Environment

Government of Yukon

Former Clinton Creek Asbestos Mine 2010 Site Inspection

Prepared by:

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Project Number:

60160515 (402.3.1)

Date:

March, 2011

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March 31, 2011

Mr. Brett Hartshorne
Yukon Government
Assessment and Abandoned Mines Branch
Department of Energy, Mines and Resources
4114 – 4th Avenue, Room 2C
Whitehorse, Yukon
Y1A 1H9

Dear Brett:

Project: **60160515 (402.3.1)**
Regarding: **Former Clinton Creek Asbestos Mine – 2010 Site Inspection**

AECOM Canada Ltd. (AECOM) is pleased to submit our Report for the above referenced project.

Should you have any questions or require any additional information, please contact either the undersigned or Kendall Thiessen directly.

Sincerely,
AECOM Canada Ltd.

Tom Wingrove, P.Eng.
Executive Vice-President,
Deputy Operations Director,
North America, Environment

GR:dh
Encl.

Distribution List

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Revision Log

Revision #	Revised By	Date	Issue / Revision Description
1	G.Robinson	March 31, 2011	Final

AECOM Signatures

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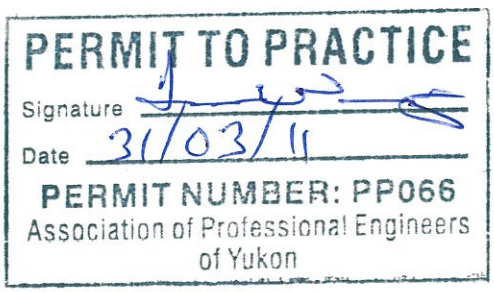

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1. Introduction

1.1 Terms of Reference

The terms of reference for this report are outlined in AECOM's letter proposal to the Yukon Government dated February 18, 2010. Work was carried out under AECOM's Standing Offer AMB-08-001 for Engineering and Consulting Services related to Operating and Abandoned Mines in the Yukon.

1.2 Scope of Work

Site inspections at the former Clinton Creek mine have been performed on a bi-annual basis since 2005. During the 2009 site inspection some damage to sections of the gabion drop structures was observed. The damage occurred during the 2009 spring freshet event and repairs were completed in the fall of 2009. The 2010 site inspection was recommended to review the condition of the repaired gabion drop structures after the 2010 spring freshet event. The damage and repair work are documented in the 2009 Site Inspection Report (AECOM 2010) and in the Construction Activity Report (AECOM 2011). Not all mine site features were inspected during the 2010 inspection. Most of the effort was placed on evaluating the condition of the main features including the Clinton Creek channel, the gabion drop structures, Wolverine Creek, the former Mill Site and the Porcupine Pit.

The site inspection was completed on July 20 and 21, 2010 and at that time no significant changes in the site features were observed. However, a significant precipitation event(s) in the Clinton Creek watershed occurred during the 2 to 3 week period after the inspection that resulted in significant changes to some of the mine site features, particularly along the Clinton Creek waste rock channel. A subsequent inspection on August 23, 2010 was conducted. The findings are provided in the letter report in Appendix A. The scope of this report is to provide a record of the mine site features at the time of the July 2010 site inspection.

2. Site Description

2.1 Location and Environment

The former Clinton Creek Asbestos Mine is located about 100 km northwest of Dawson City, Yukon, and 19 km from the Alaska border as shown on Figure 01. The mine site is situated within a triangle bounded by the Yukon River, the Forty Mile River and the International (Yukon-Alaska) border at approximately UTM coordinates 7,147,500 N / 613,000 E (UTM Zone 7 NAD83). Access to the mine is from the Top of the World Highway which runs from Dawson City to the International border crossing into Alaska. The mine is situated along Clinton Creek about 9 km upstream of the confluence with the Forty Mile River. The Forty Mile River flows into the Yukon River about 5 km downstream from the mouth of Clinton Creek.

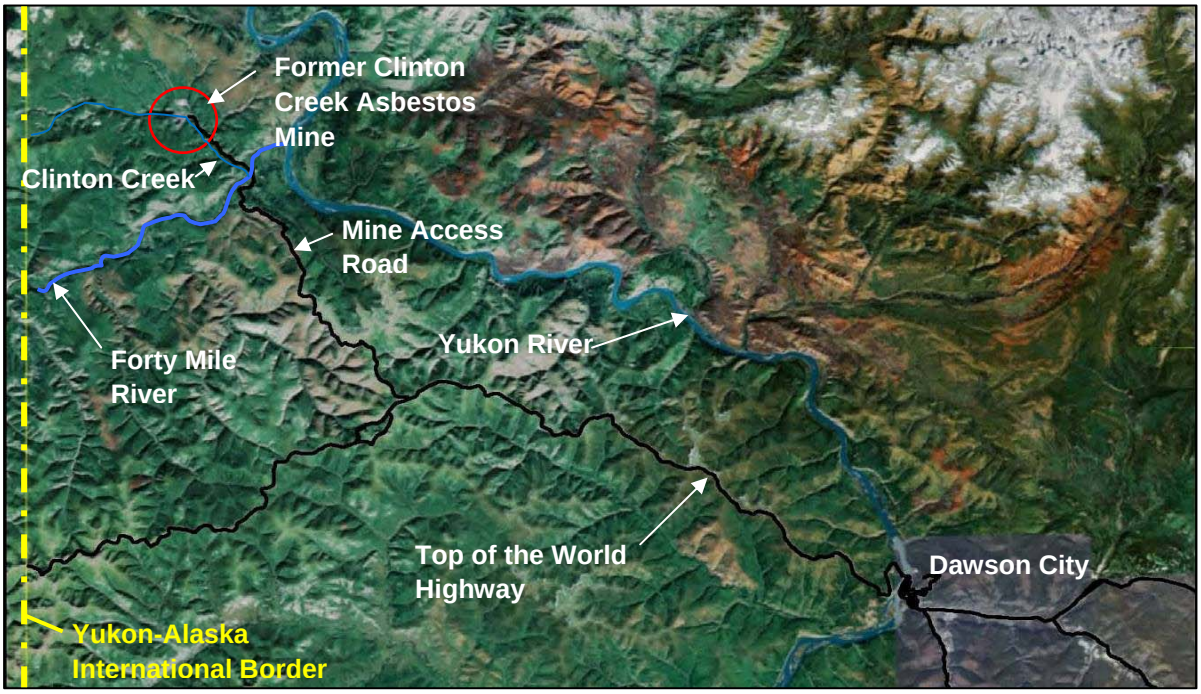

Figure 01 Key Plan (Source – Google Maps)

The former mine is located between approximately elevations 375 m above sea level (ASL) at the Clinton Creek valley floor and 590 m ASL at the former mill site. Local relief in the area is in the order of 215 m. The site is within the unglaciated Yukon-Tanana Upland with widespread discontinuous permafrost distribution. The maximum permafrost depth in the area is estimated to be in the order of 60 m (Golder, 1978). The presence of permafrost is evidenced by reports of segregated ice, in the form of large crystals and thick lenses being encountered in alluvial valley deposits and near surface bedrock in undisturbed ground (Stepanek and McAlpine, 1992). Records kept during active mining (1968-1978) indicate an annual mean temperature of approximately -2.5 degrees C with an average annual precipitation of 360 mm/yr (Golder, 1978).

2.2 Mine Site

The mine layout is illustrated on Figure 02. The Porcupine and Snowshoe Pits are located in the valley slope along the south side of Clinton Creek. The Creek pit is located along the original alignment of Porcupine Creek. The former mill site is located on a plateau along the west side of the Wolverine Creek valley about 150 m higher than the mine site area. A crusher building was formerly located on the high ground between the Porcupine and Creek Pits. Ore was transported from the crusher building to the mill site by a tram line. An abandoned airstrip is located about 1.5 km north of the mill site.

Waste rock from the three open pits was deposited along the valley slopes immediately adjacent to the pits. Porcupine and Clinton Creek are the largest of the waste rock dumps. Hudgeon Lake was formed in the 1970s due to a landslide of the Clinton Creek Waste Rock Dump across the valley floor. The lake is presently about 30 m deep with creek channel flow now over the leading edge of the waste rock dump along the north valley slope. Gabion drop structures were constructed at the Hudgeon Lake outlet from 2002 to 2004 to reduce the potential for a breach of the waste rock plug and consequential rapid lowering of the lake. Tailings from the milling operation were deposited onto the Wolverine Creek valley slope in the north and south lobes which subsequently advanced down the valley slope blocking flow along the natural creek alignment. Flow in this section of Wolverine Creek is now along the leading edge of the tailings at the east valley slope. A more detailed description of the former mine site can be found in the Former Clinton Creek Asbestos Mine Overview Report (AECOM 2009a).

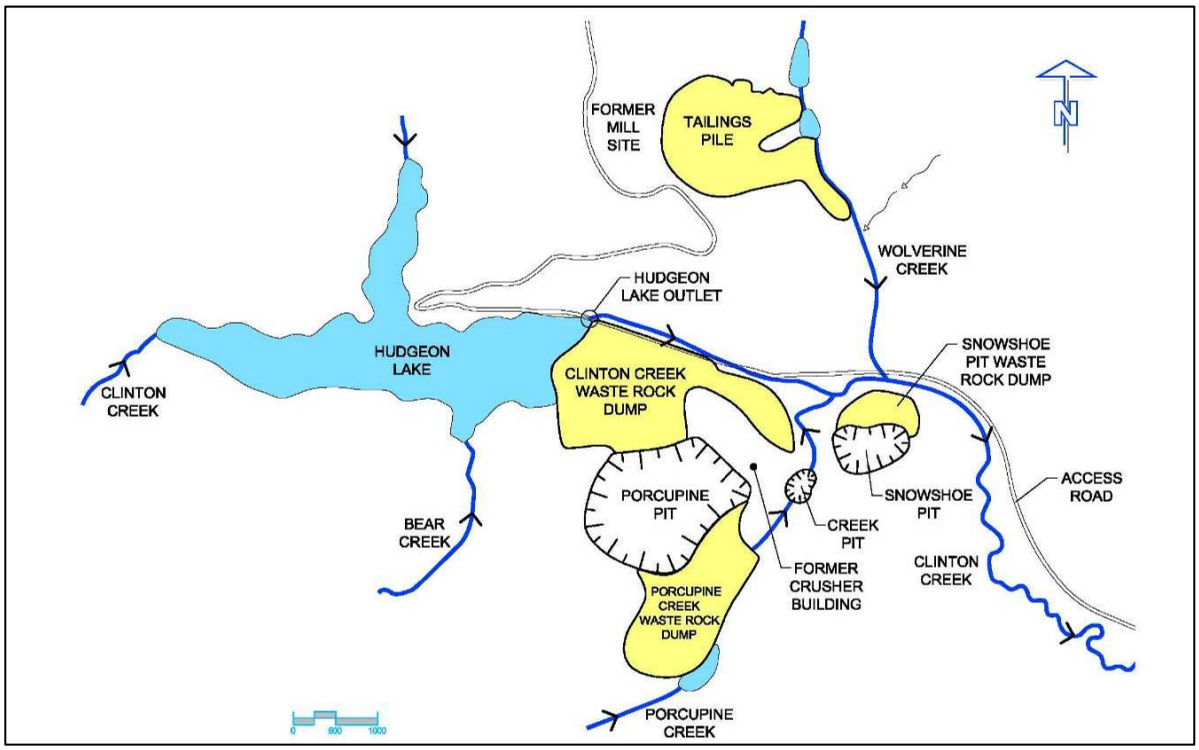

Figure 02 Mine Site Layout

2.3 Local Geology

Local geology consists of a complex assemblage of rocks that include ultramafic, igneous and metamorphic rocks such as serpentinite, diorite, amphibolite, schist, shale, siltstone and limestone (Stepanek and McAlpine, 1992). The ore body mined consists of chrysotile asbestos veinlets embedded in jade green serpentine. Of relevance to the current mine site condition are argillite bedrock outcroppings visible along the Clinton Creek channel through the waste rock dump that is highly susceptible to mechanical weathering from creek channel flow and freeze-thaw action. An orange coloured quartz-carbonate alteration is visible along the Porcupine Pit wall and an outcropping along the mine access road at the confluence of Wolverine Creek and Clinton Creek. The rock is hard and durable compared to the sedimentary rocks and schists that commonly occur on the site and for this reason, was quarried for use as fill in the gabion baskets constructed to stabilize the outlet of Hudgeon Lake.

3. Site Inspection

The site inspection was carried out on July 20 and 21, 2010 by Ken Skaftfeld, P.Eng. of AECOM and Gil Robinson, M.Sc., P.Eng. of Dyregrov Robinson Inc. Specific objectives of the inspection were as follows:

- Visually inspect the gabion drop structures at the Hudgeon Lake outlet to assess how the repairs completed in the fall of 2009 held up during the 2010 spring freshet,
- Measure the horizontal distances across each drop structure,
- Inspect the former Mill site for signs of subsided backfill placed during the demolition work in 2004,
- Visually inspect the rock lined channel and weirs on Wolverine Creek,
- Inspect the portion of the tailings pile lobes along Wolverine Creek
- As time permits, inspect the Porcupine Creek open pit and waste rock dump.

Photographs and video clips were taken during the inspection; these have been included on a DVD attached to this report in Appendix B. Select photographs from the site inspection are provided in Figures 03 to 39 along with the previous inspection photographs to illustrate the conditions observed and changes, if any, to the site features. The Figures are not bound into the report but are provided in a folder (Appendix B) so they can be viewed while reading the report. The photo locations and features of note are cross-referenced with GPS waypoints (UTM Zone 7 NAD83) throughout the report. A list of the waypoints is provided in Appendix C and the locations of the waypoints referenced in the report are shown on the Drawings. These locations are approximate only, based on the accuracy of the hand held GPS unit used. Future site inspection photographs will be taken from the same way points established during the 2009 and 2010 site inspections (AECOM 2010) to help illustrate any physical changes over time. Photo-identifiable points have been highlighted on the Figures where possible.

Descriptions along creek channels in this report may use abbreviations referring to the right hand side (RHS) and left hand side (LHS) of the channel. These abbreviations are with respect to looking in a downstream direction along the channels. The abbreviations U/S and D/S refer to upstream and downstream directions, respectively.

4. Clinton Creek Channel

The Clinton Creek channel was inspected between the Hudgeon lake outlet at Station 0+000 m and the downstream end of the creek channel at Station 0+800 m (Drawing 01). The inspection is presented starting from the downstream end of the channel for consistency with the 2009 inspection report.

4.1 Clinton Creek Channel Downstream of Gabion Drop Structures

No significant changes were visually apparent along the creek channel between the gabion drop structures (Station 0+184 m) and the downstream end of the channel (Station 0+800). The July 2010 channel profile survey completed for the Long Term Performance Monitoring Program (AECOM 2011a) did not reveal any significant changes in the channel profile. A comparison of conditions with photographs from the 2009 inspection also suggests that no significant changes in the channel occurred over the past year.

The bedrock channel bottom and outcrop visible on the LHS of the channel from approximately Station 0+600 (Drawing 01) compare well with what was observed in 2009 from Waypoints 339 and 340 (Figures 03 and 04, respectively).

Farther upstream, at approximately Station 0+560, the physical features and vegetation along the LHS and RHS of the channel, as well as the channel bottom do not appear to have significantly changed from 2009 as seen on Figures 05, 06 and 07 taken from WP 341. A similar set of photos were taken at WP 342, located at approximately Station 0+470 in an upstream direction (Figure 08), cross-channel (Figure 09) and downstream (Figure 10); No significant changes in the condition of the channel over the one year period from July 2009 to July 2010 were noted.

Figures 11 and 12 illustrate the channel condition at Station 0+370 m, 170 m downstream of the gabion drop structures. The photos in these two figures were taken from the same location (WP 344) but at a different magnification. This is the portion of the channel where down-cutting could impact on the stabilization works (drop structures) and is therefore considered a critical area to review during site inspections and when reviewing the creek profile for the performance monitoring program. Comparison of the 2009 and 2010 photos does not suggest any significant changes in the channel over this time period which is consistent with the 2010 creek channel profile survey (AECOM, 2011a). Several boulders and other channel features do not appear to have changed.

The final vantage point to observe the channel is located near Station 0+290 m (WP 345) which provides a good view of the waste rock and bedrock contact located about 50 m downstream of the drop structures. Figure 13 illustrates these features and also signs of recent slide activity of the waste rock, likely initiated by erosion along the toe of the waste rock.

4.2 Gabion Drop Structures and Hudgeon Lake Outlet

The gabion drop structures downstream of the Hudgeon lake outlet were photographed in 2009 and 2010 from WP 346 at approximately Station 0+230. From this vantage point, no significant change in the overall condition of the channel or structures located between the lake outlet (Station 0+000) and Station 0+184 was observed (Figure 14). In 2009, the structures were damaged during the 2009 spring freshet (AECOM 2010) and repaired in the fall of 2009 (AECOM 2011). While the damage was severe enough to warrant repair before the next spring freshet, it was concluded that overall, the structures were performing as intended because they continued to provide erosion protection immediately downstream of the lake outlet and mitigate the risk of a breach and rapid lowering of Hudgeon Lake.

Overall, the damage to the gabion drop structures that occurred in 2009 was more severe on the north side of the structures with the most significant damage occurring at Drop Structure #4 (DS #4). Less damage occurred at DS #2 and relatively minor damage occurred at DS #1 and DS #3.

4.2.1 Drop Structure 4

Drop Structure #4 consists of a drawdown weir with 6 tiers that provide a 2.5 m drop in channel grade and an end sill on the bottom tier. The transition from the drop structures to the natural channel is illustrated on Figure 15. Figure 16 compares the overall condition of the structure in 2009 and 2010. Of the overall damage from 2009, the most significant damage occurred to Drop Structure #4. Several of the wire baskets at the top of the structure including the drawdown weir and tiers 4, 5 and 6 were deformed and some of the baskets were torn open with the rock fill partially or completely missing (Figures 16 to 18). The lower tier of the structure was repaired by placing another layer of gabion baskets on the floor of the structure, as noted on Figure 16. The remainder of the damage was repaired by infilling the gabion baskets as required, re-fastening the lids and patching the wire mesh. The damaged end sill was not replaced.

The repaired structure did not appear to have suffered any damage in the 2010 spring freshet. The upper most tier (Tier #6) and the overlying draw down weir are tilted in the upstream direction (Figure 17). The tilting may have occurred during the 2009 spring freshet. Other than the tilting observed, the structure and the creek channel directly downstream appeared to be in good condition.

4.2.2 Drop Structure 3

Drop Structure #3 consists of a drawdown weir with 5 tiers that provide a 2 m drop in channel grade and an end sill on the bottom tier. Figure 19 illustrates the overall condition of the structure in 2009 and 2010. Cross-channel views of the structure are shown on Figure 20. The damage to Drop Structure #3 observed in 2009 included deformation of baskets, some small holes in the tops or downstream sides of individual baskets and the end sill was badly deformed but intact.

The repairs completed in 2009 held up well during the 2010 spring freshet and the structure appears to be in very good condition. The water flow over the weir was slightly uneven suggesting that RHS of the upper most tier may have settled a small amount relative to the LHS. The channel slopes between DS #3 and DS#4 (Figure 21) are in good condition with no signs of erosion other than high water marks.

4.2.3 Drop Structure 2

Drop Structure #2 consists of a drawdown weir with 6 tiers that provide a 2.5 m drop in channel grade and an end sill on the bottom tier. A comparison of the structure in 2009 and 2010 is illustrated on Figures 22 and 23. The damage observed in 2009 included the drawdown weir which was leaning downstream, loss of gabion fill from the end sill and several of the baskets on Tiers 2, 3 and 5. The end sill was also deformed.

The repairs completed in 2009 held up well during the 2010 spring freshet and the structure appears to be in very good condition. The channel slopes between DS #2 and DS#3 are in good condition with no signs of erosion other than high water marks.

4.2.4 Drop Structure 1

Drop Structure #1 consists of a drawdown weir with 4 tiers that provide a 1.5 m drop in channel grade and an end sill on the bottom tier. An upstream view of the structure in 2009 and 2010 is illustrated on Figure 24. Cross-channel view of the structure from 2007 and from 2009 and 2010 are shown on Figures 25 and 25a, respectively. The

damage observed in 2009 included the drawdown weir leaning downstream, loss of gabion fill from several of the baskets in the end sill and Tiers 2, 3 and 4 (Figure 25a) and deformation of the end sill. The 0.5m wide opening in the drawdown weir was completed in 2007 to allow the elevation in Hudgeon Lake to drop during low flow periods and prior to freeze-up. This drop structure has undergone some settlement since construction in the fall of 2002.

The repairs completed in 2009 held up well and the structure appears to be in good condition. Logs drifting off the lake were caught up at DS #1 and should be removed from the channel since some of the gabion damage observed in 2009 may have been related to logs moving over the drop structures and tearing the wire mesh of the baskets. A tension crack was observed along the LHS of the DS at the top of the slope. The tension crack extends downstream to about 20 m past DS#1.

4.2.5 Drop Structure Monitoring Results

Measurements across the drop structures have been taken since they were constructed to help detect movements / changes to the drop structures in anticipation that the waste rock movements would have some impact on the drop structures. Monitoring of the structures includes measuring the horizontal distance across the drawdown weir and the lowest tier in line with each end sill (Drawing D1, Appendix D). The monitoring results from July 2010 are attached in Appendix D. The reduction in horizontal distance of the drawdown weirs for the 1 year period from July 2009 to July 2010 ranged from 1 to 8 cm, the total closure measured to date ranges from 9 to 47 cm. The closure of the lower tiers ranged from 6 to 8 cm and the closure across the drawdown weirs ranged from 1 to 6 cm. These movements are consistent with those observed previously and as noted in the 2010 Long term Performance Monitoring Report (AECOM 2011a), are generally in good agreement with the movement of the waste rock dump towards the creek channel.

4.2.6 Lake Outlet Channel U/S of DS #1

Figure 26 illustrates the general condition of the lake outlet channel upstream of DS 1 in 2010. No signs of bank erosion or instability were observed.

5. Wolverine Creek Channel and Tailings Pile

5.1 Rock Lined Channel Section

An armoured section of the Wolverine Creek channel is located on the downstream (south) end of the south tailings lobe. It consists of a rock lined channel with a series of rock weirs constructed over a layer of tailings that is about 5 to 10 m thick. The integrity of this channel is a critical component of the risk management of the site. Although normal summer flows through the channel are small, the spring freshet produces relatively higher albeit short term flows.

A comparison of the channel in 2009 and 2010 is shown on Figures 27 and 28 at Waypoints 75 (UGL Tag 482) and 335. No significant changes in the condition of the channel from 2009 to 2010 werre observed. As noted in the 2009 Inspection Report (AECOM 2010) vegetation, including trees, is gradually re-growing in the channel after brush removal work was carried out in 2007. The brush clearing work was limited to the removal of the trees and brush from the bottom of the channel only and not the channel banks. The rock weirs are in good condition and there is minimal erosion along the bottom and sides of the channel. Some of the rocks in the weirs have shifted around over the years but the weirs are still clearly visible. It is anticipated that some maintenance of the rock weirs will be required at some point in the future.

5.2 Creek Channel Across Tailings

The creek channel alignment across the tailings can be seen Drawing 1. A view of the creek channel near the down stream limit of the South Lobe (i.e. WP 337) is shown on Figure 29. It does not appear that there has been any significant change in the channel bottom or valley slope side of the channel. Not unexpectedly, there are noticeable differences in the tailings side of the channel due to the on-going sloughing and erosion of the over steepened tailings. At the upstream end of the channel across the South Lobe (WP 338), Figure 30 illustrates that there have been no significant changes in the creek channel at this location since 2009. The leading edge of the tailings lobe which forms the RHS of the channel consists of freshly exposed tailings with numerous slumps confirming that there is ongoing erosion of the tailings and deposition of this material downstream.

Figure 31 illustrates the general location of the channel across the North Lobe as viewed from the South Lobe. The leading edge of this tailings lobe forms the RHS of the channel and consists of freshly exposed tailings with numerous slumps confirming that there is ongoing erosion of the tailings and deposition of this material downstream.

5.3 Tailings

The only change to the tailings pile that can be visually observed is the on-going sloughing and erosion of the tailings along the leading edge of the lobes. A discussion on the tailings movement is provided in the Long Term Performance Monitoring Program (AECOM 2011a).

6. Mill Site

A brief inspection of the mill site was completed. The ground subsidence reported in 2007 along the alignment of the former underground conveyor tunnel has been filled but there are a couple of small voids remaining. The void locations can be re-located using the UTM co-ordinates for Waypoints 63 and 64 which are provided in Appendix C.

Some vegetation (e.g. foxtail barley) has established on the Mill Site since the demolition and re-grading work completed in 2004. An aerial view of the Mill Site from 2005 and a view from WP #71 on the tailings pile in 2010 is shown on
Figure 32.

7. Open Pits and Waste Rock Dumps

7.1 Open Pits

No significant changes in the condition of the open pits were noted although gradual ravelling and sloughing of the pit walls is ongoing.

7.1.1 Porcupine Pit

A series of photographs taken in 2003 and 2009 illustrate the overall condition of the open pit (Figures 33 and 34). Figure 35 shows the open pit from the east side and Figure 36 illustrates the condition of the pit from the north side in 2010. Waypoint (WP) locations for the photographs are shown on Drawing 02. A ditch has been excavated around the south and west sides of the Porcupine pit to restrict access. The approximate alignment of the ditch is shown on Drawing 02. Excavated material from the ditch has been placed as a berm and warning signs have been posted.

7.1.2 Snow Shoe Pit

Figure 37 illustrates the general condition of this open pit in 2010 from WP 87. Photos should be taken from this Waypoint in future inspections.

7.1.3 Creek Pit

Figure 38, taken from WP 89, illustrates the general condition of this open pit in 2010. Note the level of water in the pond and the flow from the Porcupine Waste Rock Dump, which is located directly upstream of the pit. Some sloughing of the west wall of the Creek Pit was observed in 2010 as shown on Figure 39 taken from Waypoint 90. Photos should be taken from this Waypoint in future inspections.

7.2 Waste Rock Dumps

The waste rock dumps were not inspected in 2010. The 2009 Inspection report includes a brief discussion (AECOM 2010). A discussion on the Clinton Creek waste rock movement is provided in the Long Term Performance Monitoring Program (AECOM 2011a).

8. August 2010

As mentioned in Section 1 of this report, a precipitation event(s) that took place after the July 2010 site inspection resulted in some significant changes to the mine site features, particularly the Clinton Creek channel and gabion drop structures. A partial site inspection was completed on August 23, 2010 (Appendix A) to observe the condition of Clinton Creek and Wolverine Creek. Some of the other site features were viewed from a helicopter. The photographs from this inspection are included in Appendix A.

A weather station located on the Clinton Creek waste rock dump near Hudgeon Lake recorded precipitation at the site. The data is illustrated on Figure 40 below and shows that a total of 255 mm of rain fell from April 27 to September 13, 2010 of which 82 mm of rain fell over a 17 day period from July 11 to 27 and 70 mm of rain fell over a 4 day period beginning August 5. Sixty millimetres (60 mm) fell on August 6 over a period of about 20 hours.

At the time of the July 2010 site inspection, the mine site was wet from recent rain but flows in the creeks were not considered to be unusually high. The effects of the precipitation that fell after this inspection included some landslides in the Clinton Creek valley upstream and downstream of the mine site and high flows in the Clinton Creek channel and possibly the Wolverine Creek channel. These high flows caused significant damage to Drop Structure #4 and erosion of the creek channel and waste rock downstream of the drop structures. The creek profiles were re-surveyed in September 2010 to capture the effects of this event and are provided in the 2010 Long Term Performance Monitoring report for the site (AECOM 2011a). Directly downstream of DS#4 the creek bottom is about 5 m deeper than it was before this event. Figures 41 to 43 provide some insight into the erosion that took place on Clinton Creek in August 2010.

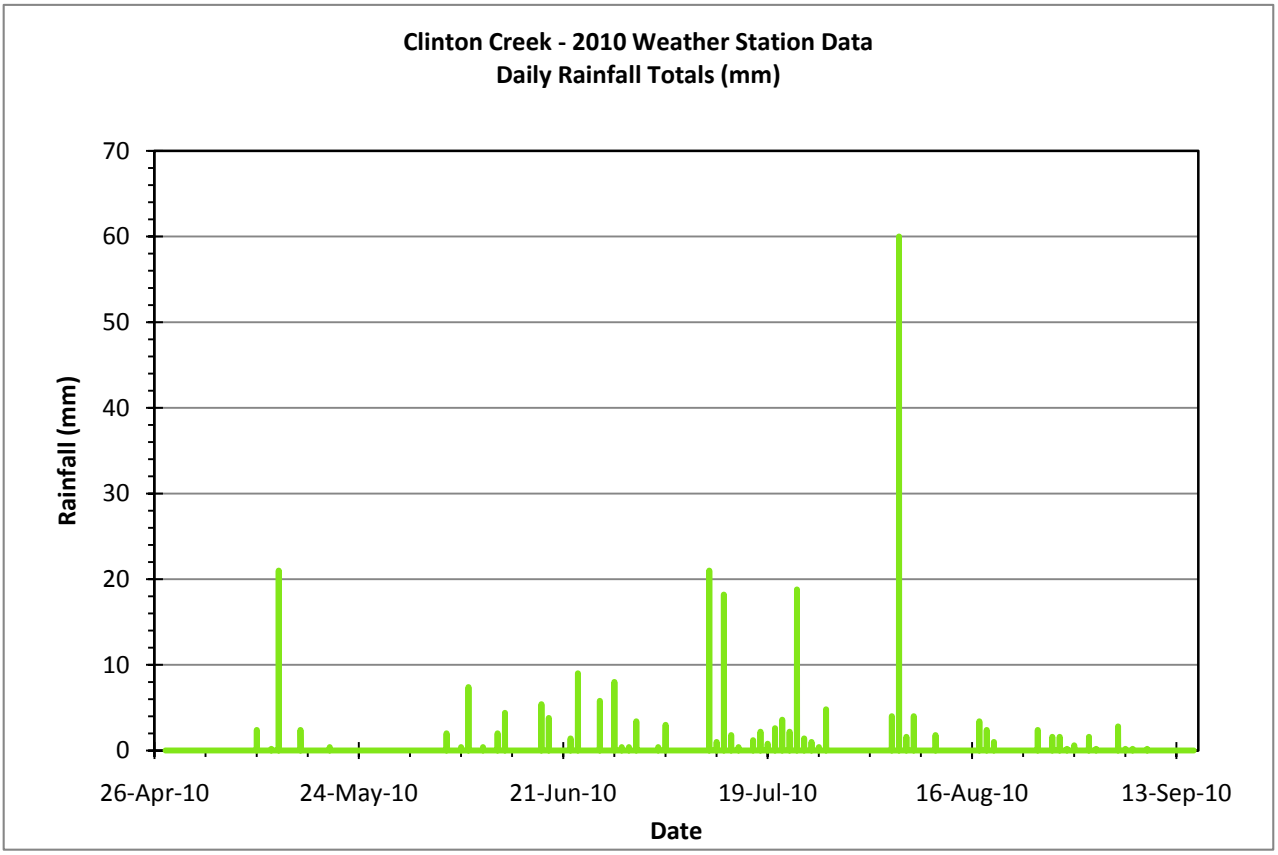

Figure 40 Daily Rainfall Amounts

Figure 41 Clinton Creek Channel on August 23, 2010

Figure 42 Clinton Creek Channel D/S of DS#4 on August 23, 2010

Figure 43 Clinton Creek Channel – DS#4 on August 23, 2010

9. Summary and Recommendations

9.1 Clinton Creek Channel

The July 2010 inspection did not reveal any significant changes to the channel downstream of the drop structures since the 2009 site inspection. The repairs made to the drop structures in the fall of 2009 were effective in restoring their integrity. The transition from the drop structures to the downstream channel was well armoured with no visual evidence of channel down-cutting. Horizontal movements of the structures are continuing but the movements are consistent with those previously observed and are not of a magnitude to date where the cross sectional geometry of the structures has been compromised.

9.2 Wolverine Creek Channel and Tailings Pile

No significant changes in the Wolverine Creek channel through the tailings were observed although ongoing erosion of the leading edge of the tailings continues. The rock lined channel and rock weirs at the downstream end of the south end of the south lobe are in good condition with the flow well within the channel banks. Vegetation (trees) is becoming re-established in the channel and removal of trees will be required in the foreseeable future to keep the channel unobstructed.

9.3 Open Pits and Waste Rock Dumps

Ravelling and sloughing of the over-steepened pit walls is continuing.

9.4 Recommendations

Repairs to the drop structures following the August 2010 event could not be completed before winter conditions stopped work at the site. A site visit is planned in the spring of 2011 to re-assess the condition of the Clinton Creek channel and drop structures and the rock lined channel on Wolverine Creek. A repair strategy will need to be developed and implemented in 2011.

Removal of logs and vegetation from the drop structures and inter-connecting sections of channel should be performed at least once per year.

Removal of vegetation from the rock lined channel should be performed in the next one or two years.

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Drawings

513,000 513,500 514,000

7,148,000

7,147,500

1.5km TO FORMER AIRSTRIP

FORMER MILL SITE

071

NORTH LOBE

081

338

WOLVERINE CREEK TAILINGS PILE

SOUTH LOBE

337

336

335

334

ROCK LINED CHANNEL

MILL ACCESS ROAD

HUDGEON LAKE

0+000 0+100 0+200 0+300 0+400 0+500 0+600 0+700 0+800

327 328 361 329 326 330 333 332 331 346 345 344 343 342 341 340 339

ACCESS ROAD

CLINTON CREEK

CLINTON CREEK WASTE ROCK DUMP

WOLVERIINE CREEK

N

LEGEND

334 GPS WAYPOINT

0 50 100 m SCALE 1:5000

UTM ZONE 7 NAD83
IMAGE DATE 1999

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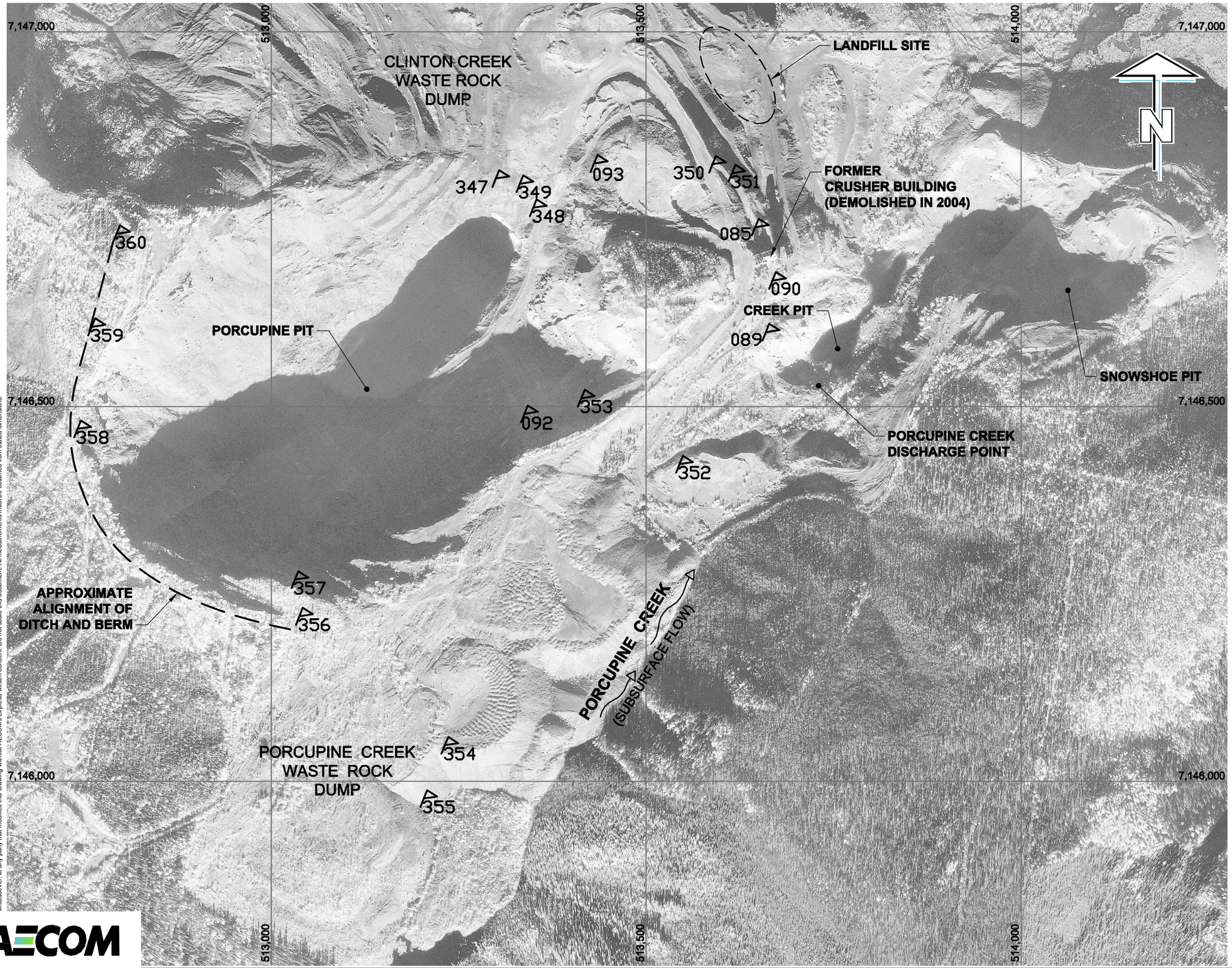
Government of Yukon
Former Clinton Creek Asbestos Mine
2010 Site Inspection

Site Plan - Clinton Creek and Wolverine Creek Drawing - 01



LEGEND

353 GPS WAYPOINT

0 50 100 m SCALE 1:5000

UTM ZONE 7 NAD83
IMAGE DATE 1999

Government of Yukon
Former Clinton Creek Asbestos Mine
2010 Site Inspection

Site Plan - Open Pits and Waste Rock Dumps Drawing - 02

AECOM

ISS/REV: 0A
AECOM FILE NAME: 60160515-02-B-F02-R0X.dwg
PLOT: 11/03/28 2:09:30 PM
Saved By: cloustonc
B SIZE 11" x 17" (279.4mm x 431.8mm)

Appendix A

August 23, 2010 Site Inspection Letter and Photographs

AECOM
17203 103 Avenue
Edmonton, AB, Canada T5S 1J4
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780 488 6800 tel
780 488 2121 fax

September 7, 2010

Brett Hartshrone
Project Manager
Assessment and Abandoned Mines Branch
Energy, Mines and Resources
Government of Yukon
PO Box 2703 (K-419)
Whitehorse, YT Y1A 2C6

Dear Brett:

Project No: 60160515

Regarding: Former Clinton Creek Asbestos Mine - Site Inspection on 23 August, 2010

Background

The Clinton Creek drop structures and channel at the outlet of Hudgeon Lake were inspected as part of the Long Term Performance Monitoring program at the mine site on 20 July, 2010. At that time, the structures were found to be in good condition and no significant changes were observed in the Clinton Creek channel through the waste rock dump downstream of the structures.

Dawson District Renewable Resource Council (DDRRC) members who tried to reach the Clinton Creek area on Monday 9 August reported that streams were flowing at high levels and a slide blocked the access road. During a subsequent ground inspection along the access road, by Al von Finster on Wednesday 11 August, several slides were found and one developed during the time of the ground inspection. Based on the field observations, it was concluded that a major precipitation event had taken place in the Clinton Creek headwaters.

As a result of the reported events at the Clinton Creek access road, Brett Hartshorne of Yukon EMR Assessment and Abandoned Mines conducted a site reconnaissance by helicopter on Thursday 19 August, 2010. During the inspection it was noticed that the channel downstream of the structure had eroded significantly and Drop Structure #4 (the drop structure farthest downstream) was severely undercut. The step drop portion of the structure appeared to be reasonably intact while the downstream apron had bent down and was hanging at a steep angle. The sacrificial apron downstream of the structure apron was gone.

During a conference call in the afternoon of Thursday 19 August, the observed damages were discussed and it was decided that a formal field inspection of the structures was required. The conference call was attended by Brett Hartshorne and Frank Patch (both of Yukon EMR Assessment and Abandoned Mines) and Ken Skaftfeld, Gil Robinson, Andrew Smith and Rolf Aslund (all of AECOM).

On Monday 23 August 2010, Brett Hartshorne and David Barrett of Yukon EMR Assessment and Abandoned Mines and Andrew Smith and Rolf Aslund of AECOM (Edmonton) inspected the drop structures on Clinton Creek. The site was reached by helicopter from Dawson City. During the site inspection, Brett Hartshorne and David Barrett concentrated on the area away from the structures while Andrew Smith and Rolf Aslund concentrated on the drop structures, the channel between the structures and the channel immediately downstream of Drop Structure #4.

Field Observations

At the time of inspection the flow was approximately 0.2 m deep over weir crest gabions, which made it necessary to wear hip waders when crossing the structures.

Hudgeon Lake

- HWMs (High Water Marks) observed on the shore to the right of the lake outlet. The HWMs were in the form of duff deposits, bent grass and sediment deposition at the ford.
- The duff deposition HWM on the lake shore was surveyed and found to be at Elevation 412.54 m

Drop Structure #1 (at lake outlet)

- Driftwood and tree trunks have accumulated on the weir crest and have trapped a floating mat of duff.
- No significant gabion damage was seen.
- No evidence of flow by-passing the structure was seen.

Drop Structure #2

- Weir crest was generally free of driftwood. One larger piece of driftwood on the left side slope of the crest and one tree trunk on the steps on the right side. Minor driftwood deposited on the left apron side slope.
- No significant gabion damage was seen.
- No evidence of flow by-passing the structure was seen.

Drop Structure #3

- One tree trunk was seen floating in the water and stuck on the left half of the weir crest. One tree trunk caught on the right side slope of the weir crest. Minor debris deposition on the steps on the left side. Two larger pieces of driftwood caught on the steps on the right side slope. Minor driftwood deposition on the left apron side slope.
- No significant gabion damage was seen.
- No evidence of flow by-passing the structure was seen.

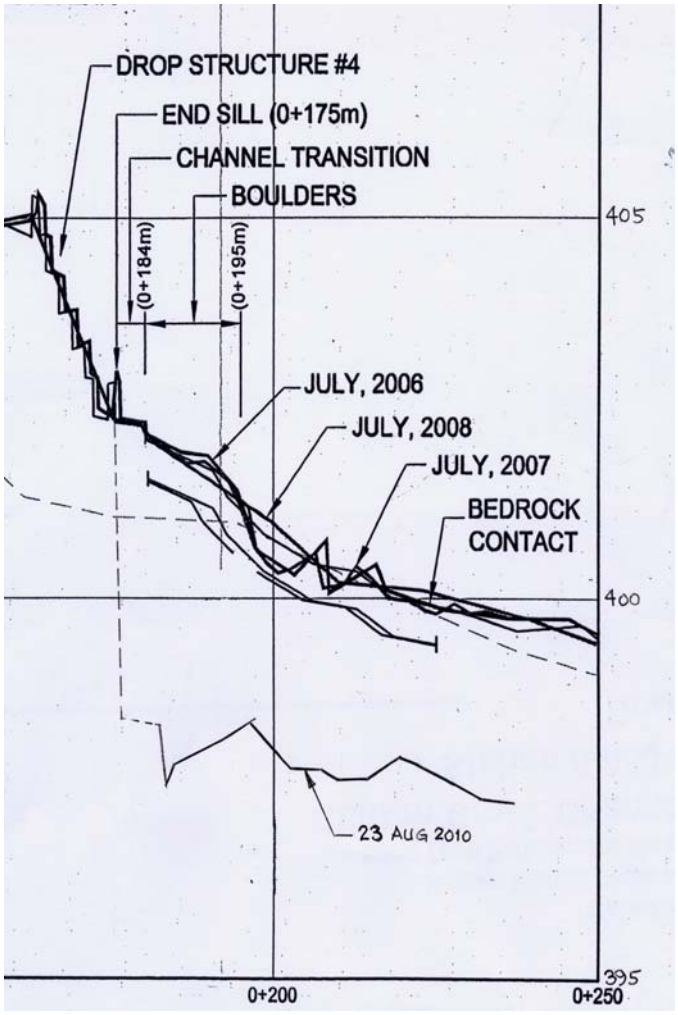
Drop Structure #4 (farthest downstream)

- No significant driftwood deposition on the weir crest. A couple of smaller pieces of driftwood caught on the left and right side slopes of the steps.
- No significant damage to the gabion steps was seen.
- Immediately downstream of the structure, the channel has degraded 4-5 m and undercut the structure apron. The undercutting extends to approximately 1-2 m downstream of the original lowest step. The material observed under the now hanging gabion apron appeared to consist of waste rock material that was surprisingly dry – minor seepage were observed in a few isolated spots. The 1-2 m of the apron closest to the original lowest step appeared to be supported by waste rock material.
- The water flowed over the relatively intact step drop portion of the structure and then flows down the hanging gabion apron portion to then drop down to the new creek bed level. It was suggested that this may now be the highest waterfall in Yukon.
- A plunge pool has developed where the water drops from the apron. The pool spans the full width of the original channel and the water depth was close to a metre deep.

- On the left side of the channel, a short distance downstream of the structure, the erosion has generated what appeared to be a one metre high vertical fractured rock face.
- The waste rock side slope along the right side of the Clinton Creek channel, between Drop Structure #4 and the old ford, is very steep and is currently unstable. The access road is washed out in places and, in places, tension cracks were seen in the middle of remnants of the former access road. Given that the waste rock side slope towards Clinton Creek is currently unstable in many places, I believe it is not advisable for any vehicles to travel along the existing access road across the waste rock pile during current conditions. Due to the washed out waste rock side slope, the theoretical stable slope from the current creek bed level may now extend to the top of the waste rock pile. Therefore it may not be possible to reconstruct the access road along the existing alignment of the access road and a completely new route across the top of waste rock pile may have to be selected.
- There are a large number of boulders in the channel immediately downstream of the structure. While it cannot be verified, it is believed that some of these boulders were part of the boulder field that was placed downstream of the structure in the past to (a) increase the tailwater level and (b) to reduce the risk of channel bed and bank erosion progressing up to the structure. The lack of high tailwater downstream of the structure has always been a concern.
- The bed profile of the channel immediately downstream of Drop Structure #4 was surveyed to get a better understanding of the current conditions. The surveyed profile is listed in the table below and plotted in the following figure.

STA	Elevation (m)
STA 0+182	398.34
STA 0+183	397.53
STA 0+184	397.83
STA 0+192	398.17
STA 0+196	398.36
STA 0+202	397.79
STA 0+207	397.74

STA	Elevation (m)
STA 0+210	397.63
STA 0+214	397.62
STA 0+219	397.93
STA 0+222	397.81
STA 0+227	397.61
STA 0+232	397.35
STA 0+237	397.32



Channel between Structures

- Along the left channel side slope, bank erosion has occurred along the un-armoured portions of the channel between the drop structures. The erosion is more severe downstream of Drop Structure #1, most likely due to the flow concentration along the left side that is caused by the curve in Drop Structure #1.
- Along the right channel side slope, the general bank erosion is similar to that along the left side. Immediately upstream of Drop Structure #3, the bank erosion is locally severe and resembles slumping.
- To assess the channel bed material, and attempt was made to wade across the channel with hip waders but this was not possible due to the large water depth. However, it was noticed that the channel bed was firm and rocky and no sediment deposition was detected.

Proposed Protection of Drop Structure #4

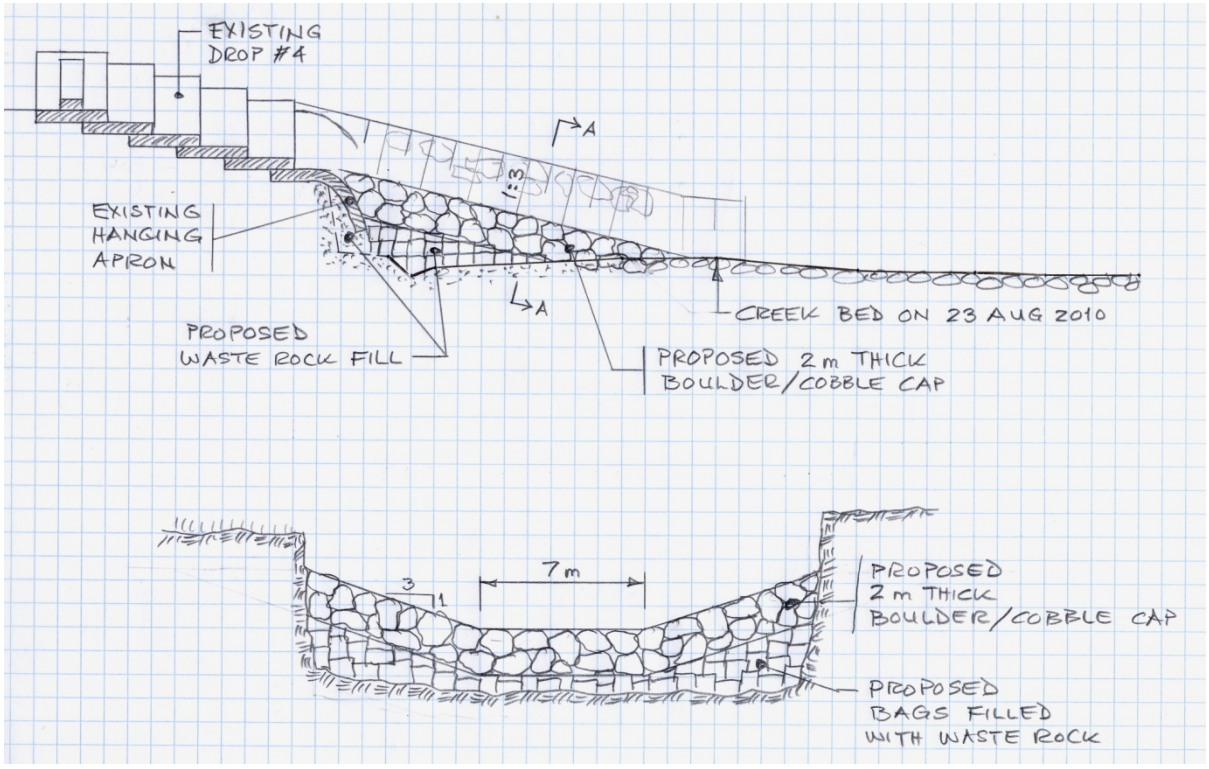
Drop Structure #4 has to be protected from total failure, to prevent a complete washout of the stabilized channel reach. At the moment, the upper portion of Drop Structure #4 is functioning well and the hanging apron protects the fill under the structure from erosion by flowing water.

Downstream of the structure, the channel bed is 4-5 m lower than before the recent flood event. There are a large number of boulders immediately downstream of the structure. The sizes of these boulders are indicative of the size of boulders that are required to resist the flood flow that occurred. As the upper portion of the structure is functioning well, that part of the structure shall be secured in place. To convey the flow from the original apron level and down to the current creek bed level, a channel transition has to be constructed. The material used in the transition has to be able to withstand the flow velocities that will occur and these velocities are a function of the channel bed slope; the steeper the slope the larger the size of the material required. In this case, the material has to be large in size to be able to have the bed slope of the transition intersect the downstream channel bed over a short length.

The proposed primary material consists of angular boulders with a diameter of approximately one metre. Concrete lock-blocks were considered as an alternative but these units are inferior to angular boulders, as they do not have the same inter-locking characteristics due to their smooth sides. To fill the voids between the boulders, it proposed that a mix of smaller boulders and cobble-sized material (such as riprap screening reject material) and waste rock material be dumped on the boulders during the construction.

The proposed transition should be constructed a steep trapezoidal channel with a bed width of 7 m, 1:3 (V:H) side slopes and a bed profile slope no steeper than 1:4 (V:H), which is the profile slope of the step drop portion of the current structure. If sufficient quantities of boulders can be secured, The eroded area was estimated to be approximately 22 m wide. Using this width and an estimated 5 m height at Drop Structure #4, the required quantity of fill was estimated for different channel profile slopes. It was found that the required volume of fill was significant and it may be difficult to find that quantity of boulders in the area.

As an alternative to using only boulders and cobbles as fill, the proposed transition was revised to have a 2 m thick lining of boulders and cobbles placed over common waste rock material. As it would be difficult to place the waste rock material in the flowing water, it is proposed to use large geosynthetic bags that are filled with waste rock material that are then placed by a crane in the water to build up a base. As the flow is slowed down by other filled bags, loose waste rock can be dumped to fill the voids between the bags before the next layer of waste rock filled bags is placed.



When the layers of waste rock filled bags are placed, the space between the upstream bags and the remnants of Drop Structure #4 will be filled with loose waste rock material. The placement of filled bags shall be placed to a level that is 2 m below the finished trapezoidal channel cross-section. To increase the stability of the stacked waste rock filled bags, it may be advisable to place geogrid between each layer of bags. The trapezoidal channel section would be capped with a 2 m thick layer of boulders and cobbles.

Using an estimated eroded channel top width of 22 m and an estimated 5 m height at Drop Structure #4, the required quantity of fill was estimated for different channel profile slopes. The estimated quantities are summarised below.

Bed Slope (V:H)	Waste Rock (m^3)	2 m Boulder Cap (m^3)	Total Volume (m^3)
1:4	630	870	1500
1:5	790	1100	1890
1:6	940	1300	2240
1:7	1100	1520	2620

Large boulders may be available from the old Porcupine Waste Rock dump although an access trail may have to be constructed to reach that location. Otherwise it may be necessary to pick through the waste rock material in the Clinton dump.

The need for protection of Drop Structure #4 is urgent, as it is possible that the structure may fail during next year's freshet. That would most likely lead to a sequential failure of the channels and structures upstream of Drop Structure #4 that could cause a rapid draw-down of Hudgeon Lake.

Sincerely,
AECOM Canada Ltd.

Rolf Aslund, P.Eng.
Senior Water Resources Engineer
Rolf.Aslund@aecom.com

RA:sw

Appendix B

July 2010 Site Photographs and Video

Clinton Creek Site Inspection - July 20 & 21, 2010

PHOTO / VIDEO INDEX

Photo #	Video #	Waypoint #	Description
Mill Area / Top of Tailings			
2714		46	View from top of tailings
2715			
2716			
2717			
2718	WP47_vid	47	View from top of tailings
2719			
2720			
2721		48 to 50	View from top of tailings - tension cracks
2722			
2723		51	South view from WP
2724		52	South view from WP - vegetation
2725		53	Trees growing on tailings
2769	WP63_64_vid	63 / 64	Backfill voids at former tunnel
2770			
2771			Vegetation on tailings
2772			Pond on Wolverine Creek
2773			
2774	North Lobe_Top_Mon1483_vid North Lobe_Top_Mon1483_a_vid		North lobe
2775			Top of tailings
2776	WP65_vid		Tailings - tension crack
2777	WP66_vid	66	Tailings - tension crack
2778		67	Tailings
2779	WP68_vid	68	Tailings - tension crack
2780	South Lobe_Top_vid WP69_vid	69	Panoramic view of tailings
2781			
2782			
2783			
2784			
2785		70	Exposed face pof tailings
2786	Mill site_vid WP71_vid	71	Mill site from tailings
2787			
GABION DROP STRUCTURES			
2726			Outlet channel U/S of DS#1
2727	WP58_vid	WP58	
2728			
2729			
2730			U/S view to DS #2
2731	DS#1_#2_RHS_vid		DS #1 from RHS of channel
2732	DS#1_RHS_vid		
2733	DS#2_RHS_vid		DS #2 from RHS of channel
2734	DS#2_RHS_a_vid		
2735	DS#2_RHS_b_vid		
2736			DS#3 from RHS of channel
2737			DS#2 from RHS of channel
2738	DS#3_RHS_vid		DS#3 from RHS of channel
2739	DS#3_RHS_a_vid		
2740			DS#4 from RHS of channel
2741	DS#3_#4_RHS_vid		
2742	DS#4_RHS_vid		
2743			
2744	Downstream DS#4_vid		Channel directly D/S of DS#4
2745			Upstream view along access road

Clinton Creek Site Inspection - July 20 & 21, 2010

PHOTO / VIDEO INDEX

Photo #	Video #	Waypoint #	Description
2746			Creek channel just d/s of DS#4
2747			
2748			DS#4 from LHS of channel
2749			Creek channel just d/s of DS#4
2750			DS#4 from LHS of channel
2751			DS#3 from LHS of channel
2752			
2753	DS#3_LHS_vid		
2754			
2755			
2756			DS#2 from LHS of channel
2757			
2758	DS#2_LHS_vid		
2759			
2760			
2761	DS#1_LHS_vid		DS#1 from LHS of channel
2762			DS#1 LHS of channel - tension crack
2763			LHS of channel from DS#1
2764			DS#1 from LHS of channel
2765			
2766			
2767			
2768			Downstream view from DS#1
CLINTON CREEK CHANNEL			
2788	WP346_vid	346	Upstream view
2789			Cross channel view
2790			Downstream view
2791	WP345_vid	345	Upstream view
2792			Cross channel view
2793			Cross channel view
2794			Downstream view
2795			Waste rock slump / sloughing
2796		344	Upstream view
2797	WP344_vid		General view from WP
2798	WP344_a_vid		
2799			
2800			
2801	WP343_vid	343	Upstream view
2802			
2803			Cross channel view
2804			Downstream view
2805			
2806		342	Upstream view
2807			
2808	WP342_vid		Cross channel view
2809			Downstream view
2810			
2811		341	Upstream view
2812	WP341_vid		Cross channel view
2813			
2814			Downstream view
2815		340	Upstream view
2816			
2817	WP339_340_vid		Cross channel view
2818			Downstream view
2819			

Clinton Creek Site Inspection - July 20 & 21, 2010

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Photo #	Video #	Waypoint #	Description
WOLVERINE CREEK			
2820		73	Panoramic view u/s to d/s
2821	WP73_vid		
2822			
2823			
2824		74	Panoramic view u/s to d/s
2825	WP74_vid		
2826			
2827			
2828	WP75_vid	75	Confluence of Wolv Creek and smaller creek from east
2829			
2830		76	Panoramic view u/s to d/s
2831	WP76_vid		
2832			
2833			
2834		77	U/S view from bottom end of rock lined channel
2835			Accidental shot
2836			Panoramic view u/s to d/s
2837			
2838			
2839		334	Rocklined channel from top of west bank
2840			Rocklined channel from creek
2841	WP334_vid		
2842			
2843			
2844	WP335_vid	335	Rocklined channel from creek
2845			
2846		78	Rocklined channel from creek
2847	WP78_vid		
2848			
2849	WP336_vid	336	U/S view from top end of rock lined channel / d/s end of south lobe
2850			
2851	WP337_vid / WP79_vid	337 & 79	Creek channel across South lobe
2852			Photos of creek across the south lobe from d/s to u/s end
2853			
2854	WP80_vid	80	
2855			
2856			
2857		338	Panoramic view from South Lobe
2858			
2859	WP338_vid		
2860			
2861			
2870			Culvert at mine access road
2871			
WOLVERINE CREEK TAILINGS			
2862	WP81_vid	81	North lobe view from South Lobe
2863		82	South Lobe photos
2864			
2865	WP82_vid		
2866			
2867			
2868		83	View of South Lobe from Monitor 25B
2869			

Clinton Creek Site Inspection - July 20 & 21, 2010

PHOTO / VIDEO INDEX

Photo #	Video #	Waypoint #	Description
SNOW SHOE AND CREEK PITS			
2872		84	Snow Shoe pit
2873			Beaver pond on Clinton Creek u/s of Wolverine Creek
2874		85	Snow Shoe pit
2875		86	Snow Shoe pit - taken from crusher bldg foundation
2876			
2877			
2878		87	Creek pit
2879	WP87_vid		
2880			
2881		88	Creek pit - west wall sloughing
2882			
2883		89	Creek pit
2884			
2885			
2886	WP90_vid	90	Creek pit - west wall sloughing
PORCUPINE PIT			
2887		91	From NE corner of pit
2888			
2889		92	Panoramic view of pit
2890			
2891	WP92_vid		
2892			
2893			
2894		93	Panoramic view from north end of pit
2895	WP93_vid		
2896			
2897			
2898			

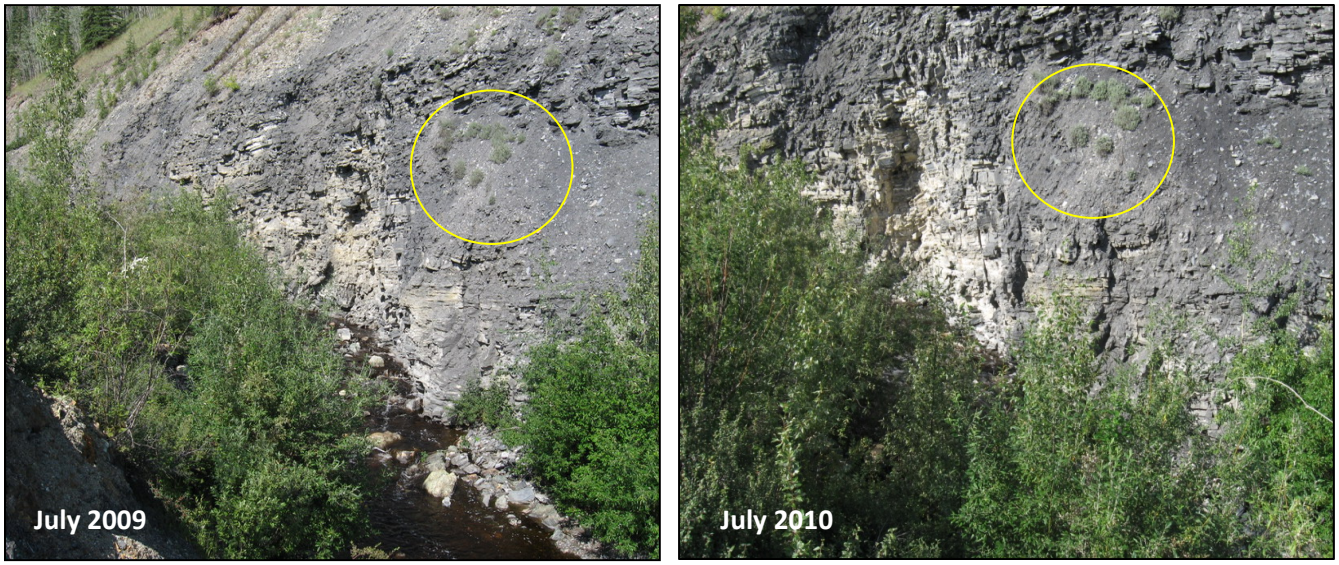


Figure 03 Station 0+600 at WP 339 in 2009 and 2010, U/S view

Figure 04 Station 0+600 at WP 340 in 2009 and 2010, D/S view

Figure 05 Station 0+560 at WP 341 in 2009 and 2010, U/S view

Figure 06 Station 0+560 at WP 341 in 2009 and 2010, cross-channel view (north)

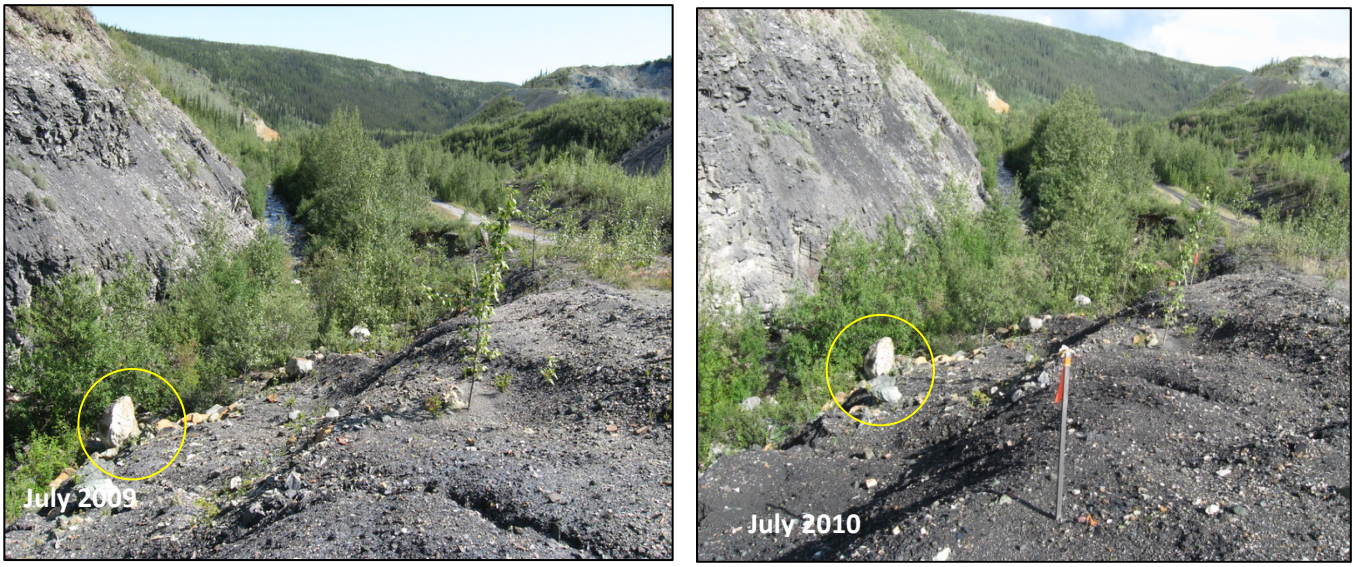


Figure 07 Station 0+560 at WP 341 in 2009 and 2010, view D/S

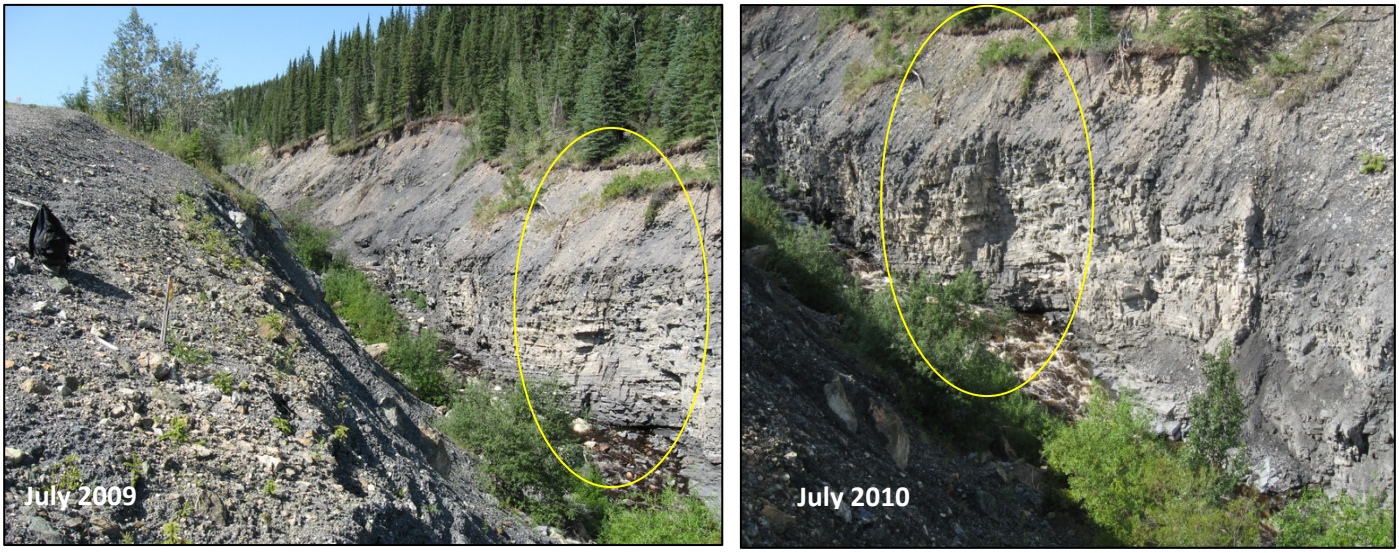


Figure 08 Station 0+470 at WP 342 in 2009 and 2010, U/S view

Figure 09 Station 0+470 at WP 342 in 2009 and 2010, North view across-channel

Figure 10 Station 0+470 at WP 342 in 2009 and 2010, D/S view

Figure 11 Station 0+360 at WP 344 in 2009 and 2010, U/S view

Figure 12 Clinton Creek Channel at WP 344 in 2009 and 2010, view U/S to drop structures

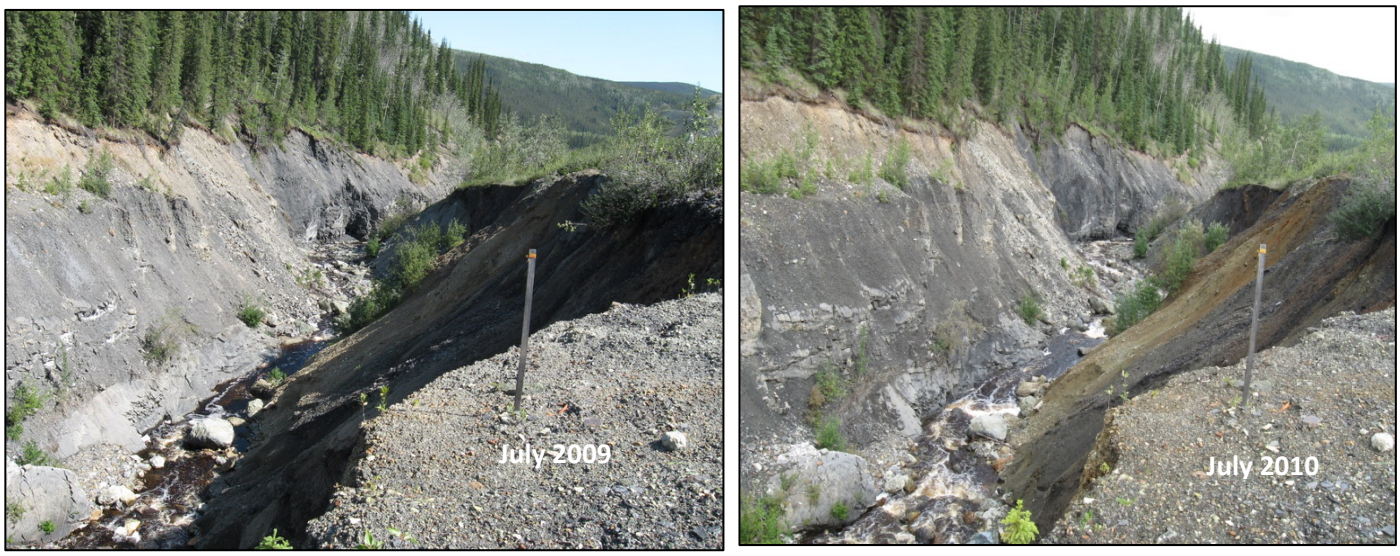


Figure 13 Clinton Creek Channel at WP 345 in 2009 and 2010, D/S view

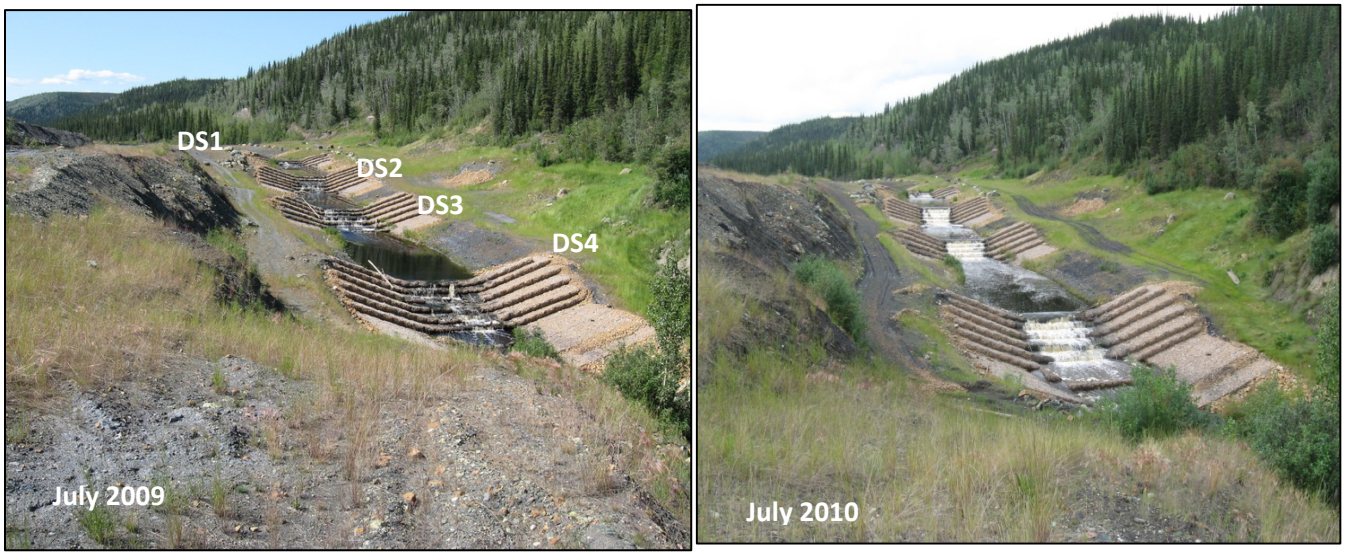


Figure 14 Gabion Drop Structures from WP 346 in 2009 and 2010, U/S view

Figure 15 Channel directly D/S of DS#4 in 2010

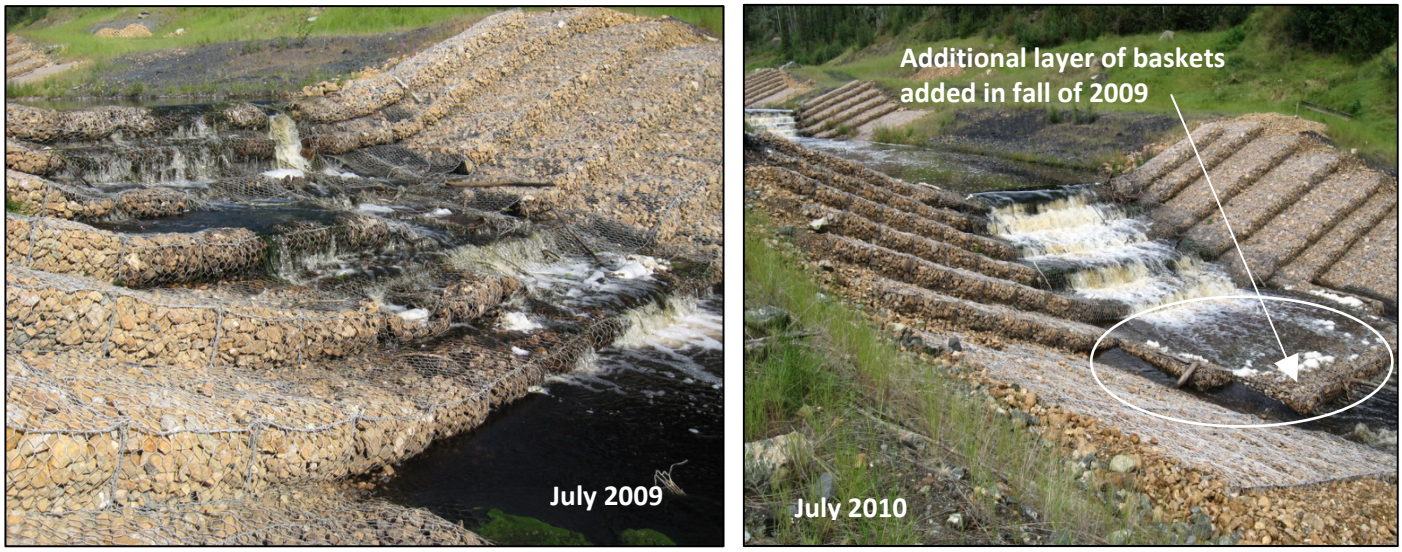


Figure 16 DS #4 in 2009 and 2010, U/S view

Figure 17 DS #4 Tier 5 and Tier 6 in 2009 and 2010, view North

Figure 18 DS #4 Tier 4 and Tier 5 in 2009 and 2010, view North

Figure 19 DS #3 in 2009 and 2010, U/S view

Figure 20 DS #3 in 2009 and 2010, cross channel views

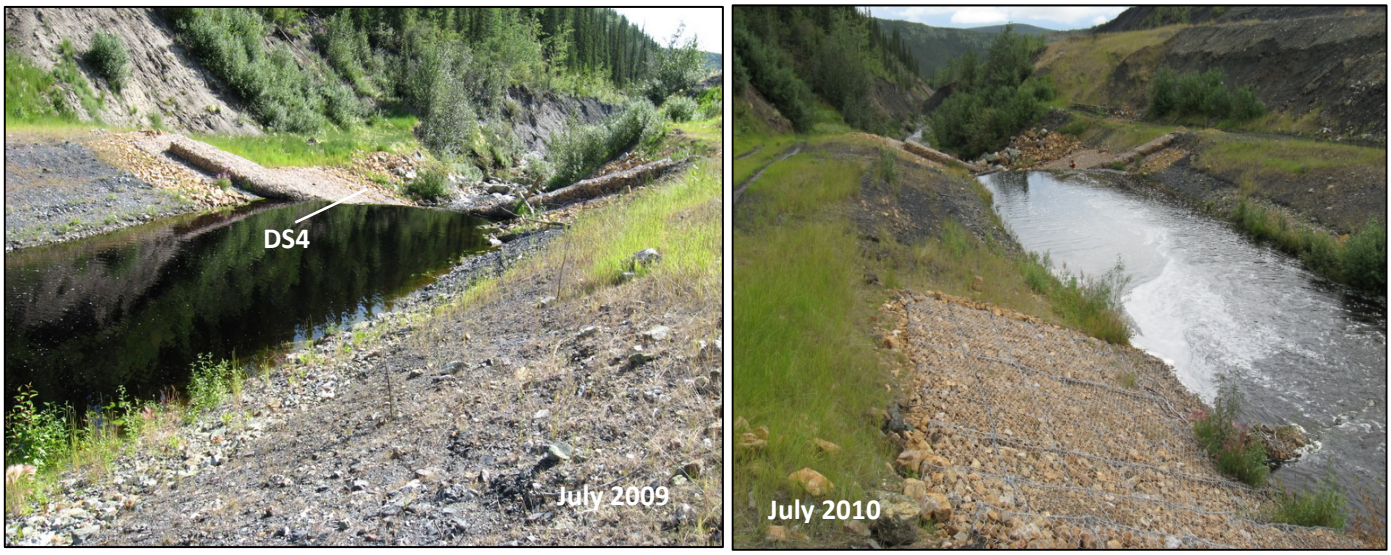


Figure 21 Pond Between DS #3 & #4 in 2009 and 2010, view D/S

Figure 22 DS #2 in 2009 and 2010, view U/S

Figure 23 DS #2 Weir, Tier 5 and 6 in 2009 and cross channel view in 2010, view North

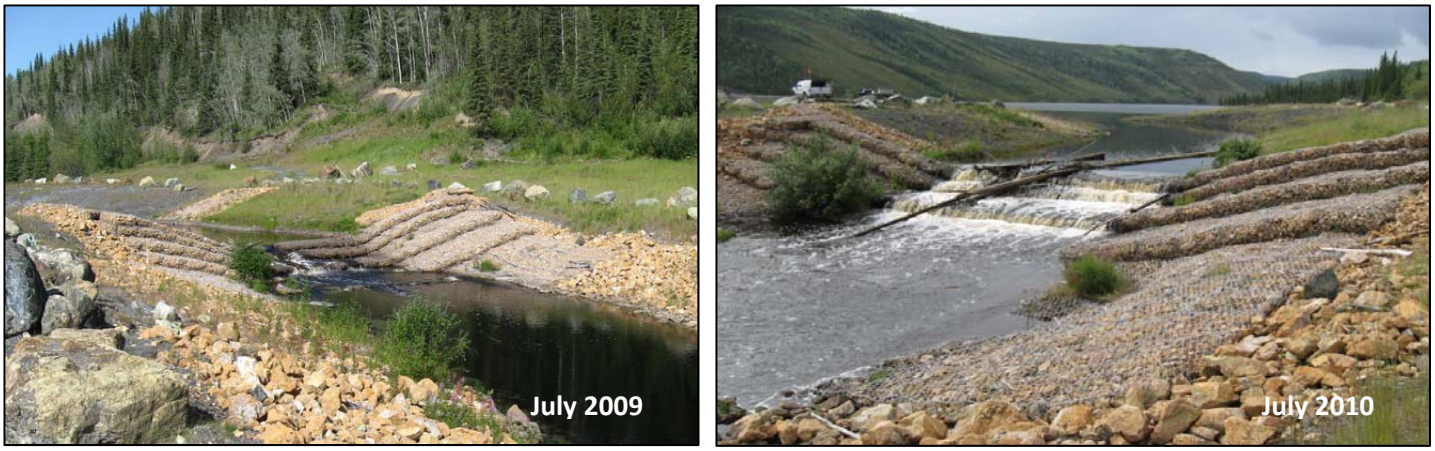


Figure 24 DS #1 in 2009 and 2010 view U/S

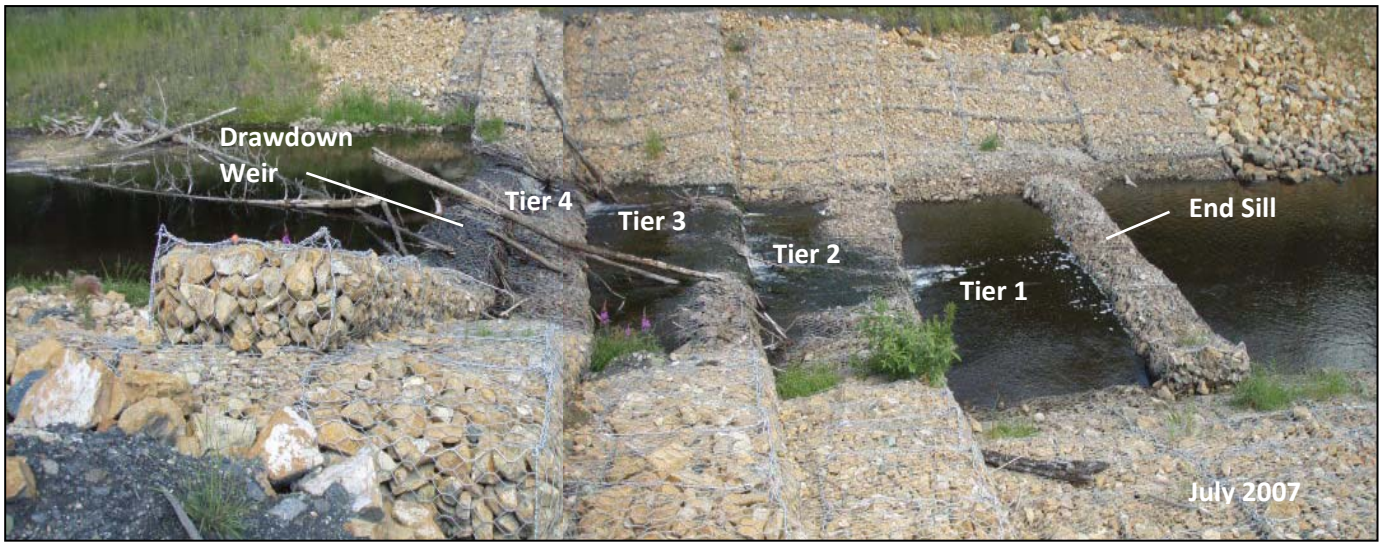


Figure 25 DS #1 in 2007, view Cross-channel to North

Figure 25a DS #1 2009 and 2010 cross-channel views to north and south, respectively

Figure 26 Lake outlet channel U/S of DS #1 in 2010

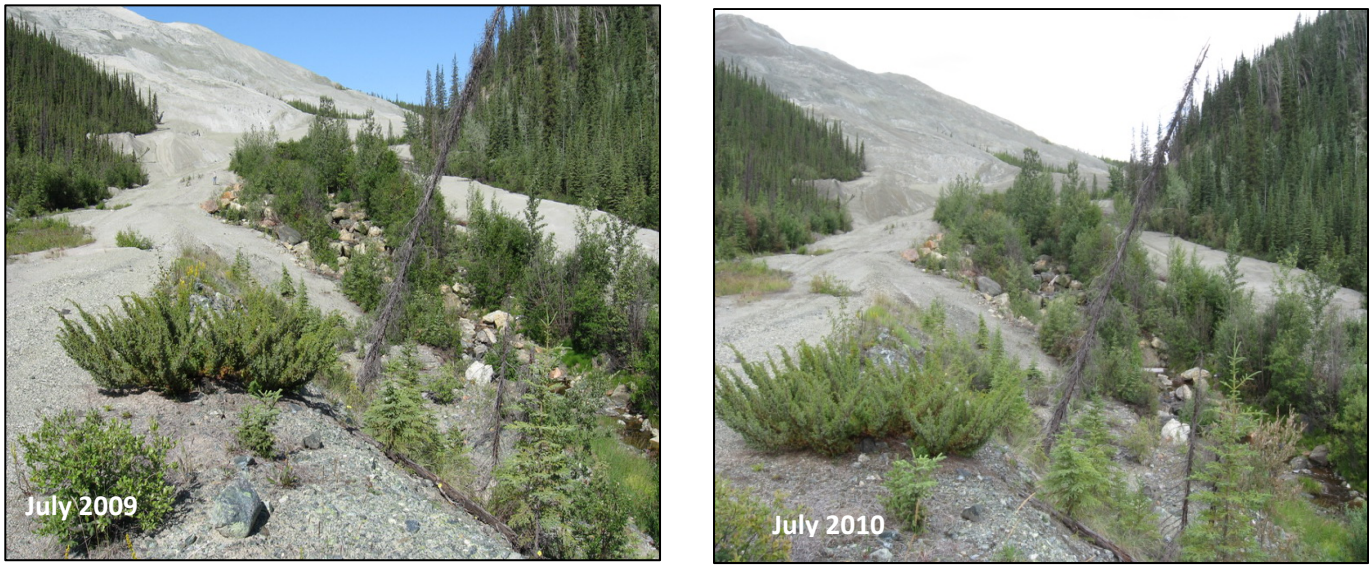


Figure 27 View U/S at Rock Lined Channel in 2009 and 2010, from WP 75 (UGL Tag #482)

Figure 28 View U/S Along Rock Lined Channel in Wolverine Creek at WP 335 in 2009 and 2010

Figure 29 View U/S Along Wolverine Creek Across S Lobe at WP 337 in 2009 and 2010

Figure 30 View of Toe of South Tailings Lobe from WP 338 in 2009 and 2010

Figure 31 View of North Lobe, Lower Slope Area and creek channel, view north from South Lobe in 2010

Figure 32 Former Mill Area in 2005 (facing SW) & 2010 (facing NW from WP 71)

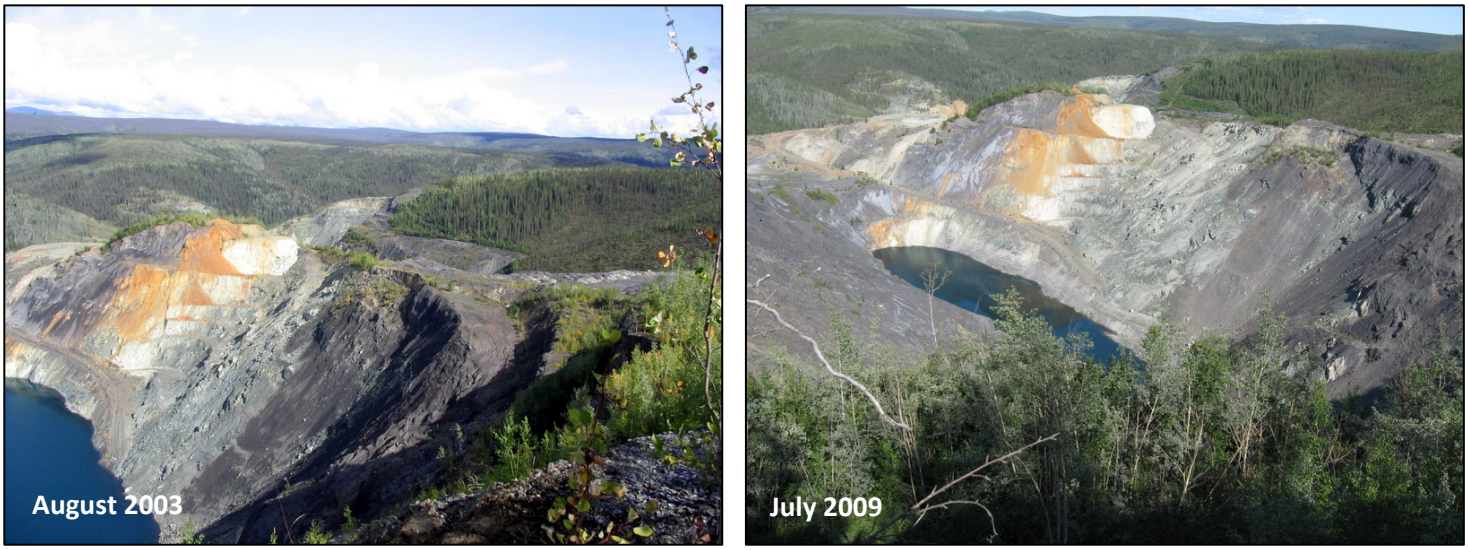


Figure 33 View NE Across Porcupine Pit in August 2003 and from WP 358 in July 2009

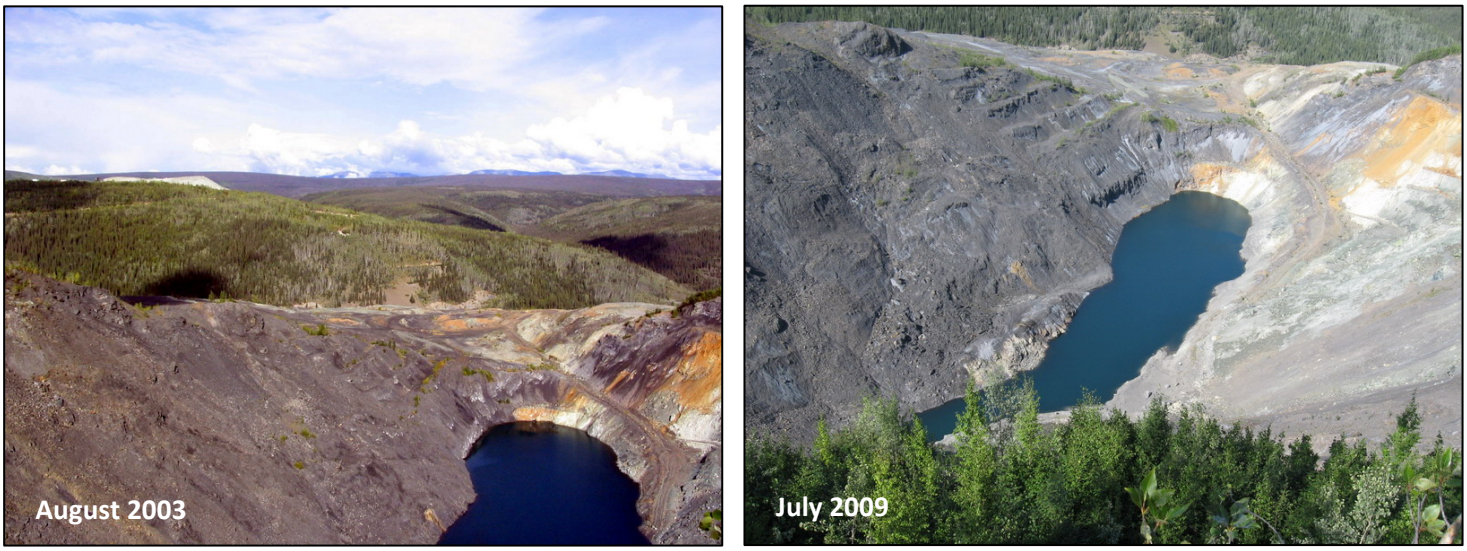


Figure 34 View N Across Porcupine Pit in August 2003 and From WP 357 in July 2009

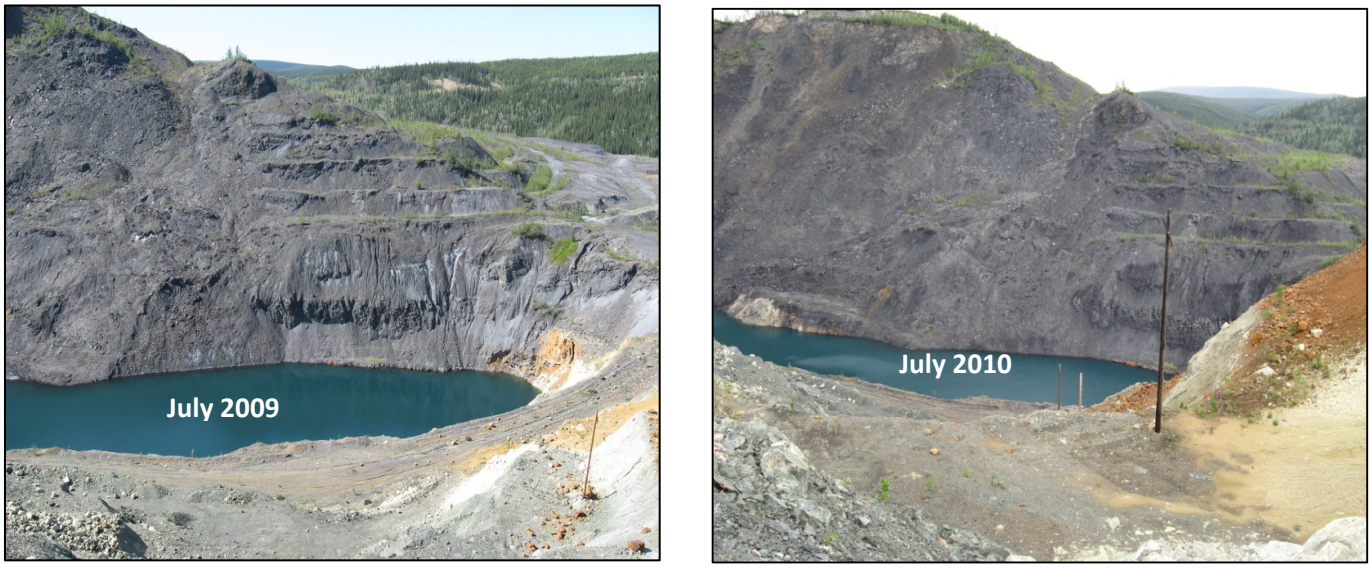


Figure 35 View W Across Porcupine Pit from WP 353 in 2009 and 2010

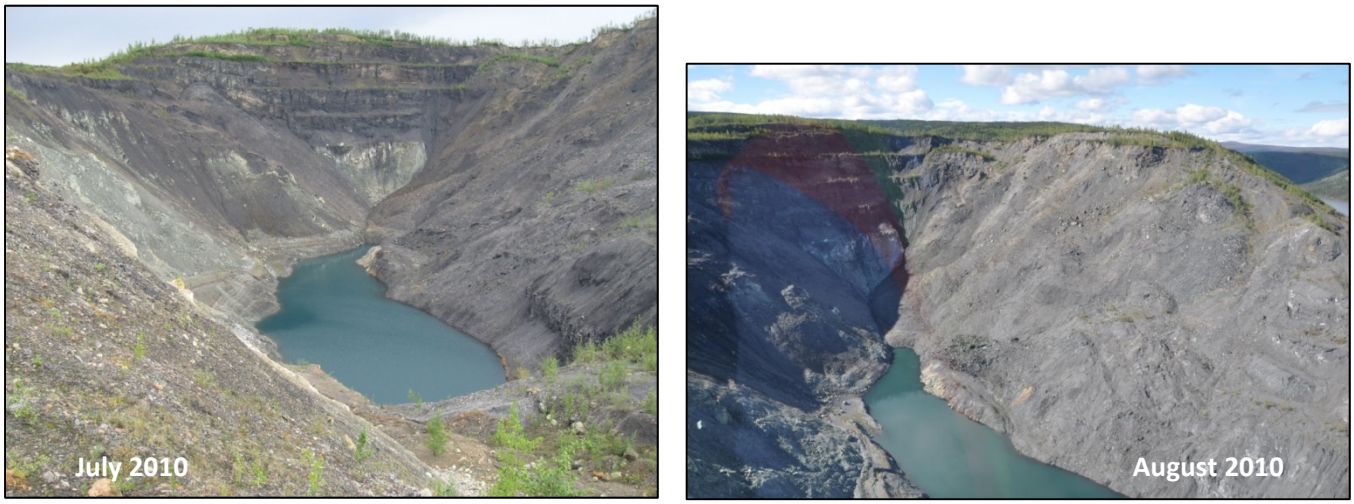


Figure 36 View W Across Porcupine Pit from WP 93 in July 2010 and a helicopter in August 2010

Figure 37 View of Snow Shoe Pit from WP 87 in July 2010, view North East

Figure 38 View of Creek Pit from WP 89 in July 2010, view East

Figure 39 View of Creek Pit from WP 90 in July 2010, view South East

Appendix C
GPS Waypoints

Site: Former Clinton Creek Asbestos Mine
Project: Site Inspection Locations

2009 / 2003 Waypoints

Date	Co-ordinates (m) Grid UTM Zone 7 Datum NAD83 WP #	Easting	Northing	Location Comments
16-Jul-09	326	512911	7147360	
16-Jul-09	327	512917	7147364	
16-Jul-09	328	512917	7147363	
16-Jul-09	329	512948	7147359	
16-Jul-09	330	512949	7147355	
16-Jul-09	331	512940	7147350	
16-Jul-09	332	512921	7147352	
16-Jul-09	333	512916	7147356	
16-Jul-09	**334**	**514093**	**7147772**	**Wolverine Creek - photo point**
16-Jul-09	335	514056	7147826	**Wolverine Creek - photo point**
16-Jul-09	336	513982	7147982	**Wolverine Creek - photo point**
16-Jul-09	337	513989	7148021	**Wolverine Creek - photo point**
16-Jul-09	338	513973	7148170	
16-Jul-09	339	513451	7147213	
16-Jul-09	**340**	**513449**	**7147213**	**Clinton Creek - photo point**
16-Jul-09	**341**	**513414**	**7147238**	**Clinton Creek - photo point**
16-Jul-09	**342**	**513336**	**7147287**	**Clinton Creek - photo point**
16-Jul-09	**343**	**513285**	**7147292**	**Clinton Creek - photo point**
16-Jul-09	**344**	**513231**	**7147314**	**Clinton Creek - photo point**
16-Jul-09	**345**	**513144**	**7147339**	**Clinton Creek - photo point**
16-Jul-09	**346**	**513085**	**7147354**	**Clinton Creek - photo point**
16-Jul-09	347	513295	7146793	
16-Jul-09	**348**	**513345**	**7146754**	**Porcupine Pit photo location**
16-Jul-09	349	513327	7146786	
16-Jul-09	350	513584	7146812	
16-Jul-09	351	513610	7146800	
16-Jul-09	352	513540	7146412	
16-Jul-09	353	513409	7146500	
16-Jul-09	354	513227	7146037	
16-Jul-09	355	513199	7145966	
16-Jul-09	356	513033	7146209	
16-Jul-09	357	513027	7146258	
16-Jul-09	358	512737	7146459	
16-Jul-09	359	512756	7146595	
16-Jul-09	360	512789	7146719	
16-Jul-09	361	512937	7147373	
19-Aug-03	350-1A	513823	7148299	
19-Aug-03	350-2A	513875	7148300	
19-Aug-03	350-3A	513900	7148311	

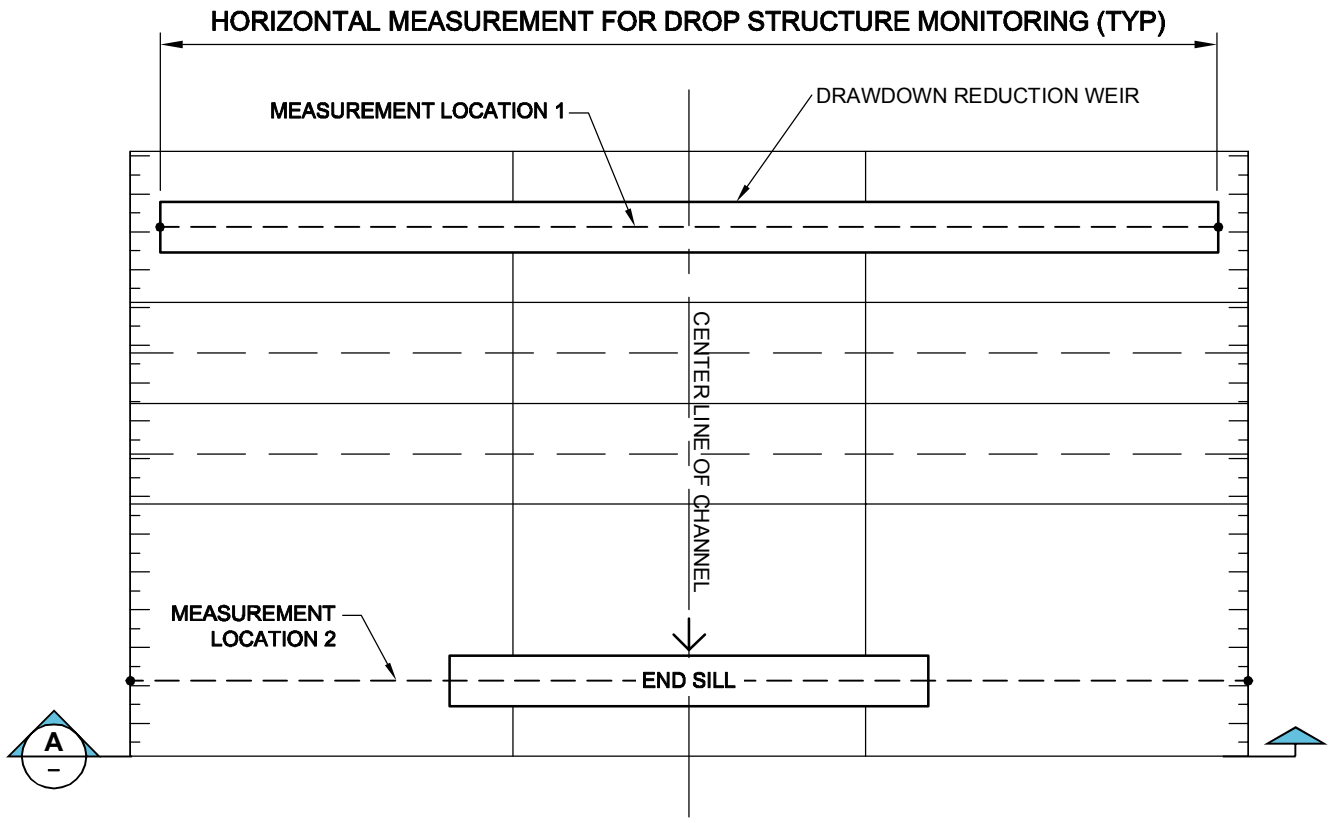
Site: Former Clinton Creek Asbestos Mine
Project: Site Inspection Locations

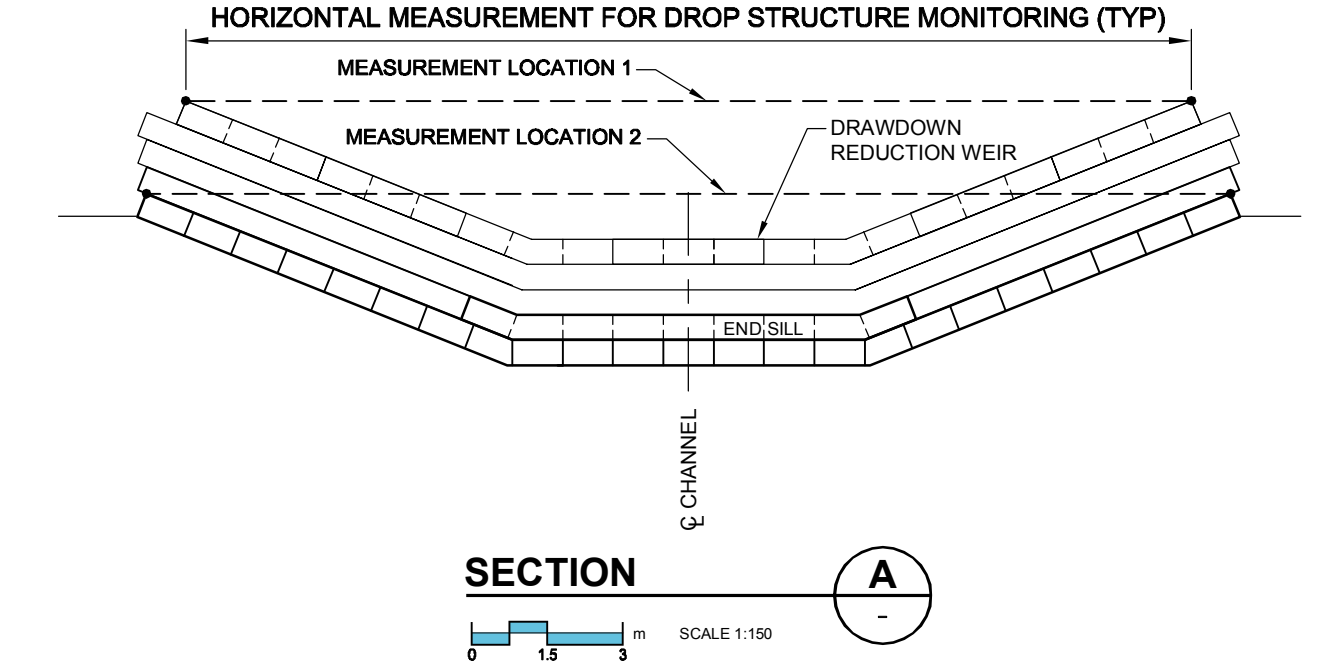
2010 Waypoints

Date	WP #	Co-ordinates (m) Grid UTM Zone 7 Datum NAD83 Easting	Northing	Location Comments
20-Jul-10	46	513402	7148269	View from top of tailings
20-Jul-10	47	513440	7148204	View from top of tailings
20-Jul-10	48	513427	7148203	Tailings - tension cracks
20-Jul-10	49	513411	7148235	Monitor 1483
20-Jul-10	50	513395	7148242	Tailings - tension cracks
20-Jul-10	51	513399	7148246	From top of tailings - south view
20-Jul-10	52	513310	7148374	From top of tailings - south view
20-Jul-10	53	513386	7148301	tailings - trees growing
20-Jul-10	54	513025	7147351	Drop Structure (DS) #4
20-Jul-10	55	513002	7147364	Between DS 3 & 4
20-Jul-10	56	512978	7147371	DS 3
20-Jul-10	57	512961	7147373	Between DS 2 & 3
20-Jul-10	58	512877	7147416	Upstream (U/S) DS #1
20-Jul-10	59	513045	7147372	DS #4
20-Jul-10	60	513062	7147391	D/S of DS #4
20-Jul-10	61	512911	7147439	Drop Structures
20-Jul-10	62	512887	7147442	Drop Structures
20-Jul-10	63	513070	7148211	Mill Site - tunnel backfill void
20-Jul-10	64	513063	7148227	Mill Site - tunnel backfill void
20-Jul-10	65	513424	7148203	Mill site / tailings
20-Jul-10	66	513420	7148202	Top of tailings pile
20-Jul-10	67	513403	7148165	Top of tailings pile
20-Jul-10	68	513390	7148168	Top of tailings pile
20-Jul-10	69	513446	7148159	Top of tailings pile
20-Jul-10	70	513437	7148193	Top of tailings pile
20-Jul-10	**71**	**513315**	**7148278**	**Mill Site photo location**
20-Jul-10	72	513250	7147292	
21-Jul-10	73	514144	7147625	Wolverine Creek: D/S of rock channel
21-Jul-10	74	514158	7147684	Wolverine Creek: D/S of rock channel
21-Jul-10	75	514140	7147739	Wolverine Creek: D/S of rock channel
21-Jul-10	76	514127	7147734	Wolverine Creek: D/S of rock channel
21-Jul-10	77	514123	7147742	Wolverine Creek
21-Jul-10	78	514012	7147914	Wolverine Creek: C/L of rock channel
21-Jul-10	79	513985	7147992	Wolverine Creek
21-Jul-10	80	513979	7148044	Wolverine Creek from top of lobe
21-Jul-10	81	513950	7148181	At tailings monitor #69
21-Jul-10	82	513956	7148091	Lower tailings slope - south lobe
21-Jul-10	83	513943	7148067	At tailings monitor #25B
21-Jul-10	84	513613	7146736	Snow Shoe Pit photo location
21-Jul-10	85	513641	7146728	Snow Shoe Pit photo location
21-Jul-10	86	513667	7146705	Snow Shoe Pit photo location
21-Jul-10	**87**	**513665**	**7146664**	**Snow Shoe Pit photo location**
21-Jul-10	88	513661	7146625	Creek Pit photo location
21-Jul-10	**89**	**513655**	**7146588**	**Creek Pit photo location**
21-Jul-10	**90**	**513664**	**7146657**	**Creek Pit photo location**
21-Jul-10	**91**	**513489**	**7146540**	**Porcupine Pit photo location**
21-Jul-10	92	513333	7146479	Porcupine Pit photo location
21-Jul-10	**93**	**513426**	**7146813**	**Porcupine Pit photo location**
21-Jul-10	94	513478	7146782	Waste rock N of open pit photo location
21-Jul-10	95	513544	7146734	Porcupine Pit photo location
21-Jul-10	96	513338	7146705	Porcupine Pit photo location
21-Jul-10	97	513318	7146639	Porcupine Pit photo location
21-Jul-10	98	513207	7146535	Porcupine Pit photo location
21-Jul-10	99	513369	7146799	Porcupine Pit photo location

Appendix D

Gabion Drop Structure Horizontal Measurement Summary





Yukon Government
Clinton Creek
2010 Site Inspection and Long Term Performance Monitoring

Drop Structure Measurements

AECOM

Drawing - D-1

Client: Government of Yukon
Project: Former Clinton Creek Asbestos Mine - 2010 Site Inspection
Job No.: 60160515
Date: 20-Jul-10

Former Clinton Creek Asbestos Mine - Clinton Creek Drop Structure Monitoring
Horizontal Measurements - Summary

Measurement Location #1 - Across Drawdown Weir

Drop Structure	Horizontal Distance Across Drop Structure (metres)									Incremental Change (m)	Incremental Change (m)	Average Annual Rate Of Movement (m/yr)	Total Change (m)	Comment
	Date 29-Jul-04	Date 22-May-05	Date 21-Jun-06	Date 03-Oct-06	Date 04-Jul-07	Date 21-Sep-07	Date 08-Sep-08	Date 16-Jul-09	Date 20-Jul-10	Sept 2008 to Jul 2009	Jul 2009 to Jul 2010	July 2009 to July 2010		
1	19.62	19.57	19.57	19.58	19.51	19.55	19.48	19.40	19.35	-0.08	-0.05	-0.05	-0.27	survey tags 1 & 2
2	19.49	19.48	19.48	19.48	19.43	19.48	19.46	19.41	19.40	-0.05	-0.01	-0.01	-0.09	survey tags 5 & 6
3	19.44	19.32	19.25	19.21	19.14	19.17	19.08	19.00	18.99	-0.08	-0.01	-0.01	-0.45	survey tags 9 & 10
4	n/a	19.61	19.55	19.51	19.43	19.46	19.40	19.35	19.29	-0.05	-0.06	-0.06	-0.32	survey tags 13 & 14

Measurement Location #2 - Across Lower Tier In-Line With End Sill

Drop Structure	Horizontal Distance Across Drop Structure (metres)									Incremental Change (m)	Incremental Change (m)	Average Annual Rate Of Movement (m/yr)	Total Change (m)	Comment
	Date 29-Jul-04	Date 22-May-05	Date 21-Jun-06	Date 03-Oct-06	Date 04-Jul-07	Date 21-Sep-07	Date 08-Sep-08	Date 16-Jul-09	Date 20-Jul-10	Sept 2008 to Jul 2009	Jul 2009 to Jul 2010	July 2009 to July 2010		
1	n/a	21.00	20.99	20.90	20.83	20.85	20.77	20.66	20.58	-0.11	-0.08	-0.08	-0.42	survey tags 3 & 4
2	n/a	21.15	21.06	21.05	21.01	21.01	20.95	20.90	20.83	-0.05	-0.07	-0.07	-0.32	survey tags 7 & 8
3	n/a	21.50	21.31	21.31	21.25	21.24	21.17	21.09	21.03	-0.08	-0.06	-0.06	-0.47	survey tags 11 & 12
4	n/a	21.48	21.46	21.36	21.34	21.35	21.30	21.27	21.20	-0.03	-0.07	-0.07	-0.28	survey tags 15 & 16

Year	Monitored By	
2004	UMA	
2005	UMA	
2006	Gov of Yukon	Survey tags installed in September 2006
2007	UMA (July) / GY (Sept)	
2008	Gov of Yukon	
2009	AECOM	
2010	AECOM	

Average	**-0.07**	**-0.05**	**-0.05**	**-0.33**
Minimum	**-0.03**	**-0.01**	**-0.01**	**-0.09**
Maximum	**-0.11**	**-0.08**	**-0.08**	**-0.47**