

CLINTON CREEK ASBESTOS MINE
Report
on
1987 Site Inspection

Prepared For:
NORTHERN AFFAIRS PROGRAM
Whitehorse, Y.T.

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G052

TABLE OF CONTENTS

| | <u>Page</u> |
|-----------------------------------|-------------|
| 1.0 INTRODUCTION | 1 |
| 2.0 CLINTON CREEK WASTE DUMP | 2 |
| 3.0 CLINTON CREEK CHANNEL | 5 |
| 4.0 PORCUPINE CREEK WASTE DUMP | 6 |
| 5.0 WOLVERINE CREEK TAILINGS PILE | 9 |
| 6.0 WOLVERINE CREEK CHANNEL | 11 |
| 7.0 CLOSURE | 12 |

LIST OF FIGURES

| | |
|--|----|
| Figure 1 Clinton Creek Waste Dump | 4 |
| Figure 2 Porcupine Creek Waste Dump | 7 |
| Figure 3 Wolverine Creek Tailings Pile | 10 |

APPENDIX A - Photographs

1.0 INTRODUCTION

This letter-report summarizes observations made during the 1987 inspection of the Clinton Creek mine area. The site visit was undertaken on June 19, 1987 in the company of Mr. H.F. McAlpine and included ground reconnaissance of the Clinton Creek and Porcupine Creek waste dumps and Wolverine Creek tailings piles. Specific attention has been paid to both the Clinton and the Wolverine Creek channels in areas influenced by previous mining activities.

Our assessment of movements and deformations which have occurred or continued on the waste and tailings piles since our last visit in 1986 is based on field observations and comparative evaluation of previously taken photographs. It is understood that no ground monitoring of survey stations was undertaken since the summer of 1986.

In order to facilitate future assessment of terrain changes, a number of photographs have been taken and a selection of them are included in this report.

Sketches schematically depicting the main surficial and instability features of the waste dumps and tailings piles have been prepared on the basis of field observations. The sketches could be used for diagrammatic illustration of terrain modifications until more detailed plans or air photo mosaics are acquired. The slide features plotted on these sketches indicate the type and direction of current movements.

2.0 CLINTON CREEK WASTE DUMP

The characteristics of slide scarps, cracks and fissures confirm the continuing instability of this waste dump. Since there appears to be very little change in the general terrain configuration and only a few slide features such as scarps and cracks have developed, it may be assumed that the mean rate of movement is within the same range as previously determined by monitoring, i.e. 300 to 500 mm per year.

The main observations made during the site visit and our interpretation of the movements which have occurred since the 1986 site visit are summarized below:

- The uppermost section of the dump outlines the slide headscarp and exhibits a series of arcuate fresh scarps (Photo 1). While the majority of these scarps are located in the same areas as previously encountered, there could have been some retrogression on the top of the hill affecting the natural ground.
- Fissures caused by the sliding of the Porcupine pit wall are intersecting the waste dump headscarp.
- A section of the dump forming the shore of Hudgeon Lake has failed.
- Tension cracks running perpendicular to the creek channel (Photo 2) are fresh and indicate recent movements.
- These tension cracks extend across the access road to the Clinton Creek channel (Photo 3).





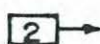
- The south bank of the Clinton Creek channel, formed by the waste, is eroding downstream from the armoured channel section.

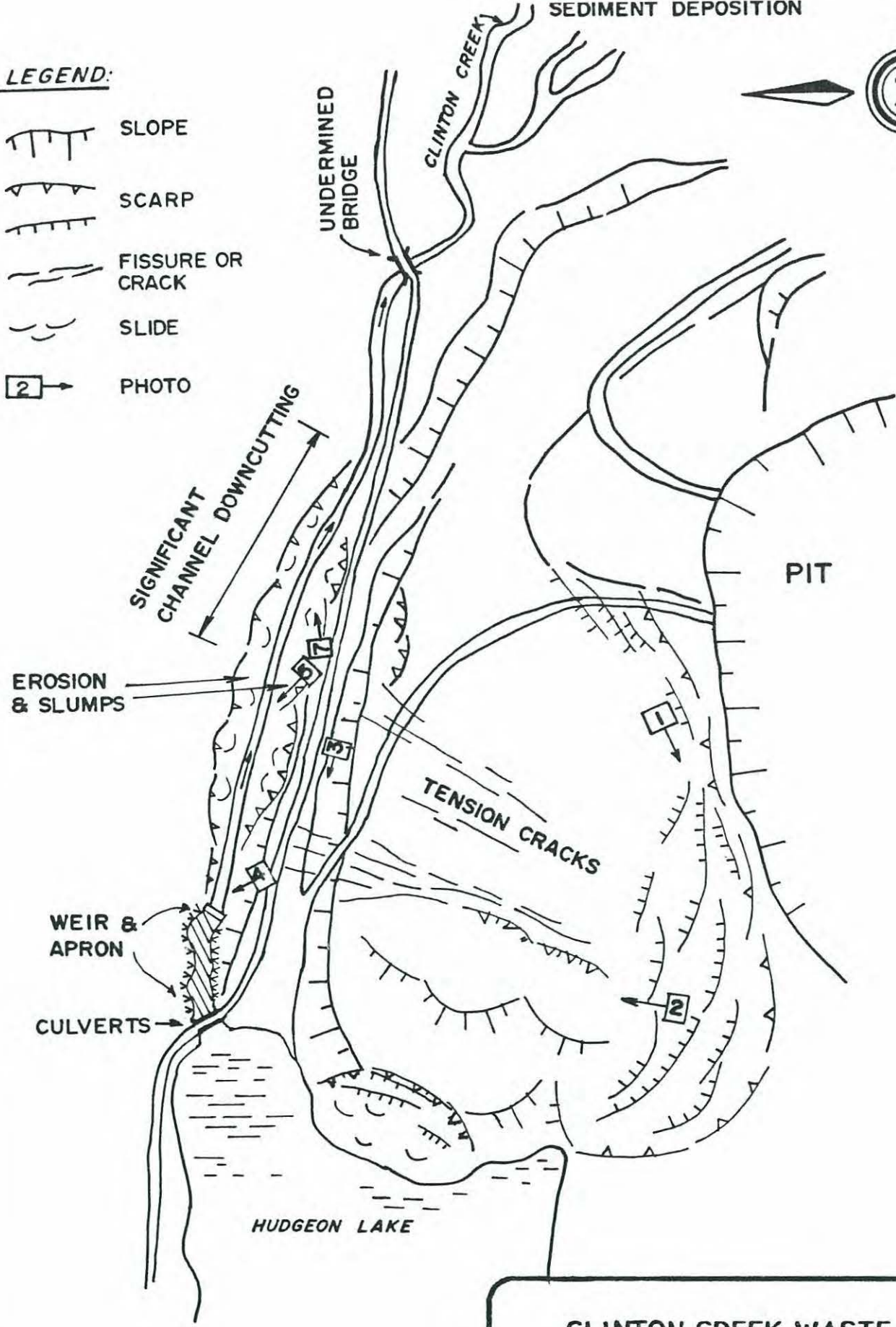
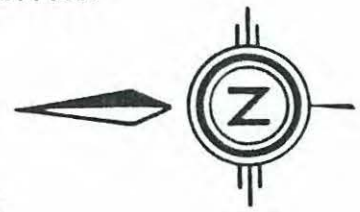
Review of the current slide features (Figure 1) indicates that:

- a) the uppermost dump area is moving into the valley,
- b) the centre segment of the waste dump is either stationary or bulging,
- c) the toe of the dump is moving into available open space, i.e. into the lake, creek channel and towards the downstream flat area,
- d) major movement occurs towards the lake, and
- e) the dump movement into the creek channel appears to be presently in balance with the lateral erosion.

SEDIMENT DEPOSITION

LEGEND:

-  SLOPE
-  SCARP
-  FISSURE OR CRACK
-  SLIDE
-  PHOTO



**CLINTON CREEK WASTE DUMP
SCHEMATIC PLAN**

N.T.S.

FIGURE 1.

3.0 CLINTON CREEK CHANNEL

The terrain in the lake outfall area, both on the waste dump side as well as on the valley side, does not exhibit any signs of distress or visible deformations. However, the downstream ends of culverts are at higher elevations than the inlets which is indicative of previous movements.

The culvert inlets are partially obstructed by timber and other debris.

The armoured section of the creek channel downstream from the lake outfall and the drop weir (Photo 4) does not exhibit any major changes since the 1986 site visit. The exposed length of buried stumps indicates that some downcutting is possibly taking place upstream from the weir. Erosion of the south abutment at the drop weir continues.

The channel downstream from the weir to a point approximately half way across the waste dump area has been also relatively stable since 1986. This channel section has a constant gradient (Photo 5) and contains a series of steps across the channel bottom. Erosion of the south bank continues at a relatively slow rate.

The channel across the downstream segment of the dump is continuously downcutting which results in an uneven stream gradient. The tendency to form meanders is apparent (Photo Nos. 6 and 7). Boulders originally placed on the channel bottom and which are now more than 0.5 m above the channel bed indicate the extent of vertical erosion.

The banks within the downstream channel sector are steep, undermined by the creek and unstable (Photo 6). The bedrock forming the north side of the channel is comprised of thinly-bedded and jointed shale and calcareous sandstone. Some beds dip into the channel. The weak and jointed bedrock is erodible.

4.0 PORCUPINE CREEK WASTE DUMP

The mine waste deposited into the Porcupine Creek valley remains unstable. The main instability features and drainage conditions are schematically shown on Figure 2.

Steep, fresh scarps outline the upper limits of individual slides which form a complex instability zone encompassing the entire waste dump.

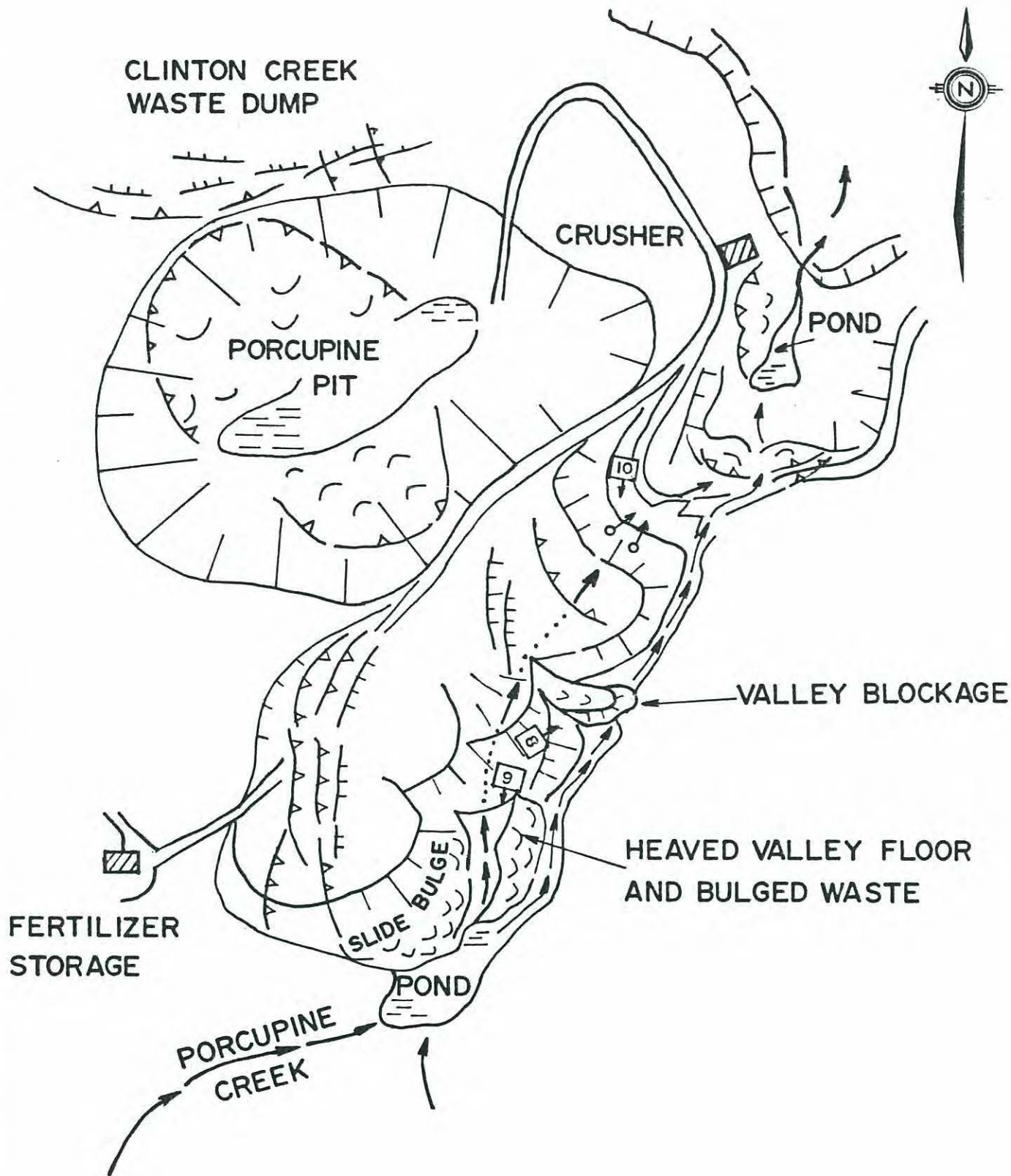
A relatively narrow slump, combined with ground heave, blocks the valley at about the mid-point of the dump (Photo 8). However, there is a flow through this approximately 10 m wide valley blockage.

A small pond exists upstream from the blockage. The ground has been pushed up by the slide masses and the gap between the toe of the waste dump and the east valley side is narrow.

An overflow channel cut through the bulged toe of the waste dump directs water towards the dump. The channel widens in front of the dump forming a fan-like delta (Photo 9). Despite a considerable width of the entry area, some flooding occasionally occurs. Finer-grained sediments are deposited in this area.

The underflow obviously follows more permeable zones within the dump and is discharged above the pile toe at its downstream end (Photo Nos. 10 and 11). The seepage, estimated in the order of 25 igpm (1.9 l/sec), is dispersed over a relatively wide zone.

Further downstream the flow from the dump and surface drainage paralleling the east side of the dump unites and flows over a small dump into the valley bottom. Surface erosion and saturation of the material contribute to the instability of this dump.



NOTE: LEGEND ON FIG. 1

PORCUPINE CREEK WASTE DUMP
SCHEMATIC PLAN

N.T.S.

FIGURE 2.

Because of a relatively small watershed blocked by this dump, the creek flows are low. Consequently, it is not expected that the ongoing instability of the dump and creek channel will cause major sediment transport downstream.

5.0 WOLVERINE CREEK TAILINGS PILE

The two tailings piles on the south slope of the Wolverine Creek valley continued to move downhill (Figure 3).

The movements of the south pile appears to be accelerating. The most active areas are presently along the toe of the pile and the downslope sector. There are no major changes in the uppermost segment of the pile since last year.

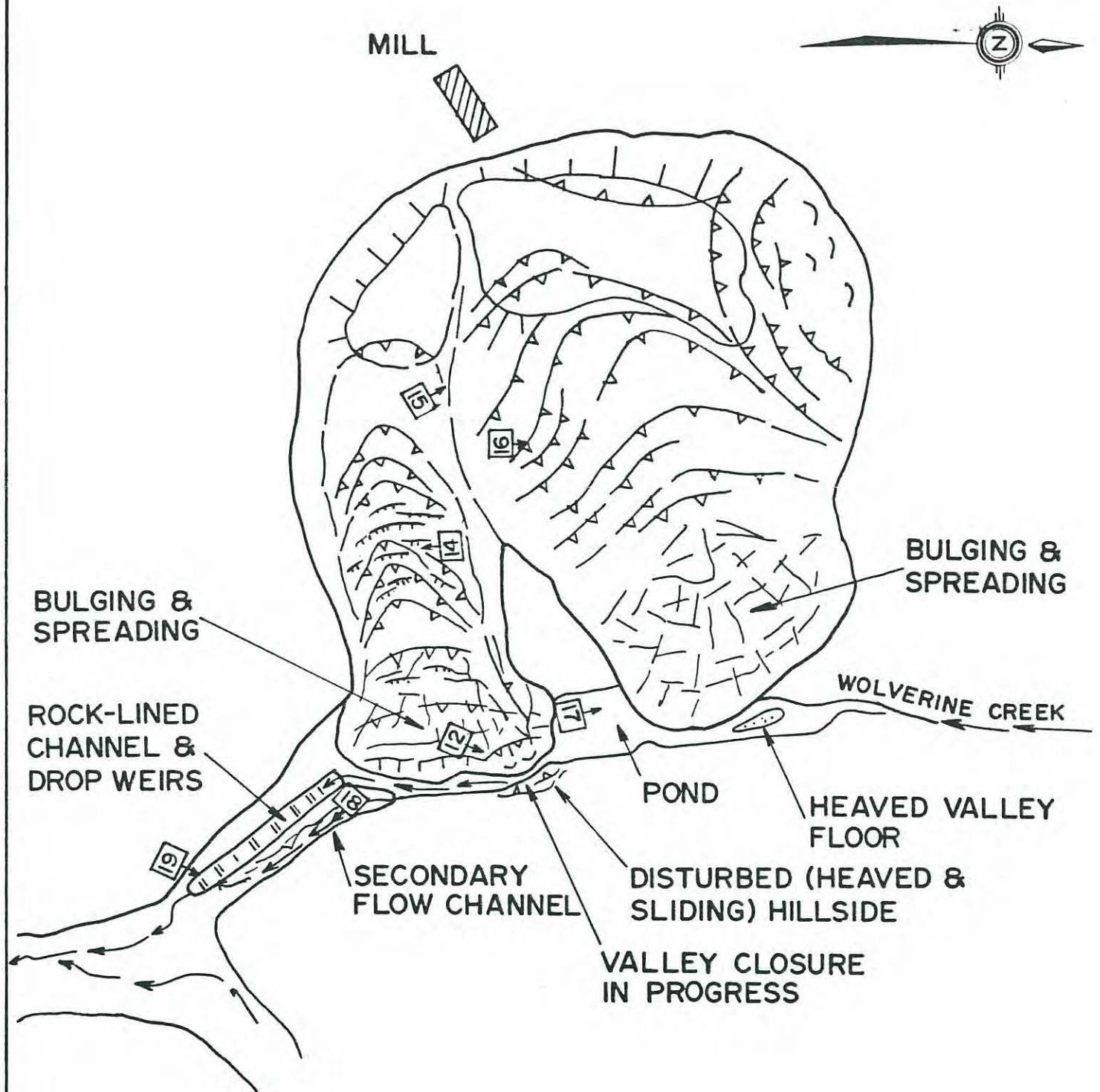
The toe area is traversed by two main sets of cracks - parallel and perpendicular to the stream. Perpendicular cracks are typical of upward movement. The parallel set indicates the downslope movement.

The material build-up along the stream channel is noticeable and the channel bottom is at least locally heaving (Photo 12). On the upstream side of this pile the original valley floor is being pushed up (Photo 13). The movement of the dump subgrade is apparently destabilizing the opposite hillside which shows extensive cracks and sliding.

Significant deformations occur in the middle sector of the south pile (Photo 14). It is estimated that movements in this region have increased since our 1986 site inspection.

The uppermost sector of the north tailings pile shows more activity than the top of the south one (Photo 15). As illustrated on Figure 3, the top area of the north lobe is spreading in all directions.

The middle sector of the north pile is badly disturbed (Photo 16) and it is very difficult to evaluate the relative rate of movement. However, there is no doubt that the horizontal displacements occurring in this area would be similar to those previously measured, i.e. in the range of 10 to 20 m per year.



NOTE: LEGEND ON FIG.1

**WOLVERINE CREEK
TAILINGS PILES
SCHEMATIC PLAN**

N.T.S. FIGURE 3.

The displacement rate of the toe area (Photo 17) has decreased because of the support provided by the east valley wall. The toe bulge has a lower slope gradient than in 1986 and has advanced slightly towards the east valley wall. The heaving of the valley bottom in front of this toe continues.

6.0 WOLVERINE CREEK CHANNEL

A partial blockage which was observed in 1986 at the upstream end of the south pile has been washed away by the spring runoff (Photo 12).

The existing flow across the upstream segment of the south tailings pile is taking place outside and above the channel which existed in this area until about 1985.

The stream is divided into two channels at the downstream end of the south pile. Most of the flow is through the armoured channel with drop weirs. However, a new channel has eroded along the east side of the valley.

Flow through this new channel has increased since 1986 and the channel is deeper (Photo Nos. 18 and 19) than it was during the previous site inspection. The cracks between the spillway and the new channel (Photo 18) have a fresh appearance.

7.0 CLOSURE

The results of the inspection confirm the continuing instability of the waste dumps and tailings piles.

The Clinton Creek waste dump shows signs of increased instability towards the lake. Elsewhere, the movements appear to be similar to those observed in 1986.

Clinton Creek channel shows very little change since 1986 except along the downstream sector. The deposition of material eroded from the channel and its banks occurs within the flat area downstream from the dump. The west abutment of the bridge across Clinton Creek is severely undermined.

Porcupine Creek flows through the waste dump as well as through the valley blockage. Further behavior of these flows should be monitored.

Major deformations continue within the downstream section of the south tailings pile and upper sector of the north pile in the Wolverine Creek valley. These deformations could have an adverse impact on the creek channel in the foreseeable future.

Existence of an abandoned fertilizer storage, located southwest from Porcupine Creek waste dump, was not reported in the mine company abandonment plan.

Since the monitoring of dumps has been apparently discontinued it is recommended, for your consideration, to acquire low level air photos of the mine area. The photographs should be at a scale of approximately 1:5000. These could be used for field inspections to depict, on a schematic basis, major changes as they occur in the future.

Previously discussed photogrammetric monitoring could be accurate to ± 10 cm vertically and horizontally and would provide a good base for evaluation of ongoing ground deformations. However, the initial installation and survey costs are estimated to be in the order of \$25,000.00.

Respectfully submitted,

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

A handwritten signature in cursive script, appearing to read "M. Stepanek".

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

MS/jlw#5

G052

PHOTO DOCUMENTATION



Photo 1: Fresh scarps outline the uppermost sector of the Clinton Creek Dump. No significant change in slump characteristics since 1986.



Photo 2: Waste dump - N.W. sector of toe area. Tension cracks run perpendicular to the creek. Recent slumping occurred on the lakeside.



Photo 3: Tension cracks traverse the creek bank and access road. Sharp crack edges confirm recent movements.



Photo 4: Lake outfall, armoured banks and drop weir did not change since 1986.

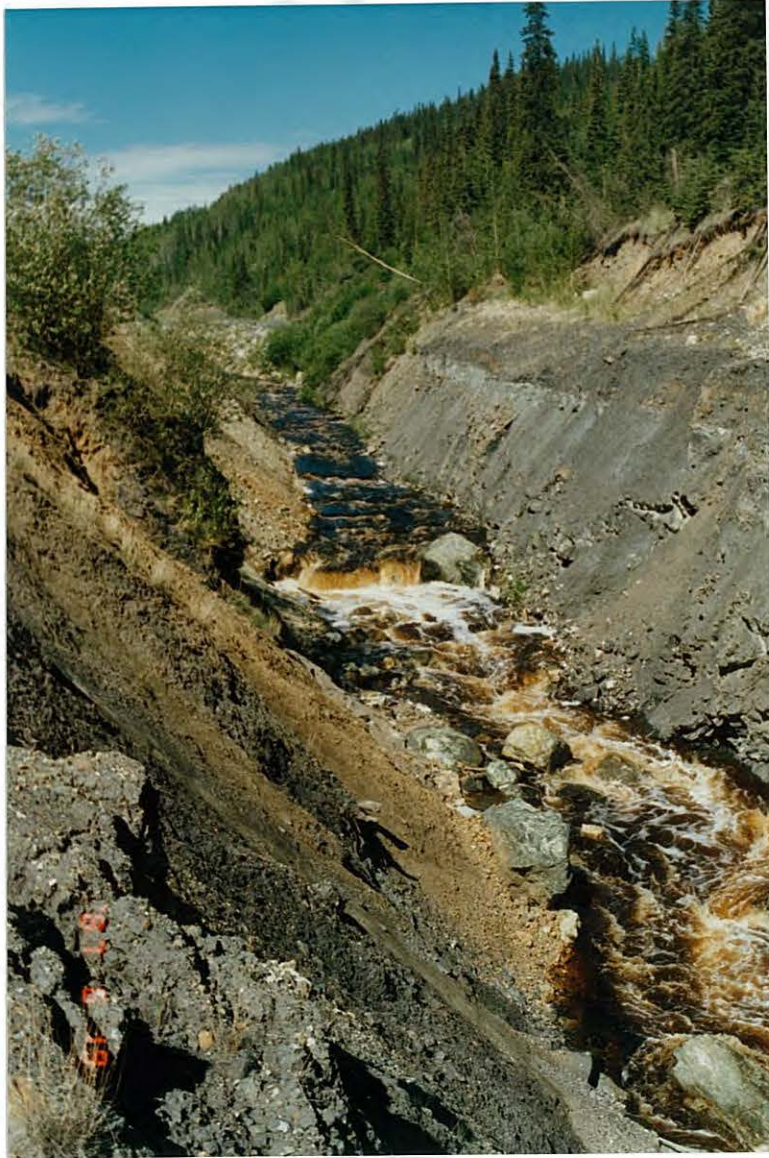


Photo 5: Upstream sector of the Clinton Creek channel experienced very little erosion since the 1986 site visit. North bank slumping appears to continue at a constant rate.

Photo 6: Downstream sector of the stream channel is downcutting and both banks are unstable.

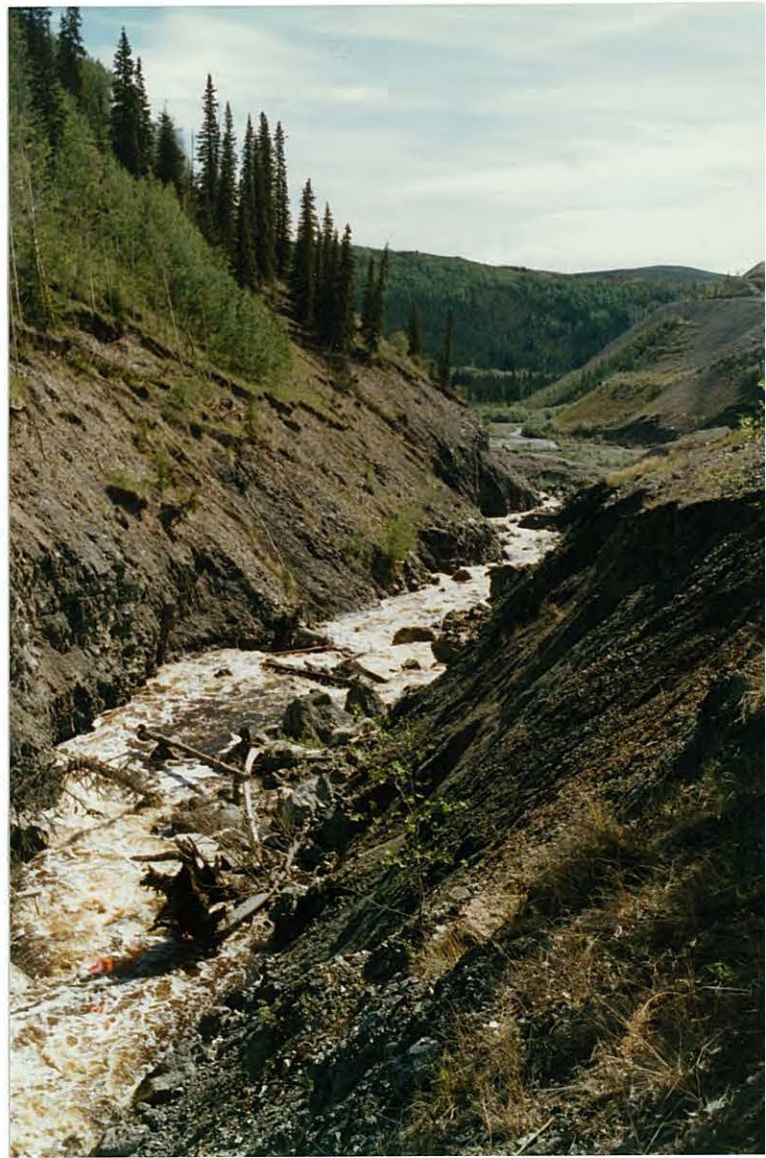


Photo 7: The same creek sector in 1986.





Photo 8: Partial blockage of the Porcupine Creek valley.



Photo 9: View of the heaved valley floor and bulged waste along the upstream toe of the Porcupine dump. Note an overflow channel directing flow into the dump.



Photo 10: The downstream section of the Porcupine Dump. The underflow is discharged above the toe of the dump, apparently following more permeable materials within the waste. Surface drainage channel is on the left.



Photo 11: Seepage from the underflow.



Photo 12: Build-up of material in the toe area of the south tailings pile and squeezing of the Wolverine Creek channel.



Photo 13: Upstream side of the south pile. The ground is pushed up disturbing the opposite hillside which is cracked and unstable.



Photo 14: Middle sector of the south tailings pile shows fresh and deep tension cracks.



Photo 15: Upper sectors of the south pile (left) and north pile (right).



Photo 16: Middle sector of the north pile exhibits extensive deformations and the rate of movement continues to be high.



Photo 17: The toe area of the north pile is flatter than it was in 1986 and advanced only slightly towards the east valley wall.



Photo 18: View of tension cracks developed between the armoured channel and secondary channel.



Photo 19: Junction of armoured and newly developed channels.