

Government of Yukon

# **Clinton Creek Drop Structures Construction Activity Report - Draft**

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**Project Number:** 60114504 (6029-015-00)

Date: December, 2009

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December 11, 2009

Rachel Pugh Project Manager Assessment and Abandoned Mines Branch Energy, Mines and Resources Yukon Government Box 2703 (K-419) Whitehorse, Yukon Y1A 2C6

Dear Ms. Pugh:

Project No:	60114504 (6029-015-02)
Regarding:	Clinton Creek Drop Structures
	Construction Activity Report

AECOM is pleased to submit the draft construction activity report for the rehabilitation of the Drop Structures at the Clinton Creek Abandoned Mine Site.

If you have any questions or comments, please call or email.

Sincerely, AECOM Canada Ltd.

 $\sim$ 

Andrew Smith, P.Eng Water Resources Engineer Andrew.smith3@aecom.com

AS:sw cc: Rolf Aslund – AECOM Gil Robinson - AECOM

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# **Revision Log**

Revision #	Revised By	Date	Issue / Revision Description
0	Andrew Smith	December 11, 2009	Draft

## **AECOM Signatures**

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# 1. Introduction

During the fall of 2009, work took place at the Clinton Creek Abandoned Mine Site (the site) to repair damage sustained at the four drop structures during the 2009 spring run-off. Work began on September 8 and continued until October 16, an approximate six-week period. While the original construction plan did change, almost all of the damage on the four structures was repaired.

Construction was undertaken by Han Construction Ltd. (the contractor) from Dawson City, Yukon. Han Construction Ltd. is owned by Chief Isaac Inc., which is a business unit of the Tr'ondek Hwech'in First Nation. Han Construction was the contractor originally used to construct the drop structures. Resident inspection services were provided by AECOM.

This report details the construction activity including:

- Progress of Work;
- Summary of Work completed;
- Air quality sampling conducted during construction, and the laboratory results; and
- Equipment and excess material remaining.

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# 2. Historical Summary

Based on evidence of on-going deterioration of the Hudgeon Lake outlet, creek stabilization measures consisting of four gabion drop structures were constructed from 2002 to 2004 (Figure 2.1). Because the waste rock was still undergoing creep movements, and may do so for many more years, gabion drop structures were selected for the channel stabilization measures because they can accommodate some movements of the waste rock pile and remain functional. The gabion drop structures serve as grade control points connecting nearly flat channel sections.

Some maintenance work has been done on each new drop structure following the first spring freshet event after construction. The maintenance work involved opening some of the backets to top off the gabion fill material which settled during the high flows of the first spring freshet event for each drop structure



Figure 2.1 Clinton Creek Channel Stabilization Works (2004)

## 3. Gabion Drop Structures

The gabion structures used on Clinton Creek along the waste rock pile channel stabilization reach are step-drop structures with the steps having a rise of 0.5 m and a run of 2.0 m. The structures were constructed of 0.5 m thick, 1.0 m wide and 3.0 m long gabions with 1.0 m gabion overlap between steps. Each gabion basket has three  $0.5 \times 1.0 \times 1.0 \times 1.0$  m compartments separated by partition walls made of the same material as the gabion basket. The top lid of the basket can be opened, to place the stone fill, and the lid is "hinged" along the long side of the gabion basket.

The use of gabion drop structures along this reach of the Clinton Creek channel was selected based on the need for flexible structures due to the gradually shifting waste rock material. The use of rock sills constructed of large boulders were considered during the initial assessment, but rejected due to the lack of large boulders in the area and the inherent instability of rock sills.

Gabion drop structures have been used on rivers that are much larger than Clinton Creek and the use of steps provides incremental energy dissipation along the drop. In one example by Maccaferri, the design discharge is 100 m<sup>3</sup>/s and the same guideline illustrates the estimation of the energy loss along the steps. The unit discharge (m<sup>3</sup>/s per m bed width) is governing rather than the total discharge, but Maccaferri does not state any recommended range of unit discharges in their design guideline.

During construction, the gabions for each step were placed side-by-side with the long sides parallel to the direction of flow and tied together using C-rings. The C-rings are C-shaped stainless steel wire fasteners that are crimped into a ring using a pneumatic crimping tool. Through experience, it is known that the crimping tool has a tendency to jam and the jaws of the tool get worn out when doing many wire clamping against a soil surface base.

As an alternative to using C-rings, one can use a 2.20 mm diameter galvanized steel wire that is threaded around the adjacent gabion edge-wires using taut double-loops at no more that 150 mm spacing along the gabion edges. To stitch up a 1 m long edge of a gabion, one needs a 3 m length of wire to ensure that one has enough of free length to pull even the last couple of loops taut. The constant threading of the wire and pulling every loop taut, while firmly gripping the wire with pliers, is time consuming and physically demanding. As a result, the wire tying method is usually used for only smaller gabion projects while the C-ring clamping method is used for larger gabion projects, such as the Clinton Creek project.

After the adjacent gabion baskets have been tied together, the baskets are filled with stones and the lids are folded down. The three free sides of the gabion lids are then secured with either C-rings or tying wire. In addition, the lids are secured to the internal partition walls that separate the gabion compartments.

# 4. Damage Assessment

### 4.1 General

Some gabions failed in the four Clinton Creek structures during the 2009 spring run-off. According to local residents, the 2009 spring run-off was very unusual with significant prolonged rainfall coincident with a rapid and large ambient temperature rise that caused a large spring run-off event. As a result, the four gabion step drop structures were subjected to an unusually large spring runoff event during 2009.

In general, it can be said that Drop Structure #1 (closest to Hudgeon Lake) and Drop Structure #3 suffered the least damage. Drop Structure #2 slightly suffered more damage and Drop Structure #4 (farthest downstream) suffered the most damage. Drawings in Appendix A present the damage at each drop structure.

Most of the gabions have failed due to the partial loss of gabion fill material, which has resulted in the remaining material being forced by the water flow against the downstream wall of the gabion basket compartment. This has caused some of the seams that were closed with C-rings to burst open. Once the material has been washed out of the downstream gabion compartment, a similar series of events (partial loss of fill, increased force on downstream wall, bursting of C-clamped seam and total loss of remaining fill material) will occur in the next upstream gabion compartment, resembling an incremental domino effect.

From what was observed in the field it appears, if the gabion fill is partly lost in a gabion basket compartment the remaining fill is forced against the downstream gabion end wall. This creates a pool of water upstream of the remaining fill, which will result in a larger hydrodynamic force on remaining fill and the gabion end wall due to the lack of energy dissipation that the gabion fill normally provides. In this case, it is apparent that the gabion fill loss has caused a force on the downstream end wall that is sufficient to open the C-rings and release the remaining fill material.

The C-rings are made of stainless steel and are very difficult to open up once they have been clamped in place. Therefore it is very surprising that the C-rings have been stretched open. It is possible that the force pulsations caused by the turbulent flow over and through the gabions over a prolonged time may have gradually stretched the rings open.

### 4.2 Drop Structure #1

Drop Structure #1 is a 1.5 m high 3-step structure. At Drop Structure #1, one gabion on the left side of the floor of Step 2 up from the basin floor had lost the stone fill from the two downstream gabion basket compartments. Several gabions, especially downstream of the low flow notch in the upstream weir, have lost a part of the stone fill through the gabion mesh openings leaving the gabions only partly filled.

The floor jet sill was deformed but was generally intact and no channel bed erosion was detected downstream of the structure. The depth of flow at the downstream end of the apron was approximately 0.5 m at the time of inspection.

Given that the structure is now seven years old and has experienced one extreme event, the structure was considered to be in fair condition.

### 4.3 Drop Structure #2

Drop Structure #2 is a 2.5 m high 5-step structure. Drop Structure #2 suffered significant damage to the gabions on Steps 2 and 4 from the apron and some damage to the gabions on Step 1.

At Step 1, one of the gabions appeared to have lost its end wall and several gabions have lost parts of the gabion fill material through the gabion mesh. One gabion appeared to be on the verge of breaking open along the C-ring clamped edge to spill the remainder of the gabion fill that was pushed against the downstream gabion end wall.

On Step 2, the gabions on the left side of the floor have split open along the C-ring clamped downstream gabion edges and discharged the fill from the downstream compartments of the gabions. On the right side of the same step, is one gabion with the C-ring clamped gabion edge partly open. The second compartment of all floor gabions appeared to be partly filled.

The gabions on Step 3 of the structure appeared to be intact but all floor gabions had lost part of the fill through the gabion mesh openings.

On Step 4 from the apron, all floor gabions except for the gabion farthest to the right have opened up along the downstream edges and lost the fill in the downstream gabion basket compartments. All the downstream gabion end wall appeared to be in place. At the floor gabion farthest to the right, the gabion was partly open along the downstream edge and three C-rings were seen hanging from the lid edge and the 3.4 mm diameter edge wire in the lid was broken. In addition, there were two elongated holes (approximately 0.25 x 0.60 m) with rounded upstream and downstream edges in the lid resembling the hole that would occur if a 0.25 m diameter pole is pierced through the lid and then pried in the downstream direction.

Step 5 appeared to be in generally fair condition.

The floor jet impact sill on the apron was breached but no erosion was evident on the channel bed downstream of the structure.

### 4.4 Drop Structure #3

Drop Structure #3 is a 2.0 m high 4-step structure. The damage to Drop Structure #3 consisted of open gabion baskets of the structure floor on Step 3, total loss of gabion fill in the downstream compartments of the gabions at the toe of the side slopes on Step 3 and partial loss of gabion fill from several gabions on the floor and at the toe of the side slopes.

The floor jet impact sill on the apron was deformed but still in place and no channel bed erosion was evident downstream of the structure. Deposition of gabion fill material extended from just inside the structure to approximately 2 m downstream of the structure.

### 4.5 Drop Structure #4

Drop Structure #4 is a 2.5 m high 5-step structure. Drop Structure #4 suffered significant damage during the 2009 spring runoff event but then primarily along the left half of the structure. Along the right half of the structure, the damage consisted of some opened gabion basket edges on the structure floor with subsequent loss of gabion fill and some partial loss of fill material through the gabion mesh openings in other gabions on the structure floor. Along the left half (four gabions wide) of the structure, all gabions on the structure floor had opened up and discharged the gabion fill in the two downstream compartments of the gabions on Steps 2, 3 and 4 from the apron. In addition, the fill in a large part of the apron floor had been lost.

The most significant damage to Drop Structure #4 was the damage to the apron floor. The lids, interior partitions and gabion fill had been lost, leaving a 5 m wide and 3 m long hole in the apron floor. The bottoms of the gabions were still in place over the geotextile that was placed below the structure during the construction. Two compartments at each end of the sill were still in place but the rest of the sill had been lost.

The edges of the gabions on Step 1 were intact and the floor gabions had only suffered partial loss of fill through the gabion mesh openings.

The gabions on Step 5 were generally intact and the weir across Step 5 was damaged in the left half of the structure.

It shall be noted that Drop Structure #4 is generally more susceptible to damage than any other drop structure, due to the lack of adequate tailwater at this structure. The lack of adequate tailwater is the result of the steep channel downstream which causes a more shallow and rapid channel flow than what develops in the channels between the drop structures.

### 4.6 High Water Marks

Three HWM (High Water Mark) at Drop Structure #3 were surveyed. A HWM, consisting of woody debris, on the left side and immediately upstream of the weir gabion row was found to be located 0.79 m above the weir crest.

A 0.2 m high vertical erosion face along the left channel side slope upstream of Drop Structure #3 may indicate the high water level during the flood event. The toe of the erosion face was located 0.91 m above the weir crest upstream of Drop Structure #3. At the downstream end of the riprap at Drop Structure #2, the toe of the erosion face was 0.78 m above the weir crest at Drop Structure #3.

At Drop Structure #4, a woody debris HWM was found approximately 0.8 m below the top of the side slope gabions on the left side of the structure. This indicates that the water level upstream of Drop Structure #4 was approximately 1.2 m above the weir crest of Drop Structure #4.

From a comparison of the woody debris HWMs at Drop Structure #3 and Drop Structure #4, it can be said that the water level upstream of Drop Structure #4 was approximately 0.4 m higher at Drop Structure #4 during the same discharge. As a result, it can be said that the right half of the channel at Drop Structure #4 must have been obstructed, possibly by ice and snow due to that part of the channel may be in shadow from the waste rock during the snow melt season.

# 5. Construction Activities

Construction Activities included:

- Removal of debris that had accumulated at the drop structures;
- Screening new rock fill to remove fine material prior to use;
- Repairing and refilling empty gabion baskets within each drop structure;
- Removal and replacement of the damaged end sill at Drop Structure #2;
- Removal of the damaged end sill at Drop Structure #4;
- Fill and cover with gabion mat material, the hole within the basin at Drop Structure #4;
- Placing new 0.5 m gabion baskets overtop the basin at Drop Structure #4;
- Covering the existing drops at Drop Structure #4 using 2 rolls of gabion mesh;
- Hand stitching of all top edges, previously closed using C-rings, at all drop structures;
- Removal of historical signs from the abandoned mine site and at Wolverine Creek; and
- Removal of debris from the culvert inlets at the Wolverine Creek crossing.

Work at the site, each week, is described below. A total of 34 days were spent at the site, a breakdown is presented in Table 4.1. Pictures taken during construction are presented in Appendix A.

### Table 4.1 Summary of Working Days

Location / Activity	Time (days)
Mobilization and debris removal from drop structures	4
Drop Structure #1	4
Drop Structure #2	4
Drop Structure #3	4
Drop Structure #4	16
Sign removal and culvert cleanup	2
Total	34

### Week 1 – week ending September 12

- Mobilization of equipment including the Loader, Bobcat and Grizzly Screener;
- Mobilization of material to the site including 4 rolls of gabion mesh (30 m by 3 m each), 65 0.3 m gabion baskets and an unknown quantity of 0.5 m gabion baskets (excess material from the original construction);
- Removal of debris from the drop structures;
- Screening rock fill material at the site to remove fine material. The stockpiled material was put through the grizzly screener three times; and
- Began the repairs at Drop Structure #4 which included removal of the damaged end sill and repair of gabions at the drops in the right half of the structure.

By Friday, all debris had been removed for the drop structures and the damaged end sill at Drop Structure #4 was removed. Work to repair the damaged gabion compartments began Saturday morning.

### Week 2 - week ending September 19

- Continued screening existing rock fill material;
- Continued work at Drop Structure #4, repairing the gabion drops and filling in empty gabion baskets in the left half of the structure; and
- Filled in and repaired baskets along the waters edge at all drop structures, when flow in the channel was too high.

On Thursday night, September 17, a significant amount of rain fell and by the following morning the lake level increased by 22 cm from the previous night (17:00). Flows had increased in the channel such that work could not be completed safely. Friday, work continued above the waters edge. By 17:00 on Friday, the lake water level was 33 cm above the level recorded 24 hours earlier.

Saturday the contractor and AECOM arrived at the Clinton Creek ford near Wolverine Creek but could not access the site as flow in the creek was too high to cross with vehicles or wade. No work was conducted on Saturday so AECOM and the HAN Crew Boss decided to wait until Monday to assess conditions at the site, with a reduced construction crew.

#### Week 3 - week ending September 26

No work was conducted at the site on Sunday, September 20. Monday morning the contractor, the equipment operator and AECOM arrived on-site by 9:00. Flow in the creek was still above that of the previous week, but AECOM and the contractor crossed the creek in the operator's truck to access the site. Flows were still too high to work instream so the following work was completed:

- Constructed the gabion baskets that were to be placed at the downstream end of Drop Structure #4 (two 3-compartment baskets);
- Moved enough rock fill material to each drop structure to complete the repairs without equipment on-site; and
- Demobilized the bobcat from the site and moved the loader to the west side of the Forty Mile Bridge. The loader was demobilized the following day.

By 17:00 on Monday, September 21 the lake water level had dropped to 21 cm above the water level recorded Thursday September 17<sup>th</sup>, four days prior. As flows were still too high to work instream, AECOM and the HAN Crew Boss decided to suspend construction and assess conditions at the site on Wednesday, September 23.

Wednesday, AECOM and the contractor's Crew Boss arrived onsite at 12:30. The lake water level dropped 10 cm in two days and was now at 11 cm prior to the rain event Thursday night. AECOM and the Crew Boss decided to begin work again the following day.

Work continued on Thursday and Friday and included:

- Hand stitching at each drop structure, along the banks above the flow; and
- Repairing and filling baskets within the drops at Drop Structure #1.

### Week 4 - week ending October 3

As the work proceeded into Week 4, no substantial amount of rain fell and the lake water level continued to drop. By Saturday at 9:00 am the lake water level was 8 cm above the level prior to the rain event and work continued instream, including:

- Filling and repairing gabion baskets at drops within Drop Structure #1, including hand stitching the baskets closed;
- Filling and repairing gabion baskets at drops within Drop Structure #2, including hand stitching the baskets closed; and
- Filling and repairing gabion baskets at drops within Drop Structure #1, including hand stitching the baskets closed.

By the end of the week, except for minor filling and repair at Drop Structure 1, 2 and 3, all baskets had been repaired. Major work left at these three drop structures included the removal and installation of the new end sill at Drop Structure #2 and hand stitching baskets throughout each drop structure that were previously closed using C-rings.

#### Week 5 - week ending October 10

At the beginning of Week 5, the contractor was back at Drop Structure #4 and work continued through the week including:

- Infilling the hole within the basin at Drop Structure #4. The hole, which was filled towards the beginning of the job, was recreated due to the higher flow in the channel after the rain event;
- Gabion Mesh material was placed overtop of the filled hole at Drop Structure #4. All four edges of the cover were hand stitched to the existing gabions below;
- Placed the 9 gabion baskets at the basin of Drop Structure #4. The edges were hand stitched to the existing baskets, where possible. In addition, the baskets were fastened to each other and to the existing baskets below using C-rings;
- Filled all new gabion baskets and hand stitched them closed;
- Began to lay gabion mat material overtop of the drops at Drop Structure #4;
- Debris blocking the culvert inlets at the Wolverine Creek Crossing were cleared; and

• Historical signs at the Wolverine Creek Crossing and at the site were removed.

Beyond the original scope of work, an additional day was taken to remove the historical signs and the clear the culvert inlets at Wolverine Creek.

#### Week 6 - week ending October 17

Work finished at the site on Friday, October 16 and included:

- Finished laying the gabion mat material overtop of the drops at Drop Structure #4;
- Removed what was left of the existing end sill at Drop Structure #2;
- Installed, filled and hand stitched closed a new end sill at Drop Structure #2. The new end sill was made of four gabions baskets, 0.3 m x 1 m x 2 m;
- Finished the minor filling within gabion compartments at drop structures #1 and #2; and
- Finished hand stitching the downstream edge of all drops and end sills perpendicular to the flow that were previously closed using C-rings;

Another additional day was taken to clear brush that had overgrown at one of the Wolverine Creek Culvert inlets, to place rock riprap at both culvert inlets and to remove the remaining garbage from the site. By Friday, October 16, all work was completed at the site and all equipment and material removed.

# 6. Equipment and Material Remaining

All left over material was taken to either Rick Gillespie's Yard or the Mackenzie Yard (HAN Construction Yard), both in the Callison Subdivision east of Dawson City. Table 6.1 presents a description of the material left, including quantity and location. The two pneumatic crimping tools were delivered to the Assessment and Abandoned Mines Branch Office of the Yukon Government.

### **Table 6.1 Construction Material Inventory**

			UTM Coordinate	es (Zone 7)
Description	Material Remaining	Location	Northing	Easting
0.3 m Gabion Baskets (2 x 1 x 0.3 m)	62	Gillespie Yard	7102241	580483
PVC Coated Mesh Rolls (30 x 3 m)	2	Gillespie Yard	7102241	580483
Box of C-rings (1600 per box)	9	Gillespie Yard	7102251	580587
0.5 m Old Gabion Baskets (3 x 1 x 0.5 m)	150 (approximately)	Mackenzie Yard, HAN Construction	7101839	580251

Towards the end of the job, the contractor was unable to maintain a tight seal between the pneumatic crimping tool and the air hose, one of the tools became unusable. The air hose connects to the crimping tool with a metal fitting and the fitting screws into the bottom of the tool handle. It is believed that the threads where the fitting screws into are striped. Maccaferri suggests retaping the threads at the original diameter, no larger and using thread sealant. If this does not work, it may be cheaper to purchase new tools to continue replacing parts.

# 7. Asbestos Air Quality Testing

Air quality samples were taken throughout the duration of the project. Two, Model 224 PCXR4 AirChek samplers were available to sample at the site. Each air sample was collected using a 25 mm Asbestos PCM Cassette with a 0.8 m filter material.

Samples were taken at locations where the contractor was working during the day. Usually the contractor was working at one location per day and so typically only one daily sample was taken. Towards the end of the project, the batteries on each of the samplers was either not charging properly at night or the batteries were not holding the charge and would stop sampling after only an hour. This is the reason for the sparse sampling during the end of the project. Four different sets of samples were sent to ALS Laboratories in Edmonton for PCM analysis for Asbestos.

A summary of the results are presented in Table 8.1. All samples are below the Yukon Personal Exposure Limit of 0.5 fibres per ml of air. Laboratory results are presented in Appendix B.

### **Table 8.1 Summary of Asbestos Air Quality Results**

		Duration		Resorts	
Identification #	Date	(min)	Location	(fibres/ml)	Weather
BF355444	15-Sept-09	412	Drop Structure #4	0.002	Clear Sky, Dry, No Wind
BF355565	15-Sept-09	403	Drop Structure #1	0.004	Clear Sky, Dry, No Wind
BF355452	16-Sept-09	300	Top of Waste Rock Pile, Adjacent Creek	0.001	Cloudy, Light Rain, No Wind, Ground Wet
BF355457	16-Sept-09	220	Drop Structure #4	0.006	Cloudy, Light Rain, No Wind, Ground Wet
BF355577	25-Sept-09	375	Drop Structure #3	0.001	Cloudy, No Wind, Ground Wet
BF355549	25-Sept-09	403	Drop Structure #1	0.001	Cloudy, No Wind, Ground Wet
BF355402	26-Sept-09	313	Drop Structure #1	0.001	Cloudy, No Wind, Ground Wet
BF355483	27-Sept-09	480	Drop Structure #2	0.001	Partly Cloudy, Light Wind, Ground Frozen
BF355580	27-Sept-09	480	Drop Structure #1	0.001	Partly Cloudy, Light Wind, Ground Frozen
BF355543	28-Sept-09	480	Drop Structure #2	0.001	Cloudy, No Wind, Ground Frozen
BF355515	29-Sept-09	471	Drop Structure #2	0.001	Cloudy, No Wind, Ground Frozen
BF355510	30-Sept-09	469	Drop Structure #3	0.001	Clear Sky, No Wind, Ground Frozen in Morning
BF355405	1-Oct-09	349	Gabion Structure #3	0.001	Clear Sky, No Wind, Ground Frozen in Morning
BF355435	2-Oct-09	321	Drop Structure #4	0.001	Cloudy, No Wind, Ground Frozen
BF355590	2-Oct-09	320	Gabion Structure #3	0.001	Cloudy, No Wind, Ground Frozen
BF355433	3-Oct-09	470	Drop Structure #4	0.001	Partly Cloudy, Light Wind, Ground Frozen
BF355503	4-Oct-09	371	Gabion Structure #4	0.001	Clear Sky, Light Wind, Ground Frozen
BF355574	10-Oct-09	339	Drop Structure #4	0.001	Cloudy, No Wind, Ground Frozen
BF355548	12-Oct-09	420	Drop Structure #4	0.001	Clear Sky, No Wind, Ground Frozen

## 8. Summary

- Repairs were required to the four Drop Structures at the outlet of Clinton Creek as a result of damage sustained during the 2009 spring runoff;
- Drop Structure #1 and #3 sustained the least damage as compared to Drop Structure #2 and #4. Drop Structure #2 suffered slightly more damage and Drop Structure #4 suffered the most damage;
- Most of the gabions have failed due to partial loss of gabion fill material through the mesh openings;
- Construction Activities were conducted between September 8 and October 16, 2009, including mobilization and demobilization;
- High flows in the creek due to a rain event delayed work at the site towards the beginning of the project but all work, as directed onsite, was completed;
- 16 days were spent at Drop Structure #4 while 4 days were spent at each of the other three structures. Two additional days
  were used to remove blockages from the two culverts at the Wolverine Creek Crossing and to remove the historical
  information signs at the site;
- The gabion material not used, including the 0.3 m gabion baskets, PVC coated mesh rolls and boxes of C-rings were left at Rick Gillespie's Yard in the Callison Subdivision. Surplus 0.5 m gabion baskets, from the original construction, are located in HAN Construction's Mackenzie Yard in the Callison Subdivision.
- Both pneumatic crimping tools require repair at the connection between the tool and the air hose. Maccaferri suggests retaping the threads on the tool at the same diameter for a tight fit between the tool and the fitting; and
- Results from analysis of the air quality samples show concentrations of Asbestos at the site are below the Yukon Government's Personal Exposure Limit of 0.5 fibres per ml of air.





# **Appendix A**

Drawings of Damage to Drop Structures











# **Appendix B**

Drawings of Changes to Drops Structures #2 and #4



1=2 Wote

17/03 Scale:

Plot

TOP OF BASKET ON ©		
406.84		
407.48		
408.03		
408.52		
409.03		
409.60		
407.20		
410.10		



1=2

TIER	TOP OF BASKET ON ©
1	402.1
2	402.6
3	403.1
4	403.6
5	404.1
6	404.6
END SILL	N/A
DRAWDOWN WEIR	405.1

- 1. UNDER TIER 1 DRAIN IS 9m WIDE, 0.3m THICK

2. MESH MATERIAL HAND STITCHED TO UNDERLYING BASKETS.

ng Ltd.	GOVERNMENT OF YUKON		
005	FORMER CLINTON CREEK ASBESTOS MINE CLINTON CREEK CHANNEL STABILIZATION - STAGE	Ξ3	
R/RA			
KMS	DROP STRUCTURE #4 - DETAILS	80	в
006-00		DWG. No.	REV.



# **Appendix C**

Photographs taken during Construction Activities



Photo 1: Drop Structure #1, looking upstream. All compartments have been filled with rock and closed Flow in Creek partially blocked using plywood and plastic sheets.



Photo 2: Drop Structure #1, looking upstream to left bank. All compartments have been filled with rock and closed.



Photo 3: Drop Structure #1. New gabion tops hand stitched on the upstream and downstream edges.



Photo 4: Drop Structure #2. All compartments have been filled with rock and closed. The new end sil has been placed at the downstream end of the structure.



Photo 5: Drop Structure #2. New 0.3 m end sill placed at the downstream end of the structure.



Photo 6: Drop Structure #2. Top of new 0.3 m end sill hand stitched closed.



Photo 7: Drop Structure #3. All compartments have been filled with rock and closed. The end sill is deformed a little but is still intact and attached to the gabions below.



Photo 8: Drop Structure #4. Empty baskets within the structure.



Photo 9: Drop Structure #4. Baskets being filled with large rock.



Photo 10: Drop Structure #4. Placement of the mat at the location of the filled hole, downstream end of the structure.



Photo 11: Drop Structure #4. The upstream bottom end of the new 0.5 m baskets were hand stitched to the existing structure.



Photo 12: Drop Structure #4. Hand stitching at the downstream end of the structure.



Photo 13: Drop Structure #4. Wire mesh placed overtop of existing gabions.



Photo 14: Drop Structure #4. Construction complete including the installation of new 0.5 m gabion baskets at the downstream end of the structure.



Photo 15: Wolverine Creek Road Crossing. Existing west culvert inlet cleared of debris.



Photo 16: Wolverine Creek Road Crossing. Existing east culvert inlet cleared of debris.



Photo 17: Air quality pump and sample cartridge.



Photo 18: Leftover screened rock material. Approximately 60 % left of what was screened.



# **Appendix D**

Asbestos Air Sample Results -ALS Laboratory Group

# ALS Laboratory Group ANALYTICAL CHEMISTRY & TESTING SERVICES

### **Environmental Division**



AECOM CANADA LT <b>ATTN:</b> GIL ROBINS 99 COMMERCE DRI	°D. ON VE	Certificate of Analysis	Report Date: Version:	06-OCT-09 14:43 (MT) FINAL
WINNIPEG MA R3F	9 0Y7			
Lab Work Order #:	L825643		Date Receive	ed: 01-OCT-09
Project P.O. #: Job Reference: Legal Site Desc: CofC Numbers:	6029-01500-0300			
Other Information:				
Comments:				
	Nicole Thib Account Ma	Mo Hatutt anager	>	

THIS REPORT SHALL NOT BE REPRODUCED EXCEPT IN FULL WITHOUT THE WRITTEN AUTHORITY OF THE LABORATORY. ALL SAMPLES WILL BE DISPOSED OF AFTER 30 DAYS FOLLOWING ANALYSIS. PLEASE CONTACT THE LAB IF YOU REQUIRE ADDITIONAL SAMPLE STORAGE TIME.

ALS Canada Ltd. Part of the **ALS Laboratory Group** 9936-67 Avenue, Edmonton, AB T6E 0P5 Phone: +1 780 413 5227 Fax: +1 780 437 2311 www.alsglobal.com A Campbell Brothers Limited Company

# ALS LABORATORY GROUP ANALYTICAL REPORT

Sample Details	/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
l 825643-1	BE355444 (412 MIN DURATION AT 5 I /M	11N)						
Sampled By:	ANDREW SMITH on 15-SEP-09 @ 09:40							
Matrix:	AIR							
Fibre Densit Field Blank	t <b>y</b> Correction	<0.5		0.5	f/field		05-OCT-09	R971083
Sample Vol	ume	2060		0	L		05-OCT-09	R971083
Fibres/Filter		4000		3000	Fibres		05-OCT-09	R971083
Fibre Densit	ty	11		7	Fibres/mm2		05-OCT-09	R971083
Fibre Conce	entration	0.002		0.001	fibres/mL		05-OCT-09	R971083
L825643-2	BF355565 (403 MIN DURATION AT 5 L/	1IN)						
Sampled By:	ANDREW SMITH on 15-SEP-09 @ 09:53							
Matrix:	AIR							
Fibre Densit	ty							
Field Blank	Correction	<0.5		0.5	f/field		05-OCT-09	R971083
Sample Vol	ume	2015		0	L		05-OCT-09	R971083
Fibres/Filter		8000		3000	Fibres		05-OCT-09	R971083
Fibre Conce	entration	20		0.001	fibres/ml		05-OCT-09	R971063 R971083
1 825643-3	BE355452 (300 MIN DURATION AT 51/M	(IN)		0.001				1107 1000
Sampled By:	ANDREW SMITH on 15-SEP-09 @ 09:18							
Matrix:	AIR							
Fibre Densit	ty							
Field Blank	Correction	<0.5		0.5	f/field		05-OCT-09	R971083
Fibres/Filter		<3000		3000	Eibres		05-OCT-09	R971083
Fibre Densit	ty	<7		7	Fibres/mm2		05-OCT-09	R971083
Fibre Conce	entration	0.001		0.001	fibres/mL		05-OCT-09	R971083
L825643-4	BF355457 (222 MIN DURATION AT 5 L/M	1IN)						
Sampled By:	ANDREW SMITH on 15-SEP-09 @ 09:32							
Matrix:	AIR							
Fibre Densit	ry Correction	<0.5		0.5	f/field		06-OCT-09	R971083
Sample Vol	ume	1100		0	L		06-OCT-09	R971083
Flow Rate B	Based On						06-OCT-09	R971083
Fibres/Filter		6000		3000	Fibres		06-OCT-09	R971083
Fibre Densit	ty	17		7	Fibres/mm2		06-OCT-09	R971083
		0.006		0.001	nores/mL		06-001-09	R9/1083

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

## **Reference Information**

#### **Test Method References:**

ALS Test Code	Matrix	Test Description	Method Reference**
ASBESTOS-FBRS/FLT- ED	Filter	Fibre Density	NIOSH 7400A

Sample results are corrected using field blank results. A comment will appear at the end of each sample result section if no field blank was submitted.

Sr values: 5-20 0.11 >20-50 0.075 >50-100 0.10

\*\* 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
ED	ALS LABORATORY GROUP - EDMONTON, ALBERTA, CANADA

#### Chain of Custody Numbers:

#### GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.

mg/kg - milligrams per kilogram based on dry weight of sample

mk/kg wwt - milligrams per kilogram based on wet weight of sample

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight

mg/L - unit of concentration based on volume, parts per million.

< - Less than.

D.L. - The reporting limit.

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory. UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Environmental Division

(ALS)

### Chain of Custody / Analytical Request Form Canada Toll Free: 1 800 668 9878 www.alsglobal.com

COC #

Page \_\_\_\_ of \_\_\_

Report To		Report Fo	rmat / Distribut	tion		Service	Reques	ted (Rush	for routine	analysis subject	to availal	oility)
Company:	AECOM Canada	Standard	Other			O Regular (Default)						
Contact:	Gil Robinson	DPDF	✓ Excel	🗌 Digital	🗌 Fax	● Priority (Specify Date Required $\rightarrow \rightarrow$ ) 8-Oct-09 Surc				Surcha	rges apply	
Address:	99 Commerce Drive	Email 1:	gil.robinson@a	ecom.com		O Emerg	ency (1 Bu	siness Day)	- 100% Sur	charge		
	Winnipeg, Manitoba, R3P 0Y7	Email 2:	rolf.aslund@ae	com.com, andre	w.smith3@	O For Em	ergency <	1 Day, ASA	P or Weeke	nd - Contact ALS		
Phone:	204-928-9266 Fax:							F	nalysis F	Request		
Invoice To	Same as Report ? 🗹 Yes 🗌 No	Client / Pro	oject Informati	on		Please	indicate	below Fi	Itered, Pro	eserved or bot	n (F, P, F	<sup>-</sup> /P)
Company:		Job #:	6029-01500-03	00								
Contact:		PO / AFE:										
Address:		LSD:										
						stos						ers
Phone:	Fax:	Quote #:				spei						itain
Lab V (lab	Vork Order # L825643.	ALS Contact:		Sampler:	Andrew Smith	est for A						r of Cor
Sample #	Sample Identification (This description will appear on the rep	port)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	PCM te						Numbe
	BF355444 (412 min duration at 5 L/min)		15-Sep-09	09:40 Start	Air	x						
	BF355565 (403 min duration at 5 L/min)		15-Sep-09	09:53 Start	Air	x	++					1
	BF355452 (300 min duration at 5 L/min)		16-Sep-09	9:18 Start	Air	x						1
	BF355457 (222 min duration at 5 L/min)		16-Sep-09	9:32 Start	Air	x						1
			·									
			<u></u>									
										+ $+$ $+$		]
		Special Instr	uctions / Regu	lations / Hazard	lous Details							
Originally fror andrew.smith	n Bottle Request # BR55897. If have any questions pl 3@aecom.com	ease call Andrew Si	mith at 780-918	-3242 or email a	at andrew.smith3@	)aecom.o	om. Ple	ease also	email res	ults to		
	Failure to comp By the use of this form the use	lete all portions of er acknowledges ar	this form may nd agrees with	delay analysis the Terms and	. Please fill in th Conditions as p	is form L rovided	.EGIBL` on a sej	(. parate Ex	cel tab.			
	SHIPMENT RELEASE (client use)	SHIPM	ENT RECEPT	ON (lab use onl	v)	ervation	Albion / SH	PMENT	VERIFICA	TION (lab use	only)	
Released by	: Date (dd-mmm-yy) Time (hh-mm) Re	eceived by:	Date:	Time:	Temperature:	Verified	by:	Dat	9:	Time:	Obse	rvations:
Andrew Smith	n 28-Sep-09 08-00	40X 01.	oct 09.1	6:08	C						If Yes	add SIF

GENF 18.02 Front

# AECOM

AECOM 17007 – 107<sup>th</sup> Avenue, Edmonton, AB, Canada T5S 1G3 T 780.486.7000 F 780.486.7070 www.aecom.com

## **Transmittal Form**

Date:	October 1, 2009	Project Number:	6029-015-00-0300-3.1
Contact:			
Company:	ALS Laboratory Group	Telephone # :	780-413-5227
Address:	9936 – 67 Avenue Nw	Sent By :	Rolf Aslund, P.Eng.
	Edmonton AB T6E 0P5	and, and the first international	
Copies To:			
Urgent	For Your Use For Rev	riew For Your Inform	nation Confidential

### Project Name:

### List of Drawings and Other Materials:

Quantity	Description	Date
1	Analytical Request form and samples	
		na na sana ana ana ana ana ana ang kana ang kana na ang kana na
a de Mara - enn en Monschule al faible parte alle		· · · · ·

Sent Via:							
	nali	courier	picked up	by hand	email	fax	other
Authorized Signa	ature:						
Name (please prir	nt):	Rolf /	Aslund, P.Eng.	Title:			

# ALS Laboratory Group ANALYTICAL CHEMISTRY & TESTING SERVICES

### **Environmental Division**



	PRELIMINARY RESULT	ſS	
AECOM CANADA LT	D.	Report Date:	23-OCT-09 11:56 (MT)
ATTN: GIL ROBINS	ON	Version:	DRAFT
99 COMMERCE DRI	/E		
WINNIPEG MA R3F	0Y7		
Lab Work Order #:	L828633	Date Receive	ed: 09-OCT-09
Project P.O. #: Job Reference: Legal Site Desc: CofC Numbers:	6029-01500-0300 281009		
Other Information:			
Comments:	Mauraan Olinak		
	Senior Account Manager		

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# ALS LABORATORY GROUP ANALYTICAL REPORT

L228331         BF35577 (375 MIN DURATION AT 5 LWMN) Sample VB         Image: Construction in the image: Constructi	Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
Sample Op.         ANDREY OWINT ON TO DUCE FOR the ToDO         Matrix:         AR           Flore Density Field Blank Correction         -0.5         0.5         Iffield         15-007-00         R891004           Sample Volume         1875         0.0         L         15-007-00         R891004           Flore Density Flore Density         25         0.05         0.01         flores/m12         15-007-08         R891004           Flore Concentration         0.05         0.01         flores/m12         15-007-08         R891004           Sample Volume         25.5         0.05         flore         flores/m12         15-007-08         R891004           Sample Volume         2015         0.05         flore         flores/m12         flore One R891004           Sample Volume         2015         0.05         flore         flore One R891004         flore One R891004           Sample Volume         2015         0.003         10.01         flores/m12         flore One R891004           Flore Density         0.003         0.001         flores/m12         floreSome Flore         floreSome Flore           Flore Density         0.002         0.001         flores/m12         floreSome Flore         floreCT-08         R891004	L828633-1 BF355577 (375 MIN DURATION AT 5 L/	MIN)						
Fire Density Sample Volume         -0.5 15 / CCT 09 Files         0.5 15 / CCT 09 15 / CCT 09 Files         R891004 15 / CCT 09 15 / CCT 08 15 / CCT	Matrix: AIR							
Sample Volume         1875         0         L         15-CCT-09         R981004           Fibre Fibre Concentration         0.005         0.001         fibres/mL         15-CCT-09         R981004           L228033-2         BF355549 (403 MIN DURATION AT 5 L/MIN)         0.005         0.001         fibres/mL         15-CCT-09         R981004           Sample By:         ANDREW SMITH on 25-SEP-09 B 10.05         0.5         0.5         1/field         15-CCT-09         R881004           Sample By:         ANDREW SMITH on 25-SEP-09 B 10.05         0.5         0.5         1/field         15-CCT-09         R881004           Sample Dy:         ANDREW SMITH on 25-SEP-09 B 10.05         0.5         0.5         1/field         15-CCT-09         R881004           Fibro Density         7 <td>Fibre Density Field Blank Correction</td> <td>&lt;0.5</td> <td></td> <td>0.5</td> <td>f/field</td> <td></td> <td>15-OCT-09</td> <td>R981004</td>	Fibre Density Field Blank Correction	<0.5		0.5	f/field		15-OCT-09	R981004
Fibre Density         15-0CT-09         R891004           Fibre Concentration         0.005         0.001         Fibres/mL         15-0CT-09         R891004           L2280332         EP36564 (400 MIN DURATIO AT 5 L/MIN)         0.005         0.001         Fibres/mL         15-0CT-09         R891004           L2280332         EP36564 (400 MIN DURATIO AT 5 L/MIN)         0.05         0.05         Iffield         15-0CT-09         R891004           Fibre Density         AIR         16-0CT-09         R891004         15-0CT-09         R891004           Sample Volume         2015         0.05         Iffield         15-0CT-09         R891004           Fibre Density         17         7         Fibres/mL         15-0CT-09         R891004           L228033-3         BF355402 (420 MIN DURATION AT 5 L/MIN)         0.003         0.001         Fibres/mL         15-0CT-09         R891004           L228033-3         BF355402 (420 MIN DURATION AT 5 L/MIN)         3000         Fibres/mL         15-0CT-09         R891004           L228033-3         BF355402 (420 MIN DURATION AT 5 L/MIN)         3000         Fibres/mL         15-0CT-09         R891004           L228033-4         BF355403 (400 MIN DURATION AT 5 L/MIN)         30001         Fibres/mL         15-0CT-09	Sample Volume	1875		0	L		15-OCT-09	R981004
Fibre Concentration         0.005         0.001         Reserval         15-OCT-09         R881004           L62823-22         EF355649 (403 MIN DURATION AT 5 L/MIN) Sampled S2.         ANDREW SMITH on 25-SEP-09 @ 10.05         I/field         15-OCT-09         R891004           Hints:         AIR         2015         0.05         I/field         15-OCT-09         R891004           Fibre Density         2015         0.05         I/field         15-OCT-09         R891004           Fibre Density         17         300         Fibres/mn2         15-OCT-09         R891004           L22823-33         EF355402 (420 MIN DURATION AT 5 L/MIN)         0.003         0.001         fibres/mn2         15-OCT-09         R891004           L22823-33         EF355402 (420 MIN DURATION AT 5 L/MIN)         0.001         0.01         fibres/mn2         15-OCT-09         R891004           L22823-33         EF355402 (420 MIN DURATION AT 5 L/MIN)         0.002         0.01         Fibres/mn2         15-OCT-09         R891004           Sample Volume         2100         0         15-OCT-09         R891004         15-OCT-09         R891004           Fibre Smith         0.002         0.001         Fibres/mm2         15-OCT-09         R891004           L228023-4	Fibres/Filter Fibre Density	10000		3000 7	Fibres Fibres/mm2		15-OCT-09 15-OCT-09	R981004 R981004
La2823-2         BF355549 (403 MIN DURATION AT 5 L/MIN)         Brain         Brain <td>Fibre Concentration</td> <td>0.005</td> <td></td> <td>0.001</td> <td>fibres/mL</td> <td></td> <td>15-OCT-09</td> <td>R981004</td>	Fibre Concentration	0.005		0.001	fibres/mL		15-OCT-09	R981004
Satilized by:         ANDREW SMITH ON 28-3EP-39 to 1003           Matrix:         AIR           Fibre Density         2015           Sample Obume         2003           Sample Obume         2003           Sample Obume         2000           Sample Obume         2000           Sample Obume         2000           Fibre Density         2000           Fibre Concentration         20.5           Obume         13         7           Fibre Density         881004           Fibre Density         2000           Fibre Density         2000           Sample Obume         2400           Fibre Density         22	L828633-2 BF355549 (403 MIN DURATION AT 5 L/	MIN)						
Fibre Density Field Blank Correction Sample Volume         -0.5 2015         0.5 2015         1/field 0         15-OCT-09 Hores         R881004 15-OCT-09 15-OCT-09         R881004 R881004           Fibre Density         0.003         0.01         Fibres/ Hores         15-OCT-09         R881004           L828033-3         BF355402 (420 MIN DURATION AT 5 L/MIN) Sampled By: ANDREW SMITH on 26-SEP-09 @ 09:15         0.01         1/field         15-OCT-09         R891004           L828033-3         BF355402 (420 MIN DURATION AT 5 L/MIN) Sampled By: ANDREW SMITH on 26-SEP-09 @ 09:15         0.5         1/field         15-OCT-09         R891004           Fibre Density Fibre Density         2100         0         1         Fibres         15-OCT-09         R891004           Fibre Density Fibre Density         0.02         0.001         Fibres         15-OCT-09         R891004           L828033-4         BF355433 (480 MIN DURATION AT 5 L/MIN) Sampled By: ANDREW SMITH on 27-SEP-09 @ 08.5         0.5         1/field         15-OCT-09         R891004           L828033-4         BF355433 (480 MIN DURATION AT 5 L/MIN) Sampled By: ANDREW SMITH on 27-SEP-09 @ 08.5         0.5         1/field         15-OCT-09         R891004           L828033-5         BF355530 (480 MIN DURATION AT 5 L/MIN) Sampled By: ANDREW SMITH on 27-SEP-09 @ 08.5         0.5         1/field         15-OCT-09 <t< td=""><td>Matrix: AIR</td><td>5</td><td></td><td></td><td></td><td></td><td></td><td></td></t<>	Matrix: AIR	5						
Fibre Density Sample Volume         -0.5         0.5         t/filed         15-OCT-09         R981004           Bind Bink Correction         2015         0         L         15-OCT-09         R981004           Fibre Density         17         7         Fibres/mm2         15-OCT-09         R981004           Fibre Density         17         7         Fibres/mm2         15-OCT-09         R981004           L228033         BF355402 (420 MIN DURATION AT 5 L/MIN)         0.003         0.001         fibres/mL         15-OCT-09         R981004           L228033         BF355402 (420 MIN DURATION AT 5 L/MIN)         0.003         0.001         fibres/mL         15-OCT-09         R981004           Sample Volume         AIR         2100         0         L         15-OCT-09         R981004           Fibre Density         13         7         Fibres/mL         15-OCT-09         R981004           Fibre Concentration         0.002         0.001         fibres/mL         15-OCT-09         R981004           L228334         BF35492 (480 MIN DURATION AT 5 L/MIN)         3000         Fibres         15-OCT-09         R981004           L22834         BF35493 (480 MIN DURATION AT 5 L/MIN)         3000         Fibres         15-OCT-09         R								
Sample Volume         2015         0         L         1         15-OCT-09         R981004           Fibre Concentration         0.003         77         0.001         Fibres/mL         15-OCT-09         R981004           L22633.3         BF355402 (420 MIN DURATION AT 5 L/MIN)         0.003         0.01         fibres/mL         15-OCT-09         R981004           L22633.3         BF355402 (420 MIN DURATION AT 5 L/MIN)         Sample Volume         0.05         frield         15-OCT-09         R981004           L22633.4         ANDREW SMITH on 26-SEP-09 @ 0.9:15         0.5         frield         15-OCT-09         R981004           Sample Volume         2100         0         L         15-OCT-09         R981004           Fibre Density         13         7         Fibres/max         15-OCT-09         R981004           Fibre Concentration         0.002         0.001         fibres/mL         15-OCT-09         R981004           L28283.4         BF355483 (480 MIN DURATION AT 5 L/MIN)         3000         Fibres/mL         15-OCT-09         R981004           L82863.4         BF355483 (480 MIN DURATION AT 5 L/MIN)         Sample MS/L         ANDREW SMITH on 27-SEP-09 @ 0.55         Matrix:         AIR         15-OCT-09         R981004	Fibre Density Field Blank Correction	<0.5		0.5	f/field		15-OCT-09	R981004
Fibre Density         17         3000         Fibre Site         15-OCT-09         R981004           Fibre Concentration         0.003         0.001         fibres/mL         15-OCT-09         R981004           L828633-3         BF355402 (420 MIN DURATION AT 5 L/MIN)         sampled By:         ANDREW SMITH on 26-SEP-09 @ 09:15         15-OCT-09         R981004           Matrix:         AIR	Sample Volume	2015		0	L		15-OCT-09	R981004
Thise Concentration         D.03         D.01         Tible Concentration         Tible Concentration <thtible concentration<="" th=""> <thtible concentration<<="" td=""><td>Fibres/Filter Fibre Density</td><td>6000 17</td><td></td><td>3000</td><td>Fibres</td><td></td><td>15-OCT-09</td><td>R981004</td></thtible></thtible>	Fibres/Filter Fibre Density	6000 17		3000	Fibres		15-OCT-09	R981004
L828633-3         BF355402 (420 MIN DURATION AT 5 L/MIN)           Sampled By:         ANDREW SMITH on 26-SEP-09 @ 05:15           Matrix:         AIR           Fibre Density         705           Filter Density         2100           Fibre Density         50000           Fibre Spritter         50000           Fibre Spritter         50000           Fibre Concentration         6.002           Fibre Concentration         6.002           Fibre Density         13           Fibre Concentration         6.002           Sample Volume         15-OCT-09           R981004	Fibre Concentration	0.003		0.001	fibres/mL		15-OCT-09	R981004
Sampled By:         ANDREW SMITH on 26-SEP-09 @ 09:15           Matrix:         AIR           Fibre Density         7           Fibre Density         5000           Fibre Sprilter         5000           Sample Volume         2100           Fibre Sprilter         5000           Sample Volume         13           Fibre Density         13           Fibre Concentration         0.002           0.001         fibres/mile           Sample Volume         2400           Fibre Density         22           Fibre Sprilter         8000           Sample Volume         2400           Volume         2400           Sample Volume         2400           Fibre Density         22           Fibre Sprilter         8000           Sample Volume         2400           LB28633-5         BF355504 (480 MIN DURATION AT 5 L/MIN)	L828633-3 BF355402 (420 MIN DURATION AT 5 L/	MIN)						
Mailul.         Aix           Fibre Density Field Blank Correction Sample Volume         20,50 20,00         0,5 3000         f/field 0         15-OCT-09 15-OCT-09         R981004 R981004           Fibre Spriller         5000         3000         Fibres         15-OCT-09         R981004           Fibre Density         13         7         Fibres/miller         15-OCT-09         R981004           Ebste Concentration         0.002         0.001         fibres/miller         15-OCT-09         R981004           B23633-4         BF355483 (480 MIN DURATION AT 5 L/MIN)         0.002         0.001         fibres/miller         15-OCT-09         R981004           B23633-4         BF355483 (480 MIN DURATION AT 5 L/MIN)         Sample Volume         2400         0         L         15-OCT-09         R981004           Barbit K         AIR         7         Fibres/miller         8000         3000         Fibres         15-OCT-09         R981004           Sample Volume         2400         0         L         15-OCT-09         R981004           Fibre Density         22         7         Fibres/miller         15-OCT-09         R981004           Is20CT-09         R981004         0.003         0.001         fibres/miller         15-OCT-09	Sampled By: ANDREW SMITH on 26-SEP-09 @ 09:1	5						
Fibre Density Sample Volume         <0.5         f/field 0         15-OCT-09         R981004           Fibres/Filter         5000         3000         Fibres         15-OCT-09         R981004           Fibre Density         13         7         Fibres/mm2         15-OCT-09         R981004           Fibre Concentration         0.002         0.001         fibres/mL         15-OCT-09         R981004           L828633-4         BF355483 (480 MIN DURATION AT 5 L/MIN)         0.002         0.001         fibres/mL         15-OCT-09         R981004           L828633-4         BF355483 (480 MIN DURATION AT 5 L/MIN)         3000         Fibres/mL         15-OCT-09         R981004           Sample Volume         2400         0         L         15-OCT-09         R981004           Sample Volume         2400         0         L         15-OCT-09         R981004           Fibre Density         22         7         Fibres         15-OCT-09         R981004           Fibre Concentration         0.003         0.001         fibres/mL         15-OCT-09         R981004           Fibre Density         22         7         Fibres/mL         15-OCT-09         R981004           Fibre Density         22         7								
Fibre Density	Fibre Density	-0.5		0.5	f/field		15 OCT 00	D091001
Fibres/Filter         5000         3000         Fibres/ Fibre Density         15-OCT-09         R981004           Fibre Concentration         0.002         0.001         fibres/ fibres/ fibres/ matrix:         15-OCT-09         R981004           L228633-4         BF355483 (480 MIN DURATION AT 5 L/MIN)         15-OCT-09         R981004           Sampled By:         ANDREW SMITH on 27-SEP-09 @ 08:55         0.5         f/field         15-OCT-09         R981004           Fibre Density         -         -         -         -         R981004         15-OCT-09         R981004           Sample Volume         -         AlR         -         -         -         -         -         -         -         -         -         R981004           Fibre Density         -         -         -         0.5         f/field         15-OCT-09         R981004           Fibre Concentration         -         0.003         0.001         fibres/mL         15-OCT-09         R981004           Fibre Concentration         0.003         0.001         fibres/mL         15-OCT-09         R981004           L282833-5         BF355580 (480 MIN DURATION AT 5 L/MIN)         -         -         -         -         -         -         -	Sample Volume	2100		0.5	L		15-OCT-09	R981004
Hore Density         13         7         Hores/mm2         15-OC 1-09         R981004           Fibre Concentration         0.002         0.001         fibres/mL         15-OC 1-09         R981004           L828633-4         BF355483 (480 MIN DURATION AT 5 L/MIN)         15-OC 1-09         R981004         15-OC 1-09         R981004           Sampled By:         ANDREW SMITH on 27-SEP-09 @ 08:55         0.5         f/field         15-OC 1-09         R981004           Fibre Density         AIR         2400         0         L         15-OC 1-09         R981004           Fibre Density         2400         0         L         15-OC 1-09         R981004           Fibre Density         22         7         Fibres/mm2         15-OC 1-09         R981004           Fibre Concentration         0.003         0.001         fibres/mL         15-OC 1-09         R981004           L828633-5         BF355580 (480 MIN DURATION AT 5 L/MIN)         Sample Volume         2400         0         L         15-OC 1-09         R981004           L828633-5         BF355580 (480 MIN DURATION AT 5 L/MIN)         Sample Volume         2400         0         L         15-OC 1-09         R981004           Sample Volume         2400         0         L <td>Fibres/Filter</td> <td>5000</td> <td></td> <td>3000</td> <td>Fibres</td> <td></td> <td>15-OCT-09</td> <td>R981004</td>	Fibres/Filter	5000		3000	Fibres		15-OCT-09	R981004
L828633-4         BF355483 (480 MIN DURATION AT 5 L/MIN)           Sampled By:         ANDREW SMITH on 27-SEP-09 @ 08:55           Matrix:         AIR           Fibre Density         5           Field Blank Correction         <0.5	Fibre Density Fibre Concentration	13 0.002		7 0.001	Fibres/mm2 fibres/mL		15-OCT-09 15-OCT-09	R981004 R981004
Sampled By:         ANDREW SMITH on 27-SEP-09 @ 08:55         Matrix:         AIR           Fibre Density         -         0.5         0.5         f/field         15-OCT-09         R981004           Sample Volume         2400         0         L         15-OCT-09         R981004           Fibres/Filter         8000         3000         Fibres         15-OCT-09         R981004           Fibre Density         22         7         Fibres/mc         15-OCT-09         R981004           Fibre Concentration         0.003         0.001         fibres/mL         15-OCT-09         R981004           L828633-5         BF355580 (480 MIN DURATION AT 5 L/MIN)         3ampled By:         ANDREW SMITH on 27-SEP-09 @ 08:59         Natrix:         AIR         15-OCT-09         R981004           Fibre Density         AIR         2400         0         L         15-OCT-09         R981004           Fibre Density         AIR         -         -         Fibre Sites         15-OCT-09         R981004           Fibre Density         -         -         -         -         -         -         R981004           Fibre Density         -         -         -         -         -         -         R981004	L828633-4 BF355483 (480 MIN DURATION AT 5 L/	MIN)						
Matrix:AIRFibre Density Field Blank Correction<0.5	Sampled By: ANDREW SMITH on 27-SEP-09 @ 08:5	5						
Fibre Density Field Blank Correction         <0.5         0.5         f/field         15-OCT-09         R981004           Sample Volume         2400         0         L         15-OCT-09         R981004           Fibres/Filter         8000         3000         Fibres         15-OCT-09         R981004           Fibre Density         22         7         Fibres/mn2         15-OCT-09         R981004           Fibre Concentration         0.003         0.001         fibres/mn2         15-OCT-09         R981004           L828633-5         BF35580 (480 MIN DURATION AT 5 L/MIN)         0.003         0.001         fibres/mL         15-OCT-09         R981004           L828633-5         MATIX:         AIR         AIR         R981004         15-OCT-09         R981004           Fibre Density Field Blank Correction         <0.5	Matrix: AIR							
Filed Blank Correction         20.5         0.5         1/1erd         15-OCT-09         R981004           Sample Volume         2400         0         L         15-OCT-09         R981004           Fibres/Filter         8000         3000         Fibres/         15-OCT-09         R981004           Fibres/Filter         22         7         Fibres/mm2         15-OCT-09         R981004           Fibre Density         22         7         Fibres/mm2         15-OCT-09         R981004           L828633-5         BF355580 (480 MIN DURATION AT 5 L/MIN)         0.003         0.001         fibres/mL         15-OCT-09         R981004           Sample Dy:         ANDREW SMITH on 27-SEP-09 @ 08:59	Fibre Density	0.5		0.5	f/field		15 OCT 00	D004004
Fibres/Filter         8000         3000         Fibres         15-OCT-09         R981004           Fibre Density         22         7         Fibres/mn2         15-OCT-09         R981004           Fibre Concentration         0.003         0.001         fibres/mL         15-OCT-09         R981004           L828633-5         BF355580 (480 MIN DURATION AT 5 L/MIN)         0.001         fibres/mL         15-OCT-09         R981004           Sampled By:         ANDREW SMITH on 27-SEP-09 @ 08:59         Atrix:         AIR	Sample Volume	2400		0.5	L		15-OCT-09	R981004 R981004
Fibre Density       22       7       Fibres/mm2       15-OCT-09       R981004         Fibre Concentration       0.003       0.001       fibres/mL       15-OCT-09       R981004         L828633-5       BF355580 (480 MIN DURATION AT 5 L/MIN)       Sampled By:       ANDREW SMITH on 27-SEP-09 @ 08:59       R981004       R981004         Matrix:       AIR       AIR	Fibres/Filter	8000		3000	Fibres		15-OCT-09	R981004
L828633-5BF355580 (480 MIN DURATION AT 5 L/MIN) Sampled By: ANDREW SMITH on 27-SEP-09 @ 08:59 Matrix:AIRAIRAISTACTAISTACTAISTACTAISTACTFibre Density Field Blank Correction Sample Volume Fibres/Filter Fibre Density Fibre Density Fibre Density Fibre Density Fibre Density Fibre Density Fibre Density Fibre Density Fibre SerierAIRAISTACTAISTACTAISTACTAISTACTAISTACTAISTACTFibre Density Fibres/Filter Fibre Concentration<0.5 120 0 121515-OCT-09 12R981004 15-OCT-09R981004 15-OCT-09R981004 15-OCT-09L828633-6 Matrix: Matrix:BF355573 (BLANK) Sampled By: ANDREW SMITH on 28-SEP-09 Matrix:000 L15-OCT-09 15-OCT-09R981004 R981004	Fibre Density Fibre Concentration	22 0.003		7	Fibres/mm2 fibres/mL		15-OCT-09 15-OCT-09	R981004 R981004
Sampled By:ANDREW SMITH on 27-SEP-09 @ 08:59 Matrix:AIRAIRFibre Density Field Blank Correction<0.50.5f/field 015-OCT-09R981004Sample Volume24000L15-OCT-09R981004Fibres/Filter50003000Fibres15-OCT-09R981004Fibre Density127Fibres/mm215-OCT-09R981004Fibre Concentration0.002001fibres/mL15-OCT-09R981004L828633-6BF355573 (BLANK) Sampled By:ANDREW SMITH on 28-SEP-09Image: ConcentrationImage: ConcentrationImage: ConcentrationImage: ConcentrationImage: ConcentrationImage: ConcentrationMatrix:AIRImage: ConcentrationImage: ConcentrationImage: ConcentrationImage: ConcentrationImage: ConcentrationImage: ConcentrationAnd trix:AIRImage: ConcentrationImage: ConcentrationImag	L828633-5 BF355580 (480 MIN DURATION AT 5 L/	MIN)						
Matrix:AIRAIRFibre Density Field Blank Correction<0.50.5f/field 015-OCT-09R981004Sample Volume Fibres/Filter24000L15-OCT-09R981004Fibres/Filter50003000Fibres15-OCT-09R981004Fibre Density Fibre Concentration127Fibres/mm215-OCT-09R981004L828633-6BF355573 (BLANK)0.0020.001fibres/mL15-OCT-09R981004L828633-6BF355573 (BLANK)Sampled By: ANDREW SMITH on 28-SEP-09LLLLLLLMatrix:AIRLLLLLLLLL	Sampled By: ANDREW SMITH on 27-SEP-09 @ 08:5	9						
Fibre Density Field Blank Correction<0.50.5f/field 015-OCT-09R981004Sample Volume24000L15-OCT-09R981004Fibres/Filter50003000Fibres15-OCT-09R981004Fibre Density127Fibres/mm215-OCT-09R981004Fibre Concentration0.0020.001fibres/mL15-OCT-09R981004L828633-6BF355573 (BLANK)0.0020.001fibres/mL15-OCT-09R981004Sampled By:ANDREW SMITH on 28-SEP-09LIIIIIIMatrix:AIRIIIIIIIII	Matrix: AIR							
Field Blank Correction         <0.5         f/field         15-OCT-09         R981004           Sample Volume         2400         0         L         15-OCT-09         R981004           Fibres/Filter         5000         3000         Fibres         15-OCT-09         R981004           Fibre Density         12         7         Fibres/mm2         15-OCT-09         R981004           Fibre Concentration         0.002         0.001         fibres/mL         15-OCT-09         R981004           L828633-6         BF355573 (BLANK)         881004         15-OCT-09         R981004           Sampled By:         ANDREW SMITH on 28-SEP-09         Image: All R	Fibre Density			_				
Fibres/Filter     5000     3000     Fibres     15-OCT-09     R981004       Fibre Density     12     7     Fibres/mm2     15-OCT-09     R981004       Fibre Concentration     0.002     0.001     fibres/mL     15-OCT-09     R981004       L828633-6     BF355573 (BLANK)     0.002     0.001     fibres/mL     15-OCT-09     R981004       Sampled By:     ANDREW SMITH on 28-SEP-09     ANDREW SMITH on 28-SEP-09     Image: Content of the second	Field Blank Correction Sample Volume	<0.5 2400		0.5	f/field		15-OCT-09 15-OCT-09	R981004 R981004
Fibre Density Fibre Concentration         12 0.002         7 0.001         Fibres/mn2 fibres/mL         15-OCT-09         R981004           L828633-6         BF355573 (BLANK) Sampled By:         ANDREW SMITH on 28-SEP-09         AIR         Image: Constraint of the symbol         Image: Co	Fibres/Filter	5000		3000	Fibres		15-OCT-09	R981004
L828633-6         BF355573 (BLANK)           Sampled By:         ANDREW SMITH on 28-SEP-09           Matrix:         AIR	Fibre Density	12		7	Fibres/mm2		15-OCT-09	R981004
Sampled By: ANDREW SMITH on 28-SEP-09 Matrix: AIR		0.002		0.001	IIDIES/IIIL		10-001-09	R901004
Matrix: AIR	Sampled By: ANDREW SMITH on 28-SEP-09							
	Matrix: AIR							

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

# ALS LABORATORY GROUP ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L828633-6 BF355573 (BLANK) Sampled By: ANDREW SMITH on 28-SEP-09 Matrix: AIR <b>Fibre Density</b> Field Blank Correction Fibres/Filter Fibre Density	<0.5 <3000 <7		0.5 3000 7	f/field Fibres Fibres/mm2		15-OCT-09 15-OCT-09 15-OCT-09	R981004 R981004 R981004
Fibre Density	<7		7	Fibres/mm2		15-OCT-09	R981004

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

### **Reference Information**

#### **Test Method References:**

ALS Test Code	Matrix	Test Description	Method Reference**
ASBESTOS-FBRS/FLT- ED	Filter	Fibre Density	NIOSH 7400A

Sample results are corrected using field blank results. A comment will appear at the end of each sample result section if no field blank was submitted.

Sr values: 5-20 0.11 >20-50 0.075 >50-100 0.10

\*\* 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	
ED	ALS LABORATORY GROUP - EDMONTON, ALBERTA, CANADA	
Chain of Custody Numbers:		
281009		

#### **GLOSSARY OF REPORT TERMS**

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.

mg/kg - milligrams per kilogram based on dry weight of sample

mk/kg wwt - milligrams per kilogram based on wet weight of sample

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight

mg/L - unit of concentration based on volume, parts per million.

< - Less than.

D.L. - The reporting limit.

N/A - Result not available. Refer to qualifier code and definition for explanation.

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

# ALS Laboratory Group ANALYTICAL CHEMISTRY & TESTING SERVICES

### **Environmental Division**



AECOM CANADA LI ATTN: GIL ROBINS	ГD. ON	Certificate of Analysis	Report Date: Version:	24-NOV-09 09:00 (MT) FINAL
99 COMMERCE DRI	VE			
WINNIPEG MA R3F	P 0Y7			
Lab Work Order #:	L832565		Date Receive	ed: 22-OCT-09
Project P.O. #: Job Reference: Legal Site Desc: CofC Numbers: Other Information:	6029-01500-0300			
Comments:				
	m (			
	Maureen Olir Senior Accou	Nic nek unt Manager		

THIS REPORT SHALL NOT BE REPRODUCED EXCEPT IN FULL WITHOUT THE WRITTEN AUTHORITY OF THE LABORATORY. ALL SAMPLES WILL BE DISPOSED OF AFTER 30 DAYS FOLLOWING ANALYSIS. PLEASE CONTACT THE LAB IF YOU REQUIRE ADDITIONAL SAMPLE STORAGE TIME.

ALS Canada Ltd. Part of the **ALS Laboratory Group** 9936-67 Avenue, Edmonton, AB T6E 0P5 Phone: +1 780 413 5227 Fax: +1 780 437 2311 www.alsglobal.com A Campbell Brothers Limited Company

# ALS LABORATORY GROUP ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L832565-1 BF355543 Sampled By: ANDREW SMITH on 29-SEP-09 @ 09:00 Matrix:							
<b>Fibre Density</b> Field Blank Correction Sample Volume Fibres/Filter Fibre Density Fibre Concentration	<0.5 2400 4000 11 0.002		0.5 0 3000 7 0.001	f/field L Fibres Fibres/mm2 fibres/mL		19-NOV-09 19-NOV-09 19-NOV-09 19-NOV-09 19-NOV-09	R1070644 R1070644 R1070644 R1070644 R1070644
L832565-2 BF355515 Sampled By: ANDREW SMITH on 29-SEP-09 @ 09:09 Matrix:	)						
<b>Fibre Density</b> Field Blank Correction Sample Volume Fibres/Filter Fibre Density Fibre Concentration	<0.5 2355 11000 29 0.005		0.5 0 3000 7 0.001	f/field L Fibres Fibres/mm2 fibres/mL		19-NOV-09 19-NOV-09 19-NOV-09 19-NOV-09 19-NOV-09	R1070644 R1070644 R1070644 R1070644 R1070644
L832565-3 BF355510 Sampled By: ANDREW SMITH on 29-SEP-09 @ 09:13 Matrix:	5						
Fibre Density Field Blank Correction Sample Volume Fibres/Filter Fibre Density Fibre Concentration	<0.5 2345 12000 31 0.005		0.5 0 3000 7 0.001	f/field L Fibres Fibres/mm2 fibres/mL		19-NOV-09 19-NOV-09 19-NOV-09 19-NOV-09 19-NOV-09	R1070644 R1070644 R1070644 R1070644 R1070644
L832565-4 BF355405 Sampled By: ANDREW SMITH on 30-SEP-09 @ 09:15 Matrix:	i						
Fibre Density Field Blank Correction Sample Volume Fibres/Filter Fibre Density Fibre Concentration	<0.5 1745 10000 25 0.005		0.5 0 3000 7 0.001	f/field L Fibres Fibres/mm2 fibres/mL		19-NOV-09 19-NOV-09 19-NOV-09 19-NOV-09 19-NOV-09	R1070644 R1070644 R1070644 R1070644 R1070644
L832565-5 BF355435 Sampled By: ANDREW SMITH on 01-OCT-09 @ 09:52 Matrix:	2						
Fibre Density Field Blank Correction Sample Volume Fibres/Filter Fibre Density Fibre Concentration	<0.5 1605 7000 18 0.004		0.5 0 3000 7 0.001	f/field L Fibres Fibres/mm2 fibres/mL		19-NOV-09 19-NOV-09 19-NOV-09 19-NOV-09 19-NOV-09	R1070644 R1070644 R1070644 R1070644 R1070644
Sampled By: ANDREW SMITH on 02-OCT-09 @ 09:57 Matrix:	7						

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

# ALS LABORATORY GROUP ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L832565-6 BF355590 Sampled By: ANDREW SMITH on 02-OCT-09 @ 09:57 Matrix:	7						
Fibre Density Field Blank Correction Sample Volume Fibres/Filter Fibre Density Eibre Concentration	<0.5 1600 12000 31		0.5 0 3000 7	f/field L Fibres Fibres/mm2		19-NOV-09 19-NOV-09 19-NOV-09 19-NOV-09	R1070644 R1070644 R1070644 R1070644 R1070644
L832565-7 BF355433 Sampled By: ANDREW SMITH on 03-OCT-09 @ 09:08 Matrix:	5		0.001	IDIES/IIIL		19-110/0-09	R1070644
Fibre Density Field Blank Correction Sample Volume Fibres/Filter Fibre Density Fibre Concentration	<0.5 2350 12000 31 0.005		0.5 0 3000 7 0.001	f/field L Fibres Fibres/mm2 fibres/mL		19-NOV-09 19-NOV-09 19-NOV-09 19-NOV-09 19-NOV-09	R1070644 R1070644 R1070644 R1070644 R1070644
L832565-8 BF355503 Sampled By: ANDREW SMITH on 04-OCT-09 @ 09:3 Matrix:	7						
Fibre Density Field Blank Correction Sample Volume Fibres/Filter Fibre Density Fibre Concentration	<0.5 1855 10000 25 0.005		0.5 0 3000 7 0.001	f/field L Fibres Fibres/mm2 fibres/mL		19-NOV-09 19-NOV-09 19-NOV-09 19-NOV-09 19-NOV-09	R1070644 R1070644 R1070644 R1070644 R1070644

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

## **Reference Information**

### **Test Method References:**

ALS Test Code	Matrix	Test Description	Method Reference**
ASBESTOS-FBRS/FLT- ED	Filter	Fibre Density	NIOSH 7400A

Sample results are corrected using field blank results. A comment will appear at the end of each sample result section if no field blank was submitted.

Sr values: 5-20 0.11 >20-50 0.075 >50-100 0.10

\*\* 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
ED	ALS LABORATORY GROUP - EDMONTON, ALBERTA, CANADA

#### Chain of Custody Numbers:

#### GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.

mg/kg - milligrams per kilogram based on dry weight of sample

mk/kg wwt - milligrams per kilogram based on wet weight of sample

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight

mg/L - unit of concentration based on volume, parts per million.

< - Less than.

D.L. - The reporting limit.

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory. UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Environmental Division

# ALS

### Chain of Custody / Analytical Request Form Canada Toll Free: 1 800 668 9878

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				Chal	in of Custody /	Analytical R	equest Form					cc	)C#			
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Report To				Report F	ormat / Distribu	tion	Service Requested (Rush for routine analysis subje					subject	lo availat	xility)		
Company:	AECOM Canada			🗹 Standar	d 🗌 Other			🖤 Reg	uiar (Defa	uit)						
Contact:	Gil Robinson			PDF	Excel	Digita	Fax		- Chippert		2 Qued	-			Surcharr	es apply
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Phone:	204-928-9266	Fax:									Analy	sis R	equest	1		
nvoice To	Same as Report ?	Yes	No No	Client / P	roject informati	on		Pleas	se indica	te bel	ow Filtere	d, Pre	served	or both (	(F, P, F/	P)
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Originally fro	m Bottle Request #	BR55897. If hav	e any question	s please call Andrew S	Smith at 780-918	3242 or email	at andrew.smith3@	aecom	.com. P	lease	also emai	i resul	ts to			
			Failure to co	mplete all portions o	of this form may	delay analysi	s. Please fill in thi	s form	LEGIB	LY.						
		By the use of	this form the	user acknowledges a	and agrees with	the Terms an	d Conditions as p		d on a se	eparat	te Excel t	ab.				
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GENF 18.02 Front

# ALS Laboratory Group ANALYTICAL CHEMISTRY & TESTING SERVICES

### **Environmental Division**



AECOM CANADA LT	D.	Certificate of Anal	ysis Report Date:	26-NOV-09 10:49 (MT)
ATTN: GIL ROBINS	ON		Version:	FINAL
99 COMMERCE DRI	VE			
WINNIPEG MB R3F	P 0Y7			
Lab Work Order #:	1 838998		Date Receive	ad 10-NOV-09
Project P.O. #: Job Reference:	60114506			
CofC Numbers:	101209-1			
Other Information:				
Commenter				
Comments:				
		M. Qair		
		Maureen Olinek Senior Account Manager		

THIS REPORT SHALL NOT BE REPRODUCED EXCEPT IN FULL WITHOUT THE WRITTEN AUTHORITY OF THE LABORATORY. ALL SAMPLES WILL BE DISPOSED OF AFTER 30 DAYS FOLLOWING ANALYSIS. PLEASE CONTACT THE LAB IF YOU REQUIRE ADDITIONAL SAMPLE STORAGE TIME.

ALS Canada Ltd. Part of the **ALS Laboratory Group** 9936-67 Avenue, Edmonton, AB T6E 0P5 Phone: +1 780 413 5227 Fax: +1 780 437 2311 www.alsglobal.com A Campbell Brothers Limited Company

## ALS LABORATORY GROUP ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L838998-1 BF355574							
Sampled By: CLIENT on 10-OCT-09 @ 08:52							
Matrix: AIR							
Fibre Density							
Field Blank Correction	<0.5		0.5	f/field		19-NOV-09	R1070644
Sample Volume	1695		0	L		19-NOV-09	R1070644
Fibres/Filter	6000		3000	Fibres		19-NOV-09	R1070644
Fibre Concentration	17 0.004		7 0.001	fibres/mm2		19-NOV-09	R1070644 R1070644
L838998-2 BF355548							
Sampled By: CLIENT on 12-OCT-09 @ 09:48							
Matrix: AIR							
Fibre Density							
Field Blank Correction	<0.5		0.5	f/field		19-NOV-09	R1070644
Sample Volume	2100		0	L		19-NOV-09	R1070644
Fibres/Filter Fibre Density	9000		3000	Fibres		19-NOV-09	R1070644
Fibre Concentration	0.004		0.001	fibres/mL		19-NOV-09	R1070644
L838998-3 BF355398 (BLANK)							
Sampled By: CLIENT							
Matrix: AIR							
Fibre Density							
Field Blank Correction	<0.5		0.5	f/field		19-NOV-09	R1070644
Flow Rate Based On	2000		2000	Fibras		19-NOV-09	R1070644
Fibre Density	<3000 <7		3000 7	Fibres/mm2		19-NOV-09	R1070644

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

## **Reference Information**

### **Test Method References:**

ALS Test Code	Matrix	Test Description	Method Reference**						
ASBESTOS-FBRS/FLT- ED	Filter	Fibre Density	NIOSH 7400A						

Sample results are corrected using field blank results. A comment will appear at the end of each sample result section if no field blank was submitted.

Sr values: 5-20 0.11 >20-50 0.075 >50-100 0.10

\*\* 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
ED	ALS LABORATORY GROUP - EDMONTON, ALBERTA, CANADA
Chain of Custody Numbers:	

### 101209-1

#### **GLOSSARY OF REPORT TERMS**

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.

mg/kg - milligrams per kilogram based on dry weight of sample

mk/kg wwt - milligrams per kilogram based on wet weight of sample

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight

mg/L - unit of concentration based on volume, parts per million.

< - Less than.

D.L. - The reporting limit.

N/A - Result not available. Refer to qualifier code and definition for explanation.

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

# ALS

### Chain of Custody / Analytical Request Form Canada Toll Free: 1 800 668 9878 www.alsglobal.com

COC # 101209-1

Page <u>1</u> of <u>1</u>

Report To		Report Format / Distribution				Service Requested (Rush for routine analysis subject to availability)									
Company:	AECOM Canada	Standard Other				Regular (Default)									
Contact:	Gil Robinson	PDF 🛛 Excel Digital 🗌 Fax					$O Priority (Specify Date Required \rightarrow \rightarrow) Surcharges apply$								
Address:	99 Commerce Drive		Gil.Robinson@	n O Emergency (1 Business Day) - 100% Surcharge											
	Winnipeg, Manitoba, R3P 0Y7	Email 2:	Andrew Smith	3@aecom.com		O For Emergency < 1 Day, ASAP or Weekend - Contact ALS									
Phone:	204-477-5381 Fax: 204-284-2040						Analysis Request								
Invoice To	Same as Report ?  Yes  No	Client / Project Information				Please	indicat	e below F	iltered, I	Preserve	d or both	(F, P, I	F/P)		
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BF355548 (420 minute duration at 5 l/min)			12-Oct-09	9:48	Air	X								1	
	BF355398 (BLANK)		N/A	N/A	Air	X								1	
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Andrew Smith	10-Nov-09 11:00	m	10-Kreit	\$ 15:24	°C							Yes /	/No? sadd !	SIE	