PINE POINT MINE

Closure and Reclamation Plan

(UPDATE TO

RESTORATION AND ABANDONMENT PLAN

TAILING IMPOUNDMENT AREA

DECEMBER, 2006)

teckcominco

1. INTRODUCTION

The Pine Point Mine was a large lead/zinc open pit mining operation located in southern North West Territories approximately 100 km east of Hay River as shown in Figure 1. The deposit was first staked in 1898 by prospectors going to the Klondike to search for gold. Exploration of the site proceeded in stages and it was not until 1961 that agreement to develop of the property was reached. Pine Point Mines (initially 78% owned by Cominco Ltd.) constructed the mine and production started in 1964. The mine operated for over 20 years with all major activity ending in the spring of 1988. During the life of the mine approximately 70 million tons of ore grading 2.9% lead and 6.8% zinc were mined.

In June of 1987, the Restoration and Abandonment Plan was issued and subsequently approved. The plan was implemented immediately upon closure of the mine in 1988. Updates to the plan were issued in 1990 and again in 1991 as reclamation work neared completion. By October 1991 the only outstanding work (other than related to the tailings impoundment facility) was the removal of three large concrete bins, two residential houses, and the dump site to be filled. Subsequently, this work was completed.

To enable the mine to be developed, Pine Point Mines acquired the surface rights from the Crown for the town site area, the areas required for mining and processing facilities, and for the tailing impoundment area. After the mine closed and as reclamation activities were completed in accordance with the Restoration and Abandonment Plan, the surface leases were surrendered back to the Crown (mid to late 1990's). Currently only one surface land lease (#85B/16-9-9) continues to be held by Teck Cominco Metals Ltd. (formerly Cominco Ltd.). This lease encompasses the tailings impoundment area to allow for the on-going management of the tailings facility. As Lease #85B/16-9-9 is the only surface land tenure that Teck Cominco continues to hold at the site, the update to the Restoration and Abandonment Plan is directed to issues associated with this lease area.

2. TAILINGS IMPOUNDMENT AREA

The 1991 update of the Restoration and Abandonment Plan identified two remaining issues to be dealt with in the tailings impoundment area:

1. Effluent quality
2. Long-term stability of dykes and decant structures

The tailings impoundment area covers an area of approximately 2.5 by 2.8 km in plan and contains about 54 million tonnes of tailings. The primary mineral in the tailings is dolomite with lesser amounts of calcite. These minerals are accompanied by low-percentage to trace quantities of pyrite, marcasite, sphalerite, galena, muscovite and quartz. The impoundment is situated to the north of the former millsite on terrain which slopes very gently towards the northwest. The perimeter dyke contains the tailings and pond water extends fully along the north and west side of the disposal area and partially along the higher south and east sides as shown in Figure 2. The pond water originates from precipitation that falls within the tailings impoundment area. The total length of the perimeter dykes is approximately 8.5 km and the maximum height of these dykes is about 11m at the northwest corner of the impoundment. The tailings range in thickness from 14m near the discharge point to 5.3m near the tailings pond at the north end of the impoundment. Prior to 1993, a 150mm nominal thickness of sand and gravel were place over most of the exposed tailings surface to mitigate dust plume generation.

2.1. Effluent Quality

The principle issue with effluent quality is the concentration of dissolved zinc in the pond water. Concentrations of zinc in the tailings pond water exceed the permit levels specified in the Water Licence so that the water must be treated prior to discharge to the environment. The zinc concentration was initially believed to be the result of residual dissolved material created in the acid leach circuit that was used to treat the zinc concentrate while the mill was in operation. The first few years after the mine closed, the concentration of zinc decreased significantly, but this trend did not continue. Subsequently, field investigations of the tailings that confirmed that it was the carbonate minerals in the tailings and not the residual materials from the acid leach circuit that were controlling the zinc concentration in the pore waters. In the past 10 years there has been no apparent trend of either increasing or decreasing zinc concentrations in the tailings pond waters (SRK letter report 'Pine Point Mine – Review of Tailings Discharge Monitoring Data', December 14, 2006). As long as zinc concentrations in the pond water exceed Water Licence permit levels, treatment of the water during the annual discharge period will be required.

The treatment method used is to inject a lime/water mixture into the pond water as it flows into a serpentine settling channel (which is located within the tailings impoundment area). As the water flows through the channel, the pH of the water is increased by the lime and zinc is precipitated out of solution and settles out of the water column. At the end of the settling channel, the water is discharged from the tailings impoundment. The water discharged is compliant with the requirements of the Water Licence for all parameters including metals concentrations, pH, and turbidity.

Prior to 2006, Teck Cominco rented the equipment used to conduct the water treatment process. In 2006 Teck Cominco purchased new equipment for the treatment process to have better control of the equipment being used; to ensure the equipment being used is reliable; and to be able to modify the equipment to refine the treatment process.

Teck Cominco is committed to continue monitoring water quality as required in the Water Licence and will continue to conduct an annual water treatment program until the pond water within the tailings impoundment meets Water Licence criteria and can be discharged without treatment.

2.2. Tailings Impoundment Dyke Stability

Management of the tailings impoundment area will consist of two phases, the first being the on-going management of the facility as long as the pond water requires treatment on an annual basis prior to being released, and the second stage will occur once the pond water is compliant and no longer requires treatment prior to being released.

2.2.1. Prior to Tailings Pond Water Being Compliant for Untreated Discharge

As long as water within the tailings impoundment area exceeds Water Licence permit conditions, the water will continue to be impounded within the facility prior to treatment and discharge. Under these conditions, there is always water stored within the impoundment area which requires that the tailings dykes are maintained in good condition. Currently, the tailings dykes are inspected in the spring after snow melts, during the summer, and again in the fall to verify that they are in good condition. The current Water Licence requires that a formal inspection by a geotechnical engineer is done every second summer to have an expert examination

of the dam condition and to identify potential maintenance requirements to keep the dam in good condition.

Teck Cominco has internal policies regarding the management of tailings facilities that includes:

- The development and regular review of an Operating, Maintenance, and Surveillance (OMS) manual for the facility. This manual is currently under development for this facility by Golder Associates and will be completed prior to the 2007 summer open water season.
- A periodic dam safety review. To conduct a dam safety review, an independent geotechnical engineer reviews the physical conditions of the dyke, the stability design calculations of the dyke, and the adequacy and compliance of the program specified in the OMS manual. A dam safety review is currently underway (by SRK Engineering Consultants) and will be completed in 2007 prior to the summer open water season.

These tools are intended to supplement the geotechnical inspections to ensure that the long-term integrity and safety of the tailings dykes are maintained.

2.2.2. Subsequent to the Tailings Pond Water Becoming Compliant for Untreated Discharge

Once monitoring of the tailings pond waters confirm that water quality is consistently compliant with effluent discharge requirements (without being treated), then the long term, permanent closure of the tailings facility will proceed. Final closure of the tailings facility will include the construction of a permanent spillway through the north dyke to eliminate the pond of water within the tailings impoundment area and to allow rainwater and snowmelt to flow from the impoundment area unimpeded. The final spillway and approaches will be designed to ensure that water does not pond against the dykes and that the spillway is capable of handling major flood events.

During normal operation, tailings impoundment dykes were constructed with a 1.5H to 1.0V upstream slope and a 2.0H to 1.0V downstream slope. In addition, crest widths were maintained between four and six meters to handle large equipment traffic.

Prior to final abandonment, Teck Cominco proposes to ensure long-term stability of the dykes by reducing slope erosion by recontouring the dykes to reduce the slope angle. It is envision that the maximum slopes on the downstream side of the dykes will be reduced to 3.0H to 1.0V. To achieve this, the dykes will be recontoured such that the crests are cut down to a minimum of 0.5 metres from the tailings surface. At this time there will no longer be a pond within the impoundment area. As the dykes will no longer be retaining water the requirement for a 1.0 m freeboard will not be applicable. Reducing the slope gradient of the recontoured dykes will also enhance revegetation of the slopes. This will further increase the long-term stability.

A geotechnical firm experienced in the design of tailings impoundment abandonment will be retained to provide the detailed designs. The designs will be submitted to the Water Board for review and approval prior to implementation at an appropriate future date.

NORTHWEST TERRITORIES WATER BOARD

WATER REGISTER NO. N1L3-0035

February 25, 1992

Mr. D.L. Johnston
Vice President
Mine Operations
Cominco Metals
200 Burrard Street
Vancouver, B.C.
V6C 3L7

Dear Mr. Johnston:

RE: REVISIONS TO THE SPILL CONTINGENCY PLAN FOR PINE POINT

The N.W.T. Water Board has reviewed your revisions, dated December 17, 1991. As indicated, these revisions were requested due to the fact Cominco has removed all facilities and personnel from the Pine Point site. The revisions regarding the Spill Contingency Plan are hereby approved by the Board.

If you require further assistance, please do not hesitate to contact this office. If your inquiry is of the technical nature, please feel free to contact Mr. John Witteman of the Water Resources Division at (403) 920-8240.

Sincerely,

Dave Nickerson

Dave Nickerson
Chairman
N.W.T. Water Board

bcc: [redacted]

P.O. Box 1500, Yellowknife, N.W.T., X1A 2R3, 9th Floor, Precambrian Building
Phone: (403) 920-8191 Fax: (403) 873-5763 Telex 034-45623

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cc - DIU + FL
file - WR
[redacted]

Cominco Metals
A Division of Cominco Ltd.

David L Johnston
Vice President
Mine Operations

December 18, 1991

Mr. D. Nickerson, Chairman
Northwest Territories Water Board
P. O. Box 1500
Yellowknife, Northwest Territories
X1A 2R3

DEC 2 7 91

C035
[redacted]
FT. SMITH
DISTR

Dear Dave:

Re: Revised Restoration and Abandonment Plan - Pine Point Operation

You will find enclosed a revised Restoration and Abandonment Plan for the Pine Point mill site, tailings pond and refuse dump. This revision reflects the work done in 1991 and that remaining to be done.

Yours truly,

J Hoffman

for D. L. Johnston
Vice President,
Mine Operations

DLJ:jh

Enclosure

RESTORATION AND ABANDONMENT PLAN

MILLSITE AND TAILINGS CONTAINMENT AREAS

COMINCO LTD. - PINE POINT OPERATIONS

DECEMBER, 1991

INTRODUCTION

This Plan Update has been prepared to outline the Restoration and Abandonment activities that have been completed to date at the Pine Point Operation and to identify Cominco Ltd.'s plans for the final abandonment of the site.

Pine Point was a large lead/zinc open pit mining operation located in the southern North-west Territories, see Figure 1. The mine was in operation for over twenty years and all major activity was competed in the spring of 1988.

The most recent formal Restoration and Abandonment Plan was issued in June of 1987, with an Update in December 1990. Since that time all mining and milling activities have been completed. Shipment of the stockpiled concentrates was completed in the spring of 1991. No further activity is anticipated at the site beyond the planned abandonment and restoration work.

The Plan reviews completed work and future plans for three separate areas: the mill site, N-32 dump, and the tailings containment area.

Restoration and Abandonment activities for the mill site and N-32 dump should be complet-ed by the fall of 1993. Work related to the final abandonment of the tailings containment area will be ongoing for an indefinite period. During the interim, Cominco Ltd. will ensure that all water discharged from the pond meets the quality requirements of the Water Licence.

Cominco Ltd.'s philosophy in developing this Plan was to eventually leave the site in a main-tenance-free state with all known hazards addressed.

GENERAL ABANDONMENT CONCEPTS

Upon completion of final abandonment, all buildings and fixtures at the site will have been removed. All basements or disturbances at the mill site will be filled and graded. (See Figure 2.)

Ditches or berms will be in place to prevent run-off from entering the tailings containment area.

Drill core produced during exploration drilling is stored in three locations to the west of the mill site, see Figure 3. Territorial Mining Regulations require that the core be left in place.

Material in the N-32 dump site will be capped with a layer of fill and the dump will be left with stable slopes.

The tailings containment area will be abandoned with a stable surface to ensure minimal wind disturbance. The dykes will be recontoured to flatter stable slopes to minimize the potential for erosion.

A permanent spillway will be constructed through the dyke capable of discharging all snowmelt and rainwater. Where necessary, solids adjacent to the dykes will be recontoured to prevent water from ponding against the dyke shoulders.

Treatment of snowmelt and rain water impounded in the containment area will continue until the untreated effluent consistently meets the current licence requirements.

MILL SITE

Work Completed to Date

Buildings

To date all the buildings owned by Pine Point Mines have been removed from the mill site area.

Land

1. **Ore Stockpile Pads**
   Reclamation of the ore stockpile pads was finalized prior to the completion of milling in 1988.

2. **Concentrate Stockpile Pads**
   Approximately 25,000 tons of stockpile pad material were treated in a special milling circuit established in Pine Point during the summer of 1990. The sulphides recovered in the treatment process were shipped for further treatment outside the Northwest Territories. The coarse portion of the pads and the non-sulphide sands were disposed of in the tailings pond. All of the concentrate stockpile pads to the east and west of the mill site have now been restored.

3. **Waste Oil Storage**
   All waste oil stored on surface at the property has been burnt off, the waste oil storage area to the west of the mill site has been restored.

Work Remaining

Buildings

Final inspection of building sites is required in 1992.

Land

1. **Railway Tracks**
   The Canadian National Railway has tentative plans to remove the line between Hay River and Pine Point. The exact timing will depend on the railway receiving regulatory approval to abandon the line.

2. **External Ditching**
   The external ditch along the south dyke will be completed following the removal of the loading shed and railway trackage.

N-32 DUMP

Work Completed to Date

The N-32 dump was in active use until October 1991 and, as such, no restoration work has been carried out.

Work Remaining

Following completion of building site clean-up, the material in the N-32 dump will be buried with a layer of fill and access to the dump site blocked by an earth berm.

TAILINGS CONTAINMENT AREA

Concerns related to the abandonment of the tailings disposal area can be divided into three principle areas: surface stability, effluent quality, and long-term stability of the dykes and decant structures.

Worked Completed to Date

Surface Stability

1. **Monitoring**
   Monitoring programs were in place from 1987 through 1989 to gather information concerning the impact of wind-blown tailings and to collect data on wind speed, precipitation and temperature on the pond surface.

   Studies were carried out over a number of years to investigate the feasibility of stabilizing the pond surface through revegetation. Intensive work in 1987 and 1988 determined that this would not be a feasible alternative.

2. **Covering**
   During the summers of 1990 and 1991 a total of 1250 acres, or approximately 86 percent of the pond, was covered with a layer of coarse gravel. The main pond area has been covered, and the cover has been effective in stabilizing the surface and preventing dust pluming, see Figure 2 and Figure 4.

Effluent Quality

Prior to the completion of milling in 1988, it was envisaged that the quality of impounded snowmelt and rainfall would be adequate to allow untreated discharge by the summer of 1990. Subsequent experience and research have confirmed that effluent quality will be a concern for some time. In-pond treatment and discharge of pond water was carried out successfully in 1990. In-pond treatment was also successful in 1991, however, discharge was by pump and flow turbulence near the pump intake resulted in entrainment of fine solids and elevated copper analysis for a three-day period. Zinc content of the discharge water was within licence limits.

1. **Nature of Problem**
   The principal problem is the amount of zinc in the impounded water. The source of the zinc is believed to be residual dissolved material created in the acid leach circuit that was used to treat the zinc concentrate while the mill was in operation.

2. **Research**
   Column leach tests have indicated that zinc may continue to be flushed from the tailings mass by snowmelt and rainfall for several more years. This flushing will be monitored by water sampling within the pond.

3. **Treatment**
Testwork was carried out in 1990 to develop a treatment process for the impounded water. The process developed used sodium hydroxide to form metal hydroxides which are then allowed to settle out of the water. This process was abandoned due to the high physical risks associated with using concentrated caustic soda.

4. **Acid Generation**
Testwork was carried out in 1988 to determine the potential for acid generation in the tailings pond. As expected the carbonate material which makes up the bulk of the solids in the pond provides a very high neutralization potential and acid generation will not be a problem.

Dyke Stability

Short-term stability of the tailings dykes has been assured through geotechnical inspections and the repair of some minor surface erosion. No final abandonment work can be carried out on the dykes until the water quality issue is resolved.

Work Remaining

Surface Stability

1. **Covering of Ponds**
Areas of the pond adjacent to the north dyke where water pools prior to discharge will not be covered until just prior to the final abandonment of the pond. This area will require a thicker layer of cover at that time to bury the metal precipitates formed during the water treatment process.

The placement of additional cover adjacent to the other dykes will be dependent on ground conditions and the extent of any dusting problems in those areas.

2. **Monitoring**
The dustfall monitoring program has been stopped given the apparent effectiveness of the gravel cover in reducing dust migration problems from the pond.

Effluent Quality

1. **Treatment**

Treatment of impounded snowmelt and rainfall prior to discharge will continue until the quality of the untreated water consistently meets the requirements of the Water Licence.

At this time it is not clear how long treatment will be required but a ten-year time frame is probably not unreasonable.

The continuous treatment polishing pond in the north-east corner of the main pond remains available for use. The pond could be used to treat the water using hydrated lime.

Lime treatment was used successfully for many years. While under current conditions it would be a logistically more difficult and more expensive approach than an in-pond batch treatment process, it remains as a viable alternative.

2. **Monitoring and Research**

The two piezometers in place near the north dyke to monitor pore water quality in the tailings mass did not survive the past winter.

Cominco believes that the best long-term approach to the issue of soluble zinc is to allow rain and snowmelt to flush the material from the tailings mass. Cominco recognizes that a number of years will be required to achieve adequate flushing and will ensure that adequate treatment and water discharge is done on a periodic basis.

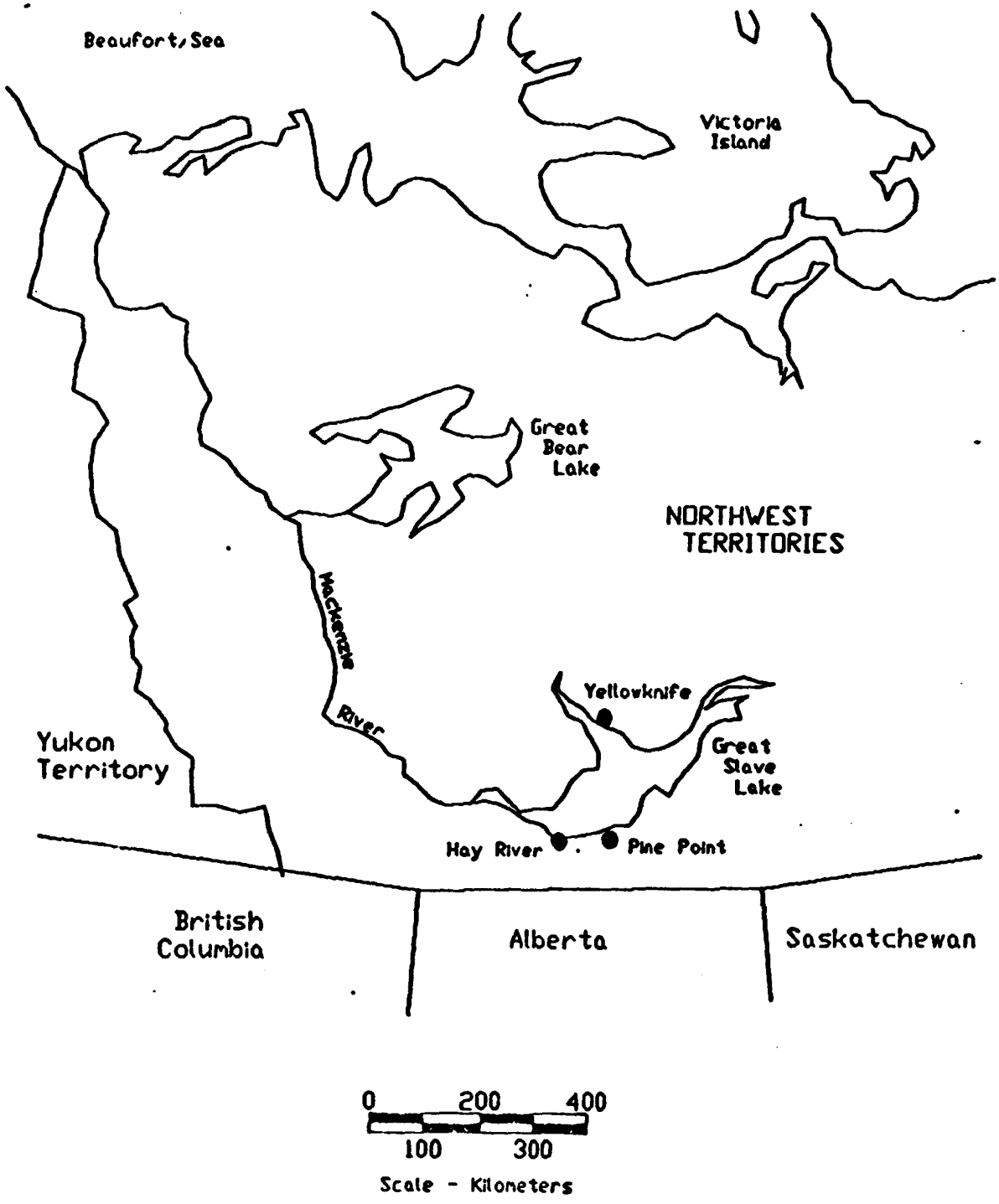
Soluble zinc migration from the tailings mass will be reflected in the level of zinc in the ponded water in the north end of the tailings pond.

Dyke and Decant Stability

1. **Final Decant Structure**

Prior to the final abandonment of the tailings pond, a permanent spillway will be constructed through the north dyke to allow rainwater and snowmelt to escape from the pond. The final spillway and approaches will be designed to

FIGURE 1
LOCATION OF SITE



ensure that water does not pond against the dykes and that the spillway is capable of handling major flood events.

A geotechnical firm, experienced in pond abandonment, will be retained to design the spillway and approaches. It will be a number of years before the spillway is constructed, however, Cominco intends to have the design work completed and the plans submitted to the Water Board for review at an appropriate future date.

2. **Recontouring of Dykes**
During normal operation, dykes were constructed with a 1.5 to 1.0 upstream slope and a 2.0 to 1.0 downstream slope. In addition, crest widths were maintained between four and six meters to handle large equipment traffic.

Prior to final abandonment, Cominco proposes to ensure long-term stability through reduced slope erosion by recontouring the dykes to provide maximum slopes of 3.0 to 1.0. To achieve this, the dykes will be recontoured such that the crests are cut down to a minimum of 0.5 meters from the tailings surface. Although this is below the licence requirement of 1.0 meters of freeboard, it must be recognized that this minimum freeboard is only required under normal operating conditions.

In addition, contouring the dykes will enhance the prospects of revegetation which would further increase the long-term stability.

Geotechnical consultants will be retained to confirm the feasibility of this approach.

3. **Pre-abandonment Monitoring**
Prior to final abandonment, stability of the dykes will be assured through periodic inspections during the summer months and biannual geotechnical inspections as required by the Water Licence.

Tailings Trestle

The steel tailings trestle and wood stave pipelines were torn down and removed during the summer of 1991. The material removed was disposed of in the N-32 dump.

D. L. Johnston:jh
December 17, 1991

FIGURE 2
PINE POINT PLANT SITE AND TAILINGS POND

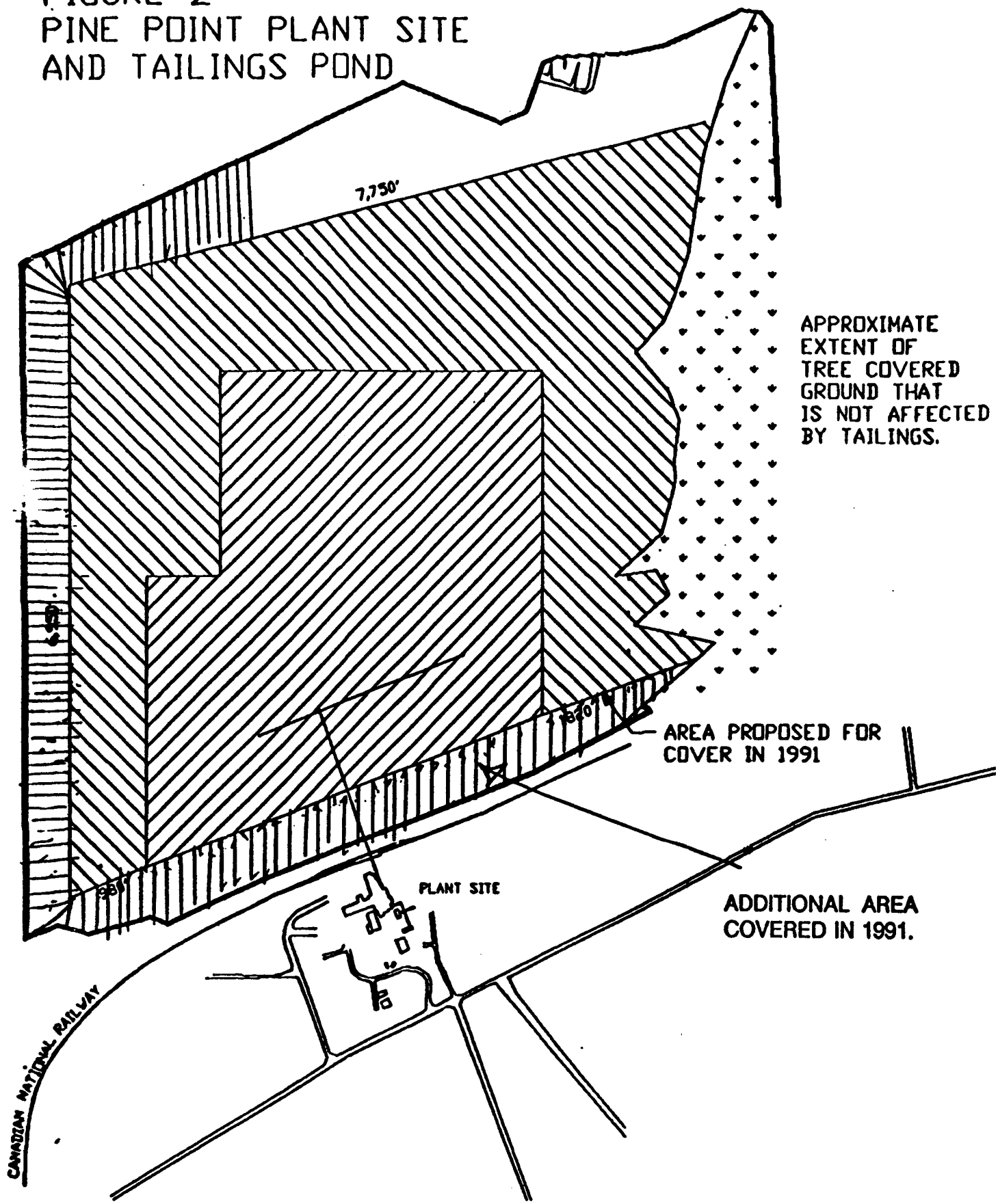


FIGURE 3
PINE POINT
PLANT SITE

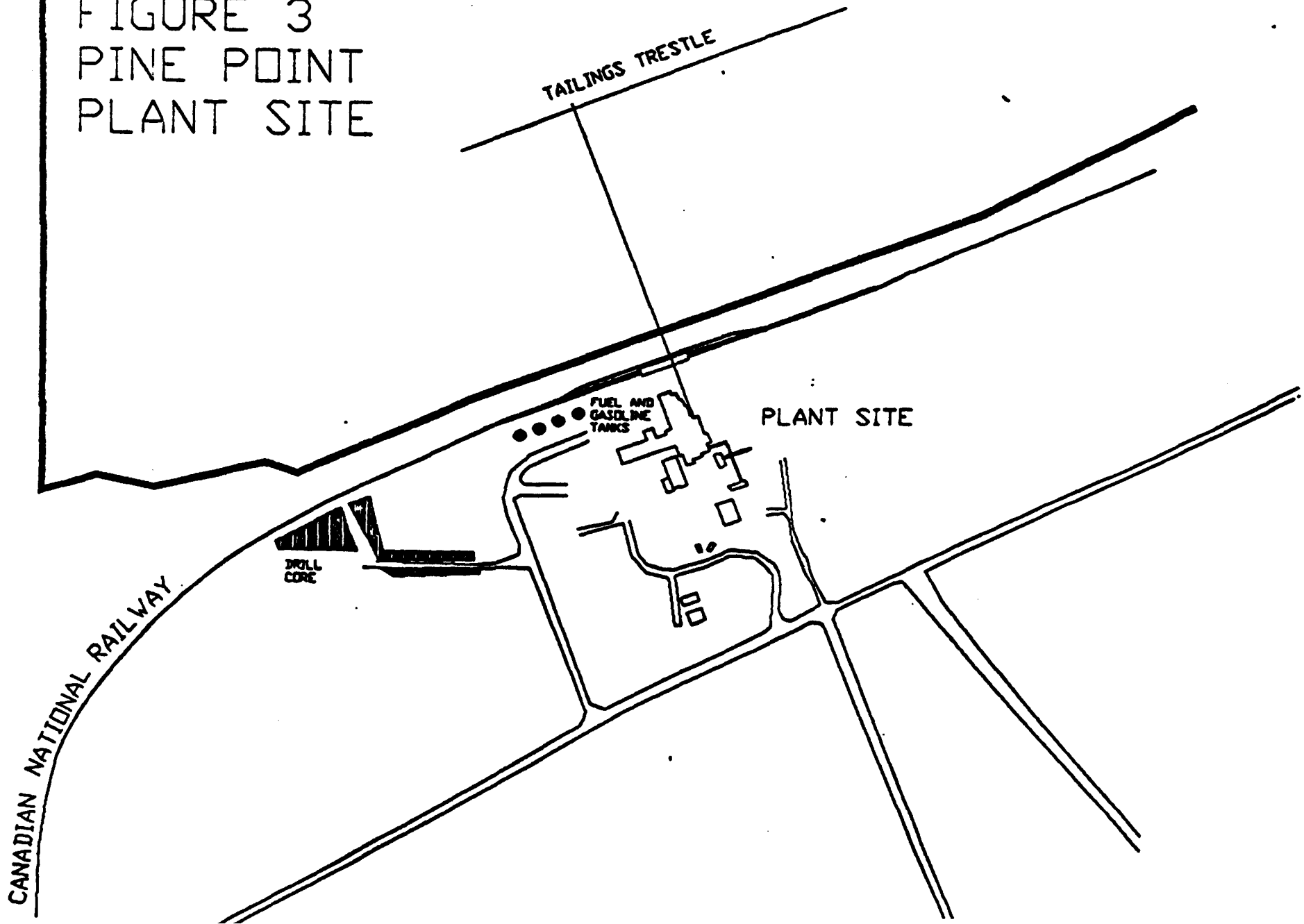


FIGURE 4
PINE POINT PLANT SITE
AND TAILINGS POND
AND BORROW PITS