



KLOHN LEONOFF
CONSULTING ENGINEERS

Our File: PB 3169 0101

August 23, 1984

Brinco Mining Limited
2000-1055 West Hastings Street
Vancouver, British Columbia
V6E 3V3

Mr. Peter C. Jones,
Vice-President, Mining

Clinton Creek Waste Dump and Tailings Piles
1984 Site Visit

Dear Sirs:

We are pleased to submit six copies of our report on the 1984 site visit to Clinton Creek. The report includes our observations on the waste dump and tailings piles and recommendations for work to be carried out in 1984 to complete the Clinton Creek channel modifications. No work on the Wolverine Creek channel is recommended for 1984. Our report also includes results of the survey of monitoring points on the waste dump and tailings piles, as well as the survey of the longitudinal profile of Clinton Creek over the waste dump.

Yours very truly,
KLOHN LEONOFF LTD.

Peter C. Lighthall, P.Eng.
Project Manager

Encl.
PCL/ld

REPORT ON 1984 SITE VISIT

PROJECT: CLINTON CREEK MINE WASTE DUMP AND
TAILINGS PILES

LOCATION: CLINTON CREEK, YUKON TERRITORY

CLIENT: BRINCO MINING LTD.
CASSIAR DIVISION

OUR FILE: PB 3169 0101

AUGUST 23, 1984

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1. INTRODUCTION

This report presents a review of stability aspects at the former Clinton Creek asbestos mine, Clinton Creek, Yukon Territory, following a site visit on June 14 and 15, 1984. The main areas of concern are the channel of Clinton Creek which passes over the mine waste dump and the tailings piles on the west slope of Wolverine Creek valley. A tour of the waste dump and tailings piles was made on June 14 by Peter Jones of Brinco Mining and Peter Lighthall of Klohn Leonoff. On June 15, Jones and Lighthall accompanied Yukon Territory Water Board representative Bud McAlpine and the Water Board's consultant, Milos Stepanek of Hardy Associates, in a further tour of the site. Mr. Robert Clark of Brinco Mining surveyed movement monitoring points on the tailings pile and waste dumps, obtained an updated survey profile of the Clinton Creek channel and surveyed the upstream portion of the channel on which reconstruction was partially completed in September 1983.

This report includes a description of observations made during the site visit, results of the monitoring survey, recommendations for work to be carried out in 1984 and comments on future monitoring and performance of the waste dump and tailings piles.

2. WASTE DUMP

2.1 GENERAL

The Clinton Creek waste dump was described in Klohn Leonoff's report on Mine Waste Dumps, dated August 16, 1983. The waste dump consists of argillite material placed across the valley of Clinton Creek during the years 1968 to 1978. The dump has blocked the valley to form a large dam that impounds Hudgeon Lake, which has a maximum depth of about 85 ft. The present channel of Clinton Creek occupies the north side of the valley where it has incised a channel bounded by waste dump material to the south and bedrock valley walls to the north. The waste dump is founded on a permafrost foundation and movements of the dump, in the

order of a few feet per year, have been ongoing since completion of dumping in 1977. The stream channel is gradually downcutting at the interface between the bedrock on the left (north) bank and the waste dump material on the right bank. Erosion of the right bank occurs as the creep movement of the dump tends to squeeze the channel.

A riprap-ribbed erosion control section, designed by Golder Associates, was constructed in 1981 near the upper end of the channel. During spring runoff in 1982, the flow escaped from the rock-ribbed channel and eroded a new channel into fine-grained soils on the left bank.

Klohn Leonoff recommended remedial works to repair the channel in their August 16, 1983 report. The work was partially completed in September 1983, with the objective of relocating the stream away from the north bank to prevent further erosion of the silty soils. The work carried out was described in Klohn Leonoff report dated November 4, 1983. Essentially, the work consisted of relocating the stream away from the eroded north bank, constructing a riprap plug, complete with geotextile lining, at the upstream end of the erosion channel, excavating an emergency overflow channel in the road embankment at the outlet of Hudgeon Lake, installing a new monitoring point on the waste dump near the outlet and establishing a survey profile of the channel bottom. The remainder of the work outlined in Klohn Leonoff's August 1983 report is to be completed in 1984.

2.2 OBSERVATIONS ON 1984 SITE VISIT

The partial Clinton Creek channel modifications carried out in 1983 appear to have been successful in preventing further erosion of the north bank during the 1984 freshet. The streamflow is confined within the relocated channel constructed in 1983. The lower rib of the previous rock-ribbed channel structure was left in place in 1983 and this has provided an effective control against downcutting of the channel.

Just upstream of this control structure, a portion of the streamflow is deflected toward the erosion channel on the north, at a location where the side channel lining was too low and was overtopped. This small portion of the streamflow has not caused significant new erosion. At the location of the plug constructed upstream of the erosion channel, the stream channel was narrowed during construction. The channel should be widened in this area to avoid concentrated flow and to allow for squeezing by dump movement over the years. Photographs 1 and 2 in Appendix I show the condition of the upstream portion of the channel.

The riprap apron downstream of the Hudgeon Lake culverts has continued to perform satisfactorily in preventing erosion at the upper end of the channel. We consider the present apron to be satisfactory for the final channel. We recommend that the previously proposed geotextile filter which was to be installed beneath the apron riprap, be eliminated.

Further downstream, the waste dump channel does not appear to have changed significantly since June 1983. Oversteepened, freshly exposed slopes of waste dump material indicate that some erosion of the creeping waste dump is continuing. Comparison with photographs from 1983 indicates that downcutting of the channel bottom has not advanced significantly in the past year. The channel is becoming increasingly protected by large waste rock fragments which remain following erosion of the waste dump. Photographs 3 and 4 show the armoring in the stream channel and photograph 4 also shows the considerable numbers of large rock fragments available in the waste dump face.

2.3 MONITORING RESULTS

Results of the June 1984 survey of movement monitoring stations on the waste dump are presented in Appendix II. Seven points on the waste dump were surveyed; of these, vertical movements were determined for all seven, but horizontal movements were determined on only five points

because of deterioration of the reflecting prisms. In addition, movements of seven channel closure sections were determined. The locations of monitoring stations are shown on Drawing D-1006A attached.

All of the waste dump monitor points and channel closure sections indicate that the rate of horizontal movement has decreased slightly in recent years. Movement rates of the points, from September 1983 to June 1984, ranged from 0.9 ft/yr to 2.1 ft/yr. Every point has shown a slowing in the movement rate from the previous years. The rates of vertical movement, however, indicate a slight increase from previous years. We are not certain of the reason for the apparent increase in vertical movements.

Survey of the channel bottom of Clinton Creek over the waste dump was also carried out to compare with the profile determined in September 1983. The results of this survey are shown on Drawing D-1006A. The profile was extended approximately 800 ft further downstream. The June 1984 profile shows minor variations from that surveyed in September 1983. These variations are probably because of differences in placement of the stadia rod in the channel, which is made very irregular by the large boulders on the channel bottom. Overall, however, the new profile shows no downcutting trend over the 9 month period. The channel profiling should be continued in future years so that the progress of downcutting can be monitored.

2.4 1984 CONSTRUCTION PROGRAM

The work we recommend to be carried out in 1984 to complete the channel modifications is shown on Drawing D-1007. The main items of work are as follows:

- a) Backfilling of the eroded channel should be completed with material borrowed from the waste dump. The backfill should be brought up to about 5 ft above the level of the final stream channel. The configuration of the backfill is shown on Drawing D-1007. The volume of backfill required is estimated as about 5000 yd³.

- b) Geotextile should be laid against the channel side slope formed by the mine waste backfill, covered with a protective layer of mine waste, and riprap placed along the channel side as shown on Drawing D-1007. Placement of riprap and filter are required only on those areas indicated on the drawing. We consider the portion of the existing channel immediately downstream of the plug constructed in 1983 to have adequate side slope protection.
- c) The portion of the channel opposite the 1983 construction should be widened to a minimum bottom width of 50 ft. This can be accomplished by removing the existing side slope riprap, excavating a portion of the existing berm and replacing the riprap on the widened channel sides. The material excavated from the berm may be used as backfill for the eroded channel.

We estimate the following material quantities will be required for the work described above:

| | |
|--------------------------------------|----------------------|
| Mine waste (stream channel backfill) | 5000 yd ³ |
| Geotextile - Mirafi | |
| P-600X woven filter cloth | 1000 m ² |
| Mine waste (geotextile cover) | 250 yd ³ |
| *Riprap | 200 yd ³ |

- * Much of the channel lining riprap will be obtainable from material presently in place on the channel sides. The above estimate is for additional material which must be scavenged from the waste dump.

2.5 FUTURE REQUIREMENTS

The 1984 construction program outlined in Section 2.4 above will substantially complete the remedial work recommended in Klohn Leonoff's report of August, 1983, and the modifications agreed upon with Mr. Stepanek presented in an addendum letter dated September 2, 1983. We anticipate that, although this channel configuration will be modified somewhat with erosion and continued waste dump movement, it will have

sufficient flexibility to eventually reach an equilibrium condition and allow the waste dump to be finally abandoned. Prior to abandonment, the culverts at the outlet of Hudgeon Lake should be removed. We expect the culvert removal to be carried out by Brinco in 1985.

3. WOLVERINE CREEK TAILINGS PILES

3.1 GENERAL

The Wolverine Creek tailings piles were formed by depositing approximately 10 to 12 million tons of dry, mainly serpentine material from the Clinton Creek millsite over the western slope of Wolverine Creek valley. The south tailings lobe was placed in the years 1968 to 1974, when a failure of the tailings pile occurred and a segment of the pile moved downslope and blocked Wolverine Creek, creating a small lake in the valley bottom. The tailings deposition location was relocated northward and tailings were placed in the north lobe from 1974 until mine closure in 1978. A rock-lined channel was installed in 1978 to convey Wolverine Creek over the failed portion of the south lobe. Survey monitors were installed on the tailings piles to monitor downslope movements. Portions of the tailings on the north and south lobes were excavated in 1978 in attempting to stabilize the tailings piles, in accordance with recommendations by Golder Associates. Movements of the tailings piles have continued in spite of the attempted stabilization measures. A further description of the tailings piles were presented in Klohn Leonoff "Report on Wolverine Creek Tailings Piles", January 16, 1984.

3.2 OBSERVATIONS ON 1984 SITE VISIT

The Wolverine Creek tailings piles can be seen to be continuing their large downslope movements. The movements are apparent in the following observations:

- a) The toe of the south lobe is considerably more cracked and upthrust than in 1983 and the stream channel between the tailings pile toe and the east slope of Wolverine Creek valley is being squeezed by the tailings pile movements. At the outlet of the small lake, the toe of the tailings pile forms a scarp which has undergone minor erosion by Wolverine Creek. Foundation material is undergoing some upward displacement from the tailings pile loading. The channel at the toe of the south lobe is shown on Photographs 5 and 6.
- b) The toe of the north lobe has entered the lake in the valley bottom and extends an estimated 20 ft beyond the 1983 shoreline. The toe of the north lobe is shown on Photograph 7.
- c) Continued development of cracking is evident over the surfaces of both the tailings piles. Photographs 9 and 10 show radial cracking on the south lobe.

The erosion resistant channel constructed to convey Wolverine Creek over the failed mass of the south tailings lobe has continued to perform well. The stream flows within the constructed channel section and no problems with erosion are evident.

Klohn Leonoff's report of January 26, 1984, recommended that actual dimensions of the channel be determined to assess its flow capability. Measurements taken during the 1984 site visit showed that the channel has a minimum bottom width of about 30 ft and an effective lined depth of about 4 ft. The riprap forming the energy-dissipating weirs and the channel lining appears to have a mean diameter of about 3 ft. We consider the channel to be adequately constructed to convey and resist erosion from relatively large flood flows, such as can be reasonably expected over the next several years of service that will be required until the tailings piles approach stability and a long term channel can be designed.

3.3 MONITORING RESULTS

Results of June 1984 survey observations of monitoring points on the tailings piles are included in Appendix II. The trends shown by these movement observations are as follows:

- a) On the north lobe, the rates of horizontal movement of 11 of 13 points surveyed have decreased from the rates in June 1983. Two points, 350-1A and 350-3A, showed some increase in rate of movement. The maximum rate was at point 350-3A, near the toe of the north lobe, which showed a movement rate of over 100 ft/yr since September 1983. The trend of vertical movements was more or less consistent with the horizontal movements.
- b) Horizontal movements of all six points surveyed on the south lobe showed an increase over the rate for the previous year.

Drawing D-1004A shows monitoring point locations and rates of movement from September 1983 to June 1984.

3.4 ONGOING INSPECTION AND MAINTENANCE

Although the channel of Wolverine Creek was further narrowed by movement of the south tailings lobe over the past year, we consider the channel to have adequate width that no maintenance is recommended for 1984. Some minor erosion of tailings is likely to occur over the next year, but we consider the channel to be safe against major blockages.

We recommend that the strategy of continued annual observation of the channel be continued. As required, the existing erosion resistant channel should be extended upstream to convey Wolverine Creek over the tailings piles. When the tailings piles approach a stable state, a long term channel for Wolverine Creek can be designed and installed.

KLOHN LEONOFF LTD.



Peter C. Lighthall, P.Eng.
Project Manager

PCL/ld

APPENDIX I
PHOTOGRAPHS



Photo 1: Upstream end of Clinton Creek channel, looking downstream. Note narrow channel opposite bank protection section construction in 1983. June 14, 1984.



Photo 2: Upstream end of Clinton Creek channel, looking upstream. Note portion of stream flow escaping from channel just upstream of last weir left in channel. June 14, 1984.



Photo 3: Clinton Creek channel across waste dump, looking downstream. June 15, 1984.



Photo 4: Clinton Creek channel looking upstream. Note accumulation of large rock fragments in stream channel and frequent occurrence of rock in waste material. June 15, 1984.



Photo 5: Wolverine Creek at outlet of lake formed by south tailings lobe. Note channel squeezing and upthrust foundation material from tailings pile movements. June 14, 1984.



Photo 6: Looking downstream at Wolverine Creek channel at toe of south tailings lobe. June 14, 1984.



Photo 7: Toe of north tailings lobe extending into lake. June 14, 1984.



Photo 8: Wolverine Creek channel downstream of tailings piles. For scale, note Peter Jones of Brinco in Centre of photo. June 14, 1984.

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Photo 9 and 10: Panorama looking upslope from toe of south tailings lobe.
Note radial cracking on surface of tailings pile.
June 14, 1984.

August 23, 1984

APPENDIX II
MONITORING DATA

TABLE 1
MINE WASTE DUMPS

| Station | Coordinates & Elevation June 14, 1984 | Rates of Movement (ft/yr) | | | | | | | |
|---------|---|---------------------------|---------|---------|---------|----------|---------|---------|---------|
| | | Horizontal | | | | Vertical | | | |
| | | June 82 | June 83 | Sept 83 | June 84 | June 82 | June 83 | Sept 83 | June 84 |
| 20A | N 110773.22 E 106808.46 1470.66 | 1.50 | 2.61 | 0.65 | 1.78 | -0.41 | -0.66 | -0.89 | -1.43 |
| 21A | N 110840.87 E 106346.41 1475.15 | 2.60 | 2.36 | 0.72 | 1.53 | -0.81 | -0.92 | 0.00 | -1.40 |
| 22A | N 110827.32 E 106107.52 1472.76 | 3.60 | 2.82 | 0.27 | 2.09 | -0.90 | -1.28 | -0.20 | -2.04 |
| 68 | N E 1435.57 | 3.00 | 2.69 | 3.17 | N.R. | +0.18 | -1.25 | -1.06 | -0.72 |
| 81-1 | N 110205.95 E 106548.85 1501.43 | 2.60 | 2.15 | 2.28 | 1.29 | -0.79 | -0.78 | -0.58 | -1.68 |
| 81-2 | N 110766.37 E 106660.40 1463.78 | 2.80 | 2.57 | 1.91 | 1.72 | -0.89 | -0.47 | -3.72 | -0.26 |
| 19 | N E 1422.09 | - | - | 1.39 | N.R. | - | - | -0.59 | -0.76 |

TABLE 2WASTE DUMP CHANNEL CLOSURES

| Station | Rate of Horizontal Closure (ft/yr) | | | | | Rate of Vertical Movement (ft/yr) | | | | |
|---------|------------------------------------|---------|---------|-----------|---------|-----------------------------------|---------|---------|-----------|---------|
| | Nov 81 | June 82 | June 83 | Sept 83 | June 84 | Nov 81 | June 82 | June 83 | Sept 83 | June 84 |
| A | 2.82 | 2.15 | 1.99 | 2.29 | 1.63 | 0.00 | -0.08 | 0.00 | -0.48 | -0.66 |
| B | 1.61 | 1.54 | 1.56 | 1.74 | 0.91 | -0.02 | -0.07 | -0.31 | -1.19 | -0.14 |
| E | 0.65 | 1.14 | 0.92 | destroyed | | 0.00 | +0.06 | +0.29 | destroyed | |
| F | 2.61 | 1.99 | 1.89 | 1.81 | 1.21 | -0.02 | -0.16 | -0.09 | -1.09 | -0.32 |
| G | 3.22 | 2.53 | 2.27 | 2.32 | 1.64 | -0.03 | +0.01 | +0.30 | -0.75 | +0.12 |
| J | | | | | 1.17 | | | | | +0.23 |
| K | | | | | 1.99 | | | | | +0.14 |
| L | | | | | 1.76 | | | | | -0.10 |

TABLE 3
WOLVERINE TAILINGS PILE
NORTH LOBE

| Station | Coordinates & Elevation June 14, 1984 | Rates of Movement (ft/yr) | | | | | |
|---------|---|---------------------------|---------|---------|----------|---------|---------|
| | | Horizontal | | | Vertical | | |
| | | June 83 | Sept 83 | June 84 | June 83 | Sept 83 | June 84 |
| 26 | N 114491.77 E 108227.75 1891.30 | 3.61 | 11.91 | 0.27 | -0.32 | +0.17 | -0.67 |
| 80-2 | N 114321.57 E 108442.75 1818.65 | 6.50 | 0.45 | 0.40 | -0.23 | -0.59 | -0.17 |
| 26 A | N 114483.48 E 108414.75 1836.42 | 0.62 | 0.93 | 0.17 | -0.36 | +2.72 | -1.42 |
| 80-1 | N 114708.62 E 108420.67 1832.53 | 0.77 | 0.76 | 0.69 | -0.67 | +0.14 | -0.63 |
| 80-4 | N 114020.48 E 108855.28 1666.71 | 1.96 | 1.14 | 1.05 | -0.61 | -0.24 | -0.54 |
| 80-5 | N 114171.64 E 108943.37 1608.93 | 32.64 | 12.43 | 8.35 | -32.18 | -12.16 | -9.39 |
| 500-1 | N 114509.10 E 108880.86 1608.38 | 57.14 | 50.20 | 33.33 | -24.52 | -16.36 | -15.39 |
| 650-1 | N 114712.40 E 108863.27 1628.35 | 50.26 | 32.57 | 18.63 | -16.53 | -10.36 | -5.69 |
| 350-1A | N 114357.36 E 109105.80 1558.30 | 55.99 | 79.47 | 91.48 | -19.85 | -23.45 | -34.05 |

TABLE 3
(continued)
WOLVERINE TAILINGS PILE
NORTH LOBE

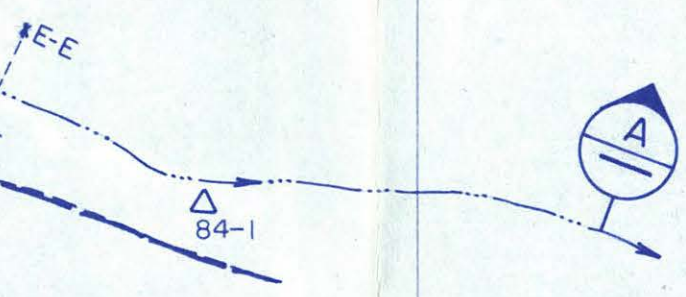
| Station | Coordinates & Elevation June 14, 1984 | Rates of Movement (ft/yr) | | | | | |
|---------------|---|---------------------------|---------|---------|----------|---------|---------|
| | | Horizontal | | | Vertical | | |
| | | June 83 | Sept 83 | June 84 | June 83 | Sept 83 | June 84 |
| 500-2 | N 114496.34 E 109187.26 1528.83 | 74.37 | 93.73 | 58.47 | -27.28 | -43.52 | -29.31 |
| 350-2A | N 114344.14 E 109270.53 1504.94 | 91.95 | 95.14 | 71.55 | -37.57 | -29.41 | -24.54 |
| 650-2 80-6 | No Reflection | 88.62 | 66.66 | - | -42.99 | -36.26 | - |
| 80-7 | N 114501.25 E 109353.84 1465.95 | 103.27 | 94.49 | 59.88 | -42.96 | -35.16 | -24.75 |
| 350-3A | N 114398.63 E 109372.29 1462.36 | 109.93 | 95.04 | 108.69 | -44.06 | -43.11 | -29.03 |

TABLE 4
WOLVERINE TAILINGS PILE
SOUTH LOBE

| Station | Coordinates & Elevation June 14, 1984 | Rates of Movement (ft/yr) | | | | | |
|---------|---|---------------------------|---------|---------|----------|---------|---------|
| | | Horizontal | | | Vertical | | |
| | | June 83 | Sept 83 | June 84 | June 83 | Sept 83 | June 84 |
| 24 | N 113481.65 E 108332.61 1825.22 | - | 1.73 | 1.85 | - | -1.17 | -1.14 |
| 24A | N 113446.15 E 108982.20 1599.29 | 16.39 | 21.52 | 19.18 | -5.77 | -8.40 | -6.83 |
| 24B | N 113471.07 E 109173.60 1534.03 | 15.02 | 19.04 | 17.92 | -5.14 | -6.40 | -6.01 |
| 24D | No Reflection | 10.87 | 14.29 | - | -3.79 | -3.89 | - |
| 25B | N 113555.97 E 109638.17 1383.10 | 10.44 | 14.12 | 12.38 | -2.36 | -1.93 | -2.26 |
| 25C | N 113749.74 E 109812.27 1354.13 | 3.43 | 7.99 | 6.72 | +2.64 | +3.93 | +2.69 |
| 80-9 | N 113371.74 E 109790.31 1342.79 | 2.72 | 3.68 | 3.43 | +0.87 | +1.93 | +1.41 |

DRAWINGS

- D-1004A - PLAN OF WOLVERINE CREEK TAILINGS PILES
- D-1006A - PLAN AND LONGITUDINAL PROFILE OF WASTE DUMP CHANNEL
- D-1007 - 1984 CHANNEL MODIFICATIONS - PLAN AND SECTIONS



108 500E

LEGEND

△^{20A} SURVEY MONUMENT

x-----x CROSS-CHANNEL REFERENCE LINE
A A-A

NOTES

I. PROFILE IS PLOTTED WITH 5 TIMES VERTICAL EXAGGERATION.

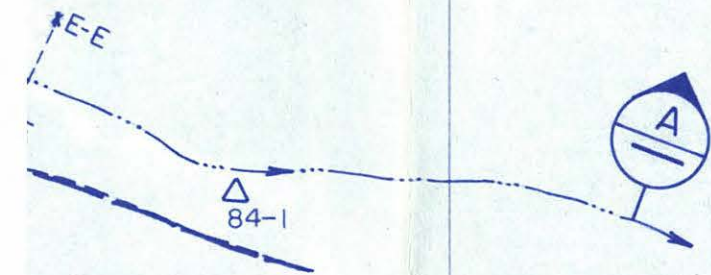
LEGEND

△^{20A} SURVEY MONUMENT

x-----x CROSS-CHANNEL REFERENCE LINE
A A-A

NOTES

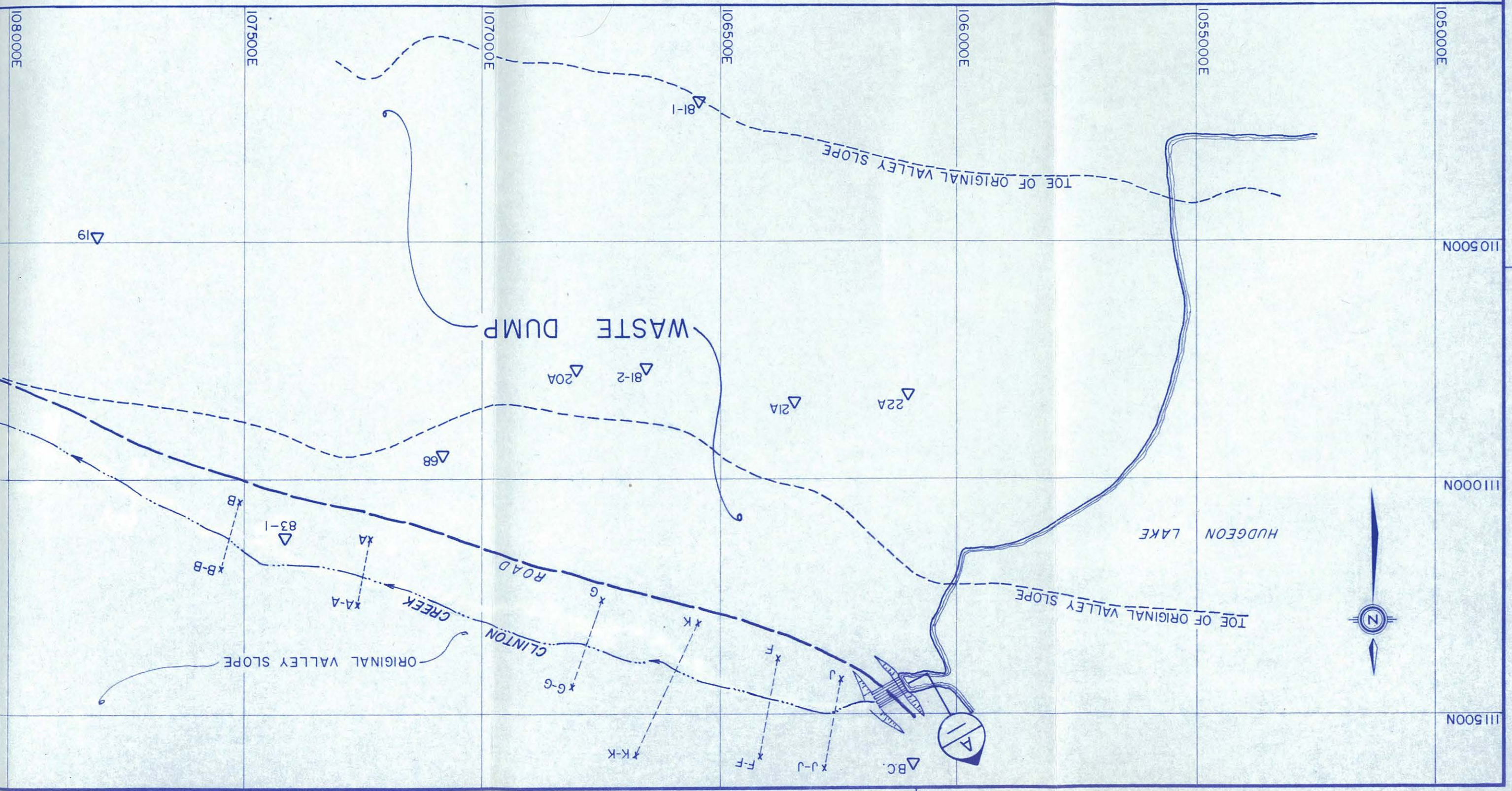
I. PROFILE IS PLOTTED WITH 5 TIMES VERTICAL EXAGGERATION.



108 500E



PLAN



C

D

3

2

1

B

ELEVATION - FEET

1340
1320
1300
1280
1260
1240
1220

DOWNSTREAM END OF CULVERTS

0+000

0+500

1+000

SEPT. 23, 1983

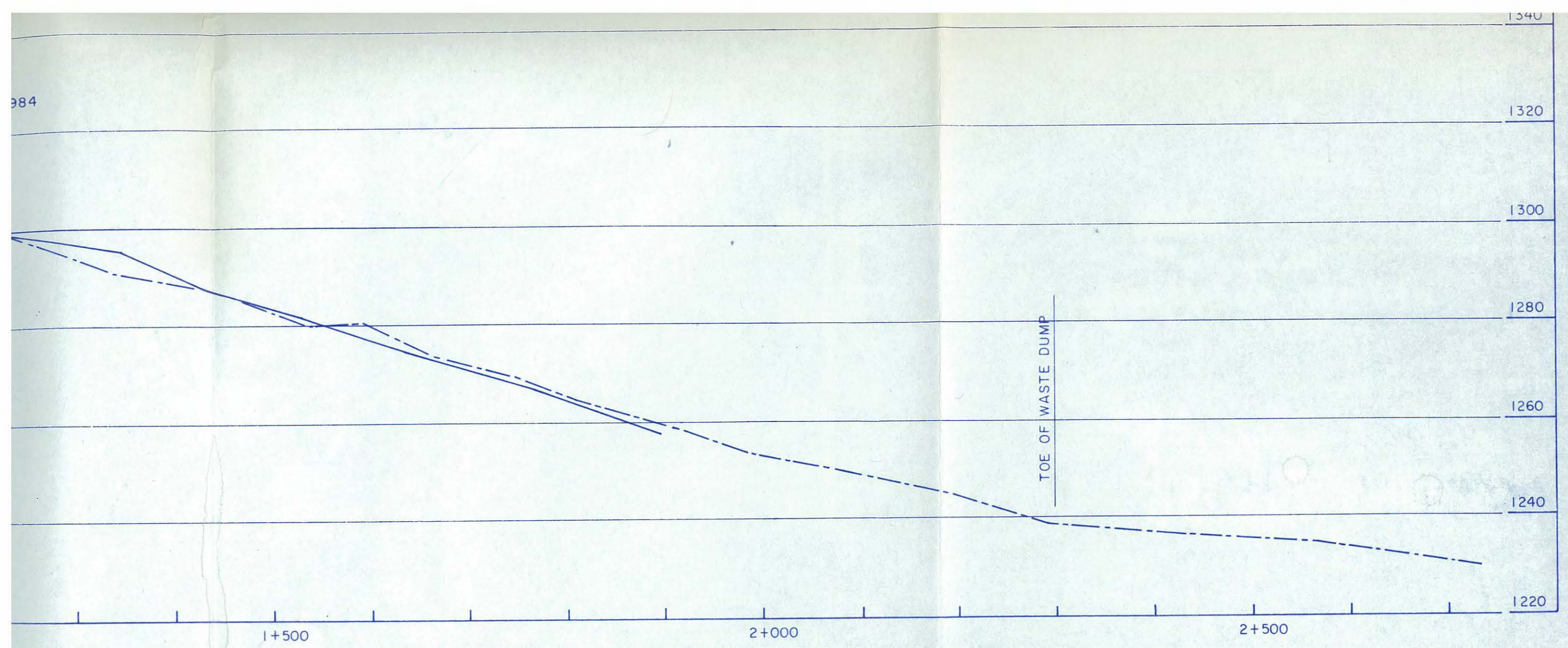
JUNE 15

SECTION (A)



A

984



ELEVATION - FEET

1+500

2+000

2+500

1220

1240

1260

1280

1300

1320

1340

TO BE READ WITH KLOHN LEONOFF REPORT DATED AUG. 23, 1984

SCALE:

| | | | | |
|---------------|----------------|------------------|-----------------|--|
| REV. A | DATE AUG. 1984 | REVISION DETAILS | | |
| DESIGN P.C.L. | DRAWN EDP. | DATE FEB., 1984 | SCALES AS SHOWN | |

| | | | | |
|---------|---|--|--|--|
| PROJECT | CLINTON CREEK MINE WASTE DUMP | | | |
| TITLE | PLAN AND LONGITUDINAL PROFILE OF WASTE DUMP CHANNEL | | | |

| | | | |
|---------------|-------------|----------|------|
| DATE OF ISSUE | PROJECT No. | DWG. No. | REV. |
| | PB 3169-01 | D-1006 | A |



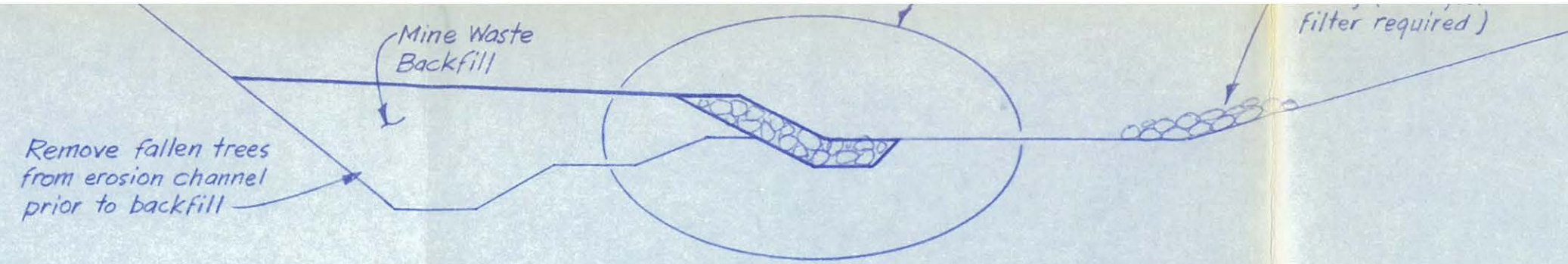
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CASSIAR DIVISION

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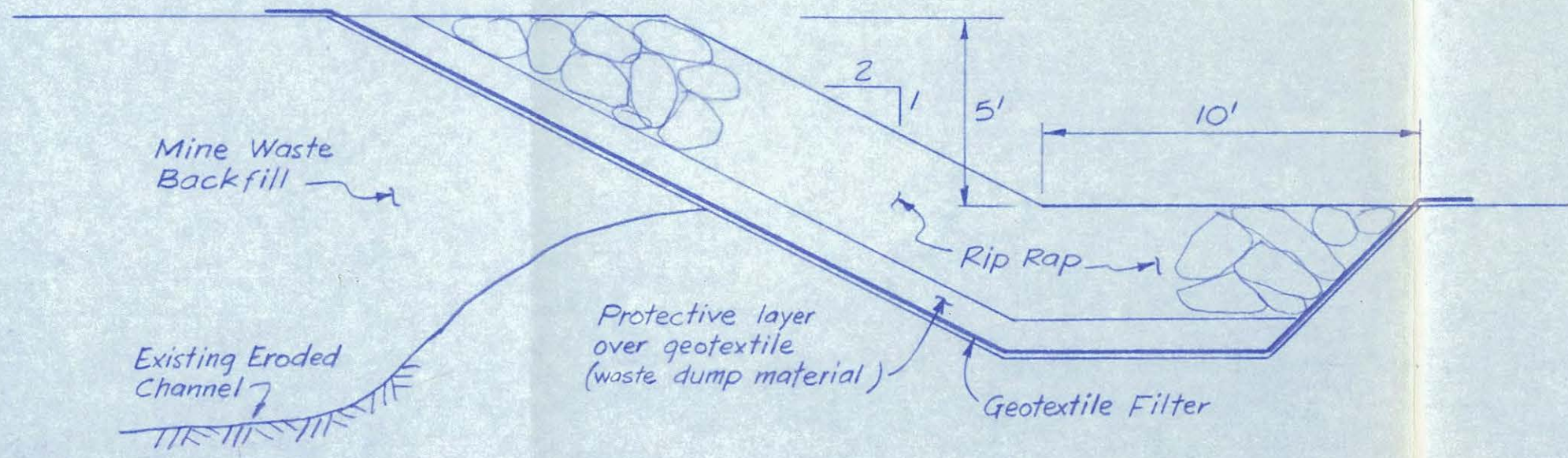
APPROVED
[Signature]

ELEVATION - FEET
1340
1320



TYPICAL SECTION OF CHANNEL LINING
Scale 1" = 20'

B



A



DETAIL OF LEFT BANK CHANNEL LINING
Scale 1" = 4'

NOTES

1. Plans and sections are approximate, based on limited survey data, sketches of site prepared during site inspection by Klohn Leonoff and photographs of the area.
2. Backfill in existing channel should be placed in maximum 1 ft. lifts and compacted by bulldozer travel.
3. Geotextile filter to consist of high strength woven polymer such as Mirafi P600X or equivalent. Where two sheets are joined provide minimum 1 metre overlap.
4. Rip rap gradation :

| | |
|----------------|------------------|
| % finer by wt. | <u>rock size</u> |
| 100 | 3.0 ft |
| 50 | 1.5 ft |
| 10 | 0.5 ft |
5. Final alignment of rip rap lining and extent of rip rap placement to be approved by the Engineer on site.

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| | | DESIGN | DRAWN | DATE | SCALES |
| | | PCL | FC | JULY 1984 | AS SHOWN |
|  KLOHN LEONOFF LTD. CONSULTING ENGINEERS | | PROJECT CLINTON CREEK MINE WASTE DUMP | | | |
| | | TITLE 1984 CHANNEL MODIFICATIONS PLANS AND SECTIONS | | | |
| CLIENT: BRINCO MINING LIMITED CASSIAR DIVISION | | DATE OF ISSUE AUG. 23, 1984 | PROJECT No. PB 3169-01 | DWG. No. D-1007 | REV. |
| | | APPROVED  | | | |

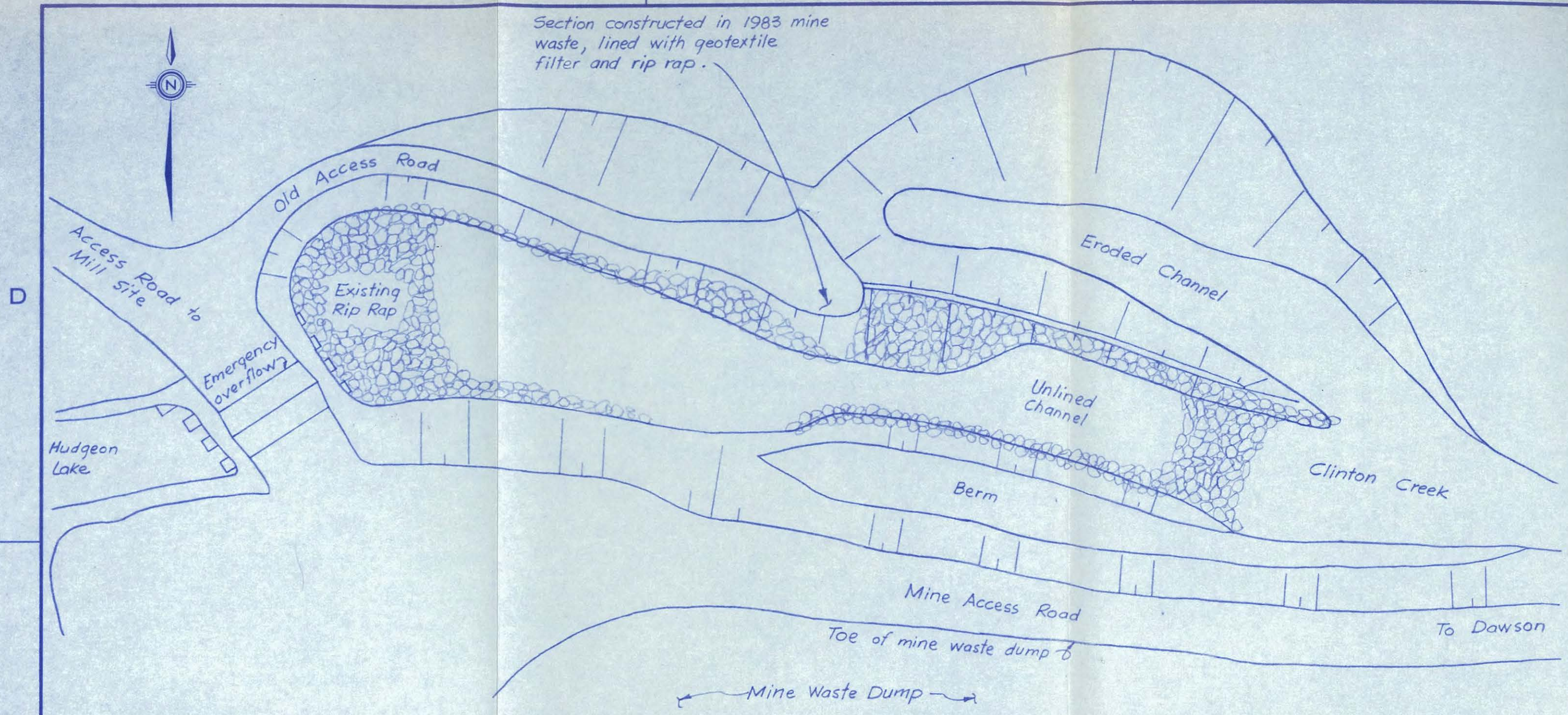
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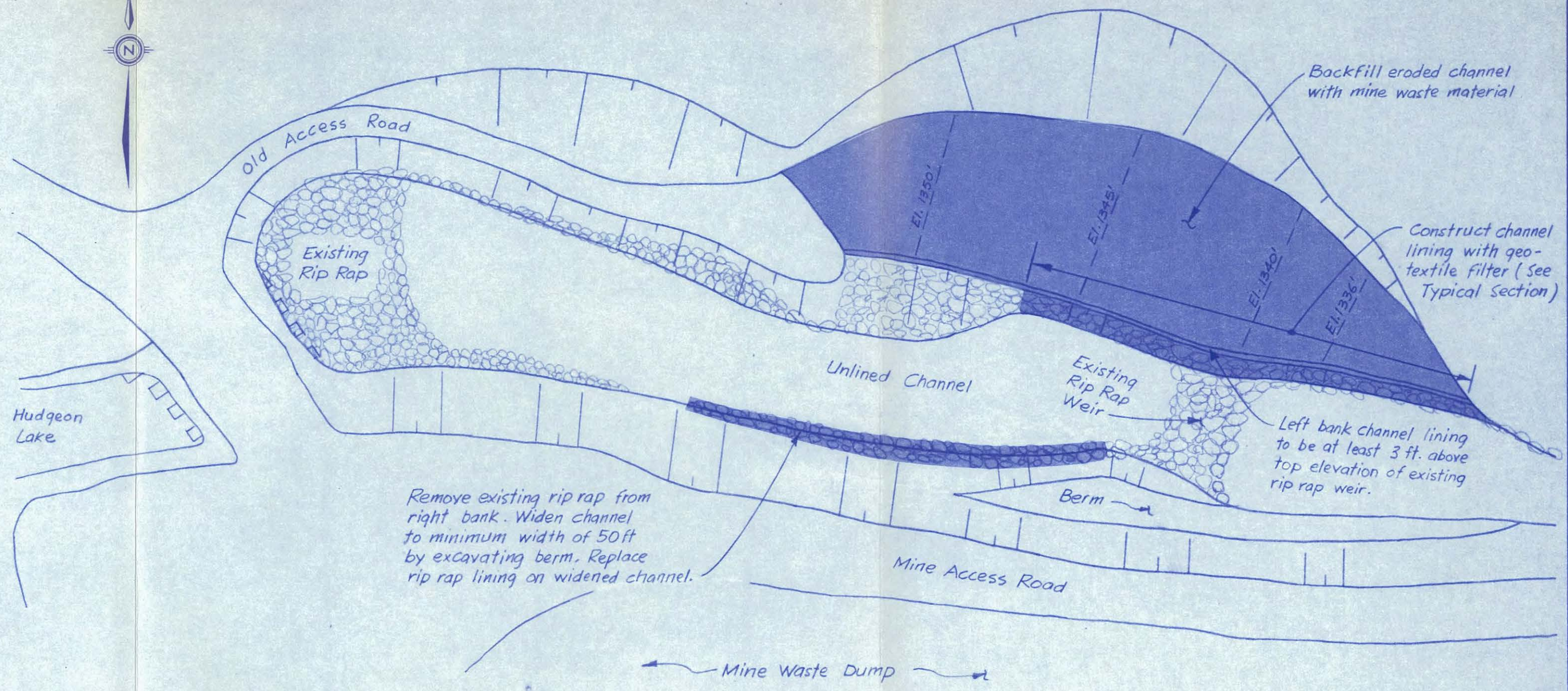
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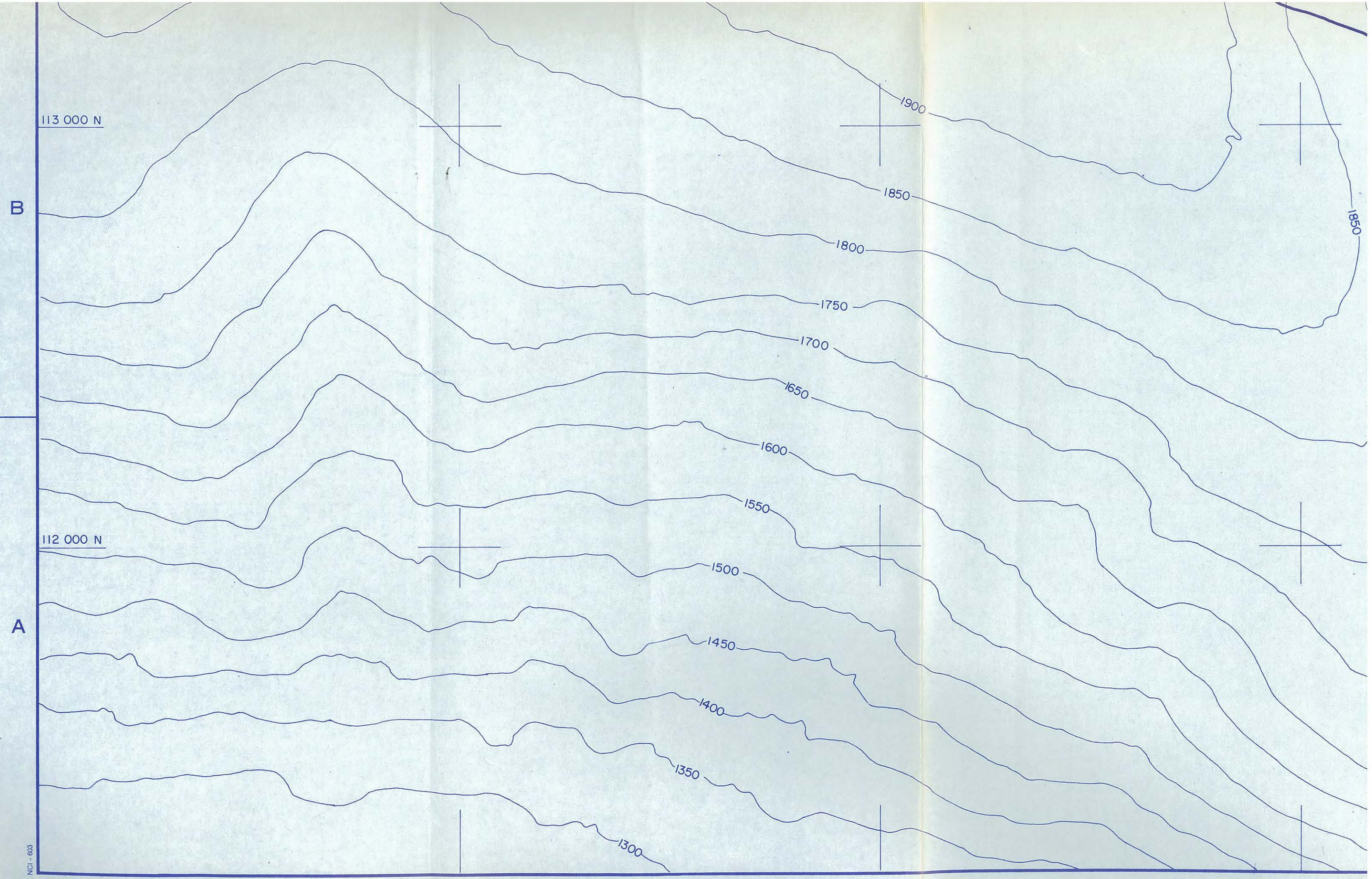
Section constructed in 1983 mine waste, lined with geotextile filter and rip rap.

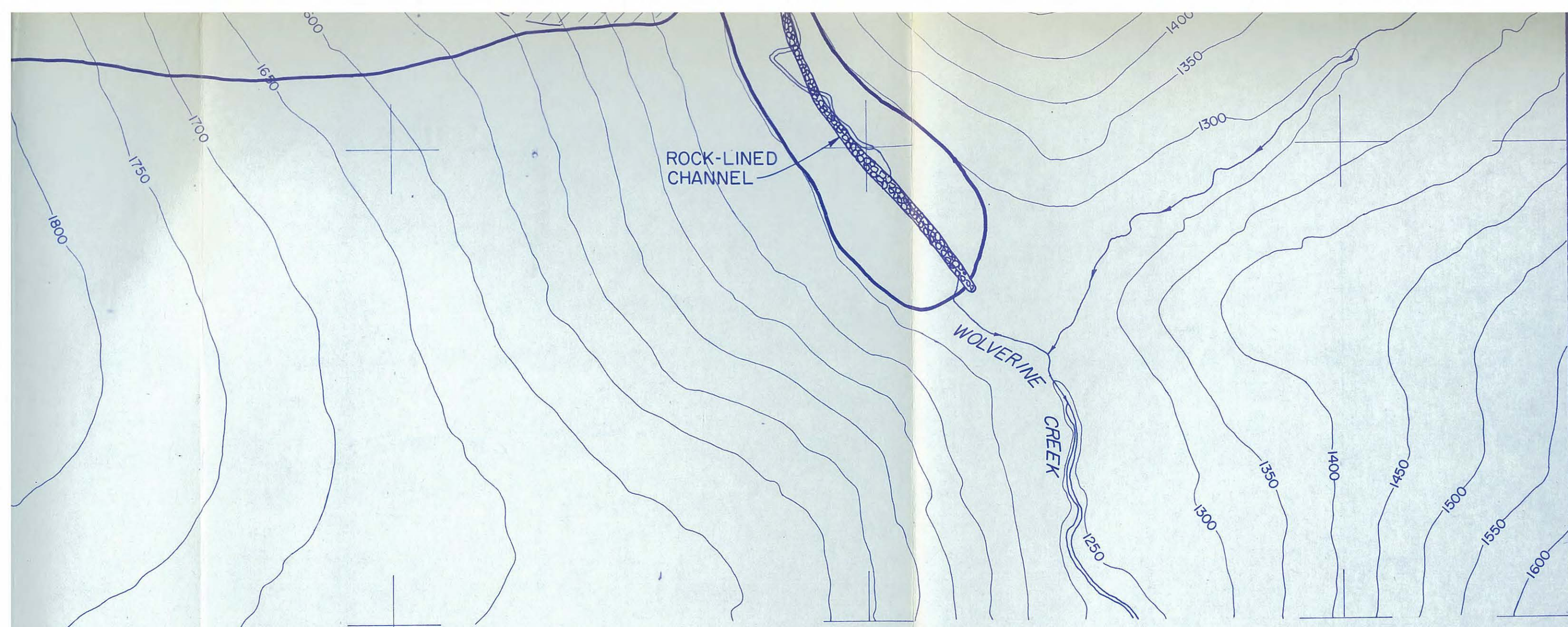


PLAN OF RIP RAP CHANNEL - JUNE 1984
Scale 1"=50'



PLAN OF 1984 CHANNEL CONSTRUCTION
 Scale 1" = 50'





ROCK-LINED CHANNEL

WOLVERINE CREEK

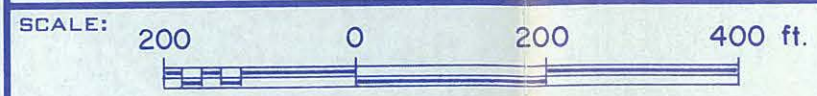
LEGEND

 Monitoring Point (Rate of horizontal movement - ft/yr
24 Sept. 1983 to June 1984)

NOTE

TOPOGRAPHY TRACED FROM CASSIAR ASBESTOS CORPORATION LIMITED SHEET No. 223, COMPILED IN 1965 BY McELHANNEY AIR SURVEYS LTD.

TO BE READ WITH KLOHN LEONOFF REPORT DATED AUG. 23, 1984



| | | |
|------|---------|--|
| REV. | DATE | REVISION DETAILS |
| A | July 84 | Monitor points plotted to 1984 coordinates. Movement rates revised. Position of toe revised. |

| | | | |
|--------|-------|-----------|-----------|
| DESIGN | DRAWN | DATE | SCALE |
| P.C.L. | F.C. | DEC. 1983 | 1" = 200' |



KLOHN LEONOFF LTD.
CONSULTING ENGINEERS

PROJECT CLINTON CREEK MINE RECLAMATION

TITLE PLAN OF WOLVERINE CREEK TAILINGS PILES

AS A MUTUAL PROTECTION TO OUR CLIENT, THE PUBLIC AND OURSELVES, ALL REPORTS AND DRAWINGS ARE SUBMITTED FOR THE CONFIDENTIAL INFORMATION OF OUR CLIENT FOR A SPECIFIC PROJECT AND AUTHORIZATION FOR USE AND/OR PUBLICATION OF DATA, STATEMENTS, CONCLUSIONS OR ABSTRACTS FROM OR REGARDING OUR REPORTS AND DRAWINGS IS RESERVED PENDING OUR WRITTEN APPROVAL.

CLIENT: BRINCO MINING LIMITED
CASSIAR DIVISION

| | | | |
|---------------|-------------|----------|------|
| DATE OF ISSUE | PROJECT No. | DWG. No. | REV. |
| JAN. 26, 1984 | PB 3169-01 | D-1004 | A |
| APPROVED | | | |

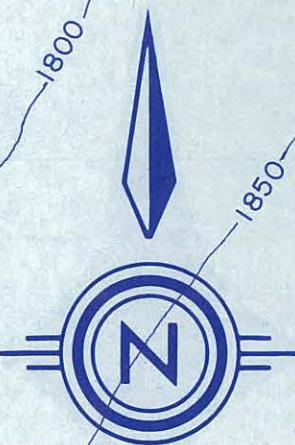
1

2

3

105 000 E
106 000 E
107 000 E
108 000 E

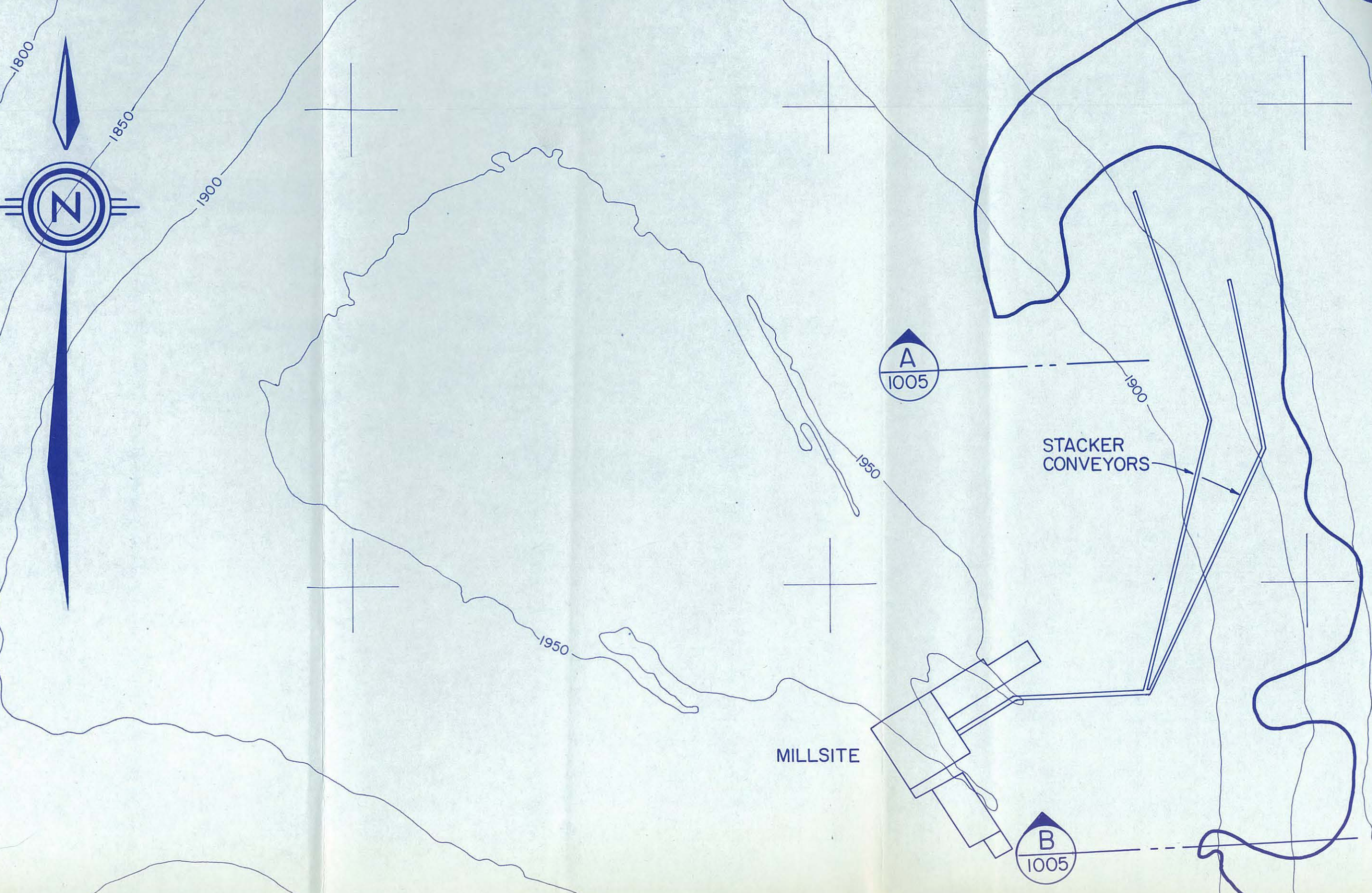
115 000 N



D

114 000 N

C



A
1005

STACKER
CONVEYORS

MILLSITE

B
1005

4

5

6

109 000 E

110 000 E

111 000 E

LOCATION OF LATERAL SLIP PLANE

ESTIMATED POSITION OF TOE-1984

TAILINGS EXCAVATED 1978

TAILINGS PILE

CHANNEL BEING SQUEEZED BY TAILINGS PILE

A
1005

B
1005

