ABANDONED CLINTON CREEK ASBESTOS MINE

REPORT

ON

1997 AND 1998 SITE INSPECTIONS

Prepared for
NORTHERN AFFAIRS PROGRAM
Whitehorse, Y.T.

Prepared by:
GEO-ENGINEERING (M.S.T.) LTD.
Calgary, Alberta

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G1000

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1.0 INTRODUCTION

The Clinton Creek mine area was visited on June 30, 1998 in the company of Mr. H.F. McAlpine. The 1997 inspection took place on June 19 and in addition to the writer and Mr. H.F. McAlpine, Mr. G. Whitley, and Mr. W. Kettley participated as well. The previous inspections were undertaken on August 13, 1995 and June 17, 1996; however, no reports were compiled on these visits. The most recent mine area inspection report is dated May 1993. A summary of mine history, historical behaviour of mine pits and dumps is presented in the Review Report dated December 1986.

1.1 SUMMARY OF 1995 AND 1996 INSPECTIONS

Observations made during the 1995 and 1996 visits are summarized in the following sections.

1.1.1 Clinton Creek Waste Dump

Fresh cracks, observed in the middle and uppermost segments of the dump, confirmed an ongoing movement. The uneven surface of the road traversing the toe of the dump, and the development of minor cracks, indicate that the toe of the dump continued to advance into both the Clinton Creek channel and the lake. However, there were no significant changes in the overall topography of this dump.

1.1.2 Clinton Creek Channel

No significant changes in the creek channel between the lake outlet and the drop weir were observed since 1992. Even though a notch has developed in the rock plug at the downstream end of the armoured section, the overall stability of the weir and the performance of the armoured channel upstream from the weir was satisfactory.

The channel downstream from the weir, to a point approximately half way across the waste dump area, has also been relatively stable. Further downstream, the south bank channel, composed of mine waste, was eroding and sliding.

The north channel bank in the downstream sector was unstable. There was evidence of retrogressive failures and sloughing of undercut banks, including a section incised into the bedrock.

1.1.3 Porcupine Creek Dump

Similar to the Clinton Creek Dump, the rock waste deposited into the Porcupine Creek valley has continued to move. The toe of the dump first blocked the drainage downstream from the east toe of the dump between 1990 and 1992. Since 1992 the blockage has become more robust. There was no overflow of this valley plug since 1995.

Water from the lake has since been seeping through the waste rock. The discharge points at the north end of the dump have changed. Originally, springs forming a small stream, daylighted at the toe of the waste dump, at the road level. This discharge became concentrated and occurred along the natural ground and waste material interface. Later on, the seepage path through the waste dump has been modified and discharges occurred at higher points above the road.

1.1.4 Wolverine Creek Tailings

The tailings have been stacked in two piles, referred to as the north and south lobes. The southern tailings pile lobe, which initially blocked the valley in 1974, continued to restrict the creek channel at its upstream end. Periodically, the channel was temporarily blocked due to the dump sloughing. This event first occurred in 1986 and its reoccurrence has recently become more frequent. The creek continued to erode bedrock forming the east side of the channel.

The north lobe appeared to be less active since 1992. However, the dump toe continued to spread in the upstream direction and a new channel has been cut across the tailings pile toe. The movement caused bulging of the original ground in front of the tailings toe.

Both segments of the tailings pile continued to move downhill at a significant rate. The channel blockages apparently occurred more frequently, but were relatively easily eroded away. The armoured spillway channel functioned as designed.

2.0 1997 FLOOD

A significant flood occurred in 1997, apparently shortly before our site visit, since the waters were still receding on June 19. The cause of the flood was likely a large precipitation event. The flood exceeded flow stages monitored in the past. It was estimated that the flow reached a level some 1.8 m above the "normal" stage at the gauge station. The Clinton Creek channel was significantly modified and driftwood, leaves and mud deposited on the banks clearly outlined the extent of this event.

Because of this flood, the focus of our attention during the 1997 trip was on stream channels in areas where they may impact the waste and tailings dumps.

2.1 CLINTON CREEK CHANNEL

The flood caused major changes in the Clinton Creek channel location and configuration in the area between its junction with the Wolverine Creek and the incised segment along the waste dump. In this reach, the previous creek channel has been plugged with debris and a new channel eroded (Photos 1, 2 and 3). The volume of deposited material illustrates the extent of erosion which took place further upstream in the channel segment running along the toe of the rock waste dump.

The channel segment, now incised into the toe of the waste dump and the north valley wall, has been widened and further downcut (Photo 4). Downcutting and lateral erosion triggered extensive sloughing of channel banks in the lower and middle portions of this creek segment (Photos 5 and 6).

The armoured creek segment and the weir (controlling the channel gradient a short distance downstream from the lake outlet) were mostly destroyed. The weir has been completely eroded away (Photo 7) and the total drop in the channel bed at this location is estimated to be in the range of 1 to 2 m. Only a relatively narrow strip of armoured channel remains at the lake outlet (Photo 8). At the downstream end of this armoured channel vertical erosion was estimated in excess of 0.5 m.

The lake outlet (Photo 9) was widened and a previously covered culvert was exposed. The channel, at this location, was 17 m wide with an estimated depth at the flood stage of 1.2 m and the gradient about 1 percent. On this basis, the peak flow was calculated to be in the order of 65 m^3/s, i.e., within the range of the predicted 1 in 100 year flood (Klohn Leonoff report, Clinton Creek Downstream Hazard Assessment, 12-19-1987).

Klohn Leonoff's report predicted the sediment transport capacity of the creek to be in the range of 6,900 m^3 to 9,700 m^3 for a 24-hour period during a 1 in 200 year flood event. The writer estimates that the volume of sediment deposited within the floodplain between the downstream end of the incised channel and the Clinton Creek confluence with Wolverine Creek (more than 0.5 km distance) may be within this range.

Field observations are summarized as follows:

- The 1997 flood was within the predicted range of a 1 in 100 year event.

- The armoured channel segment has been significantly reduced and the weir controlling the uppermost channel gradient destroyed.
- Retrogressive erosion did not reach the lake, but stopped some 20 m downstream from the un-armoured lake outlet.
- Significant erosion (both lateral and downcutting) occurred throughout the incised channel. As noted during previous site visits, argillite bedrock does not resist erosion.
- Lateral erosion on the waste dump side of the channel steepened the slopes and increased retrogressive sloughing of the channel slopes, as expected.

2.2 WOLVERINE CREEK

Erosion of the access road surface at the Wolverine Creek crossing indicates that the 1997 flood exceeded the culvert capacity and the road embankment was overtopped. However, the damage was not very significant, except at the culvert outlet. Similarly, the channel upstream from the crossing was substantially modified; however, the spillway performed quite well (Photo 10).

The creek channel along the toe of the south tailings pile lobe was somewhat widened and the toe of the lobe eroded and steepened. This, in turn, triggered widespread sloughing of the tailings face (Photo 11). The heaving and "bulldozing" of the tailings pile subgrade is evident at the upstream end of the channel. A beaver dam has been lifted above the channel and adjacent lake bottom (Photo 12) due to the ground movement.

The pond level between the south and north lobe was about 0.5 m below the high water level marks. It is possible that the outlet channel at the beaver dam was downcut during the flood event.

Ground bulging was also evident at the upstream side of the north lobe and across the channel on the east valley slope.

It is believed that the intensity of a precipitation event which caused the about 1 in 100 year flood of Clinton Creek was likely less intensive within the Wolverine Creek water shed.

2.3 ROCK WASTE AND TAILINGS DUMPS

Only a brief review of the rock waste and tailings dump was undertaken in 1997. Both main rock waste dumps (in the Clinton Creek and Porcupine Creek valleys), continued to move, as evidenced by fresh cracks and scarps. With the exception of discharge from the Porcupine Creek dump (larger flow occurring higher up on the downstream toe, there was no noticeable impact on the rate of movement or extent of deformations due to the flood event.

Similarly, fresh cracks and failures of tailings blocks along the face of the south lobe confirm on-going deformations and instability of these dumps.

3.0 1998 INSPECTION

Performance of mine structures during the 1997 - 1998 time period was similar to pre-1997 conditions. On-going gradual degradation of the stream channel and continuing sloughing and deformations of the mine dump and pits was evident. Observations made during this field trip are summarized in the following sections.

3.1 CLINTON CREEK CHANNEL

The creek flow was in the range of "normal summer" volume and the Hudgeon Lake water level was about 600 to 700 mm below the high water level mark. Downcutting of the channel bottom and lateral erosion is evident between the remaining lake outlet armoured plug and the floodplain downstream from the Clinton Creek waste rock dump.

Lateral erosion is more active than channel downcutting throughout the downstream channel segment (Photo 13). There is evidence of vertical and lateral erosion in the middle section of the channel. For example, some of the boulders originally positioned in the channel are located well above the current channel bottom. Downcutting appears to be more significant (than lateral erosion) between the former weir and armoured section of the lake outlet (Photo 15).

Heavy seepage from the waste rock side of the channel exists about 60 m downstream from the lake outlet. It is believed that this seepage represents leakage from the lake.

It is the writer's opinion that the armoured section of the lake outlet could be destroyed by any significant flood event.

3.2 WOLVERINE CREEK CHANNEL

No significant changes in the channel appearance and performance of the spillway were observed in 1998. Upstream from the spillway the channel continues to erode the bedrock-controlled bank (Photo 16) and the creek erodes (washes away) blocks of tailings falling down from the advancing tailings pile face.

3.3 ROCK WASTE DUMPS

None of the waste rock dump achieved equilibrium conditions. Fresh scarps and cracks were evident, indicative of on-going deformations.

3.3.1 Clinton Creek Waste Dump

While on a "global scale" the waste dump segment forming the valley plug appears to maintain its previous configuration (Photo 16), cracks and surface deformations confirm its ongoing movements. The west segment of the dump also slides into the lake.

Significant movement of the upper portion of the dump and underlying rock mass is occurring into the open pit. A headscarp, roughly perpendicular to the Clinton Creek valley, is now about 4 m high.

3.3.2 Porcupine Creek Dump

An ongoing instability is indicated by fresh cracks along the uppermost segments of the dump. However, vertical differences are small and the movement is likely relatively slow. The southern portion of the dump appears to be more active than the northern one (Photo 18). Surface discharge of runoff from the Porcupine Creek watershed is blocked at two locations (Photo 19). Water seeps (flows) through the dump and is discharged through its north face. The discharge area is located some 4 m upslope from the road bench. The flow was quite heavy at the time of the 1998 visit, estimated in the 15 to 20 igpm range. It is of interest to note that the discharge zone functioning during the 1997 visit (located west from the current one) failed and was dry.

3.4 TAILINGS PILES

The general appearance of both south and north pile lobes is similar to that observed during previous site visits. The pile movements continue and their rates are apparently irregular, reflecting the displacement of individual dump segments. For example, when a

lower block moves, the adjacent upslope segment accelerate and the failure gradually progresses to the top of the pile.

Since 1986 the southern lobe (Photo Nos. 20 and 21) has temporarily blocked the creek channel and the blockage has been eroded away during larger flow events. It appears that the blockage may be a yearly event, reoccurring during the fall and winter low flow seasons.

The north lobe reached the valley bottom in 1985 and temporarily blocked the creek flow in 1987. The original valley bottom was "bulldozed" up and against the east valley wall. This created another small lake. However, its level is controlled by beavers. The flow from this lake overtopped easily erodible tailings and cut a new channel through the toe of the north lobe (Photo 22). The rate of the north lobe advance appears to be slower than the rate of the south lobe since the channel blockage did not reoccur at the north lobe. However, fresh cracks in the middle and upper segments of this lobe are indicative of the ongoing movement (Photo 23).

4.0 CONCLUSIONS AND RECOMMENDATIONS

Based on observations made during the 1997 and 1998 site visit, the following conclusions are made:

- All waste dumps and tailings piles continue to be unstable.
- A significant flood occurred in 1997 which modified the Clinton Creek channel, eroded the rock weir controlling the channel gradient within the uppermost creek segment and damaged the channel armouring at the lake outlet.
- The Clinton Creek channel degradation, in the section along the toe of the rock waste dump, appears to be more significant than that predicted in Klohn Leonoff's 1997 report for a large flow event. However, no visible acceleration of dump movement was noticed at the time of the site visit.
- Wolverine Creek appeared to be less affected by the flood or the storm did not cover the entire watershed.
- The risk of breaching the Hudgeon Lake outlet has increased.

- rehabilitation of the Hudgeon Lake outlet channel,
- installation and monitoring of water gauges in Hudgeon and Wolverine lakes, and
- maintenance of warning signs along the access road and at the creek channels.

Reconstruction of the rock weir and armoured channel downstream from the Hudgeon Lake outlet would minimize the risk of an uncontrolled release of water from the lake, until the next major flood event.

Respectfully submitted,

GEO-ENGINEERING (M.S.T.) LTD.

M. Stepanek, M.Sc., P.Eng.
Principal Consultant

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APPENDIX A

PHOTOGRAPHS

Photo 1: Looking downstream along the current Clinton Creek channel; upstream from its junction with Wolverine Creek.

Photo 2: Original creek channel completely filled with debris; note the bridge.

Photo 3: New creek channel eroded east from the bridge, away from the original channel.

Photo 4: Eroded and downcut channel at the downstream portion of the dump.

Photo 5: Significant downcutting and lateral erosion occurred within the downstream segment. Refer to Photo 10 of the 1990 report and Photos 9 and 10 of the 1988 report.

Photo 6: Similar changes occurred in the middle and upper channel segments. Compare with Photo 8/1990 and Photos 7 and 8/1988.

Photo 7: Armoured channel and control weir was destroyed during the 1997 flood event. Compare with Photo 7/90 and Photos 5 and 6 of the 1988 report.

Photo 8: Looking upstream at the remaining portion of the armoured lake outlet. Retrogressive erosion reached this channel section; the original channel bottom is indicated by vegetated bank on the right bottom.

Photo 9: Looking downstream at the lake outlet. Lake level was approximately 500 mm above the current level during the peak flood stage.

Photo 10: No significant deformations were observed on the Wolverine Creek spillway after the 1997 flood.

Photo 11: Looking downstream along the toe of the south lobe face.

Photo 12: View of heaved creek bottom at the upstream end of the south tailings pile lobe.

Photo 13: Downstream segment of the Clinton Creek channel in 1998. Lateral erosion is more significant than channel downcutting. Compare Photo 5.

Photo 14: Former weir area in 1998, compare with Photo 7. Note erosion of the left bank.

Photo 15: Looking downstream from the lake outlet. At this location, the channel was cut down by about 2 m.

Photo 16: Wolverine Creek channel along the south tailings pile lobe. Note continuing erosion of argillite bedrock, both in lateral as well as vertical directions.

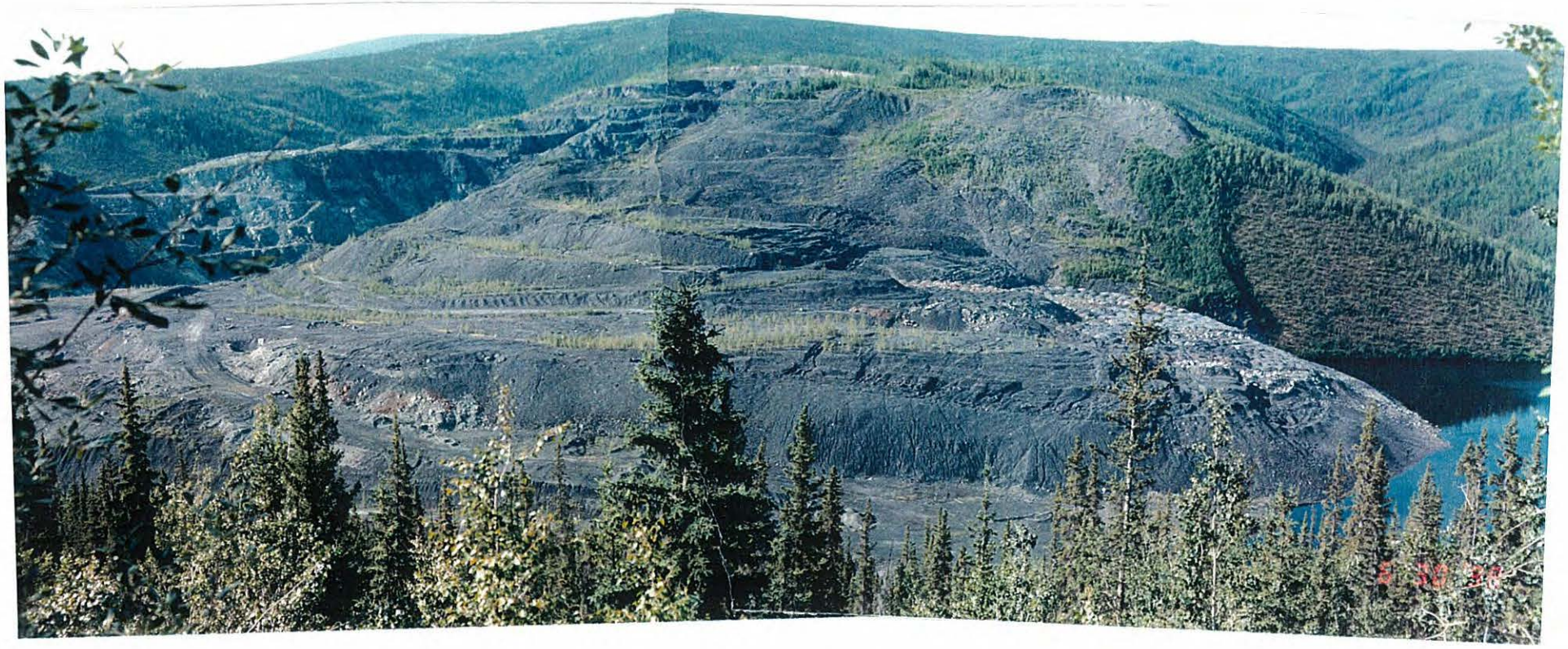

Photo 17: View of the Clinton Creek waste rock dump. Notice cracks and scarps indicative of recent dump movement.

Photo 18: Southern segment of Porcupine Creek waste dump. Note steep slopes and bulging toe areas – indicative of active deformations.

Photo 19: View of the plug blocking the surface discharge from the dump area and upstream lake.

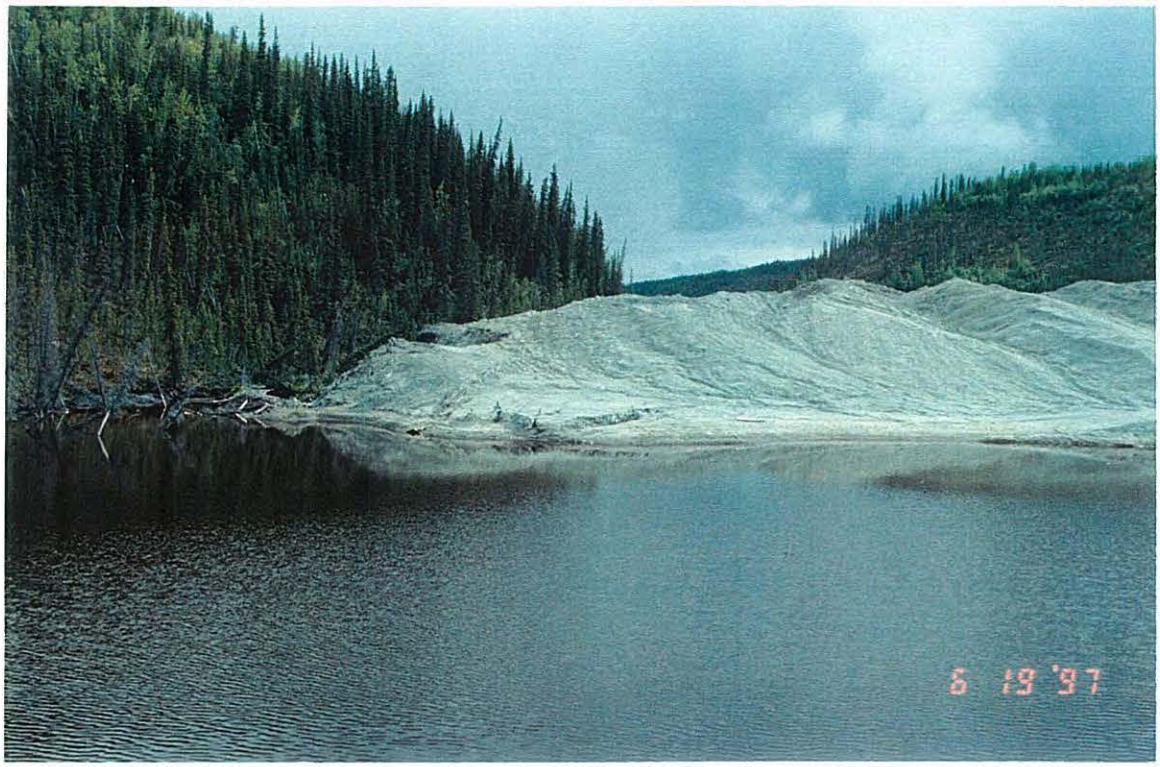

Photo 20: View of the toe of the southern lobe, photographed in 1997.

Photo 21: View of the same area in 1998.

Photo 22: View of the north tailings pile lobe, overlooking the pond between two lobes.

Photo 23: Detailed view of the broken surface of the north tailings pile lobe upslope from the toe area.