUISHED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	RECEIVED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)
Barry Warren	2018/01/26	08:15	Eva Sykora EVA SYKORA	2018/01/26	08:17

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B806344_COC

COC-1027 Keystone

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (800) 220-3675/ 786-0262
http://www.emsl.com E-mail: Dnalab2@EMSL.com

Client:	**Maxxam Analytics**	EMSL Order ID:	**611800125**
	4606 Canada Way	Date Received:	**1/25/2018**
	Burnaby, BC V5G 1K5	Date Analyzed:	**1/30/2018**
Attn:	**Nancy Niklis**	Date Reported:	**1/30/2018**
Project:	**B803484**	Date Amended:	

Rapid Detection of Total *Bacteroides* by Quantitative PCR

EMSL Test: M095

Lab Sample Number	Client Sample ID	Description	Soil Received	Soil Sampled (g)	CEs */g Soil
0125-1	SU8121-SS18-1B	N/A	Bulk	1.141	None Detected
0125-2	SU8122-SS18-2A	N/A	Bulk	1.2354	None Detected
0125-3	SU8124-SS18-3A	N/A	Bulk	1.1834	None Detected
0125-4	SU8127-SS18-4B	N/A	Bulk	1.2234	155
0125-5	SU8130-SS18-6A	N/A	Bulk	1.3169	None Detected

CEs: Cell Equivalent, measured by PCR using genomic DNA standards.

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Sergey Balashov, Ph.D.
PCR Laboratory Director

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (800) 220-3675/ 786-0262
http://www.emsl.com E-mail: Dnalab2@EMSL.com

Client:	**Maxxam Analytics**	EMSL Order ID:	**611800125**
	4606 Canada Way	Date Received:	**1/25/2018**
	Burnaby, BC V5G 1K5	Date Analyzed:	**1/30/2018**
Attn.	**Nancy Niklis**	Date Reported:	**1/30/2018**
Project:	**B803484**	Date Amended:	

Rapid Detection of Total *Bacteroides* by Quantitative PCR

EMSL Test: M095

Lab Sample Number	Client Sample ID	Description	Water Received (mL)	Water Sampled (mL)	CEs*/100 mL
0125-6	SU8137-SW18-2	N/A	250	250	None Detected
0125-7	SU8138-SW18-3	N/A	250	250	57,036

CEs: Cell Equivalent, measured by PCR using genomic DNA standards.

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Sergey Balashov, Ph.D.
PCR Laboratory Director

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (800) 220-3675/ 786-0262
http://www.emsl.com E-mail: Dnalab2@EMSL.com

Client:	**Maxxam Analytics**	EMSL Order ID:	**611800125**
	4606 Canada Way	Date Received:	**1/25/2018**
	Burnaby, BC V5G 1K5	Date Analyzed:	**1/30/2018**
Attn:	**Nancy Niklis**	Date Reported:	**1/30/2018**
Project:	**B803484**	Date Amended:	

Rapid Detection of Human *Bacteroides* by Quantitative PCR

EMSL Test: M199

Lab Sample Number	Client Sample ID	Description	Bulk Received	Bulk Sampled (g)	CEs* /g Soil
0125-1	SU8121-SS18-1B	N/A	Bulk	1.141	None Detected
0125-2	SU8122-SS18-2A	N/A	Bulk	1.2354	None Detected
0125-3	SU8124-SS18-3A	N/A	Bulk	1.1834	None Detected
0125-4	SU8127-SS18-4B	N/A	Bulk	1.2234	None Detected
0125-5	SU8130-SS18-6A	N/A	Bulk	1.3169	None Detected

Note: The qPCR assay for human *Bacteroides* is based on HF183 marker which was evaluated by EPA scientists (SAM, 33, 2010). The qPCR detects human specific *Bacteroides* predominantly.

CEs: Cells Equivalent, measured by PCR using genomic DNA standards.

Sergey Balashov, Ph.D.
PCR Laboratory Director

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (800) 220-3675/ 786-0262
http://www.emsl.com E-mail: Dnalab2@EMSL.com

Client:	**Maxxam Analytics**	EMSL Order ID:	**611800125**
	4606 Canada Way	Date Received:	**1/25/2018**
	Burnaby, BC V5G 1K5	Date Analyzed:	**1/30/2018**
Attn.	**Nancy Niklis**	Date Reported:	**1/30/2018**
Project:	**B803484**	Date Amended:	

Rapid Detection of Human *Bacteroides* by Quantitative PCR

EMSL Test Code: M199

Lab Sample Number	Client Sample ID	Description	Water Received (mL)	Water Sampled (mL)	CEs /100 mL
0125-6	SU8137-SW18-2	N/A	250	250	None Detected
0125-7	SU8138-SW18-3	N/A	250	250	2032

Note: The qPCR assay for human *Bacteroides* is based on HF183 marker which was evaluated by EPA scientists (SAM, 33, 2010). The qPCR detects human specific *Bacteroides* predominantly.

CEs: Cells Equivalent, measured by PCR using genomic DNA standards.

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Sergey Balashov, Ph.D.
PCR Laboratory Director

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (800) 220-3675/ 786-0262
http://www.emsl.com E-mail: Dnalab2@EMSL.com

Client:	**Maxxam Analytics**	EMSL Order ID:	**611800180**
	4606 Canada Way	Date Received:	**2/5/2018**
	Burnaby, BC V5G 1K5	Date Analyzed:	**2/5/2018**
Attn:	**Nancy Niklis**	Date Reported:	**2/8/2018**
Project:	**B806344**	Date Amended:	

Rapid Detection of Total *Bacteroides* by Quantitative PCR

EMSL Test: M095

Lab Sample Number	Client Sample ID	Description	Soil Received	Soil Sampled (g)	CEs */g Soil
0180-1	SW2436-SS18-9A	N/A	Bullk	1.2638	None Detected

CEs: Cell Equivalent, measured by PCR using genomic DNA standards.

Sergey Balashov, Ph.D.
PCR Laboratory Director

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Client:	**Maxxam Analytics**	EMSL Order ID:	**611800180**
	4606 Canada Way	Date Received:	**2/5/2018**
	Burnaby, BC V5G 1K5	Date Analyzed:	**2/5/2018**
Attn:	**Nancy Niklis**	Date Reported:	**2/8/2018**
Project:	**B806344**	Date Amended:	

Rapid Detection of Human *Bacteroides* by Quantitative PCR

EMSL Test: M199

Lab Sample Number	Client Sample ID	Description	Bulk Received	Bulk Sampled (g)	CEs* /g Soil
0180-1	SW2436-SS18-9A	N/A	Bullk	1.2638	None Detected

Note: The qPCR assay for human *Bacteroides* is based on HF183 marker which was evaluated by EPA scientists (SAM, 33, 2010). The qPCR detects human specific *Bacteroides* predominantly.

CEs: Cells Equivalent, measured by PCR using genomic DNA standards.

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Sergey Balashov, Ph.D.
PCR Laboratory Director


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