CANADIAN ZINC
CORPORATION

Fax Cover Sheet

Date: January 31, 2003

To: **Vern Christensen – Executive Director - MVEIRB**

Fax: **1-867-766-7074**

From: Peter Campbell

Pages: 25 (including cover sheet)

Subject: **CZN Response to MVEIRB letter of December 24, 2002**

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MACKENZIE VALLEY ENVIRONMENTAL IMPACT REVIEW BOARD

Vern:

Please find attached a copy of Canadian Zinc's responses to the MVEIRB's questions as detailed in your letter of December 24, 2002. An electronic version of this same material is being emailed to you today in electronic *.pdf format.

Should you have any questions or require any additional information please feel free to contact me at your convenience.

Regards,

Peter

Suite 1202-700 West Pender Street
Vancouver, BC V6C 1G8
Tel: (604) 688-2001 Fax: (604) 688-2043
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CANADIAN ZINC CORPORATION

January 31, 2003

By Fax: 1-867-766-7074
By email: VChristensen@mveirb.nt.ca

Mr. Vern Christensen
Executive Director
Mackenzie Valley Environmental Impact Review Board
PO Box 938, 200 Scotia Centre, 5102 – 50th Ave.
Yellowknife, NT
X1A 2N7

Dear Mr. Christensen:

Re: Completion of the Canadian Zinc Environmental Assessment (EA)

Please find enclosed Canadian Zinc's responses to the further questions raised by the Responsible Ministers and the MVEIRB following review of Canadian Zinc's response of November 1, 2002 to MVEIRB IR#1 dated October 18, 2002 as detailed in your letter of December 24, 2002.

Canadian Zinc engaged the services of Rescan Environmental to further review the Board's questions and Canadian Zinc's responses. Rescan has provided a letter endorsing CZN's approach, which we have appended for your reference. We have also completed the sections and plans recommended by Rescan and appended these to our submission as well.

For your convenience, our submission is being submitted in hard copy by fax and in electronic *.pdf format by email.

Should you have any questions or require any additional information please feel free to contact me at your convenience.

Yours very truly,

CANADIAN ZINC CORPORATION

J. Peter Campbell
Environmental Affairs Consultant

Encl.

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Refer to File no. CZN LETTER REV1

January 28, 2003

Canadian Zinc Corporation
Suite 1202 – 700 West Pender Street
Vancouver, B.C.
V6C 1G8

Attention: Mr. J. Peter Campbell
Vice President, Project Affairs

Dear Peter:

Re: Review of Canadian Zinc Corporation's Response to Mackenzie Valley Environmental Impact Review Board.

We have reviewed the series of questions addressed to Canadian Zinc Corporation by the Mackenzie Valley Environmental Impact Review Board in a letter dated December 24, 2002 and the response prepared by Canadian Zinc Corporation.

Based on the level of effort proposed by Canadian Zinc Corporation, we found the response to be of sufficient clarity and detail for the Environmental Impact Review Board to make a decision on Canadian Zinc Corporation's permit application. We also found the proposed water treatment plan to be generally consistent with good mining practice for the types of development being comtemplated.

However, we do recommend that plans and cross sections of the proposed treatment works be prepared for the proposed decline and the polishing pond , along with a general site plan depicting the water management handling system. We believe this will assist the Board in their evaluation of your treatment works.

If you require any further assistance please do not hesitate to call.

Yours truly,
RESCAN™ ENVIRONMENTAL SERVICES LTD.
per:

Clem Pelletier
President

1/31/03

Canadian Zinc's Responses to Questions Raised by Responsible Ministers and MVEIRB (MVEIRB Letter to CZN dated December 24, 2002)

1. *Explain how CZN will ensure that minewater from the decline will be of a quality suitable for discharge following settling (as stated on page 4 of the IR response). Please note that a commitment by CZN to meet water licencing requirements is an unsatisfactory response since it provides no factual basis for the Review Board to make a decision on the EA.*

The statement made on page 4 of CZN's November 1, 2002 response relates to the belief that minewater will be of a quality suitable for discharge following settling without further treatment due to the nature of the rock in which the decline is being developed.

CZN has drilled some 40 holes in the close vicinity of the proposed line of the decline. All of these holes were into unmineralized, fairly massive carbonate rocks with no obvious water inflows. None of these holes intersected cavities or significant amounts of ground water. The layout of the decline is designed to take into account the rock through which it is being driven, with the aim being to ensure all tunnelling is in competent rock with minimal water inflows and requiring minimal support. The same rock units that will be penetrated by the decline are in fact exposed in the existing underground workings and have been observed to be very competent lithologies.

The decline will be driven uphill (+5% gradient) for the first few meters to prevent surface water inflow. At this point, once the decline has reached competent rock out of the surface disturbance, the decline will then be driven down hill at a maximum gradient of 15%. At the peak of the decline, a settling sump will be driven down hill into the sidewall of the tunnel. This will be the primary settling sump for the decline operation and will be completely enclosed underground, the design of which would include provision for capture of floating hydrocarbons.

A series of sumps will then be driven into the sidewall of the decline as it is extended downwards. Water from the face (principally drilling and service water) will flow by gravity to the first sump. Water from the first sump will be pumped to the second sump and so on until this water reaches the primary sump at the entrance to the decline.

The design of the water handling system underground is intended to ensure that water is kept off the floor of the decline as much as possible. This is to prevent unnecessary contamination of any ground water flows by oil and other contaminants such as explosives residue. The primary cause of ammonia contamination from underground development is typically careless handling of ammonia based explosives (ANFO) during charging and blasting operations. It is CZN's intention to restrict the careless use of ANFO and to maximise as far as is possible the use of gelignite based explosives to remove this problem.

Following settling in the primary settling sump near the portal of the decline, minewater should be suitable for discharge to the main site catchment pond. It is intended that water from the sump would be pulled from below the surface of the sump by use of a weir or stilling well, and then conveyed by pipeline to the polishing pond in the mill yard. Water will be further treated for settling of suspended solids and precipitation of metal hydroxides in the polishing pond, after which it will be directed into the main site catchment pond prior to final disposal through the Harrison Creek primary discharge point. Discharge water quality will be ensured at this point by routine monitoring as detailed in previous submissions and in accordance with the Water Licence.

The water handling system for this development and the remainder of the Prairie Creek Mine development is designed around a total site water management program. This program includes the new construction of a polishing pond in the mill yard to allow treatment of water by raising the pH through the addition of lime or soda ash, prior to passing it to the final site catchment pond and eventual discharge to the receiving environment. This is a standard method of treatment for such contaminated waters throughout the world.

CZN maintains that based on the extensive information available from the drilling and other activities in the area of the decline, we do not expect to intersect significant amounts of water, nor do we expect there to be significant amounts of zinc or other metal loadings. However, CZN commits to treating water from the decline as proposed above in order to ensure that metal levels meet discharge criteria. The ability of the proposed treatment works to meet such levels was demonstrated in Tables 3 &4 of CZN's November 1, 2002 submission. Treated water will be directed to the polishing pond, prior to final discharge through the final catchment pond.

Confirmation of the quality of the minewater as being suitable for discharge will be ensured through routine monitoring. As proposed in the Environmental Management Plan appended to the Environmental Assessment Report dated June 21, 2001 samples would be collected and analyzed from the decline settling pond and site catchment pond on at least a monthly basis during operations. Initially, sampling would be more frequent, likely weekly, until steady state conditions are confirmed.

In the event that minewater, following underground settling, was found to be of such quality likely to make the site catchment pond water unsuitable for discharge to the receiving water treatment would be initiated as proposed. The suitability of the catchment pond water for discharge to the receiving environment would then be confirmed by routine monitoring as mentioned above.

2. *Explain how CZN will meet CCME guidelines for the protection of freshwater aquatic life given that estimates of decline and portal water quality show zinc to be an order of magnitude higher than previous licence limits, and two orders of magnitude higher than CCME guidelines for the protection of freshwater aquatic life.*

This question presumes the decline water will in fact be of a similar quality to the existing mine water. As CZN has previously stated, there is ample evidence to suggest this will not be the case.

The decline is being driven in the hanging wall of the mineral deposit. Based on the 40 diamond drill holes completed from the surface in the vicinity of the decline, CZN has designed the 600 meter decline development to take place in competent carbonate rocks. In contrast, all the existing mine development totalling some 5,000 meters on three levels and including around 1,500 metres in heavily oxidised mineralisation reports to the 870 meter level. Total drainage from the existing workings is estimated to be 0.006 m^3/sec, or about 1.2 ml/s per meter of development. Applying this factor to the decline development would equate to only about 0.0072 m^3/s of minewater production once the decline is fully developed. Even this is expected to be an extreme worst case, however, considering the limited intersection of the water bearing vein in the decline development as compared to the existing workings.

Standard mining practice and NWT mining regulations will require preparation of a development plan which will include precautions against water inrushes. This will include drilling of cover holes ahead of development to prevent unexpected water inflow. In order to take a further sample of vein ore the decline will be driven into the vein for a distance of only about 5-10 metres.

CZN knows from previous drilling in this area that the metals in the vein at this level are in fact only approximately 8% oxidized and this is one of the reasons that such a sample is needed to allow confirmation of predicted metallurgy over most of the orebody.

CZN therefore believes that the water volumes from this development will be mostly restricted to service and drilling water, with minimal amounts of ground water. It is CZN's opinion that zinc and other metal levels in the decline water will be minimal because of the very short length of the development in mineralisation and the lower levels of oxidation in the vein at this depth.

Current discharge from the site as a whole including the 870 meter portal and all other flows from the mine are released to the environment via the final site catchment pond and currently meet MMER requirements. However, as part of this development, CZN is proposing to treat all minewater through lime addition to reduce metals levels to below applicable discharge limits. Tables 3 & 4 in CZN's response of November 01, 2002 clearly show that zinc levels can be effectively reduced to below discharge limits previously set under the original Water Licence and the Metal Mining Effluent Regulations. In the design of the water management system and in projecting downstream water quality, CZN has assumed the decline water to be of a quantity and quality similar to the 870 portal flow. However, because of the limited length of the decline and the very restricted amount of development in mineralisation, this appears to CZN to be a worst case approach. The additional treatment of the 870 portal flow has the added advantage of further improving existing discharges from the site.

The CCME guidelines for the protection of freshwater aquatic life were formulated to reflect objectives for optimum receiving environment water quality, not as a measure of discharge or effluent water quality, and therefore CCME standards should not be applied to the quality of the overall discharge from the minesite, but rather to evaluating the effects of discharges on water quality in Prairie Creek downstream of the minesite taking into account available dilution. The MMER regulations were formulated Canada wide, to ensure that mines have a defined standard of discharge to work towards. These regulations, originally put into place in 1977 and revised in 2002, provide clear guidance to mining companies and regulators of the expected standards to be met by mining operations. The Water Quality Projection Models appended to CZN's response of November 1, 2002 clearly show that meeting standard discharge criteria, such as those in the MMER and the expired Water Licence, will result in CCME guidelines being consistently met downstream of the minesite in Prairie Creek.

3. *CZN has provided a brief outline of potential treatment options for ammonia, but has not identified which, if any, would be undertaken for purposes of this development, nor what process would be involved. The Review Board is asking CZN to identify what ammonia treatment option and associated processes will be used for this development.*

Ammonia contamination is typically the result of poor explosives handling practices and excessive use and disposal of ammonia nitrate based explosive such as ANFO or ANFEX. Ammonia based explosives are highly soluble and ammonia does not normally form part of the background contamination from underground rocks in this area. In low concentrations, ammonia is in fact beneficial to plant life being a major component of fertilizers. Current ammonia levels from the mine site have been recorded at less than 0.005 mg/l, indicating the transient nature of ammonia in a discontinued mining operation.

In its November 1, 2002 response, CZN identified mitigation and treatment options in the event of a problem with ammonia as follows:

- Minimizing explosive use by reducing powder factors to minimum required to achieve effective blasting
- Ensuring proper handling and housekeeping with respect to explosive use underground
- Dilution within site water management system to reduce ammonia concentrations to non toxic levels; nitrogen products are an essential nutrient source in aquatic systems at lower concentrations
- Increasing residence times within site water management system to allow for volatilization of un-ionized ammonia (NH_3) at elevate pH, oxidation of ammonia to less toxic nitrate and biological nitrification of ammonia to nitrate
- Wetland bio-treatment to optimise biological uptake of ammonia

All of these measures are available to CZN and would be employed in roughly the order presented depending on the magnitude of the ammonia loadings (ie. concentration and volume) requiring treatment.

The first two measures will be implemented as a function of operational planning in order to avoid the need for any of the following four treatment options. Dilution will be achieved as a normal course within the site water management facilities, firstly by combining the decline water flow, after settling in the decline sumps, with the flow from the 870 portal in the polishing pond and secondly by combining with additional site runoff water in the final site catchment pond, both of which have very low ammonia levels.

In addition to the foregoing, if ammonia levels still proved problematic then CZN will replace the standard ammonium nitrate/fuel oil (ANFO), or emulsion based explosives with low ammonia, gelignite based, "stick" or gel explosives. ANFO products have the advantage of being less expensive and more versatile.

Increased residence times could be further achieved if required, by constructing an additional polishing pond and additional bio-uptake can be achieved if necessary, by constructing channels lined with aquatic vegetation within the site footprint or by constructing a wetland area downstream of the minesite to which ammonia contaminated minewater could be piped.

Such wetlands are proven technology for treating mine effluents not only for ammonia and other nitrogen compounds, but also for metals. The key consideration in constructing such wetlands is size to ensure optimum retention time to allow for adequate uptake. Considerable area is available downstream of the minesite to allow for construction of an adequately sized wetland area. As an example, Placer Dome's Campbell Mine in Ontario utilizes a 9 ha wetland system to effectively treat a polishing pond discharge of 2 million m^3 per year. By comparison, the projected worst case flow from the decline, assuming it to be comparable to the 870 portal, is about 70,000 m^3 over the 6 month development period.

4. *Explain whether CZN intends to develop a site water management system that includes the capture and treatment of all minewater, including that from the 870 m level.*

CZN has clearly stated that it is its intention to develop a site water management program as part of the decline development. This was outlined in the Development Description and Cumulative Effects Sections on page 4 and page 7, respectively, of CZN's November 1, 2002 response as follows:

> "A final excavated sump would be located underground near the portal entrance where minewater could be treated, if necessary, prior to discharge. Minewater would then be piped down to a polishing pond to be constructed adjacent to the mill prior to release to the site catchment pond which then discharges to Harrison Creek. The polishing pond would also serve as a treatment pond for the 870 portal discharge which would be piped to it."
>
> and,
>
> "The developments as proposed will realize the added benefit of minewater from the historic 870 portal being treated in conjunction with minewater from the decline prior to discharge to the catchment pond and then to the receiving environment."

This configuration was also depicted in Figure 1 submitted in conjunction with the response.

To summarize for the purposes of this submission, the answer to this question is: Yes, CZN intends to develop a site water management system in conjunction with the proposed developments that includes the capture and treatment of all minewater, including that from the 870 m level. The treatment plan will ensure that final discharges from the mine site and decline development will take place from the final catchment pond and that such discharges will meet the appropriate standards. The ability of the proposed treatment plan to meet such standards was clearly demonstrated in Tables 3 and 4 of CZN's November 1, 2002 submission

5. *CZN's IR response suggests that minewater could be contained in a proposed polishing/treatment pond constructed adjacent to the mill. Please explain if and how CZN will ensure the proposed polishing/treatment pond is impermeable and appropriately sized for treatment.*

The purpose of the polishing pond is not to permanently contain minewater, but rather to provide additional retention time to settle finer particles and to allow treatment by pH addition to reduce the soluble metals prior to release to the site catchment pond and then the receiving environment.

The polishing pond will be sized based on flow volumes reporting to it to allow sufficient retention time to effect settling. Typical criteria for such sizing suggest a pond with a length to width ratio of 5:1 and a retention time of 20 hours[1]. The current design for the polishing pond, based on worst case design combined inflows of $0.02 m^3/s$ from the decline, 870m portal and pilot plant, and is for a pond 12 m wide by 60 m long by 2.5 m in depth for a volume capacity of 1440 m^3 with a 0.5 m freeboard. Sufficient area is available in the proposed location between the mill and the 870 portal to enlarge the polishing pond if necessary to accommodate larger flow or to effect more efficient settling as the case may be.

[1] Guidance for Assessing the Design, Size and Operation of Sedimentation Ponds Used in Mining – BC Ministry Environment, Lands and Parks

The polishing pond will be lined either with impermeable clay or a synthetic liner. Impermeable clay is available locally and was used in the original construction of the tailings impoundment. A bentonite mix could also be used as a liner. Synthetic liner is also available on-site from the construction of the tailings pond. Alternatively, new liner may be sourced and flown into the site.

In practice, only water that requires treating will need to be directed to the polishing pond. Water from the pilot plant will normally be treated inside the mill building prior to discharge to the final site catchment pond. As a consequence, while the pond will be constructed to handle up to 0.02 m^3/sec, only the 870 meter and decline water (0.012m^3/sec over the summer months) are expected to be treated therein on a regular basis.

6. *Explain how and when CZN intends to address the issue of untreated mine water discharging from the 870 m portal into the settling pond and then into Harrison Creek in an unmanaged and untreated manner.*

Water has been flowing from the 870m level since its development in 1979. This water flow is seasonal and goes from the 870 meter level into the final site catchment pond and then into Harrison Creek. The discharge from the final catchment pond was authorized under Water Licence N3L3-0932 at the time of mining and has been monitored routinely over the intervening years. Since Canadian Zinc's involvement with the property in 1991 the discharge from the catchment pond to Harrison Creek has never exceeded the MMLER maximum grab sample limit for any element and has only exceeded the expired Water Licence maximum grab sample limit on a single occasion, that being for zinc (0.851 mg/l) on October 18, 1994.

As was clearly demonstrated in the report entitled Historical Water Quality of Prairie Creek Project Area (INAC, July 2002), water quality in Prairie Creek downstream of the minesite has not been significantly impacted as compared to upstream water quality, and in the majority of cases consistently meets Canadian Water Quality Guidelines for the Protection of Aquatic Life. Similarly, the data indicated that water quality at the mouth of Prairie Creek remains unaffected and has no potential for impacting on the South Nahanni River.

However, as stated in CZN's November 1, 2002 response, it is the Company's intention that minewater from the 870 m portal will be further treated in conjunction with the proposed developments to ensure that all water flowing from the site meets current MMER and water licence standards. Consequently, as part of this development, the flow from the 870m portal will be treated with lime or soda ash, both of which are available on site, and directed to the polishing pond. This treatment could be effected as early as spring 2003 assuming permits are in place to allow the developments to proceed.

7. *Provide information regarding the design, location and method of water transfer between the sumps, settling ponds, and polishing pond, including retention times, capacity, flow rates, treatment criteria, expected outcomes, and confirmatory monitoring.*

1/31/03

As stated in CZN's November 1, 2002 response:

> "Minewater produced during decline development and underground exploration will be handled through the use of collection sumps and pumps. The underground drainage collection system would consist of a series of excavated collection sumps equipped with pumps located at intervals along the length of the decline, the positioning of which will be determined based on the lift capacity of the pumps and the vertical head between sumps. A final excavated sump would be located underground near the portal entrance where minewater could be treated, if necessary, prior to discharge. Minewater would then be piped down to a polishing pond to be constructed adjacent to the mill prior to release to the site catchment pond which then discharges to Harrison Creek. The polishing pond would also serve as a treatment pond for the 870 portal discharge which would be piped to it."

Additional information is herein provided as follows:

The mining plan for the decline includes three sumps, each approximately 23 m^3 in capacity, to be constructed along the 600m length of the decline. The lowest sump will be located at the end of the decline at approximately the 815m elevation, the mid-level sump will be located at approximately the 845m elevation and the top sump will be located at approximately the 875m elevation. The sumps will be approximately 200m linearly and 30m in elevation apart. The sumps will be blasted out of the bedrock in the floor of the decline with ditching directing groundwater to them. Each sump will be equipped with a submersible pump of sufficient capacity to handle the required flow and to lift water to the next highest sump. Water will be carried from one sump to the next by suitably sized pipe. For the purposes of the design of the water management systems, flow volumes from the 870 portal of 0.006 m^3/s have been assumed for the decline. Based on this flow rate, the retention time of the sumps will be approximately 1 hour. This is considered to be a worst case as the decline is expected to generate significantly less water due to the nature of the rock in which it is being developed and the much shorter length of the decline.

The primary decline settling sump will be located underground just inside the mouth of the portal at the 905m elevation. The decline settling sump will be approximately 3m wide by 20m long by 2m deep for a capacity of 120 m^3. As with the other sumps, the settling sump will be blasted out of bedrock in the floor of the decline. Based on anticipated flows of 0.006 m^3/s the sump will have a retention time of approximately 5.5 hours. This sump will be used primarily to settle out the coarse and midsize fractions of the sediment load in the minewater. Flow from the settling sump will be directed by gravity through a pipe to the polishing pond to be located between the mill and the 870 portal. The settling sump will be designed such that any overflow from the sump will be directed back down into the decline. Provision will be incorporated into the design of the sump to allow for cleanout of deposited sediment and capture of any floating hydrocarbons. The former will be achieved by a ramp into the back end of the sump to provide access for mine equipment. When clean out is required the water will be decanted from the sump and sediment cleaned out by scooptrams. Sediment will be disposed of by burial underground, or otherwise in an approved manner. Hydrocarbons will be captured by absorbent booms across the outlet of the settling sump and/or weirs across the width of the sump forcing clean water to flow under the weir and floating hydrocarbons to be retained on the surface behind the weir much in the same manner as standard oil/water separators. Any oils so retained will be soaked up by absorbent pads. Oil soaked pads will be stored in barrels and burned or otherwise disposed of in an approved manner.

Dissolved metals will be treated in a polishing pond proposed to be located between the mill and the 870 portal at about the 864m elevation. This will permit minewater from both the decline and 870 portal to be directed by gravity through pipes to the polishing pond without the need for pumping. The polishing pond will be excavated into the ground with berms constructed around the pond to prevent inflow of surface runoff. The pond will be lined with clay or a synthetic liner to prevent exfiltration to the groundwater. The polishing pond is proposed to be 12m wide by 60m long by 2.5 m deep providing a capacity of 1440 m^3 with a 0.5m freeboard. This in turn would provide an additional 20 hour retention time at the estimated worst case inflow rate of 0.20 m^3/sec for the combined discharges from the 905 decline portal, 870 portal and pilot plant. Internal baffles or berms will also be employed to prevent short circuiting and maximize retention times. Provision will also be included for the use of settling aids, such as flocculants, if necessary to facilitate settling of solids and precipitates.

A byproduct of the treatment process will be all settled material retained within the decline settling sump, surface polishing pond and mill process water treatment tanks. This material will be a combination of:

- sediment created by physical activity underground,
- metal hydroxide or carbonate precipitates, and
- excess lime or soda ash

The treatment and polishing ponds will be designed to retain all settled material without resuspension and to provide access in the event that the ponds are required to be cleaned out during operations. Given the short term nature of the proposed developments, it is expected that the ponds will be sized so as not to require cleaning out. Sufficient tankage is available in the mill to retain all tailings material generated during operations of the pilot plant.

Sufficient area is available in the proposed location between the mill and the 870 portal to enlarge the polishing pond if necessary to accommodate larger flow or to effect more efficient settling as the case may be.

Settled material retained in the decline settling sump, surface polishing pond and mill tanks can either be handled by:

- leaving in place, decanting water and backfilling the ponds
- being removed from the ponds and placed back underground in a dry location, possibly in combination with tailings produced by the pilot plant
- being retained and disposed of with tailings produced once the mine is in operation, or
- being removed and buried, possibly in combination with the tailings produced by the pilot plant; in this event material would be buried in a dry location above the water table and away from surface runoff; material would be encapsulated within a clay lined pit to minimize the potential for contact with water and resolubilization.

The proposed location for the polishing pond is within the area from which all runoff reports to the main site catchment pond. The discharge from the polishing pond will be directed to the site catchment pond either by pipe or an open excavated channel. Currently open excavated channels carry site runoff to the catchment pond. The site catchment pond is located just upstream of the confluence of Harrison and Prairie Creeks with the confines of the site flood protection berms.

The catchment pond is roughly triangular in shape, 100m on each side, for a surface area of about 2500 m^2 with an estimated average depth of 2m for a volume capacity of 5000 m^3. The catchment pond discharges via a weir and culvert to Harrison Creek, which in turn discharges through two culverts to Prairie Creek.

V-notch weirs or other suitable flow measuring devices will be installed on each of the decline, 870 portal, polishing pond and site catchment pond discharge points. Flows will be recorded in conjunction with development and operations at least weekly during periods of discharge.

Treatment for dissolved metals by pH adjustment will be effected through addition of a lime or soda ash slurry to the discharges either individually or as a combined flow upstream of the polishing pond. The lime slurry will be prepared by addition of bagged lime to water in a mixing tank. The slurry will then be added to the flow at a predetermined rate, expected as somewhere in the order of the 125 mg lime per litre of water demonstrated as being very effective at the Silvertip property, to produce a pH of around 9.5 to achieve optimum precipitation of dissolved zinc. Silvertip is an advanced exploration lead/zinc property in BC with a mineral resource totalling 2.57 million tonnes grading 6.4% Pb, 8.8% Zn, 325 g/t Ag and 0.63 g/t Au. A very similar lime treatment system as that being proposed at Prairie Creek was used at Silvertip in 1999 to successfully treat minewater from de-watering of the underground workings prior to discharge to the receiving environment.

If treated individually, separate lime additions stations will be set up on each of the pipelines upstream of the polishing pond. The pilot plant effluent will be treated separately in the thickeners in the mill building prior to discharge. Treated pilot plant effluent is expected to be of a quality that it could be discharged from the thickeners directly to the site catchment pond. This would reduce the total flow volume to the polishing pond, which would in turn provide additional retention time in the polishing pond to effect treatment of minewater flows.

Treatment of effluents with lime or soda ash, to precipitate dissolved metals is standard proven technology and is expected to produce a treated effluent with water quality within the ranges demonstrated in Tables 3 & 4 of CZN's November 1, 2002 response. Discharge water quality will be confirmed through routine monitoring. Such monitoring was originally proposed in the Environmental Management Plans appended to the Environmental Assessment Reports for the Underground Decline and Metallurgical Pilot Plant Programs submitted June 21, 2001. Daily monitoring of the polishing pond for pH and at least monthly sampling of the catchment pond discharge for a full suite of water quality parameters including pH, conductivity, alkalinity, hardness, sulphate, nitrate-nitrite, ammonia, oil & grease and total metals scan will verify minewater treatment efficiency. Pilot plant effluent will be sampled and analysed for the same suite of parameters prior to discharge from the thickeners to the polishing or catchment pond.

8. *CZN has indicated that it is prepared to proceed with its proposed developments without the use of the existing tailings pond. Therefore, the alternative method proposed by CZN in its IR response to the Review Board is in fact, the only water management and treatment method currently under consideration in the EA. CZN is asked to provide alternatives to its current plan to treat and discharge to the surrounding environment. If the alternative is to be on-site containment, CZN is asked to provide sufficient detail so that the alternative can be analysed and assessed.*

CZN originally proposed to utilize the tailings pond only for pilot plant effluent and offered to incorporate the tailings pond as a standby measure for decline minewater in response to regulatory concern in the event of a requirement for alternative methods of handling water should standard treatment measures proved unsuccessful and containment was deemed an acceptable alternative. CZN obtained the expert opinion of BGC Engineering that the tailings dam would be suitable for such a purpose, subject to final geotechnical inspection prior to use. This usage was intended as a contingency use only. CZN has always intended to treat all water from the site as part of this development to a level that would allow safe discharge and within the guidelines of the MMER and the water licence to be issued for the development.

The decision to change the preferred alternative from containment within the existing tailings impoundment to treat and discharge was brought about by requests of the "responsible ministries" who were concerned over the stability of the tailings impoundment dam. However, the tailings pond remains a viable alternative to the current treat and discharge plan. Such use has been analysed and assessed in detail over the course of the EA. It is CZN understanding that the general consensus was that such use, if approved, would be subject to geotechnical certification prior to use and CZN is in agreement with this approach.

The Board should be aware that the only practical alternative to the current treat and discharge plan for the proposed development, in the absence of the tailings dam proposal, is curtailment of flows. Ceasing mining work and grouting or sealing an unexpected water flow from the decline will minimize the amount of water to be treated and discharged, howevert not eliminate it entirely. CZN has proposed and will be required to protect against inrushes by the development of a plan with provision for cover holes. This would be the normal circumstance on any underground mine development.

The design of the decline is such that all water must be pumped up to the final settling sump. In the event that the sump overtops, the water will flow back into the decline, not out of the portal. Total volume of the decline when complete will be in excess of 4100 m^3, which will provide storage for at least 190 hours in the event of a pump failure. All water produced by the pilot plant is contained in the mill tankage until such time as it is suitable for discharge. Work on the pilot plant would be halted in the event that tankage becomes full; and resumed once the water had been treated to a level which will allow discharge within the licence provisions.

9. *CZN intends to treat mine water using sumps, settling ponds and a polishing pond. CZN is asked to explain its water quality predictions resulting from these treatment methods and to provide its supporting methodology and calculations for purposes of assessing potential discharge quality or impacts on Prairie Creek. Suggesting that CZN will meet Mackenzie Valley Land and Water Board discharge limits is an insufficient response for assessment purposes.*

The Water Quality Projection Model appended to CZN's November 1, 2002 response was prepared as a dilution model specifically intended to demonstrate adherence to CCME guidelines for the receiving environment below the minesite and to demonstrate the potential for impacts on downstream water quality associated with existing discharges assuming the meeting of specific discharge criteria from the minesite in conjunction with the proposed developments. The model uses flow rates and water quality parameter concentrations from discharges and receiving waters to predict downstream water quality.

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The predicted concentration of a specific parameter is determined in the model by adding together the flow rates of each individual discharge multiplied by the concentration of the specific parameter in question in that discharge, and dividing by the combined flow rate.

For example, the predicted zinc concentration of 0.7962 mg/l in Harrison Creek in the Base/Worst Case scenario (Table 5-1 Rev.1) is determined by adding together the individual flows times their zinc concentration for each of the pilot plant, decline, 870 portal discharges and Harrison Creek upstream and dividing by the combined flows in Harrison Creek at the mouth as follows:

$$((0.401*0.008)+(7.17*0.006)+(7.17*0.006)+(0.063*0.1))/0.12 = 0.7962$$

(Note that in the original model there was a minor calculation error that accounts for the slight difference between the value of 0.7832 originally reported and 0.7962 reported here. This error has been corrected and revised tables appended to this submission)

The model presented four scenarios for consideration:

- Base/Worst Case (Table 5-1)
  - Assumes no treatment of any site discharges
- MMER Case 1 (Table 5-2)
  - Assumes treatment of the development discharges (pilot plant & decline) only and not the 870m portal discharge to meet at a minimum the discharge limits set under the Metal Mining Effluent Regulations
- MMER Case 2 (Table 5-3)
  - Assumes treatment of all discharges (pilot plant, decline & 870m portal) to meet at a minimum the discharge limits set under the Metal Mining Effluent Regulations
- N3L30932 Case (Table 5-4)
  - Assumes treatment of all discharges (pilot plant, decline & 870m portal) to meet at a minimum the discharge limits set in the original water licence issued to the Prairie Creek Mine (Water Licence N3L3-0932)

For further reference, a fifth scenario has been prepared for the purposes of this submission:

- Testwork Case (Table 5-5 a & b)
  - Assumes treatment of all discharges (pilot plant, decline & 870m portal) to meet levels demonstrated as achievable based upon the results of previous treatment testwork as presented in Tables 3 & 4 in CZN's November 1, 2002 response.

Note that the model presents the worst case for the decline by assuming both the flow and quality of decline minewater will be comparable to that of the 870 portal. As stated earlier in the text CZN does not expect this to be the case, but has taken this position in order to provide the most conservative view. A worst case is also presented for the pilot plant by assuming a continuous flow rate equivalent to that of dewatering of the thickener over a single shift. In actual fact, the pilot plant will only produce liquid effluent at a rate of 0.0008 m^3/s, an order of magnitude less than assumed in the model. Further, no discharges from the pilot plant will take place unless water quality has been tested to ensure compliance with appropriate water quality measures can be met.

10. *Please provide a contingency plan describing how CZN plans to treat mine water should ammonia levels exceed the Mackenzie Valley Land and Water Board established limits.*

For information on treatment plans for ammonia, please see response to Question No. 3 above.

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11. Please provide CZN's contingency plan, exclusive of flooding the decline, in the event discharges from the decline development are higher than accounted for or expected.

CZN will be required to design the development of the decline, such that any risk of inrushes is fully minimized. A plan will be put in place and cover holes will be drilled in advance of decline development. Should cover holes intercept higher than expected water volumes, grouting will be employed to prevent infiltration of excess water into the workings.

In the event that water volumes were continuously greater than expected, pumps and water management facilities would be upgraded to handle the increased flows accordingly. If water volumes were found to be significantly greater than expected and greater than the capacity of the water management facilities in place, work in the decline would have to be halted and the areas of inflow would have to be grouted. As a last resort, the decline would have to be allowed to flood until such facilities were upgraded to handle the greater volumes of water, at which time dewatering and underground development could once again commence. It should be pointed out that the evidence from some 40 holes in the area of the decline have given no indication of trapped or perched water tables within the area of the decline. The design of the decline has concentrated on placing the decline in competent rock of relatively low porosity. As a consequence of the above, the Company considers the risk of any uncontrolled water flows into the decline to be low.

The design of the decline is such that in the event that subsequent bulk-heading of the decline were considered desirable, this can be achieved at the point where the decline turns down hill to ensure competent wall to the tunnel to achieve a water tight bulkhead.

12. CZN is asked to provide information on the design of the proposed underground sumps and plans for handling of residual hydrocarbons.

An oil absorbent boom is currently in place across the discharge point of the main site catchment pond. Oil absorbent pads and/or booms will also be employed at each of the sumps, the primary decline minewater settling sump and the polishing pond. Pads and booms will be inspected regularly and replaced as required. Oily pads and booms will be placed in barrels and burned in the on site incinerator, or otherwise disposed of in an approved manner.

Additionally, weirs or stilling wells will be employed around discharge points to force clean water under and retain floating hydrocarbon products which would then be cleaned up with absorbent pads. Internal baffles or berms will also be employed to prevent short circuiting and maximize retention times. The discharge from the catchment pond to the receiving environment will be routinely monitored to ensure compliance with Water Licence requirements. Typical licence requirements include no visible sheen and/or less than 5 mg/l oil & grease.

In the event of a significant hydrocarbon spill underground mining activity, including dewatering, would be halted, floating hydrocarbon product would be pumped from the water surface of sumps or ponds into barrels and transferred to the waste oil storage tank for future disposal. Such a spillage would be fully contained within the decline development.

For additional information on the design of sumps and the water handling system, please see the response to Question No. 7 above.

Prairie Creek Mine
Underground Decline and Metallurgical Pilot Plant
Water Quality Projection Model

Terms & Assumptions

MMER - Metal Mining Effluent Regulations
N3L3-0932 - Water Licence Issued for original operations of Prairie Creek Mine, July 1, 1982
CWQG FAL - Canadian Water Quality Gideljnes for protection of Freshwater Aquatic Life
Dilution Ratio - Ratio of streamflow to combined effluent discharge from site

Water quality and volume of minewater from decline assumed to be equivalent to 870 portal; actual decline minewater expected to be of much better quality and less volume
Pilot Plant effluent assumed to be a continuous flow; in actual practice flow would only occur over about a 6 hour period once every 10 days or so.
Red/italized numbers in boxes represent effluent water quality changes to meet minimum treatment requirements
For South Nahanni River - No LTO's for Hg or Sb - used values from Prairie Creek upstream of the minesite
Background concentrations for Prairie Creek upstream based on data from July 1988 to present in order to eliminate effect of earlier high detection limits and certain outliers

Flow estimates

m3/s	Prairie Creek at mine	S Nahanni at Virginia Falls	S. Nahanni at Clausen Cr	Prairie Creek at Mouth	Prairie Creek drainage area	(sq. km)
June	18.3	823	1260	32.5	880	total
July	11.8	597	970	21.0	495	above mine
August	9.3	388	713	16.5		
Sept	6.3	240	449	11.2		
Oct	2.8	134	241	5.0		
Avg	9.7	436	727	17.2		

No treatment

Table 5-1 (Rev.1)

Prairie Creek Mine
Underground Decline and Metallurgical Pilot Plant
Water Quality Projection Model - Base/Worst Case (No Treatment of Site Discharges)

	Discharge Criteria			Discharge and Baseline Receiving Water Quality							Predicted Downstream Receiving Water Quality			
	MMER	N3L3-C932	CWQG FAL	Pilot Plant	Decline	870 Portal	Prairie Cr. u/s	Harrison Cr. u/s	Harrison Cr. @ mouth	S. Nahanni River at Virginia Falls	Predicted Conc.(mg/l) Harrison Creek @ mouth	Predicted Conc.(mg/l) Prairie Creek d/s @ Galena Creek	Predicted Conc.(mg/l) Prairie Creek d/s @ Mouth	Predicted Conc.(mg/l) South Nahanni River d/s Prairie Creek
Flow m3/s				0.008	0.006	0.006	9.7	0.1	0.11	438	0.12	9.8	17	727
Dilution Ratio											5	490	850	36350
Parameters	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	LTO mg/l	mg/l	mg/l	mg/l	mg/l
Ag			0.0001	0.033	0.005	0.006	0.00001	0.00002	0.00001	0.0001	0.0028	0.0000	0.00003	0.0001
Al				0.2	0.08	0.08	0.01	0.01	0.002	0.8729	0.0297	0.0103	0.0101	0.8527
As	0.5-1.0	0.15-0.30	0.005	0.2	0.0213	0.0213	0.0004	0.006	0.0076	0.0006	0.0205	0.0006	0.0005	0.0006
Ca				212	126	126	51	60.1	50.5	46.1	76.8	51.4	51.2	46.2
Cd		0.015-0.03	0.000063	0.024	0.0345	0.0345	0.0002	0.0022	0.0051	0.0004	0.0069	0.0003	0.0002	0.0004
Cu	0.30-0.60	0.075-0.15	0.004	0.051	0.037	0.037	0.0009	0.0002	0.018	0.0027	0.0073	0.0010	0.0009	0.0027
Cr		0.15-0.30		0.015	0.005	0.005	0.0017	0.006	0.008	0.0012	0.0065	0.0018	0.0017	0.0012
Fe			0.3	0.033	0.215	0.215	0.0704	0.29	0.399	1.42	0.2654	0.073	0.072	1.39
Hg		0.0015-0.003	0.0001	0.04	0.001	0.001	0.00004	0.0009	0.00016	0.00004	0.0035	0.0001	0.0001	0.00004
Mg				4.93	59.3	59.3	19.8	33.9	24.5	11.8	34.5	20.0	19.9	12.0
Mn				0.068	0.008	0.008	0.001	0.007	0.008	0.365	0.0112	0.001	0.001	0.3565
Mo			0.073	0.034	0.019	0.019	0.003	0.031	0.034	0.0014	0.0300	0.003	0.003	0.0014
Ni	0.50-1.00	0.20-0.40	0.15	0.02	0.038	0.038	0.0014	0.003	0.013	0.0089	0.0076	0.001	0.001	0.0087
Pb	0.20-0.40	0.15-0.30	0.007	0.265	0.046	0.046	0.001	0.0065	0.026	0.001	0.0294	0.001	0.001	0.0010
Sb				0.2	0.12	0.12	0.0002	0.002	0.01	0.0002	0.0270	0.001	0.0004	0.0002
Se			0.001	0.2	0.0838	0.0836	0.001	0.002	0.002	0.0005	0.0234	0.001	0.001	0.0005
Zn	0.50-1.00	0.30-0.60	0.03	0.401	7.17	7.17	0.005	0.063	0.26	0.031	0.7982	0.015	0.011	0.0326

Notes: Assumes no treatment of any site discharges
Assumes worst case conditions for decline minewater flow and quality as comparable to that of the 870 portal
Assumes worst case conditions for pilot plant as continuous flow at a rate equivalent to dewater thickener over one shift; actual pilot plant liquid effluent produced at only 0.0008 m3/s

Table 5-2 (Rev. 1)

Prairie Creek Mine
Underground Decline and Metallurgical Pilot Plant
Water Quality Projection Model - MMER Case 1 (Treatment of Development Discharges;No Treatment of Historic 870 Portal Discharge)

	Discharge Criteria			Discharge and Baseline Receiving Water Quality							Predicted Downstream Receiving Water Quality			
Flow m3/s Dilution Ratio	MMER	N3L3-0932	CWQG FAL	Pilot Plant 0.008	Decline 0.006	870 Portal 0.006	Prairie Cr. u/s 9.7	Harrison Cr. u/s 0.1	Harrison Cr. @ mouth 0.11	S. Nahanni River at Virginia Falls 436	Predicted Conc.(mg/l) Harrison Creek @ Mouth 0.12 5	Predicted Conc.(mg/l) Prairie Creek d/s @ Galena Creek 9.8 490	Predicted Conc.(mg/l) Prairie Creek d/s @ Mouth 17 850	Predicted Conc.(mg/l) South Nahanni River d/s Prairie Creek 727 38350
Parameters	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	LTO mg/l	mg/l	mg/l	mg/l	mg/l
Ag			0.0001	0.033	0.006	0.006	0.00001	0.00002	0.00001	0.0001	0.0028	0.0050	0.00003	0.0001
Al				0.2	0.08	0.08	0.01	0.01	0.002	0.8729	0.0297	0.0103	0.0101	0.8527
As	0.5-1.0	0.15-0.30	0.005	0.2	0.0213	0.0213	0.0004	0.006	0.0076	0.0006	0.0205	0.0008	0.0006	0.0006
Ca				212	126	126	51	60.1	50.5	46.1	76.8	51.4	51.2	46.2
Cd		0.015-0.03	0.000063	0.024	0.0345	0.0345	0.0002	0.0022	0.0051	0.0004	0.0069	0.0003	0.0002	0.0004
Cu	0.30-0.60	0.075-0.15	0.004	0.051	0.037	0.037	0.0009	0.0002	0.018	0.0027	0.0073	0.0010	0.0009	0.0027
Cr		0.15-0.30		0.015	0.005	0.005	0.0017	0.006	0.003	0.0012	0.0065	0.0018	0.0017	0.0012
Fe			0.3	0.033	0.215	0.215	0.0704	0.29	0.399	1.42	0.2654	0.073	0.072	1.39
Hg		0.0015-0.003	0.0001	0.04	0.001	0.001	0.00004	0.0009	0.00018	0.00004	0.0035	0.0001	0.0001	0.00004
Mg				4.93	59.3	59.3	19.8	33.9	24.5	11.8	34.5	20.0	19.9	12.0
Mn				0.058	0.008	0.008	0.001	0.007	0.008	0.365	0.0112	0.0011	0.0011	0.3565
Mo			0.073	0.034	0.019	0.019	0.003	0.031	0.034	0.0014	0.0300	0.0033	0.0032	0.0014
Ni	0.50-1.00	0.20-0.40	0.15	0.02	0.038	0.038	0.0014	0.003	0.013	0.0089	0.0076	0.0015	0.0014	0.0087
Pb	0.20-0.40	0.15-0.30	0.007	*0.20*	0.046	0.046	0.001	0.0056	0.026	0.001	0.0251	0.0013	0.0012	0.0010
Sb				0.2	0.12	0.12	0.0002	0.002	0.01	0.0002	0.0270	0.0005	0.0004	0.0002
Se			0.001	0.2	0.0836	0.0836	0.001	0.002	0.002	0.0005	0.0234	0.0013	0.0012	0.0005
Zn	0.50-1.00	0.30-0.60	0.03	0.401	*0.5*	7.17	0.005	0.063	0.26	0.031	0.4627	0.0106	0.0032	0.0305

Notes: Assumes pilot plant and decline discharges treated to minimum MMER standards; no treatment of historic 870 portal discharge
Assumes worst case conditions for decline minewater flow and quality as comparable to that of the 870 portal
Assumes worst case conditions for pilot plant as continuous flow at a rate equivalent to dewater thickener over one shift; actual pilot plant liquid effluent produced at only 0.0008 m3/s

Table 5-3 (Rev.1)

Prairie Creek Mine
Underground Decline and Metallurgical Pilot Plant
Water Quality Projection Model - MMER Case 2 (Treatment of All Site Discharges)

	Discharge Criteria			Discharge and Baseline Receiving Water Quality							Predicted Downstream Receiving Water Quality			
Flow m3/s Dilution Ratio	MMER	N3L3-0932	CWQG FAL	Pilot Plant 0.008	Decline 0.006	870 Portal 0.006	Prairie Cr. u/s 9.7	Harrison Cr. u/s 0.1	Harrison Cr. @ mouth 0.11	S. Nahanni River at Virginia Falls 436	Predicted Conc.(mg/l) Harrison Creek @ Mouth 0.12 5	Predicted Conc.(mg/l) Prairie Creek d/s @ Galena Creek 9.8 490	Predicted Conc.(mg/l) Prairie Creek d/s @ Mouth 17 850	Predicted Conc.(mg/l) South Nahanni River d/s Prairie Creek 727 36350
Parameters	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	LTO mg/l	mg/l	mg/l	mg/l	mg/l
Ag			0.0001	0.033	0.005	0.006	0.00001	0.00002	0.00001	0.0001	0.0028	0.0000	0.00003	0.0001
Al				0.2	0.08	0.08	0.01	0.01	0.002	0.8729	0.0297	0.0103	0.0101	0.8527
As	0.5-1.0	0.15-0.30	0.005	0.2	0.0213	0.0213	0.0004	0.006	0.0076	0.0006	0.0205	0.0006	0.0005	0.0036
Ca				212	126	126	51	60.1	50.5	46.1	76.8	51.4	51.2	45.2
Cd		0.015-0.03	0.000063	0.024	0.0345	0.0345	0.0002	0.0022	0.0051	0.0004	0.0069	0.0003	0.0002	0.0004
Cu	0.30-0.60	0.075-0.15	0.004	0.051	0.037	0.037	0.0009	0.0002	0.018	0.0027	0.0073	0.0010	0.0009	0.0027
Cr		0.15-0.30		0.015	0.005	0.005	0.0017	0.006	0.008	0.0012	0.0055	0.0018	0.0017	0.0012
Fe			0.3	0.033	0.215	0.215	0.0704	0.29	0.399	1.42	0.2654	0.0729	0.0718	1.39
Hg		0.0015-0.0030	0.0001	0.04	0.001	0.001	0.00004	0.0009	0.00016	0.00004	0.0035	0.0001	0.0001	0.00004
Mg				4.93	59.3	59.3	19.8	33.9	24.5	11.8	34.5	20.0	19.9	12.0
Mn				0.068	0.008	0.008	0.001	0.007	0.008	0.365	0.0112	0.0011	0.0311	0.3565
Mo			0.073	0.034	0.019	0.019	0.003	0.031	0.034	0.0014	0.0300	0.0003	0.0032	0.0014
Ni	0.50-1.00	0.20-0.40	0.15	0.02	0.038	0.038	0.0014	0.003	0.013	0.0069	0.0076	0.0015	0.0014	0.0037
Pb	0.20-0.40	0.15-0.30	0.007	0.20	0.046	0.046	0.001	0.0086	0.026	0.001	0.0251	0.0013	0.0012	0.0010
Sb				0.2	0.12	0.12	0.0002	0.002	0.01	0.0002	0.0270	0.0005	0.0004	0.0002
Se			0.001	0.2	0.0836	0.0835	0.001	0.002	0.002	0.0005	0.0234	0.0013	0.0012	0.0005
Zn	0.50-1.00	0.30-0.60	0.03	0.401	0.5	0.5	0.005	0.063	0.26	0.031	0.1292	0.0065	0.0059	0.0304

Notes:
Assumes pilot plant, decline and 870 portal discharges all treated to minimum MMER standards
Assumes worst case conditions for decline minewater flow and quality as comparable to that of the 870 portal
Assumes worst case conditions for pilot plant as continuous flow at a rate equivalent to dewater thickener over one shift; actual pilot plant liquid effluent produced at only 0.0003 m3/s

Table 5-4 (Rev.1)

Prairie Creek Mine
Underground Decline and Metallurgical Pilot Plant
Water Quality Projection Model - N3L30932 Case (Treatment of All Site Discharges)

	Discharge Criteria			Discharge and Baseline Receiving Water Quality							Predicted Downstream Receiving Water Quality			
Flow m3/s Dilution Ratio	MMER	N3L3-0932	CWQG FAL	PilotPlant 0.008	Decline 0.006	870 Portal 0.006	Prairie Cr. u/s 9.7	Harrison Cr. u/s 0.1	Harrison Cr. @ mouth 0.11	S. Nahanni River at Virginia Falls 436	Predicted Conc.(mg/l) @ Harrison Creek 0.12 5	Predicted Conc.(mg/l) Prairie Creek d/s @ Galena Creek 9.8 490	Predicted Conc.(mg/l) @ Prairie Creek d/s @ Mouth 17 850	Predicted Conc.(mg/l) South Nahanni River d/s Prairie Creek 727 36350
Parameters	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	LTO mg/l	mg/l	mgl	mg/l	mg/l
Ag			0.0001	0.033	0.006	0.006	0.00001	0.00002	0.00001	0.0001	0.0028	0.0003	0.00003	0.0001
Al				0.2	0.08	0.08	0.01	0.01	0.002	0.8729	0.0297	0.0103	0.0101	0.8527
As	0.5-1.0	0.15-0.30	0.005	*0.15*	0.0213	0.0213	0.0004	0.006	0.0076	0.0036	0.0171	0.0006	0.0005	0.0006
Ca				212	126	126	51	60.1	50.5	46.1	76.8	51.4	51.2	46.2
Cd		0.015-0.03	0.000063	*0.015*	*0.015*	*0.015*	0.0002	0.0022	0.0051	0.0004	0.0343	0.0003	0.0002	0.0004
Cu	0.30-0.60	0.075-0.15	0.004	0.051	0.037	0.037	0.0009	0.0002	0.018	0.0027	0.0073	0.0010	0.0009	0.0027
Cr		0.15-0.30		0.015	0.005	0.005	0.0017	0.006	0.008	0.0012	0.0065	0.0018	0.0017	0.0012
Fe			0.3	0.033	0.215	0.215	0.0704	0.29	0.399	1.42	0.2654	0.073	0.072	1.39
Hg		0.0015-0.0030	0.0001	*0.0015*	0.001	0.001	0.00004	0.0009	0.00016	0.00004	0.0010	0.0001	0.0000	0.00004
Mg				4.93	59.3	59.3	19.8	33.9	24.5	11.8	34.5	20.0	19.9	12.0
Mn				0.058	0.008	0.008	0.001	0.007	0.008	0.355	0.0112	0.0011	0.0011	0.3565
Mo			0.073	0.034	0.019	0.019	0.003	0.031	0.034	0.0014	0.0300	0.0033	0.0032	0.0014
Ni	0.50-1.00	0.20-0.40	0.15	0.02	0.038	0.038	0.0014	0.003	0.013	0.0089	0.0076	0.0015	0.0014	0.0087
Pb	0.20-0.40	0.15-0.30	0.007	*0.15*	0.046	0.046	0.001	0.0086	0.026	0.001	0.0218	0.0013	0.0011	0.0010
Sb				0.2	0.12	0.12	0.0002	0.002	0.01	0.0002	0.0270	0.0005	0.0004	0.0002
Se			0.001	0.2	0.0836	0.0836	0.001	0.002	0.002	0.0005	0.0234	0.0013	0.0012	0.0005
Zn	0.50-1.00	0.30-0.60	0.03	*0.3*	*0.3*	*0.3*	0.005	0.063	0.26	0.031	0.1025	0.0262	0.0057	0.0304

Notes: Assumes pilot plant, decline and 870 portal discharges all treated to minimum Water Licence N3L3-0932 standards
Assumes worst case conditions for decline minewater flow and quality as comparable to that of the 870 portal
Assumes worst case conditions for pilot plant as continuous flow at a rate equivalent to dewater thickener over one shift; actual pilot plant liquid effluent produced at only 0.0008 m3/s

Table 5-5a

Prairie Creek Mine
Underground Decline and Metallurgical Pilot Plant
Water Quality Projection Model - Testwork Case - Based on Results from Table 3 (Treatment of All Site Discharges)

	Discharge Criteria			Discharge and Baseline Receiving Water Quality							Predicted Downstream Receiving Water Quality			
Flow m3/s Dilution Ratio	MMER	N3L3-0932	CWQG FAL	Pilot Plant 0.008	Decline 0.006	870 Portal 0.005	Prairie Cr. u/s 9.7	Harrison Cr. u/s 0.1	Harrison Cr. @ mouth 0.11	S. Nahanni River at Virginia Falls 436	Predicted Conc.(mg/l) Harrison Creek @ Mouth 0.12 5	Predicted Conc.(mg/l) Prairie Creek d/s @ Galena Creek 9.6 490	Predicted Conc.(mg/l) Prairie Creek d/s @ Mouth 17 850	Predicted Conc.(mg/l) South Nahanni River d/s Prairie Creek 727 36350
Parameters	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	LTO mg/l	mg/l	mg/l	mg/l	mg/l
Ag			0.0001	0.033	0.005	0.005	0.00001	0.00032	0.00031	0.0001	0.0028	0.0000	0.00003	0.0001
Al				0.2	0.08	0.08	0.01	0.01	0.002	0.8729	0.0297	0.0103	0.0101	0.8527
As	0.5-1.0	0.15-0.30	0.005	*0.01*	*0.01*	*0.01*	0.0034	0.005	0.0076	0.0006	0.0067	0.0015	0.0014	0.0006
Ca				212	126	126	51	60.1	50.5	46.1	76.8	51.4	51.2	46.2
Cd		0.015-0.03	0.000063	*0.002*	*0.002*	*0.002*	0.0002	0.0022	0.0051	0.0004	0.0022	0.0002	0.0002	0.0004
Cu	0.30-0.60	0.075-0.15	0.004	*0.04*	0.037	0.037	0.0039	0.0002	0.018	0.0027	0.0065	0.0010	0.0009	0.0027
Cr		0.15-0.30		0.015	0.005	0.005	0.0017	0.005	0.008	0.0012	0.0065	0.0018	0.0017	0.0012
Fe			0.3	0.033	*0.05*	*0.05*	0.0704	0.29	0.399	1.42	0.2489	0.0727	0.0717	1.39
Hg		0.0015-0.0030	0.0001	*0.0002*	*0.0002*	*0.0002*	0.00004	0.0009	0.00016	0.00004	0.0008	0.0000	0.0000	0.00004
Mg				4.93	59.3	59.3	19.8	33.9	24.5	11.8	34.5	20.0	19.9	12.0
Mn				0.068	0.008	0.008	0.001	0.007	0.008	0.365	0.0112	0.0011	0.0011	0.3565
Mo			0.073	0.034	0.019	0.019	0.003	0.031	0.034	0.0014	0.0300	0.0033	0.0032	0.0014
Ni	0.50-1.00	0.20-0.40	0.15	0.02	0.038	0.038	0.0014	0.003	0.013	0.0089	0.0076	0.0015	0.0014	0.0087
Pb	0.20-0.40	0.15-0.30	0.007	*0.003*	*0.003*	*0.003*	0.001	0.0086	0.026	0.001	0.0077	0.0011	0.0010	0.0010
Sb				0.2	0.12	0.12	0.0002	0.002	0.01	0.0002	0.0270	0.0006	0.0004	0.0002
Se			0.001	0.2	0.0836	0.0836	0.001	0.002	0.002	0.0005	0.0234	0.0013	0.0012	0.0005
Zn	0.50-1.00	0.30-0.60	0.03	*0.09*	*0.09*	*0.09*	0.005	0.063	0.26	0.031	0.0675	0.0058	0.0054	0.0304

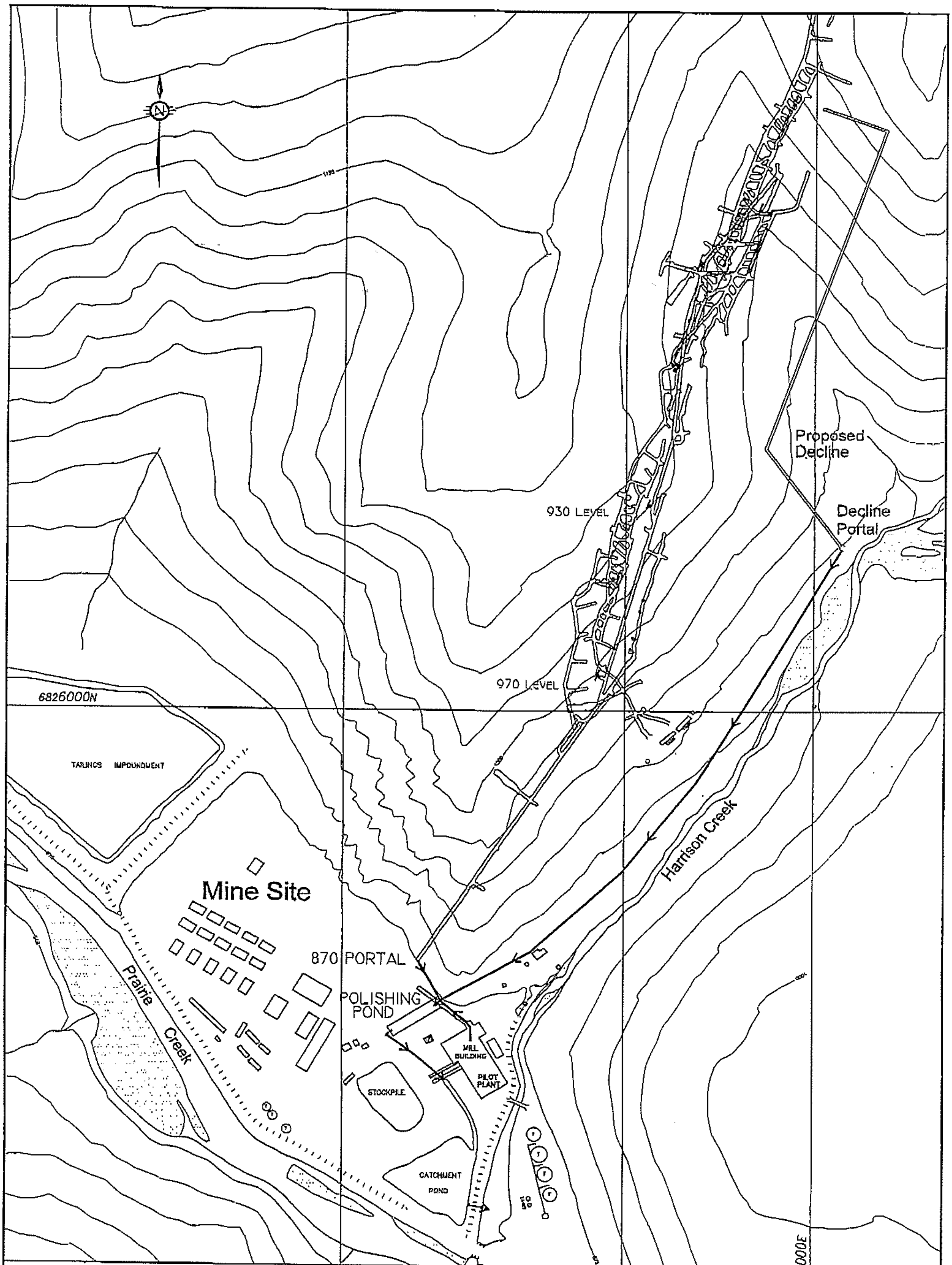
Notes: Assumes all discharges treated to levels demonstrated as achievable by previous testwork as presented in Tables 3
Assumes worst case conditions for decline minewater flow and quality as comparable to that of the 870 portal
Assumes worst case conditions for pilot plant as continuous flow at a rate equivalent to dewater thickener over one shift, actual pilot plant liquid effluent produced at only 0.0008 m3/s

Table 5-5b

Prairie Creek Mine
Underground Decline and Metallurgical Pilot Plant
Water Quality Projection Model - Testwork Case - Based on Results from Table 3 & 4 (Zn) (Treatment of All Site Discharges)

	Discharge Criteria			Discharge and Baseline Receiving Water Quality							Predicted Downstream Receiving Water Quality			
	MMER	N3L3-0932	CWQG FAL	Pilot Plant	Decline	870 Portal	Prairie Cr. u/s	Harrison Cr. u/s	Harrison Cr. @ mouth	S. Nahanni River at Virginia Falls	Predicted Conc.(mg/l) Harrison Creek @ Mouth	Predicted Conc.(mg/l) Prairie Creek d/s @ Galena Creek	Predicted Conc.(mg/l) Prairie Creek d/s @ Mouth	Predicted Conc.(mg/l) South Nahanni River d/s Prairie Creek
Flow m3/s				0.008	0.006	0.006	9.7	0.1	0.11	436	0.12	9.8	17	727
Dilution Ratio											5	490	650	36350
Parameters	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	LTO mg/l	mg/l	mg/l	mg/l	mg/l
Ag			0.0001	0.033	0.006	0.006	0.00001	0.00002	0.00001	0.0001	0.0028	0.0000	0.00003	0.0001
Al				0.2	0.08	0.08	0.01	0.01	0.002	0.8729	0.0297	0.0103	0.0101	0.8527
As	0.5-1.0	0.15-0.30	0.006	0.01	0.01	0.01	0.0004	0.036	0.0076	0.0036	0.0367	0.0005	0.0004	0.0006
Ca				212	126	126	51	60.1	50.5	46.1	76.8	51.4	51.2	49.2
Cd		0.015-0.03	0.000063	0.002	0.002	0.002	0.0002	0.0022	0.0051	0.0004	0.0022	0.0002	0.0002	0.0004
Cu	0.30-0.60	0.075-0.15	0.004	0.04	0.037	0.037	0.0009	0.0002	0.018	0.0027	0.0065	0.0010	0.0009	0.0027
Cr		0.15-0.30		0.015	0.005	0.005	0.0017	0.006	0.008	0.0012	0.0065	0.0018	0.0017	0.0012
Fe			0.3	0.033	0.05	0.05	0.0704	0.29	0.399	1.42	0.2489	0.0727	0.0717	1.39
Hg		0.0015-0.0030	0.0001	0.0002	0.0002	0.0002	0.00004	0.0009	0.00016	0.00004	0.0008	0.0000	0.0000	0.00004
Mg				4.93	59.3	59.3	19.8	33.9	24.5	11.8	34.5	20.0	19.9	12.0
Mn				0.068	0.008	0.008	0.001	0.007	0.008	0.365	0.0112	0.0011	0.0011	0.3565
Mo			0.073	0.034	0.019	0.019	0.003	0.031	0.034	0.0014	0.0300	0.0033	0.0032	0.0014
Ni	0.50-1.00	0.20-0.40	0.15	0.02	0.038	0.038	0.0014	0.003	0.013	0.0089	0.0076	0.0015	0.0014	0.0087
Pb	0.20-0.40	0.15-0.30	0.007	0.003	0.003	0.003	0.001	0.0065	0.026	0.001	0.0077	0.0011	0.0010	0.0010
Sb				0.2	0.12	0.12	0.0002	0.002	0.01	0.0002	0.0270	0.0005	0.0004	0.0002
Se			0.001	0.2	0.0836	0.0836	0.001	0.002	0.002	0.0005	0.0234	0.0013	0.0012	0.0005
Zn	0.50-1.00	0.30-0.60	0.03	0.39	0.39	0.39	0.005	0.063	0.26	0.031	0.1175	0.0064	0.0058	0.0304

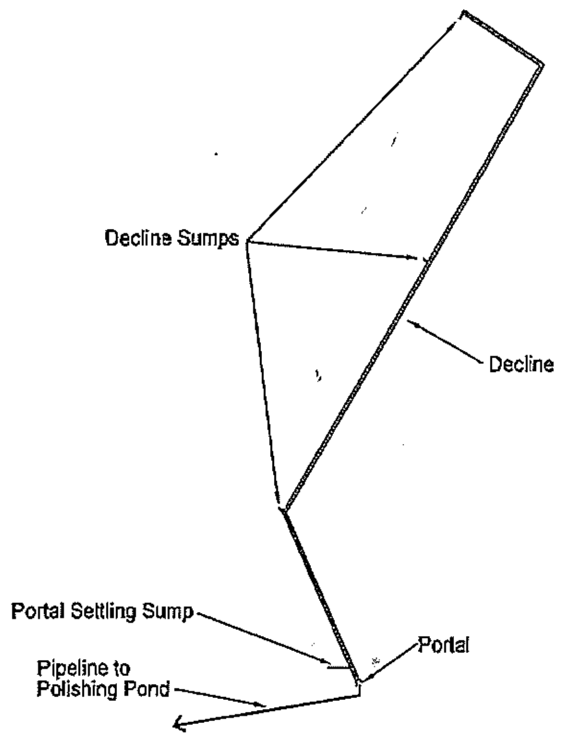
Notes:
Assumes all discharges treated to levels demonstrated as achievable by previous testwork as presented in Tables 3 & 4; Zn from Table 4
Assumes worst case conditions for decline minewater flow and quality as comparable to that of the 870 portal
Assumes worst case conditions for pilot plant as continuous flow at a rate equivalent to dewater thickener over one shift; actual pilot plant liquid effluent produced at only 0.0008 m3/s



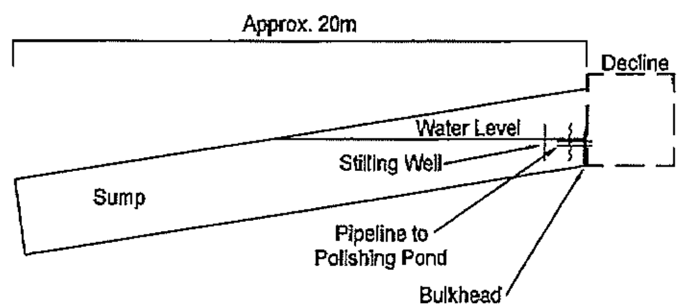
CANADIAN ZINC CORPORATION	PRAIRIE CREEK MINE
SCALE 1:4,000 (0 50 100 150 200 metres)	WATER MANAGEMENT SITE PLAN

Date: Jan. 31, 2003 | Drawing: Site_Plan.dwg | Figure: 1

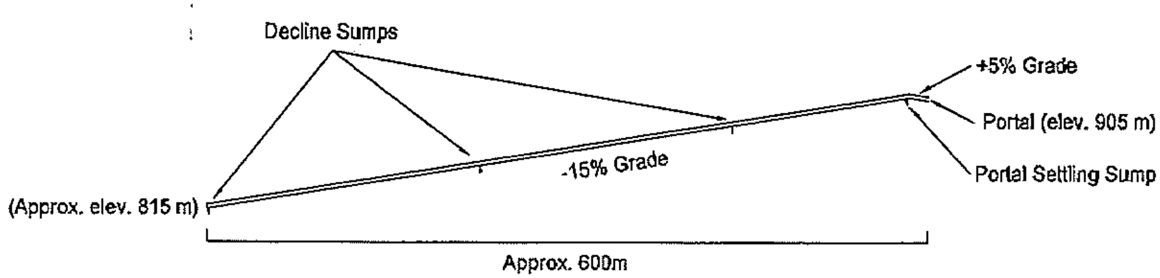
SCHEMATIC PLAN VIEW



SCHEMATIC DIAGRAM OF PORTAL SETTLING SUMP DETAIL



SCHEMATIC CROSS SECTION



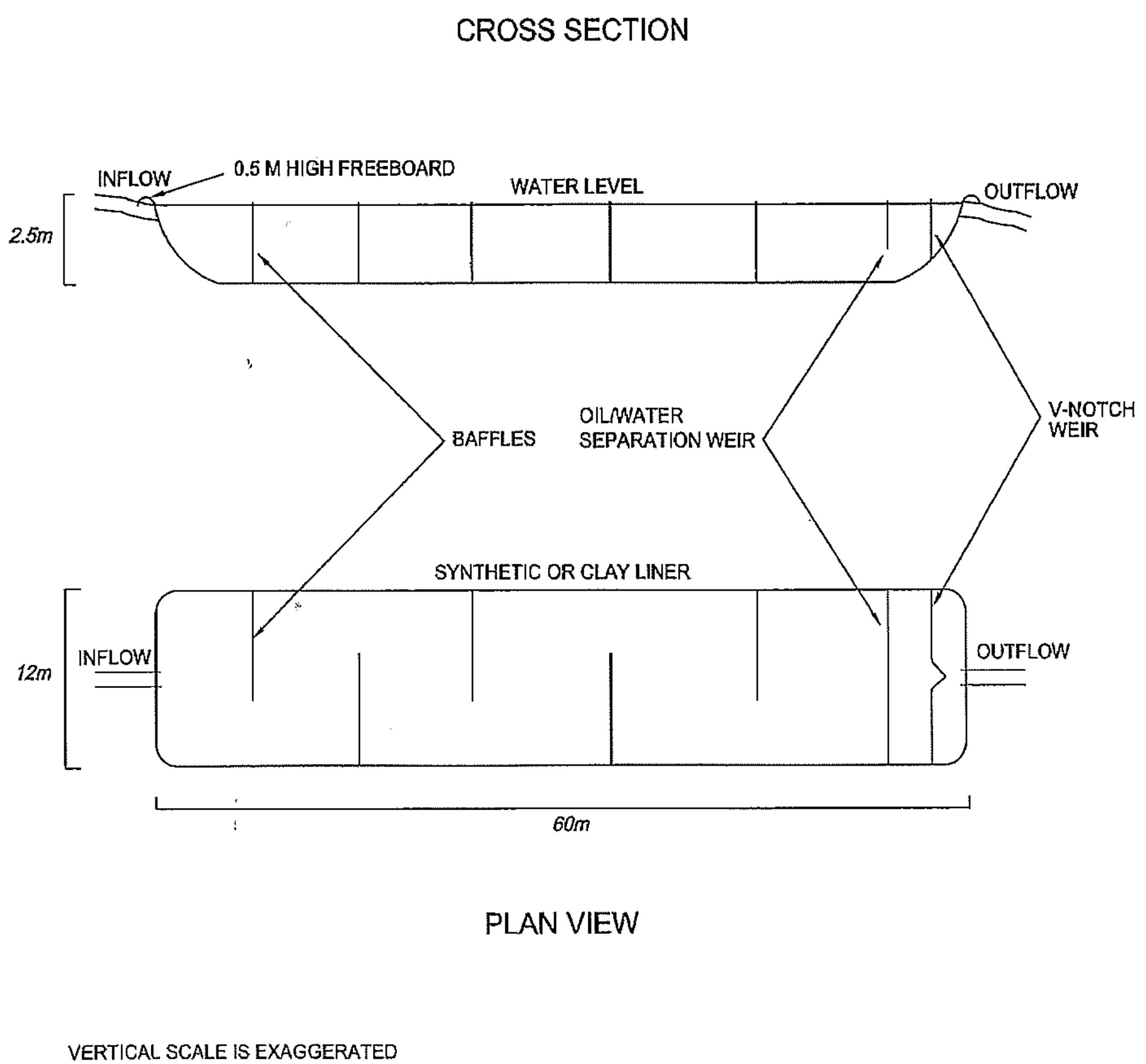
Date:	January, 2003
Drawing:	Decl_Schematic.dwg
Revised:	

CANADIAN ZINC CORPORATION

PRAIRIE CREEK MINE

UNDERGROUND DECLINE WATER MANAGEMENT

Scale: NTS	Figure 2



Date:	January, 2003
Drawing:	Polish_Pond.dwg
Revised:	

CANADIAN ZINC CORPORATION

PRAIRIE CREEK MINE

Typical Schematic of Polishing Pond

Scale: NTS	Figure 3