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December 20, 2010

Paul Mercredi, Environmental Assessment Officer
Mackenzie Valley Environmental Impact Review Board
200 Scotia Centre
P.O. Box #938
Yellowknife, NWT
X1A 2N7

RE: Proposed Hydrometallurgical Plant Tailings Management Facility

Dear Paul,

Avalon has received the Review Boards letter issued December 17th, 2010, requesting clarification to the currently proposed tailings management facility for the Hydrometallurgical Plant. In a response issued December 20th, 2010, Avalon issued a technical review of alternative tailings management areas considered for the Thor Lake Project conducted by Knight Piesold Consulting titled "*NB10-0048-hydromet tailings plan description.pdf*".

In this report, Knight Piesold identified that Alternative #3 was the most attractive option, taking into account environmental, economic and operational factors. Alternative #3 is identified in the report as utilizing the historic N-38 open pit for placement of the hydrometallurgical tailings. The reasons for this decision are included in the Knight Piesold report including the description for tailings disposal.

Avalon will be utilizing alternative #3 as defined in Knight Piesold's report titled "*NB10-0048-hydromet tailings plan description.pdf*" and issued to the Review Board. Additional detailed information will be available with the issuance of the final Terms of Reference for incorporation into the DAR.

Thank you

A handwritten signature in blue ink, appearing to read "David Swisher", is written over a light blue horizontal line.

David Swisher
VP Operations
Avalon Rare Metals

MEMORANDUM

To:	Mr. David Swisher	Date:	November 3, 2010
Copy To:	Rick Hoos	File No.:	NB101-390/2-A.01
From:	Matthew Parfitt	Cont. No.:	NB10-00488
Re:	Thor Lake Project - Pine Point Hydrometallurgical Plant Site Tailings Review		

David:

This memo presents our review and recommendations for tailings disposal for the Pine Point Hydrometallurgical Plant Site being proposed as part of the Thor Lake Project. The information provided below is based on two site visits to Pine Point and review of available historic information. A series of select photos from the site visits is presented in Appendix A and a list of reference documents in Appendix B.

Introduction

As part of the Thor Lake Rare Earth Metals Project Nechalacho, Avalon Rare Metals Inc. (Avalon) is proposing to build a Hydrometallurgical Plant at the site of the former Pine Point Mine (previously operated by Teck Cominco Metals Ltd. (formerly Cominco Ltd.) to process the flotation concentrate from the mine located north of Great Slave Lake. The Hydrometallurgical Plant Site is located on the south shore of Great Slave Lake approximately 75 km east of the town of Hay River NWT and approximately 70 km southwest of the town of Fort Resolution on Highway 5. The project site location is shown on Figure 1.

The former Pine Point Mine areas used for mining and processing, including the former town site area, were reclaimed by industry and government after closure of the mine in 1988 with the majority of the surface leases surrendered back to the Crown in the mid to late 1990's. Currently only one surface land lease (#85/16-9-9) continues to be held by Teck Cominco Metals Ltd. This lease encompasses the historic tailings impoundment area which is still managed by Teck Cominco. There are also mining claims held by Tamerlane Ventures located to the south of the historic tailings impoundment area as shown on Figure 2.

The existing site continues to be serviced by a Northwest Territories Power Corporation substation and line power from the Talston Dam. In addition, the site is directly accessible via Territorial Highway 5, which is classified as an all-weather highway with no load restrictions by the GNWT Department of Transportation. The highway also connects directly to the Canadian National Railways railhead located at Hay River.

The main components of the proposed Thor Lake Project Hydrometallurgical Site are summarized as follows:

- Barge Docking Facilities - Concentrate generated from mining and flotation processing at the Nechalacho Mine will be delivered by barge and offloaded at a temporary docking facility to be constructed on the south shore of Great Slave Lake (see Photo 1) approximately 8.5 km north of the proposed Hydrometallurgical Process Plant location.
- Hydrometallurgical Process Plant - The Hydrometallurgical Process Plant will be located on a previously disturbed area as shown on Figure 3. The proposed area consists of a historic gravel

borrow area stripped of vegetation and organics as shown on Photo 2. The plant will process the flotation concentrate from the mine located north of Great Slave Lake.

- Hydrometallurgical Tailings Management Facility (HTMF) - The HTMF will be located in close proximity to the Hydrometallurgical Process Plant. Potential alternative locations for the HTMF are shown on Figure 3 and include:
 - Alternative 1 - Within footprint of historic Tek Cominco Tailings impoundment (Photo 3)
 - Alternative 2 - New facility adjacent to plant site in area not previously impacted
 - Alternative 3 - Within historic open pit(s) (Photos 4, 5 and 6)

A brief summary of the site conditions and preliminary tailings design criteria are provided below along with a discussion of the tailings disposal alternatives and recommended approach.

Site Conditions

The Hydrometallurgical Process Plant site is located within the Great Slave Lowlands Mid-Boreal Ecoregion. It is a nearly flat wetland-dominated area which is part of the Taiga Shield (Ecosystem Classification Group, 2007). The area is characterized by short, cool summers and long, cold winters. The mean annual temperature is -17.5 °C, and annual precipitation ranges from 300 to 400 mm. This ecoregion is classified as having a subhumid mid-boreal eco-climate.

Scattered patches of mixed-wood and jack pine forests rise only a few meters above a sea of patterned and horizontal fens and peat plateaus. Huge northern ribbed fens, net fens and horizontal fens occupy much of the area; linear beach ridges and other upland areas occur as islands within them and usually support mixed forests of pine, black and white spruce, trembling aspen, and balsam poplar.

The topography of the site can be described as flat to gently sloping, generally to the north. Topography around the proposed Hydrometallurgical Process Plant area typically ranges between 190 and 220 metres above sea level (mASL) and decreases to approximately 160 mASL along the south shore of Great Slave Lake.

Overburden

Overburden within the Pine Point area includes the following:

- Within the upland areas in the vicinity of the proposed Hydrometallurgical Process Plant, the depth of organics is minimal, typically less than 50 cm.
- Beach ridges (coarse-textured alluvial or wave-washed till) form prominent linear features running parallel to contour or in an east-west trend within the area of the proposed Hydrometallurgical Process Plant. The ridges mark the former extent of glacial Lake McConnell and provide a local abundant source of sand and gravel. Exposures of the sand and gravel on open pit slopes and within historic borrow pits suggest that the stratum is up to 3 to 4 metres thick (Photo 7).
- Flat lacustrine plains overlain by peatlands (poorly drained muskeg up to 3 m deep) cover much of the area north of the proposed Hydrometallurgical Process Plant area and south of Great Slave Lake. Wetlands occur throughout this area.
- A basal glacial till deposit typically underlies the beach and organic deposits. The till stratum is exposed in historic open pit walls around the site and ranges from a few meters in depth to upwards of 30 to 40 m (Photos 8, 9 and 10). Based on site visit observations, the till stratum appears to be

relatively homogeneous consisting of a compact to dense clayey sand and silt with some gravel and small boulders. Historic testing (Knight and Piésold Ltd, 1984) indicates that the till in the Pine Point area is well graded and consists of approximately 13 percent gravel, 27 percent sand, 40 percent silt and 20 percent clay.

Bedrock

The bedrock geology of the Pine Point area has been studied extensively due to past mining activities. Generally the stratigraphy includes sedimentary rocks overlying a west dipping surface or Precambrian igneous and metamorphic rocks. On a regional scale, the Pine Point area lies within the interior platform between the Precambrian shield to the east and foothills of the western Cordillera to the west. A generalized regional geology plan is shown on Figure 4. The Pine Point Zn-Pb ore deposits are located within the Presqu'île barrier reef complex consisting of Devonian carbonates which separates the Mackenzie basin made up of shales and limestones to the north and the Elk Point basin made up of evaporites and carbonates to the south. A summary of stratigraphic nomenclature used for the Presqu'île barrier reef complex produced by Rhodes et al, 1984 is shown on Figure 5.

The barrier reef complex is about 10 km wide and 200 m in thickness in the Pine Point area and outcrops under overburden to the eastern portion of the Pine Point area dipping at a shallow angle of about 1.9 m per km to the west. A geological plan for the Pine Point area is shown on Figure 6. Simplified geological sections for the area are shown on Figure 7. The barrier reef complex includes the Sulphur Point formation (limestone/dolostone) and Pine Point (or Upper Keg) formation (dolostone) which are the principle hosts of the Zn-Pb mineralization. Some interpretations include a Presqu'île formation at the top of the Pine Point formation which is described as a coarse crystalline dolomite (Photos 11 and 12). The mineralization within the barrier reef complex is cited to be due to karstification of the host rocks as the ore bodies are pervasive within interconnected paleokarst networks. Tabular karst is the most common solution network which occurs along a crude stratabound horizon that coincides with the base of the Presqu'île dolomite.

Permafrost

The Hydrometallurgical Plant site is located near the north boundary of the sporadic discontinuous permafrost zone as shown on Figure 8. It has been reported that there is no permafrost in the vicinity of the site. Observations during the site visit suggest that there is no evidence of permafrost within the upland areas around the Tek Cominco tailings impoundment, N-38 pit or proposed process plant site. However there are large differential settlements on historic haul roads (Photo 13) located to the northwest within lower elevations. These settlements indicate that there is likely discontinuous permafrost within low lying, poorly drained areas.

Hydrogeology

The hydrogeology for the Pine Point region has been previously studied by Geologic Testing Consultants (GTC, 1983) and Stevenson International Groundwater Consultants (Stevenson, 1984). The following hydrogeology description is largely based on this work.

Regional Hydrogeology

On a regional scale, groundwater flow is believed to originate in topographic highs (recharge area) such as the Caribou Mountains located 200 km south of the Pine Point area as shown on Figure 9. The Caribou Mountains rise approximately 600 m above the surrounding land surface and groundwater flow is more or less radially distributed. Stevenson (1984) has postulated that a perched groundwater flow

system exists within the Caribou Mountain uplands which recharges the lower Slave Point formation. Due to geologic conditions, most of the groundwater is thought to discharge to the Hay River valley to the northwest and the Little Buffalo River and Slave River valleys to the northeast. A smaller portion is thought to flow north to Great Slave Lake.

The area surrounding Great Slave Lake represents a lowland and is considered a major groundwater discharge area. Other areas of regional discharge are the Hay River, Buffalo River, Little Buffalo River and Slave River. Groundwater discharge is evident as sulphurous springs and as areas of high specific conductance in rivers. Springs discharging mineralized groundwater have been observed along the south shore of Great Slave Lake at High Point, Sulphur Point and Windy Point. Springs have also been observed at the mouth of Salt River and at the base of the Little Buffalo River Formation escarpment. High specific conductance readings have also been observed along Slave River, Salt River, Little Buffalo River, Buffalo River and along Great Slave Lake between Fish Point and Presqu'île Pont. Groundwater discharge is also evident through the presence of swampy areas and sulphurous springs throughout the northern sections of the Pine Point area. Sulphurous springs documented along tributaries of the Buffalo River within the Pine Point Area by EBA in 2005 are shown Photos 14, 15 and 16.

Site Hydrogeology

Local groundwater recharge to the bedrock aquifer at the Pine Point site is likely to be variable and largely controlled by the overburden geology. High rates of recharge are expected in areas where sinkholes are present, but in general recharge will be limited by the presence of till overburden. Several small ponds were observed in boggy areas that were several meters above the regional water table, indicating that recharge is relatively slow through the till. Local surface water / groundwater flows through the till, then downwards through fractured bedrock towards the water table. Several seepage points observed in pit walls indicate that there is some lateral flow within the unsaturated bedrock. Photos 17 and 18 show stains along the north wall of the N-33 Pit due to groundwater seepage occurring along bedding planes within the dolomite. This seepage is thought to be due to local infiltration being directed horizontally along bedding planes. The staining indicates that the local seepage is highly mineralised and sulphurous.

The bedrock units that represent the most productive aquifers are the Presqu'île formation and the Pine Point formation. A simplified stratigraphy relating geology to hydrogeology (for the A-70 Pit area to the northwest portion Pine Point area) developed by Vogwill (1976) is shown on Figure 10. As shown, the Presqu'île and Pine Point formations form the main aquifer consisting of highly porous, well fractured dolomite, and groundwater within the saturated bedrock is expected to flow along solution channels, bedding planes and fractured zones. According to Stevenson (1984), the aquifer is laterally confined by the Buffalo River shales to the north and the Muskeg evaporites to the south as shown Section 2 of Figure 7. Overlying clay till overburden and Watt Mountain limestones of generally low permeability act to confine the aquifer on top while the Chinchaca formation evaporites underlying the Pine Point and Keg River formations form an effective vertical barrier below the aquifer. The hydraulic continuity is thought to be more predominant along the northeast-southwest trend of the barrier reef complex due to karstification, solution channelling and jointing characteristics (GTC, 1983).

The permeability of the Presqu'île aquifer formation is very high with transmissivities in the order of $1 \times 10^{-2} \text{ m}^2/\text{s}$ (GTC, 1983). Based on work completed by Stevenson (1984), the groundwater gradient in the Pine Point area is generally northwards towards Great Slave Lake while to the south of the Pine Point area, the groundwater gradient trends from west to east as shown on Figure 11. Local gradients range from about 0.4 percent northwards along the north part of the area and about 0.25 percent westward along the south portion. Interpretation of the groundwater gradient contours in relation to the topography

indicates that the groundwater level is up to 30 m below the surface along the northeastward trending ridge in the east-central part of the site. In the northwest portion of the site (Figure 11), the piezometric surface is higher than the ground surface. High piezometric levels have resulted in groundwater discharge as springs (Photo 14) along the incised Buffalo River channel and other small tributary channels in the area.

Although the Presqu'île aquifer has a high permeability, the flow through it is thought to be slow due to the low gradient in the Pine Point area. Based on a preliminary calculation taking into account the documented transmissivity values, gradients and geological sections, the flow velocity is estimated to be less than 1 m per day. Due to the high porosity, the storativity of the aquifer is quite high. It is estimated that about 1 billion m³ of water was removed during mining activities from 1968 to 1984. According to Stevenson (1984), this water came from water stored within the aquifer (16%), recharge from local precipitation (76%), with the remainder from the regional groundwater flow.

Tailings Characteristics

Although testing is underway, to date there are no physical or chemical testing results available for the Hydrometallurgical tailings stream. Based on testing results for the concentrate and the proposed process, the preliminary characteristics assumed for the Hydrometallurgical tailings are outlined below:

- The tailings solids from the proposed process will be predominantly gypsum (approx. 84%) which are expected to be similar to phosphogypsum tailings in terms of void ratio, dry density and consolidation properties. The following physical characteristics are anticipated;
 - A specific gravity for the tailings solids high in gypsum content has been assumed at 2.40 (Vick, 1990)
 - Based on an assumed final solids content of approximately 65% by weight and a void ratio of 1.3 (Vick, 1990) the assumed final average settled dry density for the tailings is 0.9 t/m³
 - In general terms the settled tailings is anticipated to be a soft paste like material with relatively low shear strength / bearing capacity and a relatively low permeability
 - Due to the deposition environment (northern climate), air drying will be limited and consolidation of the tailings mass will be dependent on drainage conditions and material permeability
- From a geochemical point of view the tailings will be a fully neutralized material (by the addition of limestone) and it is expected that there will not be any regulatory exceedances of significant amounts of leachable metals based on testing of the concentrate completed to date.

Both physical and geochemical tailings test work will be completed as soon as Hydrometallurgical tailings samples are available to confirm the tailings parameters.

Tailings Disposal Alternatives

As noted previously there are three alternative locations for tailings disposal at Pine Point. The potential alternatives are discussed below and shown on Figure 3.

Alternative 1 - Teck Cominco Tailings Impoundment

For the pre-feasibility study it was proposed to place the HTMF on or within the historic Cominco Tailings Impoundment. The proposed layout included a lined facility constructed over part of the existing tailings beach. Other possibilities considered for use of the Cominco Tailings Impoundment involve raising the perimeter dams and utilizing the entire area for the HTMF. This approach was based on trying to make

use of an existing brownfields site so as to minimize additional impacts to the area. Subsequent to visiting the site in June, 2010 and conducting a brief inspection of the Cominco Tailings it is not recommended that the HTMF be placed at this location for the following reasons:

- The entire Cominco Tailings Impoundment has been reclaimed by placing a sand and gravel layer over the tailings and allowing it to self vegetate (Photo 3). Establishing a new facility on it will disturb the existing reclamation.
- The existing dykes around the Cominco Tailings Impoundment are quite high and steep (Photo 3) and any additional loading or raising would need to be confirmed through significant geotechnical investigations
- It would be difficult to establish individual responsibilities for environmental liabilities between the historic Cominco tailings and a newly constructed HTMF

Alternative 2 - New Facility Adjacent to Process Plant Site

A second alternative for the HTMF is to establish a new facility adjacent to the Process Plant Site as shown on Figure 3. This would require clearing of a large area and construction of significant embankments and associated water management facilities. This would create a new impact to the Pine Point Area and leave long-term dams or embankments in place. The cost of constructing the dams will also be significant due to the relatively flat terrain. Although such a facility would be designed and constructed taking into account up to date best practice engineering and environmental techniques, it will add an impact to the site and represent a long-term (minimal) risk.

Alternative 3 - Place Tailings in Historic Open Pit(s)

The alternative to place the Hydrometallurgical tailings within historic open pit(s) was identified as a result of the site visit conducted in June, 2010. cursory review of the site conditions and subsequent review of background information for the site, and other projects implementing pit disposal of tailings, indicates that this alternative has merit from a technical and environmental point of view. Use of one or more of the historic open pits in the area for tailings disposal offers the following advantages:

- Construction of dams and associated impacts related to site disturbance for fill placement, borrow excavations and tailings placement in undisturbed areas can be minimized
- Filing of one or more historic pits with tailings and use of previously stripped materials for capping and reclamation will help to restore these areas back to pre-development conditions
- Risks associated with building dams to contain low strength tailings and process waters can be avoided
- Earthworks costs related to dam construction can be minimized

The concept of placing tailings within one or more of the historic open pit(s) will require consideration of potential groundwater impacts. Due to the location of the open pits within the high permeability Presqu'île aquifer, it is likely that all or most of the released tailings pore water will infiltrate into the aquifer unless a barrier layer is placed around the tailings. At this stage of the project, it is proposed that a barrier layer will not be required for the following reasons:

- Testing of concentrate from the Nechalacho Flotation process indicates that there will be no significant leachable contaminants or metals
- The hydrometallurgical tailings stream will be fully neutralized and pore water that is released from the slurry will be neutral and is expected to be of generally good quality

- The water quality from the Presqu'île aquifer is typically sulphurous and saline and as such is not recognized as a valuable groundwater resource for human or wildlife consumption
- The volume of tailings pore water that will be added to the Presqu'île aquifer will likely be a small fraction of the volume within the aquifer and is expected to have very minimal impact to existing groundwater flow, volume or quality

Tailings Disposal Concept

Following consideration of the above alternatives, it was decided that placing the HTMF tailings within historic open pit(s) (Alternative 3) is the most attractive option, taking into account environmental, economic and operational factors.

Based on a review of available open pits in close proximity to the Process Plant Site, the N-38 Pit was selected as the best option. The N-38 pit is located approximately 2.5 km south of the proposed Hydrometallurgical Process Plant site at Pine Point as shown on Figure 12. The N-38 Pit is located within the Presqu'île Dolostone of the Sulphur Point formation. The N-38 pit was developed to mine a normal prismatic ore body approximately 250 m long and 150 m wide. The total ore extracted from the N-38 pit was approximately 1.2 million tonnes grading 4.9% lead and 7.4% zinc resulting in approximately 58,000 tonnes of lead and 87,500 tonnes of zinc being produced. Based on an estimated area of 25 Ha and anticipated depth of 20 to 25 m the available volume of the N-38 pit is roughly 5 million cubic metres which is similar to the solids storage capacity estimated for the Pre-feasibility Study.

An inspection of the N-38 Pit completed on September 10 and 11, 2010 indicates that the pit bottom is generally above the water table (Photo 4). There are 4 relatively small low areas where water is present within the pit. There is also quite a large amount of waste rock piled in the bottom of the pit (Photo 4), likely placed during later operations. The pit is also surrounded with waste piles of till, waste rock and some organics as well (Photo 5). The development concept of using the N-38 pit for Hydrometallurgical tailings disposal is described in the following points:

- Preparation of the pit for tailings disposal will involve the following items:
 - Existing waste rock within the bottom of the pit will be used to re-grade the bottom of the pit so that all areas are above the aquifer water table. This will ensure that the deposited tailings are not in direct contact with aquifer water and that tailings are deposited within a dry basin to promote drainage and consolidation of the solids.
 - A perimeter road will be constructed around the edge of the pit to allow tailings to be strategically discharged to form an initial layer as quickly as possible over the bottom of the pit. Once the initial layer is formed, the discharge can be managed to maintain a central pond, if appropriate, for water management.
- During ongoing operations, it is proposed that excess water accumulation within the pit be pumped to an adjacent pit (N-33 Pit in Photo 6) for discharge and infiltration within the Presqu'île aquifer. A preliminary water balance flow sheet is shown on Figure 13. The water balance assumes there will be insignificant seepage through the tailings into the surrounding N-38 pit once enough tailings is placed to contain the water.
- Monitoring of water quality will be conducted in the following manner:
 - Samples of slurry will be taken at the plant discharge and both the solids and pore water will be tested for parameters of interest
 - Groundwater monitoring wells will be established around the pit and used for determination of baseline water quality as well as ongoing monitoring
 - Once a water pond starts to form within the pit, additional water samples can be taken to be tested for parameters of interest

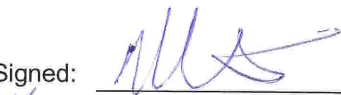
- Once the pit has been filled to capacity with tailings solids, the following closure concept is proposed:
 - The tailings discharge will be managed to create a final tailings surface that will allow all excess water and runoff to be removed
 - Following an initial period of time to allow drying of the tailings surface and consolidation, a layer of local waste rock will be placed (likely in the winter) to provide a structural support layer
 - A capping or shedding layer of local till will be placed over the waste rock layer to minimize infiltration
 - Locally available organic material will be placed over the till layer and the surface will be vegetated with species that will establish quickly to minimize erosion. In the long-term other endemic species will be applied based on proposed final land use.

Summary


A summary of site conditions at Pine Point and alternatives for tailings disposal for the Hydrometallurgical process plant has been presented. Based on review of the site conditions and alternatives for tailings disposal, the recommended concept involves placing tailings within the N-38 pit south of the plant site. This approach for tailings disposal is deemed advantageous for both economic and environmental reasons as it minimizes construction costs, additional impacts and allows for reclamation of previously impacted areas from previous mining operations. Additional work including topographical site mapping, hydrogeological site investigations and testing of the Hydrometallurgical tailings will allow the concept to be refined to a feasibility level design.

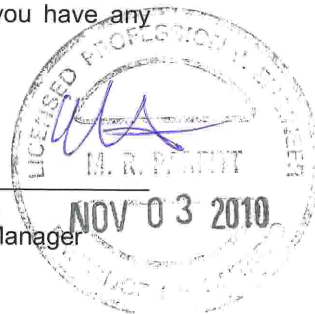
We trust that this provides you with the information you require at this time. Should you have any questions or comments, feel free to contact us.

Signed:


Jordin Barclay
Project Hydrogeologist

Approved:


Matthew R. Parfitt, P.Eng.
Senior Engineer/Project Manager



Attachments:

Figure 1 Rev 0	Pine Point Area - Site Location
Figure 2 Rev 0	Pine Point Area - Existing Site Plan
Figure 3 Rev 0	Pine Point Area - Hydrometallurgical Tailings Management Facility Alternatives
Figure 4 Rev 0	Pine Point Area - Simplified Devonian Geology of Northwestern Canada
Figure 5 Rev 0	Pine Point Area - Summary of Stereographic Nomenclature
Figure 6 Rev 0	Pine Point Area - Geological Plan
Figure 7 Rev 0	Pine Point Area - Simplified Geological Cross-Sections
Figure 8 Rev 0	Pine Point Area - Permafrost Distribution in Canada
Figure 9 Rev 0	Pine Point Area - Regional Plan Hydrogeology
Figure 10 Rev 0	Pine Point Area - Geologic and Hydrogeological Stratigraphy of the Presqu'île Barrier Reef Complex at the A-70 Pit Area
Figure 11 Rev 0	Pine Point Area - Groundwater Gradient Plan
Figure 12 Rev 0	Pine Point Area - Hydrometallurgical Site - General Arrangement
Figure 13 Rev 0	Pine Point Area - Preliminary Water Balance Flow Sheet
Appendix A	Photos
Appendix B	List of References

/mrp



NTS



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NOTES:

1. IMAGERY FROM NASA WORLD WIND.

AVALON RARE METALS INC.

THOR LAKE PROJECT

PINE POINT AREA
SITE LOCATION

Knight Piésold
CONSULTING

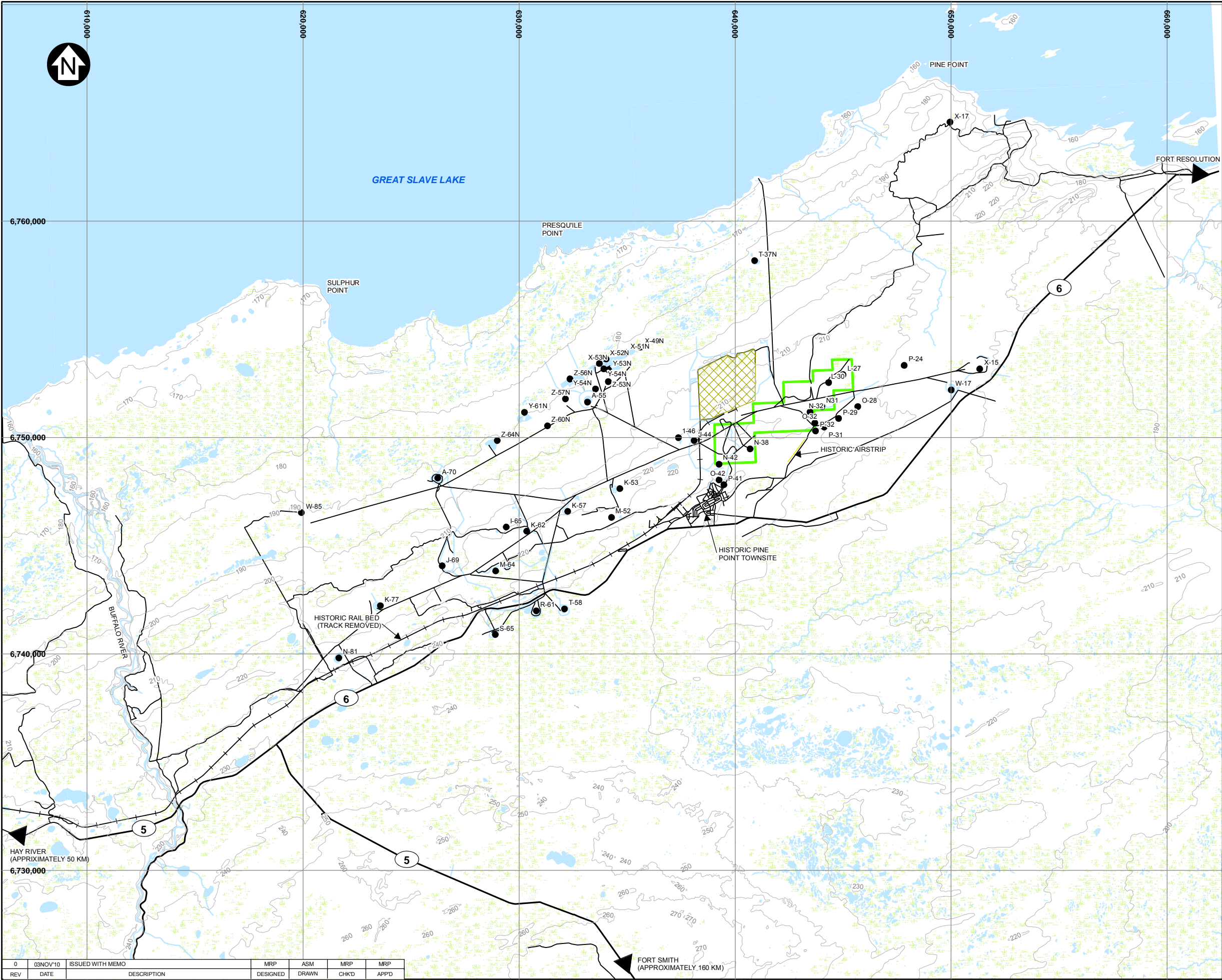
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NB10-00488

FIGURE 1

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LEGEND:

- HISTORIC OPEN PIT
- 6 TERRITORIAL HIGHWAY
- ROAD
- RAIL BED (TRACK REMOVED)
- CONTOUR
- RIVER/STREAM/DRAINAGE
- WATER
- WETLAND
- TAILINGS AREA
- TAMERLANE CLAIM BOUNDARY
- TECK COMINCO LEASE BOUNDARY
- HISTORIC COMINCO TAILINGS

LEGEND:

1. BASE MAP 1:50,000 © HER MAJESTY THE QUEEN IN RIGHTS OF CANADA
DEPARTMENT OF NATURAL RESOURCES (2009.) ALL RIGHTS RESERVED.
2. CO-ORDINATE GRID IS IN METRES.
DATUM: NAD83
PROJECTION: UTM ZONE 11 N
3. CONTOUR INTERVAL IS 10 METRES.



AVALON RARE METALS INC.

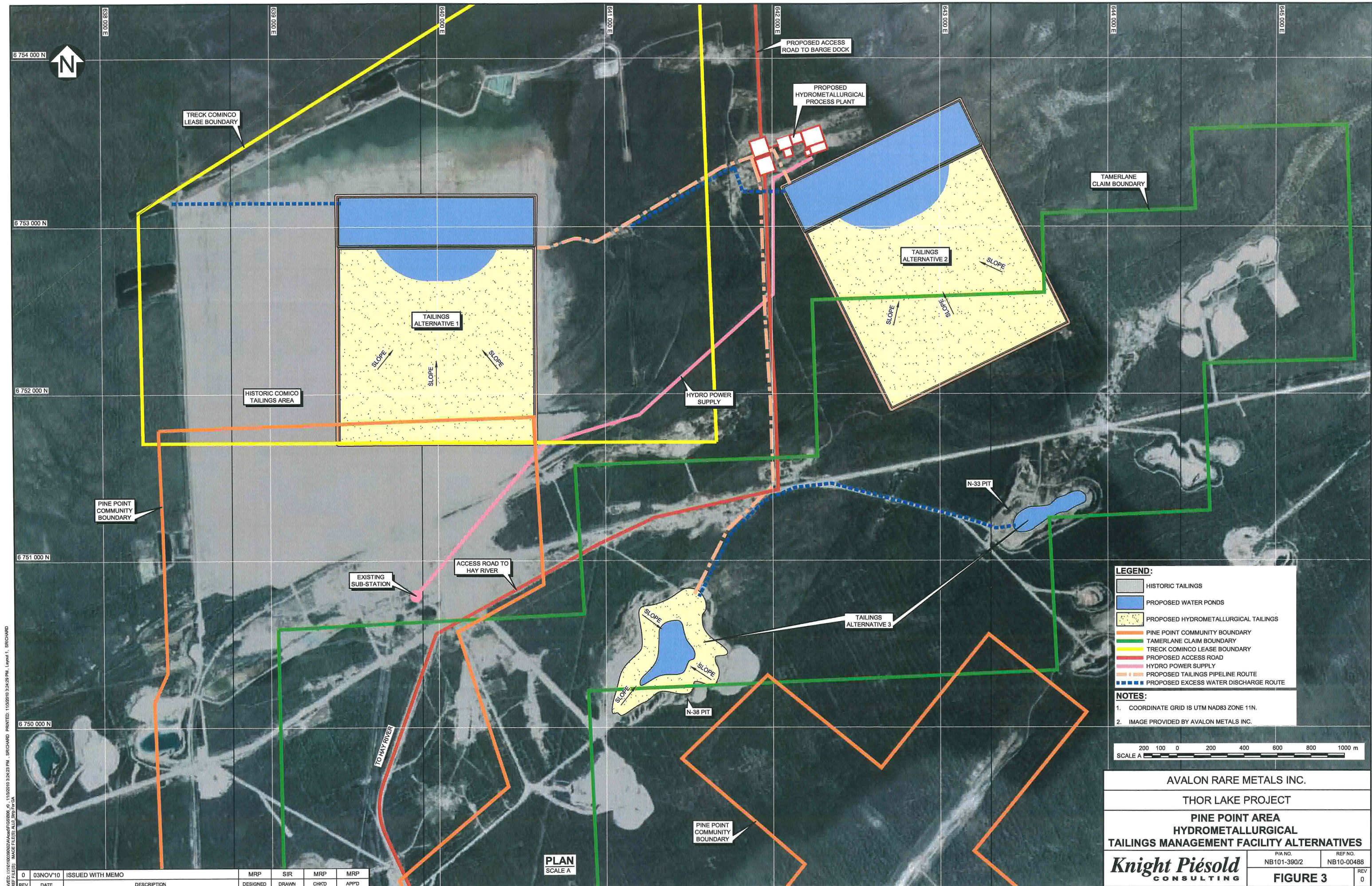
THOR LAKE PROJECT

PINE POINT AREA
EXISTING SITE PLAN

Knight Piésold CONSULTING	PIA NO. NB101-390/2	REF NO. NB10-00488
	FIGURE 2	

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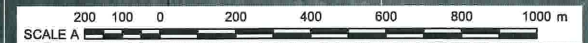
PLAN
SCALE A

LEGEND:

- HISTORIC TAILINGS
- PROPOSED WATER PONDS
- PROPOSED HYDROMETALLURGICAL TAILINGS
- PINE POINT COMMUNITY BOUNDARY
- TAMERLANE CLAIM BOUNDARY
- TRECK COMINCO LEASE BOUNDARY
- PROPOSED ACCESS ROAD
- HYDRO POWER SUPPLY
- PROPOSED TAILINGS PIPELINE ROUTE
- PROPOSED EXCESS WATER DISCHARGE ROUTE

NOTES:

- COORDINATE GRID IS UTM NAD83 ZONE 11N.
- IMAGE PROVIDED BY AVALON METALS INC.



AVALON RARE METALS INC.

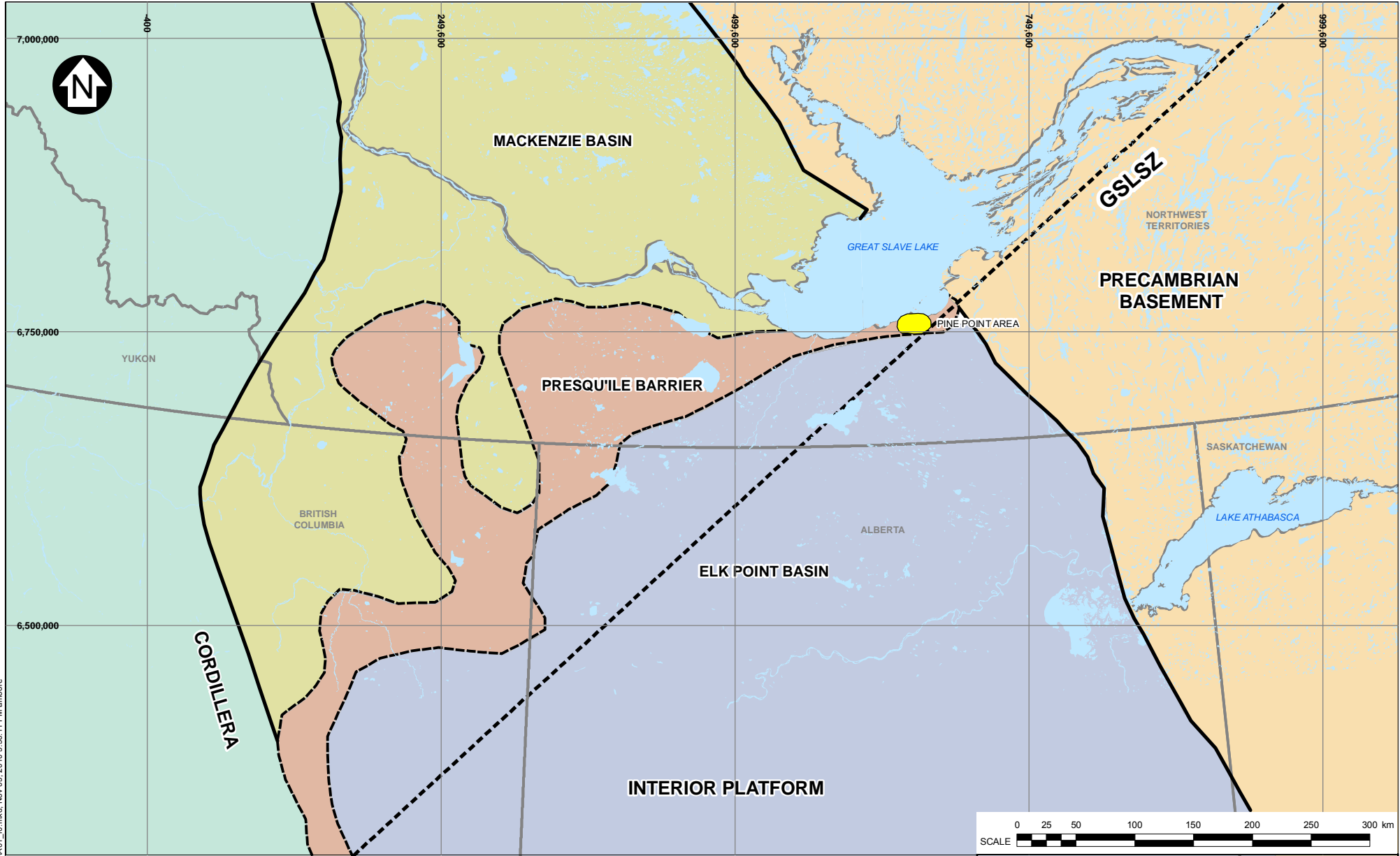
THOR LAKE PROJECT

PINE POINT AREA
HYDROMETALLURGICAL
TAILINGS MANAGEMENT FACILITY ALTERNATIVES

Knight Piésold
CONSULTING

PIA NO. NB101-390/2	REF NO. NB10-00488	REV 0
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FIGURE 3



LEGEND:

--- GREAT SLAVE LAKE SHEAR ZONE (GSLSZ)

--- STREAM/RIVER/DRAINAGE

--- WATER

--- PINE POINT AREA

--- CORDILLERA

--- PRECAMBRIAN BASEMENT

--- INTERIOR PLATFORM

--- ELK POINT BASIN

--- MACKENZIE BASIN

--- PRESQU'ILE BARRIER

NOTES:

1. ADAPTED FROM: "REGIONAL STRUCTURAL DATA FOR HAY RIVER AREA NWT WITH EMPHASIS ON PINE POINT MINING CAMP" TURNER AND GAC, FIGURE 1, 2003.

2. CO-ORDINATE GRID IS IN METRES.
DATUM: NAD83
PROJECTION: UTM ZONE 11

AVALON RARE METALS INC.

THOR LAKE PROJECT

**PINE POINT AREA
SIMPLIFIED DEVONIAN GEOLOGY OF
NORTHWESTERN CANADA**

Knight Piésold
CONSULTING

P/A NO.
NB101-390/2

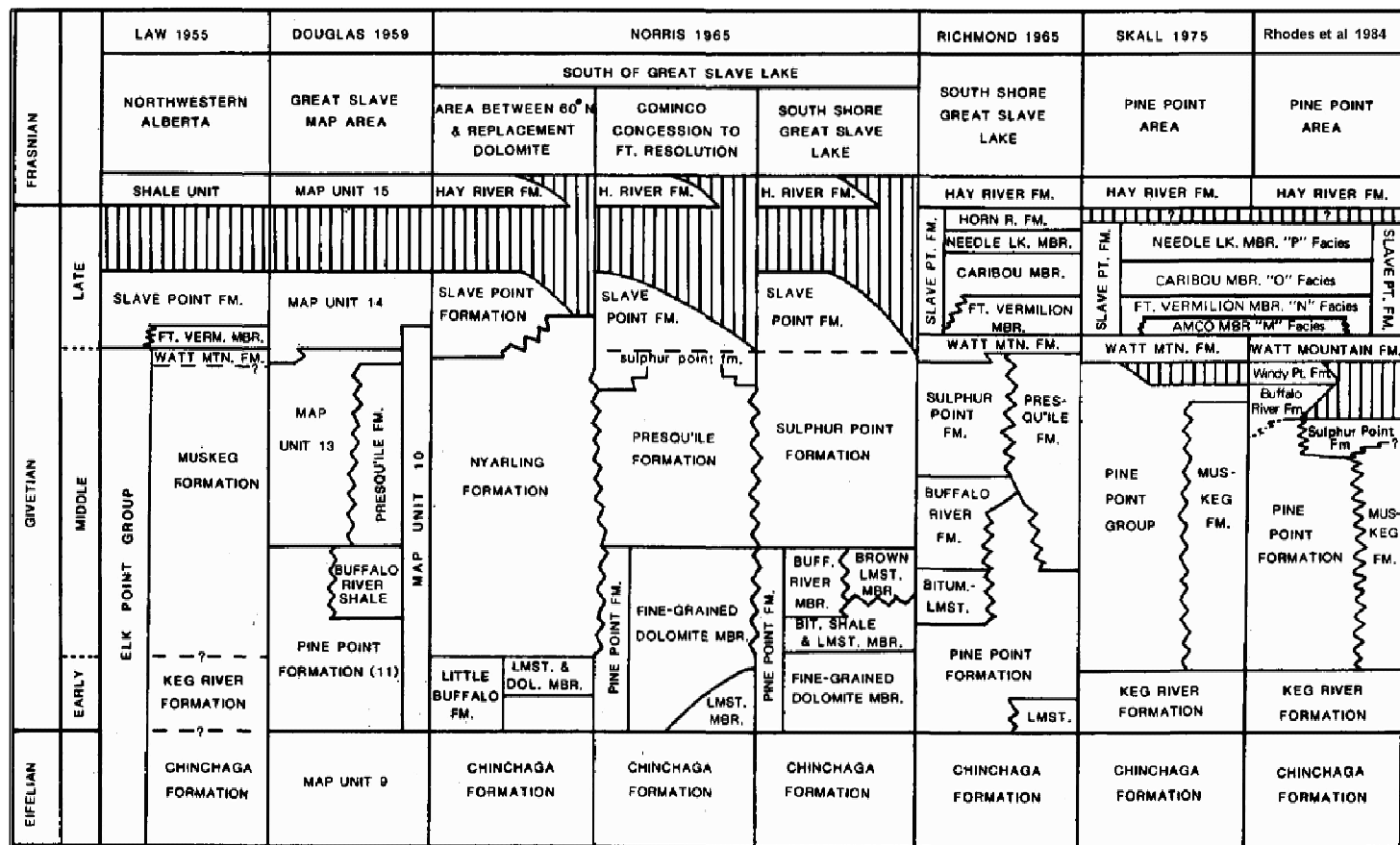
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FIGURE 4

REV
0

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REV	DATE	DESCRIPTION	MRP DESIGNED	ASM DRAWN	MRP CHKD	MRP APPD
0	03NOV10	ISSUED WITH MEMO				



NOTES:

- FIGURE BASED ON RHODES ET AL, 1984, PINE POINT ORE BODIES AND THEIR RELATIONSHIP TO THE STRATIGRAPHY, STRUCTURE, DOLOMITIZATION AND KARSTIFICATION OF THE MIDDLE DEVONIAN CARRIER COMPLEX.

AVALON RARE METALS INC.

THOR LAKE PROJECT

PINE POINT AREA SUMMARY OF STEREOGRAPHIC NOMENCLATURE

Knight Piésold
CONSULTING

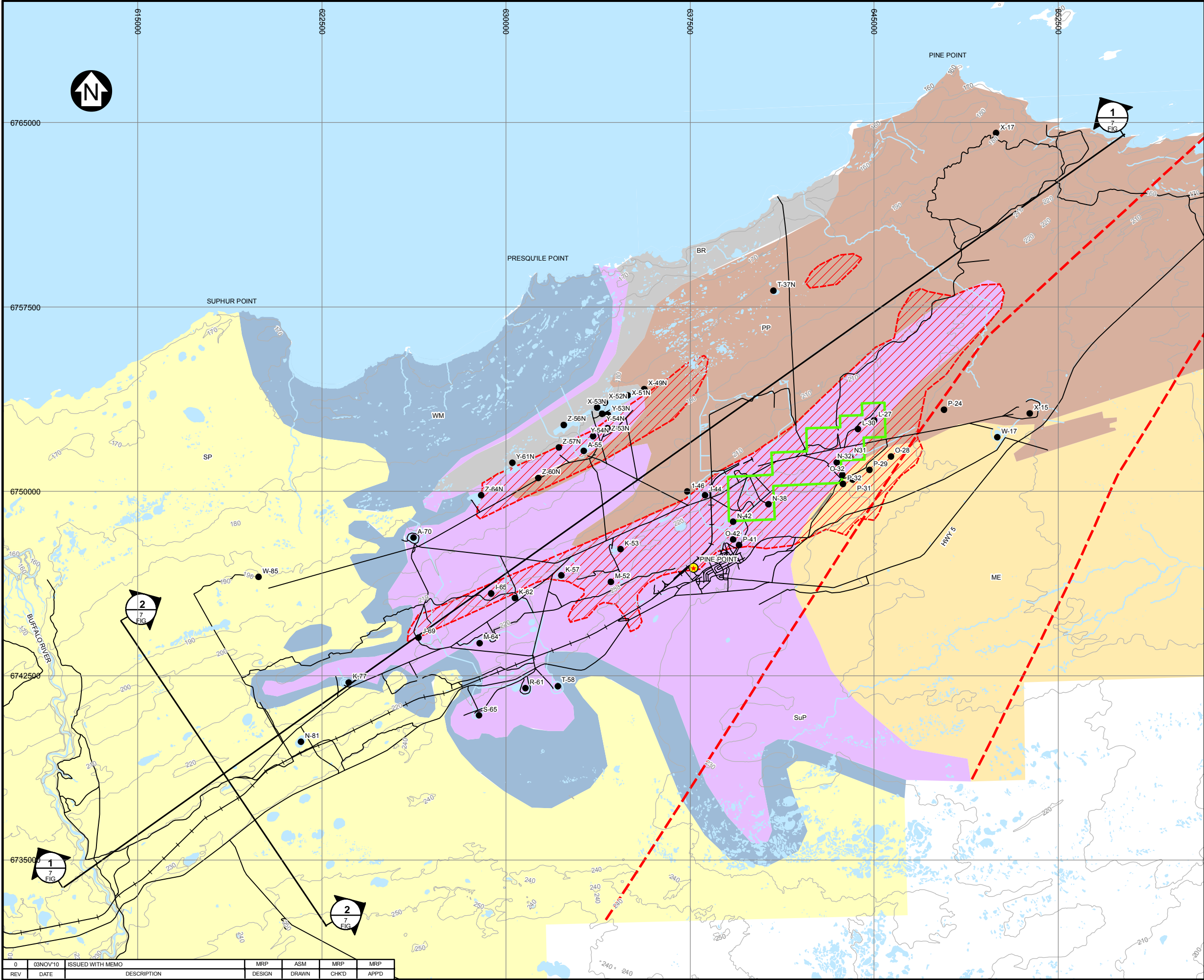
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NB101-390/2

REF NO.
NB10-00488

FIGURE 5

REV
0

0	03NOV'10	ISSUED WITH MEMO	MRP	SIR	MRP	MRP
REV	DATE	DESCRIPTION	DESIGNED	DRAWN	CHKD	APPD



LEGEND:

WATER

TAMERLANE CLAIM BOUNDARY

TECK COMINCO LEASE BOUNDARY

SP

SLAVE POINT FORMATION
DOLOMITIC AND ANHYDRITE LIMESTONE

WM

WATT MOUNTAIN FORMATION
SHALE / LIMESTONE

SuP

SULPHUR POINT FORMATION
LIMESTONE AND DOLOSTONE

Pr

PRESQU'ILE FORMATION
COARSE (VUGGY) CRYSTALLINE DOLOMITE

PP

PINE POINT FORMATION
FINE CRYSTALLINE DOLOMITE

LKR

LOWER KEG RIVER FORMATION
ARGILLACEOUS LIMESTONE / DOLOSTONE

CH

CHINCHACA FORMATION
ANHYDRITE, MINOR SILTSTONE

ME

MUSKEG EVAPORITES
GYPSUM ANHYDRITE

BR

BUFFALO RIVER FORMATION
SHALE

SUBSURFACE STRIKE-SLIP FAULT

RIVER/STREAM/DRAINAGE

ROAD

RAIL BED (TRACK REMOVED)

CONTOUR

COMMUNITY

HISTORIC OPEN PIT

- NOTES:
1. BASE MAP: © HER MAJESTY THE QUEEN IN RIGHTS OF CANADA, DEPARTMENT OF NATURAL RESOURCES (2004). ALL RIGHTS RESERVED.

2. COORDINATE GRID IS SHOWN IN UTM (NAD83) ZONE 11 AND IS IN METRES.

3. CONTOUR INTERVAL IS IN METRES. CONTOUR INTERVAL IS 10 METRES.

4. CLAIM BOUNDARIES HAVE BEEN DIGITIZED AT A 1:50,000 SCALE.

5. GEOLOGY OBTAINED FROM HANNIGAN 2007, THE METALLOGENY OF THE PINE POINT MISSISSIPPI VALLEY-TYPE ZINC-LEAD DISTRICT, SOUTHERN NORTHWEST TERRITORIES, GEOLOGICAL SURVEY OF CANADA.



AVALON RARE METALS INC.

THOR LAKE PROJECT

PINE POINT AREA
GEOLOGICAL PLAN

Knight Piésold

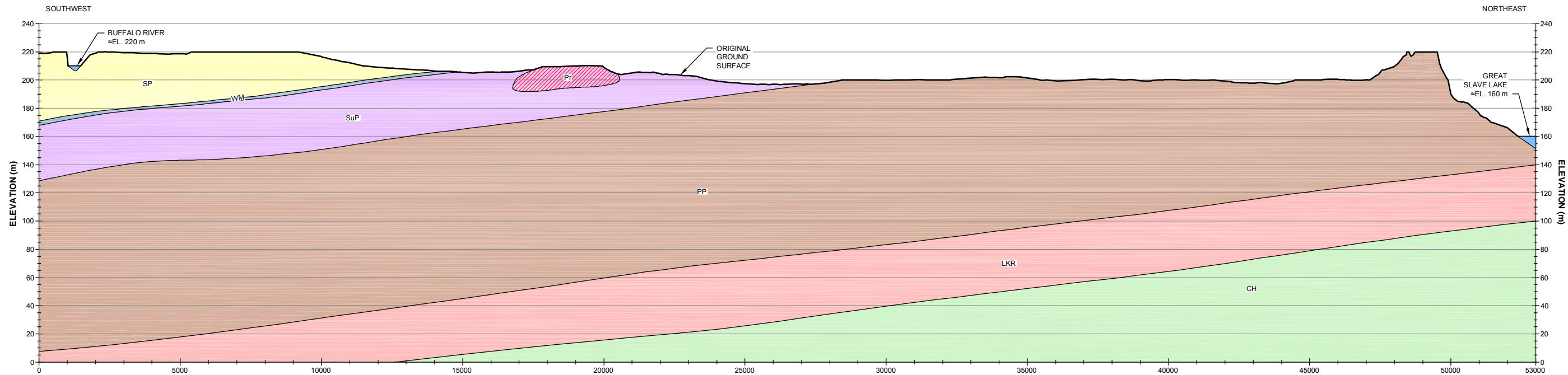
CONSULTING

PIANO.
NB101-390/2

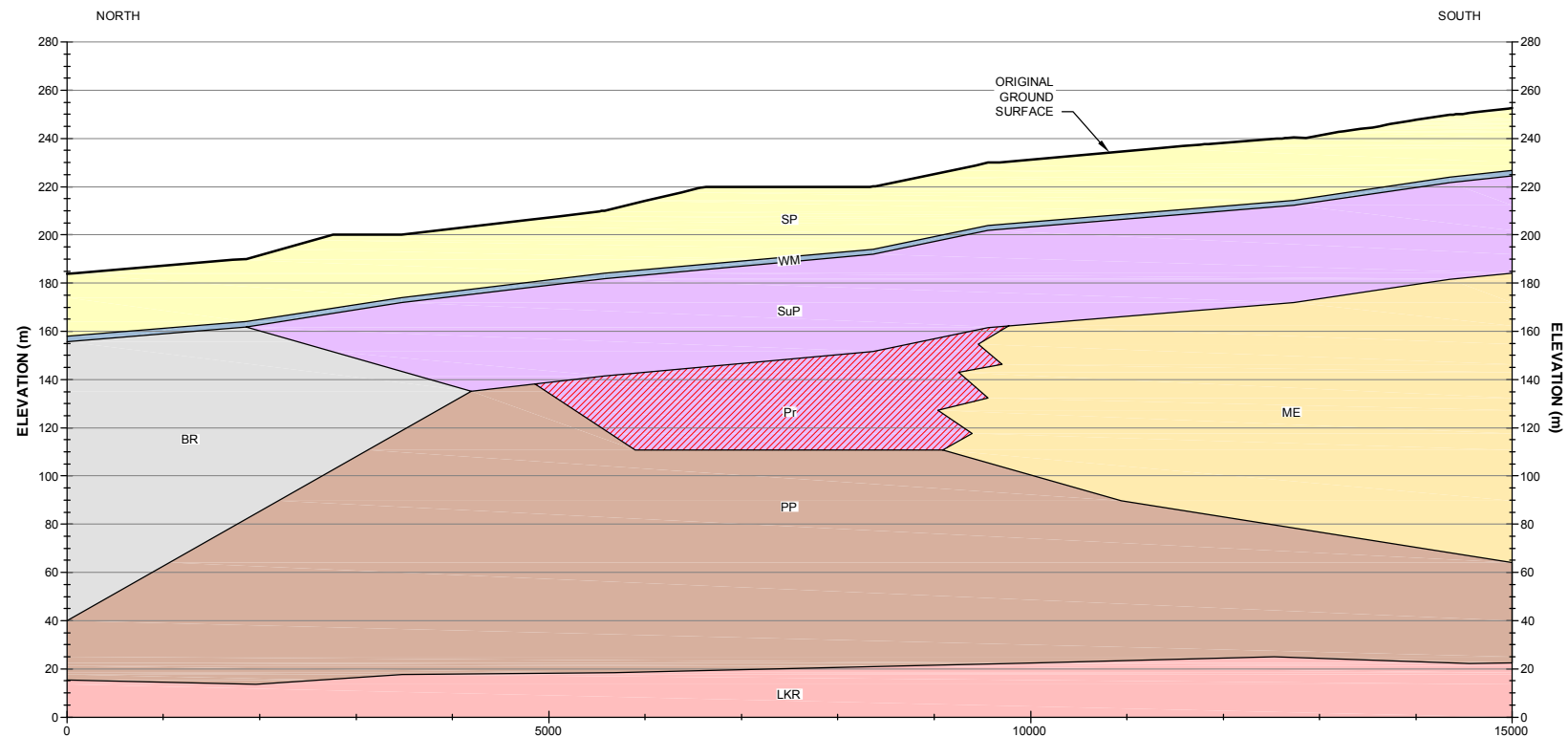
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FIGURE 6

REV
0



1
6
FIG
SECTION
PROFILE THROUGH PRESQU'ILE BARRIER REEF COMPLEX
HORIZONTAL: AS SHOWN
VERTICAL: AS SHOWN



2
6
FIG
SECTION
CROSS SECTION THROUGH PRESQU'ILE BARRIER REEF COMPLEX
HORIZONTAL: AS SHOWN
VERTICAL: AS SHOWN

- LEGEND:**
- WATER
 - SP SLAVE POINT FORMATION
DOLOMITIC AND ANHYDRITE LIMESTONE
 - WM WATT MOUNTAIN FORMATION
SHALE / LIMESTONE
 - SuP SULPHUR POINT FORMATION
LIMESTONE AND DOLOSTONE
 - Pt PRESQU'ILE FORMATION
COARSE (VUGGY) CRYSTALLINE DOLOMITE
 - PP PINT POINT FORMATION
FINE CRYSTALLINE DOLOMITE
 - LKR LOWER KEG RIVER FORMATION
ARGILLACIOUS LIMESTONE / DOLOSTONE
 - CH CHINCHACA FORMATION
ANHYDRITE, MINOR SILTSTONE
 - ME MUSKEG EVAPORITES
GYPSUM ANHYDRITE
 - BR BUFFALO RIVER FORMATION
SHALE

NOTES:

1. FIGURE BASED ON INTERPRETATION OF GEOLOGIC SECTIONS FROM GSC MAP 1370A, 1972 "GEOLOGY GREAT SLAVE LAKE DISTRICT OF MACKENZIE", RHODES ET AL, 1984 AND HANNIGAN, 2007.

AVALON RARE METALS INC.

THOR LAKE PROJECT

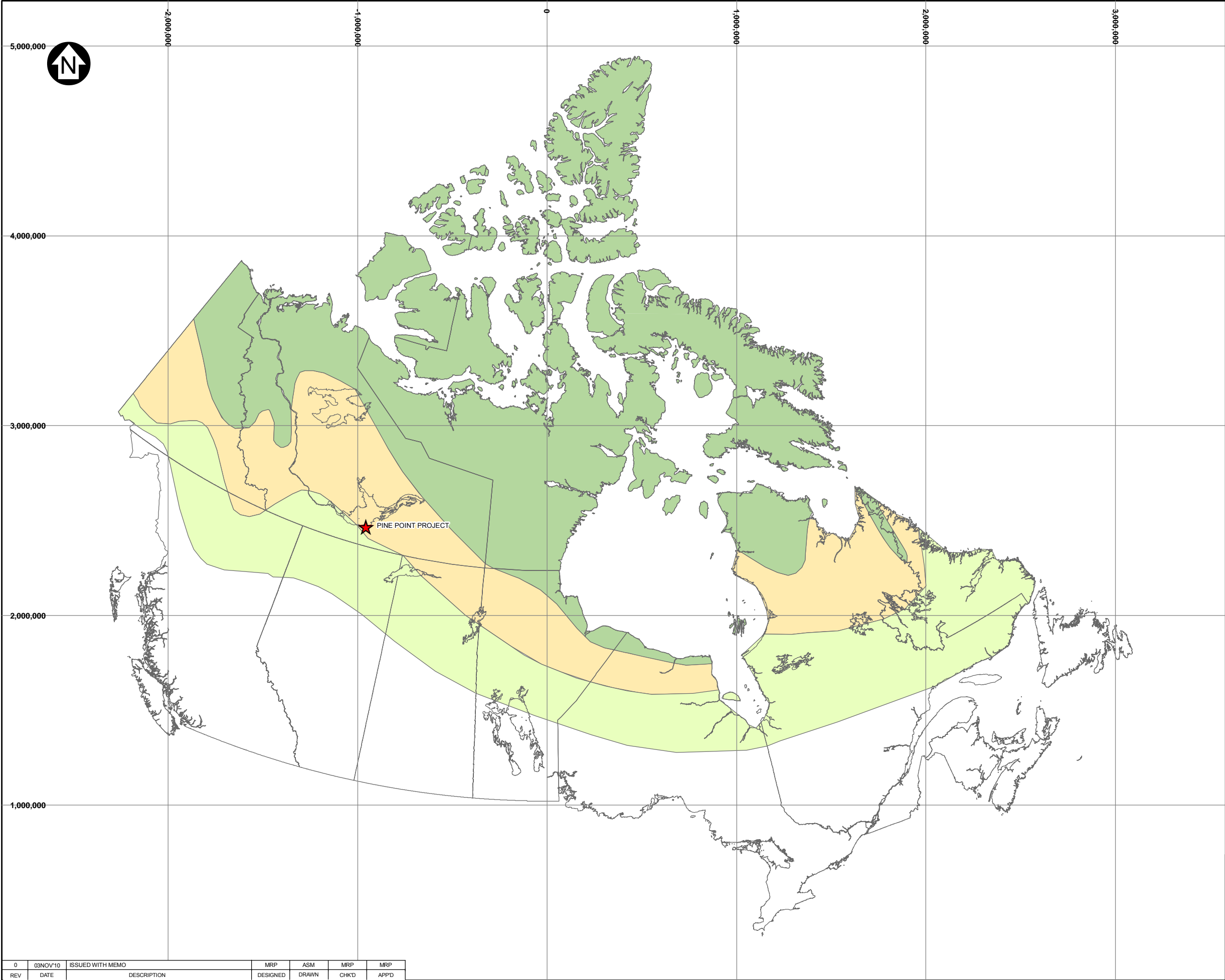
PINE POINT AREA
SIMPLIFIED GEOLOGICAL CROSS-SECTIONS

Knight Piésold
CONSULTING

PIA NO. NB101-390/2	REF NO. NB10-00488
FIGURE 7	
REV 0	

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- LEGEND:**
- CONTINUOUS PERMAFROST
 - WIDESPREAD DISCONTINUOUS PERAMFROST
 - SPORADIC DISCONTINUOUS PERMAFROST

- NOTES:**
1. BASE MAP: © HER MAJESTY THE QUEEN IN RIGHTS OF CANADA, DEPARTMENT OF NATURAL RESOURCES (2004). ALL RIGHTS RESERVED.
 2. PERMAFROST DISTRIBUTION DIGITIZED FROM BURNS 2004.
 2. CO-ORDINATE GRID IS IN METRES.
DATUM: NAD83
PROJECTION: CANADA LAMBERT CONFORMAL CONIC



AVALON RARE METALS INC.

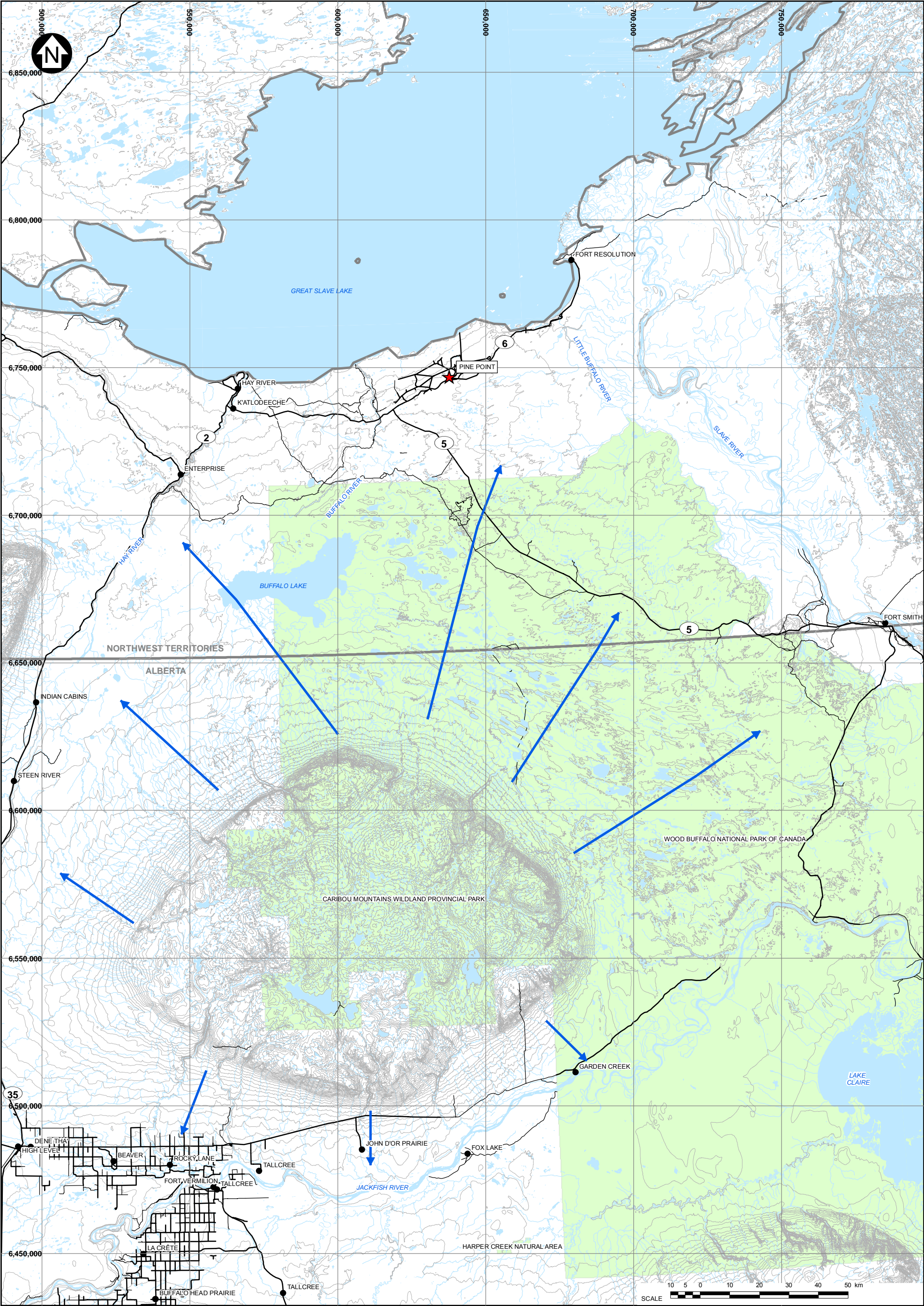
THOR LAKE PROJECT

**PINE POINT AREA
PERMAFROST DISTRIBUTION IN CANADA**

Knight Piésold CONSULTING	PIA NO. NB101-390/2	REF NO. NB10-00488
	FIGURE 8	
	REV 0	

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REV	DATE	DESCRIPTION	DESIGNED	DRAWN	CHK'D	APP'D



LEGEND:

- COMMUNITY
- ➔ REGIONAL GROUND WATER FLOW DIRECTIONS
- ROAD
- LIMITED-USE ROAD
- CONTOUR
- STREAM/RIVER/DRAINAGE
- WATER
- PROTECTED AREA

NOTES:

1. BASE MAP 1:250,000 © HER MAJESTY THE QUEEN IN RIGHTS OF CANADA DEPARTMENT OF NATURAL RESOURCES (2009.) ALL RIGHTS RESERVED.
2. CO-ORDINATE GRID IS IN METRES.
DATUM: NAD83
PROJECTION: UTM ZONE 11
3. CONTOUR INTERVAL IS 20 METRES.

AVALON RARE METALS INC.

THOR LAKE PROJECT

**PINE POINT AREA
REGIONAL PLAN
HYDROGEOLOGY**

Knight Piésold
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P/A NO.
NB101-390/2

REF NO.
NB10-00488

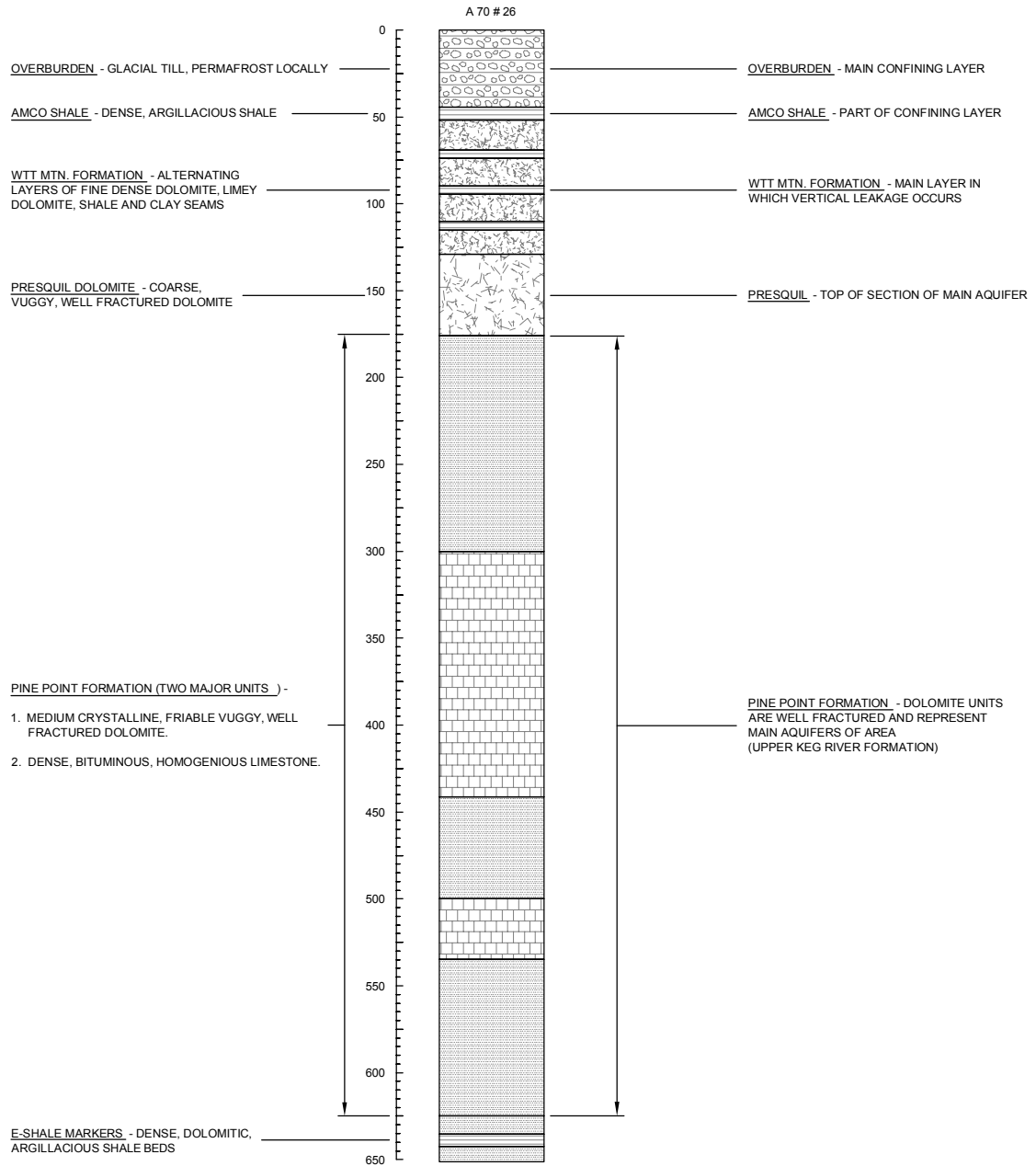
FIGURE 9

REV
0

0	03NOV10	ISSUED WITH MEMO	MRP	ASM	MRP	MRP
REV	DATE	DESCRIPTION	DESIGNED	DRAWN	CHKD	APPD

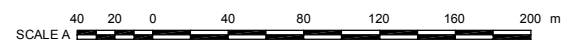
GEOLOGICAL

HYDROGEOLOGICAL



NOTES:

- FIGURE BASED FROM VOGWILL, 1976, SOME PRACTICAL ASPECTS OF OPEN PIT DEWATERING AT PINE POINT



AVALON RARE METALS INC.

THOR LAKE PROJECT

PINE POINT AREA - GEOLOGIC AND HYDROGEOLOGIC STRATIGRAPHY OF THE PRESQU'ILE BARRIER REEF COMPLEX AT THE A-70 PIT AREA

Knight Piésold
CONSULTING

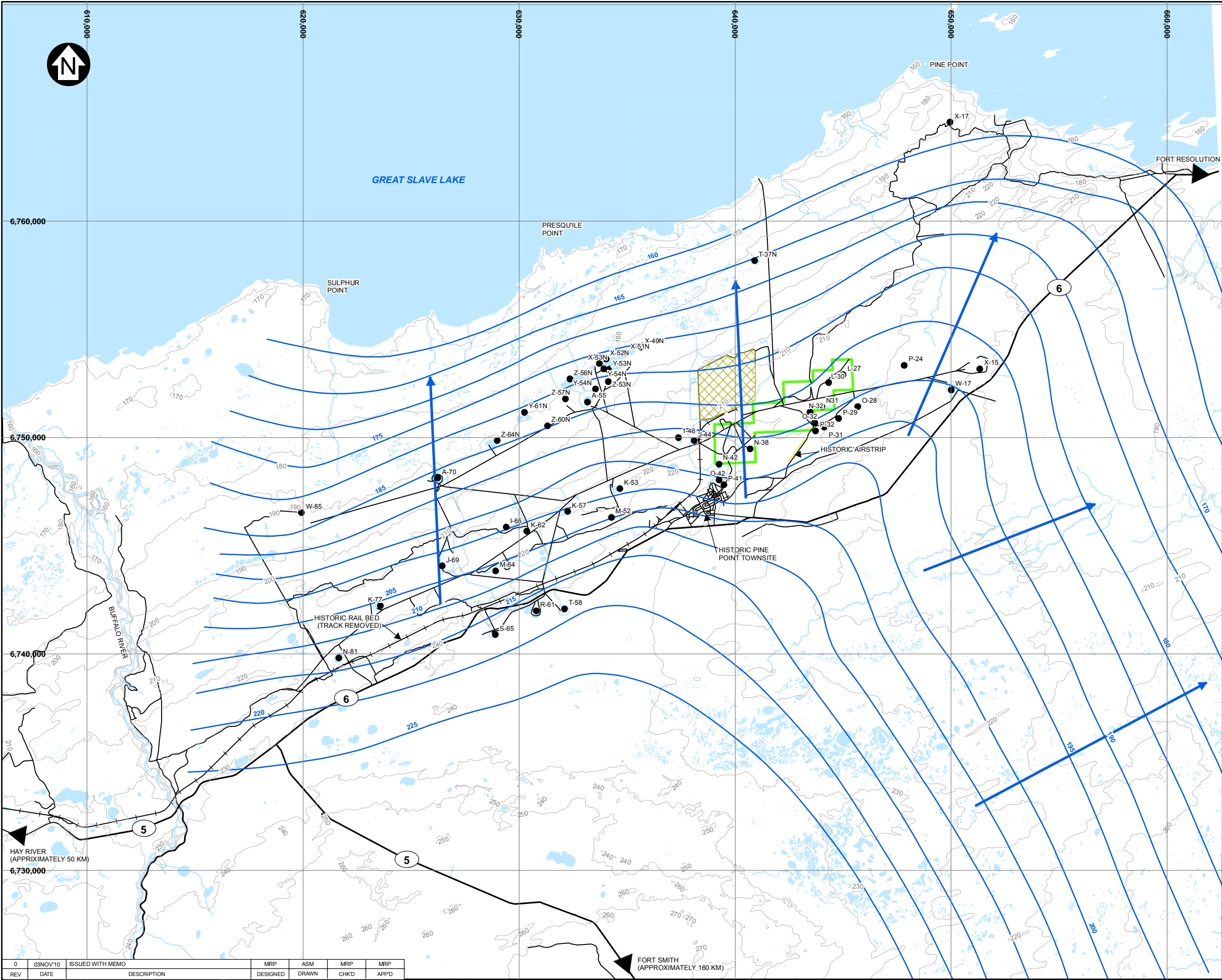
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REF NO.
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FIGURE 10

REV
0

0	03NOV'10	ISSUED WITH MEMO	MRP	SIR	MRP	MRP
REV	DATE	DESCRIPTION	DESIGNED	DRAWN	CHK'D	APP'D



LEGEND:

- HISTORIC OPEN PIT
- TERRITORIAL HIGHWAY
- ROAD
- RAIL BED (TRACK REMOVED)
- CONTOUR
- GROUNDWATER CONTOUR (SEE NOTE 4)
- GROUNDWATER FLOW DIRECTION
- RIVER/STREAM/DRAINAGE
- WATER
- TAILINGS AREA
- TAMERLANE CLAIM BOUNDARY
- TECK COMINCO LEASE BOUNDARY
- HISTORIC COMINCO TAILINGS

LEGEND:

- BASE MAP 1:50,000 © HER MAJESTY THE QUEEN IN RIGHTS OF CANADA
DEPARTMENT OF NATURAL RESOURCES (2009.) ALL RIGHTS RESERVED.
- CO-ORDINATE GRID IS IN METRES.
DATUM: NAD83
PROJECTION: UTM ZONE 11 N
- CONTOUR INTERVAL IS 10 METRES.
- GROUNDWATER CONTOURS FROM STEVENSON, 1984. 'FIGURE 3 CONTOURS OF NATURAL PIEZOMETRIC LEVELS IN THE MAIN AQUIFER (PRESQUILLE) IN PINE POINT MINES PROPERTY.'

SCALE 2 1 0 2 4 6 8 10 km

AVALON RARE METALS INC.

THOR LAKE PROJECT

PINE POINT AREA
GROUNDWATER GRADIENT PLAN

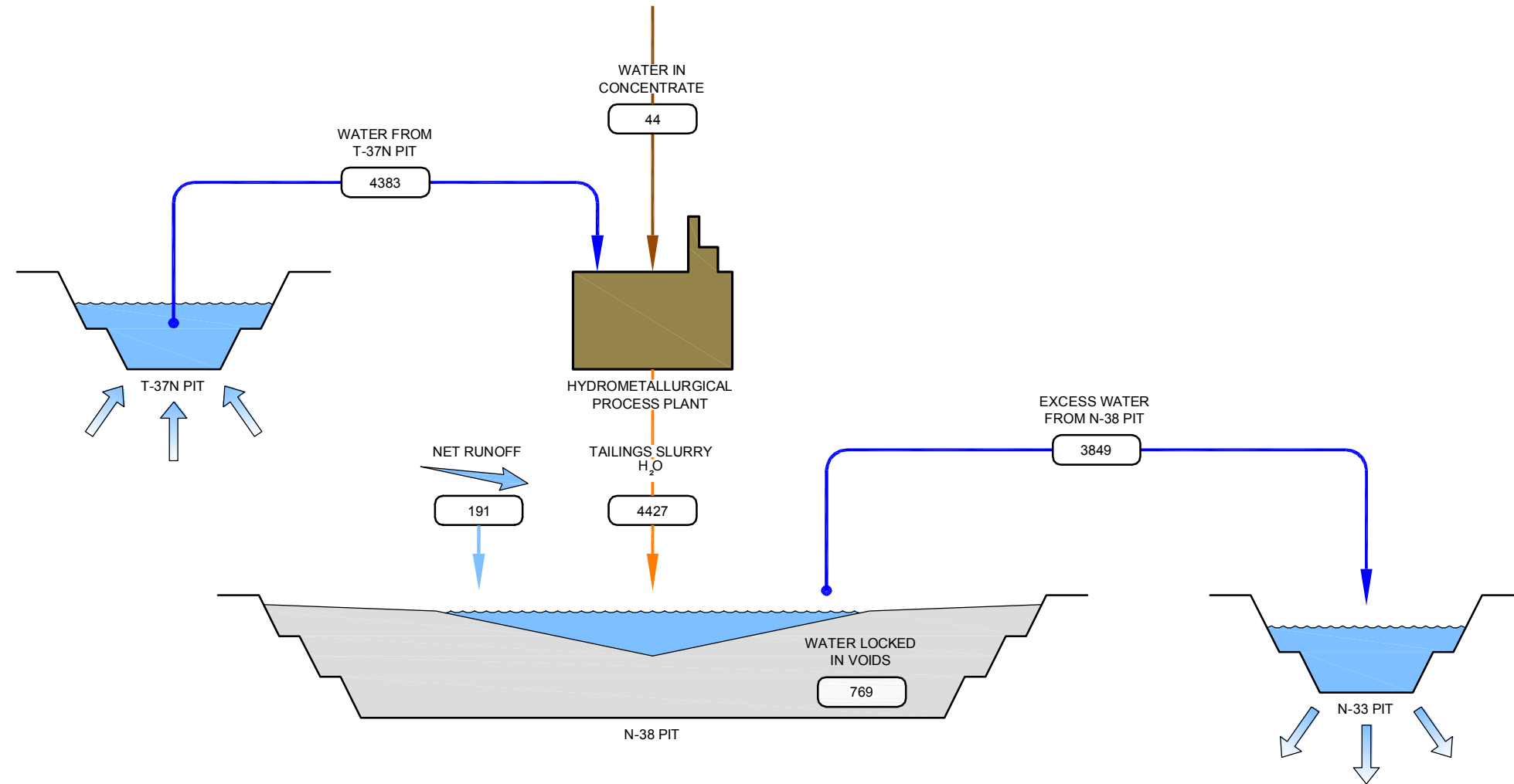
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FIGURE 11	
REV 0	

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REV	DATE	DESCRIPTION	DESIGNED	DRAWN	CHK'D	APP'D





LEGEND:

1000 ESTIMATED AVERAGE FLOW (m³/DAY)

NOTES:

1. ESTIMATES ARE FOR AVERAGE PRECIPITATION CONDITIONS AND DO NOT INCLUDE EXTREME PRECIPITATION EVENTS.

AVALON RARE METALS INC.			
THOR LAKE PROJECT			
PINE POINT AREA PRELIMINARY WATER BALANCE FLOW SHEET			
Knight Piesold CONSULTING	PIA NO. NB101-390/2	REF NO. NB10-00488	REV 0
	FIGURE 13		

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REV	DATE	DESCRIPTION	DESIGNED	DRAWN	CHK'D	APP'D

APPENDIX A

PHOTOS

(Pages A-1 to A-9)



Photo1 – Great Slave Lake near Proposed Temporary Barge Docking Facility.



Photo 2 – Proposed Hydromet Site location at historic gravel borrow area.



Photo 3 – Cominco tailings embankment and reclaimed tailings beach to right.



Photo 4 – View looking south showing N-38 Pit.



Photo 5 – View looking north showing conditions in bottom of N-38 Pit.



Photo 6 – View looking southeast showing N-33 Pit.



Photo 7 – View showing historic gravel borrow face to left of photo.



Photo 8 – View showing till with minimal organics overlying bedrock.



Photo 9 – View showing till overburden with rilling (small erosion gullies).



Photo 10 - View showing gravel overlying deep till overburden.



Photo 11 – View showing Presqu'île dolostone in N-38 Pit wall.



Photo 12 – View showing crystalline dolostone form Presqu'île formation.



Photo 13 – View of settlement on haul road due to melting of permafrost.



Photo 14 – View of Sulphurous spring discharge at Buffalo River tributary.



Photo 15 – View of Sulphurous discharge in Buffalo River tributary.



Photo 16 – View of Buffalo River tributary with mineralized water from aquifer.



Photo 17 – View showing N-33 Pit wall seepage from bedding plane.



Photo 18 – N-33 Pit wall seepage discharge.

APPENDIX B

LIST OF REFERENCES

(Page B-1)

List of References

1. Durston, K., 1979, Open Pit Dewatering at the Pine Point Operations of Cominco Limited.
2. GTC Geologic Testing Consultants, Hydrogeologic Evaluation of the Pine Point - Great Slave Lake Region, GTC Geologic Testing Consultants, 1983.
3. Hannigan, P., 2007, Metallogeny of the Pine Point Mississippi Valley-Type Zinc-Lead District, Southern Northwest Territories.
4. Knight and Piésold Ltd., 1983, Control of Groundwater in Ore Body - Proposal for Trial Grouting Program.
5. Knight and Piésold Ltd., 1984, Trial Grouting Program for Seepage Control - Laboratory Tests on Blended Till Slurries.
6. Rhodes, D., E.A., Lantos, J.A. Lantos, R.J. Webb, D.C. Owens (1984), Pine Point Orebodies and Their Relationship to the Stratigraphy, Structure, Dolomitization, and Karstification of the Middle Devonian Barrier Complex, Economic Geology Vol. 79, 1984 pp. 991-1055.
7. Stevenson International Groundwater Consultants Ltd., 1984, A Study of the Great Slave Reef Pine Point Mines Aquifer, Based on Analyses of Selected Pine Point Mines Pumping Test Data, Stevenson International Groundwater Consultants Ltd.
8. Stevenson International Groundwater Consultants Ltd., 1983, Hydrogeology of R190 Mineralized Region Great Slave Reef Project Westmin Resources Limited. Vancouver: Stevenson International Groundwater Consultants Ltd.
9. Turner, W., and Gal, L., 2003, Regional Structural Data from the Hay River Area, Northwest Territories, with Emphasis on the Pine Point Mining Camp.
10. Tyson, R., 2006, Minerals of the Pine Point Lead-Zinc Deposits Northwest Territories Canada.
11. Vick, S.G., 1990, Planning, Design, and Analysis of Tailings Dams.
12. Vogwill, R., 1976, Some Practical Aspects of Open-Pit Dewatering at Pine Point.