CANADIAN ZINC CORPORATION

PRAIRIE CREEK MINE DEVELOPER'S ASSESSMENT REPORT

MAIN REPORT Volume 1 of 4

SUBMITTED IN SUPPORT OF:

Environmental Assessment of
Prairie Creek Mine EA 0809-002

SUBMITTED TO:

Mackenzie Valley Review Board
Yellowknife, NT X1A 2N7

SUBMITTED BY:

Canadian Zinc Corporation
Vancouver, BC V6B 4N9

March 2010

PROJECT FACT SHEET

CORPORATE DATA

Project Name	Prairie Creek Mine
Company Name and Address	Canadian Zinc Corporation Suite 1710, 650 West Georgia Street Vancouver, B.C., V6B 4N9 Telephone: (604) 688-2001 Fax: (604) 688-2043
Contacts	Alan Taylor, Chief Operating Officer and VP Exploration David Harpley, VP Environment & Permitting Affairs Canadian Zinc Corporation 9926-101st Avenue PO Box 500 Fort Simpson, NT X0E 0N0 Telephone: (867) 695-3963 Fax: (867) 695-3964
Contacts	Wilbert Antoine, Manager of Northern Development

COMMUNITY DATA

First Nation Territory	Nahanni Butte Dene Band, Dehcho
Nearest Community	Nahanni Butte, 95 km south-east
Other Communities Nearby	Fort Liard, 165 km south-east Fort Simpson, 185 km east
Land Claims Status	In negotiation, Dehcho Process

PROJECT DETAILS

Project Location	550 km west of Yellowknife, NWT 61°33’ N latitude, 124°48’ W longitude
Measured and Indicated Resource	5,158,164 tonnes @ 10.8% Pb, 11.3% Zn, 175 g/t Ag and 0.4% Cu in Vein and Stratabound Ore
Mining Methods	Underground mine.

Concentration Process	Crushing, dense media separation, grinding, flotation
Mine Production Rates	Up to 1,200 tonnes/day ("t/d") mined, 1,000 t/d milled, producing approximately 120,000 tonnes/year of concentrate
Product	Zinc and lead concentrates with contained silver and copper.
Concentrate Transport	Winter road haul to Fort Nelson (BC) rail-head
Mine Life	14 years presently defined
WATER SUPPLY	
Mill Process	Mine water recycle from Water Storage Pond
Potable	On-site wells from Prairie Creek aquifer
ACCESS	
Air	1,000 m gravel airstrip
Road	Existing 180 km winter road to the Liard Highway
POWER	
Generation	On-site diesel-fuelled generators
Fuel Storage	Tank Farm, 6.8 million litres (4 tanks)
WORKFORCE	
Construction Workforce	~120 people at peak
Operations Workforce	~220 people total, ~110 on-site at any one time
Permanent Camp	150-person accommodation block
Proposed Work Schedule	Three week fly in-fly out rotation (flexible variations in schedule as required)

WASTE MANAGEMENT	
Tailings	Backfilled underground together with DMS rock and cement
DMS Rock	Underground backfill and surface disposal in waste rock pile
Waste Rock	Engineered surface waste rock pile
Garbage and Sewage Sludge	On-site incineration
WATER MANAGEMENT	
Mine Drainage	Used in mill process or treated and discharged
Mill Process Water	Water treatment and discharge

K'AONDÉH KEE GONDÁAGEDI

(Executıve Summary)

Gondááts'edı Kéhots'eníhthı (Introductıon)

Canadıan Zınc Mıne góhgedı tł'a ezhıı Praırıe Creek Mıne tł'a azhǫ t'áh gots'ęh á agų́ht'e. Ezhıı ndéh gozhíhe gots'ęh satsǫ́xų̨ laǫndíh kageneta ezhıı kaǫndíh t'áhsıı met'aodéʔa ǫt'e t'áh kats'uge gedı.

Ezhıı á yundéé gáhjene taıhonǫ xaye sǫ́ǫndı ekúh á Cadıllac Mıne góhgedı ezhıı kéhogenį́hthe ı̨le. Káa ek'élu éhtah zhagį́htsı̨ ı̨le kóó kıı t'ahságogį́lá íle. Gots'ęh á kíí tsı̨ne góʔǫ anagújá gots'ęh á Canadıan Zınc Mıne ǫkıhonǫ xaye gondee godlı̨ a goghǫh náogeendı.

It'áh nahxı̨ káa dúle malaída sǫǫndı gedı t'áh á ezhıı godı̨ eghálats'enda, godı̨ nats'eneteh, gots'ęh godı̨ tthe náts'ededhıh nezų ségogį́lá. Ezhıı azhǫ k'áhla ezhıı góla. Dúh k'achu méhnaots'enúhsah gedı t'áh á amı̨ı̨ t'ahsíí zhaodı̨shǫ (engıneer) kazháǫndíh gots'ęh k'aodhee éhtah ezhıı séé nezų mek'ats'enuhhtá egenı̨dhę. Dene gotah déhtthı t'áh gǫndí kagı̨la gháádé ehsą́ą́ méhots'enį́hthı gha.

Dıı Canadıan Zınc Mıne góhgedı godı̨ satsǫ́ kats'uge gedı ezhıı tł'a Nahʔą Dehé kų́ę́ góla gots'ęh godı̨ Nádélı̨cho gots'ęh Lıttle Doctor (Tu Ehgaa) góhgedı gogeh ezhıı á hútł'íe goghǫh náegenı̨dhe. Ezhıı á kéhots'enúhsah gedı á agot'ı̨. Kóó alaa kéhots'eníhthı gha nı̨dé edı̨htł'éh gháádé zǫh á náonídah gha góʔǫ gedı; tu gha chu edı̨htł'éh gų́lı̨, ndéh náets'eníhdáh gots'ęh ndéh k'eh k'eots'ege nı̨dé káa megha edı̨htł'éh gų́lı̨ gha goʔǫ. Gots'ęh godı̨ı̨ ndéh zhíhe goats'enda ezhıı chu megha edı̨htł'éh gų́lı̨, ek'élu zhek'ę́ę́ t'ahsíı éhxǫegededhah gha ezhıı k'elue chu edı̨htł'éh gháádé ehsą́ą́ k'ǫǫ gehtsı̨ gha góʔǫ.

Amı̨ı̨ gogha edı̨htł'éh séleh sı̨ı̨ ezhıı á Tu K'aodhee góhgedı ezhıı á dáǫndıı ndéh tsı̨ı̨́dhı ch'á gǫndı thela ghááde ęhʔęę góhgedı. Dúwé tsı̨́godhı láǫndıh k'ę́ę́ edı̨htł'éh ts'ehtsı̨ ghááde zǫh á hęʔęh gohgedı. Kaǫndíh t'áh ezhıı á azhǫ séésu zheghǫh náegenı̨dhe gots'ęh edı̨htł'éh gehtsı̨ gots'ęh k'achu séé nezų̨h łéhots'ede ts'ı̨hʔǫ á hęʔęh góhgedı. Ezhıı ghááde á yundaa goedelegha láǫndíh.

Canadıan Zınc Mıne yundee ǫkı Į̨mbehé gondéé godlı̨ á Tu Ts'ę́ K'aodhee ts'ę́ egedı̨htł'éh. Ekúh á satsǫ́ káthıge kéhonéhthıdhı gha t'áh tu gha edı̨htł'éh gots'ęh ndéh gha edı̨htł'eh enídhę góhgedı. T'áh á ǫkene láǫndíh ezhıı ek'élu k'ę́ę́ edegha tthe nígı̨htł'ı, tthe íle edé satsǫ́ metah láǫndíh ezhıı edegha nígı̨́htł'ı gha. Ededaa ek'élu k'ę́ę́ gek'éndíh láǫndíh. Ezhıı tł'a ǫkene ehsą́ą́ kagǫndíh olí gedı.

Yundıı Xaye láǫndíh á edı̨htł'éh gots'ę́ anajá. Ekúh á Tu K'aodhee gots'ę́ egedı̨ı̨tł'éh á kagedı edahxǫ edıı t'ahsíı dánéht'ee dek'eh nídénítł'éh kaahłá nı̨dé kádúle ęhʔęh ts'enı̨dhę t'áh nahegha edı̨htł'éh ts'ehtsı̨ kéhots'eníhthı láǫndíh góhgedı.

Yundíı ı̨mbéh gotah chu keots'enúhthı gedı kóó ezhıı Park chu nechá aogı̨́la t'áh godhǫǫtheʔa agújá. Alaa tł'a kíí gombáh godlı̨ á gomıne theʔǫ ı̨lé égų́h á node ts'ę́ ezhıı Park chu nechá agı̨́la t'áh gedhǫǫetheht'a lágújá. Ezhıı gots'ı̨hʔǫ séé gotanı̨ láǫndíh á ezhıı gomıne dúh theʔǫ agų́já t'áh náhotí godlı̨ láǫndíh. Edı̨́oʔǫ́ǫ́ edı̨htł'éh łǫ dúyé ehsą́ą́ getsı̨ ghááde ehsą́ą́ kéhonıdhı gha gedı. K'achu gúlíí godlı̨ anagededı t'áh k'achu séé nezų̨ų̨h mats'ı̨ndá olı sǫ́ǫndı gedı. Ezhıı ek'élu chu mıne gots'ęh Nahʔą Dehé gok'eodı̨́ʔá láǫndíh ehsą́ą́ ats'eleh gha kóó nezų̨ų̨h mets'endah énı̨dé zǫh dúle gedı.

Azhıı Ghálaeda

Ndéh gozhíhe gots'ęh tthe met'aodéʔá (Geology and Mıneral Resource).

Satsǫ́ dáǫndíh kágeneta tł'a ndéh gozhíhe dagǫndíh agų́ht'e sǫ́ǫndı kóó kíı dene dhedhé kǫthet'ı láǫndíh, kaǫndíh á satsǫ́ ndéh gozhíhe k'ǫǫthet'ı. Ǫhk'éh chu satsǫ́ ndaah metah zháthela ǫhk'éh tł'a kíı ttheká láǫndíh kaǫndíh tah á satsǫ́ kǫ́ǫthet'ı. Satsǫ́ detthoı t'áh chu ǫt'e. Tthe delǫle láǫndíh, ų́hk'aa thetee éhgedı kaǫndíh tah t'ahsíı k'ǫthet'ı. T'ahsíı kíí satsǫ́xų̨ láǫndíh á azhǫ k'éǫthet'ı k'ę́ę́ metah kéodat'į. Ezhıı azhǫ nát'ehtsí gha nįdé dáodacho k'eothıge gha gedı gha nįdé tł'a káa dıı ndu daecho gáhjenę tanį kaodacho olı gedı. Edı satsǫ́ dáǫndíh met'áh ats'et'į gha? Azhíı gha ǫt'e sǫ́ǫndı ts'enįdhę nįdé; tthııcho, lamǫ, saamba, met'áh ełets'ę́ots'edeh gha satsǫ́ xóo k'ǫ́ǫthet'ı, gokų́ę́ gots'ę́ ek'ák'ǫǫ gha satsǫ́ xóo k'ǫǫthet'ı ezhıı kaǫndíh gha met'áodéʔá kaǫndíh á gedı.

Kéhots'enį́hthe gots'ęh nįdé tł'a edahxǫ yundaa honǫ ʔǫ́ǫ́ dų̨ xaye gots'ę́ malaída olí sǫ́ǫndı gedı.

Ndéh Gok'eh (Envıronment)

Ndéh nezų̨ųh k'éts'endíh gha nezų̨ųh megháádé ats'et'į gha edįhtł'éh ts'ehtsį ezhıı gogháádé dé zǫh dúle yundaa godelé gedı. Yúndee káa honǫ ʔǫ́ǫ́ ehts'ę́taı xaye t'ǫ́h gots'ęh á ndéh ghǫh keogehndıh, tu ehtah ehxǫgehndıh, tu dáǫndíh, łue ehtah mezhíhe k'ǫ́íʔóh, det'ǫnı ehtah. T'ahsíı zhágúndíh met'áh láǫndíh énįdé ezhıı azhǫ mexǫts'ehndı įlé á agų́ht'e. Ezhıı azhǫ chu dek'eh nídénítł'éh įlé gedı. Ndéh chu thekǫ́ adandıh gedı t'áh ghǫh á dáútł'ıé góhdlı gots'ęh dáútł'ıé gókǫ́ anagot'įh ezhıı ehtah azhǫ meghǫh náets'enıdhe gots'ęh dek'eh níts'edénįtł'éh gedı.

Tthe Kats'ege K'é (The Mıne)

Ezhıı godı̨ı̨ ndéh gozhíhgedíge gha gedı tł'a yuzhee, ndéh gozhíhe, taı gots'ę́ ehndah góla gots'ę́ gozhíh gedı̨́gé ı̨le gedı. Yundaa anats'ídlá édé k'éʔǫ́ǫ́ yuzhee k'eots'ets'e ne taılı̨́h ehsą́ą́ k'achu kaodehthaa ndeh gozhíh ts'ę́ aots'eleh gha sǫ́ǫndı gedı. Ezhıı satsǫ́ genı̨dhę tthegódé metah thela ǫt'e héh dánéht'ee kágege gha olí sǫ́ǫndı genı̨dhę tł'a edahxǫ jǫ elácho k'ǫǫgúhthe ehts'ę́taı séé tthe dánéʔǫ́h kaneht'ee gotah ehsą́ą́ łíe dzęé k'eh kágege gha.

Tthe Nádedhıh K'é (Mıll)

Godı̨ t'ahsíı nádedhıh, tágedetsı, tagedehshí ezhıı tł'a tthegódécho zhíhe á t'ahsíı geenı̨dhę thela. Káondíh t'áh kíí tthegódécho tágedeshí t'áh aetsele agehʔı̨́h gots'ęh kíí tthedhaa láǫndíh gots'ę́ nígedę́hshíh. Azhíı gots'ęh á t'ahsíı nekéhgodlı̨ satsǫ́ láǫndíh ezhıı gúlęę nígı̨dhah gots'ęh k'éʔǫ́ǫ́ ezhıı metth'elea láǫndíh ezhıı azhǫ k'éʔǫ́ǫ́ aetselea tágededhıh. Nǫde ts'ę́ kíı séé łembee láǫndíh gots'ęh geníonéhsah gots'ęh á tu zhetah agehʔı̨́h gots'ęh t'ahsíı gúlíí chu zhatah agehʔı̨ ts'ı̨hʔǫ́á azhǫ łats'ıkeh lágot'ı̨́h. Azhıı genı̨dhę kagele gots'ęh ezhıı chu gúlíı azhǫ nígı̨́htł'í. Kíí ttha láǫndíh thetł'ı agehʔı̨́h gots'ęh ehsą́ą́ ezhıı azhǫ tehmı̨é t'ágehtł'í. Tehmı̨e nechaa káa gáhjene ehts'ę́dı̨ı̨ goké k'aeká láǫndíh gots'ęh edahxǫ dı̨ı̨ íle édé sı̨lái goké kadahdacho sǫ́ǫndı. Łǫǫ edegha nígı̨le goghááde ededaa ekǫǫ ek'élu mbáh gots'ę́ éhxǫegedele gha gedı.

Ezhıı gek'eaehtsıh lágehʔı̨ gha t'ahíı ndaah zhetah agehʔı̨ kóó kíí t'ahsíı dzǫǫt'e ǫt'e íle gedı. Ezhıı tł'a kíí hútł'íé meghǫh naets'enı̨dhe gha íle sǫ́ǫndı genı̨dhę, tł'a det'ats'ehtł'ı gots'ęh godı̨ naots'enehsáh íle ezhıı azhǫ mek'éts'endíh gots'ęh nǫde ts'ę́ nı̨dé ndéh gozhíh anagedleh gha gedı.

Ezhıı tthe nadadhıhé kíí met'aodéʔá íle láǫndíh édé thạh níhgı̨́htł'ı gha. Káa mǫnats'ı̨t'e láǫndíh kíí met'aodéʔá íle édé dzéh láǫndíh zhetah nígenę́htth'éh gots'ęh ndéh gozhíhe anagedleh gots'ęh séé nezų̨h ehníagedę́htth'éh gha. Godį egozhíhaodį́ʔá níogenįʔǫ ílé ezhıı tthe kų̨ met'aodéʔá íle t'áh daneʔǫ́h anagudleh t'áh seenagųdleh gha. T'ahsíı ch'ıé mǫshets'ezheh ts'ęh satsǫ́tenį gots'ęh edįhtł'éh k'ǫ́ǫdéla káǫndíh; edįhtł'éh azhíı dúle mek'eets'edehtła k'eegedehtła gots'ęh ezhıı satsǫ́tenį láǫndíh tł'a azhǫ negehtsí gots'ęh yundaa mǫla ndehé ts'ę́ nagededhah gha gedı. Ts'ǫ́ kų́ę́ kaǫndíh zhágóla nıdé jǫ kų́ę́ dáǫndıı ezhıı kazháondíh gok'éts'endíh k'ę́ę́ éhsąą séégehʔį goghááde gedetsı gots'ęh kexǫgehndıh gha.

Tu K'éhodíh (Water Management)

Tu dáǫndıı k'ets'endíh gha tł'a; taagáha ǫkı éhsą́ą́ nıլį aguht'e, ezhıı taagáha łíe tł'a godį eghálagenda ndéh gozhíhe k'eots'ege édé łáųlíí tu nılį láǫndíh. Ezhıı tł'a kíí xáádé á ǫt'e gedı. Ezhıı chu á dáǫndíh satsǫ́ t'enéa láǫndíh łáųlíí metah egodat'į gedı. Ezhıı chu éhsą́ą́ met'áh egodat'į gha t'áh datłeh láǫndíh getah agehʔį gots'ęh gık'aehtsıh lágehʔį gha. Ezhıı chu kíí mǫǫnejı íle, kíí t'asááǫndíh gha íle sǫ́ǫndı gedı. Kóo kíí nezų̨h ehsą́ą́ mexǫts'ehndı gha gedı.

Ezhıı taagáha ǫkı nılį ezhıı godį eghálagenda gots'ęh nılį láǫndíh ezhıı tł'a medáá mįe atselıa láǫndíh geetsį. Mezhíhe plastıc láǫndíh nígenıdhah gots'ęh gohtł'áh ų́hkaa ttheteé láǫndíh chu nígenįhtł'ı t'áh dúwé deghadelįh gha seogį́lá. Ǫhk'éh hutł'íe tu deehanat'ı, Łuk'eh zhah edítła edį́ tu łǫ agondeh gohthę t'áh medhąh séé nezų̨h tsá ʔéh láǫndíh nezų̨h ǫt'e ats'į́la gedı. Kaǫndíh t'áh á dúwé meghadelį́h gha seothídlá gedı. Łáųlíí á gets'ǫǫts'ehthe gots'ęh mexǫts'ehndıh á ǫt'e t'áh kíí nezų olı gedı.

Mıne kehogenį́hthe tł'ąą nıdé daǫndíh t'áh tu ghálagenda gha gedı tł'a, ezhıı godį káogege łáųlíí mezhíhe nılį á ǫt'e. Ezhıı gots'ęh nılį gha mıa laǫndíh gehtsį ılé nahohdehsı ıle ezhıı dánéhʔǫ́h ajá tł'ąą nıdé.

Tthetagedehshí gha nı̨dé ezhıı gots'ę̨h éhsą́ą́ tu agedídla gots'ę̨h gıt'áh at'ı̨ gots'ę̨h k'achu gots'ę́ nagedezı̨́h gha. It'áh kíí łą́ų̨líí nałǫdalı̨h lágot'ı̨ t'áh get'áh at'ı̨ gots'ę̨h á senagehʔı̨́h láǫndíh gots'ę̨h t'ahsíı daatłeh láǫndíh getah ahʔı̨́h. Ezhıı tł'a kíí dúwé met'áh ndéh tsı̨́ı̨́dhı sǫ́ǫndı gedı ezhıı héh chu nezų̨ų̨h maída gha gedı.

Ezhıı tu łą́ų̨líí get'áh at'ı̨ t'áh tu tsę ajá nı̨dé kóó Xaye nı̨dé kíí t'ahsáa gehʔı̨ gha íle łą́ų̨líí á get'áh at'ı̨ gha. Xaye ghá́áde gots'ę̨h Łuk'éh íle nı̨dé Į̨mbéh aodandıh dezǫh á kaǫdíh gha kų́ę́ gogéhʔǫ gozhıhe á senageʔı̨́h gots'ę̨h ezhıı gots'ę̨h tu nezų̨ agújá nı̨dé zǫh éhsą́ą́ nǫde ts'ę́ gedetsı lágot'ı̨́h gha.

Tsǫ́ kų́ę́ gots'ę̨h tu tł'a tu t'áh á seenegeʔı̨́h gha. Ezhı tł'a mets'edı̨tse tł'ą̨ą̨ nı̨dé godı̨ gots'ę́ moodedetsı olı sǫ́ǫndı gedı t'áh á káǫndíh gha kų́ę́ zháogı̨́htsı̨ ezhıı goghadetł'í láat'ı̨́h ghá́ádé, tu nezų̨ godlı̨ moodat'ı̨ at'ı̨́h. Ezhıı gots'ę̨h éhsą́ą́ tthegodé tah ną́ı̨lı̨ nahohdehsı ı̨le ezhıı gots'ę̨h tu metah at'ı̨́h gots'ę̨h náchų̨h édé shıh k'eh gots'ę̨h tu nádelı̨ azhǫ tu ehts'áádı láǫndíh t'áh ezhıı mıa hólı̨ dehsı ezhıı azhǫ ełetah at'ı̨h. Ezhıı gots'ę̨h á ezhıı tu kachu t'áh aneget'ı̨. Zhet'áh tthe k'aegehtsıh ehtah agot'ı̨, k'áhlah tu met'aodeʔá láǫndíí get'áh at'ı̨ gha á edegha seegeleh gots'ę̨h á nǫde ts'ę́ séé nezų̨h ajá tł'ą̨ą̨ dé gedetsı gha.

Tu ts'edǫ gha káǫndíh édé t'ahsę́ę́ gúlę́ gots'ę́ ndéh zhíhogedídeh. Nıdhą́ą́ gots'ę̨h tu ts'edǫ gha ezhıı godı̨ dene azhǫ eghálagenda gogha nezų̨ níots'ı̨́ʔáh gha. Ezhíı ts'ę̨h ehsą́ą́ k'ǫ́la tu ts'edǫ gha góʔǫ

Alaeda K'é Tahsíı Zháhólı̨ (Sıte Infrastructure)

Kų́ę́, mehchı̨é ghálaenda k'é gots'ę̨h gonaah t'ahsíı dene zhágı̨́htsı̨ met'áodéʔá ghǫh kagǫndíh gha gedı. Atthee t'ǫ́h gots'ę̨h Cadıllac Mıne kéhogenı̨́hthe gots'ę̨h kų́ę́ gozhǫa zhágóla ezhıı tł'a azhǫ senaots'edleh gha gedı. Godı̨ náts'edéh, godı̨ mékáets'eht'éh, godı̨ nats'eneteh, godı̨ satsǫ́ k'égendíh ehtah zhágų́lı̨. Kų́ę́ nechá ezhıı satsǫ́ kágege zhezhıh k'égendíh chu ǫt'e gha. Ek'ak'ǫ́ gha satsǫ́ etłeh gha kų́ę́ gogehtsį gots'ęh godį t'ahsíı k'eegedetła k'é chu gų́lį gha. Ehtł'éh láǫndíh t'ahsíı met'aodéʔale, t'ahsíı dúle mek'eets'edehtł'a gha seegots'elé gha.

Gots'ę́ Ek'élu Nįʔá (Access Road)

Godį káogege gots'ęh Lıard ek'élu ts'ę́ ek'élu gedethıh gha. Dıı ek'elu tł'a kíí goek'élue ehsą́ą́ ǫt'e íle kíí eghalagenda gha ek'élu gehtsį á ǫt'e. T'ahsíı nezų kágįgé tł'ąą nįdé Lıard ek'élu ts'ę́ ehnątanį ezhıı gots'ę́ Xat'ą́ą́ gots'ęh gahchene Edáıdzęa tł'ąąxą gots'ę́ t'ahsíı éhxǫegedele gha. Ededaa ezhı nígįle gha. Edáıdzęa tł'ąą nezų góhtę tł'ąą nįdé k'achu ahsíı nıagedídhah gots'ęh yutthee Lıard ek'élu mbáh ededaa nígįle gha. Nezu góhtę agújá édé ezhıı mehchįe Lıard ek'élu ts'ę́ nǫgohthe sį́į ehnatanį gots'éh ededaa t'ahsíı tłeh kazháǫndíh nígįdhah gha. Xaye góhtę nįdé godį tthe k'ágege ezhıı gots'ę́ t'ahsíı ehxǫegededhah gha.

Ezhıı Lıard ek'élu gáh t'ahsíı nígenıla įlé tł'a dene gúlíí éhsą́ą́ éhxǫegedele gha. Tahsíı mets'enįdhę tłeh, mǫshéts'ezheh t'ashíı kaǫndíh éhxǫets'ededhah gha kóó kíí mek'ę́ę́ ezhıı satsǫ́ yundaa gededhah gha á ek'élu dehthítsį gedı. Dıı ek'élu gedéhtsį tł'a gogha eghálaenda gha zǫh á ǫt'e. Kíí dene hózhę zhek'ę́ę́ k'egohthe gha góʔǫ le t'áh mexǫts'ehndıh gha. Mek'ę́ę́ náts'ezéh kexǫts'ehndíh íle nįdé ehch'agots'į́hthı gohthę íle édé t'ahsíı nahładetł'é gohthę t'áh ghǫh á nezu dek'elue ehxǫgehndıh gha.

Ezhıı ek'elu tł'a alaa kíı ek'édzeh á ageleh gha gedı įlé kǫ́ǫ́ godı tsá nádeh, godį golǫ ndaa zhágų́lį gots'ęh godį det'ǫnı deyehtth'ęę níaleh gotah nįʔá olı. Dıı á Nahʔą Dehé gots'ęh dene hútł'íe geghǫh náegenįdhe gots'ę́ kagedı ts'įhʔǫ́ gúlíí anaúdleh gedı. Nahʔą Dehé gondah godį tthembaa nį́ʔa mbáh godéʔá gots'ęh Nahe Dehé ts'ęh Lıard ek'élu ts'ę́ ek'elu nįʔá k'énaįʔa gha.

Ezhıı goloah gots'ęh det'ǫnı gonezųuh nádeh gots'ęh ezhıı Parks Canada góhgedı nahech'ąą agot'į láǫndíh gedı chu gháádé agį́la t'áh káa dene azhǫ gogedítth'e láǫndíh. Ezhıı ts'įhʔǫ á ekúhzhee kíí łę́ht'e olı sǫ́ǫndı gedı gháádé á ek'élu nagehtsį gha gedı.

Tthe Káts'ege K'é Godáedę́tį́h (Mıne Closure)

Tthe kats'ege k'é anagų́t'e édé dáǫndíí seenagots'eleh gha? Ezhıı tł'a tthegódécho dahdį́la ezhıı ehtah k'ę́ę́ níats'įle gots'ęh gohtłeh metah ats'eleh gha. Kų́ę́ zhágola, godį eghálats'įnda įlé ezhıı kų́ę́ kazháǫndíh azhǫ nagededhah gha. Ezhıı godį elák'et'ah nanetłe ezhıı zǫh éhsą́ą́ kíí dáǫndıı theʔǫ kaǫndíh olí gedı. Kéhots'enį́the godhęh dáǫndıı goʔǫ įlé gáhjene ezhıı láǫndíh gots'ę́ éhsą́ą́ seníogį́le gha.

Yundee kenats'endıh énįdé Pıne Poınt gohts'edı ezhıı chu á kagonįt'é įlé, kóó dúh ekǫ́ǫ́ goats'enda kíí goįtłedı kíí tł'o zǫh á zháníhsheh láǫndıı keodát'į. Elák'et'ah naedeh k'é zǫh láǫndíh á góʔǫ ezhıı k'ę́ę́ éhsą́ą́ seenagogedleh gha.

Gondaa Ts'eedı (Consultatıon)

Canadıan Zınc Mıne ezhıı tł'a Nahʔą Dehé gots'ę́xǫh ǫt'e t'áh łąalíí gots'ę́ gogendeh. Dáǫndıı athít'į olí Dene góhgedı t'áh Dene kagedı, yunį́h gots'ęh nahe gǫndıé zhágų́lį ezhıı ghááde t'ahsıı t'ahsaats'eleh gha dúle sǫ́ǫndı gedı. Ezhıı éhsą́ą́ mǫla k'ę́ę́ tradıtıonal knowledge góhgedı. Ezhıı gǫndı zhǫe gháádé godį náts'įdé, godį dene tthęne thela, godį náídíh náts'ehtsí, godı golǫah aet'į, godį dene gha ch'ágų́ht'e ezhıı kazhágǫndíh gogohthę agųndeh íle ts'edı nįdé kádúle zhedhąh agedeh sǫ́ǫndı gedı. Ezhıı gots'į́ʔǫ á Nahʔą Dehé, Canadıan Zınc Mıne ehtah ełéhogede gots'įhʔǫ á edįhtł'éh géhtsį k'ę́ę́ t'áh káa dúlé sǫ́ǫndı gedı t'áh á géhnįonį́sá. K'áhla hútł'ıé názhaetı t'áh éhsą́ą́ ek'élu, ndéh chu dáǫndıı k'ets'endı, tthembaa zhíhe gots'ęh kaįlį ezhıı chu dáondıı tu tsį́dhı ch'a gok'éts'endíh t'ahsíı kazháondíh azhǫ ghǫh ełendaats'edı olí. Ezhıı got'áh tsįne t'áh yundaa goalé.

Ezhıı ek'élu chu ts'edutthıh gedı kóó xǫ t'ahsíı gha got'áodéʔá tł'a, godįį ehdzoo ats'ehʔį gohthęę agundeh íle gedı t'áh kíí gok'agáh godlį á ek'élu gehtsį gha.

Met'áh Dágǫndíh Olı (Impact Assessment & Human Envıronment)

Impact Assessment gots'ęh Human Envıronment ts'edı nįdé ezhıı Praırıe Creek Mıne tł'a see nezų meghǫh náenídhe gedı. Tł'a dúhzhee Dene Ndéhe k'eh elaúda enídhę ezhıı tł'a mets'į́ʔǫ́ǫ́ alaeda ts'ęhk'eh ndaa goedelé gha sǫ́ǫndı. Dúh jǫ gotah kíí eghálaeda łǫ gų́lį íle, government gots'ágendı ts'įhʔǫ́ zǫh á alaeda gų́lı láǫndíh. Dıı eghálaenda gots'įhʔǫ Nahʔąą Dehé, Łíídlįį Kų́ę́, Lıard kazhaǫndíh Dehcho zhíhe gots'ęh Dene alaídéh gha dúle. Ezhıı gots'ęh amįį eghálaeda aetselea déhtsį láǫndíh édé dúle mets'įhʔǫ́ dúle t'ahsíı náts'edendíh, mets'įhʔǫ́ dúle saamba ts'edetsį, ededį chu dúle alagenda. Ełegha alats'enda ehtah agot'į édé edahxǫ dúle met'áh ndaa goedelé sǫ́ǫndı gedı. Thaa gots'ę́ éhsą́ą́ eghálats'enda gots'ęh dezǫą zháts'eníhshéh t'áh nezų eghálats'enda gots'įhʔǫ́ dezǫa eghalaeda k'eh k'eogedíhʔáh olí sǫ́ǫndı.

Yundaa keodat'į édé káa edahxǫ dáǫndıı ełets'áts'edı gok'éh nezųųh níots'į́ʔáh gha láǫndíh gedı. Ezhıı á meghǫh náets'enįdhe kóó yundaa dágǫndíh olı gedı.

Ezhıı godį eghálaída gots'ę́ ek'élu thítsį chu mek'ę́ę́ náts'ezéh gha gonezu olı sǫ́ǫndı gots'ęh mek'ę́ę́ chu ehdzoo ats'ehʔį gha gonezų olí sǫ́ǫndı gedı. Kóó kíí dene ohzhįį zhek'ę́ę́ gegohthe gots'ęh nágezéh gha goʔǫ íle. Amįį eghálaenda íle édé ezhıı at'ı̨ gha goʔǫ íle. Nahʔą Dehé gots'ęh Dene met'áh ałt'ı̨ genı̨dhę nı̨dé kíí nahegha łą́ht'e gedı.

Edı̨́goʔǫ́ dene zhek'ę́ę́ k'egohthe édé mets'ı̨hʔǫ́ mehchı̨é ełech'agúthı íle édé edı̨́goʔǫ́ t'ahsíı golǫah kanats'ezéh t'áh edı̨́goʔǫ́ t'ahsíı łǫ łááts'ehdeh édé dzǫǫt'e olí t'áh ezhıı chu á kexǫts'ehndı gha góʔǫ.

Tu Nezųųh K'éhodíh (Water Quality)

Ezhı deha kadélı̨ ts'ęh tu chu nezų mexǫedıh gha. T'ahsíı aetselea zhetah nádéh ǫt'e édé ezhıı azhǫ mexǫehndıh gha. Ezhıı edı̨htł'éh nahegha ts'ehtsı̨ ezhıı dáǫndıı gok'ets'undíh godı ezhıı gháádé gots'ę́ gok'éts'endíh gha dúle kóó nahxı̨ı̨ tł'a séé dúlé dáǫndıı nezų gok'éts'endíh gháádé á athíʔı̨ gha gedı.

Tthe káts'ege k'é káa goghǫh enathít'e édé dáǫndıı seenagúdleh gha? Ezhıı got'áh tł'a godı̨ gozhíhaodíʔá ezhıı azhǫ tthe met'áodéʔá íle goohnathídheh gots'ęh ehníedenítth'éh gha gedı. Tthe k'ǫdélá chu nezų nínídhah gha gedı. Ndéh gozhíhe gots'ęh tu kálı̨h gháts'enda édé káá satsǫ́ t'enı̨a metah egodet'ı̨ olí kóó yutthee ságodéhthaa nı̨nı̨lı̨ nı̨dé húle anadeh gha sǫ́ǫndı gedı. Yundah ts'ę́ édé kíí t'ahsíı égodat'ı̨ íle t'áh kíı dúle tu ts'edǫ láǫndíh gots'ęh éhsą́ą́ nezu anadeh gha sǫ́ǫndı gedı. Ezhíı chu éhsą́ą́ yundah ts'ę́ mexǫedıh gha.

Łue (Fısh)

Ezhıı deha dehsee metah t'ahsíı nandeh ǫt'e ét'ıı ts'enı̨dhę t'áh ghǫh á mek'anéthítǫ gedı. Sambaa aetselea bull trout geendı zhek'ę́ę́ nádéh gots'ęh łue dek'alı, łúha káondíh chu gúlı̨ gedı. Kóó ezhıı tł'a yundee ságodéhthaa gáhjenę dı̨ı̨ dechı̨ ekǫ́ǫ́ ts'ę́ zǫh á łue égodat'ı̨ gedı. Tthe kats'ege ekúhzhee tł'a kí łue nadedéh íle láondíh, yudee ts'ę́ Funeral Creek góhgedı ezhıı zọh łue egodat'ı̨ gedı. Eghálaenda k'é tł'a kíí łue nadedéh íle láọndíh káa thaa goaídá kóó kíí kagọndíh íle laọndíh gedı. Yudee ts'ę́ zọh godı̨jíh agų́ht'e t'áh łue nándéh láọndíh. Shíh dénı̨t'ı meʔǫ́hne godlı̨ı̨ ekǫ́ǫ́ ts'ę́ zọh á łue nádéh láọndíh gedı.

Aır

Eghálaída ts'ı̨hʔǫ́ zhát'a ts'ę́ xọ t'ahsíı andeh gohthę gha chu goaıdá ı̨lé gedı. Edı̨htł'éh k'eedítła, ek'akǫ́ gha satsǫ́ goahtheh kazhaondíh ezhıı zọh éhsą́ą́ mets'ı̨hʔọ łe zhat'a gots'ę́ at'ı̨ gha. Tthe táts'edehshí ezhıı chu mets'ęh łémbé láọndíh zhat'a gots'ę at'ı̨h. Ezhıı t'ahsíı taı kadeʔa zọh éhsąą mets'ęh łe zhat'a gots'ę́ at'ı̨ olí. Kóó náhchuh édé kíí zhat'a gots'ę́ at'ı̨h íle, ndéh gots'ę́ anat'ı̨h. Ezhıı chu káa nezų maında kóó kíí met'áh t'ahságọndíh íle láọndíh. Ezhıı satsǫ́ zhágoahtheh ezhıı tł'a kíí Nahʔą Dehé náts'edeh dáodacho tanı̨ k'aodacho á agų́ht'e.

Golọah gots'ęh Ndéh Gok'éh T'ahsíı Zhánísheh (Wıldlıfe and Vegetatıon)

Golọa k'ǫ́íʔáh gohthęę agodeh gohthe ts'enıdhę kóó naxı̨ tł'a mehchı̨e necha k'egohthe nı̨dé kíí nágotłah íle á alaída, tł'a edı̨́ godek'ı t'áh chu agų́ht'e t'áh kexọts'ehndıh t'áh a ats'et'ı̨ gha. Godı̨ı̨ ek'élu ts'edehge gok'ę́ę́ ndéh gok'eh t'ahsíı zháızheh ts'ęhk'eh tsı̨godhı gohthę ts'enı̨dhę kóo kíı mehchı̨e łie nadetłe ezhıı zọh éhsą́ą́ kaodaka gha. Ezhıı ts'ęhk'eh tł'a kíí hutł'íe dzágųdleh gha íle sǫ́ọndı genı̨dhę.

Ndéh Gok'eh Dágọndíh (Terraın and Stabılıty)

Tthehndégúhtłéh goch'á íle édé kų́ę́ dáọndıı hólı̨ gha goeda édé tł'a ọhk'éh ndéh nọenídáh ne xọ azhọ gogohthęę náonetł'ı gohthę agų́ht'e. Ezhıı chu goghọh naets'enıdhe kóó káa edheh t'ǫ́h mexọnáenııdhe t'áh medaa saah nıgots'enı̨ʔọ á agų́t'e. Kų́ę́ kíí dúwé natł'í sǫ́ọndı káọndíh á zhaehthítsı̨. Ek'élu chu tthembaa t'áh k'ǫ́theʔá ezhıı azhọ mek'anethítọ. Tthendéh gúhtłéh gha láọndíh ezhıı á azhọ gok'ats'enéhtọ kíí lááh kóó kagújá íle lákeodát'į t'áh kíí kagondeh gha íle sǫ́ǫndı genįdhę. Godį tthembaa tah ek'élu nįʔá goʔǫ́hnets'ę́ náchaadeh ts'ę́ deghaodéʔa ezhıı zǫh á tthembaa k'eh gohtł'éh gų́lį t'áh ghǫh á ǫhk'éh hutł'ıe náchųh t'áh tthehndégúhtłéh anagot'įh. Ǫhk'eh zǫh á ndéh godádedzoh láat'į láǫndíh kóó kıı mets'įhʔǫ t'ahsagǫndíh íle láǫndíh.

Godį ek'élu ts'ue k'ę́ę́ déʔá nįdé ǫhk'eh łáųlíí mezhıhe tę gų́lį á agų́t'e. Ǫhk'éh níembaa mek'eh ejıhts'ehkah t'áh sa zhédídıh t'áh naxęh nįdé mets'įhʔǫ hútł'íe gozhíhgodįʔá nechá agot'į́h. It'áh godį kagǫǫdíh édé kíí mech'ats'edętsı gha íle kíí medahét'ıı éhsą́ą́ ttha níts'įhtł'í gha. Ezhıı á chu dene t'ahsíı zháúhłeh k'éogedezhǫ sį́į gok'agenéhtǫ.

Łuk'éh tu łǫ agondeh gohthę ch'á chu gok'éthįdıh. Godį tu met'ah athít'į gha mįe zhaéhthítsį ezhıı godhąh chu ʔéh nátse gots'ęh dahdįchá á zháéhthítsį t'áh kíí dúwé meghadedla sǫ́ǫndı.

T'ahsíı Got'áh Dzaagot'į́h (Accıdents and Malfunctıons)

Tthe káts'ege k'e tłeh gots'ęh t'ahsíı mǫ́ǫnejı héh eghálaeda gha édé tł'a Praırıe Creek ch'ąą ts'ę́ godį ʔeh godhąthet'ı ezhıı zhíhe éhsą́ą́ melats'enda gha. T'ahsíı nahłaadétł'ı édé dúlé ezhıı goch'ąą delį́h ch'a mek'éts'endíh gots'ęh tu ets'edets'ı ezhıı chu dúle gozhaa gots'ę́ godáts'edęchu. Ek'élu k'ę́ę́ t'áhsíı nałaadetł'ı gohthę ch'a chu tł'eh tenį met'áh t'ahsíı k'ezheh gots'ęh t'ahsíı met'áh k'eohdíh gha zháóhlį ǫt'e kaǫndíh t'áh éhsą́ą́ k'ezheh gha. Xaye agų́ht'e édé ezhıı chu gots'andı t'áh t'ahsıı nałaadétł'ı seegots'eleh gots'ę́ łąąt'ę k'ets'endíh gots'ándı. T'ahsíı k'ezhee chu zháítę ǫt'e éhsą́ą́ k'ezheh gha. Kaǫndíh kóó t'ahsíı ts'íhegodetsı gohthę gha chu ek'élu nıʔá k'ę́ę́ kexǫgehndıh gha.

Łááhgocho Got'áh T'ahsíı Éts'ededíh (Cummulatıve Effects)

Tthe káts'ege goalats'enda gots'ę́ kíí ezhıı gothah łaahcho t'ah ʔehsáá gų́ht'e gha íle sǫ́ǫndı. Ezhıı k'ahla alaeda gots'ę́ satsok'o (Mackenzıe Gas

Pıpelıne) detthıh gha níodę́dhé édé, dúhdęę tł'a kíı hutł'ıe gúlęę mets'ededíh gha íle sǫ́ǫndı. Kaǫndíh kóó ezhıı satsǫ́k'o ghálaeda tł'a kíí gozhaah gogha zǫh megha dene elaídeh ts'enıdhe ǫt'e t'áh dıı elaeda tł'a kíí hutł'íe zhededí gha íle sǫ́ǫndı. Ek'elu met'áh ats'et'ı gha íle kóó mek'ę́ę́ ats'et'ı édé mets'ı̨hʔǫ tsı̨́godhı gots'ęh goloah ts'ęhk'eh met'áh t'ahsaagondeh gohthę. Kagǫndíh ghǫh á Canadıan Zınc amı̨ı̨ zhek'ę́ę́ at'ı̨ gha goútǫ́ gots'ęh ek'élu k'ę́ę́ kexoúdıh genı̨dhę.

T'ahsíı Ehxǫedíh gots'ęh meghǫh Gondáts'edı (Monıtorıng and Reportıng)

Tthe kats'ege k'é eghálaenda gots'ę́ gots'ęh gotł'ąą gots'ę́ éhsą́ą́ elaenda k'éh dagot'ı gots'ęh ndéh gok'éh kexǫedıh gha. Canadıan Zınc aegenı̨dhę gháádé édé tł'a dúhdęę gots'ęh dene gohéh alaenda t'áh gotah at'ı̨ édé genı̨dhę. CZN t'ahsíı keogehndíh gok'éh edı̨htł'éh zhágedítł'éh gonááh maats'enda goghaogı̨́ʔáh gha genı̨dhę. CZN, Parks Canada gots'ęh Dehcho Technıcal Commıttee kíí azhǫ t'áh gogha ǫt'e agų̨hjá édé genı̨dhę gots'ęh łáádı duhdęę nazhaetı gha łéagedéh gots'ęh ezhıı et'ı chu Tthe káts'ege k'e dágot'ı gok'ǫ́ǫgenehtah gots'ęh t'ahsıı meghǫh názháets'enı̨déh ghǫh gogendeh édé genı̨dhę.

EXECUTIVE SUMMARY

Introduction

The Prairie Creek Mine (the "Mine") is 100% owned by Canadian Zinc Corporation ("CZN") and is situated in the southern Mackenzie Mountains of the Northwest Territories ("NWT"). The Mine contains significant infrastructure, including a processing plant ("Mill"), office buildings, workshops and accommodations, all constructed in the early 1980's by Cadillac Explorations Ltd. Cadillac received permits to operate the Mine and an access road to the Liard Highway, but never commenced operations. CZN acquired the property in 1993, and has since completed numerous exploration, engineering, and environmental programs and studies.

CZN applied to the Mackenzie Valley Land and Water Board ("MVLWB") in June, 2008 for a Water Licence and land use permit ("LUP") to operate the Mine, and LUP's to operate transfer facilities approximately half way along the access road and near the Liard Highway. The applications were referred to the Mackenzie Valley Review Board ("MVRB") for Environmental Assessment ("EA") in August, 2008. The MVRB issued Terms of Reference ("TOR") for a Developers Assessment Report ("DAR") in June, 2009 and included use of the access road in the EA.

In June 2009, the Nahanni National Park Reserve ("NNPR") was officially expanded. The Mine area is now surrounded by the expanded park but is not part of the park, and approximately half of the length of CZN's access road crosses the park.

CZN currently holds a Water Licence and LUP for underground exploration/development and operation of a pilot plant, two LUP's for surface mineral exploration, and a LUP for use of the access road. These permits were issued following EA's conducted by the MVRB. Through these EA's, the site and existing facilities have been extensively studied and reviewed. A number of plans and structures were previously developed by CZN and approved for use by the MVLWB.

The Project

Geology and Mineral Resource. Mineralization consists of Vein and Stratabound style base metal deposits, contained in limestones, dolostones and shales. The current resource to be mined totals over 5 million tonnes, contains the metals lead, zinc, silver and copper, and will be mined over 14 years.

Environment. Extensive environmental data has recently been collected in the area of the Mine to update and add to the information that was collected previously. Sixteen years of flow data have been recorded on Prairie Creek. There is now an extensive database on water quality, stream flows, local climate, and the numbers, proximity and habitats of fish and wildlife in the area.

The Mine. All mining will be underground, and will produce between 600 to 1,200 tonnes of ore per day. Underground workings already exist on three levels inside the mountain. Future workings will include three new deeper levels. Mining will take place year round.

The Mill. In the Mill, the ore will be processed to separate the metal bearing minerals (concentrates) from the waste (gravel-sized rock, and silts called tailings). The ore is first crushed to a gravel size. Metal bearing rock is separated from waste rock. The metal bearing rock is then ground down to flour and processed in tanks of water, called flotation cells. Concentrates of lead and zinc (each containing silver and copper) are produced from successive cells, leaving residues of tailings and process water. Chemicals are used to separate the different concentrates in the cells. These are mainly organic-based, and are non-toxic. The concentrates will be placed in sealed bags, and stored in a building ready to be hauled out over the access road in winter time.

After processing, the residue tailings will be filtered to remove process water, and then sent to a separate plant where they will be mixed with the waste rock plus a small amount of cement. The mixture will then be taken underground to fill the holes left from mining.

Waste Management. All of the tailings from the Mill will go underground in the backfill mix. Three-quarters of the waste rock from the Mill will also go underground in the mix. The remaining quarter together with waste rock from the mining of access tunnels underground will be placed in an engineered Waste Rock Pile ("WRP"), located in a small valley west of Harrison Creek, a tributary of Prairie Creek.

The major benefits of the waste management plan are that, after the Mine is closed, there will be no waste on the Prairie Creek floodplain, and the underground workings will be completely filled. Other site waste that is free of contaminants (e.g scrap metal) will be buried in the WRP. Hazardous waste will be taken off-site for disposal. Camp waste will be incinerated. Camp sewage will be treated in a plant on-site.

Water Management. There will be two main sources of water to be managed during mine operations: drainage from the Mine; and, process water from the Mill. Both water sources will contain metals, although the process water will contain a greater variety of metals plus residues from the Mill chemicals.

A large pond was originally built on site with dykes and a clay lining for tailings disposal. This pond will be re-engineered as a Water Storage Pond ("WSP"). After the pond was originally built the backslope slumped, raising concerns about stability and possible leakage. The new WSP will include slope stabilization works, and a new plastic liner in addition to the existing clay liner.

During start-up of the Mine, the WSP will be filled with mine drainage water up to the operating water level. During operations, the WSP will supply feed water to the Mill. The WSP will continue to receive some mine water, but will also receive a portion of the Mill process water, which can be recycled to the Mill after temporary storage.

Most of the mine water will be treated year round in a new treatment plant to reduce metal concentrations, and then released to Prairie Creek. The remaining process water not recycled will also be treated in the new plant. Process water will not be treated and released in January to March, and the treatment and release rate in other months will be varied depending on the flows in Prairie Creek. This way, metal concentrations occurring in Prairie Creek can be kept to a minimum in all months.

Treated sewage water and seepage collected from the WRP will also be sent to the WSP, but the flows will be comparatively small. Runoff from rainfall and snowmelt will be channelled through existing ditches and a collection pond before discharge to Prairie Creek, as occurs at present. Potable water for the Camp will be supplied by wells.

Site Infrastructure. The existing buildings will be upgraded and modernized. New facilities will include a kitchen/accommodation block, concentrate shed, power generation units, and an incinerator.

Manpower. Approximately 120 people are expected to be needed during initial construction, and 220 staff for operations, with half being on-site at any one time. Personnel will work for three weeks, followed by three weeks off, with transport by charter flights. CZN's policy is to give preference to qualified regional residents, followed by northern residents. Training programs will be organized to maximize local employment. Projections indicate that, in time, as many as 70 workers may be regional residents, and including service providers, this number may be 150 plus.

Access Road. The transport of concentrates from the Mine, and of supplies into the Mine, will be a major part of the project because of the volumes involved. A detailed transportation plan has been developed. It is essential to open the access road from the Mine to the mid-point transfer facility early in the winter and start the concentrate haul. The remaining concentrates would be hauled directly to the transfer facility near the Liard Highway after mid-January when the ice bridge over the Liard River is open, while contractor trucks haul out the concentrates left at the mid-point. The mine trucks would take supplies (including fuel) to the Mine on the back haul. Highway trucks will take most of the concentrates to Fort Nelson in winter. However, because of highway restrictions, the haul will be completed in summer.

CZN is proposing to re-align sections of the access road to promote safety, reduce human and environmental risks, and accommodate the wishes of the Nahanni Butte Dene Band (avoiding wetlands and wildlife habitat) and Parks Canada (avoiding karst features).

Mine Closure. At the end of the Mine's life, the site will be reclaimed. The Waste Rock Pile will be covered with a clay-rich soil. Site buildings and infrastructure, if deemed not to have any future use, will be dismantled. The airstrip will be left for emergency landings. Dykes will be breached and graded, and the site will be returned to its natural setting.

Consultation

CZN has a long history of engagement with local First Nations and government agencies. CZN has had representatives in the region for many years, and senior staff has met with local Bands frequently. CZN has concluded Memoranda of Understanding with the Nahanni Butte Dene Band, Liidlii Kue First Nation and Parks Canada, and has initiated Impact Benefit Agreement negotiations with the First Nation groups.

CZN contacted the local Bands regarding their traditional knowledge ("TK"), and subsequently met with the Nahanni Butte Dene Band to discuss TK. The Band outlined their concerns with the project, and CZN's responses to date include investigation of road re-alignment options, and surveys of specific locations along the access road for heritage resources.

Impact Assessment

Human Environment. The Prairie Creek Mine is a relatively modest project that is proposed for a region of the NWT that has limited other confirmed economic prospects. The real economic and social impact of this project will be generated through the participation of local labour and business in the area, including the communities of Nahanni Butte, Fort Simpson and Fort Liard . Participation will come in the form of direct employment, direct supply of goods and services, and spin-off activities. There will be a period of adjustment as people and communities integrate into the wage economy. The rise in financial wealth and all that it affords will more than offset this initial adjustment period. For those living in the project area, an operating Prairie Creek Mine offers an opportunity for a generation of employment, and will result in a population that is better educated, better trained and better able to cope with, adapt to and capture new opportunities in the future.

Access road operations are expected to increase traditional land use in the area since a re-aligned access road will afford easier access to hunting areas and trap lines. However, a cooperative effort is required to control road access because un-authorized use poses risks to safety and to wildlife from hunting pressures.

Water Quality. Recent studies show that the historical discharge of untreated mine drainage has had no significant impact on downstream water and stream sediment quality, or aquatic life. This suggests Prairie Creek is not particularly sensitive to discharges from the Mine. Nevertheless, CZN's water management strategy for operations will minimize the potential for impacts.

CZN commissioned a study of background metal concentrations in Prairie Creek, with the objective of setting water quality targets to protect aquatic life. The targets set are lower than national targets.

Predictions show that the planned discharge from the Mine during operations will not cause metal concentrations in Prairie Creek to exceed the targets when creek flows are in the normal range year round. CZN will monitor flows in the creek, and if flows are found to be lower than normal, the discharge will be temporarily adjusted so that the targets are not exceeded. This will mean no impacts on Prairie Creek water at the Mine, or 7 km downstream at the new NNPR boundary.

After mine closure, there will be no drainage from mine portals because the Mine and access tunnels will be completely filled. However, the bedrock surrounding the Mine workings is expected to allow the passage of groundwater. This water will contain metals, mostly from mineralization considered uneconomic and not mined, and to a lesser extent from the backfilled waste mixture. A small quantity of seepage from the covered Waste Rock Pile is also possible.

It is believed that the natural zinc concentrations that existed in Prairie Creek before any mine development potentially exceeded the water quality target during winter months when creek flows were lower than normal.

Predictions for Prairie Creek after mine closure suggest all metal concentrations will remain within the water quality targets when creek flows are in the normal range year round, but if creek flows are lower than monthly in winter, zinc concentrations could be similar to those predicted to have potentially occurred before mine development. Post-mine predictions also indicate higher cadmium concentrations in winter if creek flows are unusually low. However, cadmium is not stable in the natural environment and disappears quickly because of various natural reactions. Therefore, the target for this metal is unlikely to be exceeded. As such, it is likely that no additional impacts on water quality will occur after mine closure compared to pre-mine conditions.

Fish. Bull trout and mountain whitefish are found in Prairie Creek near the Mine, however numbers are low. Spawning trout were found in Funeral Creek, a tributary of Prairie Creek upstream of the Mine. No evidence of spawning has been found downstream of the Mine. Based on the water quality predictions, Mine operations should have no impact on fish. Water quality after Mine closure may cause limited impacts in the immediate vicinity of the Mine site when Prairie Creek flows are less than winter normals. These impacts may have occurred naturally before the Mine existed.

Air. New power generators and an incinerator will limit the release of exhaust gases. Frequent wet conditions will naturally control dust. Any impacts will be limited to the Mine area.

Wildlife and Vegetation. Impacts to wildlife from Mine operations are expected to be limited and largely avoidable. Dall's sheep lamb on high ground in the area in the spring and could be disturbed by air traffic. Flight path management will be adopted. There is a potential for mortality of Dall's sheep, woodland caribou and wood bison associated with access road use. A wildlife sighting and notification system will be adopted, in addition to the posting of speed limits. Grizzly bear-human encounters are possible at the Mine site and programs to limit any attraction of bears will be implemented, along with training to respond appropriately to bear encounters. No significant impacts on vegetation are expected because of the relatively small areas of disturbance relative to the large areas of vegetation types.

Terrain and Stability. No large-scale landslide features are evident near the Mine and access road, and the risk of major slope failure appears to be small. Small-scale slope failures and mudflows are possible along the access road east of the Mackenzie Mountains, particularly where permafrost might exist in lowland areas. Impacts can be minimized by good drainage and avoiding removal of the vegetation layer during annual road construction. Engineered structures (the WSP and WRP) have been designed to be stable during earthquakes. Dykes protecting the site during major floods were designed and built properly. Maintenance repairs have been made to the armour rock on the dykes.

Accidents and Malfunctions. The majority of Mine activities, and all those associated with chemicals, fuel and hazardous material, will take place within a dyke-protected area, isolated from Prairie Creek. Any spills or contamination can be contained on site, and discharge of site water to the environment can be stopped temporarily. The potential for spills or leaks along the access road will be minimized by controlling road use and using industry-standard containers for transport and storage. Winter conditions will assist in the containment of any spills until a response team can complete a clean-up. The bags of concentrate being transported will be frozen, but road bed tests will be made along the route to make sure material is not being lost.

Cumulative Effects. Very little other activity is or will likely be occurring in the area during Mine operations that could cause cumulative effects. If the Mackenzie Gas Pipeline construction occurs during the life of the Mine, there will be significant regional disruption, but this is unlikely to significantly affect the Mine because the pipeline will require short-term skilled labour. Un-authorized use of the access road would raise safety and wildlife concerns. CZN is hoping to control access, and will closely monitor road activity.

Monitoring and Reporting. Significant monitoring of operations and the environment will occur during and after the Mine's life. CZN expects individuals from local communities to be involved in this, preferably as employees. CZN undertakes to share the monitoring results. CZN's desire is for the current CZN-Parks Canada-Dehcho Technical Committee to evolve into a more public, inclusive committee that meets frequently in the region, and is used as a forum to review Mine performance and to discuss and address concerns.

TABLE OF CONTENTS

PROJECT FACT SHEET 1

EXECUTIVE SUMMARY SOUTH SLAVEY TRANSLATION 5

EXECUTIVE SUMMARY 18

1.0 INTRODUCTION 49
- 1.1 Site and Regulatory History 49
- 1.2 Mineral Claims and Leases 56
- 1.3 Nahanni National Park Reserve 56

2.0 INFORMATION ON THE DEVELOPER 60
- 2.1 Corporate Overview 60
- 2.2 Honouring Commitments 61
- 2.3 Environmental Performance 61
  - 2.3.1 Regulatory Compliance 62
  - 2.3.2 Compliance with Commitments 63
  - 2.3.3 Compliance with Measures 66
- 2.4 Corporate Policies 68

3.0 ASSESSMENT BOUNDARIES 70
- 3.1 Geographic Boundaries 70
  - 3.1.1 Valued Component Boundaries 70
  - 3.1.2 Overall Study Area Boundaries 72
- 3.2 Temporal Boundaries 72

4.0 EXISTING BIOPHYSICAL ENVIRONMENT 74
- 4.1 Development Location and Ecoregions 74
- 4.2 Ambient Air Quality and Noise Levels 76
  - 4.2.1 Ambient Air Quality 76
  - 4.2.2 Background Noise 77
- 4.3 Climate 78
- 4.4 Hydrology 81
  - 4.4.1 Watershed Surface Water 81
  - 4.4.2 Site Surface Water 84
  - 4.4.3 Site Groundwater 91
  - 4.4.4 Surface Water – Groundwater Interaction 92
  - 4.4.5 Mine Water 95
- 4.5 Mine Water Quality 95
- 4.6 Receiving Water Quality 100
- 4.7 Aquatic Ecosystem 101
  - 4.7.1 Fisheries Studies 1980-2005 101
  - 4.7.2 Fish Populations 101

4.7.3 Aquatic Habitat ... 103
4.7.4 2006-2008 Aquatic Studies ... 103
4.7.5 Harrison Creek ... 106
4.8 Wildlife ... 107
4.8.1 Objectives from the TOR ... 107
4.8.2 Background Information Sources ... 107
4.8.3 Habitat Setting ... 108
4.8.4 Specific Wildlife Existing Environment ... 108
4.9 SARA and COSEWIC Species ... 113
4.9.1 Horned Grebe ... 114
4.9.2 Peregrine Falcon ... 114
4.9.3 Short-eared Owl ... 114
4.9.4 Rusty Blackbird ... 115
4.9.5 Common Nighthawk ... 115
4.9.6 Olive-sided Flycatcher ... 115
4.9.7 Woodland Caribou ... 116
4.9.8 Wood Bison ... 116
4.9.9 Wolverine ... 116
4.9.10 Grizzly Bear ... 116
4.10 Vegetation and Plant Communities ... 117
4.10.1 Conditions Prior to Site Development ... 117
4.10.2 Previous Baseline Studies - Mine Site and Prairie Creek ... 117
4.10.3 Previous Baseline Studies – Access road ... 118
4.10.4 Present Conditions ... 122
4.10.5 Rare Plants ... 123
4.11 Geology ... 123
4.11.1 Mine Geology ... 123
4.11.2 Access Road Geology ... 131
4.12 Terrain ... 136
4.12.1 Seismic History ... 136
4.12.2 Karst Landform ... 137
4.12.3 Soils and Granular deposits ... 138
4.12.4 Ground Stability ... 139

5.0 EXISTING HUMAN ENVIRONMENT ... 140

5.1 Historic Developments ... 140
5.1.1 Pre-1975 ... 140
5.1.2 1975-1979 ... 140
5.1.3 1979-1982 ... 142
5.1.4 Grainger Camp ... 142
5.1.5 Cat Camp ... 142
5.1.6 Post-1982 ... 144
5.2 Other Infrastructure ... 144
5.3 Protected Area Status ... 144

5.4 Highway 7 Traffic ... 145
5.5 Training/Skill levels ... 149
5.6 Socio-Economic Conditions ... 150
5.7 Land Use ... 151
5.7.1 Traditional Uses ... 151
5.7.2 Operations of Nahanni National Park Reserve ... 155
5.7.3 Outfitting ... 155
5.7.4 Resource Use and Exploration ... 155
5.8 Harvesting ... 157
5.9 Heritage Resources ... 158
5.10 Other Economic Activities in the Region ... 159

6.0 DEVELOPMENT DESCRIPTION ... 160

6.1 Project Lifespan (Gantt Chart) ... 160
6.2 Mine Footprint ... 160
6.3 Existing Infrastructure at the Prairie Creek Mine ... 163
6.3.1 Mill Concentrator Complex ... 163
6.3.2 Administration Building ... 171
6.3.3 Accommodation Complex ... 171
6.3.4 Maintenance Workshops ... 172
6.3.5 Tank Facilities ... 172
6.3.6 Water Treatment Facilities ... 173
6.3.7 Water Storage Facilities ... 173
6.3.8 Coarse Ore and Waste Rock ... 174
6.3.9 Waste Treatment Facilities ... 174
6.3.10 Cement Plant ... 174
6.3.11 Storage Pads and Other Structures ... 174
6.3.12 Airstrip ... 176
6.3.13 Explosive Magazines ... 176
6.3.14 Underground Facilities ... 176
6.3.15 Site Ancillary Facilities ... 177
6.3.16 Road Camps ... 177
6.4 Changed Levels of Existing Infrastructure Use ... 178
6.5 Permits Required ... 178
6.6 Other Required Developments ... 179
6.7 Underground Facilities ... 183
6.8 Explosives ... 186
6.9 Mining Methods ... 186
6.10 Mill Process ... 188
6.10.1 Ore Processing ... 188
6.10.2 Reagents ... 190
6.10.3 Concentrate Bagging and Storage ... 190
6.11 Backfill Process ... 191
6.12 Mine Waste Management ... 194

6.12.1 Waste Rock and DMS Rock 194
6.12.2 Tailings 199
6.13 Aggregates 200
6.14 Hazardous/Non-Hazardous Materials 201
6.15 Water Requirements 208
6.16 Water Management System 208
6.16.1 Mine Drainage 210
6.16.2 Mill Process Water 211
6.16.3 Waste Rock Pile 211
6.16.4 Dense Media Separation Pile 214
6.16.5 Ore Stockpiles 214
6.16.6 Sewage Treatment 214
6.16.7 Water Storage and Treatment 214
6.16.8 Water Transfer 215
6.17 Water Balance 218
6.18 Water Monitoring 219
6.19 Power and Fuel 221
6.20 Other Infrastructure and Activities 222
6.21 Access Road 222
6.21.1 Access Road Alternatives 222
6.21.2 Road Construction 229
6.22 Access Road Water Management 230
6.22.1 Construction 230
6.22.2 Operations 230
6.23 Concentrate Haul 230
6.24 Transfer Facilities 235
6.24.1 Locations 235
6.24.2 Construction 238
6.24.3 Operations 243
6.25 Manpower 244
6.26 Worker Transportation/Scheduling 247

7.0 PUBLIC ENGAGEMENT 248

7.1 Engagement Methods 248
7.2 Engagement Summary 249
7.2.1 Pre-Application Consultation and Community Support 249
7.2.2 Post-Application Consultation and Community Support 252
7.3 Environmental Agreements 255
7.4 Traditional Knowledge Information Collection 256

8.0 IMPACT ASSESSMENT – MINE SITE WATER QUALITY 258

8.1 Historic Impact 258
8.1.1 Mine Water Chemistry 258
8.1.2 Contaminant Loads 260

8.1.3 Impacts of Historic Mine Water Discharge ... 262
8.2 Waste/Material Characterization ... 263
8.2.1 Mined Waste/Materials ... 263
8.2.2 Mined Waste/Materials Geochemical Properties ... 263
8.2.3 Mined Waste/Materials Contaminant Release ... 264
8.2.4 Hazardous and Non-Hazardous Products/Waste ... 265
8.2.5 Other Materials ... 267
8.3 Discharges During Operations ... 267
8.4 Discharges After Mine Closure ... 269
8.5 Water Quality Objectives ... 270
8.6 Potential Impacts ... 272
8.6.1 Mine Operations ... 272
8.6.2 Mine Closure ... 274
8.7 Water Management Facilities ... 276
8.7.1 Sewage Treatment ... 276
8.7.2 Polishing Pond and Catchment Pond ... 276
8.7.3 New Water Treatment Plant ... 277
8.7.4 Water Collection Systems ... 277
8.7.5 Water Storage Pond ... 278
8.8 Accidents and Malfunctions ... 278
8.8.1 Floods ... 278
8.8.2 Geologic Instability ... 279
8.8.3 Failure of Water Retention Structures ... 279
8.8.4 Freezing Effects ... 281
8.8.5 Mine Water Treatment ... 281
8.9 Water Quality Monitoring and Management ... 281
8.9.1 Contingency Plans ... 281
8.9.2 Conceptual Surface Water and Groundwater Monitoring Plans ... 282
8.9.3 Community Involvement in Monitoring ... 282
8.9.4 Post-Closure Monitoring ... 283

9.0 IMPACT ASSESSMENT –NNPR ... 284

9.1 Water Quality ... 284
9.1.1 Water Quality of Prairie Creek entering NNPR ... 284
9.1.2 Worst-Case Scenario ... 285
9.1.3 Mitigation, Monitoring and Contingency Planning ... 286
9.2 Unforeseen Events ... 286
9.3 Aquatic Ecosystems ... 291
9.3.1 Downstream Prairie Creek ... 291
9.3.2 Access Road ... 292
9.4 Terrestrial Ecosystems ... 293
9.4.1 Wildlife and Vegetation ... 293
9.4.2 Terrain and Stability ... 295
9.5 Collaborative Programs ... 296

10.0 IMPACT ASSESSMENT – OTHER 298

10.1 Off-Site Water Quality and Quantity 298
10.1.1 Sources of Contamination 298
10.1.2 Potential Impacts and Mitigation 298
10.1.3 Mitigation Summary and Monitoring 301
10.2 Fish and Aquatic Habitat 302
10.2.1 Fish-Bearing Water Bodies 302
10.2.2 Impacts from Operations 303
10.2.3 Impacts after Mine Closure 305
10.2.4 Commitments 306
10.2.5 Best Management Practices 307
10.2.6 Accidents and Malfunctions 307
10.3 Wildlife 308
10.3.1 Mine Site Operations 308
10.3.2 Access Road 313
10.3.3 Wildlife Management Plan 315
10.4 Terrain 316
10.4.1 Waste Rock Pile Stability 316
10.4.2 Terrain-Operations-Terrain Impacts 316
10.4.3 Stability of Engineered Structures 318
10.4.4 Mitigation and Monitoring 319
10.5 Air Quality 320
10.6 Vegetation 321
10.6.1 Land Clearing 321
10.6.2 Rare Plants 322
10.6.3 Harvested Plants 322
10.6.4 Emissions 322
10.6.5 Dust 322
10.6.6 Invasive Plants 322
10.6.7 Mitigation and Best Management Practices 323
10.7 Monitoring and Management Plans 323
10.7.1 Collaborative Monitoring and Adaptive Management 323
10.7.2 Existing Monitoring and Management Plans 323
10.7.3 Conceptual Monitoring and Management Plans 323
10.7.4 Communication of Results 324
10.7.5 Summary of Monitoring and Management Systems 324

11.0 IMPACT ASSESSMENT – HUMAN ENVIRONMENT 325

11.1 Socio-Economic and Social Impacts 325
11.2 Cultural Impacts 326
11.3 Monitoring and Management Plans 327

12.0 CLOSURE AND RECLAMATION PLAN 329

13.0 CUMULATIVE EFFECTS 333

13.1 Water Quality 333
13.2 Wildlife 333
13.3 Air Quality 335
13.4 Socio-Economic 335
13.5 Access Road and Liard Highway 336
13.5.1 Access Road Management 336
13.5.2 Liard Highway 336
13.6 Historic Developments 337
13.7 Human Activities 338
13.8 Monitoring/Adaptive Management 339

LIST OF TABLES

Table A	Concordance Table	42
Table B	Commitments Table	47
Table 1-1	History of Permitting Activity – Prairie Creek Mine	55
Table 1-2	Prairie Creek Land Tenure	57
Table 2-1	CZN's Permits and Record of Compliance	62
Table 2-2	CZN's Record of Compliance with Commitments	64-66
Table 2-3	CZN's Record of Compliance with Review Board measures	67
Table 4-1	Climate Data	79
Table 4-2	Mean and Minimum Monthly Flows at the Prairie Creek Mine WSC Station	82
Table 4-3	Mean and Minimum Monthly Flows for Downstream Stations on Prairie Creek	84
Table 4-4	Polishing Pond and Ditch Flows (L/sec)	93
Table 4-5	Mine Water Sample Results 2006-2007	96-98
Table 4-6	Mine Water Sample Results 2008-2009	99
Table 4-7	Field Dates and Key Findings for Fisheries Work in the Prairie Creek System	102
Table 4-8	Total Metal Results for Sediment Samples	105
Table 4-9	Prairie Creek Sediment Composition	105
Table 4-10	Vegetation Units Along Access Road	122
Table 5-1	Highway #7 Traffic	147
Table 5-2	NNPR Visitation Statistics	156
Table 6-1	Construction, Operation and Closure Schedule, Prairie Creek Mine	161
Table 6-2	Summary of Existing Infrastructure and Proposed Changes/Additions	164-169
Table 6-3	Paste Backfill Projects	195
Table 6-4	Life of Mine (Years 0-14) Waste Quantities	199
Table 6-5	Temporary Start-Up Storage Quantities	200
Table 6-6	Hazardous and Non-Hazardous Material Quantities	202-206
Table 6-7	Tailings Water Quality from Metallurgical Testing	212
Table 6-8	Surveillance Network Program Outline	220
Table 6-9	Fuel Consumption and Storage	221
Table 6-10	Transportation Schedule	231
Table 6-11	Direct Manpower Requirements for Prairie Creek Mine	245
Table 7-1	Consultation Personnel Detail	249
Table 7-2	Use of Traditional Knowledge	256-257
Table 8-1	Historical Mine Water Quality	259
Table 8-2	Contaminant Loads – Zinc	260
Table 8-3	Contaminant Loads - Cadmium	261
Table 8-4	Contaminant Loads – Sulphate	262
Table 8-5	Mine Water and Process Water Before and After Treatment	269
Table 8-6	Discharge from Mine Area after Closure	270

List of Tables (cont'd)

Table 8-7	Generic Water Quality Objectives	271
Table 8-8	Site Specific Water Quality Objectives	271
Table 8-9	Predicted in-Stream Concentrations During Mine Operations, Prairie Creek at Harrison Creek	273
Table 8-10	Predicted in-Stream Concentrations Post-Mine Closure and pre-Mine Prairie Creek at Harrison Creek	275
Table 8-11	Post-Closure Surface Water Monitoring	282
Table 9-1	CZN/PC/DCFN Technical Team Meeting Schedule	297
Table 10-1	Environmental Monitoring and Management Summary	324
Table 11-1	Socio-Economic Monitoring and Management System	328

LIST OF FIGURES

Figure 1-1	Aerial Photograph of the Prairie Creek Mine Site	50
Figure 1-2	Photograph of the Prairie Creek Mine; Main Yard Facilities	51
Figure 1-3	Property Location	52
Figure 1-4	Location of Claims and Leases	58
Figure 1-5	Expanded Nahanni National Park Reserve	59
Figure 3-1	Geographic Assessment Boundaries	73
Figure 4-1	Prairie Creek Mine Access Road	75
Figure 4-2	Temperatures Recorded at Prairie Creek (May 2005 to August 2008)	80
Figure 4-3	Prairie Creek Catchment and Sub-Catchments	83
Figure 4-4	Water Sample Locations, Watercourses	85
Figure 4-5	Water Sample Locations, Mine Site	86
Figure 4-6	Seep at North-West Corner of Mill	87
Figure 4-7	Flow of Seep Water Along West Side of Mill	88
Figure 4-8	Flow into Mill Ditch from Buried Culvert	89
Figure 4-9	Discharge of Site Ditch (Left) and Mill Ditch (Right) into Catchment Pond	90
Figure 4-10	Surface Water and Groundwater Interaction, Mill Area	94
Figure 4-11	Seasonal Wildlife Ranges along and Adjacent to the Prairie Creek Mine Site and Access Road	109
Figure 4-12	Property Geology	124
Figure 4-13	Stratigraphy and Structure looking North from Zone 6	125
Figure 4-14	Representative Deposit Mine Cross Section	126
Figure 4-15	Mineral Resource Outline; Long Section	129
Figure 4-16	Physiographic Zones Along the Prairie Creek Access Road	132
Figure 4-17	Simplified Regional Geology Along the Prairie Creek Access Road	133
Figure 5-1	Historic Developments Proximal to Prairie Creek Mine Site	141
Figure 5-2	Grainger Site	143
Figure 5-3	Cat Camp Site	143
Figure 5-4	Prairie Creek Mine; Haulage Route	148
Figure 6-1	Existing Infrastructure at Prairie Creek Mine	162
Figure 6-2	Reagent Storage Pad	175

List of Figures (cont'd)

Figure 6-3	Location of Modified or Additional Infrastructure at Prairie Creek Mine Site	180
Figure 6-4	Location of Upgraded and Modified Infrastructure; Main Yard	181
Figure 6-5	Conceptual View of Upgraded Facilities at Prairie Creek Mine Site	182
Figure 6-6	Conceptual Mine Design (Long Section and Plan View)	184
Figure 6-7	Proposed Mining Method - Cut and Fill Stoping	187
Figure 6-8	Simplified Metallurgical Process Flow Sheet	189
Figure 6-9	Bulk Bag Frame	192
Figure 6-10	Sealed Concentrate Bags	192
Figure 6-11	Bag lifter with Portable Scale	193
Figure 6-12	Stacked Bags in Concentrate Storage Building	193
Figure 6-13	Location and Design of Waste Rock Pile	197
Figure 6-14	Waste Rock Pile; Conceptual Layout	198
Figure 6-15	Waste Management Code System	207
Figure 6-16	Solid Waste Facility Layout	209
Figure 6-17	Reconfigured Water Storage Pond	213
Figure 6-18	Site Water Balance – Summer	216
Figure 6-19	Site Water Balance – Winter	217
Figure 6-20	Prairie Creek Mine; Access Road (with Inset Figures)	223
Figure 6-21	Access Road: Polje By-Pass Alternative	225
Figure 6-22	Access Road: Silent Hills and Wolverine-Grainger Gap Alternative	226
Figure 6-23	Access Road: Nahanni Front Range Alternative	228
Figure 6-24	Photo of Typical Concentrate Highway Haul Truck	234
Figure 6-25	Location and Topography of Tetcela Transfer Facility Area	236
Figure 6-26	Location and Topography of Liard Transfer Facility –Lindberg Landing	237
Figure 6-27	Location and Topography of Liard Transfer Facility – Nahanni Butte	239
Figure 6-28	Proposed Concentrate Storage Structure	240
Figure 6-29	Tetcela Transfer Facility Design and Layout	241
Figure 6-30	Layout of Liard Transfer Facility	242
Figure 7-1	Mine Tour for Nahanni Butte Dene Band, 2005	250
Figure 7-2	The Dehcho Territory	251
Figure 9-1	Lower Prairie Creek Slope Failure Scenario	288
Figure 12-1	Conceptual View of Closure Stages of the Prairie Creek Mine	331
Figure 12-2	Conceptual View of Closure Stages of the Tetcela Transfer Facility	332

LIST OF APPENDICES

	Appendix
VOLUME 2	
Site Hydrogeology Report, Prairie Creek Mine Site, Northwest Territories, Canada: Robertson GeoConsultants Inc., December 2009	**1A**
ADDENDUM to Site Hydrogeology Report – Results of Transient Groundwater Modeling, Prairie Creek Mine, NWT: Robertson GeoConsultants Inc., March 17, 2010	**1B**
Load Balance Calculations for Mine Water and Surface Water, Prairie Creek Mine, NWT: Robertson GeoConsultants Inc., March 17, 2010	**1C**
Prairie Creek Water Treatment Testing, including Appendix A; Relevant Toxicity Data; SGS-CEMI, February 2010	**2**
Final Humidity Cell Report, Prairie Creek Project, NWT Canada: pHase Geochemistry, January 27, 2010	**3**
Geochemical Characterization of Paste and Paste Components, Prairie Creek Project, NWT Canada: pHase Geochemistry January 27, 2010	**4**
Source Term Water Quality Predictions, Prairie Creek Project, NWT, Canada: pHase Geochemistry, March 5, 2010	**5**
Water Treatment Plant Operations: SNC Lavalin October 6, 2009	**6**
Development of Site-Specific Water Quality Guidelines for Prairie Creek, NWT: Saskatchewan Research Council, March 2010	**7**
Mine Area Background Receiving Water Quality: CZN	**8**
Water Balance: CZN	**9**
Receiving Water Quality During Operations and Discharge Criteria: CZN	**10**

VOLUME 3	
Preliminary Design; Waste Rock Pile at Prairie Creek Mine NWT: Golder Associates, February 2010	**11**
Preliminary Design; Water Storage Pond at Prairie Creek Mine NWT: Golder Associates, March 2010	**12**
2009 Rare Plant and Wildlife Survey, Prairie Creek Mine Area and Winter Road, NT: EBA Consulting October 2009	**13**
Prairie Creek Mine Winter Road Re-Alignment Air and Ground Stream Crossing Fish Habitat Assessments: Memo Report, Dillon Consulting Limited, November 25, 2009	**14**
Pre-Feasibility Engineering Study for Cemented Paste Backfill Plant for the Prairie Creek Project: Golder PasteTec: December 21, 2009,	**15A**
Laboratory Evaluation of Prairie Creek Mine Backfill: Golder Paste Technology Ltd., Technical Memorandum, October 21, 2009	**15B**
Laboratory Evaluation of Canadian Zinc Mine Tailings For Use as Prairie Creek Mine Backfill: Golder PasteTec: November 10, 2009,	**15C**
Terrain Assessment Report Prairie Creek Mine, Northwest Territories: Golder Associates, January 2010	**16**
Wildlife and Vegetation Impact Assessment: Golder Associates, March 2010	**17**
Prairie Creek Mine Project Flood Protection and Embankment Berm Armour Inspection: northwest hydraulic consultants, August 14, 2009	**18A**
Annual Inspection – Flood Erosion Protection-Prairie Creek Mine NT: Golder Associates, August 19, 2009	**18B**
Progress Report on Repairs to Flood Protection Works, Prairie Creek Mine: CZN letter to INAC September 3, 2009	**18C**
Berm Repairs Along Prairie Creek: Golder Associates, March 12, 2010	**18D**

VOLUME 4	
Socio-Economic Impact Assessment for the Prairie Creek Mine: Impact Economics, January 29, 2010.	**19**
Developer's Assessment Report Prairie Creek Mine Air Quality: Golder Associates, February 2010.	**20**
Prairie Creek Mine, Access Road Archaeological Investigations, 2009: Points West Heritage Consulting Ltd., December 16, 2009	**21**
Results of Preliminary Numerical Modelling Program of WRP Cover System Alternatives at Prairie Creek: Memorandum O'Kane Consulting Inc. February 24, 2010.	**22**
Power Data: Energy and Power Alternatives: SNC Lavalin, Inc. memos and CAT 3516 Generator Performance Data	**23A**
Generator Set Package Performance Data: Caterpillar Inc., December 1, 2005	**23B**
Additional Considerations for Fish Habitat Compensation: Golder & Associates Technical Mem, September 30, 2009	**24**
Recent Seismic Data and Report on The 1985 Nahanni Earthquakes, Natural Resources Canada, 1987.	**25**
Community Consultation Log and Recent Surveys:	**26**
Prairie Creek Mine Draft Preliminary Closure and Reclamation Plan: CZN, February 2010	**27**
Prairie Creek Project 2010 Fuel Spill Contingency Plan: CZN, January 2010	**28**
Prairie Creek Mine Site Occupational Health and Safety Plan: CZN, January 2010	**29**
Prairie Creek Mine Human Resources Management Plan: CZN, January 2010	**30**
Canadian Zinc Corporation Code of Ethics: CZN	**31**
Prairie Creek Mine Wildlife Management Plan: CZN	**32**
Material Safety Data Sheets: Ethylene glycol, Sodium sulphide flakes, Sulphuric acid	**33**

LIST OF ACRONYMS

ACM	asbestos containing material
ADK	Acho Dene Koe Band
Ag	Silver
AMSL	above mean sea level
ANFO	Ammonium nitrate-fuel oil
Bar	Baros (measurement of pressure)
BBL	gallon barrels (42 gallons)
BC	British Columbia
BMP	Best Management Practice
BOD	Biochemical Oxygen Demand
BTU	British Thermal Unit
Cadillac	Cadillac Explorations Ltd.
CBH4	Navigation Canada Designation for the Prairie Creek Airstrip
Ca	Calcium
CCME	Canadian Council of Ministers of the Environment
Cond	Electrical Conductivity
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
Cr	Chromium
CRP	Closure and Reclamation Plan
CTF	Concentrate Transfer Facility
CZN	Canadian Zinc Corporation
CFM	Cubic Feet per Minute
Cd	Cadmium
Cu	Copper
DAR	Developer's Assessment Report
DCFN	Dehcho First Nations
dB	decibel (measurement of sound pressure level)
DMS	Dense Media Separation
EA	Environmental Assessment
EC	Environment Canada
ENR	Environment and Natural Resources
FAA	Federal Aviation Administration
Fe	Iron
FSCP	Fuel Spill Contingency Plan
GDP	Gross Domestic Product
GNWT	Government of the Northwest Territories
GVW	Gross Vehicle Weight
Ha	hectare (area 100 m by 100 m)
Hg	Mercury

List of Acronyms (cont'd)

Kg	kilogram
Km 83	Kilometre marker along access road, Km 0 is Prairie Creek Site
km	Kilometre
INAC	Indian and Northern Affairs Canada
IBA	Impact and Benefits Agreement
JMRFN	Jean Marie River First Nation
LKFN	Liidlii Kue First Nation
LTF	Liard Transfer Facility
LUP	Land Use Permit
L/sec	litres per second (flow volume)
m	metre
m^2	1 metre by 1 metre (area)
m^3/day	cubic metres per day (flow volume)
Mg	magnesium
mg/L	milligrams per litre
MERA	Mineral and Energy Resource Assessment
MOU	Memorandum of Understanding
MTS	Mine Training Society
MVLWB	Mackenzie Valley Land and Water Board
MVRMA	Mackenzie Valley Resource Management Act
MVEIRB	Mackenzie Valley Environmental Impact Review Board
MVRB	Mackenzie Valley Review Board
MVT	Mississippi Valley Type
NAG	Non Acid Generating
NBDB	Nahanni Butte Dene Band
NI 43-101	National Instrument 43-101
NNPR	Nahanni National Park Reserve
NO_2	Nitrogen Dioxide
NT or NWT	Northwest Territories
O_3	Ozone
PAG	potentially acid generating
Pb	Lead
PDAC	Prospectors and Developers Association of Canada
PDR	Project Description Report (CZN 2008)
PC	Parks Canada
PCBs	Polychlorinated Biphenyls
PCDCA	Prairie Creek Development and Cooperation Agreement

List of Acronyms (cont'd)

pH	Measurement of water acidity or alkalinity
PKFN	Pehdzeh Ki First Nation
PM_{10}	Particulate Matter with a micron diameter of 10 or less
ROM	Run of Mine
SARA	Species at Risk Act
SARC	San Andreas Resources Corporation
Sb	Antimony
SEIA	Socio-Economic Impact Assessment
SG	Specific Gravity
SGS-CEMI	SGS-Canadian Environmental & Metallurgical Inc.
SNP	Surveillance Network Program
SO_2	Sulphur Dioxide
SRC	Saskatchewan Research Council
STP	Sewage Treatment Plant
t/d, tpd	Tonnes per day
TCA	Tailings Containment Area
TDS	Total dissolved solids
TK	Traditional Knowledge
TOC	Total Organic Carbon
TOR	Terms of Reference
TSP	Total Suspended Particulates
TSS	Total Suspended Sediments
TSX	Toronto Stock Exchange
TTF	Tetcela Transfer Facility
ug/L	micrograms/litre
µs/L	microSiemens/cm (measure of conductivity)
UV	ultraviolet
WCB	Workers Compensation Board
WMP	Wildlife Management Plan
WSC	Water Survey of Canada
WSP	Water Storage Pond
WTP	Water Treatment Plant
WRP	Waste Rock Pile
Zn	Zinc

DEFINITION OF TERMS

TERM	DEFINITION
Acid generating	Solid material containing sulphides which produce a weakly acidic solution after oxidation and leaching
Adit	A nearly horizontal passage from the surface into a mine. It is usually driven into the rock at a shallow positive angle to allow mine drainage to flow out
Berm	A mound or bank of earth used as a barrier
Catchment Pond	The pond at the southern end of the Prairie Creek Site designed to catch site waters before release to creek
Concentrate	The valuable minerals produced by the Mill after separation from most of the non-economic or gangue minerals
Diamond drill	A drill rig that uses drill bits containing industrial diamonds and which cores a continuous cylinder of rock as it is drilled
Dissolved metals	Metals dissolved in water
Dense Media Separation	A process whereby minerals are separated by their contrasting specific gravities, heavy minerals sink and light minerals (waste) float
Gangue	Minerals in the ore which do not contain metal and are therefore waste e.g. quartz
Grandfathered	A previously regulated activity that is exempt from a new environmental assessment process
Karst	A type of topography that is formed on limestone rocks by dissolution.
Mill	Also known as the Process Plant or Concentrator, the location where mined ore is processed
Mineralization	An accumulation of potentially economic minerals
Neutral drainage	Drainage from solid material containing sulphides which is not acidic, but may contain dissolved metals

Definition of Terms (cont'd)

TERM	DEFINITION
Polje	A flat floored, steep sided enclosed basin which is fed by groundwater.
Portal	An entrance to an underground mine.
Precipitation	Rain and snow as an equivalent water depth
Reclamation	To return the land to productive use, as near as possible to its original state
Stope	The cavity left when a block of ore is removed
Stratabound Mineralization	A usually flat-lying body of mineralization semi-conformable to the bedding of the host rocks
Stratigraphy	A sequence of different rock types, usually from young to old
Tailings	The collection of non-economic minerals remaining at the end of the mill process, in this case after flotation
Tank Farm	The engineered and fully bermed site which includes 4 large steel diesel storage tanks and 2 smaller gasoline tanks
Total Metals	Metals occurring in water in both the dissolved form and contained in suspended sediment
Vein Mineralization	A sheet of mineralization, usually oriented near the vertical and cross cutting the stratigraphy
Water Storage Pond	The temporary water storage pond created from the conversion of the existing tailing containment facility

Table A: Concordance Table

Terms of Reference				Location in DAR	
Section	**Title**	**Sub-Section**	**Description**	**Section**	**Additional Reference**
3.2.1	Summary Materials	1	English and South Slavey summaries		Exec Sum
		2	Audio		
		3	Concordance table		Table A
		4	Commitments table		Table B
3.2.2	Developer	1	Corporate Summary	2.1	
		2	Ensure contractor's commitments	2.2	
		3	Environmental Performance	2.3	
		4	Corporate Policies	2.4	Appendix 31
3.2.3	Assessment Boundaries	1	Spatial Study Area boundaries	3.1	
		2	Spatial VC boundaries	3.1.2	
		3	Temporal boundaries	3.1.1	
3.2.4	Existing Environment	1	Physical location	4.1	
		2	Ambient Air Quality	4.2	Appendix 20
		3	Climatic conditions	4.3	
		4	Hydrology & hydrogeology	4.4	Appendix 1A, 1B
		5	Surface water & groundwater quality	4.6	Appendix 8
		6	Mine water quality	4.5	
		7	Aquatic organisms	4.7	Appendix 24
		8	Wildlife	4.8	Appendix 17
		9	Wildlife at risk	4.9	
		10	Vegetation & plant communities	4.10	Appendices 13, 17
		11	Terrain, geology, mineralogy	4.11, 4.12	Appendix 16
		12	Soils & sediments	4.12.3, 4.7	
		13	Historic developments	5.1	
		14	Other physical infrastructure	5.2	
		15	Current/proposed protected areas	5.3	
		16	Existing traffic Highway 7 (Liard Hwy)	5.4	
		17	Training / skill levels	5.5	
		18	Current socio-economic conditions	5.6	Appendix 19
		19	Historic / present land use	5.7	
		20	Traditional harvesting activities	5.8	Appendix 26
		21	Physical heritage resources	5.9	Appendix 21
		22	Economic activities	5.10	

Table A: Concordance Table (cont'd)

Terms of Reference				Location in DAR	
Section	**Title**	**Sub-Section**	**Description**	**Section**	**Additional Reference**
3.2.5	Development Description	1	Gantt chart estimated lifespan	6.1	
		2	Footprint PC mine site	6.2	
		3	Existing infrastructure components	6.3	
		4	Changes to existing infrastructure	6.4	
		5	Permits required	6.5	
		6	Other required developments	6.6	
		7	Underground facilities	6.7	
		8	Explosives	6.8	
		9	Mining & ore transportation methods	6.9	
		10	Backfill technology; paste, transport	6.11 & 6.12.2	Appendix 15A
		11	Mined materials storage	6.12.1	Appendix 11
		12	Description Milling Process	6.10	
		13	Location aggregate production & storage	6.13	
		14	Hazardous Materials	6.14	Appendix 33
		15	Water management & treatment	6.16	Appendices 2, 6, 12
		16	Water balance	6.17	
		17	Water required	6.15	
		18	Water quality & quantity monitoring	6.18	
		19	Energy generation, fuel storage & transport	6.19	Appendix 23
		20	Other infrastructure & activities	6.20	
		21	Proposed Access road	6.21	Appendix 14
		22	Water management & monitoring, road	6.22	
		23	Transportation route – concentrate	6.23	
		24	Tetcela & Liard Transfer Facilities	6.24	
		25	Manpower	6.25	
		26	Worker transport & scheduling	6.26	
3.2.6	Public Engagement	1	Engagement Summary	7.2	Appendix 26
		2	Engagement Methods	7.1	
		3	Environmental Agreements	7.3	
		4	Traditional Knowledge info. Collection	5.7.1, 7.4	
3.3.2	Mine Site Water Quality	1	Historic Minewater discharge	8.1	
		2	Waste/material characterization	8.2	Appendices 3, 4
		3	Water discharge quality & quantity	8.3	Appendices 1B, 1C, 2
		4	Assessment of impacts	8.6	Appendices 1B, 1C, 10
		5	Contaminated groundwater	8.4	Appendices 1A, 1B, 1C
		6	Site specific sensitivities & objectives	8.5	Appendix 7

Table A: Concordance Table (cont'd)

Terms of Reference				Location in DAR	
Section	**Title**	**Sub-Section**	**Description**	**Section**	**Additional Reference**
	Mine Site Water Quality (cont.'d)	7	Adequacy of water management	8.7	Appendix 6
		8	Accidents & malfunctions	8.8	
		9	Water quality monitoring	8.9	
3.3.3	Ecological Integrity NNPR	1	Water quality impacts	9.1	
		2	Accidents & malfunctions	9.2	
		3	Aquatic impacts	9.3	
		4	Terrestrial impacts	9.4	Appendix 16
		5	CZN & Parks Canada collaboration	9.5	
3.3.4	Off-site Water Quality	1	Sources of contamination	10.1.1	
		2	Impacts from erosion, accidents etc.	10.1.2	
		3	Mitigation & monitoring	10.1.3	
3.3.5	Fish & Aquatic Habitat	1	Identify fish-bearing water bodies	10.2.1	
		2	Impacts to key aquatic organisms and habitat	10.2.2 & 10.2.3	
		3	Developer's commitments	10.2.4	
		4	Best management practices	10.2.5	
		5	Accidents & malfunctions	10.2.6	
3.3.6	Wildlife & Habitat	1	Impact on wildlife and wildlife habitat	10.3.1, 10.3.2	Appendix 17
		2	Impacts from increased intensity	10.3.1	
		3	Impacts on 'wildlife at risk'	10.3.1, 10.3.2	
		4	Best management practices		
		5	Wildlife management plan		Appendix 32
3.3.7	Terrain	1	Stability of waste rock pile	10.4.1	Appendix 11
		2	Impact on terrain stability	10.4.2	Appendix 16
		3	Stability of engineered structures	10.4.3	Appendices 11, 12, 18
		4	Mitigation & monitoring	10.4.4	Appendix 16
3.3.8	Air Quality	1	Pre-development conditions	4.2.1, 4.3.1	Appendix 20
		2	Impacts from project emissions	10.5	
		3	Monitoring, mitigation & management		
3.3.9	Vegetation	1	Total amount land clearing required	10.6.1	Appendix 17
		2	Impact on rare plants	10.6.2	Appendix 13
		3	Impact on harvested plants	5.8, 10.6.3	Appendix 17
		4	Impacts from emissions	10.6.4	
		5	Impacts from dust	10.6.5	
		6	Invasive species	10.6.6	
		7	Best management practices	10.6.7	

Table A: Concordance Table (cont'd)

Terms of Reference				Location in DAR	
Section	**Title**	**Sub-Section**	**Description**	**Section**	**Additional Reference**
3.3.10	Biophysical Environmental Monitoring and Management Plans	1	Collaborative monitoring, management	10.7.1	
		2	Existing monitoring & mgnt plans	10.7.2	
		3	Conceptual monitoring & mgnt plans	10.7.3	
		4	Communicating results	10.7.4	
		5	Env. monitoring & mgnt systems	10.7.5	
3.4.1	Employment & Business Opportunities	1	Human resource requirements	11.1	Appendix 19
		2	Employment of local residents		
		3	Barriers to local employment		
		4	Maximizing local employment		
		5	Training programs		
		6	Strategies for contractors		
		7	Goods & services required		
		8	Commitments to local contracting		
		9	Barriers to northern businesses		
		10	Training necessary for local business		
3.4.2	Beneficial and Adverse Socio-Economic Impacts	1	Estimates of economic impacts	11.1	Appendix 19
		2	Impacts on other economic activities		
		3	Over-exposure to fluctuations		
		4	Disposable income, social services		
		5	Mitigation of adverse impacts		
3.4.3	Social Impacts	1	Community wellness & health issues	11.1	Appendix 19
		2	Impacts on individual communities		
		3	Health of mine workers & their families		
		4	Human resource mgnt plans, programs		
		5	Potential impact on public safety		
		6	Impacts, Lindberg Landing & Ft. Liard		
		7	Safety issues, use of PC airstrip		
		8	Reduction of wilderness values, NNPR		
		9	Lessons from previous developments		

Table A: Concordance Table (cont'd)

Terms of Reference				Location in DAR	
Section	**Title**	**Sub-Section**	**Description**	**Section**	**Additional Reference**
3.4.4	Cultural Impacts	1	Consultation re traditional knowledge	11.2	
		2	Archaeological & heritage resources		Appendix 21
		3	Heritage mitigation measures		
		4	Impacts on traditional harvesting		
		5	Impact on traditional economic activity		
		6	Mitigation commitments		
3.4.5	Human Environment Monitoring & Management Plans	1	Engaging re monitoring impacts	11.3	Appendix 19
		2	Existing wellness monitoring		
		3	Human environment monitoring results		
		4	Adaptive management systems		
		5	Human environment monitoring systems		
3.5	Closure & Reclamation	1	Policies and regulations used		
		2	Draft prelim. closure & reclam. plan		Appendix 27
		3	Management & monitoring for ARD		
		4	Visual depictions, 1, 10, 25 years		
		5	Plans for vegetation		
		6	Harrison, Prairie, Funeral Creek habitat		
		7	Transfer facilities and winter road		
		8	Record of consultations		
3.6	Cumulative Effects	1	Developments included	13.1, 13.2, 13.4, 13.5	
		2	Historic developments	13.6	
		3	Emission sources outside of project	13.3	
		4	Effect of other human activities	13.7	
		5	Monitoring	13.8	

Table B: Commitments Table

CZN Commitment	DAR Section
Consultation	
Continue to engage First Nations throughout the EA process	7.2
Participate in a Public Advisory Committee, or some form thereof, this being an evolution of the existing Parks Canada-CZN-Dehcho Technical Committee, meeting regularly in the region	7.3
Culture	
If possible heritage/cultural resources are found, they will be preserved and the authorities notified.	11.4
Monitor un-authorized use of the access road and hunting	11.4
Fish	
Replace any habitat losses to the satisfaction of Fisheries and Oceans Canada ("DFO")	10.2
Make use of DFO's *Operational Statements* for creek crossings, including span structures and culverts:	10.2
Minimize disturbance of stream banks and riparian areas at stream crossings;	10.2
Avoid disruption of the only known spawning location in the area (bull trout in Funeral Creek) during the spawning period (mid-August)	10.2
Continue the site policy of no fishing or any other unnecessary disturbance of the aquatic environment;	10.2
Operations Management	
Ship all concentrates in bags free of external concentrate dust	10.1
Review and update spill contingency plan	10.2
Annual geotechnical inspections of major structures (Water Storage Pond, Waste Rock Pile, Flood Protection Berm) and terrain in and around them	10.4
Road	
All trucks on the access road to carry spill kits, and drivers must have read the spill contingency plan	10.1
Speed limits to be posted on all sections of the road	10.1
All trucks to have communications to be on alert for on-coming traffic and to be in contact with a controller	10.1
CZN will ensure that all of its vehicles and equipment using the access road are properly maintained and free of leaks	10.1
Road use will be monitored by radio and inspections	10.1
The access road bed will be sampled before and after the seasonal haul period as a check on potential contamination from concentrate losses	10.1
Modify the existing Controlled Road Use Plan for access road operations to promote safety and minimize the risk of accidents	10.2
Road use will be controlled with the assistance of the NBDB and un-authorized use monitored	10.3
Inspections of potentially unstable areas and karst features along the access road at a frequency determined by observed conditions	10.4
Remove temporary crossing structures and snow-fills at break-up to avoid blockage and erosion	10.2
Construct a stable road bed adjacent to creeks and providing for runoff control to minimize the dispersal of sediment during precipitation events	10.2
Promote re-vegetation of riparian areas to further reduce the potential for sedimentation	10.2

Table B: Commitments Table (cont'd)

CZN Commitment	DAR Section
Socio-Economics	
Hire-first policy for qualified local residents, then northern residents	11.1
Source services and supplies locally, and across the north provided these are competitive.	11.1
Monitor employment of Dehcho residents and social impacts via IBA reports	11.5
Water	
Closely monitor ammonia concentrations in water if Amex is used.	6.8
Curtail process water treatment during January and March, and adjust treatment rates in other months to match Prairie Creek flows	8.6
Use a diffuser in the bed of a single, deep channel in Prairie Creek for site discharge to ensure complete mixing with receiving water	8.6
Closely monitor discharge water quality and the receiving environment's ability to absorb the discharge	8.6
Continue to investigate metal release from the Mine and WRP after Mine closure and further develop mitigation plans	8.6
Wildlife	
Review and update Flight Impact Management Plan	10.3
Review and update Plan for Bear Encounters	10.3
Log large wildlife sightings (Dall's sheep, woodland caribou, wood bison and carnivores) with respect to location along the access road, numbers observed and reaction to road activity. If a problem area is identified, discuss corrective measures with ENR.	10.3
Snow removal along the access road avoiding high banks so that wildlife can flee from traffic. Failing this, lave lower snow banks every 100 m to facilitate wildlife moving off the road surface.	10.3
Continue ban on hunting by CZN personnel	11.2

1.0 INTRODUCTION

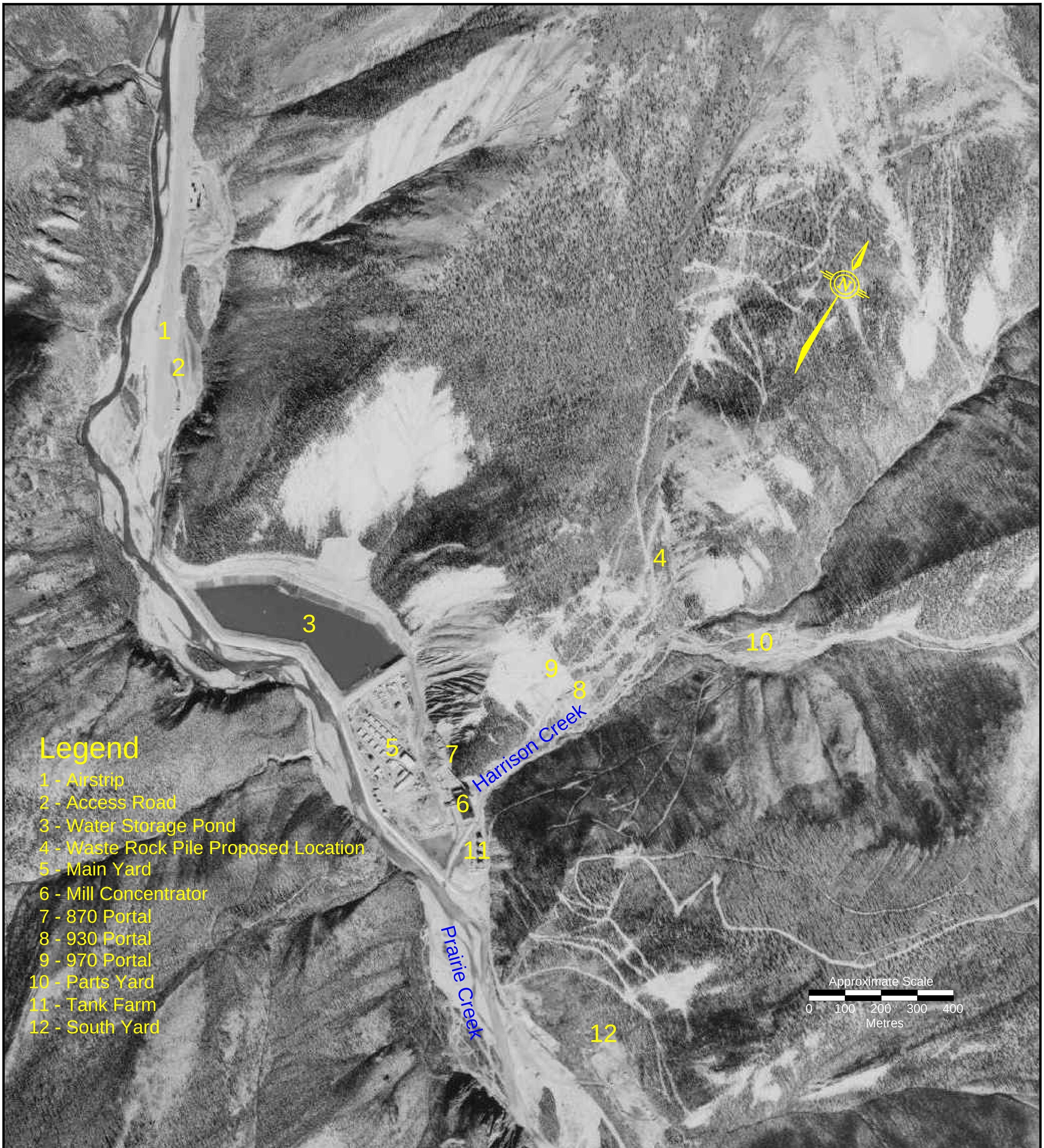
The Prairie Creek Mine site (Figure 1-1 and 1-2) is located in the southern Mackenzie Mountains in the south-west corner of the Northwest Territories (Figure 1-3). The Mine is 100% owned by Canadian Zinc Corporation ("CZN"), and consists of significant mine infrastructure and facilities constructed in the early 1980's. The Mine received an operating Water Licence in 1982 and Land Use Permits ("LUP") in 1980 to allow production of concentrates of lead and zinc and a silver-bearing copper concentrate and use of an access road from the Mine to the Liard Highway. The Mine was three months from production when it was placed into receivership due to market conditions.

CZN, formerly named San Andreas Resources Corporation ("SARC") acquired the property in 1991, and has since expanded and developed the mineral resource. After completing numerous engineering, environmental and economic studies, CZN applied for a Type "A" Water Licence and a Type "A" LUP to support reactivation of the Mine for production, and two Type "A" LUP's for transfer facilities approximately half-way along the access road and at the junction of the road with the Liard Highway. CZN already holds LUP MV2003F0028 for operation of the road. The applications were referred to environmental assessment ("EA"). In the terms of reference ("TOR") for the EA, issued by the Mackenzie Valley Review Board ("MVRB"), construction and operation of the access road in support of mine operations was included in the scope of development.

This Developer's Assessment Report ("DAR") has been completed to fulfill the requirements detailed in the TOR. As noted in the TOR, "The public registry for this file (EA) includes a wealth of information from previous environmental studies, applications, environmental assessments, and other documents detailing the historic operation and work done by Canadian Zinc over the past two decades. This wealth of historic information provides a strong base for the Developer's Assessment Report, especially considering the developer will use many of the existing components on site and the same winter road." This historic information has been summarized and incorporated in the relevant sections of this report. The DAR has also been structured to follow the TOR outline closely, and as requested, the text of the DAR has been written in plain language as much as possible and practicable, with technical details provided in appendices.

1.1 Site and Regulatory History

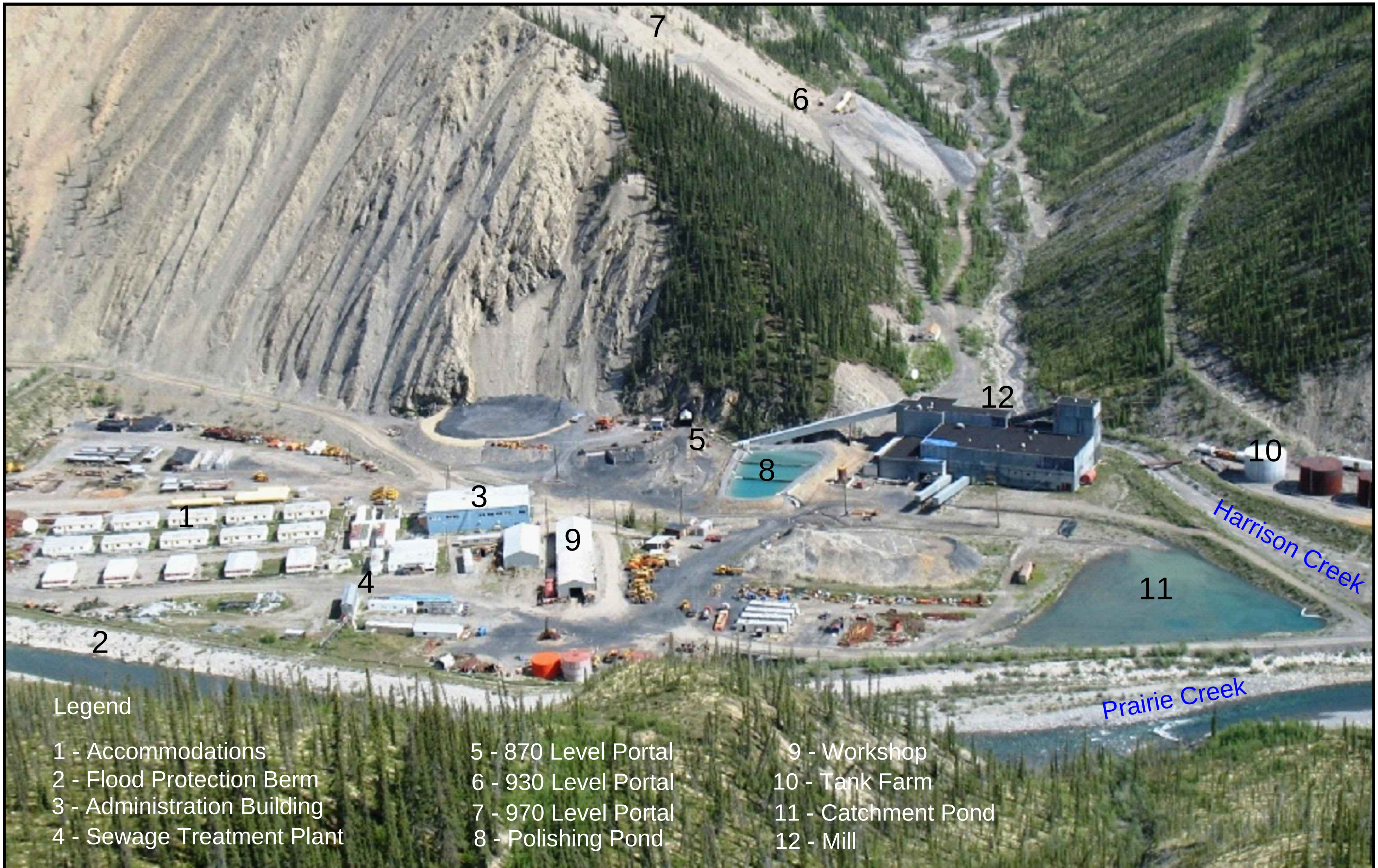
Mineralization was first discovered at Prairie Creek in 1928 and the first recorded mineral claim was staked in 1932. Limited recorded exploration work was conducted on the property until 1966. Cadillac Explorations Ltd. ("Cadillac") then acquired the property and, from 1966 to 1969, discovered and explored twelve mineralized base metal bearing veins located along a linear northerly trend. Underground development of Zones 7 and 8 was initially carried out during 1969 and was followed in the early 1970's by the discovery and subsequent underground development at Zone 3, this zone being the origin of the existing mine workings and subsequently was renamed the Main Zone.



CANADIAN ZINC CORPORATION

Date:	October 2009
Drawn By:	C. Reeves
Scale:	As Shown
Drawing:	DAR Fig 1-1.dwg

FIGURE 1-1: Aerial Photograph of the Prairie Creek Mine Site



CANADIAN ZINC CORPORATION

Date:	October 2009
Drawn By:	C. Reeves
Scale:	Not Shown
Drawing:	DAR Fig 1-2.dwg

FIGURE 1-2: Photo of the Prairie Creek Mine; Main Yard Facilities

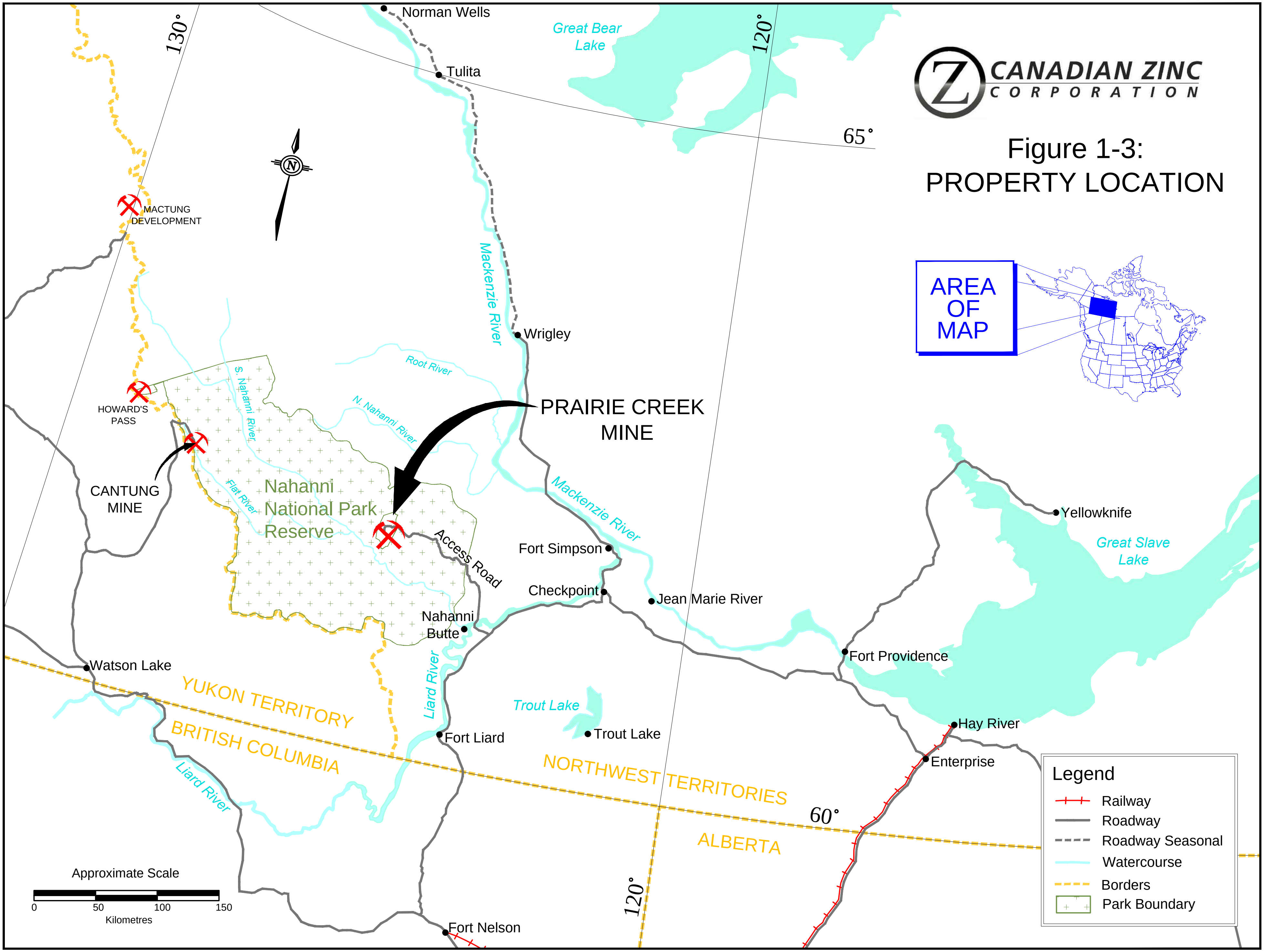


Figure 1-3:
PROPERTY LOCATION

Between 1970 and 1980, extensive underground development of Zone 3 took place, as well as engineering and environmental studies. A winter tote road from Camsell Bend into the Site was established in 1974/75 in order to bring supplies and heavy equipment into the Site. A feasibility study (engineering plans and cost estimates) was completed by Kilborn Engineering (B.C.) Ltd. in 1980 for Cadillac. Environmental assessments were directed by Ker Priestman, and culminated in Preliminary Environmental Evaluation reports, one on the Mine, Mill and Camp, and one on the Winter Access Road, both dated May 1980, and subsequently in "Environmental Evaluation, Prairie Creek Project", dated October, 1980. These studies were the basis for successful applications for Land Use Permits (LUP's) and a Water Licence.

A new access road was constructed from the then partially completed Liard Highway (Northwest Territories Highway 7) into Prairie Creek, beginning in the summer of 1980. The road intersected the Liard Highway 3 km north of Lindberg Landing, approximately 7 km north of the Blackstone River. The road was used extensively over the period from late January to the end of March in both 1981 and 1982. In excess of 800 loads were hauled into the Mine site over these two years.

By May 1982, mine infrastructure was 90-95% complete, and mine preparation work to produce an initial 500 tons per day had been finalized and completed. At that time, the silver price declined and Cadillac Explorations Ltd. was placed into receivership after a total of $64 million had been expended on the Project. The Mine was held on care and maintenance status until 1990.

In 1991, CZN (at that time named SARC) negotiated an option to acquire an interest in the property. SARC completed four consecutive years of surface diamond drill exploration campaigns. In 1993, SARC exercised its option to acquire a 100% interest in the mineral properties and a 60% interest in the plant and facilities of the Mine subject to a 2% net smelter royalty. The remaining interest in the plant and facilities along with the royalty were subsequently purchased by CZN in 2004.

In 1993/94, additional environmental assessment research and further metallurgical studies were completed. A project environmental scoping document was completed by Rescan Environmental Services Ltd. in December 1994 and submitted to regulatory authorities. A 1995 drill program explored for extensions of the Vein to the north and successfully intersected the vein structure. This demonstrated the continuance of the Vein and a drill defined strike length of 2.1 km.

In 1996, SARC and the Nahanni Butte Dene Band ("NBDB") of the Dehcho First Nations negotiated the Prairie Creek Development Co-operation Agreement ("PCDCA").

In 1999, SARC's name was changed to Canadian Zinc Corporation. That year, CZN completed a grassroots exploration program on areas underlain by similar geology and structural settings as found in the Main Zone.

CZN subsequently undertook further studies to support an engineering Scoping Study.

Prior to the enactment of the Mackenzie Valley Resource and Management Act ("MVRMA") in 1999, Land Use Permits (LUPs) were issued by Indian and Northern Affairs Canada ("INAC") for activities such as diamond drilling exploration. Since the adoption of the MVRMA, CZN has applied to the Mackenzie Valley Land and Water Board ("MVLWB") for LUPs, many of which were referred to EA under the direction of the Mackenzie Valley Review Board ("MVRB" or "Review Board"). A history of permitting under the MVRMA is given in Table 1-1. To date, 6 of CZN's applications to the MVLWB for exploration activities have been referred to EA. This has established a significant amount of data and information on the site and also has led to the establishment of approved management plans for the site.

In November 2001, applications for a LUP for development of an underground decline to allow more efficient definition drilling of the mineral resource, and a Water Licence for pilot plant testing of the ore were submitted to the MVLWB. Both applications were referred to a joint EA. LUP MV2001C0023 and Water Licence MV2001L2-0003 were subsequently issued in September, 2003. CZN considers this history significant since these projects closely resemble the activities now being applied for, albeit at a smaller scale. During the EA, existing site facilities were reviewed in detail which led to a recommendation to construct a polishing pond to provide secondary treatment of mine waters. A polishing pond was subsequently designed, built and certified to professional engineering standards in 2005. The MVRB noted that the inclusion of the Polishing Pond "addresses many of the concerns raised by the parties to the EA pertaining to water treatment", and "it will play a useful role in mitigating the adverse impacts of the proposed development". Plans developed for the LUP and Water Licence and approved by the MVLWB include a Mine Water Contingency Plan, Waste Rock and Ore Pile Monitoring Plan, Wildlife Management Plan and a Fuel Spill Contingency Plan. The reader is encouraged to review the existing plans some of which are attached in Appendices 27-32, and other information posted on the websites of the MVLWB and MVRB.

CZN applied to use the existing access road alignment in May, 2003. The Supreme Court of the Northwest Territories ruled that the road was 'grandfathered' under the MVRMA according to Section 157.1. LUP MV2003F0028 for use of the road was issued by the MVLWB on April 7, 2007. Subsequent to receiving the road permit, an evaluation of the road determined that washed-out sections of the road required repair, and further permits were needed. A quarry permit and Water Licence were issued in relation to the repairs, as well as an authorization from Fisheries and Oceans Canada following several fisheries studies.

A request to amend the Phase 2 surface drilling LUP was made to allow further exploration outlying from the Main Zone. The amendment application was referred to EA in June, 2004 and became EA 0405-002 (Dec. 23, 2005) for the Phase 3 surface drilling project. The MVRB found that significant adverse effects on the environment can be prevented with adequate environmental management. The MVRB also found that the proposed development is not likely to be cause for significant public concern as long as all of CZN's commitments and all of the measures recommended by the MVRB are implemented. After a public hearing in Fort Simpson, LUP MV2004C0030 was issued in May, 2006. Additional water quality studies and wildlife surveys were conducted in support of permit requirements.

Table 1-1 History of Permitting Activity – Prairie Creek Mine

Permit/Licence Type	Permit/Licence Identifier No.	Permit/Licence Purpose	Date of Application	EA	Date Issued	Elapsed Time (days)	Expired/ Expires	Issuing Agency	Enabling Legislation
Land Use Permit	N80F249	Winter Road	04-Mar-80	Yes	02-Jul-80	59	1983	DIAND	TLA&R
Land Use Permit	N80F248	Expl DDH & u/g dev	04-Mar-80	Yes	14-Apr-80	41	12-Apr-85	DIAND	TLA&R
Water Licence	N3L3-0932	Mining & Milling	30-Jul-80	Yes	01-Jul-82	690	30-Jun-86	NWTWB	NIWA&R
Quarry Permit	81/42	Gravel quarry	31-Mar-81	No	02-Jul-81	93	Per N80F248	DIAND	TQR
Land Use Permit	N82F761	All weather road	16-Aug-82		N/A	N/A	N/A	DIAND	TLA&R
Land Use Permit	N86C537	Expl DDH	12-Feb-86	No	07-Apr-86	54	30-Oct-86	DIAND	TLA&R
Land Use Permit	N87C668	Expl DDH	21-Jan-87	No	06-Mar-87	44	30-Sep-88	DIAND	TLA&R
Land Use Permit	N92C778	Expl DDH	11-Jun-92	No	27-Jul-92	46	30-Dec-94	DIAND	TLA&R
Land Use Permit	N95F346	All weather road	23-Dec-94		N/A	N/A	04-Jan-96	DIAND	TLA&R
Land Use Permit	N95C373	Expl DDH	01-Mar-95	No	12-Apr-95	42	10-Apr-98	DIAND	TLA&R
Land Use Permit	MV2000C0030	Expl DDH (6-7)	28-Jul-00	Yes	14-Jun-01	322	13-Jun-06	MVLWB	MVRMA
Land Use Permit	MV2000C0030	Cat camp cleanup	28-Jul-00	Yes	N/A	250	N/A	MVLWB	MVRMA
Land Use Permit	MV2001C0022	Expl DDH (50-60)	05-Mar-01	Yes	30-Nov-01	270	29-Nov-08	MVLWB	MVRMA
Land Use Permit	MV2001C0023	U/G Decline	05-Mar-01	Yes	10-Sep-03	920	09-Sep-10	MVLWB	MVRMA
Water Licence	MV2001L2-0003	Pilot Plant	05-Mar-01	Yes	10-Sep-03	920	09-Sep-13	MVLWB	MVRMA
Winter Road	MV2003F0028	Winter Road	25-Sep-03	No	11-Apr-07	1288	10-Apr-12	MVLWB	MVRMA
Land Use Permit	MV2004C0030	Expl DDH(amend)	01-Jun-04 (referred)	Yes	11-May-06	709	10-May-11	MVLWB	MVRMA
Water Licence	MV2007L8-0026	Rehab winter road	07-Jun-07	No	pending	177+		MVLWB	MVRMA
Fisheries Authorization	DFO	Rehab winter road	07-Jun-07	No	pending	177+		DFO	
Quarry Permit	INAC	Rehab winter road	29-Jun-07	No	pending	155+		INAC	

Abbreviations & Notes:

TLA & R	=	Territorial Lands Act and Land Use Regulations
NIWA & R	=	Northern Inland Waters Act and Regulations
TQR	=	Territorial Quarrying Regulations
MVRMA	=	Mackenzie Valley Resource Management Act
DIAND	=	Department of Indian Affairs and Northern Development (Indian and Northern Affairs Canada)
MLWB	=	Mackenzie Valley Land and Water Board
NWTWB	=	Northwest Territories Water Board

Detailed baseline studies describing the existing environment in the vicinity of the Prairie Creek Mine and along the existing access road corridor were undertaken in 1980-81 as a component of previous environmental assessments conducted in support of operating permits (Land Use Permits and a Water Licence) issued at that time. Water Survey of Canada operated an automated flow monitoring station on Prairie Creek adjacent to the Mine from 1974-1990. Additional studies to update the baseline were undertaken in 1994-1995 in support of further permitting efforts. These studies included field assessments and descriptions of fisheries and aquatic resources, as well as wildlife populations and wildlife habitat. However, CZN has also conducted extensive studies to further define baseline conditions. Additional water quality data collection commenced in 2001, with an expanded program since 2004. In 2005, a climate station was re-activated at the Mine site. In addition, several fisheries studies have been carried out, along with a stream flood assessment. Two further wildlife surveys have been undertaken, and a wildlife sighting log has been maintained at the camp.

1.2 Mineral Claims and Leases

CZN owns a 100% interest in the Prairie Creek Mine and property. The land holdings comprise eight mining leases and two surface leases on national topographic sheets 95-F/10 and 95-F/7. CZN also holds six additional mineral claims. Details of the land holdings are given in Table 1-2 and shown on Figure 1-4.

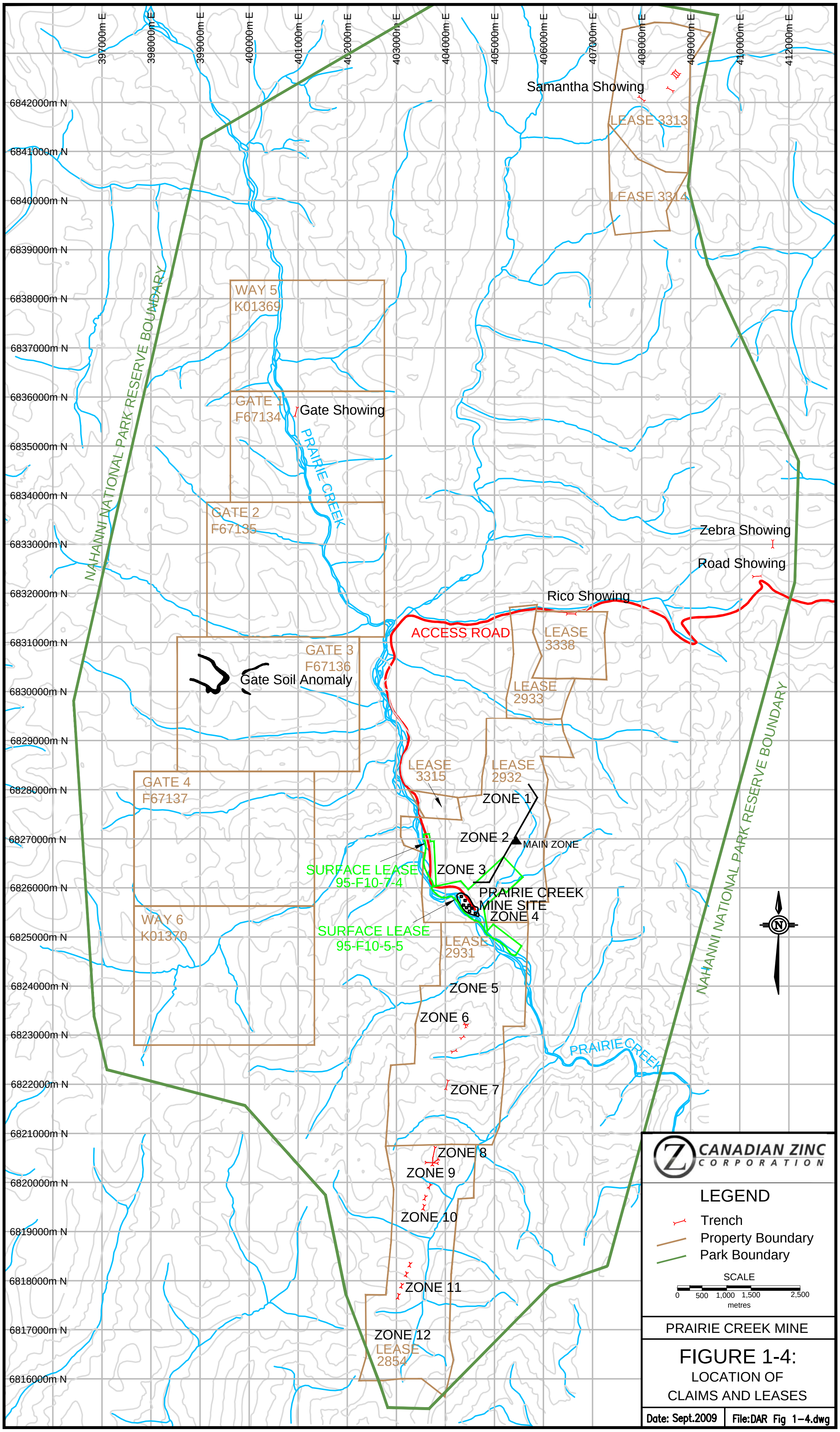
1.3 Nahanni National Park Reserve

In June 2009, the Nahanni National Park Reserve ("NNPR") was expanded by Act of Parliament. The expansion to 30,000 km^2 covers most of the South Nahanni River watershed and the Nahanni North Karst (see Figure 1-5). The expanded NNPR completely encircles the Prairie Creek Mine, however the Mine itself and a large surrounding area of approximately 300 km^2 is specifically excluded from the Park.

The *Canada National Parks Act* was amended to enable the Minister of the Environment to enter into leases or licences of occupation for lands in the expansion area for the purpose of an access road to the Prairie Creek Mine, including facilities connected with that road, such as the proposed transfer stations.

Table 1-2 Prairie Creek Land Tenure

Claim#	Lease/Claim Name	Area Ha	Area Acres
	Mineral Claims		
F67134	GATE 1	731.59	1,807.75
F67135	GATE 2	1,003.30	2,479.20
F67136	GATE 3	1,003.30	2,479.20
F67137	GATE 4	1,003.30	2,479.20
K01369	WAY 5	731.57	1,807.75
K01370	WAY 6	1,003.30	2,479.20
Mineral Claim Total		***5,476.36***	***13,532.30***
	Surface Leases		
95F/10-5-3	Mine site	113.6	280.74
95F/10-7-2	Airstrip	18.2	45.07
Surface Lease Total		***131.8***	***325.81***
	Mining Leases		
ML 2854	Zone 8-12	743	1,835.99
ML 2931	Zone 4-7	909	2,246.18
ML 2932	Zone 3	871	2,152.28
ML 2933	Rico West	172	425.02
ML 3313	Samantha	420.05	1,037.96
ML 3314	West Joe	195.86	483.99
ML 3315	Miterk	43.7	107.98
ML 3338	Rico	186.16	460
Mining Lease Total		***3,540.77***	***8,749.40***
Grand Total		***9,148.93***	***22,607.51***


397000m E
398000m E
399000m E
400000m E
401000m E
402000m E
403000m E
404000m E
405000m E
406000m E
407000m E
408000m E
409000m E
410000m E
412000m E
6842000m N
6841000m N
6840000m N
6839000m N
6838000m N
6837000m N
6836000m N
6835000m N
6834000m N
6833000m N
6832000m N
6831000m N
6830000m N
6829000m N
6828000m N
6827000m N
6826000m N
6825000m N
6824000m N
6823000m N
6822000m N
6821000m N
6820000m N
6819000m N
6818000m N
6817000m N
6816000m N
Samantha Showing
LEASE 3313
LEASE 3314
NAHANNI NATIONAL PARK RESERVE BOUNDARY
WAY 5
K01369
GATE 1
F67134
Gate Showing
PRAIRIE CREEK
GATE 2
F67135
Zebra Showing
Road Showing
Rico Showing
ACCESS ROAD
LEASE
3338
GATE 3
F67136
Gate Soil Anomaly
LEASE
2933
LEASE
3315
LEASE
2932
GATE 4
F67137
ZONE 1
ZONE 2
MAIN ZONE
SURFACE LEASE
95-F10-7-4
ZONE 3
PRAIRIE CREEK
MINE SITE
ZONE 4
WAY 6
K01370
SURFACE LEASE
95-F10-5-5
LEASE
2931
NAHANNI NATIONAL PARK RESERVE BOUNDARY
ZONE 5
ZONE 6
PRAIRIE CREEK
ZONE 7
ZONE 8
ZONE 9
ZONE 10
ZONE 11
ZONE 12
LEASE
2854
N
CANADIAN ZINC
CORPORATION
LEGEND
Trench
Property Boundary
Park Boundary
SCALE
0 500 1,000 1,500 2,500
metres
PRAIRIE CREEK MINE
FIGURE 1-4:
LOCATION OF
CLAIMS AND LEASES
Date: Sept.2009
File:DAR Fig 1-4.dwg

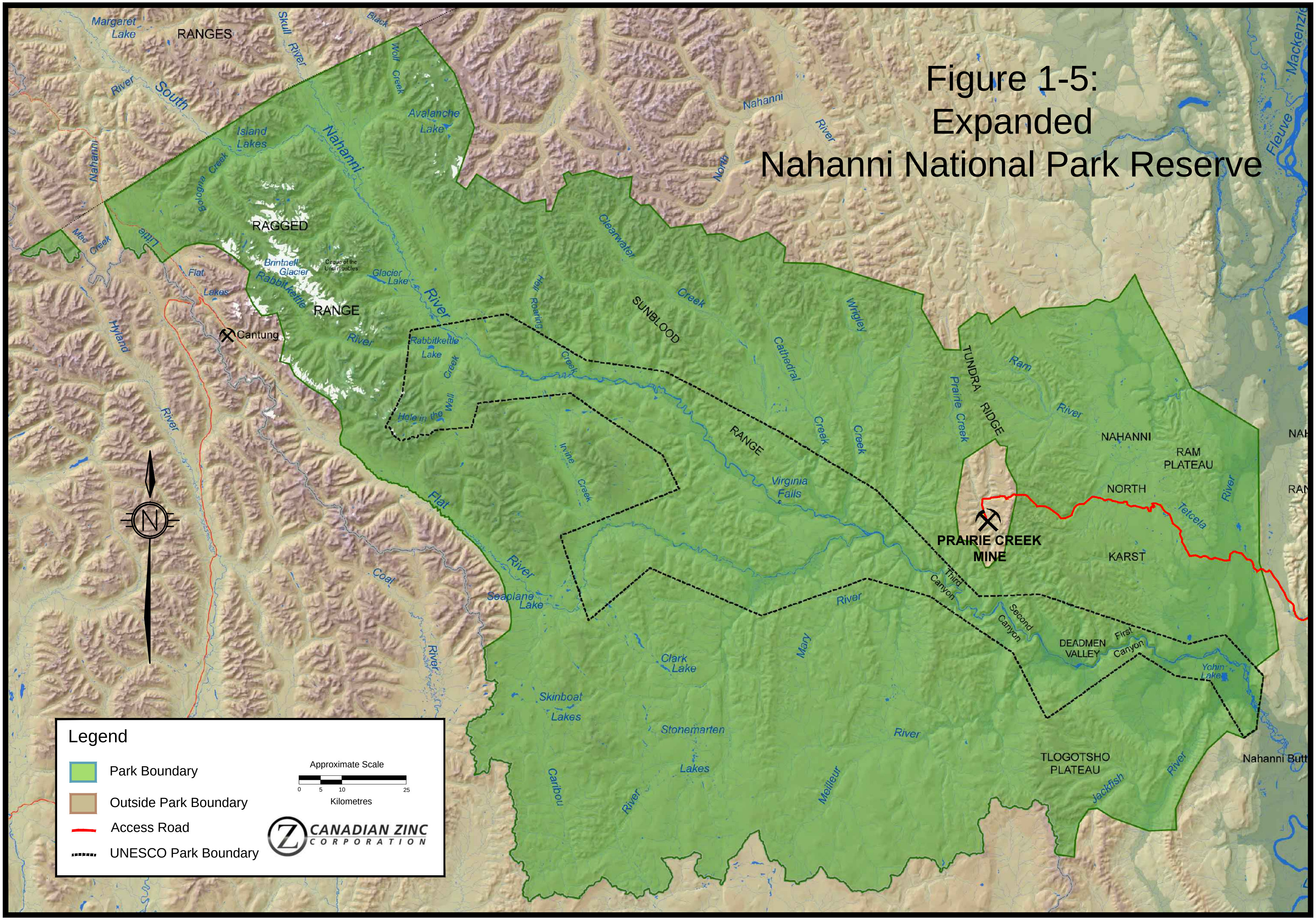


Figure 1-5:
Expanded
Nahanni National Park Reserve

2.0 INFORMATION ON THE DEVELOPER

2.1 Corporate Overview

Canadian Zinc Corporation's head and registered office is located at Suite 1710, 650 West Georgia Street, Vancouver, British Columbia, Canada V6B 4N9. CZN also has a regional office in Fort Simpson at: 9926-101st Avenue, PO Box 500, Fort Simpson NT, X0E 0N0. The corporate registered NWT address is Lawson Lundell LLP, P.O. Box 818, 4908-49th Street, Yellowknife, NT, X1A 2N6.

CZN is listed on the Toronto Stock Exchange, the OTC Bulletin Board in the United States, and on the Frankfurt Exchange in Germany.

The CZN Board of Directors is:

John F. Kearney	Chairman, President and Chief Executive Officer
Alan B. Taylor	Chief Operating Officer and Vice-President, Exploration
John A. MacPherson	Board Member
Brian Atkins	Board Member
Dave Nickerson	Board Member

As required by National Instrument 58-201, CZN's corporate governance practices are outlined in the Management Information Circular posted on the SEDAR website, www.sedar.com, dated May 12, 2009 and on CZN's website: www.canadianzinc.com.

Corporate History

In 1991, San Andreas Resources Corporation ("SARC") entered into an option agreement with Nanisivik Mines Ltd., to acquire a 60% interest in the Prairie Creek Mine property. Subsequently in 1993, pursuant to an Asset Purchase Agreement that superseded the previous option agreement, SARC acquired a 100% interest in the Prairie Creek property and a 60% interest in the plant and equipment subject to a Net Smelter Royalty of 2%.

SARC's name was changed to "Canadian Zinc Corporation" on May 25, 1999. Subsequently in 2004, CZN arranged with Titan Resources to purchase the remaining 40% interest in the Prairie Creek property and also repurchased the outstanding 2% royalty. This simplified CZN as the entire 100% owner of the Prairie Creek property and Mine.

CZN relies on share purchases (equity finance) to fund its present financial commitments. Over the past five years the following financings have occurred:

- 2004: $2.4 million.
- 2005: $5.4 million.
- 2006: $22 million.
- 2007: $10.2 million.

2.2 Honouring Commitments

It is CZN's policy to achieve and maintain a high standard of environmental care in conducting its business as a resource company, and through its developments, contribute to sustaining society's material needs. CZN's approach to environmental management seeks continuous improvement in performance by taking account of evolving scientific knowledge and community expectations.

From time to time, CZN will need to secure the assistance of contractors and subcontractors ("service providers") to carry out various tasks requiring specific expertise related to the operation of the Prairie Creek Mine. In order to ensure that its contractors and subcontractors honour and adhere to all commitments made, CZN will ensure, through written contracts, that all such parties are aware and comply with all the terms and conditions that are associated with such permits that are necessary for operating the Mine.

When hiring contractors, CZN will provide instruction and training, if necessary, to bind all contractors and sub-contractors to corporate policies. Such policies will include social, environmental, human rights, and health and safety policies. Compliance with such policies will be a contractual obligation for services or supplies. A process will also be in place for monitoring and enforcing compliance.

It is standard policy that all service providers must comply with all pertinent laws and regulations.

CZN will endeavour to ensure that all service providers are fully qualified and responsible to undertake the tasks required prior committing to contracts.

2.3 Environmental Performance

CZN has a very good environmental performance record in terms of the absence of significant negative events, and follow-through on commitments and measures from environmental assessments. In the sub-sections below, CZN's environmental performance is discussed with reference to regulatory compliance, commitments made during prior EA's, and measures required by the MVRB during prior EA's. In this discussion, reference is made to permits issued by the MVLWB, and EA's conducted by the MVRB. Permits issued and EA's conducted prior to the operation of the two Boards are not considered as they are not deemed to be particularly relevant to the discussion. This confines the discussion to the present decade. We note that there were two LUP's issued by INAC to San Andreas (CZN's predecessor) in the early 1990's for surface exploration drilling, and that other than those and the permits discussed below, all other permits were before the tenure of SARC/CZN.

2.3.1 Regulatory Compliance

CZN's permits and record of compliance is shown in Table 2-1.

As part of the underground Decline Development project, CZN undertook during EA to treat the mine water discharging from the 870 level portal. This flow pre-dated CZN's operations on site. Thus, CZN planned to treat mine water from the existing workings in addition to water pumped from the new Decline. The Water Licence for this activity lists concentration limits for several parameters, mainly metals, to be met by treated water leaving the Polishing Pond. Since water treatment started in 2006, CZN has found it challenging to consistently meet the limit for zinc with its exploration-scale water treatment process, mainly because of the difficulty in settling out fine particulate matter. Dissolved metals have been successfully removed from the water, however, a small quantity of fine sediment has remained and is sufficient to elevate total metal concentrations. The water treatment process has evolved as more knowledge of conditions has been acquired, and CZN has made several changes, employing additional mixing and reaction tanks and secondary treatment processes. These have helped but have not entirely solved the problem. CZN is continuing to evaluate ways to meet the prescribed limits. This situation is not considered to be an 'out of compliance' situation since CZN has not received a violation notice from INAC. The situation is also not expected to be an issue during operations when a much more sophisticated and automated treatment system will be employed. It should also be noted that recent studies in Prairie Creek have noted that there has been no significant impact on the creek from historical mine discharges, let alone the recent treated water discharge.

Table 2-1: CZN's Permits and Record of Compliance

Permit/Licence				EA No.	Compliance
Type	No.	Purpose	Issued		
Land Use Permit	MV2000C0030	Phase 1 surface drilling (6-7 holes)	14-Jun-01	00/002	
Land Use Permit	MV2001C0022	Phase 2 surface drilling (50-60 holes)	30-Nov-01	01/003	
Land Use Permit	MV2001C0023	Underground Decline and Pilot Plant	10-Sep-03	01/002	In compliance.
Water Licence	MV2001L2-0003				
Land Use Permit	MV2004C0030	Phase 3 surface drilling (50 sites)	11-May-06	0405-002	In compliance. CZN ordered to abandon new Galena road
Land Use Permit	MV2003F0028	Winter Road	11-Apr-07	No EA	In compliance.
Water Licence	MV2007L8-0026	Winter Road	20-Mar-08	No EA	In compliance.

The LUP for the Phase 3 surface exploration drilling required CZN to cut a new road section adjacent to Galena Creek to reduce the number of stream crossings from three to one. CZN undertook to cut a new road, however the area was found to contain significant muskeg and permafrost which proved to be a problem to establish a stable road bed. The Inspector determined that the area was unstable and ordered CZN to stabilize the new cut, install sediment production controls and revert to the old road.

2.3.2 Compliance with Commitments

CZN's record of compliance with commitments is shown in Table 2-2.The Phase 1 surface exploration drilling LUP included commitments to build roads by stripping and stockpiling surficial material, and to back-blade the material back over the road on completion of drilling. The majority of all drilling undertaken was carried out either on mountain tops or adjacent to arterial access roads. Soils were very thin and stony. Consequently, there was very little material stripped. Some material was back-bladed over drill pads, but access roads were left because of the high probability of future use. The Phase 2 drilling area was superimposed on the Phase 1 area, and the Phase 3 area on Phase 2. Hence, all access roads have been left for future use since exploration in areas outlying from the Mine site is not complete.

CZN fully complied with an extensive list of commitments made for the Decline and Pilot Plant projects. As part of Decline development, CZN undertook to treat all water discharging from the mine, including drainage from the existing 870 level portal and that from the new Decline. CZN originally planned to create a new portal for the Decline. However, the Decline was developed from the existing 870 level, the starting point being approximately 1 km from the 870 level portal. Flows from the Decline discharge to the 870 level. The combined mine water flow is treated at the point where it exists the 870 level portal. Flows are monitored daily and sampled weekly. Waste rock from the Decline was placed on a prepared, clayey soil pad just west of the 870 level portal.

A pilot plant was never operated at the mine, and thus there were no tailings or process water for disposal. The large pond, originally built for tailings storage, was also not used. Hence, many of the commitments made in the EA were not applicable.

There was a similarly long list of commitments for the Phase 3 drilling project, and high level of CZN compliance. The main environmental issues with this project were the potential for sediment production and crossings of Prairie Creek. Creek sampling ultimately showed that sediment levels in the creek are controlled by flow conditions, and that project activities had no impact or significant influence. CZN had intended to produce a seed mix for reclamation. However, subsequent to permitting, a vegetation specialist from the Government of the Northwest Territories (S. Carriere) recommended against the use of a seed mix because of the difficulty of preventing the introduction of non-local species. The Phase 3 drilling LUP is still active, and CZN is considering additional exploration. Therefore, CZN has not yet contemplated reclamation-related activities.

Table 2-2: CZN's Record of Compliance with Commitments

Permit/Licence				EA No.	Commitment	Compliance
Type	No.	Purpose	Issued			
Land Use Permit	MV2000C0030	Phase 1 surface drilling (6-7 holes)	14-Jun-01	00/002	Exclusive use of water as drilling medium	Complied
					Build roads by stripping & stockpiling surficial material, back-blade over when drilling complete	Mostly not possible due to thin soil. Roads still in use.
Land Use Permit	MV2001C0022	Phase 2 surface drilling (50-60 holes)	30-Nov-01	01/003	None.	
Land Use Permit	MV2001C0023	Underground Decline and Pilot Plant	10-Sep-03	01/002	Approved geotechnical assessment of tailings facility before receiving process water	Tailings facility never used
					Tailings solids to be retained in Mill thickeners	No Pilot Plant and no tailings produced
					Process water to be tested before discharge	No Pilot Plant
					Process water to be treated if necessary	No Pilot Plant
					Pilot Plant to be operated inside Mill	No Pilot Plant
					Use up to 75 m^3/day from wells	Max use was approx 12 m^3/day
					Inspect tailings dams daily during development	Tailings facility was never used. However, per Water Licence, dams were inspected annually by an engineer, and frequently by site staff. No instabilities requiring response
					Report any dam instabilities to engineers	
					Develop response plans for any dam instabilities	
					Monitor tails pond water level and 870 and Catchment Pond flows weekly	870 flows monitored daily, Catchment Pond weekly. Tails pond not used
					Monitor discharges to environment monthly	Discharges monitored weekly
					Maintain generators to be efficient	Done frequently to minimize consumption
					Fulfill Development Cooperation Agreement	
					Daily operations meetings during development	Meetings every morning
					Daily operations report during development	Complied
					Operations monitoring throughout development	Complied
					Test process/tails pond water monthly	No Pilot Plant or tails pond use
					Safety orientation before personnel can work	Mandatory
					Monitor Decline discharge rate daily	870 & Decline flows monitored jointly

Table 2-2 (cont'd)

Permit/Licence					Commitment	Compliance
Type	No.	Purpose	Issued	EA No.		
					Decline discharge to have settling before release	2 sumps underground, Polishing Pond
					Decline discharge to be treated if necessary	870 & Decline flows treated jointly
					Test Decline discharge for quality monthly	Tested weekly
Water Licence	MV2001L2-0003				Develop Decline in carbonate rock	Complied
					Weekly waste rock sampling, monthly testing	Complied
					Store water rock near portal or in plant site	Complied
					Allow Decline to flood after program	Complied
					Secure entrance to Decline	Decline driven from 870 1 km from portal
					Use existing roads to access Decline	Complied
					Construct sumps in the Decline, primary at portal	Complied, primary near 870 portal
					Construct polishing pond for 870 portal discharge	Complied
					Line polishing pond, enable cleanout/floating hydrocarbon capture	Complied
					Raise pH in polishing pond (lime/soda), aid settling	Complied
					Manage all mine water	Complied
					Employ absorbant pads/booms in sumps/ponds	Complied
					Discharge all site water via Catchment Pond	Complied
					Manage ammonia levels, use gelignite if necessary	Complied
Land Use Permit	MV2004C0030	Phase 3 surface drilling (50 sites)	11-May-06	0405-002	Field survey spring 2006 by qualified biologist	Complied
					Develop re-vegetation seed mix based on survey	Not recommended by GNWT
					Establish test plots for re-vegetating roads	Outstanding
					Restore new roads and drill pads and those used when no longer required	Outstanding
					Prevent hunting by staff	Mandatory
					Address species at risk in survey, including caribou	Complied
					No work if listed species present until appropriate mitigation	Complied
					Create wildlife management plan	Complied
					Create flight impact management plan	Complied

Table 2-2 (cont'd)

Permit/Licence					Commitment	Compliance
Type	No.	Purpose	Issued	EA No.		
					Revise Health and Safety Plan re bears	Complied
					Use Little Quartz roads to access Zones 8 and 9	Complied
					Relocate Galena Creek road to reduce creek crossings	Complied, although permafrost forced Inspector to order use of old road
					Implement erosion prevention measures	Complied
					Clean equipment prior to crossing Prairie Creek	Complied
					Don't cross Prairie Creek before June 15	Complied
					Maintain water clarity in compliance with CCME	Complied
					Follow PDAC's E3 guidelines	Complied
					Weekly water samples at 3 locations	Complied
					Maintain a wildlife log	Complied

2.3.3 Compliance with Measures

CZN's record of compliance with measures required by the MVRB in prior EA's is shown in Table 2-3. The table lists only those measures directed to CZN (some measures were directed to other parties).

A significant number of measures were associated with the Decline Development and Pilot Plant project. Most involved the assessment of existing facilities and production of management plans. The Fuel Tank Farm was assessed, as well as the flood protection dikes following the update of predicted flood elevations. Plans produced included a Mine Water Contingency Plan, Waste Rock and Ore Pile Monitoring Plan, Wildlife Management Plan, Health and Safety Plan and a Fuel Spill Contingency Plan. A polishing pond was designed and built with professional engineering inspection and approval.

The only measure directed to CZN for the Phase 3 drilling project was a requirement to hire a environmental monitor from a local community. CZN contracted a monitor through Nogha Enterprises for drilling activities in 2006 and 2007.

Table 2-3: CZN's Record of Compliance with Review Board Measures

Permit/Licence				EA	Measures Required	Compliance
Type	**No.**	**Purpose**	**Issued**	**No.**		
Land Use Permit	MV2000C0030	Phase 1 surface drilling (6-7 holes)	14-Jun-01	00/002	None.	
Land Use Permit	MV2001C0022	Phase 2 surface drilling (50-60 holes)	30-Nov-01	01/003	None.	
Land Use Permit	MV2001C0023	Underground Decline and Pilot Plant	10-Sep-03	01/002	Geotechnical assessment/certification of tailings facility before use allowed	No assessment, tails facility never used
					Assessment/certification re suitability of tank farm facility	Complied
					Contingency/monitoring plan for waste rock/ore piles	Complied
					Test water collecting inside tank farm berm, treat before discharge if necessary	Complied
					Provide 870 m level portal discharge data	Complied
Water Licence	MV2001L2-0003				Water quality testing regime for site discharges	Complied
					Financial ability to fulfill Water License requirements	Security set by INAC and posted by CZN
					Develop/implement bear response plan	Complied, part of Health & Safety Plan
					Plan to protect mineral lick for on-going use	Airstrip and Yard licks still in use
					Update PMF and flood elevations with new data	Complied
					Geotechnical assessment of tailings facility stability using recent stream flow data	Complied
Land Use Permit	MV2004C0030	Phase 3 surface drilling (50 sites)	11-May-06	0405-002	Employ a community environmental monitor	Complied

2.4 Corporate Policies

CZN, being a publicly traded company on the Toronto Stock Exchange, maintains strict adherence to corporate policies relating to, but not limited to, corporate governance, ethical behaviour, and accounting practices. These policies are listed and can be reviewed on CZN's website (**www.canadianzinc.com**).

Throughout the exploration and development of the Prairie Creek Mine, CZN has adopted the Principles for Responsible Exploration as outlined in the Prospectors and Developers Association of Canada e3 (environmental excellence in exploration) Plus Principles and Guidelines located on website **www.pdac.ca/e3plus/**. The main principles would similarly relate to operations and are listed as follows:

1. Adopt responsible governance and management
Objective: To base the operation of exploration on sound management systems, professional excellence, the application of good practices, constructive interaction with stakeholders, and the principles of sustainable development.

2. Apply ethical business practices
Objective: To have management procedures in place that promote honesty, integrity, transparency and accountability.

3. Respect human rights
Objective: To promote the principles of the United Nations Universal Declaration of Human Rights by incorporating them into policies and operational procedures for exploration.

4. Commit to project due diligence and risk assessment
Objective: To conduct an evaluation of risks, opportunities and challenges to exploration, and prepare strategies and operational plans to address them before going into the field.

5. Engage host communities and other affected and interested parties
Objective: To interact with communities, indigenous peoples, organizations, groups and individuals on the basis of respect, inclusion and meaningful participation.

6. Contribute to community development and social wellbeing
Objective: To have measures in place which support the social and economic advancement and capacity building of communities whose lives are affected by exploration, while respecting the communities' own vision of development.

7. Protect the environment
Objective: To conduct exploration activities in ways that create minimal disturbance to the environment and people.

8. Safeguard the health and safety of workers and the local population

Objective: To be proactive in implementing good practices for health and safety performance in all exploration activities and seek continual improvement.

When hiring employees and contractors, it is standard CZN practice to carry out a mandatory site orientation session with prospective workers. This orientation consists of, amongst other aspects, a thorough review of site procedures and safety protocols. This includes workers reviewing and agreeing to comply with CZN's Code of Business Conduct and Ethics (refer to Appendix 31). This Code requires mandatory compliance with many aspects, such as; Honest and Ethical Conduct, Conflicts of Interest, Protection of Company Assets, Equal Opportunity, and Health Safety and Environmental Protection (refer to Appendix 29). In addition to this, CZN maintains a standard Whistleblower Policy which permits anonymous reporting of any regulatory concerns.

CZN has developed internal management plans relating to Health and Safety, and Fuel Spill Contingency. These are attached in Appendices 28 and 29. These plans would need to be reviewed for adequacy to support the proposed mining operation, and this would take place at the permitting stage..

CZN is committed to the responsible and sustainable development of the mineral resource at Prairie Creek. CZN is acutely aware of the ecological value and importance of the area to First Nations, conservationists and the public in general. CZN has every intention of designing and operating the project with the best available technology so that the temporary impact on the environment during operations is minimal, and long-term effects after closure are negligible.

CZN believes that mineral development and conservation of ecological resources need not be mutually exclusive. CZN's vision is a development where the unique ecology is protected, and mineral extraction and the related economic benefits successfully co-exist with traditional aboriginal land uses and the Nahanni National Park Reserve. Although the Park is forever, the Mine will operate for only a relatively short time and will bring substantial benefits to local communities in the form of business opportunities, training and jobs, and will be a catalyst for regional development, tourism and economic activity that can be sustained long after the eventual but inevitable mine closure.

3.0 ASSESSMENT BOUNDARIES

This section describes the geographic and temporal (time) boundaries used in this impact assessment.

3.1 Geographic Boundaries

Geographic boundaries are discussed below firstly with reference to each valued component. Overall EA study area geographic boundaries are then defined as a composite of the valued component boundaries.

3.1.1 Valued Component Boundaries

Air Quality: Diesel-powered generators and a garbage incinerator will emit gases, notably carbon dioxide, and the use of site roads and the airstrip could generate airborne particulates (dust). The area over which particulates might occur will be limited to the Mine site. However, the area of gas dispersal is potentially much larger and dependent on wind strength and direction, the latter being typically up-valley or down-valley. Gas concentrations are expected to be at background levels a few kilometres from the Mine. The assumed assessment boundaries for this component are those conforming to the Mine area excluded from the NNPR (see Figure 1-5).

Surface water quality, fish and sediments: Previous studies have shown that, despite decades of mine water discharge before CZN started treatment in 2006, the only effect detected on Prairie Creek downstream is a mild nutrient enrichment. This is attributed mainly to the comparatively high flows occurring in the creek. During all stages of the mine, CZN expects water quality to be within the normal range well before the confluence of Prairie Creek with the South Nahanni River. Therefore, this location is the downstream boundary assumed for assessment of surface water quality, and for aquatic life and stream sediments. For cumulative effects assessment, the TOR requires the inclusion of the Flat River for an assessment of impacts on the South Nahanni River. CZN's mining leases and mineral claims are also included for cumulative effects assessment.

Component boundaries used for the access road are in relatively close proximity to the road because operations will occur in winter when streams are frozen. Should a spill occur, it can be quickly contained and spilled material completely recovered. Component boundaries include creeks immediately downstream from the existing road alignment and the proposed re-alignments.

Groundwater: Groundwater in proximity to the mine workings is expected to flow towards Prairie Creek, discharging to floodplain deposits occupying the valley at a slow rate and in relatively close proximity to the Mine site. Significant groundwater resources reportedly exist in the North Nahanni karst, traversed by the access road (Figure 1-5). As stated above, the potential for contamination is thought to be low because transport operations will take place during the winter season. However, the reported pathways for groundwater movement in the karst down-gradient from the road have been included in the area assessed in order to comply with the EA terms of reference in terms of impact assessment on the karst.

Wildlife: Of the species to be considered during assessment, two in particular can have a significant geographic range, woodland caribou and grizzly bear. Therefore, the range of these species effectively defines the geographic component boundaries. These boundaries were slightly expanded for cumulative effects assessment in connection with the Howard's Pass, Cantung and Mactung projects.

Vegetation: The footprint of the Mine will not change significantly. The largest single addition will be the proposed Waste Rock Pile in the Harrison Creek valley. However, this is within the existing area of 'disturbance'. For cumulative effects assessment, the area is expanded to include CZN's mining leases and mineral claims. The access road alignment is also defined and has been used previously, although some re-alignments are being proposed. Therefore, component boundaries are quite small relative to other components.

Terrain: Boundaries for this component are mostly comparable to those of vegetation, including the immediate mine area and the road corridor. However, the terrain adjacent to Prairie Creek upstream and downstream of the Mine is included for the purpose of assessing the potential for a substantial slope failure and impact on creek flow.

Heritage Resources: Traditional Knowledge studies undertaken for the Nahanni Butte Dene Band defined three locations along the access road where it was considered heritage resources might occur. These locations are within the impact corridor of the access road.

Transportation: The access road to the Liard Highway is included as discussed above. Also included is the highway itself from the access road junction to the NWT-BC border. A relatively narrow corridor centred on the highway is assumed for assessment given that the highway is a public road, and potentially hazardous materials (e.g. concentrates, fuel) will mainly be transported during winter conditions.

Traditional land use: The traditional knowledge studies undertaken for the Nahanni Butte Dene Band also defined the nature and locations of traditional land uses, which are mostly in proximity to the eastern-most portion of the access road.

Socio-economics: The mine will have a direct socio-economic impact on neighbouring communities, notably Nahanni Butte, Fort Simpson and Fort Liard, but effects will also be felt throughout the Dehcho and potentially Yellowknife and the Northwest Territories in general also. However, the assessment will focus on the Dehcho.

3.1.2 Overall Study Area Boundaries

The individual valued component boundaries above, excluding those for socio-economics, have been combined into the composite study area shown in Figure 3-1. Including socio-economics would extend the study area shown to include at least the entire Dehcho region.

3.2 Temporal Boundaries

As noted in the TOR, the temporal boundaries for assessment of most of the valued components start before the main construction phase of the mine in the early 1980's. Baseline data collected for surface water flow and quality, aquatic species and wildlife in proximity to the Mine and access road before and after mine construction are all relevant to this assessment.

All valued components are assessed herein based on a 14 year mine operating period. Each component is evaluated taking account of differing intensity of activities and any seasonal sensitivity. Clearly, access road activities intensify after road construction and correlate with the main haul period. However, no intense activity compared to normal mine operations is expected during the mine construction phase because very little additional construction is required. For water quality and aquatics, consideration will be given to how site discharges change seasonally and how this relates to in-stream concentrations of parameters. The annual access road construction, operation and decommissioning season is used to consider potential impacts on applicable wildlife (e.g. caribou), in addition to the assessment of non-winter conditions and other wildlife (e.g. bears).

Valued components are also assessed for the mine decommissioning and reclamation phase, followed by a period of monitoring and site management. For most components, applicable activities will be much less and the corresponding potential for impacts similarly less than for the operating period. The site post-closure monitoring phase is considered particularly applicable to water quality. It is understood that monitoring needs to continue until site conditions have reached equilibrium and it has been verified that mine closure strategies are as predicted for environmental protection. Post-closure socio-economics are considered since employment opportunities and the local economy will be different.

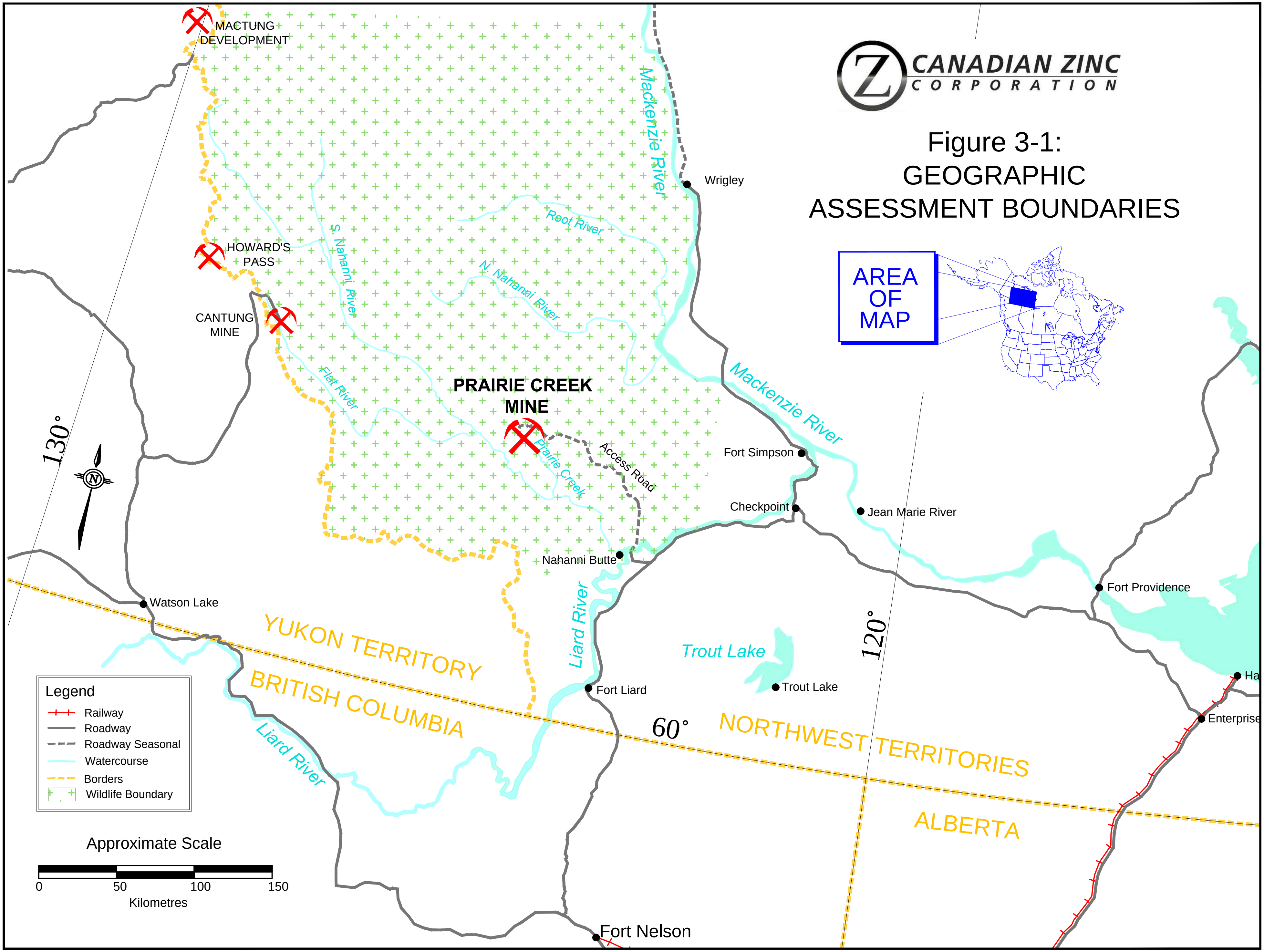


Figure 3-1:
GEOGRAPHIC ASSESSMENT BOUNDARIES

4.0 EXISTING BIOPHYSICAL ENVIRONMENT

4.1 Development Location and Ecoregions

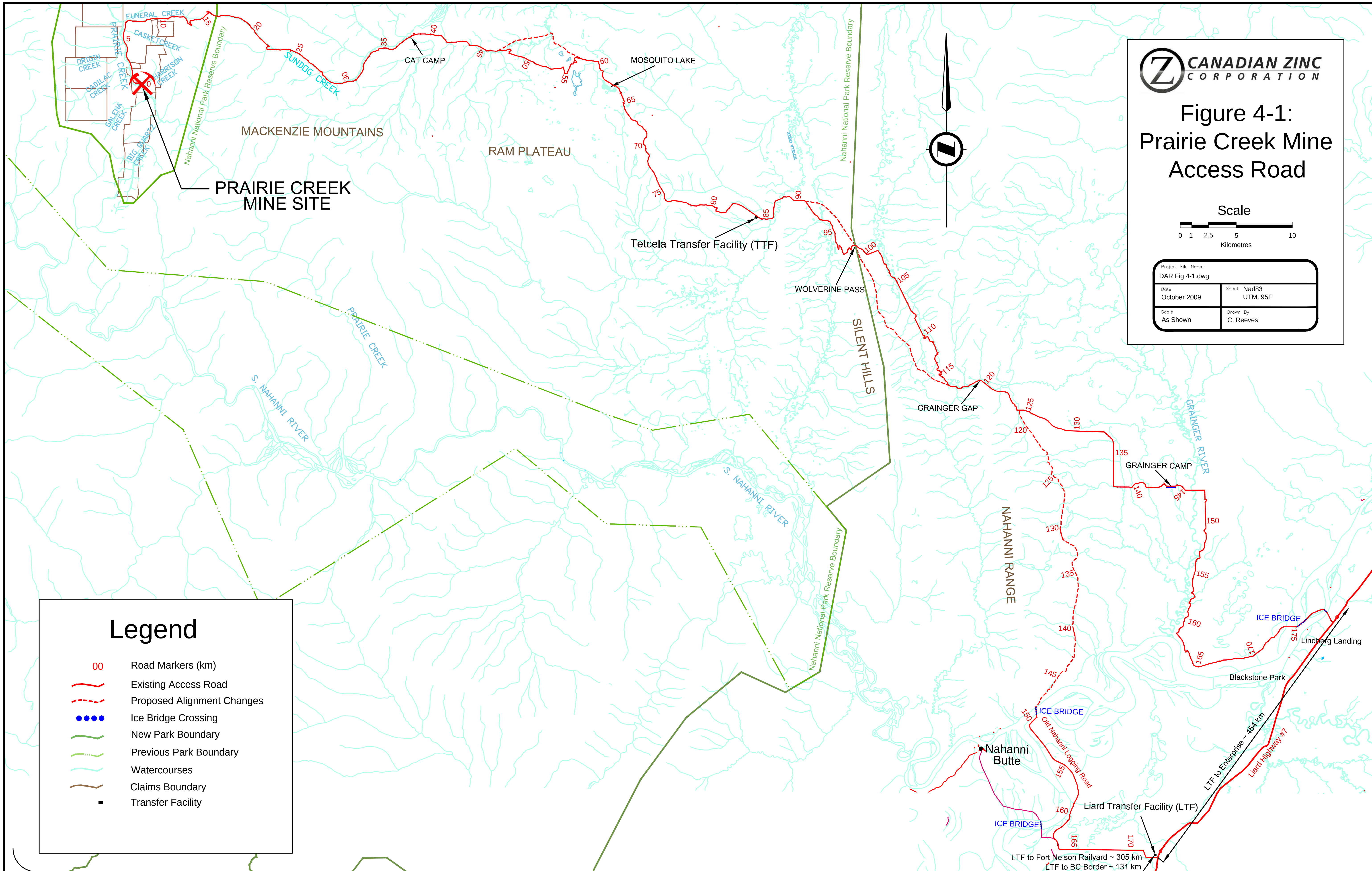
The Prairie Creek Mine site is located in the southern Mackenzie Mountains at 61° 33' North latitude and 124° 48' West longitude (Figure 1-3). The Mine site facilities are situated on the eastern side of and adjacent to Prairie Creek, about 43 km upstream from its confluence with the South Nahanni River (Figure 3-1), and approximately 7 km upstream of the point where Prairie Creek crosses the boundary of the recently expanded Nahanni National Park Reserve ("NNPR"). The South Nahanni River flows into the Liard River near Nahanni Butte, 100 km downstream from Prairie Creek. The Liard River merges with the Mackenzie River at Fort Simpson, a further 175 km downstream.

The Mine site is at an elevation of 850 m above mean sea level ("AMSL"), and is situated in topography characterized by low mountains and narrow valleys with an average relief of 300 m. The Mine site is located within the Alpine Forest-Tundra section of the Boreal Forest, characterized by stunted fir with limited undergrowth and open areas dominated by lichen.

The Mine is connected to the Liard Highway via an existing access road (see Figure 4-1). The road leaves the Mine site heading north along the Prairie Creek valley for about 7 km before turning east to cross the Mackenzie Mountains. As the Access Road climbs out of the Prairie Creek valley it enters Sub-Alpine Shrub and Alpine Tundra from an elevation of approximately 1000 m AMSL at Km 10. The road continues to climb through the Alpine to the summit of 1530 m at Km 17, then dropping down and leaving the Sub- Alpine again at the 1000 m elevation around Km 25. As the road drops from the 1000 m elevation to the 900 m elevation, it passes through a spruce-lichen Alpine forest zone similar to that found at the Mine site and then into Riparian Alluvial habitat in the Sundog tributary valley bottom.

As the road crosses the Ram Plateau it passes through an open forest Black Spruce/Pine Parkland setting between the 830 to 930 m elevations, before dropping down into the Tetcela River valley. The valley consists of a mixed coniferous/deciduous closed forest. The road then passes through a short distance of muskeg open shrub/sedge wetland at the headwaters of Fishtrap Creek, and climbs up and over the Silent Hills, again a closed mixed coniferous/deciduous forest. The existing road alignment then crosses an area of black spruce muskeg and wetlands before passing through mixed coniferous deciduous pine parkland prior to entering the Grainger River headwaters at Grainger Gap (Second Gap). A re-alignment is being considered east of the Silent Hills to move the road out of the wetlands and onto the lower slopes of the Silent Hills.

Once through the Grainger Gap, the existing road alignment drops down over a closed shrub-open sedge meadow of the Grainger Tillplain and onto the Interior Plain Mosaic of the Grainger floodplain. The floodplain/tillplain mosaic is further broken down into individual habitat units: the Grainger Tillplain, open shrub areas, lowland marsh areas and mixed deciduous coniferous forest areas ranging from less than 30% cover to greater than 50% cover. A re-alignment is being



CANADIAN ZINC CORPORATION
Figure 4-1:
Prairie Creek Mine Access Road
Scale
0 1 2.5 5 10
Kilometres
Project File Name: DAR Fig 4-1.dwg
Date October 2009
Sheet Nad83 UTM: 95F
Scale As Shown
Drawn By C. Reeves
Legend
00 Road Markers (km)
Existing Access Road
Proposed Alignment Changes
Ice Bridge Crossing
New Park Boundary
Previous Park Boundary
Watercourses
Claims Boundary
Transfer Facility
PRAIRIE CREEK MINE SITE
FUNERAL CREEK
CASKET CREEK
PRAIRIE CREEK
ORIGIN CREEK
CADILLAC CREEK
HARRISON CREEK
GALENA CREEK
BIG QUARTZ CREEK
Nahanni National Park Reserve Boundary
MACKENZIE MOUNTAINS
SUNDOG CREEK
CAT CAMP
MOSQUITO LAKE
RAM PLATEAU
Tetcela Transfer Facility (TTF)
WOLVERINE PASS
SILENT HILLS
GRAINGER GAP
S. NAHANNI RIVER
GRAINGER RIVER
GRAINGER CAMP
NAHANNI RANGE
ICE BRIDGE
Lindberg Landing
Blackstone Park
Nahanni Butte
Old Nahanni Logging Road
Liard Transfer Facility (LTF)
LTF to Enterprise ~ 454 km
Liard Highway #7
LTF to Fort Nelson Railyard ~ 305 km
LTF to BC Border ~ 131 km

proposed to take the road south along the foothills of the Front Range through mixed deciduous coniferous forest towards Nahanni Butte, thus avoiding the Grainger Tillplain. The road would cross the Liard River near the community and continue through forest to the Liard Highway.

The proposed Tetcela Transfer Facility ("TTF") is located at approximately Km 84 of the access road, as measured from the Mine site, at 61°27'38'' North latitude, 123°46'30'' West longitude. The location is on the eastern edge of the Ram Plateau in Black Spruce/Pine open forest approximately 2 km north-west of the Tetcela River. The area is a broad spur of land approximately 392 m AMSL in elevation.

If the access road remains on its current alignment, the proposed Liard Transfer Facility ("LTF") will be located at 61°8'16" North latitude, 122°48'12" West longitude, approximately 600 m south-east of the Liard River and 150 m north-west of the Liard Highway. The site is located in forest with well drained soils and a broad gentle slope. If the southern road alignment near Nahanni Butte is chosen, the LTF will be located at 60°56'88" North latitude, 123°05'50" West longitude, and approximately 150 m west of the Liard Highway at an elevation of 200 m AMSL.

The Mine property and access road are within an area claimed by the Nahanni Butte Dene Band of the Dehcho First Nations, the nearest First Nations community, as their Traditional Territory. Nearby settled communities are:

Community	Distance to Prairie Creek Mine by Air
Nahanni Butte, NT	95 km to the south-east
Fort Liard, NT	165 km to the south
Fort Simpson, NT	185 km to the east
Yellowknife, NT	550 km to the east
Fort Nelson, BC	335 km to the south

4.2 Ambient Air Quality and Noise Levels

4.2.1 Ambient Air Quality

An ambient air quality monitoring program was instituted at the Prairie Creek Mine site in 2009. The program was designed and installed by Golder Associates Ltd. (Golder). Monitoring consisted of sampling of particulates (dust) and specific gases. Three high-volume volumetric flow-controlled particulate samplers were erected on the berm of the Fuel Tank Farm to monitor total suspended particulates ("TSP"), particulate matter with a diameter less than 10 µm ("PM_{10}"), and particulate matter with a diameter less than 2.5 µm ("$PM_{2.5}$"). Sample collection consisted of operating the samplers for 24 hours. The exercise was repeated every 6 days over a period of 120 days (July 6 to November 4) to acquire approximately 20 samples of each parameter. Passive monitoring for sulphur dioxide ("SO_2"), Nitrogen Dioxide ("NO_2") and Ozone ("O_3") was also conducted using "pucks" mounted on staffs. Pucks were located on the

Tank Farm berm and on the eastern berm of the large pond. The pucks were changed out every 30 days over the 120 day particulate monitoring period.

Monitoring samples were sent to Maxxam Analytics in Burnaby, BC for analysis. Results were forwarded to Golder, who also completed an air quality assessment for Prairie Creek Mine operations. Their report is given in Appendix 20. The description of ambient air quality given below is drawn from the Golder report. The reader should consult the Golder report for more detail.

Results for 2009 sampling indicate low concentrations of particulate matter (TSP, PM_{10} and PM2.5) when compared to applicable air quality standards (NWT, Canada and Alberta), as well as low NO_2, SO_2 and O_3 values, reflecting a lack of industrial activities around the Prairie Creek Mine area. For several samplings, the concentrations were lower than the detection limit of the monitoring methods.

In addition to data from the air quality monitoring program, data generated by monitoring stations run by the Northwest Territories Environment and Natural Resources ("ENR") department were reviewed. However, because these stations are located in communities, and are very distant from the Prairie Creek Mine site, the ENR data were not considered appropriate for the purpose of determining baseline concentrations for the site air quality assessment.

4.2.2 Background Noise

Background natural noise can range widely, from wind in the trees at 30-50 db, to falling rocks (60-80 db), to a large waterfall (100 db) (source EBA Engineering Consultants Ltd., Mactung Project, 2008). The Federal Aviation Administration ("FAA") list a variety of human-caused noises, including heavy trucks at 92 dB, and a 150 cubic foot air compressor at 100 dB.

Before any development at the Prairie Creek Mine site, local background noise would come from occasional falling rocks, as well as ambient (continuous) noise from creek flows. The latter would vary depending on water level. Waterfalls also occur in the area.

Higher levels of background noise have been introduced with development of the site, and during on-going exploration. Heavy vehicle noise, and noise from construction equipment and tools, would have been prevalent during the original mine construction. Background noise will have periodically occurred during subsequent exploration, which has included power generation, heavy vehicle use (dozers, loaders and haulers), drilling, helicopter use, and fixed-wing aircraft.

For power generation, noise from a Caterpillar model 3516B is listed at 72 dB at a distance of 15 m (HGC Engineering, 2004). This model is likely not dissimilar to generator sets previously used on site, and those proposed for operations, from a noise perspective.

In the absence of an access road, on-going exploration has relied on air support. During peak exploration in 2006-2007, several flights per week occurred. Two common aircraft used during that period were the Britten-Norman Islander (65 dB on take-off, source Aviation International News) and the Cessna 208 Caravan (73 dB on take-off, source FAA). By comparison, the

Bombardier DHC-7 (Dash 7) noise level is listed as 69 dB on take-off (source FAA), and this 40-seater aircraft could be used for crew changes during operations.

4.3 Climate

A climate station was erected at Prairie Creek in 1994 (see Figure 4-5 for location). The station was equipped with temperature, relative humidity and wind strength and direction sensors affixed to a cable-stayed mast, together with an independent tipping-bucket rain gauge. All instruments sent readings to a data-logger powered by a battery whose charge was maintained by a solar panel. A period of site inactivity followed station installation, with the result that data was not downloaded and the stored data was lost. CZN refurbished and restarted the station in late May 2005. Data has been collected and downloaded regularly since that time, although a data logging malfunction occurred starting in August 2008. The station has been operational again since September 2009. Relevant recent data has been summarized in Table 4-1 together with historical data, with measurements converted from imperial to metric. Figure 4-2 shows recorded temperatures from May 2005 to August 2008.

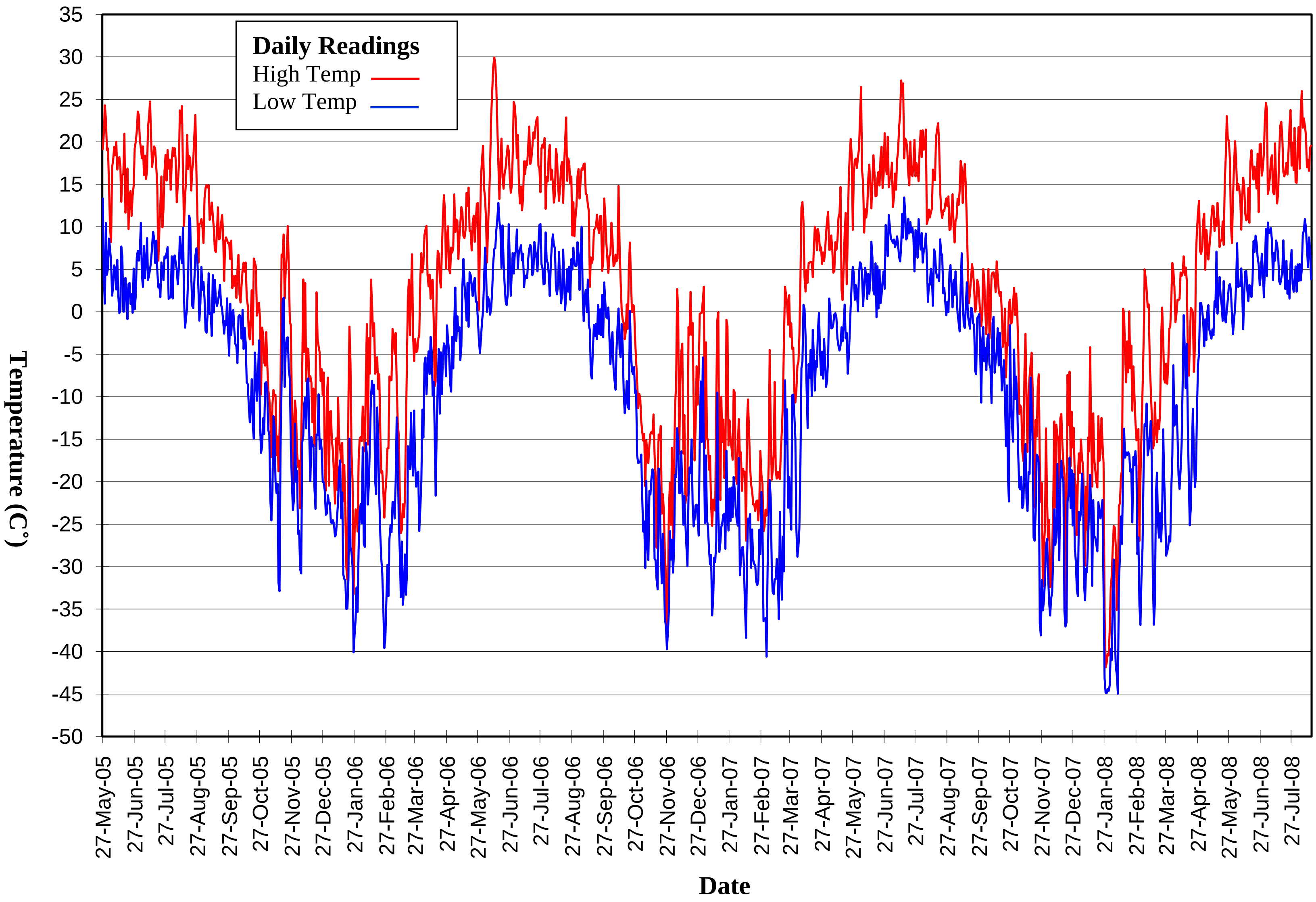
Data for the site in 1980 (Cadillac) was estimated from stations in the region. Rainfall for the site was estimated at approximately 300 mm/year, and precipitation 508 mm/year. These are both roughly 50% greater than Fort Simpson (1980). However, the average mean daily temperatures for the year were comparable at around -5^{o}C. The site was predicted to be slightly more temperate than Fort Simpson, cooler in the summer but warmer in the winter.

There are some interesting differences in data reported at Fort Simpson between 1980 and 2000. The more recent data indicates a warmer (1.2^{o}C) average mean daily temperature for the year. However, the difference is more pronounced in mid-winter months where more recent temperatures are several degrees warmer. Annual rainfall is roughly 13% greater at 224 mm, although total precipitation is only 7% greater at 369 mm. Peak precipitation still occurs in the summer months of June-August in the form of rainfall.

Data from the Prairie Creek station for 2005-2007 is consistent with recent Fort Simpson data. Annual mean daily temperature, wind speed and direction are comparable. Monthly mean daily temperatures are similar to the estimated data in 1980, and are more moderate than Fort Simpson, cooler in summer but warmer in winter. The annual rainfall total of 414 mm in 2006 is 38% higher than the 1980 estimate. 2006 appears to have been abnormally wet in May and June compared to 1980, 2005 and 2007. Snowfall depth is not available to make a comparison of total precipitation.

Table 4-1: Climate Data

Station/Parameter	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Cadillac 1980													
Mean Daily Temp ^{0}C	-25.6	-19.4	-13.3	-3.9	4.4	10.6	12.8	11.1	5.0	-4.4	-16.7	-20.6	-5.0
Rainfall mm	0.0	0.0	0.0	2.5	25.4	58.4	86.4	71.1	48.3	7.6	0.0	0.0	299.7
Precipitation mm	22.9	22.9	20.3	25.4	40.6	58.4	86.4	71.1	58.4	48.3	30.5	22.9	508.0
Evaporation mm	-	-	-	-	<25	76.2	101.6	76.2	50.8	<25	-	-	330.2
Fort Simpson 1980													
Mean Daily Temp ^{0}C	-29.4	-23.3	-15.0	-1.7	8.3	14.4	16.7	14.4	7.2	-2.2	-16.1	-24.4	-4.4
Rainfall mm	0.0	0.0	0.0	2.5	22.9	40.6	45.7	53.3	25.4	7.6	0.0	0.0	299.7
Precipitation mm	20.3	17.8	17.8	15.2	30.5	40.6	45.7	53.3	30.5	27.9	25.4	20.3	345.4
Fort Simpson 2000													
Mean Daily Temp ^{0}C	-25.4	-21.1	-13.2	-0.5	9.0	15.2	17.2	14.7	8.0	-2.3	-16.2	-23.5	-3.2
Rainfall mm	0.2	0	0.1	3.0	21.5	47.8	59.2	56.7	23.6	11.6	0.2	0	224.0
Snowfall cm	24.0	21.2	18.8	14.4	6.2	0	0	0.5	5.3	29.4	27.3	23.2	170.3
Precipitation mm	18.5	17.5	15.9	16.0	28.2	47.8	59.2	57.2	28.6	38.9	22.7	18.6	369.0
Wind Speed (km/h)	7.8	8.9	9.8	10.6	10.7	9.8	8.9	9	9.1	9.6	8.4	7.4	9.2
Most Frequent Wind Direction	NW	NW	NW	E	E	E	NW	NW	E	E	NW	NW	NW
Prairie Creek Mine 2005													
Mean Daily Temp ^{0}C					15.1	10.5	11.6	10.5	5	-3.1	-10	-13.7	2.2
Rainfall mm					6.5	75.3	88.6	51.7	44.5	27.5	20.1	2.7	316.9
Wind Speed (km/h)					8.4	7.2	5.3	5.2	4	3.1	4.1	1.9	3.3
Most Frequent Wind Direction					E	E	E	W	W	W	W	W	W
Prairie Creek Mine 2006													
Mean Daily Temp ^{0}C	-22.3	-17.1	-16.3	-1.7	5.4	12.3	12.8	10.2	5.4	-2.8	-23.1	-15.7	-4.4
Rainfall mm	0	0	24	18.8	80.1	139	59.8	56.8	32.4	3.2	0	0	414.3
Wind Speed (km/h)	2.2	2.4	5.9	6.1	6.3	5.7	6.3	4.9	4.9	3.7	3.1	2.5	4.5
Most Frequent Wind Direction	W	W	W	E	W	W	W	W	W	W	W	W	W
Prairie Creek Mine 2007													
Mean Daily Temp ^{0}C	-18.8	-22.9	-18.9	-2.1	4.8	10.7	13.7						
Rainfall mm	0.00	0.00	24.80	35.80	38.50	65.90	240.30						
Wind Speed (km/h)	2.90	3.00	6.00	5.10	5.90	6.00	5.40						
Most Frequent Wind Direction	W	W	W	W	W	W	W						



CANADIAN ZINC CORPORATION

Figure 4-2:
Temperatures Recorded at Prairie Creek Mine
(May 2005 to August 2008)

4.4 Hydrology

4.4.1 Watershed Surface Water

The Water Survey of Canada ("WSC") operated a hydrometric station on the west side of Prairie Creek opposite the Mine (see Figure 4-5), and generated average monthly flow data from October 1974 to December 1990. This data is shown in Table 4-2. The table also shows the minimum flow recorded for each month over the 16 year monitoring period.

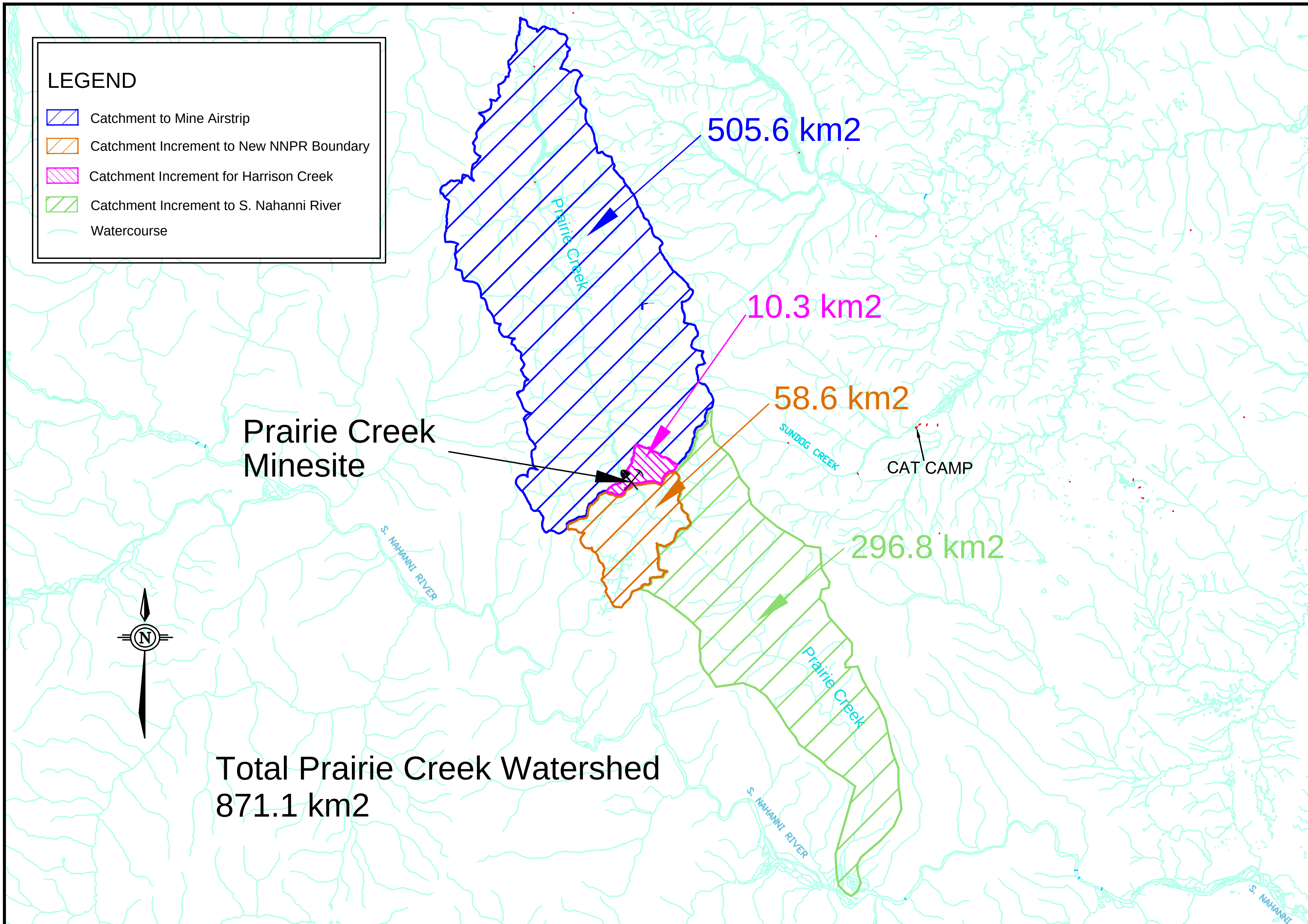
Higher monthly flows occur over the period May-September, with the peak flow month usually being June coincident with the freshet. The annual low flow month is usually March when flows are approximately 50 times less than in June. However, these data do not account for peak flows observed in the area, which occur associated with intense summer rainfall events. Two such events occurred in July 2006 and August 2007. These events are considered abnormal because they caused erosion of stream banks and CZN's access road to a degree not seen since the Mine and road were built.

The catchment area of Prairie Creek monitored at the WSC station has been measured at 505.6 km^2, and is upstream of the Mine (see Figure 4-3). Discharge from the Mine currently flows into Harrison Creek, just above its confluence with Prairie Creek. The additional Prairie Creek catchment area including Harrison Creek was measured at 10.3 km^2. The boundary of the expanded NNPR is approximately 7 km downstream. The additional Prairie Creek catchment area to this point was measured at 58.6 km^2. The total Prairie Creek catchment area was measured at 871.2 km^2.

Monthly average and minimum flows for the different locations on Prairie Creek noted above have been estimated (see Table 4-3) using the WSC data. The WSC flows were pro-rated based on catchment area. Using this approach, the mean flow of Prairie Creek at the mouth in the peak flow month of June is approximately 30 m^3/sec. By comparison, the flow of the South Nahanni River at Virginia Falls during the same month is approximately 800 m^3/sec, and the flow of the Flat River, which discharges to the South Nahanni upstream of Prairie Creek but downstream of Virginia Falls, is 300 m^3/sec (ref. "Protecting the Aquatic Quality of NNPR", Environment Canada, 1998). Therefore, the flow in the South Nahanni River at the point where Prairie Creek flows into the river is at least 37 times that of Prairie Creek.

Table 4-2: Mean and Minimum Monthly Flows (m3/sec) at the Prairie Creek Mine WSC Station

Month	**1974**	**1975**	**1976**	**1977**	**1978**	**1979**	**1980**	**1981**	**1982**	**1983**	**1984**	**1985**	**1986**	**1987**	**1988**	**1989**	**1990**	**Mean**	**Min**	**%**
Jan	N/A	0.438	0.781	0.279	0.23	0.375	0.319	0.528	0.773	0.792	**0.145**	0.206	1.23	0.865	0.603	0.269	0.639	0.530	0.145	27.4
Feb	N/A	0.264	0.66	0.269	0.17	0.241	0.162	0.357	0.387	0.55	**0.048**	0.07	0.868	0.703	0.454	0.294	0.595	0.381	0.048	12.6
Mar	N/A	0.122	0.55	0.263	0.167	0.237	0.061	0.31	0.24	0.397	0.064	**0.038**	0.661	0.489	0.292	0.468	0.577	0.309	0.038	12.3
Apr	N/A	0.516	1.1	0.596	0.376	0.325	1.05	0.363	0.536	0.272	0.861	**0.078**	0.526	0.377	0.845	4.34	0.935	0.819	0.078	9.5
May	N/A	16.4	18.4	14.9	**7.84**	10.4	8.64	13.7	9.73	7.86	8.52	13.1	15	8.43	15.1	15.9	13.8	12.358	7.840	63.4
Jun	N/A	19.4	23	-	11.9	24.4	7.26	13.4	19.2	15.8	13.6	12.7	24.4	13.2	37.4	**10.8**	12.1	17.237	10.800	62.7
Jul	N/A	14.9	19.7	14.5	10.6	14.2	9.62	**5.96**	7.51	9.23	13.8	11.5	16.1	8.99	16.8	5.98	9.09	11.780	5.960	50.6
Aug	N/A	12.8	8.52	10.7	6.27	8.89	7.95	**5.12**	8.27	16.9	8.88	7.22	10.3	9.99	8.08	5.19	14.3	9.336	5.120	54.8
Sep	N/A	7.45	5.85	7.47	**3.66**	5.08	6.83	8.06	6.44	6.03	5.48	5.43	6.75	8.3	9.08	4.09	5.08	6.318	3.660	57.9
Oct	2.77	3.1	2.43	2.78	1.57	2.04	5.61	2.75	2.32	1.54	2.69	2.84	3.93	2.66	3.73	2.56	1.64	2.762	1.540	55.7
Nov	1.61	1.33	1.04	**0.828**	0.851	1.07	1.3	1.62	1.25	0.859	0.903	2.32	1.32	0.939	1.34	1.72	1.69	1.294	0.828	64.0
Dec	0.79	0.934	0.504	**0.254**	0.629	0.556	1.04	1.3	1.05	0.46	0.535	1.84	1.04	0.770	0.791	0.944	0.812	0.838	0.254	30.3
Mean	**N/A**	**6.52**	**6.91**	**N/A**	**3.71**	**5.67**	**4.17**	**4.47**	**4.82**	**5.09**	**4.65**	**4.81**	**6.87**	**4.66**	**7.87**	**4.41**	**5.15**	**5.319**	**3.710**	**69.8**



CANADIAN ZINC CORPORATION

Date:	October 2009
Drawn By:	C. Reeves
Scale:	As Shown
Drawing:	DAR Fig 4-3.dwg

Scale

0 1 2.5 5 10 25

Kilometres

FIGURE 4-3:
PRAIRIE CREEK
CATCHMENT AND SUB-CATCHMENTS

Table 4-3: Mean and Minimum Monthly Flows (m^3/sec) for Downstream Stations on Prairie Creek

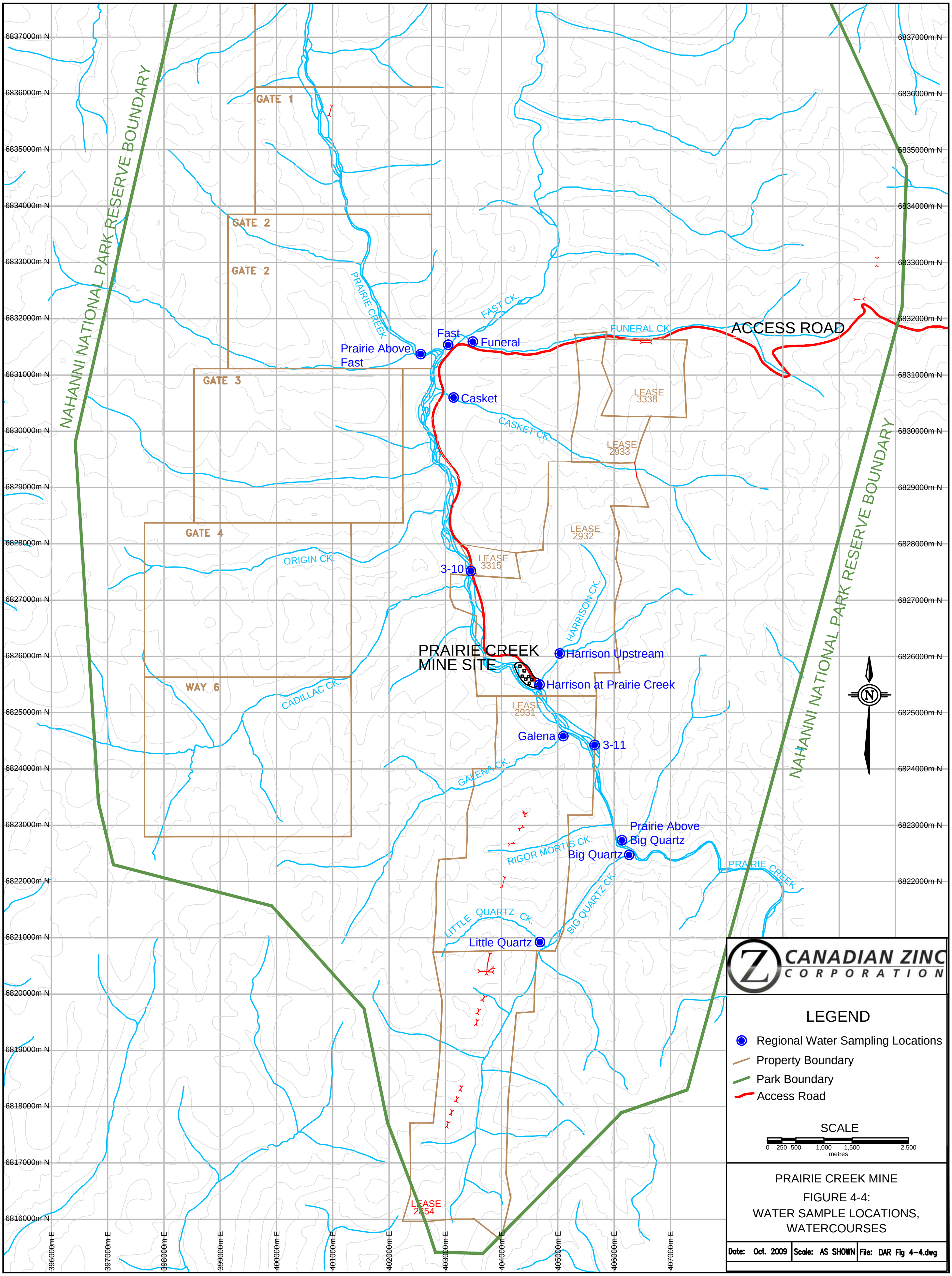
	WSC		Prairie below Harrison		Prairie at Park		Prairie at mouth	
Month	**Mean**	**Min**	**Mean**	**Min**	**Mean**	**Min**	**Mean**	**Min**
Jan	0.530	0.145	0.540	0.148	0.602	0.165	0.912	0.250
Feb	0.381	0.048	0.388	0.049	0.433	0.055	0.656	0.083
Mar	0.309	0.038	0.315	0.039	0.351	0.043	0.532	0.065
Apr	0.819	0.078	0.835	0.080	0.930	0.089	1.410	0.134
May	12.358	7.840	12.608	7.999	14.040	8.908	21.294	13.509
Jun	17.237	10.800	17.587	11.019	19.584	12.271	29.702	18.610
Jul	11.780	5.960	12.019	6.081	13.384	6.772	20.298	10.270
Aug	9.336	5.120	9.526	5.224	10.607	5.817	16.088	8.822
Sep	6.318	3.660	6.446	3.734	7.178	4.158	10.886	6.307
Oct	2.762	1.540	2.818	1.571	3.138	1.750	4.760	2.654
Nov	1.294	0.828	1.320	0.845	1.470	0.941	2.229	1.427
Dec	0.838	0.254	0.855	0.259	0.952	0.289	1.444	0.438
Mean	5.319	3.710	5.427	3.785	6.043	4.215	9.165	6.393

4.4.2 Site Surface Water

Natural surface water flow at the Prairie Creek Mine site was modified by mine construction. Prior to the Mine, surface water runoff would report to either Prairie Creek or Harrison Creek. The same is true at present, although flow paths have been modified. With the construction of a flood protection berm around the main site area, surface water now flows into the Catchment Pond which discharges to Harrison Creek just upstream of Prairie Creek (see Figure 4-4). Two ditches carry surface water into the Catchment Pond.

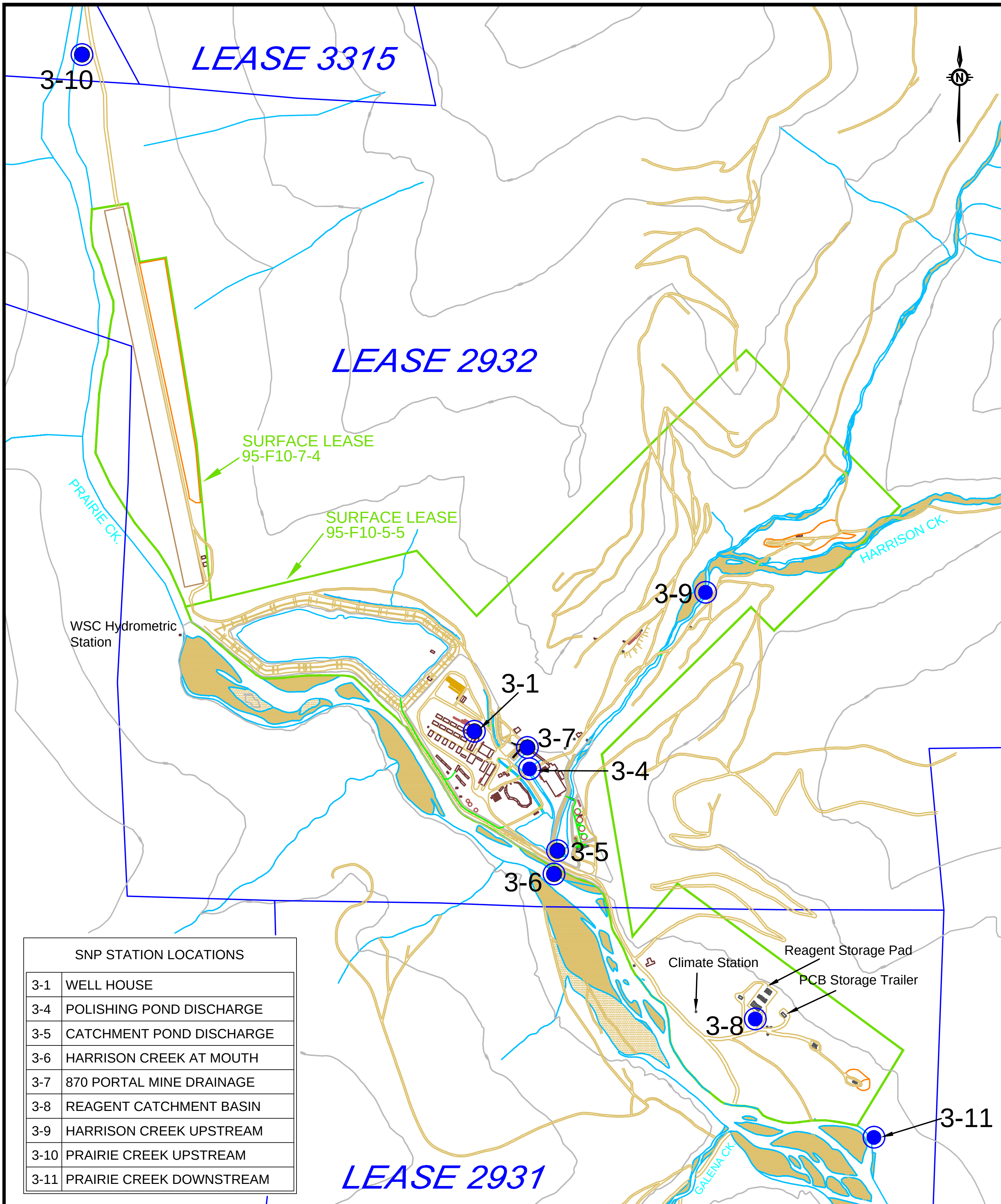
The main site ditch starts in the main yard, just north-west of the Administration Building. Mine water flowing from the 870 level by gravity is treated to remove dissolved metals, following which the treated water flows into the Polishing Pond. Discharge from the Polishing Pond flows into the main site ditch before it discharges to the Catchment Pond. Flow in the main site ditch is seasonal, with no flow in winter unless water is being pumped from a new Decline constructed underground in the 870 level. The flow of mine water shows large seasonal variation without pumping.

A second drainage ditch flows into the Catchment Pond just north of the main site ditch, but south of the Mill Building (Figure 4-9). This ditch, called the Mill ditch, carries flow from an area of seepage that originates under the concentrate out-take conveyors attached to the Mill. Part of this flow is seepage from the north-west corner of the Mill (Figure 4-6) which is carried in a pipe along the western side of the Mill before discharging at the south-west corner of the Mill, where it percolates into the ground (Figure 4-7). Prior to the Polishing Pond being built, an area of seepage also existed where the pond is now located, and this seepage flowed into the Mill ditch. Part of the Mill ditch flow is likely a continuation of this seepage. Part of the Mill ditch



PRAIRIE CREEK MINE

FIGURE 4-4:
WATER SAMPLE LOCATIONS,
WATERCOURSES



SNP STATION LOCATIONS

3-1	WELL HOUSE
3-4	POLISHING POND DISCHARGE
3-5	CATCHMENT POND DISCHARGE
3-6	HARRISON CREEK AT MOUTH
3-7	870 PORTAL MINE DRAINAGE
3-8	REAGENT CATCHMENT BASIN
3-9	HARRISON CREEK UPSTREAM
3-10	PRAIRIE CREEK UPSTREAM
3-11	PRAIRIE CREEK DOWNSTREAM

Legend

- Minesite Infrastructure
- Watercourse
- Property Roads
- SNP Sampling Locations

Scale

0 100 200 300 400 500

Metres

CANADIAN ZINC CORPORATION

Scale: As Shown

Contour Interval: 125m

File Name: DAR Fig 4-5.dwg

Date: October 2009

PRAIRIE CREEK MINE

Figure 4-5:

WATER SAMPLE LOCATIONS, MINE SITE

CANADIAN ZINC CORPORATION

Date:	October 2009
Drawn By:	C. Reeves
Scale:	Not Shown
Drawing:	DAR Fig 4-6.dwg

FIGURE 4-6: Seep at North-West Corner of Mill

CANADIAN ZINC CORPORATION

Date:	October 2009
Drawn By:	C. Reeves
Scale:	Not Shown
Drawing:	DAR Fig 4–7.dwg

FIGURE 4-7: Flow of Seep Water Along West Side of Mill

CANADIAN ZINC CORPORATION

Date:	October 2009
Drawn By:	C. Reeves
Scale:	Not Shown
Drawing:	DAR Fig 4–8.dwg

FIGURE 4-8: Flow into Mill Ditch from Buried Culvert

CANADIAN ZINC CORPORATION

Date:	October 2009
Drawn By:	C. Reeves
Scale:	Not Shown
Drawing:	DAR Fig 4–9.dwg

FIGURE 4-9: Discharge of Site Ditch (Left) and Mill Ditch (Right) into Catchment Pond

flow is also from a buried culvert that appears to drain the area below the Mill (Figure 4-8). Flow in the Mill ditch is also seasonal.

There are currently no other identifiable surface water flows on the Prairie Creek Mine site. All mine drainage emanates from the 870 level portal. There are no discharges to Harrison Creek other than from the Catchment Pond. Camp sewage is a relatively small flow and is discharged to a sump near the Administration Building and allowed to percolate.

4.4.3 Site Groundwater

Rock Mass

The rock mass that hosts the mine workings and mineralization consists of the stratigraphy shown in Figure 4-13: Cadillac Formation shales, Road River Formation shales and dolostones, and Whittaker Formation dolostones, cherts and quartzite. These rock units have negligible primary porosity (pores), not uncommon for rocks of this age. No evidence of solution cavities has been found in the local dolostones. Therefore, porosity in the rocks is almost entirely secondary in the form of bedding planes, joints and fractures.

The dominant structural features in the area are the main faults, such as the Prairie Creek Fault and the Harrison Creek Fault (see Figures 4-12, 4-13 and 4-14). The mineralized Vein itself appears to have exploited significant fractures roughly parallel to the main faults. Fault gouge is commonly associated with Vein exposures. Fractured rock masses typically have very limited storage potential for groundwater, and limited overall permeability, decreasing with depth from surface. When fractures are encountered in underground development, there is often a relatively short-duration release of water from storage, but this dissipates as storage is depleted. The Prairie Creek rock will behave much like most rock masses of this type.

Despite over 5 km of tunnel development over a footprint area of 100,000 m^2, mine inflows and discharge from the 870 portal were rarely recorded in excess of 6 L/sec (518 m^3/day) prior to 2007. Flows reduce substantially in winter. The faults and fractures underground appear to act as conduits for infiltrating precipitation from surface. This agrees with visual observations underground. Most of the underground development on the 880 level and above is dry, with the occasional weeping fracture. The majority of flow occurs from the Vein, or more likely the fracture exploited by the Vein.

Alluvium

The groundwater regime in the floodplain alluvium is very different from the adjacent rock mass. Porosity is entirely primary, and the quantity of groundwater in storage is large. Golder Associates investigated floodplain materials for Mill foundations and the location and design of tailings storage areas north and south of the Mine. The north area was subsequently developed.

The alluvium is in excess of 23 m deep in places, and consists mainly of coarse sands and gravels. In the Mill area, the gravels are approximately 16 m thick overlying bedrock. The Water Storage Pond area, where the large pond was built, has a pronounced silty clay layer 7-10 m thick at a depth of 5-7 m below surface. The clay layer effectively subdivides the alluvial aquifer into an upper zone and a lower zone. Groundwater levels are approximately 1 m below surface. Wells installed in the upper and lower zones indicate that groundwater flow is predominantly horizontal in both zones as water levels are roughly the same. A similar silty clay layer was found at the southern tailings storage area. In a February 1982 application to conduct an aquifer pumping test, Ker Priestman estimated the flow in the upper and lower gravel aquifers to be 750 m^3/day. This is slightly more than the flow from the 870 portal based on 6 L/sec (518 m^3/day), but the two combined are roughly 360 times less than the average flow in Prairie Creek opposite the Mine site (approximately 460,000 m^3/day).

4.4.4 Surface Water – Groundwater Interaction

There are a number of components of surface water – groundwater interaction at the Prairie Creek Mine site. These are summarized as follows:

- Surface runoff from the slopes above the site from snowmelt or rainfall either flows into the main site ditch directly or percolates into the alluvium underlying the site. The portion that percolates almost certainly flows into the ditch down-gradient, or remains in the alluvium and discharges to the Catchment Pond.
- Groundwater moving through the rock mass up-gradient of the site likely discharges either to surface streams (e.g. Harrison Creek) or the alluvium in the Prairie Creek valley. The groundwater entering the alluvium may discharge to the Catchment Pond, or remain in the alluvium to discharge to Prairie Creek further down-stream.
- Localized surface water – groundwater interaction occurs in proximity to the Mill building. The surface water portion of this interaction is the flow in the Mill ditch, and was described in Section 4.4.2 above.

The first two of the above components should be essentially un-contaminated water since the water does not come into contact with the Mine or mine wastes. Groundwater coming into contact with the Mine leaves the Mine as drainage and will be addressed elsewhere in this report. The third component will now be described in more detail because it could include some contaminated water.

As noted in Section 4.4.2, seepage used to occur in the area where the Polishing Pond was built. This seepage could have been an expression of the release of alluvial water which originated as up-gradient surface water runoff, but it could also have been related to the discharge of groundwater from the rock mass into the alluvium in close proximity. Drainage from the Mine currently flows down the 880 m level adit by gravity and discharges from the 870 portal. An internal sump exists in the 870 level approximately 300 m from the portal, which can be used to settle out sediment. When not in use, water in the sump has been noted to drain into the rock.

Therefore, some of the mine drainage flowing down the adit may not arrive at the portal, but may flow in the underlying bedrock. Hence, the seepage in the Polishing Pond area may include some mine drainage. This seepage is thought to continue and to feed the Mill ditch.

Seepage occurs at the north-west corner of the Mill (Figure 4-6). This water is almost certainly leakage from the bed of Harrison Creek just up-gradient. The seepage flows in a pipe to the south-west corner of the Mill where it discharges and drains into the gravel, re-appearing in the Mill ditch. The Mill ditch also has a strong flow of water near the south-east corner of the Mill Figure 4-8). This flow is from a perforated, partially buried steel culvert. The culvert continues under the Mill and is believed to have been installed for drainage. Therefore, the culvert water is also likely to be leakage from Harrison Creek.

Flow measurements were taken in the ditches to help evaluate the sources of water. Flows were measured by installing calibrated weirs, allowing water depths to be converted to flow rates. Recorded flows are given in Table 4-4.

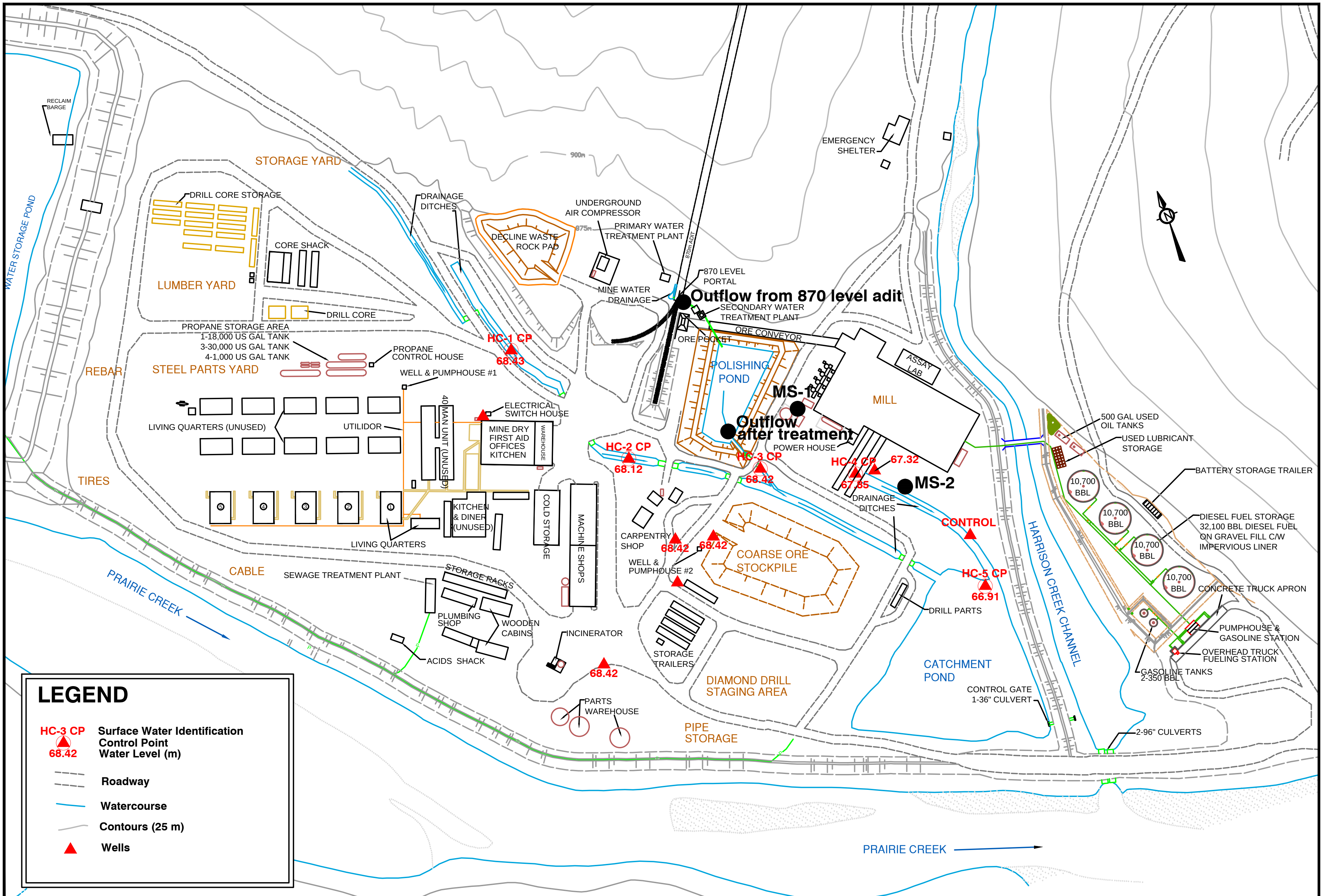
Table 4-4: Polishing Pond and Ditch Flows (L/sec)

Date	Mill Ditch	Site Ditch	Polishing Pond
Jul 1	26.6	2.2	8.6
Jul 7	26.6	2.2	9.9
Jul 16	23.3	2.2	8.6
Jul 22	16.9	1.5	8.6
Jul 28	11.2	0.8	8.6
Jul 30	20.0	0.8	8.6
Aug 5	14.0	1.5	8.6
Sep 2	14.0	0.8	11.2
Sep 9	30.0	2.2	16.9
Oct 9	0.8	0.0	8.6

Polishing Pond flows reflect the rates of mine drainage. Site ditch flows reflect the drainage of infiltrated precipitation, dropping to low or zero flows in dry or frozen conditions. Mill ditch flows vary significantly. It is considered likely that the flows correlate with the volume and height of flows in Harrison Creek, which controls the rate of leakage to seeps and drains near the Mill. The flow variations in the ditch seem too great to be the result of a significant groundwater component.

These surface water – groundwater interactions will be considered further in Section 4.6.

Ditch water and groundwater level elevations in the main yard area were measured on October 5, 2009 (Figure 4-10). Groundwater levels were measured in steel-cased wells installed in 1980 by Golder Associates during site investigations. While these wells are not screened in a particular part of the alluvium, the water levels are considered representative of the water table.. If the level in PW-02 is considered an outlier, the levels in wells MSW-01, MSW-03 and MSW-04 indicate groundwater flow towards the Catchment Pond. In proximity to these wells, surface water in the ditches appears to be at an elevation approximately 0.5 m higher. However, the elevation of the Catchment Pond water surface at HC-5 suggests pond water is in contact with the alluvial water table.



CANADIAN ZINC CORPORATION

Date:	October 2009
Drawn By:	C. Reeves
Scale:	As Shown
Drawing:	DAR Fig 4-10.dwg

SCALE

0 10 20 50 100 150

METRES

PRAIRIE CREEK MINE

FIGURE 4-10:
SURFACE WATER AND GROUNDWATER INTERACTION, MILL AREA

4.4.5 Mine Water

Mine water currently flows out of the 870 level portal by gravity, and is the drainage from the lowest elevations of the existing parts of the underground workings, which includes drifts with exposures of Vein mineralization.

Measurements taken by CZN during the warmer months of the year (June to August) in 2005 and 2006 consistently recorded mine water flows at 6 L/sec. CZN staff also observed that drainage flows reduce significantly over the winter, from approximately late October to late March. This suggests that the source of current flows is the relatively recent infiltration of snowmelt and rainfall, and that this source is curtailed once freezing conditions set in. A review of maximum and minimum daily temperature readings recorded at the Prairie Creek weather station (Figure 4-2) shows that the period of observed reduction in mine water flows coincides with the period of temperatures well below zero.

A new underground Decline was started from the end of the 880 level during the fall and early winter of 2006. Inflows were encountered when fractures or old drill holes were intersected, but flows readily dissipated, presumably after the limited quantity of water in storage had drained. Discharge from the 870 portal from November onwards was consistently measured at 2 L/sec, almost entirely from the Decline. However, flows increased in the spring of 2007 to 18 L/sec, and reached 20 L/sec in August coinciding with the resumption of Decline development. By the end of 2007, the Decline was completed and flows had reduced to 14 L/sec. Dewatering pumps were removed from the Decline in mid-December 2007, and the Decline was allowed to flood. The Decline filled with water over the course of the winter, and was full and contributing a small flow into the 870 level adit by late May 2008. Flows were then in the 9-14 L/sec range over June-October before again tailing off into winter.

4.5 Mine Water Quality

Mine water emanating from the 870 Level portal (SNP Station 3-7) has been sampled extensively since 2006. Tables 4-5 and 4-6 provide data for 2006-2007 and 2008-2009, respectively.

Zinc is the most significant component of the waters. Cadmium is also present. Low, but detectable concentrations of copper, lead and nickel also occur. Arsenic, mercury and selenium concentrations are usually recorded marginally above their detection limits, while chromium is usually not detected. The metal concentrations in the tables are total concentrations, unless where noted. The total concentrations of some metals are artificially elevated when suspended sediment (TSS) concentrations are high e.g. August 21, 2006. It is important to review data where TSS concentrations are low to determine the true chemistry of the water. For example, data for July 2, 2008 show that nearly all of the normal (low TSS) total zinc is in the dissolved state.

The data in the tables also show that there are two types of mine water leaving the 870 Level portal, one associated with drainage through the Vein and one from strata feeding the Decline. The new Decline was started in the fall of 2006. Prior to that, the mine water had a typical

Table 4-5: Mine Water Sample Results 2006-2007

Sample Date	pH	Cond	Ammonia (as N)	Arsenic	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Zinc	TSS
Jun 23 06	8.1	1160	<0.005	0.006	0.119	<0.001	0.101	0.138	0.00108	0.018	17.3	<4
Jun 30 06	8.2	1290	<0.005	<0.05	0.046	<0.005	0.022	0.04	#	<0.008	4.44	5
Jul 8 06	8.1	1200	0.123	<0.05	0.075	<0.005	0.051	0.08	0.00068	0.014	11.5	<4
Jul 14 06	8.1	1190	0.249	0.06	0.079	<0.005	0.12	0.12	0.00049	0.02	14.2	<4
Jul 21 06	8.1	1230	0.26	<0.05	0.095	<0.005	0.159	0.1	0.00043	0.016	14.0	<4
Jul 28 06	8.0	1210	0.105	<0.05	0.083	<0.005	0.143	0.31	0.0063	0.017	14.6	8
Aug 3 06	8.0	1170	0.122	0.05	0.092	<0.005	0.224	1.05	0.038	0.016	15.8	201
Aug 14 06	8.0	1210	0.198	<0.05	0.068	<0.005	0.145	0.4	0.0101	0.016	13	13
Aug 21 06	8.0	1280	16.5	0.28	0.286	0.015	1.1	8.78	0.266	0.071	33.9	1110
Aug 27 06	8.1	1310	10.0	<0.05	0.074	<0.005	0.218	1.68	0.03	0.023	12.9	312
Sep 4 06	8.2	1290	2.68	0.07	0.05	0.005	0.15	1.00	0.0293	0.016	10.3	209
Sep 11 06	8.1	1450	15.8	<0.05	0.021	<0.005	0.044	0.2	0.00421	0.015	6.22	110
Sep 20 06	8.2	1440	13.5	<0.05	0.017	<0.005	0.034	0.14	0.00214	0.013	5.31	55
Sep 26 06	8.2	1450	12.2	0.06	0.031	0.006	0.083	0.52	0.0045	0.022	7.6	112
Oct 2 06	8.3	1480	18.4	0.06	0.014	<0.005	0.03	0.13	0.00152	0.021	4.94	45
Oct 2 06											*4.37*	
Oct 9 06	8.2	1370	4.94	<0.05	0.032	0.006	0.088	0.4	0.00104	0.019	7.86	154
Oct 16 06	8.2	1490	11.6	<0.05	0.011	<0.005	0.033	0.08	0.00125	0.018	4.91	31
Oct 23 06	8.2	1390	13	0.08	0.018	<0.005	0.045	0.17	0.0028	0.018	5.32	36
Oct 30 06	8.1	1570	18	0.05	0.017	0.008	0.051	0.21	0.003	0.023	5.17	49
Nov 16 06	8.3	1680	14.5	<0.05	0.009	<0.005	0.027	0.04	0.00006	0.024	3.63	17
Nov 23 06	8.3	1560	3.58	0.05	0.009	0.007	0.032	0.08	0.00006	0.022	3.53	61
Nov 29 06	8.3	1750	2.24	<0.05	0.006	0.005	0.016	0.04	0.00007	0.018	2.26	9
Dec 05 06	8.2	1850	2.38	0.08	0.004	0.007	0.017	0.04	0.00011	0.03	1.83	10
Dec 12 06	8.3	1790	0.61	<0.05	0.003	0.005	0.011	0.03	0.00016	0.018	1.71	5
Dec 17 06	8.1	1650	0.43	<0.05	<0.002	0.006	0.005	<0.03	<0.00005	0.019	0.862	<4
Dec 29 06	8.0	1570	0.222	<0.05	<0.002	<0.005	<0.005	<0.03	<0.00005	0.023	0.496	11
Jan 5 07	8.0	1600	0.198	<0.05	<0.002	0.005	<0.005	<0.03	<0.00005	0.021	0.318	<4
Jan 9 07	8.0	1540	0.18	<0.05	0.002	0.005	<0.005	<0.03	0.00009	0.018	0.692	33
Jan 16 07	#	1570	0.169	0.05	<0.002	<0.005	0.007	<0.03	<0.00005	0.023	1.11	<4

Table 4-5: Mine Water Sample Results 2006-2007 (cont'd)

Sample Date	pH	Cond	Ammonia (as N)	Arsenic	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Zinc	TSS
Jan 24 07	#	#	0.435	<0.05	0.011	0.007	0.033	0.13	<0.00005	0.024	2.41	15
Jan 31 07	8.3	1610	0.201	<0.05	0.002	<0.005	0.007	<0.03	0.00007	0.018	1.06	8
Feb 6 07	8.3	1680	0.464	<0.05	0.003	0.006	0.009	0.04	0.00006	0.016	1.18	4
Feb 15 07	8.3	1670	0.388	<0.05	<0.002	0.006	0.007	0.04	<0.00005	0.019	1.01	6
Feb 21 07	8.3	1680	0.498	<0.05	0.003	0.006	0.012	0.04	0.00012	0.024	1.3	20
Feb 28 07	8.3	1690	0.469	<0.05	<0.002	<0.005	<0.005	0.04	<0.00005	0.025	1.08	<4
Mar 6 07	8.3	1700	0.403	<0.05	<0.002	0.005	0.006	0.04	<0.00005	0.022	1.06	#
Mar 14 07	8.3	1610	0.489	0.09	0.003	0.006	0.014	0.1	<0.00005	0.023	1.44	10
Mar 20 07	8.3	1650	0.461	<0.05	<0.002	0.006	0.01	0.05	<0.00005	0.026	0.943	4
Mar 28 07	8.3	1620	0.466	<0.05	<0.002	0.006	0.005	0.05	<0.00005	0.019	1.04	7
Apr 4 07	8.3	1550	0.244	<0.05	<0.002	<0.005	<0.005	<0.03	<0.00005	0.019	0.81	<4
Apr 12 07	8.3	1510	0.236	0.06	<0.002	<0.005	0.006	<0.03	<0.00005	0.019	1.01	14
Apr 16 07	8.3	1480	0.237	0.05	<0.002	0.006	0.005	0.04	<0.00005	0.021	1.06	7
Apr 23 07	8.1	1380	0.18	0.06	<0.002	<0.005	<0.005	<0.03	<0.00005	0.012	1.13	8
May 1 07	8.3	1410	0.189	0.1	<0.002	<0.005	<0.005	0.05	<0.00005	0.013	0.912	7
May 11 07	8.4	1340	0.07	0.07	0.007	0.006	0.014	0.12	0.00064	0.011	2.16	45
May 17 07	8.4	1400	0.16	0.1	<0.002	0.005	<0.005	0.06	0.00006	0.014	1.02	6
May 22 07	8.5	1420	0.125	0.14	<0.002	<0.005	<0.005	0.04	<0.00005	0.012	0.932	4
May 29 07	8.3	1390	0.106	0.1	<0.002	0.005	0.012	0.03	0.00009	0.019	1.01	4
Jun 5 07	8.0	1240	0.054	0.08	0.009	0.006	0.033	0.3	0.00198	0.015	2.2	46
Jun 13 07	8.3	1330	0.066	0.13	0.009	<0.005	0.035	0.39	0.0055	0.019	2.16	16
Jun 20 07	8.2	1320	0.094	0.11	0.003	<0.005	<0.005	0.03	0.00006	0.011	1.35	9
Jun 26 07	8.2	1280	0.066	0.12	0.007	<0.005	0.026	0.24	0.0029	0.014	1.9	36
Jul 4 07	8.2	1360	0.02	0.07	0.013	<0.005	0.016	0.05	0.00026	0.012	3.67	15
Jul 11 07	8	1410	0.195	<0.05	0.024	<0.005	0.023	0.07	0.00019	0.017	5.28	24
Jul 16 07	8.2	1360	0.135	0.12	0.01	<0.005	0.018	0.15	0.00145	0.013	3.18	49

Table 4-5: Mine Water Sample Results (cont'd)

Sample Date	pH	Cond	Ammonia (as N)	Arsenic	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Zinc	TSS
Jul 24 07	8	1450	0.289	<0.05	0.072	0.007	0.09	0.09	0.013	0.021	16.1	33
Aug 1 07	8.1	1440	0.52	0.05	0.072	<0.005	0.109	0.15	0.0054	0.019	14.1	55
Aug 6 07	8.0	1440	0.4	<0.05	0.057	0.005	0.092	0.17	0.0032	0.02	12.6	65
Aug 14 07	8.0	1370	0.79	0.06	0.034	<0.005	0.078	0.37	0.0034	0.02	9.85	119
Aug 23 07	8.1	1450	3.51	<0.05	0.014	0.006	0.032	0.06	0.00023	0.014	6.2	52
Aug 30 07	8.2	1380	0.118	0.07	0.03	0.006	0.089	0.52	0.00724	0.017	8.28	238
Sep 4 07	8.0	1360	0.285	0.14	0.064	0.012	0.307	4.36	0.051	0.035	12.2	1100
Sep 11 07	8.2	1370	0.45	<0.05	0.006	<0.005	0.015	0.08	0.00073	0.022	3.04	43
Sep 18 07	8.1	1310	0.86	0.07	0.013	0.006	0.045	0.34	0.0031	0.014	4.4	145
Sep 24 07	8.3	1360	0.73	0.08	0.027	0.01	0.078	0.52	0.0067	0.027	6.39	865
Oct 3 07	8.2	1390	4.8	0.07	0.012	0.013	0.044	0.21	0.001	0.035	3.7	424
Oct 10 07	8.1	1320	0.099	0.07	0.008	0.006	0.011	<0.03	<0.00005	0.017	2.81	7
Oct 16 07	8.2	1350	0.149	0.034	0.005	<0.001	0.0089	0.107	0.00032	0.017	2.22	8
Oct 24 07	8.2	1370	0.151	0.039	0.003	<0.001	0.0079	0.0613	0.00006	0.018	1.82	19
Oct 31 07	8.3	1300	0.199	0.04	0.002	<0.001	0.0064	0.0436	0.00012	0.017	1.24	13
Nov 6 07	8.3	1400	0.091	0.036	0.002	<0.001	0.0043	0.0247	0.00007	0.017	1.1	44
Nov 14 07	8.2	1400	0.173	0.04	0.001	<0.001	0.0048	0.0197	<0.00002	0.019	1.01	9
Nov 22 07	8.2	1500	0.194	0.046	0.001	<0.001	0.0038	0.0879	0.0001	0.017	0.967	19
Nov 27 07	8.4	1400	0.27	0.046	9E-04	<0.001	0.0048	0.0565	<0.00002	0.02	0.872	11
Dec 7 07	8.3	1400	0.094	0.035	0.001	<0.001	0.0045	0.0478	0.00011	0.018	0.964	14

All results in mg/L except pH (units) and Cond (μS/cm)
Cond = Electrical Conductivity
# Omitted in error
TSS = Total Suspended Solids
Metals are total concentrations, except those in itallics which are dissolved

Table 4-6: Mine Water Sample Results 2008-2009

Year	Sample Date	pH	Cond	As	Cd	Cr	Cu	Pb	Hg	Ni	Zn	TSS
2008	May 27	7.9	1300	2.3	60.7	<1	46.2	27.1	0.02	26	16500	<4
	May 27										*16400*	
	Jun 3	8.1	1200	4.2	42.4	<1	64.6	34.4	0.05	23	11300	8
	Jun 10	8.1	1200	4.6	41.4	<1	68.2	33.6	0.07	21	10200	8
	Jun 19	8.1	1300	5.4	54.6	<1	81.9	30.4	<0.02	22	12400	6
	Jun 24	8.0	1200	6.8	71.6	<1	96.2	57.7	<0.02	21	15800	14
	Jul 2	8.1	1200	6.0	67.8	<1	86.8	35.8	<0.02	19	13500	8
	Jul 2										*13100*	
	Jul 8	8.4	1300	6.1	63.5	<1	86.7	29.1	0.03	19	12700	6
	Jul 15	8.2	1200	6.9	64.9	<1	88.3	29.1	<0.02	19	12400	6
	Jul 23	8.2	1200	7.2	80.2	<1	101	35.8	0.02	20	15100	5
	Jul 30	8.1	1200	7.1	57.9	<1	83.3	34.4	0.02	19	12000	<4
	Aug 5	8.0	1200	7.5	54.6	<1	78.8	31.7	0.03	18	11600	9
	Aug 15	8.0	1200	6.5	45.9	<1	73.0	26.3	0.02	18	8750	7
	Aug 26	8.1	1200	6.6	52.3	<1	63.9	25.1	<0.02	16	10600	<4
	Sep 3	8.1	1200	134	164	3	690	1640	6.65	30	31700	210
	Sep 3										*9130*	
	Sep 9	8.2	1200	6.5	55.8	<1	67.5	26.8	<0.02	15	10500	10
	Sep 18	8.1	1200	8.0	55.3	<1	75.3	30.6	<0.02	17	10500	8
	Sep 23	8.1	1200	7.7	53.6	<1	73.4	28.1	0.03	17	10300	<4
	Oct 1	8.2	1200	7.5	42.7	<1	69.6	28.3	<0.02	17	8490	5
	Oct 1										*10400*	
	Oct 6	8.2	1200	7.1	39.6	<1	66.3	24.6	<0.02	17	7790	<4
	Oct 15	8.1	1200	7.8	48.9	10	75.7	26.5	<0.02	29	10200	7
	Oct 21	8.2	1200	7.8	40.7	<1	60.4	24.5	0.07	22	9100	5
	Oct 27	8.2	1200	9.8	39.9	<1	69.9	46.1	0.03	24	8710	9
	Nov 4	8.2	1100	8.6	40.4	<1	65.2	36.7	0.03	30	8680	7
	Nov 11	8.2	1100	7.2	39.4	<1	56.6	23.6	0.06	16	8690	7
	Nov 18	8.2	1100	6.2	37.4	<1	51.4	22.1	<0.02	16	8210	5
	Nov 25	8.2	1200	5.3	34.7	<1	48.4	29.8	<0.02	17	7950	<4
	Dec 3	8.2	1200	5.6	37.9	<1	52.9	28.7	0.04	18	8450	5
2009	Jun 16	8.1	1200	5.2	43.9	<1	61.1	25.7	0.06	17	10100	6
	Jun 22	8.1	1200	5.6	43.2	<1	61.6	23.7	0.03	17	9720	4
	Jul 1	8.1	1200	7.1	52.6	<1	73.7	36.8	<0.02	16	11400	11
	Jul 7	8.1	1200	6.1	52.3	<1	69.0	32.5	<0.02	15	10800	5
	Jul 16	8.1	1200	5.9	51.2	<1	70.0	28.6	0.03	15	10500	<4
	Jul 22	8.1	1200	6.2	45.5	<1	64.2	26.1	<0.02	15	9840	6
	Jul 30	8.1	1190	7.3	48.9	<1	68.9	28.3	<0.02	17	10700	8
	Aug 25	8.0	1160	8.4	57.6	<1	88.2	49.0	0.07	15	11100	9

Results for metals in ug/L and are totals except those in italics which are dissolved.
All other results in mg/L except pH (units) and Cond μS/cm)
Cond = Electrical Conductivity TSS = Total Suspended Solids

chemistry of 1200 µS/cm conductance, 0.5-0.1 mg/L cadmium, 10-15 mg/L zinc and detectable copper, lead and mercury. By the end of 2006 when all mine water was from the new Decline, the typical chemistry was 1600-1800 µS/cm conductance, 0.3-2 mg/L zinc and non-detectable cadmium, copper, lead and mercury. On July 14, the hardness was 800 mg/L, and on December 29, 1100 mg/L. Mine water chemistry in subsequent open water seasons was a combination of the two water types.

4.6 Receiving Water Quality

A key element of any mine development is the determination of the prevailing water quality in local receiving waters. Baseline water quality was established by Cadillac in the early 1980's. However, this was after significant development of the underground workings for exploration, which likely included the release of mine drainage. Therefore, Cadillac's data cannot be assumed to be a pre-site development baseline. CZN has undertaken sampling to update the previous work. Detailed results and discussion can be found in Appendix 8. CZN concludes that the results indicate that the water in Prairie Creek is of a very high quality. Appendix 8 also contains data from a long-term water sampling program in the South Nahanni River basin undertaken by Environment Canada (since 2003). The following text summarizes key results of the various sampling programs.

Water in local creeks is consistently alkaline, with a narrow pH range of 8.0-8.6. Electrical conductivity values and sulphate concentrations are not particularly high, and do not reflect a clear pattern. The highest readings occurred in the final discharge from Harrison Creek to Prairie Creek and appear to reflect discharge from the Prairie Creek Mine Catchment Pond (Figure 4-5). Higher readings were generally recorded in the tributaries to Prairie Creek, especially Quartz, Casket and Harrison (Figure 4-4). This may be a function of the natural leaching of mineralized rocks in these catchments. However, these creeks do not appear to influence the water quality in Prairie Creek significantly as readings are lowest at the most downstream site, Prairie Creek above Quartz.

Concentrations of arsenic, chromium, copper, mercury and nickel were not found above detection limits in any of the samples. Any cadmium concentrations that were detected exceeded the Canadian Council for Ministers of the Environment ("CCME") guideline because the guideline is close to the detection limit. Cadmium was detected in Prairie Creek above Funeral in May 2005, and in Quartz Creek in August 2005. Lead was detected in Harrison Creek upstream, in Prairie Creek below Harrison, and in Galena Creek. Selenium was detected at Prairie Creek above Funeral and Quartz Creek. The zinc concentration at Prairie Creek below Harrison in May 2005 was marginally above the CCME guideline. The zinc concentration in Funeral Creek, upstream of the mine, also exceeded the guideline in October 2005.

A limited number of sites were sampled for both total and dissolved metals in May 2005 in order to determine the likely form of any contained metals. Metals detected were primarily in the dissolved form.

Watercourses in the area were re-sampled in April and June 2006. Lower detection limits were used for metals for the June samples. All June samples had cadmium concentrations exceeding the CCME aquatic life guideline. Lead concentrations also exceeded the CCME aquatic life guideline for samples collected from Funeral Creek, Casket Creek and Harrison Creek at Prairie. These creeks all drain areas where mineral showings occur.

Samples were taken from area watercourses upstream of the mine in September 2009 to augment the existing database of baseline quality, with total and dissolved metals concentrations at low detection limits. The results show an elevation of dissolved zinc in Funeral Creek compared to other creeks.

Water quality monitoring in the South Nahanni River basin has been on-going since 1988. There are three stations on Prairie Creek, above the Mine, below the Mine and at the mouth. The Prairie Creek station upstream of the Mine is considered the most representative of background surface water quality upstream of the Mine. A comparison of water quality between upstream and downstream of the Mine shows that there is little difference in the spring and summer, but downstream concentrations (metals) are consistently higher downstream in winter. This phenomenon is discussed further in Appendix 8.

4.7 Aquatic Ecosystem

4.7.1 Fisheries Studies 1980-2005

Several studies have been conducted in the Prairie Creek system north of the Nahanni National Park Reserve ("NNPR") since 1980, including those reported in Ker Priestman (July, 1980), Beak Consultants (March, April, May, September 1981), Rescan (May-June, September 1994), and Mochnacz (August 2001). The dates and key findings of these studies are summarized in Table 4-7 in chronological order.

By the end of the 2001 fieldwork, it was known that both bull trout (*Salvelinus confluentus*) and mountain whitefish (*Prosopium williamsoni*) spawn in Prairie Creek upstream of the Mine site, most likely in Funeral Creek. Arctic grayling (*Thymallus arcticus*) are known to inhabit lower Prairie Creek, but were not found upstream of the original NNPR boundary. Each of these species is a salmonid, the first two are fall spawners and the last spawns in spring. Slimy sculpin (*Cottus cognatus*), a forage species, inhabits the main stem creek and some tributaries above and below the Mine. Other key findings of past studies are discussed below. In addition, CZN has learned that a survey by Fisheries and Oceans Canada detected spawning bull trout in Funeral Creek on August 15, 2005 (Ernie Watson, pers.comm.).

4.7.2 Fish Populations

As noted above, Prairie Creek is known to contain bull trout, mountain whitefish and slimy sculpin, both above and below the Mine site. It was speculated by Mochnacz (2001) that bull trout may reside in Prairie Creek, based on the data showing multiple age classes of this char species in the main creek, as well as in/at the mouth of Big Quartz Creek, Galena Creek and Funeral Creek. However, before 2006, only one bull trout was found in the Prairie Creek

Table 4-7: Field Dates and Key Findings For Fisheries Work in the Prairie Creek System

FIELD DATES	RESEARCHER	KEY FINDINGS
July 21-25, 1980	Ker Priestman	Dry braided channels indicating flooding and high energy system; no barriers in main stem; Harrison Creek steep, no pools, subsurface in summer; low metals in fish tissue
March 13-27, 1981	Beak	Winter survey; tributaries frozen; ice bridge survey (before/after break-up); metals low in fish tissue; benthic invertebrate density very low
April 8, 1981	Beak	Helicopter survey of access road crossings before break-up; photographs
May 21-25, 1981	Beak	High water levels after break-up; benthos low densities; arctic grayling not above park; metals low
September 22-26, 1981	Beak	Bull trout (BT) and mountain whitefish (MW) spawning in hundreds upstream of Mine; BT may be resident; catch numbers showed MW>slimy sculpin>BT; increased metals in fish from July 1980 indicates variable levels
May 30-June 1, 1994	Rescan	Prairie Creek flows: 18 cms at 1.4 m/s on 31 May [likely too fast to ford]
September 12-16, 1994	Rescan	Bull trout in Galena and Quartz creeks near mouths; Harrison almost dry/subsurface; Prairie Creek upstream of Mine looks good for fish spawning; metal levels low in fish; about 40 good holding/over wintering pools in main stem creek from park to headwaters; only slimy sculpin found upstream
August 13-14, 2001	Mochnacz	Bull trout in Funeral Creek; arctic grayling in Prairie Creek below Mine; sedimentation is main concern re bull trout

drainage basin up to the Funeral Creek confluence, and this was at the mouth of Galena Creek. Mochnacz (2001) also suggested that the bull trout population in Funeral Creek may be a resident population as the creek has multi-aged char and pools in winter.

Other species known to utilize the lower reach of Prairie Creek within the NNPR and near the confluence with the South Nahanni River include: Arctic grayling, round whitefish (*Prosopium cylindraceum*), northern pike (*Esox lucius*), burbot (*Lota lota*), white sucker (*Catostomus catostomus*) and lake chub (*Couesius plumbeus*). None of these species has been found north of the original NNPR boundary.

Fish in Prairie Creek do not move far up the tributary streams because the streams are relatively steep, flows are often ephemeral (dry in summer, frozen in winter) and have very low primary and secondary production (algae and benthic invertebrates).

4.7.3 Aquatic Habitat

Each of the past studies assessed aquatic habitat from aerial, ground and in-stream fieldwork. The Prairie Creek system is characterized by long, cold winters, when most tributaries are frozen solid and the main stem has ice cover (often open in lower reaches), high dissolved oxygen content and good over-wintering pools for fish in the main stem. The creek valley is steep-sided (including tributaries) and flat-bottomed, with extensive braiding in the main stem creek, especially upstream of the Mine site where riffle-pool habitat provides salmonid spawning capacity. This is used by at least two of the three salmonid species in the system.

The aquatic habitat in Prairie Creek below the Mine was described by Beak (1981) as follows: "Prairie Creek in this section exhibited a trellis drainage pattern, a deep U-shaped valley with steep mountains paralleling the creek on both sides. In several areas, the creek occupied the whole valley flat. The creek gradient was steep, causing a fast-flowing character with numerous white rapids in its course and very little pool development. Substrates on the banks and creek bed were composed mainly of boulders, cobbles and pebbles with very little gravel." The reaches below the Mine were categorized as migration habitat, while spawning beds were found mainly upstream of the Mine.

Few of the named tributary streams support fish all year, while the smaller, lower order tributaries are typically ephemeral water runs that are dry in summer, flow in the fall and freeze solid in winter.

4.7.4 2006-2008 Aquatic Studies

A study was initiated in 2006 by the University of Saskatchewan in conjunction with INAC to document a reference condition for algal, benthic invertebrate and fish communities in the South Nahanni River, including upstream and downstream of the Prairie Creek Mine, based on the sentinel species slimy sculpin. The study has been continued by the university in collaboration with Parks Canada, with completion in 2009. Preliminary results from the study are described below. Some of this commentary is drawn from a review by SENES Consultants Limited on behalf of INAC as part of consideration of comprehensive monitoring requirements for the

Prairie Creek Mine site. This was a measure in the Report of Environmental Assessment for CZN's Phase 3 drilling project. The SENES document is "Review of Status and Future of Cumulative Effects Monitoring at the Prairie Creek Mine", March 2009.

During the course of the 2006 work, a number of bull trout were found just upstream and downstream of Galena Creek, a western tributary to Prairie. A single trout was found in lower Galena Creek, and 1-2 trout in lower Harrison Creek. In all cases, trout observations were not associated with spawning habitat.

Sediment samples were collected in 2006 at the same locations as water samples and tested for physical and chemical parameters. A representative sediment sample was collected at each sampling area. Samples were analyzed for total metals, minerals, nutrients, hydrocarbons, particle size and total organic carbon (TOC). Parks Canada also sampled sediments in 2007.

Sediment quality was found to be previously quite variable in the South Nahanni River basin due to temporal and spatial flow differences. Environment Canada stressed the need for on-going monitoring in order to more clearly determine sediment quality since some locations in the watershed were found to have elevated metal concentrations (Halliwell 1996). Sediment quality was also difficult to analyze because streams in the South Nahanni Watershed are naturally high in metals and therefore results of sediment metal concentrations may appear high compared to standards developed for other streams in Canada. Studies by Environment Canada starting in 1988 suggested that the water and sediment quality of Prairie Creek did not have any effect on the quality of the South Nahanni River (Environment Canada 1991). Like water quality, sediment quality in the park showed some guideline exceedances but is considered to be essentially pristine (Halliwell and Catto 1998). Environment Canada found that both water quality and sediment quality are correlated to flow and therefore are highly variable (Halliwell 1996).

The researchers from the University of Saskatchewan did not find any significant difference in metal concentrations between reference, high-exposure and low-exposure sites for water or sediment samples (Figure 4-4). Total metals results for sediment samples compared to the Interim Sediment Quality Guidelines (CCME, 2003) are given in Table 4-8. The only metal which showed an increase from sediment samples collected at the high exposure site was arsenic compared to the reference and low exposure sites. Values were slightly above the CCME interim sediment quality guideline in all locations. There were no changes in concentrations of cadmium and zinc in sediment collected at the 3 sites. Sediment compositions differed only slightly between the reference, high and low exposure sites (Table 4-9), with a higher sand component at

Table 4-8: Total Metal Results for Sediment Samples

Parameter	Detection Limit	Reference Site	High Exposure Site	Low Exposure Site	Interim Sediment Quality Guidelines
Arsenic	0.2	6.4	7.6	6.4	5.9
Cadmium	0.01	1.24	1.42	0.88	0.6
Chromium	0.5	9.9	7.7	7.8	37
Copper	1	12	9	8	35.7
Lead	0.1	25.1	22.8	15.2	35
Mercury	0.01	0.06	0.03	0.04	0.17
Nickel	0.5	24.7	20.3	20	NA
Selenium	0.3	0.6	0.6	0.5	NA
Zinc	1	182	179	102	123

All values are reported in ppm * NA denotes value is not available

the high exposure site. A decreasing trend was observed for total organic carbon from the reference site to the low exposure site.

Table 4-9: Prairie Creek Sediment Composition

Parameter (% by weight)	Upstream	Nearfield	Farfield
Clay-Soil Texture	4.0	2.0	2.4
Sand-Soil Texture	92.4	96.4	93.4
Silt-Soil Texture	3.6	1.6	4.2
Total Organic Carbon	0.33	0.17	0.11

INAC and the University of Saskatchewan included slimy sculpin sampling as part of the 2006 study. Fish were used to determine community profiles as well as to analyze health. The fish health analysis consisted of fish morphology (size, proportions and parasites), tissue metal concentrations, and reproductive health (egg size and fecundity) (Spencer et al., 2007). Bowman (University of Saskatchewan), Spencer and Dubé also characterized the physical habitat, in accordance with Rapid Bio-assessment Protocols for streams (Barbour et al. 1999, cited in Bowman et al., 2008). The attributes characterized were elevation, catchment area, stream order, bankfull width, channel gradient and pattern, habitat type (i.e. riffle, run, or pool), average depth and velocity, substrate types and embeddedness and riparian cover (Bowman et al., 2008). Parks Canada, in collaboration with the University of Saskatchewan, also sampled sculpins in the fall of 2007 at eight sites on Prairie Creek as part of their ongoing monitoring work. Fish were collected and were analyzed for metal concentrations in tissue (Scrimgeour 2007).

Benthic invertebrates were also collected in the 2006 study. The invertebrates were analyzed for community profiles, including density, taxon richness, Simpson's diversity index and the Bray-Curtis index (Spencer et al., 2007). Benthic Invertebrate sampling was also a key component of the monitoring collaboration between Parks Canada and the University of Saskatchewan. Scrimgeour and Dubé collected macroinvertebrates in 2007 in addition to water, sediment and fish. These were analyzed for tissue metal concentrations in order to assess current levels of ecological health using benthic macroinvertebrates as a biological indicator. In the fall of 2008 approximately 80 sites throughout the South Nahanni Watershed were sampled to collect benthic macroinvertebrates. These samples will be used to define the ecological health of streams in the watershed. Parks Canada also conducted sampling in the fall of 2009 to assess reference areas as well as zones of influence downstream from the Prairie Creek Mine. Samples of water and benthic macroinvertebrates were collected as well as various in-stream, riparian, and watershed descriptors.

Algal samples were collected in 2006 and analyzed for community profiles in the same way as benthic invertebrates, discussed above. Parks Canada and the University of Saskatchewan also took samples of algae in 2007.

The University of Saskatchewan/INAC considered trophic levels in 2006 through the analysis of various levels of the food web, including algae, benthic invertebrates and fish. Only fish samples were analyzed for tissue metal concentrations. Parks Canada started in 2007 to look more closely at trophic levels. Collections of algae, benthic invertebrates and fish were analyzed for tissue metal concentrations. This study looked at community characteristics and gave a more complete profile of the stream's overall health through deducing the health of each part of the food web.

Results from the University of Saskatchewan show that there was not a significant detectable pattern of metal exposure in fish tissue between sites on Prairie Creek (Bowman et al., 2008). However, fish condition (length against weight) was significantly greater at the high and low-exposure sites than at the reference site. Eggs were also significantly larger at the high-exposure site. The 2006 study also found that benthic invertebrates did not show any significant density or diversity differences between sites. Only richness was greater at both exposure sites as compared to the reference site. Finally, there were more species of algae at the high-exposure site as compared to the low-exposure and reference sites (Spencer et al., 2007). These findings indicate a mild nutrient enrichment, potentially due to mine site discharge, and may be related to phosphate residue in camp sewage finding its way into the discharge. As a northern stream, Prairie Creek is naturally oligotrophic (characterized as having low productivity) and therefore sensitive to nutrient enrichment (Spencer et al., 2006).

4.7.5 Harrison Creek

The aquatic habitat of Harrison Creek was recently assessed by Golder Associates as part of an investigation of suitable locations for compensation habitat. Their investigation report is given in Appendix 24. Compensation habitat is required because some habitat was lost in the process of the repair and re-establishment of CZN's access road along Prairie Creek which had suffered erosion during recent (2006-2007) flood events. Golder determined that Harrison Creek does not provide useable fish habitat. The presence of very low flows, even after a heavy rain event, suggests to Golder that the stream could not support fish, with the possible exception of the 30 m of channel upstream of existing road culverts, and only because this 30 m stretch receives discharge from the Mine site. This also assumes that fish are able to pass the culverts, which may not be possible during most flow periods. Therefore, Golder did not recommend the inclusion of Harrison Creek in a fish habitat compensation plan.

4.8 Wildlife

This section is a summary extracted from a report by Golder Associates contained in Appendix 17. For further detail, the reader is directed to the Appendix.

4.8.1 Objectives from the TOR

The key objectives of the assessment of the existing wildlife environment, as defined in the TOR were to describe baseline conditions for wildlife (including resident and migratory bird species) and wildlife habitat, with special emphasis on key harvested species such as moose, Dall's sheep, and beaver. For each species, information on the following aspects was requested (by population if more than one distinct population is present in the EA study area):

- Population trends, including abundance, distribution and demographic structures.
- Habitat requirements, including identification of areas of important habitat (e.g., lambing areas, mineral licks), attributes of seasonal habitats in relation to how a species is using these attributes (e.g., travel routes, forage) and sensitive time periods.
- Migration routes, patterns and timing including typical patterns and range of known variation.
- Factors known or suspected to be currently affecting the species in the EA study area (e.g., harvesting, disease).
- Known or suspected sensitivities to human activities; and
- Gaps in current knowledge of the species such as impacts of disturbance on behaviour and abundance.

4.8.2 Background Information Sources

Information upon which to describe baseline conditions with respect to wildlife includes previous environmental assessment reports and recent surveys for the mine site and access road on behalf of CZN (five in 1980-1982, one in 1994 and three in 2006-2009), recent research studies in the NNPR and adjacent lands (four in 2004-2008), and Government of the NWT reports.

4.8.3 Habitat Setting

Mine Site

The Prairie Creek Mine site is located within Spruce/Lichen habitat (vegetation). Above the Mine site, this unit grades into the Sub-alpine Shrub zone (dwarf birch and willow with scattered, stunted black spruce), which in turn grades into the Alpine Tundra zone at higher elevations. As is typical of this region, the sparse tree and shrub cover associated with the lower valley slopes is due to cold air drainage within valley bottoms, which limits growth of trees.

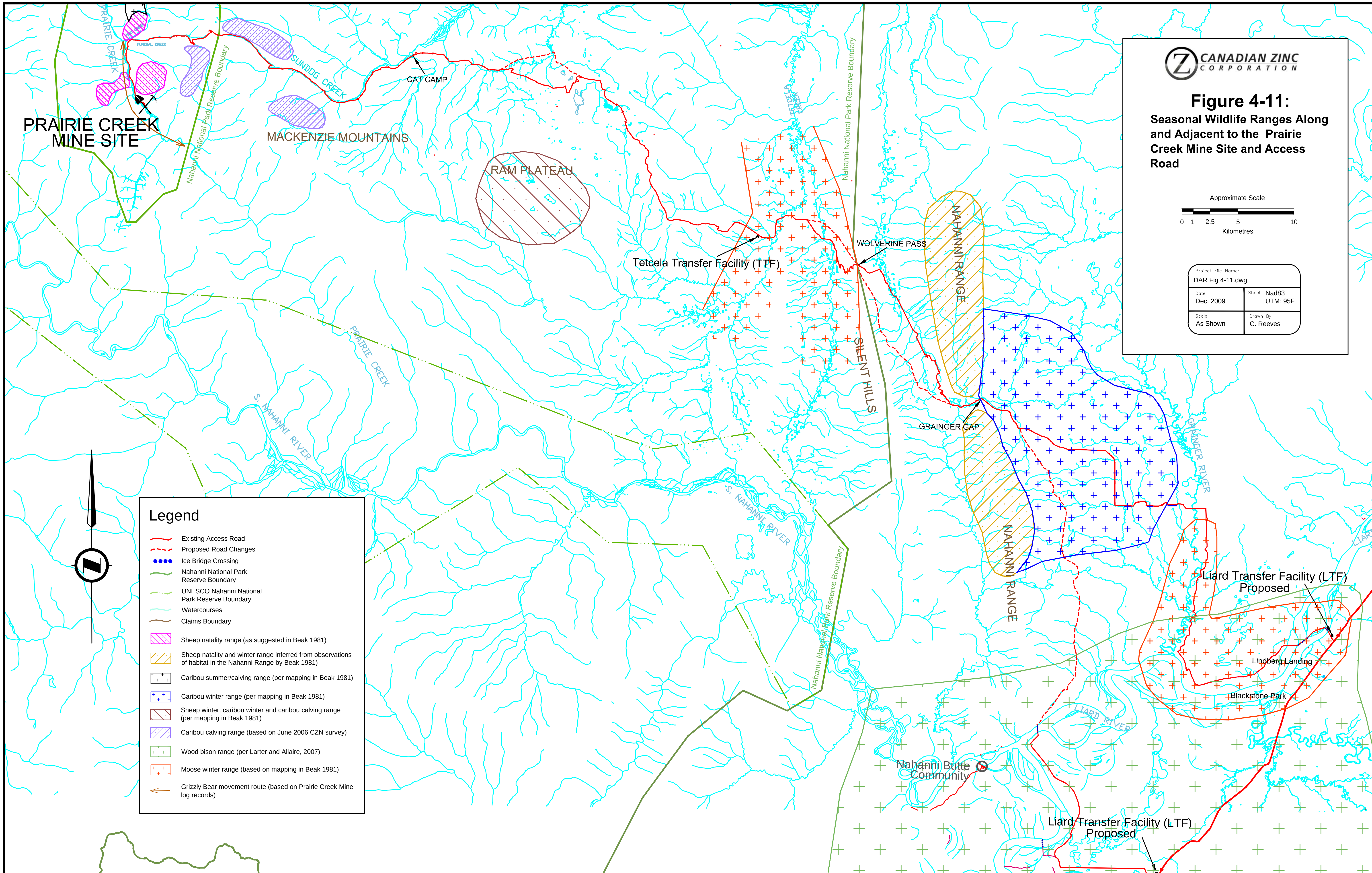
Access Road

The access road traverses a number of habitat (vegetation) units. From the Prairie Creek Mine site, the access road traverses Spruce-Lichen, Sub-alpine Shrub, Alpine Tundra, Black Spruce-Parkland, Riparian Alluvial, Pine Parkland, Mixed Coniferous-Deciduous, Black Spruce Muskeg, Grainger Tillplain, Floodplain/Tillplain, and finally Aspen-Liard Floodplain at the Liard River.

4.8.4 Specific Wildlife Existing Environment

Significant wildlife species in the vicinity of the Prairie Creek Mine site include Dall's sheep, grizzly bear, mountain caribou and wolverine. Wood bison occur along the Liard River floodplain.

The location of wildlife ranges in the Prairie Creek Mine area and along the access road is summarized on Figure 4-11.



CANADIAN ZINC CORPORATION
Figure 4-11:
Seasonal Wildlife Ranges Along and Adjacent to the Prairie Creek Mine Site and Access Road
Approximate Scale
0 1 2.5 5 10
Kilometres
Project File Name:
DAR Fig 4-11.dwg
Date
Dec. 2009
Sheet
Nad83
UTM: 95F
Scale
As Shown
Drawn By
C. Reeves
Legend
Existing Access Road
Proposed Road Changes
Ice Bridge Crossing
Nahanni National Park Reserve Boundary
UNESCO Nahanni National Park Reserve Boundary
Watercourses
Claims Boundary
Sheep natality range (as suggested in Beak 1981)
Sheep natality and winter range inferred from observations of habitat in the Nahanni Range by Beak 1981)
Caribou summer/calving range (per mapping in Beak 1981)
Caribou winter range (per mapping in Beak 1981)
Sheep winter, caribou winter and caribou calving range (per mapping in Beak 1981)
Caribou calving range (based on June 2006 CZN survey)
Wood bison range (per Larter and Allaire, 2007)
Moose winter range (based on mapping in Beak 1981)
Grizzly Bear movement route (based on Prairie Creek Mine log records)
PRAIRIE CREEK MINE SITE
PRAIRIE CREEK
SUNDOG CREEK
CAT CAMP
MACKENZIE MOUNTAINS
RAM PLATEAU
Nahanni National Park Reserve Boundary
Tetcela Transfer Facility (TTF)
WOLVERINE PASS
NAHANNI RANGE
SILENT HILLS
GRAINGER GAP
GRAINGER RIVER
S. NAHANNI RIVER
Liard Transfer Facility (LTF) Proposed
Lindberg Landing
Blackstone Park
LIARD RIVER
Nahanni Butte Community

Dall’s Sheep

Dall’s sheep inhabit the Prairie Creek Mine site area and surroundings and are regularly observed during the spring and summer around the Mine site. Dall’s sheep ranges occur in the Mackenzie Mountains of the Northwest Territory and the Yukon, other mountain ranges of the Yukon and Alaska, and the north-western part of British Columbia. Sheep are known to exhibit fidelity to home ranges, and may inhabit a particular mountain for their life cycle, including winter range, birthing areas and summer range.

Dall’s sheep occur in the Prairie Creek Mine site area primarily in spring and summer, moving to fall range (including rutting) and winter range in the Mackenzie Mountains to the east of Prairie Creek. Sheep are common on the east side of the valley above the Mine and Mill site in the spring, primarily ewes, yearlings and lambs. Rams appear to be more widely dispersed, including the west side of the Prairie Creek valley.

Sheep occur in smaller numbers along the access road through the Mackenzie Mountains, along Funeral Creek and the pass to Sundog Creek, and in the Nahanni Range through which the access road passes (Grainger Gap). In general, the density of sheep habitat use along the access road route may be highest in the Nahanni Range, where the greatest concentration of Dall's sheep sign was found.

Woodland Caribou

Woodland caribou occur as several separate ecotypes, of which two occur in the region of the Prairie Creek Project:

- Northern Mountain type which occupies the Mackenzie Mountains in the Yukon and NWT; and
- Boreal type which occurs east of the Mackenzie Mountains and into northeastern BC and northern Alberta..

Five populations of northern mountain woodland caribou overlap the Mackenzie Mountains of the NWT and are shared with the Yukon.

Caribou that belong to the Mackenzie Mountain populations have an annual distribution that straddles the Northwest Territories and Yukon; the Nahanni and Redstone populations are closest to the Prairie Creek Project site. Satellite data from collared caribou indicate that the Nahanni population generally occupies high alpine meadows in the south-east Yukon in the summer and fall, and migrate east into the Northwest Territories following the rut. In the winter, the majority of the herd occupies much of the NNPR, south and west of the Prairie Creek Mine site. Caribou that occupy the Prairie Creek Mine site area and vicinity in the Mackenzie Mountains may not be part of the Nahanni population and may be part of the Redstone population, which generally occupies range further to the north.

Wintering caribou along the access road may be part of the Redstone population, or a part of a boreal population that generally occupies the region east of the Nahanni Range but ventures west through Grainger Gap and into the Tetcela River and Fishtrap Creek areas. Boreal populations of woodland caribou occur as small populations outside of the Mackenzie Mountains in the NWT, in north-eastern B.C. and northern Alberta. These are likely small, dispersed bands throughout the year, rather than being part of the larger discrete populations.

The information available suggests that woodland caribou of the Prairie Creek area are of the Northern Mountain ecotype, and may be part of the Lower Nahanni or the Redstone population. Winter Mine site and access road surveys found only one group of 5 caribou to the west of the Mine site and one group of 13 caribou east of Grainger Gap. This is a relatively small number suggesting the area is not part of the "core" winter range. The caribou observed east of Grainger Gap may be part of a boreal population that resides east and south-east of the Nahanni Range, often in small groups.

Caribou were relatively widely dispersed in the uplands of the Prairie Creek area during a June 1981 aerial survey but appeared to have moved by July since there were few observations. The June 1981 survey included observations of cows with calves, confirming that the uplands are used for calving. It is possible that caribou in the Prairie Creek area move westward and south-westward as part of the Lower Nahanni herd or move northward as part of the Redstone population. Caribou may also remain in the Prairie Creek area as part of a local population. The Prairie Creek area (and entire drainage basin) is not considered part of key woodland caribou range by some researchers.

Moose

Moose are an important component of the ecosystem of the region, having value as a First Nations food source in the north, and are of economic, cultural and ecological significance.

Moose have been seen in the Prairie Creek valley in spring and summer, with occasional sightings near the Mine, but are scarce in the winter. The Prairie Creek valley and adjacent lower mountain slopes do not generally provide suitable moose habitat, limited by sparse browse in little cover, especially in winter. Moose sign is common but not plentiful along the access road section between the east side of the Mackenzie Mountains and the Nahanni Range, and east and south-east of the Nahanni Range to the Liard River where they are more common. Both areas were suggested during previous studies as representing moose winter range.

Wood Bison

The Wood bison Nahanni population was started in 1980 by the introduction of 28 head from Elk Island National Park. The population grew and was augmented by supplemental introductions from Elk Island National Park to its present numbers of approximately 400 head. This population inhabits both sides of the Liard River from the Blackstone River southward into northern British Columbia. Apart from natural mortality (including drowning), collision with vehicles along the Liard Highway has been a mortality factor.

A June 2006 aerial survey recorded four bison at the airstrip of the community of Nahanni Butte. Given the present distribution of the Nahanni population, bison may be found along the proposed new southern portion of the access road as it approaches the Liard River floodplain, and along the Liard Highway into British Columbia.

Grizzly Bears

Grizzly bears are an integral component of the Mackenzie Mountains and the Nahanni Region. Grizzlies occur throughout much of northern and mountainous regions of the NWT, Yukon and BC and are expected to roam widely in the Mackenzie Mountains and the region along the access road. Grizzlies occur in the Prairie Creek drainage and are active from mid-spring (approximately April) to late fall (October) when they head to their winter dens.

Anecdotal information from the Mine wildlife log suggests that a number of lone grizzly bears move through the Prairie Creek valley each spring and summer, along with occasional family groups (sow and cubs). Observations were mostly in the immediate Mine site area, the airstrip and the road in between. A minimum number of individual grizzlies is estimated at four plus a family group of three (sow and two yearling cubs).

Studies by John Weaver imply that a ‘substantial’ population of grizzly bears exists in the Prairie Creek drainage and the adjacent Mackenzie Mountains.

The location of grizzly den sites has not been documented, but it is likely that several bears den in the Prairie Creek drainage north of the mine site, and that these bears move from the upper drainage southward through the Mine site and to the adjacent uplands in the late spring and summer, returning in the fall.

Wolverine

Wolverine occur in the Mackenzie Mountains and range widely, with large home ranges of up to 405 km^2 and 1366 km^2 for females and males, respectively in northern British Columbia. Sub-adults range even more widely, with home ranges of up to 4600 km^2.

Several sightings of wolverine have been recorded in the Prairie Creek Mine site area, including one in July 1980 in alpine tundra habitat. Mine site personnel identified wolverine among species seen infrequently during the 1968 to 1980 period.

There were no observations of wolverines or tracks during recent aerial and ground surveys. However, one or more wolverines may use the Mine site and vicinity as part of their home range.

Wolves

Sightings of wolves have been infrequent near the Mine site, but they are assumed to be a persistent element of the area's wildlife. In 1980, camp personnel identified Caribou Flats and the exploration camp area as sites where wolves had been observed, including mention of wolves preying on caribou. No sightings were made during 1981 surveys.

In September 1994, a solitary wolf was observed crossing the access road approximately 1 km east of Folded Mountain. A pack of five wolves was observed along the access road in September 1994. Their abundance along the access road is unknown, but they are suspected of being important predators of woodland caribou and moose, and possibly Dall's sheep.

Observations recorded in the Mine camp log suggest that wolves travel through the Prairie Creek Mine area and valley on an occasional basis, with observations from spring to fall. Since wildlife observations were not compiled during the late fall to winter period, the occurrence of wolves through the Mine area and valley between the end of September and early April is speculative; however, there is no reason to not expect wolves to be year-round travelers through the Prairie Creek valley and Mine area. Since wolves travel widely, they are expected all along the access road at all times of the year.

Other Wildlife of Economic Value

Wildlife species that are of economic value in the Prairie Creek Mine area or along the access road, other than those discussed above, include beaver, muskrat, marten, black bear, varying hare, coyote, red fox, grouse and ptarmigan, and various waterfowl (ducks and geese). These wildlife forms provide a subsistence food source or are trapped/hunted by regional residents. Apart from a limited amount of survey information, there is little information on local or regional populations of these species, the status of those populations, or disease factors.

4.9 SARA and COSEWIC Species

As for Section 4.8, this section is a summary extracted from a report by Golder Associates contained in Appendix 17, and for further detail the reader is directed to that appendix.

The key objectives of the assessment of wildlife species at risk or endangered, as defined in the TOR, were to describe wildlife at-risk that use the EA study area, including key harvested species, and provide information to:

- Identify any species present or potentially present in the EA study area that are listed under Schedule 1 of the *Species at Risk Act* (SARA).
- Identify any species present or potentially present in the project area (assumed to be EA study area) assessed by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC).
- Describe each species in terms of the requirements listed for wildlife in general.

This section addresses the wildlife species horned grebe, peregrine falcon (*anatum* sub-species), short-eared owl, rusty blackbird, common nighthawk, olive-sided flycatcher, woodland caribou, wood bison, wolverine, and grizzly bear.

4.9.1 Horned Grebe

Horned grebe is designated as Special Concern by COSEWIC but is not on Schedule 1 of SARA. This species is designated as Secure under the NWT Status Ranks. Horned grebe are known to breed along lakes, ponds and marshes where emergent vegetation provides for nesting platforms and cover. The breeding distribution extends through the south-western parts of the NWT and includes the central and eastern portion of the access road.

Horned grebe was included on the provisional check list of birds for the access road route in 1980 based on range maps, but actual sightings of the species were not recorded during surves in 1980 and 1981, and not on wetland surveys in 1994. One observation of an unidentified grebe was recorded at a wetland along the access road route in 1980.

Based on the known range and habitat availability, horned grebe are expected to occur along the wetland margins of ponds and small lakes near the access road from the Mackenzie Mountains to the Nahanni Range, and east and south-east of the Nahanni Range toward the Liard River. As such, habitat for horned grebe is in proximity to portions of the access road; however, conflict with operation of the access road is not likely as the breeding season for horned grebe is well outside of the hauling period.

4.9.2 Peregrine Falcon

Peregrine falcon is listed as Threatened on Schedule 1 of SARA and as Sensitive under the NWT Status Ranks. Their distribution includes regions to the south, north-east and north of the Prairie Creek area, but not overlapping the Mackenzie Mountains. Peregrine falcons nest on ledges of cliffs and steep, rocky bluffs in mountainous terrain. As such, habitat is available in the Mackenzie Mountains, at the karst caves of the Ram Plateau, and possibly in the Nahanni Range.

Surveys in 1980, 1981, 1994, 2006, 2007 and 2009 did not result in any observations of peregrine falcons. Since nest sites have not been documented near the Prairie Creek Mine site, operation of the Mine should not interfere with breeding activity of this species. Further, conflict with operation of the access road is not likely as the breeding season for peregrine falcons is well outside of the hauling period.

4.9.3 Short-eared Owl

Short-eared owls are listed as Special Concern by COSEWIC and as Sensitive under the NWT Status Ranks. These small owls are ground nesters that inhabit open landscapes such as marches, grasslands and tundra. The species' breeding distribution occurs throughout the northern boreal forest and tundra of Canada. Short-eared owls feed predominantly on small mammals and as such their population trends and distribution reflect the availability of local small mammal populations.

This owl has not been observed in the Prairie Creek Mine site or along the access road. Based on its preference for open habitats for breeding, the species could inhabit the open shrublands and marsh edges along the central portion of the access road, east of the Mackenzie Mountains to the

Nahanni Range, and east and south-east of the Nahanni Range to the Liard River. As such, habitat for short-eared owls is in proximity to portions of the access road, however, conflict with operation of the access road is not likely as the breeding season for short-eared owls is outside of the hauling period.

4.9.4 Rusty Blackbird

Rusty blackbird is listed as Special Concern by COSEWIC and is designated as May be at Risk under the NWT Status Ranks. The breeding distribution of the rusty blackbird includes the boreal forest of Canada and extends to the arctic tundra and to Alaska. This blackbird nests along the edges of muskeg, bogs, beaver ponds and streams.

Previous field surveys for the Prairie Creek Mine site did not identify rusty blackbird as occurring there. Habitat for rusty blackbird is available along the access road in the region lying east of the Mackenzie Mountains to the Nahanni Range, and east and south-east of the Nahanni Range to the Liard River. The open terrain with numerous ponds, small wetlands, streams and muskeg ponds provides nesting opportunities for this species. As such, habitat for rusty blackbirds is in proximity to portions of the access road, however, conflict with operation of the road is not likely as the breeding season for rusty blackbirds is well outside of the hauling period.

4.9.5 Common Nighthawk

Common nighthawk is listed as Threatened by COSEWIC and is designated as Secure under the NWT Status Ranks. The breeding distribution of the common nighthawk is near its northern limits in the Mackenzie Mountains. This species nests in open terrain, generally in areas of gravel beaches, rocky outcrops or in early stages of growth following open forest wildfires. There is no record of common nighthawks being observed in the Prairie Creek Mine area, but there were several observations near ponds along the access road in wetland surveys during 1980 studies.

The sightings near ponds along the access road route suggest that common nighthawk is breeding there. Suitable habitat occurs in the Prairie Creek valley (open gravel areas, airstrip) and in the open terrain lying between the east slope of the Mackenzie Mountains and the Nahanni Range. As such, habitat for common nighthawk is in proximity to the Mine site and portions of the access road. The mine site occupies a limited footprint in the valley bottom of Prairie Creek, but there is a potential for conflict with breeding activity of the species along the road to the airstrip and at the airstrip, should the species be documented as breeding there in the future. With respect to operation of the access road, this will occur well outside of the breeding season for common nighthawk.

4.9.6 Olive-sided Flycatcher

Olive-sided flycatcher is listed as Threatened by COSEWIC and is designated as Sensitive under the NWT Status Ranks. This flycatcher's breeding range occurs through the boreal forest of northern Canada where it breeds along forest edges and openings, including the edge of bogs, marshes and ponds. This species was not observed during 1980, 1981or 1994 surveys. Suitable breeding habitat for olive-sided flycatcher is available in the coniferous dominated Black Spruce-

Parkland, Mixed Coniferous-Deciduous, and Black Spruce-Muskeg habitat types along the access road, Therefore, habitat for olive-sided flycatchers occurs along portions of the access road. However, conflict with operation of the access road is not likely as the breeding season for olive-sided flycatchers is well outside of the hauling period.

4.9.7 Woodland Caribou

Woodland caribou that range through the Prairie Creek Mine site area and along the western portions of the access road belong to the Northern Mountain population which is designated as Special Concern on Schedule 1 of SARA and as Secure under the NWT Status Rank. Caribou occur in the general vicinity of the Prairie Creek Mine site in small numbers in winter but are more common in spring and early summer in this area of the Mackenzie Mountains, including mountains adjacent to the western part of the access road. Caribou occur along the western portion of the access road in spring but are dispersed by the summer and fall. A small number of caribou use winter range to the east of the Nahanni Range, and are likely part of a boreal population. Boreal caribou are designated as Threatened under SARA and as Sensitive under the NWT Status Ranks. Overall, woodland caribou range overlaps the Prairie Creek Mine site area and most portions of the access road, to the Liard Highway.

4.9.8 Wood Bison

Wood bison are designated as *Threatened* under SARA Schedule 1 and as At Risk under the NWT Status Rank. The Nahanni population was introduced to the Liard River area near the community of Nahanni Butte in 1980 and through natural growth and supplemental introductions has grown to its present number of approximately 400 head. Wood bison occur only along the southern-most portion of the proposed new access road alignment, in the vicinity of the Liard River and then along the Liard Highway into northern British Columbia where they may be exposed to winter time Project operations related to transport of materials and ore concentrates.

4.9.9 Wolverine

Wolverines are listed as Special Concern by COSEWIC and designated as Sensitive under the NWT status ranks. Previous sightings of wolverines near the Prairie Creek Mine site and airstrip confirm their presence in the Project area. Given the wolverine's large home ranges and very low densities, one or more wolverines may use the Mine site and vicinity as part of their home range. Several wolverines are also expected to have home ranges that overlap the access road, especially in the Mackenzie Mountains and the Nahanni Range. Given their distribution, the Prairie Creek Mine site overlaps year-round wolverine habitat while the access road operation would affect wolverine activity only during the winter months.

4.9.10 Grizzly Bear

Grizzly bears are not listed on Schedule 1 of the SARA Site Registry, but are assessed as Special Concern by COSEWIC and ranked as Sensitive under the NWT general status ranks. Grizzlies are expected to roam widely in the Mackenzie Mountains and the region along the access road, being active from mid-spring (approximately April) to late fall (October) when they head to their winter dens. Anecdotal information suggests that a number of lone grizzly bears move through the Prairie Creek valley each spring and summer, along with occasional family groups (sow and cubs).

Recent studies of grizzly bears in the Greater Nahanni Ecosystem suggest that the population of grizzly bears in the Prairie Creek drainage and in the adjacent Mackenzie Mountains are all part of the Greater Nahanni Ecosystem. Grizzlies would also extend into the region between the Mackenzie Mountains and the Nahanni Range, where a number of food resources are available, but are less likely to occur east and south-east of the Nahanni Range to the Liard River. Grizzlies would not be exposed to operation of the access road, given that they den in late October and would not emerge again until April.

4.10 Vegetation and Plant Communities

As for Sections 4.8 and 4.9, this section is a summary extracted from a report by Golder Associates contained in Appendix 17. For further detail, the reader is directed to the appendix. CZN also commissioned a study of rare plants for the Prairie Creek Mine site and along the access road by EBA Engineering Consultants Ltd. (EBA) in July 2009. The results of the EBA study are given in Appendix 13 and are summarized here.

The key objectives of the vegetation assessment, as derived from the TOR, are to describe baseline conditions for vegetation and plant communities, including identification of any areas where rare plants are known or suspected to be present.

4.10.1 Conditions Prior to Site Development

Prior to mineral exploration, the Prairie Creek area had not been influenced by human activity, apart from First Nations use such as trapping or hunting parties. Wild fires occasionally occur in the region and have influenced forested ecosystems throughout much of the landscape.

The vegetation units mapped in 1981 studies are representative of common vegetation units of the Mackenzie Mountains, the Nahanni Ranges and the Liard floodplain forests and muskeg. Mineral exploration has affected a small area of the land base of the Prairie Creek watershed, and apart from local influences, has not affected the physical nature or biological composition of natural plant associations or communities in this watershed or ecosystems adjacent to the access road.

4.10.2 Previous Baseline Studies - Mine Site and Prairie Creek

Vegetation units from various studies are summarized below.

Spruce/Lichen

This vegetation unit is distributed entirely within the Mackenzie Mountains, extending from valley floor to the upper slope extensions of relatively stable colluvial slopes. This unit's approximate elevation range is 975-1280 m. Its most conspicuous feature is the cream-coloured ground cover provided by a thick layer of lichen. Forest cover is variable, depending on aspect and topography, with the greatest tree densities in draws and on south, southwest, and west-facing slopes. In the area between Funeral and Sundog Creeks, the unit is sparse.

This habitat unit is to be the best woodland caribou habitat in the combined study area (Prairie Creek Mine and access road). A game trail was observed parallel and immediately adjacent to Prairie Creek with caribou tracks and a few moose tracks.

Sub-alpine Shrub

In the Mackenzie Mountains, this vegetation unit occupies a mid-elevation zone lying between the spruce lichen and alpine tundra vegetation units. Vegetation in the Prairie Creek drainage and Funeral-Sundog Pass is characterized by a thin organic layer, a variable shrub cover (10 to 100%) dominated by dwarf birch, Labrador tea, and willow. Herb cover was limited (5-30%), but the ground cover was 60-100% and dominated by lichen. Evaluation in 1981 indicated only limited use, with pellet groups primarily from Dall's sheep and some woodland caribou.

Alpine Tundra

This vegetation unit comprises a substantial area, and provides much of the characteristic features of the Mackenzie Mountains. It comprises all the area above the tree line, and thus was found to be highly variable in plant cover and type. Characteristic vegetation, based on greatest coverage, was lichen, mountain-avens, heather, and creeping willow.

This is an important habitat unit, primarily as it represents key winter range and lambing areas for Dall's sheep, and calving areas for woodland caribou. Wildlife use was confirmed by evidence of cratering and browsing. Pellet groups of both Dall's sheep and woodland caribou were relatively common in this habitat type.

Pine Parkland

A small component of the pine parkland vegetation unit occurs within the Mackenzie Mountain portion of the Prairie Creek Mine site study area. This unit occurs in a low elevation valley immediately north of the Second Canyon between 425 m and 750 m elevation. Pine parkland is characterized by low tree layer cover (8 to 15%) consisting of jack pine, black spruce, white spruce, and willow. The shrub layer (coverage 5 to 45%) was dominated by dwarf birch and Scouler's willow while the herb layer (coverage 15 to 65%) was dominated by bunchberry, lingonberry, and twinflower. The ground cover is almost 100% with primarily red-stemmed feathermoss and lichen.

Pellet distribution indicated that moose is the predominant ungulate species using this vegetation unit.

4.10.3 Previous Baseline Studies – Access road

Vegetation along the access road consists of 12 vegetation units: aspen-Liard floodplain, floodplain/tillplain, Grainger tillplain, burn, black spruce muskeg, pine parkland, subalpine shrub, alpine tundra, mixed coniferous deciduous, black spruce parkland, riparian alluvial, and spruce lichen. The following is based on previous studies.

Spruce/Lichen

Along the access route east of the Prairie Creek/Ram River system divide, spruce lichen is distributed in limited areas in the valley floors of 4 of the Ram River tributaries. A description of this vegetation unit is given above, and is the best woodland caribou habitat in the combined study area. A ground survey along the access road in this habitat found almost continuous caribou tracks.

Black Spruce Parkland

This unit extends from the eastern base of the Mackenzie Mountain eastward to the eastern edge of the Ram Plateau. In terms of the access road, it starts at Km 32 and extends more or less continuously to Km 64. The elevation range of this vegetation unit is 793 to 915 m.

Tree cover varies from 5% to 30% and is comprised mostly of black spruce, with patches of white spruce on well drained south aspect slopes. Trees support a rich lichen cover. The shrub layer (20 to 45% cover) is primarily composed of dwarf birch and willow. Cover of the herb layer is also moderate (10 to 45%). Major species are kinnikinnik along with Labrador tea and blueberry. Ground cover is 100%, and is composed primarily of lichen and feathermoss.

Habitat studies indicated only limited recent browsing. Three moose pellet groups were recorded. This unit should represent an important habitat for woodland caribou at certain times of year.

Riparian Alluvial

The riparian alluvial unit is essentially sparsely vegetated alluvial streams and rivers of the Ram River system. The braided streams in this unit are relatively wide in places, and on some of the in-stream islands which survive for several years, there may be colonization by willow and various grasses and sedges. This vegetation unit is likely to represent an occasional wildlife corridor, and winter range for moose.

Pine Parkland

The pine parkland vegetation unit also occurs in both the Prairie Creek Mine site and access road study areas and was described above. Along the access road, this unit occurs on the lower slopes of the Nahanni Range between 549 and 763 m, and on the Ram Plateau from Km 53 to 63 within a limited elevation range (915 to 975 m). Tree cover is dominated by jack pine on 10% slope and southwest aspect, and by black spruce in poorly drained depressions. Like many of the lowland units, the ground cover is 100% and in jack pine stands comprises primarily feathermoss and lichen. Habitat studies indicated limited browsing in this habitat type with 9 moose pellet groups found.

Mixed Coniferous/Deciduous

The mixed coniferous/deciduous vegetation unit covers the low elevations of the Tetcela and Fishtrap Creek drainages from Km 64 to 110 where the access road approaches Grainger Gap. This is a post-fire successional forest, estimated to have resulted from a burn that occurred between 1940 and 1950.

The western slopes of the Silent Hills are well drained and tree cover is estimated at 78%. Of this, 80% was deciduous, primarily trembling aspen and paper birch, with the remainder (20%) white spruce.

The Tetcela Valley transect was variable and included elements of black spruce parkland mixed with a dense mixed coniferous/deciduous forest. The vegetation succession appeared to be returning to black spruce parkland. In 1981, the forest cover at the tree level varied from 60 to 100%, and comprised birch, alder and willow with lesser amounts of black spruce and jack pine. Cover of the lower strata (shrub, herb, and moss layers) was considerably less than the tree cover.

Habitat studies indicate that the main browse species being used were alder and willow. Nine moose pellet groups were recorded.

Black Spruce Muskeg

This vegetation unit is distributed in lowland, waterlogged drainages which grade into open wetlands. It occurs in three areas: Fishtrap Creek, west of the Silent Hills within an elevation range of 244 to 305 m; an eastern tributary of the Tetcela/Ram River system in the valley between the Silent Hills and the Nahanni Range at an elevation of approximately 490 m; and a lowland area west of the Grainger River near its mouth.

The Tetcela drainage had predominantly shrubs (cover of 35 to 60%) comprised of black spruce and blueberry willow, Labrador tea and dwarf birch. Cover in the herb layer was 25 to 50% and comprised mostly of bearberry, grass and Labrador tea. Moss and lichens provided a thick ground cover.

Habitat surveys indicate some browsing on dwarf birch and willow. A total of 3 moose pellet groups were found. The wetlands within this habitat unit represent productive waterfowl habitat, particularly for trumpeter swans.

Burn

Since 1982, there have been at least 3 burns along the access road. The earliest was situated within black spruce parkland near Km 66. The second burn took place in 1994 and covered an enormous area immediately east of the Nahanni Range. A smaller burn occurred just east of Mosquito Lake in 2008.

Sub-Alpine Shrub

This vegetation unit occurs along the access road on the eastern slopes of the Mackenzie Mountains, and in the Nahanni Range. In the former, the elevation range extends from 1325 m down-slope to 1070 m, whereas in the Nahanni Range the elevation range is considerably lower, from approximately 1220 m down to 700 m. The vegetation description for this unit is provided in Section 4.10.2.

Alpine Tundra

Alpine tundra occurs along the access road as a large area on the eastern slope of the Mackenzie Mountains, and a much smaller component in the Nahanni Range.

This habitat type is important as it represents key year-round range and lambing areas for Dall's sheep, and calving areas for woodland caribou. Pellet groups are relatively common.

Grainger Tillplain

The Grainger Tillplain unit is a rolling plain with little elevation range (approximately 460 m to 670 m) and an absence of forest cover. The basic site types include depressions and drier meadows. The former are wet sedge meadows. The drier meadows are composed of a shrub layer (80% cover) including dwarf birch and Labrador tea. The herb layer is mostly comprised of sedges, bearberry and horsetail, while the ground cover is moss. In other areas, there is a taller shrub community of alder, dwarf birch, and willow, or coniferous thickets of black spruce. As of 1994, over 40% of this habitat type occurring along the access road had recently burned. Habitat studies showed considerable availability of browse, with utilization greatest on willow. Four caribou and 3 moose pellet groups were found.

Floodplain/Tillplain

This is a heterogeneous unit comprising Grainger Tillplain and lowland marsh, shrub, and mixed forest. Major tree species in this mosaic include trembling aspen, white spruce, black spruce, paper birch, jack pine and alder. The densest of the mixed forest communities, comprising more than 50% cover, is distributed along parts of the Grainger River and provides thermal cover for wildlife.

Aspen Liard Floodplain

This vegetation type borders the Liard River from Km 151 to Km 164 (existing alignment), excluding the Liard River crossing itself. The climax tree species is white spruce, but frequent fires have led to trembling aspen introduction. Within the aspen subunit, the canopy was estimated to reach a height of 20 m, with other understory trees between 12 m and 16 m. The shrub layer was predominantly alder and prickly rose. There was limited ground cover (5%) owing to a thick layer of deciduous litter.

Habitat studies showed moderate browsing of high-bush-cranberry and light browsing of trembling aspen.

4.10.4 Present Conditions

Mine Site

Of this previously disturbed area, the footprint in terms of Mine site features is as follows for the Spruce-Lichen Zone:

Plant site -	10 ha
Water impoundment -	10 ha
Airstrip -	7 ha
Exploration roads and drill pads -	30 ha
Miscellaneous -	2.5 ha
Total	59.5 ha

Total physical disturbance to date is only 0.14% of the area of the Spruce/Lichen zone.

Access Road

The original 180 km long access road traverses several land form types and vegetation units, and is broken down in Table 4-10 by length and approximate area of vegetation units (based on a total length of 181.1 km and road corridor width of 10 m).

Table 4-10: Vegetation Units Along Access Road

Vegetation Unit	Road Length (km)	Area (ha)
1 Spruce-Lichen	13.8	13.8
2 Subalpine Shrub	10.3	10.3
3 Alpine Tundra	8.4	8.4
4 Pine Parkland	17.6	17.6
5 Black Spruce Parkland	19.2	19.2
6 Riparian alluvial	7.0	7.0
7 Mixed Coniferous/Deciduous	25.4	25.4
8 Black Spruce Muskeg	19.5	19.5
9 Grainger Tillplain	8.9	8.9
10 Floodplain/Tillplain	32.3	32.3
11 Aspen Liard Floodplain	18.7	18.7
TOTAL	**181.1**	**181.1**

4.10.5 Rare Plants

EBA completed a rare plant and wildlife survey (refer to Appendix 13) along the Prairie Creek Mine access road and in the area of the proposed waste rock pile ("WRP"). EBA conducted the survey from July 7 to 9, 2009. Two days of survey were conducted along the road, and a half day was spent surveying the WRP.

No rare plant or wildlife species defined by the COSEWIC and the federal Species at Risk Act ("SARA") were observed in the surveyed area. However, one plant species, Few Flower Meadow Rue listed as being rare in McJannet et al. (1995) was documented along the access road and an adjacent wetland. Since 1995, this plant species has been documented in many locations and will likely be de-listed in the near future.

4.11 Geology

The entire region of the Southern Mackenzie Mountains in the vicinity of the Prairie Creek site, including the access road route, is underlain by Lower Paleozoic age sedimentary rock sequences consisting of variations of limestones, dolostones, siltstones, shales and mudstones. There are no known in-situ exposures of volcanic or igneous rock within 100 kilometres of the Prairie Creek site.

4.11.1 Mine Geology

Rock Types

The Southern Mackenzie Mountains are underlain by Lower Paleozoic carbonates of the Mackenzie platform, and associated basinal limestones, dolostones and shales. The Prairie Creek property straddles both the edge of the platformal carbonates and rocks of the embayment sequence (see Figure 4-12). Figure 4-13 illustrates the locations of geologic units and structures in relation to the Mine Site.

The Prairie Creek rock (stratigraphic) sequence (see Figure 4-14), from oldest to youngest, is comprised of the Sunblood Formation sandstone, Whittaker Formation dolostones, Road River Formation shales, and Cadillac Formation thinly bedded limy shales. In the northern part of the property, Arnica and Funeral Formation dolostones and limestones overlie this assemblage.

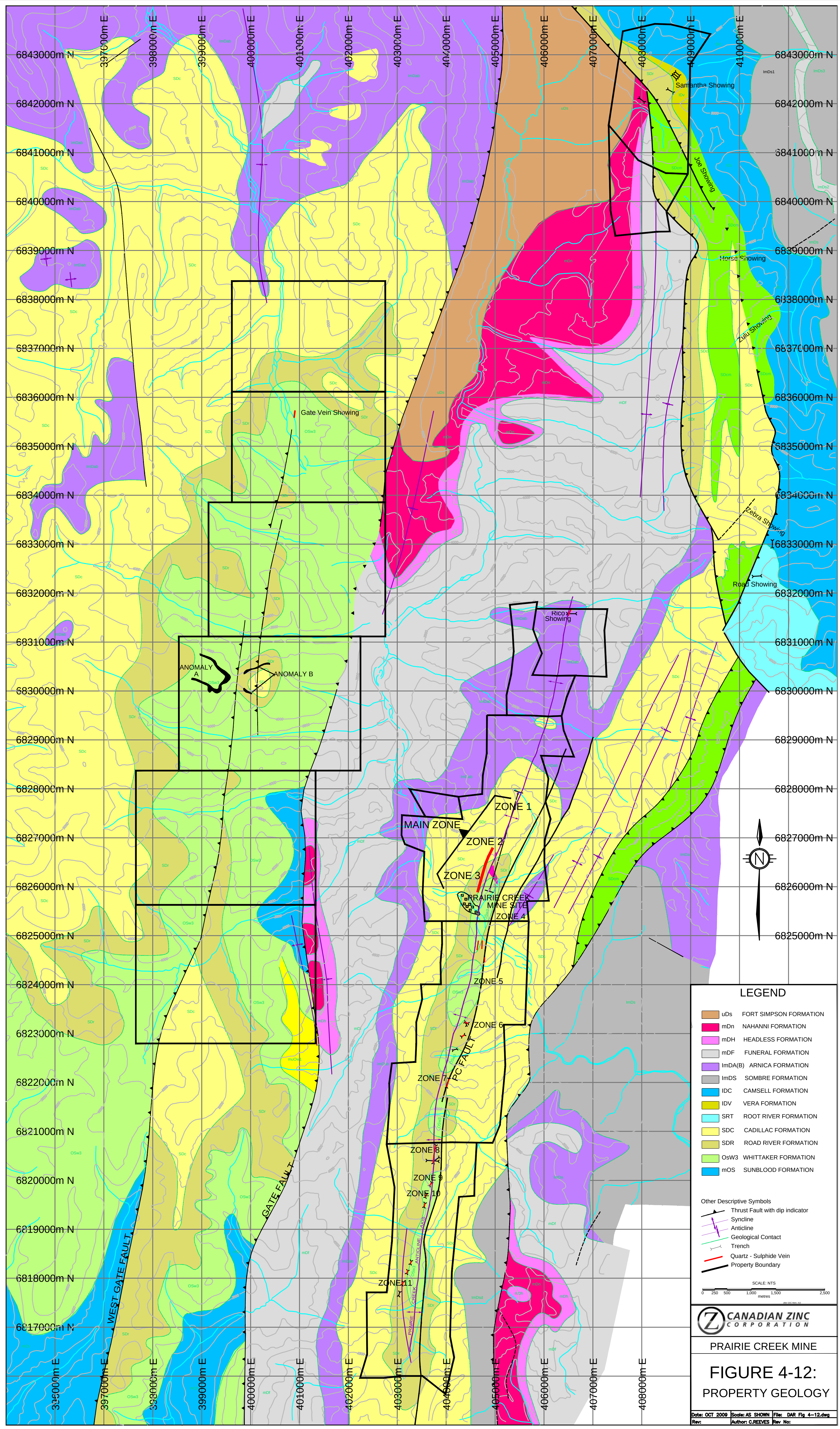
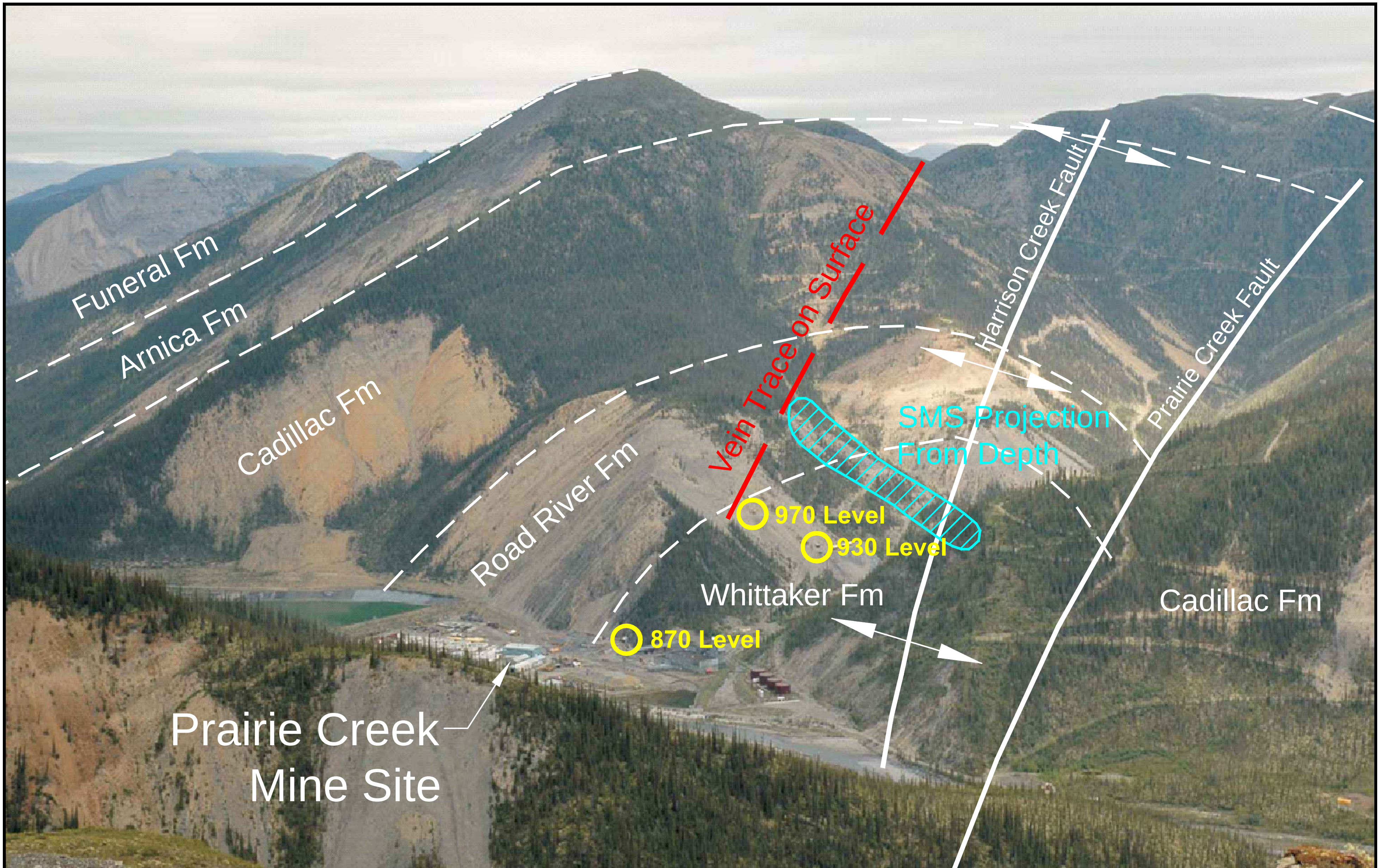


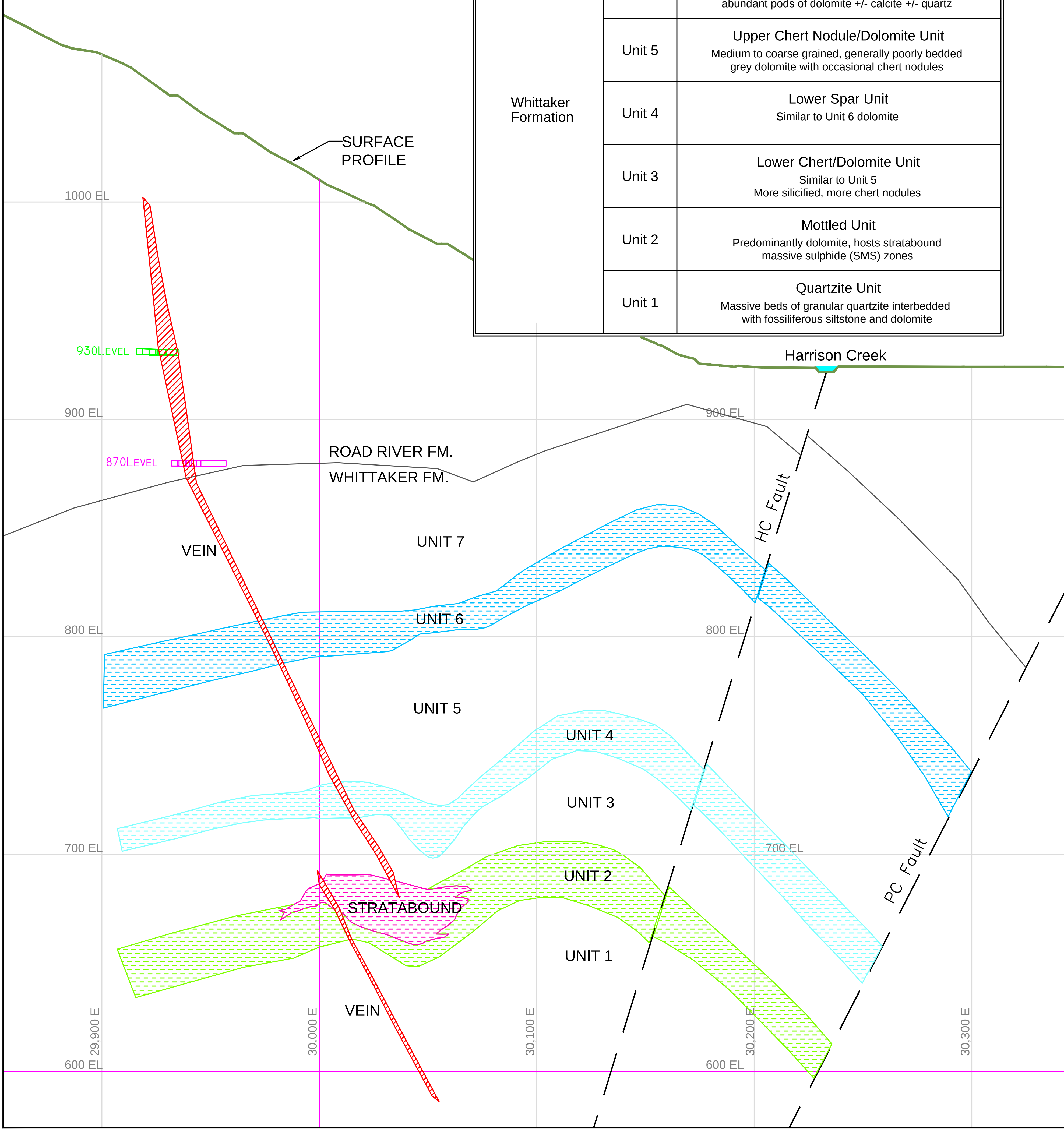
FIGURE 4-12:
PROPERTY GEOLOGY



CANADIAN ZINC CORPORATION

Date:	October 2009
Drawn By:	C. Reeves
Scale:	As Shown
Drawing:	DAR Fig 4–13.dwg

FIGURE 4-13: Stratigraphy and Structure Looking North From Zone 6



Lithologic Units and Stratigraphic Column

Cadillac Formation	Bedded Limy Shales	
Road River Formation	Shale and Argillaceous Dolostone	
Whittaker Formation	Unit 7	Ribbon Chert/Dolomite Thin interbedded chert bands and medium grained brownish-grey dolomite beds
	Unit 6	Upper Spar Unit Massively to crudely bedded medium grey dolomite with abundant pods of dolomite +/- calcite +/- quartz
	Unit 5	Upper Chert Nodule/Dolomite Unit Medium to coarse grained, generally poorly bedded grey dolomite with occasional chert nodules
	Unit 4	Lower Spar Unit Similar to Unit 6 dolomite
	Unit 3	Lower Chert/Dolomite Unit Similar to Unit 5 More silicified, more chert nodules
	Unit 2	Mottled Unit Predominantly dolomite, hosts stratabound massive sulphide (SMS) zones
	Unit 1	Quartzite Unit Massive beds of granular quartzite interbedded with fossiliferous siltstone and dolomite

PRAIRIE CREEK MINE

CANADIAN ZINC CORPORATION

Date:	October, 2009
Drawn By:	C. Reeves
Revised:	
Scale:	As Shown
Drawing:	DAR 4–14.dwg

scale

0 25 50 75 100

metres

Figure 4-14:

REPRESENTATIVE DEPOSIT CROSS SECTION
(ALONG SECTION 50325N)

Structure

As a result of deformation associated with mountain building, the Prairie Creek area is dissected by numerous north-south trending faults which form continuous belts of geology. The Prairie Creek block consists of an antiformal sequence within a 16 km long, 1-2 km wide belt. This block includes the majority of defined mineral showings referred to as "Zones" located within the mineral leases of the Prairie Creek property. The fold axis of this belt trends generally north-south and, where dissected by east-west streams, contains geologic windows which expose Whittaker Formation dolostones, forming the core of the main Prairie Creek anticline flanked by the younger Road River Formation. Figure 4-14 provides a representative cross-section through the presently defined mineral resource area showing the relation of the mineralization to the broadly folded units. Figure 4-15 shows a longitudinal section through the mine indicating the plunge of the rock units, outline and location of defined mineral resource projections and also the location of the 3 existing underground development tunnels.

Mineralization

The primary economic base metals on the Prairie Creek property are zinc ("Zn"), lead ("Pb"), silver ("Ag") and copper ("Cu").

Two principal geological styles of base metal sulphide mineralization, termed "Vein" and "Stratabound", occur within the Whittaker and Road River Formations. Together the Vein and Stratabound styles of mineralization comprise 100% of the calculated mineral resource. A third style of mineralization, termed Mississippi Valley type ("MVT"), occurs within the less deformed marginal carbonate sequence to the north but does not presently have a defined mineral resource.

Exploration at Prairie Creek has revealed many base metal mineral showings along the entire 27 km length of the property. Historical exploration of the property has led to the referencing of these surface mineral showings by name and sequentially numbered Zones. At the Mine site, the sub-surface area including the underground workings is referred to as Zone 3. As a result of continuing successful exploration and the expansion of Zone 3, progressing into Zones 1 and 2 to the north, the entire area is now referred to as the Main Zone. Zone 3 contains the estimated mineral resource which includes both Vein and Stratabound mineralization.

Vein Mineralization

Vein-hosted base metal mineralization occurs from the Main Zone through Zone 12 (refer to Figure 1-4) in the southern portion of the Prairie Creek property, and is the dominant style of metal mineralization on the property. The bulk of the mineral resources on the property are established on only one of these Vein occurrences, namely Zone 3.

The Vein in Zone 3 strikes approximately north and dips steeply to the east. It appears, from recent drilling, that the Vein becomes sub-vertical with depth. Most of the surficial mineralized zones at Prairie Creek occur within Road River Formation shales and generally occur proximal to the axial plane of a regional anticline.

Base metal mineralization consists of the minerals galena, sphalerite, pyrite, tennantite-tetrahedrite as massive to disseminated sulphides in a quartz-carbonate-dolomite gangue matrix. Silver is present both within galena and the tennantite-tetrahedrite minerals. The majority of the lead and zinc bearing minerals occur as sulphide minerals; however, there is also a significant component of oxide material present within the resource. Smithsonite is the main zinc carbonate (oxide) and cerussite occurs as the lead carbonate (oxide) mineral. As would be expected, the percentage of oxidation decreases with increasing depth and will be a factor in determining the mining and milling schedule. Mercury is contained in solid solution; that is, atomic replacement in the mineral lattices of sphalerite and tennantite-tetrahedrite. Consequently, the mercury will be taken off-site in the mineral concentrates.

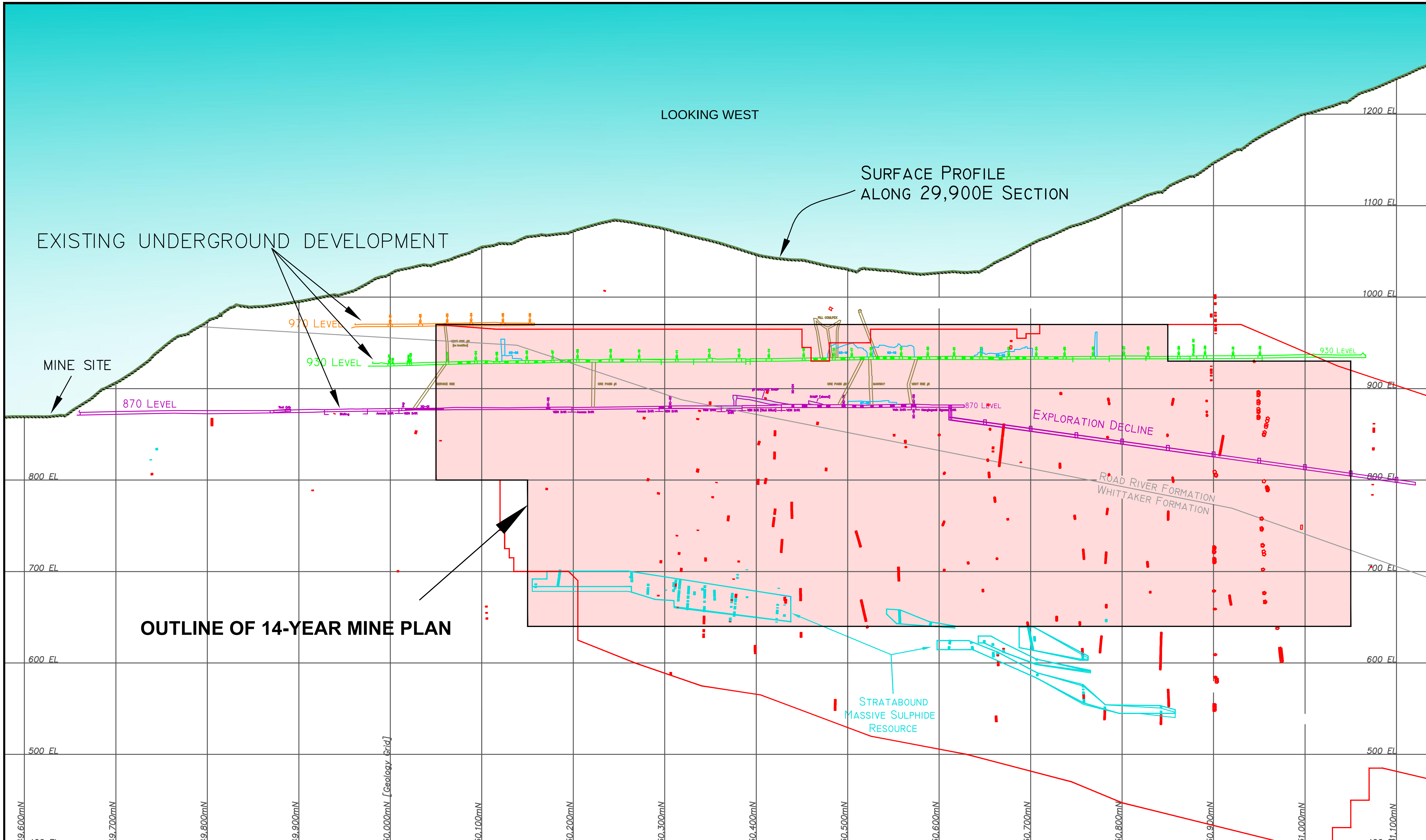
The width of the Vein varies from less than 0.1 m to greater than 5.0 m, averaging 2-3 m. Underground development has proven 940 m of Vein strike length, and diamond drilling has confirmed a continuance of the Vein for a further 1.2 km. The Vein remains open to the north beyond the last drill hole.

Towards the north end of the 930 m level workings (crosscut 30), a series of narrow (average 0.5 m wide) massive sphalerite-tennantite veins strike obliquely to the main .This zone is referred to as Vein Stockwork, and carries a mineral resource based on underground sampling and diamond drilling.

Stratabound Mineralization

Stratabound mineralization differs from the Vein type in that it is massive, has a higher pyrite content, lower galena content, large thicknesses, and appears to be somewhat planar similar to host rocks as opposed to the cross-cutting nature of the Vein. In the Main Zone, Stratabound massive sulphides occur largely within the mottled dolostone unit of the Whittaker Formation, close to both the Vein system and the axis of the Prairie Creek anticline.

Stratabound sulphide mineralization was identified in three stratigraphic horizons of the Upper Whittaker Formation, although the majority occurs within the mottled horizon. Mineralization consists of sphalerite-pyrite-galena, totally replacing the host dolostone with little associated alteration. Apparent thicknesses of the Stratabound zone of up to 28 m have been drill intercepted. The mineralization is generally fine grained, banded to semi-massive sulphide, consisting of massive fine-grained pink sphalerite, coarse-grained galena and disseminated to massive pyrite. This type of sulphide mineralization may be genetically related to the Vein mineralization; however, it is different in its mineralogy and structural setting. Stratabound mineralization has a low component of oxidation compared to the Vein.



CANADIAN ZINC CORPORATION

Date: October, 2009
Scale: As Shown
File Name: DAR Fig 4-15.dwg
Revised:
Drawn By: C. Reeves

LEGEND

- Main Vein Resource Outline
- Stratabound Resource Outline
- Drillhole intercept of stratabound massive sulphides
- Drillhole intercept of quartz/sulphide vein

SCALE
0 25 50 100 150 200
metres

PRAIRIE CREEK MINE

FIG 4-15:
MINERAL RESOURCE OUTLINE; LONG SECTION

Chemical Composition

A detailed description of host rock and mineralization geochemistry, including chemical composition, is given in a report by MESH Environmental Inc. dated April 2008. The report was submitted with CZN's applications for operating permits to the MVLWB, and is also available from the MVRB. A summary of host rock and mineralization chemical composition is given below.

All host rock units are elevated in concentrations of silver ("Ag"), cadmium ("Cd"), mercury ("Hg"), lead ("Pb"), antimony ("Sb") and zinc ("Zn") compared to crustal abundances. Concentrations of Cu, Pb, Zn, Sb, Cd and Ag tended to be highest in the upper host rock units (Road River Formation. and Unit 7) with occasional spikes located in the middle to lower units. Arsenic ("As"), copper ("Cu") and wolfram ("W") contents were elevated above crustal averages in upper host rock units (mainly Road River Formation material), with only an occasional spike in the other units.

The reason for these trends in metal content appears to be two-fold. The first is that many of the samples in the upper host rock units were collected in areas closer to the vein system (underground drifts and cross-cuts) and thus the increased metal content reflects the extent of mineralization in close proximity to the ore zones. Samples collected from drill holes in these upper units showed significantly lower metal contents. The second is that sulphide oxidation and redistribution of metals from nearby ore into adjacent host rock as metal carbonates (or "oxidized" metals) is more prevalent in the upper units closer to surface, likely as a result of increased movement of groundwater and rock-air interactions near-surface on a geological time scale. Occasionally, elevated metal carbonates at depth are indicated and are likely associated with the movement of groundwater along fractures. The presence of Zn and Pb carbonates (smithsonite and cerussite) in the upper units has been observed by mineralogical examination. In addition, many of the samples in the data set contain significantly higher Pb and Zn contents than can be accounted for by sulphides. Other elevated metals of potential concern (Cd, Ag, Cu, Sb, As, Hg, U and W) likely occur as substitutions or associations within sphalerite, galena, tetrahedrite/tennantite and/or metal carbonates.

Ratios of "oxidized" Pb/Zn (i.e. all Pb and Zn in carbonate forms) to total Pb/Zn grades in the Prairie Creek deposit show a clear trend of decreasing oxidized levels with depth. Similarly, calculated proportions of Pb and Zn as carbonate in a number of the host rock samples in this characterization program were significantly higher in the upper units (Road River and Unit 7) than in lower units. In both datasets, Zn carbonate was an order of magnitude higher in the near surface units than the lower units. A less definitive trend was observed for Pb. This is not unexpected since Pb is generally less mobile than zinc under oxidizing conditions.

Lateral gradation in total Pb/Zn contents away from the Vein was prevalent in Units 3, 4 and 5. Total Pb/Zn contents, predominantly as sulphides in the lower units, showed occasional spikes in the profiles as would be expected for a Vein system. No lateral trends in total Pb/Zn contents away from the vein existed in the upper units (Unit 6, Unit 7 and Road River Fm), likely a result of the influence of metal carbonates that overprint the upper part of the system.

Compared to host rock, the Vein and Stratabound samples were significantly elevated in the following metals: Ag, As, Cd, chromium (“Cr”), Cu, iron (“Fe”), Hg, Pb, Sb, W and Zn. All of these metals, with the exception of Fe, tended to have slightly higher concentrations in Vein material compared to Stratabound. The difference in metal content between the different types of mineralization is a result of differing mineral assemblages and proportions. In particular, base metals in the Stratabound are predominantly present as sulphides due to an overall decrease in metal carbonates with depth. Nearer to surface, base metals in the Vein are present as both sulphides and carbonates. Lower concentrations of calcium (“Ca”) and magnesium (“Mg”) in the Vein and Stratabound samples compared to host rock is consistent with other results that indicated that although some carbonates are present in mineralization, most of the effective buffering capacity in the deposit is provided by dolomite in the host rock.

4.11.2 Access Road Geology

Overview

The Prairie Creek Mine access road route is entirely underlain by sedimentary rock sequences generally consisting of various combinations of limestone, dolostone, siltstone, shale and mudstone.

There is a general reduction in geological structural complexity from the area of the Prairie Creek Mine site (steeply folded and faulted rock units) east to the Liard River (flat lying undisturbed sedimentary units). All rocks west of the Grainger Gap (Km 120) have been affected and displaced by the Laramide mountain-building events that affected much of western North America in Late Cretaceous time.

Structural complexity is also expressed in topographic relief which generally decreases from west to east. For ease of reference, based on both geology and topographic expression, the access road has been divided into six regional physiographic zones (refer to Figure 4-16), namely:

- Prairie Creek Basin (Km 0-Km 14.5)
- Mackenzie Range (Km 14.5-Km 40)
- Ram Plateau (Km 40-Km 90)
- Silent Hills (Km 90-Km 117)
- Nahanni Range (Km 117-Km 121)
- Platformal Lowlands (Km 121 to Liard River)

The region has only been mapped on a broad reconnaissance type scale by the Geological Survey of Canada. The Prairie Creek area has been mapped and documented in GSC Memoir 412 (Figure 81) entitled “The Prairie Creek Embayment and Lower Paleozoic Strata of the Southern Mackenzie Mountains” by Morrow and Cook in 1987. The most detailed maps for the remainder of the road are covered by the Geological Survey of Canada “Map 1378A, Geology of Virginia Falls” and “Map 1377A, Geology of Sibbeston Lake” both printed in 1976. These reports along with mapping completed by CZN, have been adapted to show the geology in simplified form in Figure 4-17 of this report. More detailed descriptions of each zone are given below.

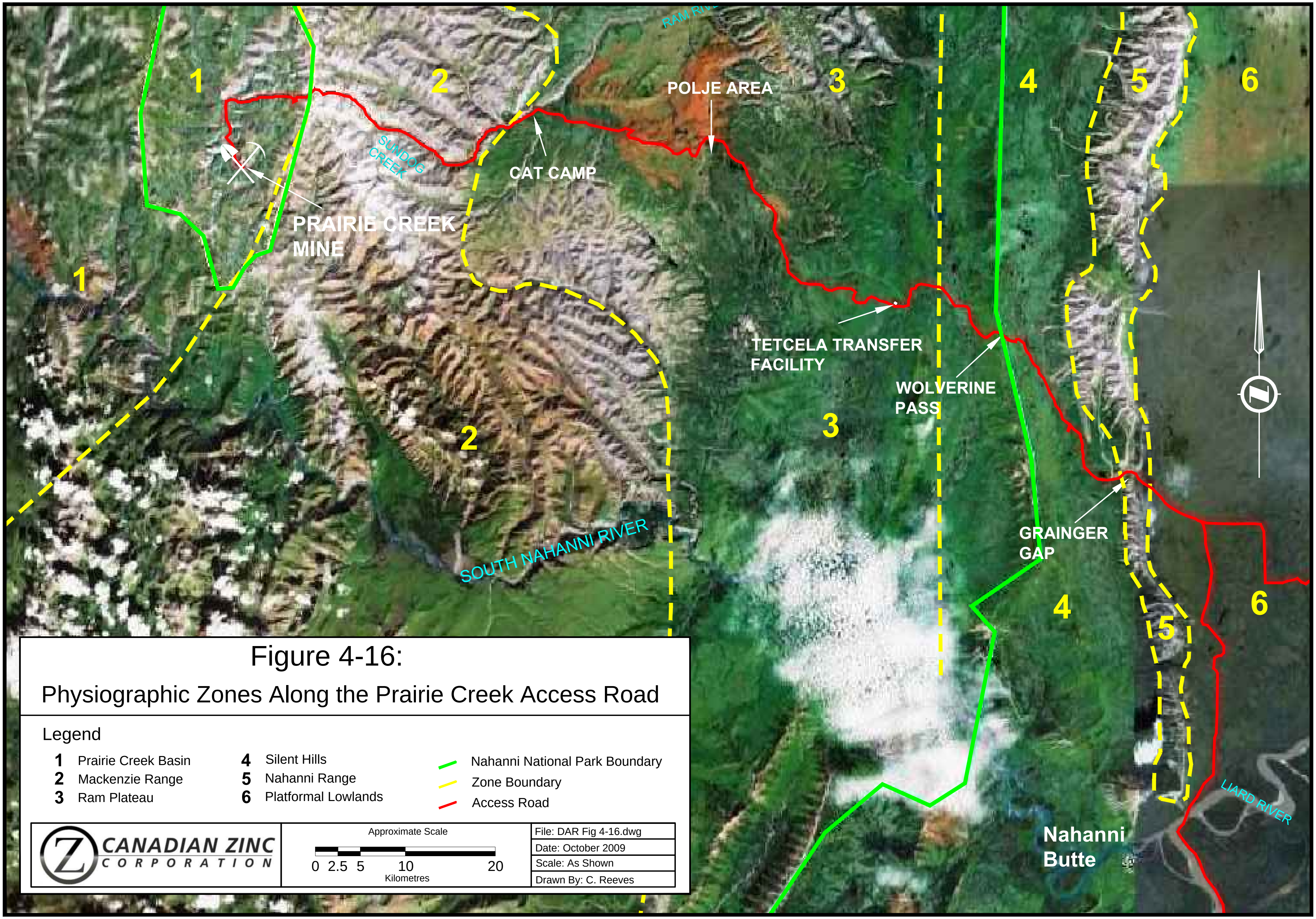


Figure 4-16:

Physiographic Zones Along the Prairie Creek Access Road

Legend

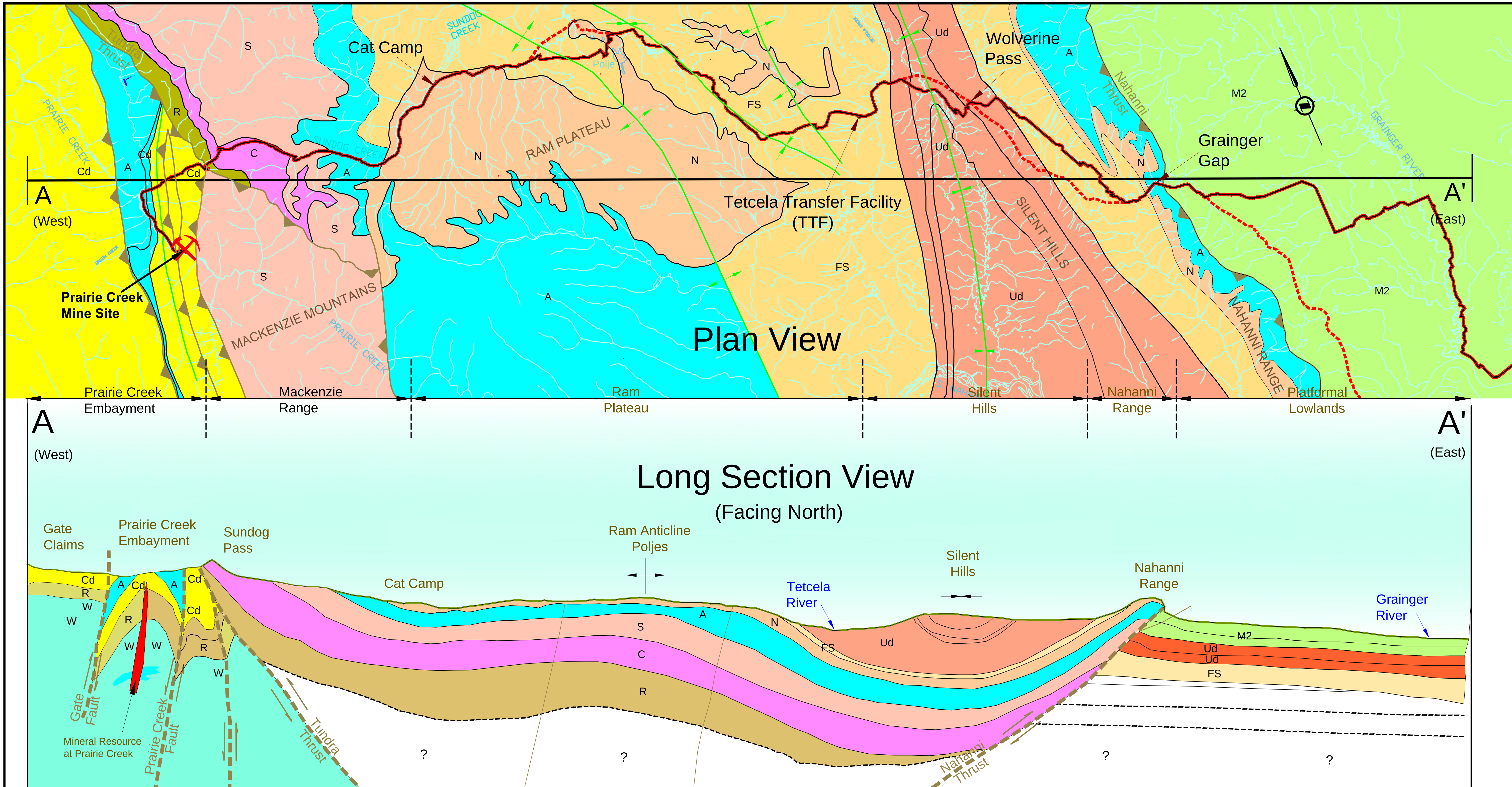
1 Prairie Creek Basin
2 Mackenzie Range
3 Ram Plateau
4 Silent Hills
5 Nahanni Range
6 Platformal Lowlands

Nahanni National Park Boundary
Zone Boundary
Access Road

CANADIAN ZINC CORPORATION

Approximate Scale
0 2.5 5 10 20
Kilometres

File: DAR Fig 4-16.dwg
Date: October 2009
Scale: As Shown
Drawn By: C. Reeves



Legend

Prairie Creek Formations

- Cd — Cadillac
- A — Arnica
- W — Whittaker
- R — Road River

Platform Formations

- M2 — Mesozoic Units
- Ud — Upper Devonian Unit
- FS — Fort Simpson
- A — Arnica
- N — Nahanni
- S — Sombre
- C — Camsell
- R — Road River

- Major Faults
- Access Road
- Access Road Re-Alignments
- Formation At Depth

Partly Adapted from Geological Society of Canada Maps 1378A and 1377A

Approximate Scale

0 1 2.5 5 10 20

Kilometres

Figure 4-17:

Simplified Regional Geology Along the Prairie Creek Access Road

File: DAR Fig 4-17.dwg

Date: October 2009

Scale: As Shown

CANADIAN ZINC CORPORATION

Prairie Creek Basin (Km 0-Km 14.5)

The area adjacent to Prairie Creek lies within the Mackenzie Mountains and contains up to 1,000 m of topographic relief in the form of abrupt cliffs and mountains.

Between Km 0 and Km 14.5, the road is underlain by rocks of the Prairie Creek Embayment which is a paleo-basin developed during Ordovician times and received active sedimentation during Ordovician-Silurian times. The regional Laramide deformation severely foreshortened the Prairie Creek Embayment units and the entire sedimentary rock sequence underwent compression to form complex folds and steep regional reverse-type faulting.

The access road abruptly turns east at Km 7 along Funeral Creek, and crosses the PC antiformal structure. The PC antiform is a continuation of the same geologic structure that is found at the Prairie Creek Mine (Figure 4-12). The PC antiformal structure at the Mine plunges at an average 15 degrees to the north, hence along this particular section of road (Km 7 to Km 12), younger rock formations are exposed (the Arnica Formation) which overly the primary host target units that are now at depth. At Km 9.5, the road crosses the main axis of the fold and coincidently this is also where the Rico base metal showing was discovered, after road building in 1980 revealed the presence of high- grade base metal bearing boulders in the creek bed. The Rico showing is located 4 Km due north of the most northerly drill hole completed at the Mine site. This drillhole (PC-95-124) also intercepted significant high-grade base metal mineralization at depth, and it is believed the Rico mineralization represents a strike extension of the same mineralization, but is yet to be fully explored.

A basal thrust is evident, as exposed on the north side of Funeral Creek, at approximately Km 14.5, and is referred to by Morrow et al. as the Tundra Thrust. The Thrust is a regional structure that dips moderately to the east and defines the eastern edge of the Prairie Creek Embayment rock sequence. The Thrust displaces the eastern sedimentary sequence over the folded Prairie Creek units (Cadillac Formation).

Mackenzie Range (Km 14.5-Km 40)

The road attains a maximum elevation of 1,522 m at Km 17, referred to as Sundog Pass. From the Pass eastward, all drainage reports to Sundog Creek, a tributary of the Ram River which subsequently drains into the Mackenzie River. In this physiographic section, the road slopes downhill to the east towards Cat Camp. The area is characterized by tight valleys, a number of stream crossings, active talus fields, box canyons and steep slopes.

East of the Tundra Thrust (Km 14.5), thick mountain forming assemblages of sedimentary rocks forming the Cadillac mega-breccia are overlain by the Camsell Formation which is in turn overlain by the thick sequence of the Sombre Formation. The latter consists of dolostones and limestones, and is subsequently overlain by the cherty siltstones referred to as the Arnica Formation up to the eastern edge of the Mackenzie Mountain range at Km 40. These platformal rock units are thought to be related to the rock units found within the Prairie Creek Embayment.

As the road approaches Cat Camp (Km 37), younger Devonian age units of the Headless Formation and the thick, competent limestone units of the Nahanni Formation become exposed and form the prominent bluffs and walls of the large box canyons around Sundog creek. At around Km 40, the terrain opens up into the broad, undulating Ram Plateau.

Ram Plateau (Km 40-Km 90)

The Ram Plateau is a regional feature which, depending upon what is included, is an area up to 30 Km east-west and over 100 Km north-south. It is characterized by moderately rolling terrain with local steep walled canyons and incised drainages.

The Ram Plateau is underlain by the Nahanni Formation which, where eroded, forms prominent bluffs and box canyons. The Nahanni Formation is a limestone unit and is susceptible to erosion and/or dissolution by surface and ground waters. The dissolution of the Nahanni Formation has been intense enough in places to form karstlands, discussed further in the following section of this report. The Nahanni Formation is well exposed in the rugged area of the Ram River just to the north of the access road. The Nahanni Formation arches up in a broad antiform and has been eroded to form spectacular box canyons. Overlying the Nahanni Formation are the black shales of the Horn River and Fort Simpson Formations, which tend to form impermeable caps that protect the underlying limestones from erosion.

Silent Hills (Km 90-Km 117)

Shortly after crossing the Tetcela River, the road climbs steeply up the Silent Hills Range to Wolverine Pass at an elevation of 580 m. East of Wolverine Pass, the road follows an area of poor drainage bordered by the Silent Hills to the west and the Nahanni Range to the east with a slight gradient to the north.

Rock exposure in this area is generally poor, however regional mapping has shown the area to be underlain by Mesozoic sedimentary formations which vary from carbon-rich shales to mudstones and siltstones. These units overlie and are younger than the Nahanni assemblage to the west. Formations mapped by the GSC above the Nahanni Formation include the Yohin Formation containing thinly bedded sandstones, the Clausen Formation, consisting of black shales, and the Flett Formation limestones in the core of the syncline at Wolverine Pass.

Nahanni Range (Km 117-Km 121)

At Km 117, the road approaches a mountain pass, referred to locally as the Grainger Gap or Second Gap, which cuts through the front range mountains of the Nahanni Range. The eastern basal slope of the Nahanni Range contains the Nahanni Thrust structure which defines the eastern limit of the Mackenzie Fold Belt. The Nahanni Thrust is a regional fault that dips at a shallow angle to the west and can be followed for many kilometres surficially and at depth through seismic profile. From the east, the Nahanni Range is the first set of mountains and forms the prominent regional buttress of bluffs against the lowlands to the east. The rugged appearance of the Nahanni Range is formed by the competent rock units of the Arnica and Nahanni Formations which have been thrust upwards. The elevation in Grainger Gap is 520 m and is bounded to the north and south by steep mountain peaks of the Nahanni Range up to 1,400 m in elevation.

Platformal Lowlands (Km 121 to Liard River)

East of the Nahanni Thrust lie the relatively undisturbed horizontal sedimentary layers of the Interior Plains.

Topography is very subdued and poor drainage produces extensive areas of swamp and muskeg; hence, exposure of bedrock in the area is very limited. All drainage in this area reports to the Grainger River which in turn flows into the Liard River. Some historic oil and gas wells show the subsurface being underlain by Mississipian black shales, mudstones and siltstones of the Besa River Formation.

Extensive Quaternary river alluvium material occurs associated with the Liard and South Nahanni Rivers. In addition, glacial moraine-type deposits, including till deposits, are extensive throughout the area. Surficial geology has been mapped by the GSC in Map 1693A, entitled "Surficial Geology Southern Mackenzie River Valley", dated 1988.

4.12 Terrain

Golder and Associates completed a terrain assessment report (Appendix 16). The report contains a series of photographic plates that portray the terrain features from the Prairie Creek Mine site and along the access road. Attached with the photographs is a description of the terrain relating to landforms, stability and granular deposits.

In addition to the photographic series, the report contains a table describing terrain zones along the road specifically relating to ground characteristics, slope stability, affects of terrain on the road, and affects of the road on terrain.

4.12.1 Seismic History

Prior to 1985, there were no recorded seismic events in the region of Prairie Creek. A magnitude 6.6 earthquake occurred on October 5, 1985 followed by a magnitude 6.9 event on December 23, 1985 (refer to Appendix 25). The occurrence of the 1985 seismic events prompted a seismic monitoring system to be set up in the region, and these have recorded a long succession of aftershocks in the area. Prior to 1985, the Nahanni Range was thought to be a relatively quiet earthquake zone.

The Prairie Creek Mine site was constructed in 1980-82 and did not appear to suffer any significant consequences of the 1985 seismic events. However, there is a Procan Exploration company report dated December 2, 1985 which implies a possible change in sub-surface water flow paths underground. It is unknown if these were temporary or permanent adjustments. The access road was not being utilized at the time of the quakes and there has been no apparent damage to the road that can be attributed to them.

The Golder Report (Appendix 16) states that past seismic activity does not appear to have caused failures of the slopes along Prairie Creek, Funeral Creek and Sundog Creek, at the scale of the valley slope. Smaller rock fall failures may have been triggered by past seismic shaking, however, these events are not readily distinguished from other forms of small scale rock fall. Future performance of the subject slopes during earthquake events cannot be determined with certainty, but the current evidence indicates that the likelihood of large rock slope failures occurring due to seismic activity is very remote.

4.12.2 Karst Landform

Background

The process of karst formation is caused by carbon dioxide dissolved in rain that percolates through the soil as a weak solution of carbonic acid. The infiltrating water naturally exploits any crack or crevice in the rock. Over long periods of time, carbonate rocks (such as limestone) begin to dissolve. However, surface lowering and wall retreat within fissures and caves occur at a rate of no more than a few millimetres per 100 years in tropical conditions, and rates are even less in temperate (colder) climates.

Openings in competent carbonate bedrock increase in size, and an underground drainage system begins to develop allowing more water to pass and further accelerating the formation of karst. Eventually, this can lead to the development of subsurface caves.

Karst Development on the Ram Plateau

The Ram Plateau is defined as the broad geographic area between the Silent Hills Range (east) and the Mackenzie Mountains (west), over 30 km east-west and greater than 100 km north-south. Topography throughout the Ram Plateau is subdued compared to the adjacent mountain ranges, however, many areas within the plateau contain incised, rugged steep-sided canyons, which are especially well developed in the Ram River area.

The steep-sided canyons generally formed as a result of the exposure of thick beds of the competent Nahanni Formation limestones. The Nahanni Formation is susceptible to dissolution or karstification due to its calcium carbonate composition.

Structurally, the Ram Plateau is underlain by a series of gently alternating folded anticlines and synclines. The Nahanni Formation is overlain by shales of the Horn River/Fort Simpson Formation which, by virtue of their very fine grained nature, are quite impervious to water infiltration.

Dr. Derek Ford, a renowned karst expert from McMaster University in Hamilton, Ontario, has completed numerous studies of the karst landforms and processes within the Ram Plateau and has identified many areas of particular focus within this terrain. The focus of the study is the area generally to the south of the access road where the Nahanni Formation is well exposed and incised. Many karst features were identified and documented and include, but are not limited to the Poljes, sinkholes (dolines), suffosion terraces, caves, labyrinth karst, and tower karst..

The Polje Area

The Polje area is one of the areas of karst development that has been the primary focus of research. The area occurs along the access road near Km 50 where the Nahanni Formation is exposed. At Km 55 to Km 57, the access road crosses the trend of the Poljes which are referred to as the First, Second and Third Poljes. Figure 2 in the Golder Report (Appendix 16) shows the location of the existing and proposed road routes in relation to specific terrain and karst features. This figure also shows recent photographs of the various karst features proximal to the road.

A Polje is defined as a flat floored, steep sided enclosed basin which is fed by groundwater. A Polje does not have any apparent surface water source, such as a creek or river, water entering or leaving via subterranean means. Depending on groundwater flow, water levels within a polje can vary considerably and the feature can either be full of water or empty. Ford et al determined that the poljes are connected hydrologically through subterranean conduits or aquifers. Dye tracing experiments confirmed the movement of groundwater from south to north, that is, from the Third to the Second to the First Polje, the water finally emanating to the surface as the Bubbling Spring just north of the First Polje. The spring feeds Polje Creek which flows north to Sundog Creek.

In addition to the Polje area, the access road crosses what Ford terms the Southwest Suffosion Terrace (Km 48 to 54), which is an elevated plateau above the Polje system. A number of suffosional sinkholes are developed in this area due to dissolution of the Nahanni Formation underneath the shale cap. Due to the elevation difference, groundwater drains to the Poljes and to the Bubbling Springs area.

The alternative road route proposed (Polje By-pass) would avoid the Southwest Suffosion Terrace and the Polje system completely. The by-pass would cross Polje Creek more than 1 km downstream from the Bubbling Springs area.

4.12.3 Soils and Granular deposits

Surficial deposits can be divided into those on the valley floor and those on the valley slopes. Alluvial deposits blanket the valley floor. In the Mine Site area, the alluvium is in excess of 23 m deep in places, and consists mainly of coarse sands and gravels overlying bedrock. A silty clay layer 7-10 m thick also occurs in many places at a depth of 5-7 m below surface.,There is also a clay layer in the profile that was probably formed by an ancient glacial lake. This clay layer was partially excavated and the material used to line the base and berms of the large pond.

The valley slopes are composed of bedrock outcrops and coarse-grained colluvium.

According to Soils of Canada (Clayton et al, 1977), Brunisols are the dominant soils in the area developed on steeply sloping terrain. In the Mine Site area, Brunisols are present on the gentler slopes and the inactive floodplain, while Regosols are found on the steeper slopes and active floodplain. Both stony and rocky phase Regosols are present. The soil moisture is humid, no part being dry for 90 consecutive days.

4.12.4 Ground Stability

Ground stability comments from the Golder report (Appendix 16) are briefly summarized below.

Based on a review of available aerial photos, historic, large scale rock slope failures are not evident in the Prairie Creek valley in the vicinity of the Mine Site, nor along the access route within the Funeral Creek and Sundog Creek valleys.

Local areas around the site and parts of the access road are prone to active, small scale rock falls. These areas occur in the mountainous terrain at site and from Km 0 to 35 (Cat Camp area) along the road. Infrastructure at the Mine and Cat Camp is constrained by topography and is proximal to these local falls. Operational practices, such as on-going monitoring and maintenance, can mitigate the effects of these relatively small events.

Rocky debris flows with essentially no organics and derived from adjacent talus have accumulated on the slopes. Flow events are believed to be related to high run-off conditions, possibly due to intense precipitation events and/or to periods of rapid thaw. Evidence of past debris flow activity can be seen at the locations of many small lateral drainages along Prairie, Funeral and Sundog Creeks.

Large scale, historic soil slope instabilities were documented by Golder in the Km 39 and Km 60 areas of the access road. Generally, the instabilities do not appear to be active. A number of recent, small-scale soil slope failures were noted along the road. These appear to be located near the interface between the surficial glacial soils and the underlying Horn River Shale Formation.

Mud flows are defined as slope failures that involve generally fine-grained soils that move in liquid fashion normally with only ten's of metres of displacement. A relatively large recent mudflow was noted at the Second Polje (Figure 1 in Appendix 16) and the western slope of the Silent Hills. These failures appear to be related to degradation of ice-rich ground in the area of the failures, possibly along with increased seepage or surface run-off into the failed areas.

It is anticipated that ice rich ground will be encountered along the existing and proposed re-aligned sections of the road. Where possible, maintenance of the organic layers in a viable and uncompacted state will help to maintain the thermal status of these areas.

5.0 EXISTING HUMAN ENVIRONMENT

5.1 Historic Developments

The Prairie Creek property has had a long sporadic history of exploration and development since mineralization was first discovered on the west bank of Prairie Creek in 1928. Excluding the access roads, there are over 100 km of tote roads on the property that supported various exploration and development activities.

5.1.1 Pre-1975

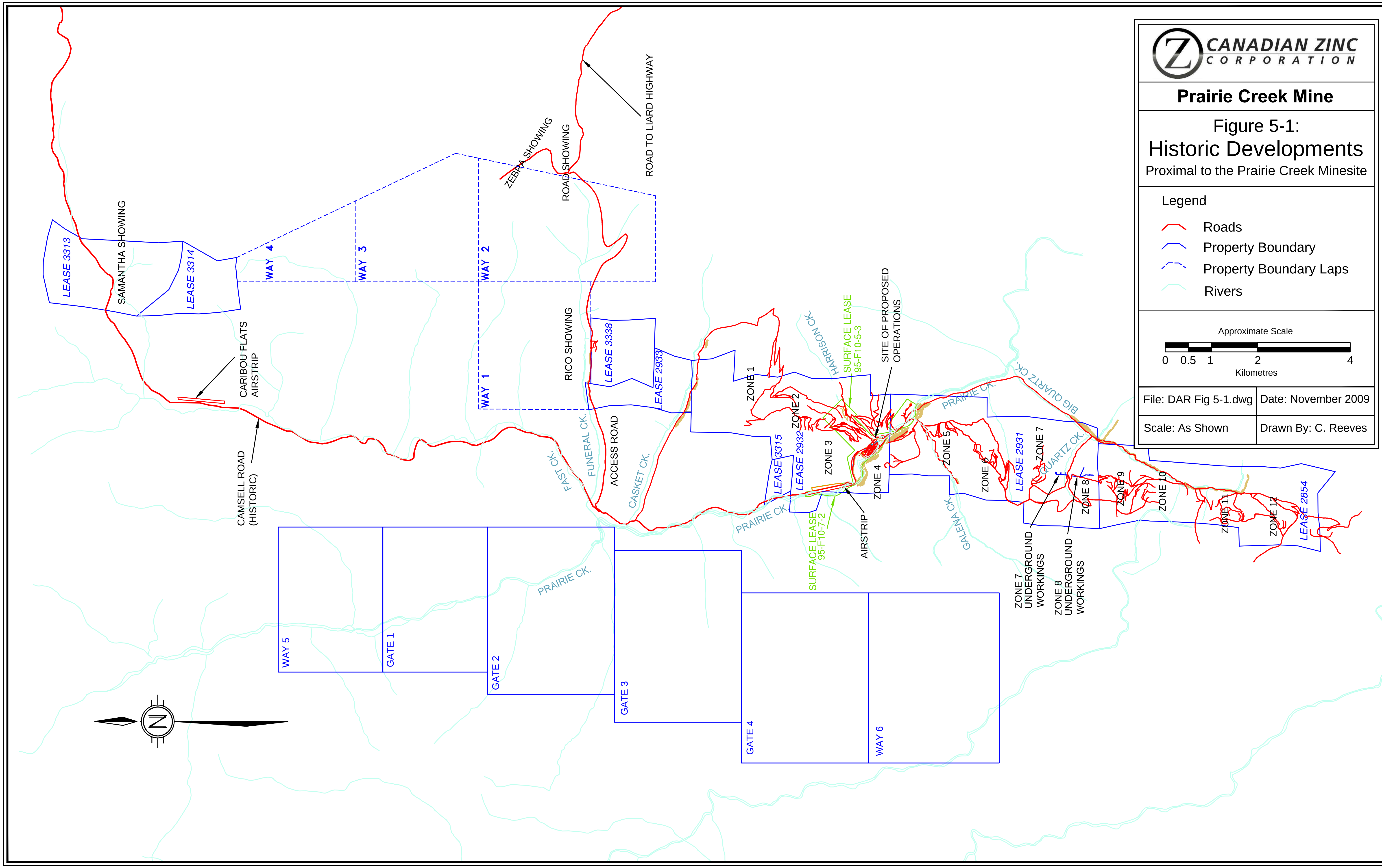
In the mid 1960's, significant exploration was commenced after two caterpillar bulldozers were brought into what is now the main Prairie Creek Mine site. The machines were barged to an area downstream from the Gate but upstream of Prairie Creek on the South Nahanni River and, with access to fuel drops from planes, were able to travel overland and into the Prairie Creek valley. The dozers commenced site development, including tote roads for drill access.

A small camp was set up at the present Mine site area and a small airstrip was established along the creek bed in 1967 to enable re-supply of the site by fixed wing. In 1968, a caterpillar ("Cat") trail was established in to Zones 7 and 8 utilizing the floodplain of Prairie Creek downstream to Big Quartz Creek, then up Big Quartz Creek to a steep ravine between Zones 7 and 8. Zones 7 and 8 contain large exposures on both hilltops of high-grade lead-zinc bearing veins. These veins were the primary focus of early exploration at Prairie Creek, 4 km to the south of the present day Mine Site. During 1969, Zones 7 and 8 were further explored by development of approximately 500 m of underground drifting along with surface prospecting. At the same time, the main vein system at Zone 3 had been discovered and was being accessed by underground development. Through the early 1970's to 1975, more roads were put in by Cat to the southern zones, reaching all the way to Zone 12. In 1975, the underground workings in Zones 7 and 8 were extended a further 270 m in a series of cross-cuts and drifts.

5.1.2 1975-1979

In 1975, a 198 km access road was established from Camsell Bend, just south of the ferry crossing of the Mackenzie River on the Mackenzie Highway north of Fort Simpson, into the Prairie Creek Mine Site. The new access provided a route to bring in supplies and new equipment which led to further site development and underground excavation at the main site, and further establishment of a network of exploration roads in the southern zones. Diamond drill exploration took place throughout the southern zones at Prairie Creek during the 1970's, including both surface access drilling and helicopter-supported diamond drilling.

In addition to the work in the southern claims, the new Camsell Road led to the discovery of base metal mineralization at the Samantha showing in the pass area at Km 20 along the Camsell Road (Figure 5-1). This discovery led to further reconnaissance-type exploration and mineral staking throughout the northern sector of the Prairie Creek property.


CANADIAN ZINC CORPORATION
Prairie Creek Mine
Figure 5-1:
Historic Developments
Proximal to the Prairie Creek Minesite
Legend
Roads
Property Boundary
Property Boundary Laps
Rivers
Approximate Scale
0 0.5 1 2 4
Kilometres
File: DAR Fig 5-1.dwg
Date: November 2009
Scale: As Shown
Drawn By: C. Reeves
ROAD TO LIARD HIGHWAY
ZEBRA SHOWING
ROAD SHOWING
SAMANTHA SHOWING
LEASE 3313
LEASE 3314
WAY 4
WAY 3
WAY 2
WAY 1
RICO SHOWING
LEASE 3338
LEASE 2933
CARIBOU FLATS AIRSTRIP
CAMSELL ROAD (HISTORIC)
FAST CK.
FUNERAL CK.
ACCESS ROAD
CASKET CK.
PRAIRIE CK.
ZONE 1
ZONE 2
ZONE 3
ZONE 4
ZONE 5
ZONE 6
ZONE 7
ZONE 8
ZONE 9
ZONE 10
ZONE 11
ZONE 12
HARRISON CK.
SURFACE LEASE 95-F10-5-3
SITE OF PROPOSED OPERATIONS
LEASE 3315
LEASE 2932
SURFACE LEASE 95-F10-7-2
AIRSTRIP
BIG QUARTZ CK.
QUARTZ CK.
GALENA CK.
LEASE 2931
LEASE 2854
ZONE 7 UNDERGROUND WORKINGS
ZONE 8 UNDERGROUND WORKINGS
WAY 5
GATE 1
GATE 2
GATE 3
GATE 4
WAY 6
N

5.1.3 1979-1982

Sufficient underground and surface exploration and development had taken place at Prairie Creek by 1979 to enable the completion of the Prairie Creek Definitive Feasibility Study, which was completed by Kilborn Engineering Ltd. in 1980. At the same time this study was being completed, the Liard Highway (#7) was under construction by the government to join Enterprise, south-east of Fort Simpson, to Fort Liard. The establishment of this highway corridor prompted Cadillac Explorations to commence construction, in 1980, of a new access road connecting the Prairie Creek Mine site with the Liard Highway near Lindberg's Landing, north of the Blackstone River. The new access road from Highway 7 provided the necessary support to bring in all supplies, equipment and manpower to build a new camp at Prairie Creek that housed over 200 people, construct a 1,000 ton per day mill, and a 2 storey office complex along with other mine facilities

The access road was completed and operational in late 1980 and 2 camps (Cat and Grainger) containing fuel caches were established along the route:

5.1.4 Grainger Camp

The Grainger Camp site is located at 61º15´ N latitude, 123º4´ W longitude to the east of Nahanni Range (refer to Figure 4-1). The Camp is located at Km 144 on the existing access road, and was established in 1981-82 as a staging area for the construction of the road and Mine. A fuel cache was maintained at the site. A 1,500 foot long airstrip was also established.

The Camp consists of the following infrastructure:

- Five silver (9,000 litre) horizontal fuel storage tanks;
- One blue and two yellow 400 barrel (82,000 litre) skid mounted bulk fuel storage tanks (Figure 5-2);
- Approximately 150 lengths of culverts (various diameters).

While the site is referred to as a Camp, there are no camp trailers at this location.

Fuel at the Grainger Camp was also incinerated in March 2002.

5.1.5 Cat Camp

The Cat Camp site is located at 61°36´ N latitude, 124°22´W longitude on the east side of the Mackenzie Mountain divide (refer to Figure 4-1). Cat Camp was established at Km 38 of the existing access road, just south of the large alluvial outwash plain of Sundog Creek (Figure 5-3). The Camp was established in 1981-82 as a staging area for the construction of the road and Mine. A fuel cache was maintained at the Camp.

CANADIAN ZINC CORPORATION

Date:	October 2009
Drawn By:	C. Reeves
Scale:	Not Shown
Drawing:	DAR Fig 5-2.dwg

FIGURE 5-2: Grainger Site

CANADIAN ZINC CORPORATION

Date:	October 2009
Drawn By:	C. Reeves
Scale:	Not Shown
Drawing:	DAR Fig 5-3.dwg

FIGURE 5-3: Cat Camp Site

The Camp consists of the following infrastructure:

- One red 9,000 litre skid mounted fuel storage tank;
- Two yellow 400 barrel (82,000 litre) skid mounted bulk fuel storage tanks;
- One blue 400 barrel (82,000 litre) skid mounted bulk fuel storage tank;
- Sixty-seven 205 litre drums and twenty-five 100 litre drums;
- Four ATCO style camp trailers;
- Approximately 200 lengths of various diameter steel culverts.

CZN applied to the MVLWB for a Land Use Permit in 2000 (MV2000C0030) to re-establish the road and retrieve valuable diesel fuel that was stored at Cat Camp and take it to the Mine for safe storage. This application was referred to EA. In the fall of 2001 before the EA process was complete, inspectors from Environment Canada observed some leakage from the fuel tank, and instructed Indian and Northern Affairs Canada ("INAC") officials to make plans to incinerate the fuel. This was done in March 2002. The MVRB subsequently closed the EA proceedings for the project.

5.1.6 Post-1982

The Mine was almost completely developed and built before operations were halted in April 1982. Since that time, there have been periodic drill exploration campaigns throughout the property. Most of the drill exploration programs utilized existing roads or extended the existing ones. A drill campaign by CZN in 2002 near Sundog Pass created a new area of roads in the Zebra area for diamond drilling.

5.2 Other Infrastructure

The only other infrastructure known in the area pertaining to this EA is a small cabin located on a lake immediately to the west of Grainger Gap near the access road. This cabin is owned by Raymond Vital, from Nahanni Butte, and is used occasionally. A trap-line was active in this area in the past, but is not consistently utilized at present.

5.3 Protected Area Status

The Nahanni National Park Reserve ("NNPR") was expanded to 30,000 km^2 in June 2009 by act of parliament, making it the third largest National Park in Canada (see Figure 1-5). The enlarged Park covers most of the South Nahanni River watershed and completely encircles the Prairie Creek Mine. However, the Mine itself and a surrounding area of approximately 320 km^2 are specifically excluded from the Park and are not part of the expanded Park. The Mine site is approximately 6 km upstream of the point where Prairie Creek crosses the new park boundary.

Section 7(1) of the new Act amended the Canada National Parks Act to enable the Minister of the Environment to enter into leases or licences of occupation of, and easements over, public lands situated in the expansion area for the purposes of a mining access road leading to the Prairie Creek Mine, including the sites of storage and other facilities connected with that road. Previously, an access road to a mine through a national park was not permitted under the Canada

National Parks Act, and the Act was amended solely for NNPR and specifically for the purpose of providing access to the Prairie Creek Mine area. The expanded park area will include all lands surrounding the Prairie Creek Mine site; however, Parks Canada has confirmed that CZN's rights will be respected, including rights of access. Therefore, development of the Prairie Creek Mine is not precluded by the expansion of the NNPR and use of the existing access road through the expanded park reserve will continue.

Approximately half of CZN's access road from the Mine to the Liard Highway is inside the expanded park. Specifically, from the Mine site, the road enters the park at Km 17 and leaves at Km 98.

In the Final Draft Dehcho Land Use Plan (2006), the Mine site and the road alignment to approximately Km 115 are within land use zone No. 6, Greater Nahanni Ecosystem. The listed acceptable land use for this zone is tourism. The remainder of the road alignment is within land use zone No. 24, Grainger/Liard Rivers, and the listed acceptable land uses are forestry, tourism and agriculture.

5.4 Highway 7 Traffic

Prairie Creek Mine operations require the transport of significant volumes of concentrate out-bound from the Mine and supplies in-bound to the Mine. Optimal utilization of existing transportation routes is imperative to a successful operation (refer to Figure 5-4).

Assuming the route re-alignments along the access road are accepted, traffic out-bound from the Mine site would join the existing Nahanni Butte road at Km 163, then travel to the Liard Transfer Facility at Km 172, located at the junction of the Nahanni Butte Road with Highway #7. The junction is located at Km 131 on Highway #7 (measured from the BC border). The Fort Liard junction is at Km 38. At the Territorial/Provincial boundary, Highway #7 becomes Highway #77. It is a further 173 km to the Fort Nelson rail yard.

The 24 km long Nahanni Butte road, while recently classified as an all-season road, is still undergoing improvements to accommodate heavy vehicles, but is currently rated for light vehicles only during the summer. During the winter season, an ice bridge is established across the Liard River (at Km 12) and the frozen road bed is better able to handle heavy vehicles. When the ice bridge is not in operation, Nahanni Butte is cut off from direct highway traffic, and boats are required to cross the Liard River.

In 1980-81, Highway #7 was under construction and had connected the Mackenzie Highway #1 to Lindberg Landing. Completion of the Highway to the BC border in order to connect with Fort Nelson via Highway #77 in BC was planned. At the same time that Highway #7 was being constructed, a feasibility study for a new access road from the Mine to connect to the new highway for haulage to Fort Nelson was being carried. At the time of Highway #7 construction, there was limited access to suitable road aggregate, and local pits provided mostly silt bearing fill material. This fill has proved to be problematic for the continuing maintenance of the Highway. The Department of Transport for the Government of the Northwest Territories ("DOT") has placed weight restrictions on use of the highway from mid-March to early June of each year.

Table 5-1 indicates monitored highway usage from statistics gathered by the DOT since 1999. This table demonstrates that usage of the highway is quite low with an annual average of less than 50 vehicles/day. Moderate traffic increases are noted south of Fort Liard in proximity to the BC border.

Highway #77 in BC is currently an approved 85 tonne gross vehicle weight route. There are some restrictions on the Highway related to over width loads crossing the bridge over the Fort Nelson River at Km 42.

The proposed Prairie Creek Mine transport operations would focus on utilizing frozen road beds to complete the majority of the haulage requirements in order to minimize road degradation issues. A more detailed description of the proposed haulage schedule is outlined in Section 6.23.

Table 5-1: Highway #7 Traffic

AVERAGE ANNUAL DAILY TRAFFIC

Kilometre	Counter ID	Counter Location	2008	2007	2006	2005	2004	2003	2002	2001	2000	1999
35	7-35	2.6 km south of Fort Liard	110	110	140	120	na	120	120	120	**	**
253	7-253	0.3 km south of Highway 1 & 7	50	50	30	30	na	30	30	30	30	30
Peak Summer Average Daily Traffic (June, July, August)												
35	7-35	2.6 km south of Fort Liard	0	**	**	130	**	130	130	130	**	**
253	7-253	0.3 km south of Highway 1 & 7	0	**	40	40	**	40	40	40	50	50

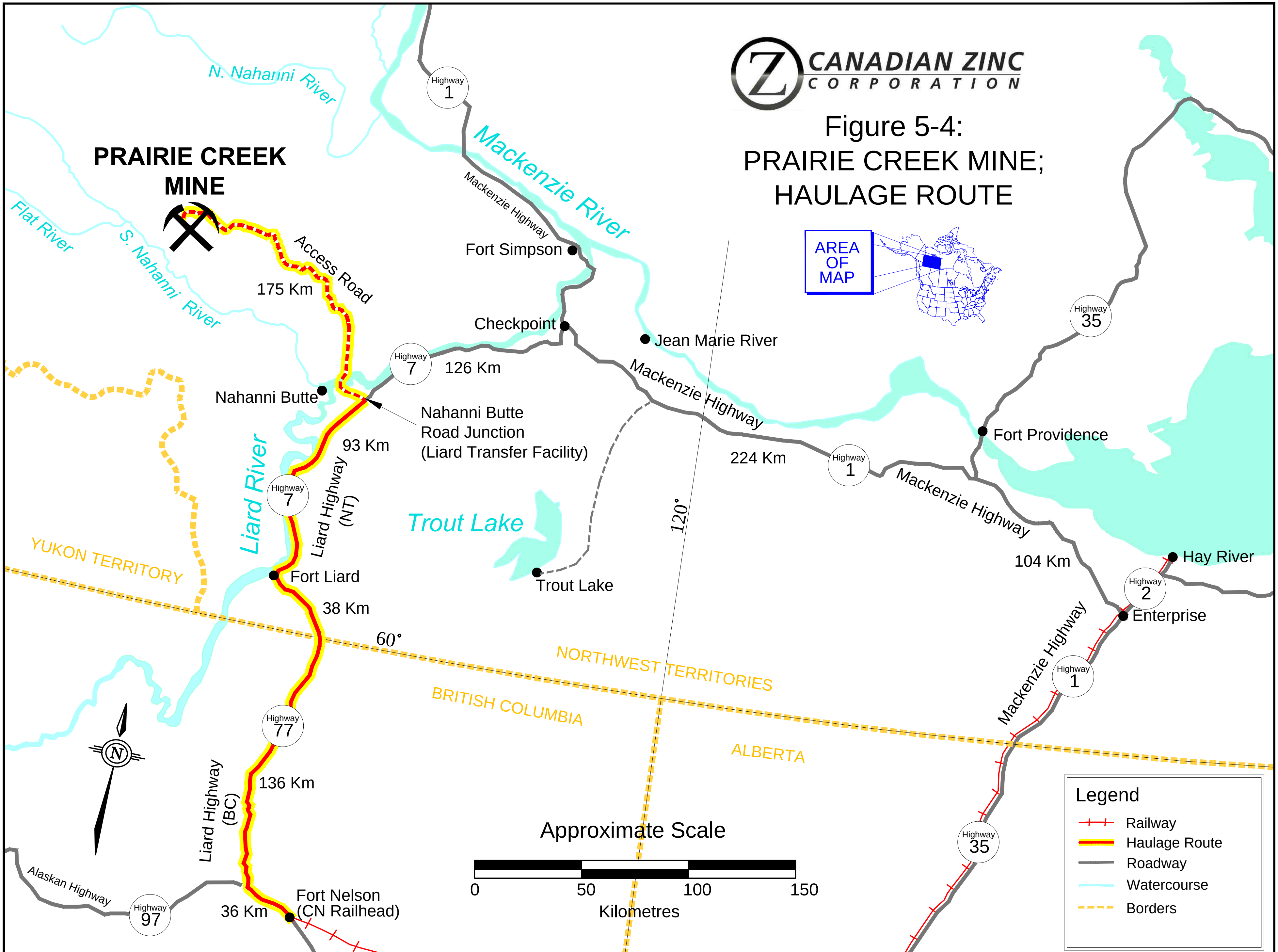
all values estimated and rounded to nearest 10

Traffic on Northwest Territories Highway 7 by Counter (prior to 1999)

FORT LIARD															
Kilometre	**Counter ID**		**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**PSADT**
1	ftl-1	**1998**			242	175	207	332	405	326	249				354
		1997	166	218	211	238					132	89			
		1996		195	210				252	197	193	156		142	225
		1995	172	366	339	213	220	209	255	297	220	172	135	134	254
		1994	150	161	197	169	206			231	190	199	162	172	231
		1993	155	165	166	170	180	204	211	193	180	171	162	146	203

NAHANNI BUTTE WINTER ROAD			Open	Close	Total	Jan	Feb	Mar
Kilometre	**Counter ID**							
2	nbwr	**1997**	09-Dec-96	17-Apr-97	129	23	40	69
		1996	01-Dec-95	25-Mar-96	115	11	10	19
		1995	01-Dec-94	26-Mar-95	115	10	17	39
		1994	10-Dec-93	26-Mar-94	100		20	10
		1993	15-Dec-92	26-Mar-93	102		13	12

Figure 5-4:
PRAIRIE CREEK MINE;
HAULAGE ROUTE



5.5 Training/Skill levels

A Socio-Economic Impact Assessment ("SEIA") for the Prairie Creek Mine compiled by Impact Economics (Appendix 19) indicates in detail the availability and average skill levels of the local and Dehcho regional labour pool and business capacity. Since there is only a limited population, coupled with the fact that the region has incurred only limited industrial, non-governmental economic activity in the region, there is not a large population with high or moderate skill levels. However, with time, training and potential employment opportunities, the potential labour pool can be enhanced from its present levels.

While business services are limited, each First Nation in the Study Area operates a development corporation capable of expanding to take on new roles or brokering joint venture arrangements with larger firms. In Fort Liard, the Acho Dene Koe First Nation ("ADK") has developed several joint ventures associated with natural gas production addressing service needs such as drilling, air and ground transportation, and environmental services. They have also pursued construction opportunities, and camp services and catering business through a holding company, Beaver Enterprises. ADK also operates a number of retail businesses selling crafts, other tourist products and fuel.

Fort Simpson offers the largest array of business services in the area. The community is home to several transportation companies servicing industry, tourism and general transportation needs, and a number of accommodation services, including hotels/motels and bed and breakfasts. Other businesses provide expediting services, construction, contracting and general retail services such as grocery outlets, fuel, taxi service, etc.

The Liidlii Kué First Nation's ("LKFN") development corporation is Nogha Enterprises. It is classified as a highway, street and bridge construction company by Industry Canada. However, Nogha is involved in a wider array of construction activities, general contracting, and services.

Similar to Beaver Enterprises, Nogha has the capacity to expand to meet new demands from industry, either independently or through the formation of a joint venture.

Nahanni Butte and Wrigley are smaller communities where only limited business and retail services are available. The First Nations in these communities have formed development corporations. However, their ability to expand to meet the business needs of industry is largely untested.

5.6 Socio-Economic Conditions

Section 5 of the SEIA (Appendix 19) describes existing socio-economic conditions in the region, including economic and social factors. A brief extract is given below.

The Study Area communities can be considered small and relatively isolated. Fort Simpson is the only community within the Dehcho region with a population that exceeds 1,000. Similar to the territory as a whole, the population is dominated by young people below the age of 25 and especially those under the age of 15. Aboriginal people make up the majority in all Study Area communities. Fort Simpson has the largest number of non-Aboriginal people in relative and absolute terms. The differences in Aboriginal and non-Aboriginal social and economic performance found in territorial data can be seen in the Study Area communities when comparing Fort Simpson to the others.

Education levels are low. This is especially true for those living outside Fort Simpson. While the economic opportunities in the Dehcho region are limited, statistics reveal that the employment record of those with at least a high school diploma is more than twice that of those without Grade 12 or its equivalent. There is also a clear division between Aboriginal and non-Aboriginal people in the Study Area communities when it comes to employment. The average employment rate of Aboriginal labour is less than 50 percent whereas non-Aboriginal employment rate exceeds 80 percent.

Overall, a weak economy and low participation means average incomes are similarly low. When coupled with the cost of living and cost of food in comparison to Edmonton and Yellowknife, these low incomes suggest higher rates of poverty among the population and in particular amongst the Aboriginal population.

Housing conditions appear to be worse in the Study Area communities than is the average. A larger percentage of houses are home to more than six people and the number in *core need* is higher than average.

Violent crime rates are high in comparison to the territorial average, while property crime rates are on par. Income support is lower in two of the three reporting communities within the Study Area, though as a region, the Dehcho has a larger percentage of people receiving income support than the territorial average.

Traditional activities and the use of Aboriginal languages are more common in the three smaller communities within the Study Area than they are in Fort Simpson which is very close to the territorial norm in these regards. The statistics on income and cost of living suggest that subsistence hunting and fishing is as much a necessity for some as it is a part of local traditions and culture.

5.7 Land Use

Historic and present day land uses in the study area are categorized as follows:

- Traditional uses by First Nations
- Operations of the NNPR
- Outfitting
- Resource use and exploration

Each of these is discussed below.

5.7.1 Traditional Uses

Information on traditional uses in the study area was requested from local First Nations.The Nahanni Butte Dene Band ("NBDB"), the Liidlii Kue First Nation ("LKFN") and the Acho Dene Koe First Nation ("ADKFN") were approached by CZN. Information from the NBDB is provided below. The LKFN advised that they did not have any traditional use concerns, and did not offer traditional use information. The ADKFN advised that they were in the process of compiling traditional use data, but this was not available at the time of completion of this DAR. CZN has not observed any traditional use or trapping activity in the immediate Mine site area during the duration of its activities in the area.

Nahanni Butte Dene Band

The text that follows was prepared by CZN and subsequently reviewed, edited and substantially added to by the NBDB to ensure correctness and non-confidentiality, with assistance from their consultant, Crosscurrents Associates Ltd. The text is now more a summary of traditional knowledge as well as traditional land use, and was altered slightly from the version returned by the NBDB.

A detailed traditional knowledge ("TK") study was undertaken by the Nahæâ Dehé Dene Band ("NDDB") in 2008, funded by Indian and Northern Affairs Canada ("INAC"). A study report was produced but is confidential. An addendum to the study was undertaken in 2009 to incorporate interaction between CZN and the NDDB regarding an overview of the project and the NDDB's concerns. A TK Addendum report was produced which included TK information from the 2008 study relevant to the Prairie Creek Mine project. This report contains non-confidential and confidential portions. CZN received a full copy after signing a confidentiality agreement with the NDDB. The information below is excerpted from the confidential portion, and has been reviewed by the NDDB and approved for inclusion in this DAR. It provides some insight into the range and extent of Nahæâ Dehé interests downriver of the Prairie Creek Mine site, as well as its interests in areas along and downstream of the access road..

The lower portion of the Nahæââ Dehé (South Nahanni River) valley is an active travel route, a rich ecological area, a well-utilized harvesting area, and an area of high traditional occupancy. People from Nahæââ Dehé travel the river from late spring, after break-up, through to the fall. Before the coming of motorized boats, travel was generally one-way in the spring time, using moose hide boats, rafts, or spruce bark canoes to bring winter furs, family, and supplies down river to summering areas, trading posts, and settlements toward the mouth and along Náchádeh (Liard River). When motorized boats were introduced to the area, flat-bottomed scows could be used throughout the summer and fall, dependent to some extent on water levels, for both up river and down river travel. Modern aluminium boats with more powerful outboard motors have extended that range.

Dahtaihtth'î (Deadmen Valley), located around the mouth of K'atåo Dehe (Prairie Creek) where it flows into Nahæâå Dehé (Nahanni River), is a high traditional use area for the hunting of moose and sheep and for seasonal fishing. It is also a corridor through which traditional trails and trap lines run. K'atåo Dehe (Prairie Creek) is the largest creek running into Nahæâå Dehé (Nahanni River) in this area. The part of K'atåo Dehe (Prairie Creek) that NDDB members currently use the most is the portion near the mouth.. Deep pools above the first major bend appear to be an important habitat area for grayling and other species and are used for subsistence fish harvesting purposes. Sheep licks near the mouth, in the same vicinity as the grayling pools, also draw local hunters to this area, particularly in the fall. Due to its seasonal importance for hunting, fishing, and trapping purposes, the area has been used over time for both seasonal and year-round camps. For at least one season, a family over-wintered in the area, at the site where a Parks Canada cabin now exists. At least one burial site is located in this valley.

According to NDDB, although the Prairie Creek Mine is a considerable way up the creek from the high land use area near its mouth, K'atåo Dehe (Prairie Creek) is a swift and shallow creek and therefore likely easily impacted by pollutants, cumulatively or through a sudden spill. There are concerns that pollutants would negatively impact fish using the lower portion of the creek, big game using licks in the vicinity of the mouth of the creek, and harvesters using the area for fishing, hunting, or camping purposes while occupying or traveling through the area. The NDDB are also concerned that the Nahæâå Dehé (Nahanni River) may be vulnerable to pollutants from its tributaries, citing seasonally shallow and slow water, back channels, and sand and gravel islands, which are subject to seasonal flooding and may act as a potential catchment area for pollutants.

Just east of Dahtaihtth'î, along the Nahæâå Dehé (Nahanni River), is Ala Tthe Zhíhgoîæá (first hole in the mountain, or First Canyon). In the past, before the use of outboard motors, travel along this steep section of the river was primarily downstream in moose hide boats in the spring time, although it is also likely that people would have walked up the valley for hunting purposes at different times of the year given that sheep come down to the lower edges of the valley walls (Dene Nation, 1975). Most hunting is carried out while travelling up the river, keeping an eye on the lower edges of the valley for sheep. Fishing is carried out at the mouth of creeks flowing from the hills.

The quantity and density of traditional place names increases significantly as Nahæâå Dehé (Nahanni River) flows into the long section of river referred to as Ndutah (the Splits). This increase in place names is an indication of high use within living and recent generations—due to the abundance of fish, plants, and game animals (such as moose, beaver, and sheep), as well as the presence of tributaries providing links to critical harvesting areas to the north and south. Two traditional, post-contact settlements were located in this area: Chitú (Yohin Lake) and Ée Túé (Fishtrap Creek). Given its historic use as a travel route and harvesting area, innumerable camps have also been set up along this particular section of the river for seasonal and temporary use by the ancestors and current members of the NDDB. There is at least one burial site in this area, as well as a hotspring which has traditionally been used for medicinal purposes.

The area of Nahæâå Dehé (Nahanni River) between Ndutah (the Splits) and its mouth at Náchádeh (Liard River) is of paramount ecological and cultural importance to NDDB, since it has been the community's primary area of occupation, both historically and currently. In addition to the current site of Nahanni Butte, there are two other traditional settlements located in this area.

NDDB is concerned about impacts from access road operations, particularly for that area from Cat Camp to the Liard River. These concerns include: water quality, damage to wetlands, impacts on fish and wildlife from contamination or sensory disturbance, impacts on critical wildlife habitat, the potential for access to traditional NDDB harvesting areas by outside hunters, and damage to possible heritage sites.

The landscape along the Prairie Creek Mine access road between Cat Camp and Tthôôtå'ooh (Second Gap, in the Nahanni Range) is quite varied but generally open and accessible, unlike the steep and narrow valleys in K'atåo Dehe (Prairie Creek) and the western section of the road. Although there is documented use of the broad, forested plateau as a traditional trail and harvesting area, the heaviest traditional use of this portion of the road is the wetland valleys running north-south along the Tehts'éhia Dehé (Tetcela River) and Ée Túé (Fishtrap Creek), and along the western side of the Nahanni Range. The plateau area to the west was utilized by Nahæâ Dehé harvesters at least as early as the 1900s, likely longer given that established land use patterns are generally maintained through successive generations. It was specifically used during the winter months as a travel route to the North Nahanni River, Cli Lake, and the pass through the Nahanni Range to Tuhgah (Little Doctor Lake), and as a trap line for beaver, lynx, marten, muskrat, wolf, wolverine, cross-fox, and mink (Dene Nation, 1975). At least one trail followed Shíro Tah Îlî (flowing from the mountains), which is the northwest branch of Tehts'éhia Dehé and located north of the mine haul road.

The settlement at Ée Túé (Fishtrap Creek) was a hub for harvesting activities. Camp sites were likely established and utilized all along the travelled routes. Winter travel was by a combination of snowshoe, dog pack and dog team (Dene Nation, 1975; Dehcho First Nations 1997). During the latter portion of the 1900s, after the community of Nahanni Butte was fully established, trapping continued between the creek and the southern portions of the plateau. Harvesting continued to take place in the winter and focused on beaver, cross-fox, lynx, marten, mink, wolverine, wolf, woodchuck, squirrel, weasel and ermine (Dene Nation, 1975).

According to NDDB, the Ée Túé / Tehts'éhia Dehé valley is a rich wetland valley lined on either side by forested hills. The area is used for a range of spring and winter harvesting activities as well as being a key travel corridor between Nahââ Dehe and Little Doctor, Cli, and Sibbeston lakes to the north, which are good fishing lakes, and Fort Simpson. Through Nógha Eteneh GoteodéÆá, this wetland is connected to the narrower wetland valley between Shíha (Silent Hills) and the Nahanni Range, which is also a spring and winter harvesting area and northerly travel route. The wetland areas have been used extensively for spring hunting given the relative abundance of beaver as well as migratory birds. Winter harvesting in the valley area included a wide range of fur species, including beaver, lynx, marten, muskrat, wolf, wolverine, cross-fox, mink, squirrel, ermine and weasel (Dene Nation, 1975) as well as moose, which appear to over-winter in this valley area.

Although fishing was not a primary purpose for people while harvesting in the valley area, except for the lower ends of Ée Túé (Fishtrap Creek), NDDB trappers are aware of the fish species in the main creeks in the area: inconnu, grayling, jackfish, and bull trout.

The Nahanni Range itself is a prime harvesting area for mountain (Dall's) sheep, likely due to the presence in the area of a sheep lick. Sheep are seen all along the high country and at Tthôôtå'ooh (Second Gap), particularly in summer. In the spring, they calve in the area. The sheep stay on top of the mountains during the winter where snow is absent. Cabins have been established and used on the small lake just west of Tthôôtå'ooh (Second Gap).

According to NDDB, given that the ancestors of the Nahæâ Dehé people are known to have traveled overland to a greater extent than via waterways, the mountain passes that provide easy access into and between valleys—such as Tthôôtå'ooh (Second Gap)—are potential areas for pre-historic and historic artifacts.

The area between Tthôôtå'ooh (Second Gap) and Náchádeh (Liard River) is the watershed of Endalîâh (Grainger River) which flows from the east side of the Nahanni Range into a relatively flat and marshy area dominated by wetlands and mixed forest cover. One notable geographic feature in this area is Endaa Shíhaa (moose lick hill), which is essentially a low, well-thicketed hill harbouring a mineral lick site. Harvestable spruce is found in certain areas along the banks of the Liard. This area is particularly good habitat for beaver and for woodland caribou, which are known to be in the area at different times of the year, particularly along the lower levels of the Nahanni Range in the spring time. It appears that the caribou move down into the lowlands for the winter, where moose are also found. Endalîâh (Grainger River) is not navigable by boat for much of the year, but there are instances where Nahanni harvesters travelled with dogs from the community along the east slope of the Nahanni Range to Second Gap hunting beaver, and then rafted down the river hunting along the way. Data generated from the Dene Mapping Project (1975) and Dehcho First Nations (1997b) mapping project show extensive traditional use of the lowland area between the Nahanni Range and Liard River, particularly for trapping and big game harvesting purposes, most of which would occur during the winter. Along with woodland caribou, moose, and Dall sheep, the furbearers traditionally harvested in this area include beaver, lynx, marten, muskrat, wolf, wolverine, cross-fox, mink, and weasel (Dene Nation, 1975). The area was also used as a winter travel route northward toward Fort Simpson.

Camps were established in this area for seasonal use during the winter months and at least one cabin was built and occupied for an extended length of time for the purposes of hunting and trapping. During spring hunting expeditions into the area, some fishing has taken place up-river, but fishing primarily occurs at the mouth. Jackfish and grayling were caught.

5.7.2 Operations of Nahanni National Park Reserve

Operations of the Nahanni National Park Reserve ("NNPR") consist of research and traditional activities, the non-commercial component, and tourist activities, the commercial component. The South Nahanni River is used extensively for guiding and canoeing trips during the summer months (see Table 5-2). River tours are supported by a number of outfitting companies from as far away as Ontario. Most tours assemble in Fort Simpson and fly in to Virginia Falls to start their trip just below the falls. The usual trip terminus is Lindberg Landing on the Liard River just north of Blackstone Territorial Park.

Prior to NNPR expansion, tourism (hiking) and research also occurred in the area of the North Nahanni Karst, proximal to CZN's access road. This area is now within the expanded park. It was recently reported in the Dehcho Drum newspaper (January 21, 2010) that NNPR had 16 employees before the expansion (9 full time and 7 seasonal) and the newly expanded park is currently in the process of hiring 20 new employees (8 full time and 12 seasonal positions).

5.7.3 Outfitting

South Nahanni Outfitters are based in Nahanni Butte and have held the outfitting licence for the area for many years. Hunting activity generally takes place in the summer and fall in areas well removed from the Mine to the north-west. The outfitting area also now falls within the expanded park, and according to the amended Act, which received Royal Assent on June 18, 2009, the activities of guides and holders of outfitter licences in the expansion area are to be repealed on June 18, 2019, 10 years after the date of Royal Assent.

5.7.4 Resource Use and Exploration

As noted above, harvestable spruce is found in certain areas along the banks of the Liard River. Logging has occurred previously in the Lindberg Landing area. Ed Lindberg resides on the east bank of the river and has operated a small sawmill previously.

No other mineral exploration has occurred in the study area in the last 30 years, to CZN's knowledge. Exploration for gas in the form of seismic investigation work occurred in the lowland valleys both sides of the Nahanni Range, but pre-dated Cadillac's activities as some seismic lines were used for the access road alignment. No further gas exploration is known to have occurred in the area since that time.

Oil and natural gas reserves are present in the Fort Liard area and in the Cameron Hills. Production has fallen sharply over the past 3 to 4 years. By the end of 2008, the only gas field in production was operated by Paramount Resources in the Cameron Hills. Production at the remaining 4 fields near Fort Liard has been suspended or abandoned.

Table 5-2: NNPR Visitation Statistics

NAHANNI NATIONAL PARK RESERVE OF CANADA VISITATION STATISTICS 1984 – 2009										
Year	**Total Park Visitors**	**Total Day Visitors**	**Total Overnight Visitors**	**# Guide Visitors**	**# Private Visitors**	**# Guided Trips**	**#Private Trips**	**Total # Trips**	**Average Group Size**	**Average Trip Length (days)**
1984	888	352	536	-	-	-	-	-		
1985	923	448	475	-	-	-	-	-	5.2	10
1986	724	260	464	-	-	-	-	-	5.0	12
1987	851	310	541	-	-	-	-	-	-	-
1988	936	431	505	301	204	33	61	94	5.6	
1989	1016	487	529	275	254	39	66	105	5.6	11.3
1990	858	279	579	241	338	38	75	113	5.9	11.3
1991	969	295	647	371	276	37	64	101	6.3	13.4
1992	1323	665	658	356	303	36	80	116	5.7	11.1
1993	1391	728	663	341	322	36	85	121	5.5	-
1994	1137	425	712	409	303	43	86	129	5.5	-
1995	1207	405	802	443	359	44	106	150	5.3	10.5
1996	1227	455	772	450	378	42	83	125	6.2	11.0
1997	1062	300	762	429	333	42	75	117	6.5	-
1998	791	185	606	326	280	34	59	93	6.5	-
1999	861	300	561	354	207	34	56	100	6.2	10.6
2000	929	350	579	398	181	38	49	82	6.6	11.7
2001	936	295	641	439	202	45	44	89	7.2	12.3
2002	977	491	486	272	214	29	48	77	6.3	11.4
2003	1018	395	623	383	240	43	43	86	7.2	10.5
2004	887	322	565	270	295	38	67	105	5.3	11.0
2005	1020	306	705	400	305	39	57	96	7.3	13.0
2006	796	215	581	365	216	39	44	83	7.0	11.2
2007	970	236	734	521	213	49	44	93	6.0	14.2
2008	810	269	541	284	257	28	48	77	7.0	12.0
2009	754	297	457	246	154	25	36	61	6.6	13.0
Average	**971.6**	**365.4**	**604.8**	**357.9**	**265.2**	**37.8**	**62.5**	**100.6**	**6.2**	**11.7**

Updated: December 8, 2009
Source: Parks Canada

5.8 Harvesting

CZN collected traditional harvesting data during a discussion on January 27, 2010 with Leon Konisenta, an elder from the Nahanni Butte Dene Band (“NBDB”). Mr Konisenta provided the following information:

Traditional harvesting used to include caribou, particularly in the early 1960’s. Some animals were harvested in the Second Gap area. However, no caribou have been harvested for approximately 20 years;

Harvesting of moose used to be common. Harvesting occurred near Nahanni Butte, around the Swan Point area and along the Liard Highway. In the fall, members would also travel up the South Nahanni River to the ‘flats’ to hunt moose. Harvested numbers were plentiful, numbering 25-30 animals in some years. Members did not need to travel too far to find moose, and could use the available access routes. Moose numbers have dwindled, and moose are now rarely found along the easy access routes. Mr. Konisenta attributes this partly to the introduction of bison to the area. Moose harvesting has also dwindled because “there’s too much willow for skidoos”;

Members used to harvest a few Dall’s sheep annually from the Nahanni Range in proximity to the village. None are harvested now;

Trapping used to be very common in the Liard River lowlands, and west of the Nahanni Range to the Wolverine Pass area. Animals trapped included lynx, mink, marten, wolverine, fox, beaver and otter. In 1978, about 600 marten were caught. However, there has been no trapping for 6 years because of a combination of fewer animals, lower pelt prices, and rising costs (fuel for skidoos);

Trapping was also common in the Yohin Lake, lower Fishtrap Creek and Netla River areas. Trapped animals were mainly marten, beaver and muskrat. Between 30 and 50 animals were trapped in good years. This trapping has also dwindled for the same reasons as above, but still occurs periodically because of the easier access; and,

Harvesting of berries and medicinal plants was and still is prevalent in the area. Berries include cranberries, blueberries and strawberries. Plants include white moss and Labrador tea. This harvesting used to occur as far away as Yohin Lake and Wolverine Pass. Currently, the harvesting occurs nearer to the village and mountains due to ease of access.

There is considerably more information on historical traditional harvesting in the confidential section of the Traditional Knowledge Assessment Report Addendum by Crosscurrent Associates Ltd. (August 2009). The information above is limited by comparison because it comes from a single source and was collected during a relatively brief meeting. However, it is intended as an indication of how traditional harvesting has changed from the past to the present.

CZN had planned to acquire traditional harvesting data for the project area by contracting a member of the NBDB. CZN developed a questionnaire to facilitate data collection, the idea being that the contracted member would consult village elders and provide a summary. Results had not been received at the time of DAR compilation. However, a completed questionnaire was provided on March 3, 2010. A copy can be found in Appendix 26. The information provided largely concurs with that from Mr. Konisenta above.

5.9 Heritage Resources

CZN initiated archaeological database searches previously in support of EA's following permit applications. The first was conducted on August 18, 2000 through the Canadian Museum of Civilization in support of Land Use Permit Application MV2000C0030. The search area encompassed the Mine site area, as well as the entire access road corridor from the Prairie Creek Mine to the Liard River. To accomplish this, the search parameters were defined by geographical coordinates to cover a block extending from 61^{o} 00' to 61^{o}45' N. latitude and from 122^{o}45' to 125^{o}00' W. longitude. No recorded archaeological sites were identified for the area of interest. The closest identified sites are south of the South Nahanni River near the mouth of the Meilleur River, 35-40 m south of the Mine site.

A second database search was undertaken on December 16, 2004 covering the area of a proposed drilling program. The search parameters were defined by coordinates 61^{o}27' to 61^{o}40' N latitude and 124^{o}44' to 124^{o}56' W longitude. No recorded archaeological sites were noted within at least 150 m of the area of interest.

CZN appreciates that the lack of recorded archaeological sites in the area does not necessarily mean none exist. CZN is not aware of any evidence of such sites in the immediate area of the Mine, and no such evidence has been found or recorded, either at the mine or along the access road.

As noted in Section 5.7, CZN held meetings with the NBDB to discuss the project and their concerns as part of a TK addendum. Meetings were held in July and August 2009. One area of concern was as follows: "Given that the ancestors of the Nahanni people are known to have travelled overland to a greater extent than via waterways, the mountain passes that provide easy access into and between valleys are potential areas for pre-historic and historic artifacts. For this reason, it would be useful to carry out archaeological work". It was agreed that archaeological work should be undertaken in key areas of the Prairie Creek access road, primarily at the Second Gap area in the Nahanni Range, but also at Wolverine Pass in the Silent Hills, and at the crossings of the Tetcela River. CZN engaged Points West Heritage Consulting Ltd. to undertake a survey of the noted key areas. Points West applied for a study permit from the Prince of Wales Heritage Centre in Yellowknife for those areas outside of the expanded NNPR, and a research permit from the NNPR for those areas inside the park. Surveys were undertaken on September 23-24, 2009 led by Gabriella Prager, archaeologist for Points West. The survey party also included representatives from the NBDB. A survey report by Points West dated December 16, 2009 can be found in Appendix 21. An extract from the Executive Summary follows.

In September, 2009, on behalf of Canadian Zinc Corporation and at the request of the Nahanni Butte Dene Band, Points West Heritage Consulting Ltd. completed an archaeological assessment of selected potions of an access road between the Liard Highway near Nahanni Butte and the Prairie Creek Mine.

The study assessed 3 sections of possible heritage concern that had been identified during a Nahanni Butte Dene Band traditional knowledge study:

1. The eastern most landscape feature is a pass known as Second or Grainger Gap.
2. The next pass of interest to the west is called Wolverine or Silent Hills Pass.
3. The westernmost area of the three identified is the crossing of the Tetcela River which is situated within the newly expanded Nahanni National Park Reserve.

All shovel tests were negative and visual inspection revealed no archaeological remains in any of the areas examined. Camp remains found in Second Gap suggest that the site probably dates no earlier than the cut-line, that is, the 1980's. Therefore, it was not recorded as an archaeological site. No other cultural evidence was observed within or in close proximity to the specific portions of the project footprint assessed during this investigation.

CZN also contacted the Liidlii Kue First Nation ("LKFN") in connection with their traditional knowledge, and specifically their input regarding the potential for the presence of heritage resources in the project area. CZN was informed (verbally in December 2009) by Mr. Allan Bouvier, Manager, Lands & Resources who works closely with the Denendeh Resources Committee (made up of hunters and trappers), that the LKFN Band had no concerns in this regard.

5.10 Other Economic Activities in the Region

The Dehcho region was a producer of tungsten until late 2009. North American Tungsten Corporation had reopened the Cantung Mine in September, 2005 after its previous shutdown at the end of 2003. The deposit is located on the Yukon/NWT border and was being serviced almost exclusively out of Watson Lake, Yukon. It is uncertain if or when the Mine will reopen.

Stornoway Diamonds Corporation was granted prospecting permits for three parcels of land north of Fort Simpson. Stornoway conducted airborne geophysical surveys over each property, and subsequently allowed the permits for two land parcels to lapse, retaining one.

Aurora Resources Inc., (recently renamed Devonian Metals Inc.) carried out diamond drill exploration in 2007 of the Wrigley Pb/Zn property 15 km west of the village of Wrigley. The property has not recently received any active surface exploration, but the company still holds the land tenure for the area.

Tamerlane Ventures Inc. has proposed and received permits to operate the Pine Point Pilot Project 48 km east of Hay River. Tamerlane is presently seeking financing to support the Pb/Zn mining venture.

The construction of the Dehcho Bridge in Fort Providence continues to move ahead somewhat sporadically. Escalating construction costs have proven to be difficult to finance and it is unknown when this project will be completed.

6.0 DEVELOPMENT DESCRIPTION

One of the unique features of this particular Developers Assessment Report on the Prairie Creek Mine project is the fact that the majority of Mine site and infrastructure are already in place. In addition, the site was fully permitted for mining operations in 1982.

The present proposal for mining operations takes full advantage of existing facilities, however, since it has been nearly 30 years since most were built, there have been technological advances in the mining and mineral processing industry that can be adapted to the operation of the Prairie Creek Mine. Most of the advances have been in relation to further mitigating environmental impacts and optimizing operations. With the passage of time, some of the facilities are dated and will require upgrades or replacement as discussed in the further sections of this chapter. However, the general operation of the mine remains the same as the original proposal.

6.1 Project Lifespan (Gantt Chart)

The well defined portion (5.2 million tonnes measured and indicated) of the mineral resource is the basis for the current 14 year project life, although further exploration could extend this by many more years.

Table 6-1 displays a Gantt Chart showing preliminary mine construction followed by the operating period, and then closure, reclamation and post-closure monitoring. Project operations are critically tied to the seasonal (winter) transport period and the need to ship out mineral concentrates and receive supplies in a relatively short time frame. The seasonal road access also affects the start-up schedule since construction supplies would have to be ordered and available at the eastern terminus of the access road during the seasonal road operating period. Once supplies are at site, it is estimated that 6 months will be required for construction before operations can commence.

6.2 Mine Footprint

The Prairie Creek site has been developed over a long period of time and there is a significant amount of infrastructure existing on site (refer to Figure 1-1, and Figure 6-1).

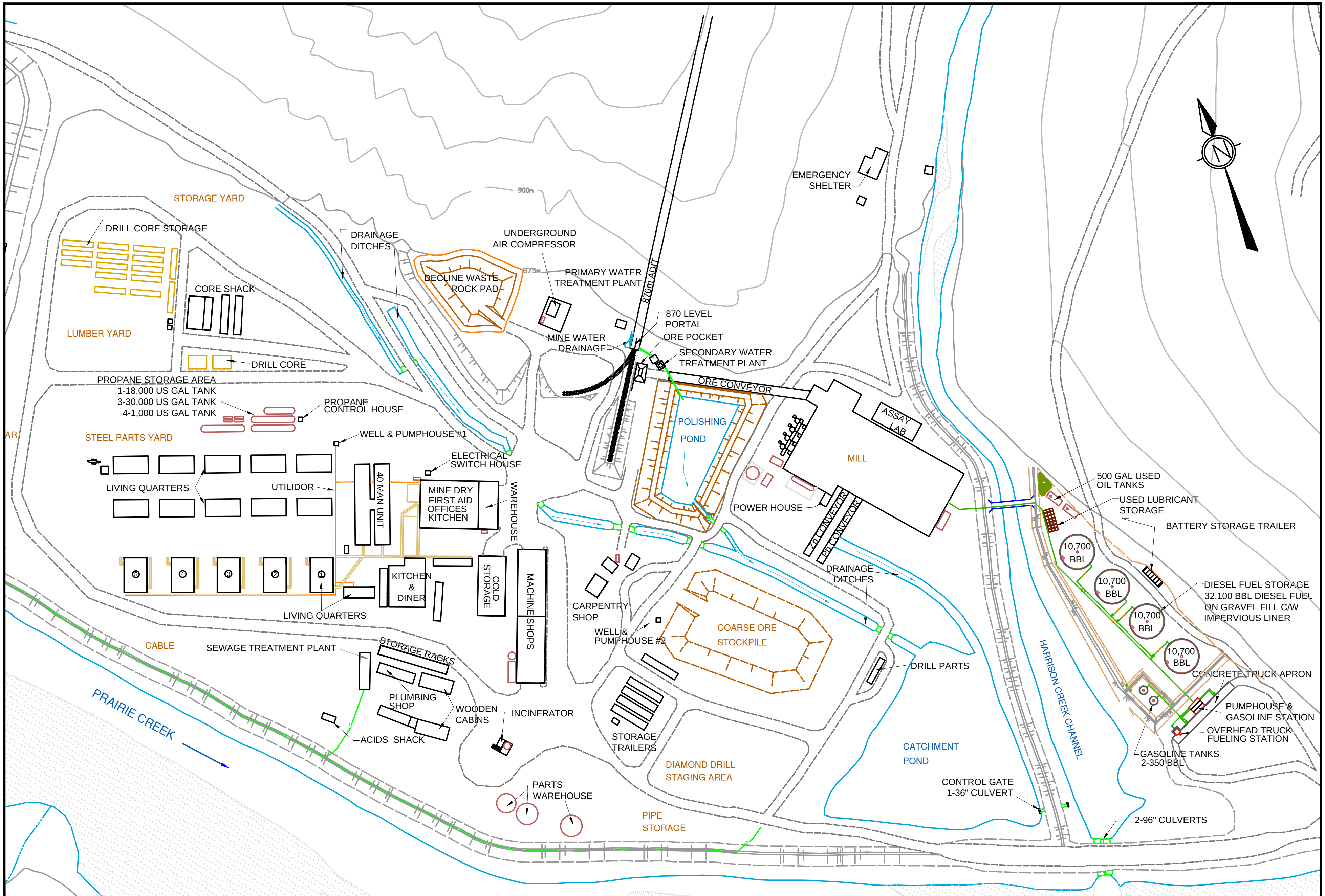
The Prairie Creek Mine site and airstrip are located on two surface leases; an 18.2 ha lease covering the airstrip, and a second lease of 113.6 ha covering the Mine site area. The total area covered by the surface leases is 131.8 ha.

The existing infrastructure at Prairie Creek is wholly located within the Surface Leases, primarily along the north-east side of Prairie Creek upstream from the confluence with Harrison Creek. The specific area that underwent intense development was created in the 1970's in order to establish the Mine site area infrastructure, and only covers a portion of the present Surface Lease. This zone of intense development occurs within a 13 ha area including the Fuel Tank Farm area just to the south of Harrison Creek. The Mine site also includes a narrow area of development extending up Harrison Creek to a storage location, referred to as the "Boneyard",

TABLE 6-1 CONSTRUCTION, OPERATION AND CLOSURE SCHEDULE, PRAIRIE CREEK MINE, NT (14 YEAR OPERATION)

Task Name	Approximate	Year 1				Year 2				Year 3				Year 4				Year 5				Year 6				Year 7				Year 8				Year 9				Year 10				Year 11				Year 12				Year 13				Year 14				12	13	14	15	16	17	18	19	20	21	22	23	24
	Duration	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4													
Mine Operating Permit		◆																																																																					
Winter Road Construction					■	■			■				■				■				■				■				■				■				■				■				■				■				■				■													
Tetcela-Mine Road Operations	Dec.1-March 31				■	■			■	■			■	■			■	■			■	■			■	■			■	■			■	■			■	■				■				■				■				■				■												
Winter Road Ice Bridge Operations	Jan. 1-March31					■				■				■				■				■				■				■				■				■				■				■				■				■																
Mine Development			■	■	■	■																																																																
Liard Transfer Facility Operations	Year round*				■	■	?	■	■	■	?	■	■	■	?	■	■	■	?	■	■	■	?	■	■	■	?	■	■	■	?	■	■	■	?	■	■	■	?	■	■	■	?	■	■	■	?	■	■	■	?	■	■	■	?	■	■													
Highway #7 and #77 haulage	Year round**				■	■		■	■	■		■	■	■		■	■	■		■	■	■		■	■	■		■	■	■		■	■	■		■	■	■		■	■	■		■	■	■		■	■	■		■	■	■		■	■													
Fort Nelson Loadout Operations	Year round					■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■												
Start Mining/Milling Operations							◆																																																															
Mine Operations							■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■													
Mine Closure																																																									◆													
Reclamation																																																										■												
Post Closure Monitoring Phase 1																																																										■	■	■										
Post Closure Monitoring Phase 2																																																													■	■	■	■	■					
Post Closure Monitoring Phase 3																																																																		■	■	■	■	■

note: 6 month lead time assumed to assemble equipment and supplies for seasonal mobilization
* supplies in bound throughout the year and concentrate out bound except when there are road restricitions on the highways
** weight restrictions occur on Highway #7 and #77 typically between March 15 and June 15
◆ milestone



CANADIAN ZINC CORPORATION

Date:	October 2009
Drawn By:	C. Reeves
Scale:	As Shown
Drawing:	DAR Fig 6-1.dwg

PRAIRIE CREEK MINE

FIGURE 6-1:
EXISTING INFRASTRUCTURE AT PRAIRIE CREEK MINE

an area of 22 ha. The Water Storage Pond ("WSP"), which adjoins the Mine site development to the north, covers an area of 12 ha.

To the north of the WSP and also along the east side of Prairie Creek is a 1,000 m long gravel airstrip (CBH4 in Canada Navigation Charts), which has a footprint of approximately 5 ha.

The combination of the above existing footprints totals an area of approximately 52 ha, and is referred to as the "Mine site Footprint". The majority of the upgraded infrastructure and new infrastructure will be located within this existing Mine site Footprint

6.3 Existing Infrastructure at the Prairie Creek Mine

A summary of all existing infrastructure components, detailing whether these will be removed or changed, is given in Table 6-2. A written summary for the major components is given below.

6.3.1 Mill Concentrator Complex

The Mill concentrator is a steel framed, metal clad building with a substantial cement foundation and covers an area approximately 80 m by 50 m. The concentrator consists of 3 main areas: the crushing/grinding circuit, the flotation circuit and the powerhouse. The original concentrator was designed to produce 3 sulphide concentrates; lead, zinc and copper.

Railcars from the 870 underground level dump ore into an existing cement lined dump pocket at the base of the main conveyor. The crushing/grinding circuit consists of a 50 tonne coarse ore bin, a primary jaw crusher, a fine ore bin, a cone crusher for oversized material, and a ball mill. The circuit is capable of processing up to 1,400 tonnes of rock per day.

The flotation circuit consists of 3 banks of flotation cells. Flotation concentrates were to be dewatered in thickener tanks followed by filter presses. The filtered concentrates were to be discharged from the Mill by 2 load-out conveyors.

Flotation tailings were to be cycloned, with the coarse fraction pumped underground and the fine fraction pumped to the tailings pond.

The Mill also contains a powerhouse consisting of 4-1150 kw Cooper Bessemer diesel engine electric generators, and 2 stationary air compressors. Associated with the powerhouse is a 5000 gallon lube oil tank enclosed by a cement berm.

While most of the existing Mill concentrator will be fully utilized as originally planned, there will be a need for some equipment, electrical, pumping, piping and safety upgrades related to optimizing the process and bringing all the operation up to present safety standards and codes. Control of the entire plant would need to be made available to a central control system along with closed circuit video surveillance, both for operations and security. The major significant upgrades are described below.

Table 6-2: Summary of Existing Infrastructure and Proposed Changes/Additions

Infrastructure Component	Existing Infrastructure Description	Changes, Upgrades or New Infrastructure	Location
MILL CONCENTRATOR COMPLEX	Crushing capacity 1400 tpd, milling capacity 1000 tpd. Conveyor gallery from 870 portal area. Majority of crushing, grinding and flotation circuits installed. Offload conveyors for zinc and lead installed. Contains 4 generator powerhouse to support hydro for the entire site.	Powerhouse generators will be replaced with more fuel efficient CAT 3512 generators with glycol heating system for entire camp. Necessary upgrade required to electrical components, master controls and motor, pump and bearing replacements. Completion of a Lead carbonate flotation circuit is required. The mill would be further insulated and heated.	Southeast part of yard.
		Dense Media Separation (DMS) Plant	Directly attached to northeast side of Mill and integrated with the crushing circuit.
		Temporary DMS Rock Storage Pad	Pad built next to DMS plant for overflow before trucking to the Waste Rock Pile.
		Paste Backfill Plant	Directly attached to northeast side of Mill next to the DMS plant.
		Concentrate Bagging Plant	On South west side where offtake conveyors are presently located.
		Concentrate Storage Shed	Steel walled shed capable of storing concentrate. Includes a bagging plant, weigh scale.

Table 6-2 (cont'd)

Infrastructure Component	Existing Infrastructure Description	Changes, Upgrades or New Infrastructure	Location
ADMINISTRATION BUILDING	2 Storey steel structure with First Aid, Dry Facilities and warehouse on first floor. Office facilities, 8 rooms accommodation, recreation and kitchen on second floor.	General upgrade of facilities relating to the new connection with the new accommodation block.	Central yard.
ACCOMMODATIONS	Trailer camp capable of housing 220 people in16 Bunkhouses. Proposed to utilize 5 bunkhouses for future operations and use the remainder or what can be salvaged storage facilities to be relocated.	Some upgrade of #1-# 5 bunkhouses would be required. These units would be used during construction phase. Other trailers that are worth salvaging could also be used as accommodations or at least storage areas.	In existing central yard adjoining the north side of the Administration Building.
		A new 2 story bunkhouse complex is proposed. This complex would be attached to the existing Administration Building and consists of a 2 * 49 man sleeper.	In existing yard adjoining the north side of the Administration Building.
		3 Unit Kitchen Diner Complex integrated into Accommodations.	In existing yard adjoining the north side of the Administration Building.
		12 * 60 person sleeper washcar also integrated into Accommodation complex.	In existing yard adjoining the north side of the Administration Building.
	Watchmans House at Harrison Creek.	Demolished or used as Emergency shelter only.	

Table 6-2 (cont'd)

Infrastructure Component	Existing Infrastructure Description	Changes, Upgrades or New Infrastructure	Location
MAINTENANCE WORKSHOPS	Two steel structure workshops contain facilities for repairing equipment and fabricating.	Upgrade of electrical, heating, insulation and internal equipment would be necessary.	Central Yard
	Other smaller buildings on site exist such as the carpenters shop, core shack, small generator shacks, well houses.	Small shed probably required to replace old sheds.	various locals within the Yard.
TANK FACILITIES	Four 10,700 barrel welded steel diesel storage tanks and 2 500 gallon steel riveted gasoline storage tanks all within a fully engineered and bermed facility. A cement based fuel pumping station is located adjacent to the tank farm.	Steel tank #1 requires lifting and a proper base foundation installed. Recent inspection has found little upgrade required on the main tanks. The fuel pump house would need to be upgraded with safety valves and better piping.	South Yard
	2*5000 gallon steel riveted gasoline tanks in a bermed site next to the main tanks.	Decommissioned	South Yard
		2 new 180,000litre Sulphuric Acid Tanks would be installed in a bermed facility next to the new Water Treatment Plant	South Central yard
	Propane storage tanks in main yard 3*30,000 and 2*30,000 gallons at 930 portal area.	rehabilitated	Main Yard

Table 6-2 (cont'd)

Infrastructure Component	Existing Infrastructure Description	Changes, Upgrades or New Infrastructure	Location
		New ~5000 gallon tank to hold water for emergency fire suppression.	next to mill complex
WATER TREATMENT FACILITY	A lime water treatment plant was installed in the 870 m underground level to treat minewaters.	A new water treatment plant would be installed on the southeast side of the concentrate storage shed. This facility would be capable of treating both minewater and mill process water.	
WATER STORAGE FACILITIES	Originally a tailings pond facility was excavated.	convert to a Water Storage Pond Facility	The Water Storage Pond would replace the tailings pond and probably would not have any significant further footprint.
	Three baffled lined Polishing Pond.	Converted to 2500 tonne ore storage facility, polishing pond decommissioned	
WASTE TREATMENT FACILITIES	Sewage Treatment Plant: Steel metal clad building containing aeration tank with 30,000 L/day capacity and a UV treatment center.consists of a metal clad building with a large bio tank.	New pumps, new UV system, a filter system for separating solids and electrical upgrade. Filtered effluent pumped to Water Storage Pond.	Central yard.
	Temporary Hazardous Waste Storage Facility	Covered and secured area for temporary storage prior to removal by road from site.	Close to Sewage Treatment Plant

Table 6-2 (cont'd)

Infrastructure Component	Existing Infrastructure Description	Changes, Upgrades or New Infrastructure	Location
	Non-Hazardous Solid Waste Facility	Incinerator: A forced air furnace with a 30 foot stack is used. This is also used to incinerate used oil.This unit would be replaced by a double walled cyclonator. Would also contain a landfill dedicated to incinerator and filtered sewage sludge and bio-remediation area.	Upper reach of the Waste Rock Pile *
WASTE ROCK PILE	Waste rock from mining was dumped down the slope next to the 970 and 930 level portals	A new waste rock facility is proposed up a small ravine north of but next to Harrison Creek approximately 300 meters east of the mill.	800 meters up Harrison Creek in a northern side ravine. *
CEMENT BATCH PLANT	Consists of 2 hoppers, screening facilities, conveyors and weigh scale.	The plant would be rehabilitated.	
STORAGE SHEDS	One steel structure exists next to the workshops and the Administration building.	Structural and electrical upgrade only.	
		New steel sprung structure added to mill to store reagents and supplies	Northwest side of Concentrate Storage Shed
		New small shacks where required throughout yard for small storage.	
AIRSTRIP	3000 ft gravel airstrip .	Upgrade base of airstrip and improve approaches.	Upgrade with better navigation lights, approach instrumentation and beacons.

Table 6-2 (cont'd)

Infrastructure Component	Existing Infrastructure Description	Changes, Upgrades or New Infrastructure	Location
EXPLOSIVE MAGAZINES	A steel magazine and 4 customized truck trailers are used for explosive storage, located 1 kilometer south of the minesite.	New steel storage magazines which are compliant with the Canada Mining Regulations would have to be brought in and set up in the same area.	
UNDERGROUND FACILITIES	3 levels of underground development exist, 970, 930, 870. The lower levels are connected and contain refuge stations, tool crib, drill shop. 75hp vent fan is located at the 930 portal.	A new portal would be established next to the existing 870 portal. This would be the collar for the new 5m*5m access ramp to develop the lower 800, 720 and 640 levels for mining.	870 level portal
SITE ANCILLARY FACILITIES	Overhead and underground electrical wiring. Piping in place from Mill to Water Storage Pond. Fire Suppression partly installed.	Overhead power lines and poles removed. Heat traced piping installed to WSP and Water Treatment Plant. Fire suppression and detection system installed site wide.	through out site
ROAD FACILITIES	Cat camp and Grainger camps.	Decommissioned and reclaimed.	*
		Two new transfer facilities: TTF at KM87 for temporary concentrate storage and the LTF facility at junction of Liard Highway for concentrate and supplies.	Km 87 and km170 on Access Road *

* denotes outside Mine Footprint

The power plant will require upgrade with the old Cooper Bessemer generating units being stripped out and scrapped to be replaced by much more fuel efficient and compact Cat 3516 generators. The 5 new units (3 running, 1 on standby and 1 under maintenance) will only take up one quarter the space of the old units, hence the powerhouse room can be utilized for storage also. The heat from the generators would be recovered in a glycol system and piped through the Mine site and used to heat the Mill, camp and parts of the underground year-round. Heat recovery will increase the fuel efficiency from approximately 40% to approximately 80%. The existing exhaust stacks for the generators would be replaced with a single stack.

Ancillary support facilities for the Cooper Bessemer generators such as the lube tank and pumping facilities would also be dismantled since they would not be required for the new generators.

Process Modifications

Over the last several years, considerable metallurgical testing and process refinement has been carried out. Two substantial changes have been made;

A Dense Media Separation plant ("DMS") is to be installed to reject the light weight unmineralized fraction between the crushing circuit and the fine ore bin. The DMS plant is described in greater detail below.

A lead carbonate flotation circuit is to be installed to increase the overall metal recovery. This modification involves re-plumbing the existing flotation circuits and adding some additional flotation capacity. No new structures are required to effect these changes.

There will also be a redesign of some milling circuits to accommodate the lead-carbonate flotation circuit, and thickener upgrades.

Dense Media Separation ("DMS") Plant

A new DMS plant is to be integrated into the existing Mill to process a maximum of 450,000 dry tonnes per annum basis utilizing ferrosilicon as the separating medium. The DMS Plant would tie into the north wall of the Mill and be joined to the existing crushing circuit via the feed/discharge conveyor galleries.

Associated with the DMS plant would be a storage pad for the overflow from the plant. This pad will be built adjacent to the DMS plant with a capacity of 10,000 tonnes, and will feed the Paste Plant or be trucked to the Waste Rock Pile.

Paste Backfill Plant

The production of paste backfill will take place in a new Paste Backfill plant located on the north side of the Mill next to the DMS plant. The paste backfill will be transported by truck or pumped via a pipeline into the underground workings.

Concentrate Bagging Plant

A new concentrate bagging plant will be located where the existing concentrate conveyors from the Mill are located, on the south side of the building.

Concentrate Storage Shed

Concentrates will be stored in a new 45 m by 140 m concentrate storage shed located to the south-west of the Mill and will be sized to store 70,000 tonnes of concentrates. The shed will have a packed gravel foundation and consist of steel supports in cement buttresses.

6.3.2 Administration Building

The Administration Building is a two-storey 22 m by 35 m, pre-engineered steel framed building with a 5,000 m^2 area. The upper floor contains mine administration offices, washrooms, engineering and geology offices and a recreation room (now partly converted to a kitchen). The lower floor contains change house facilities, first aid room, mine rescue room, washrooms, a diesel powered boiler and electrical room and a large warehouse area, all on a cement foundation.

The existing building will be upgraded with modern electrics, services and fire safety but overall the building will remain much as it is today. The existing diesel fired boiler heating system will be replaced by the glycol heating system from the powerhouse in the Mill. A new accommodation/kitchen complex will be joined to the Administration building on the west wall as described below.

6.3.3 Accommodation Complex

Camp accommodation, kitchen and dining facilities were installed for approximately 180 men, heated by propane. There are presently 15 bunkhouse units located north of the main administration building. A 30 man trailer complex was demolished in 2008.

A large kitchen complex exists consisting of 10 adjoining trailers with a seating area for 60. This facility has deteriorated beyond repair and after parts salvage would be demolished.

The kitchen and some of the accommodation trailers have deteriorated beyond repair and will be demolished and replaced. Eighty of the trailer rooms are deemed currently useable or upgradable, and these will continue to be used for the construction period and for overflow purposes during operations.

A new modular 110-man two-storey accommodation/kitchen/diner unit is planned for future operations. The new unit will contain a glycol heating system fed by the new power plant, and will be tied into the existing water, sewer and electrical infrastructure.

The new block will also contain a kitchen and full washroom facilities, and will be linked to the Administration building via a utilidor. The new 2 storey accommodation block will be of similar height to the Administration Building, but will occupy a much smaller area in the yard than the existing trailer layout.

6.3.4 Maintenance Workshops

Two Atco-type steel foldaway buildings with cement foundations installed end to end have an area of 15 m by 60 m. These facilities house workshops for equipment repair. The front shop is a machine shop. The back shop has a sump for oil spills.

The existing workshops will undergo electrical, equipment, insulation and heating upgrades to modernize and optimize the facilities. The basic building structures will remain similar to the present.

6.3.5 Tank Facilities

Tank Farm

Four large diesel storage tanks each with a capacity of 10,700 barrels (1,700 m^3 or 1.7 million litres) exist within a 3,000 m^2 containment. The containment has a 300 mm thick clay lining protected by a 900 mm thick sand and gravel cover.

Two 500 gallon riveted steel tanks also exist within their own berm and were used for gasoline storage. These have not been used since 1982 and are empty.

Two 500 gallon steel tanks on skids are located within the Tank Farm berm and contain used lubricants. In addition, there are numerous mostly empty 45 gallon drums, and a covered truck trailer containing depleted batteries.

The main Tank Farm diesel storage tanks will be repaired and painted as per recommendations following an inspection in September 2008. New insulation will be applied to piping and the fuel distribution house will require upgrades for efficiency and safety.

The existing gasoline storage tanks cannot be certified and will be dismantled. The existing lube tank that feeds the powerhouse in the Mill would also be dismantled.

Propane Tankage

A propane storage facility is located immediately to the east of the accommodations and consists of one 18,000 gallon, three 30,000 gallon and four 1,000 gallon tanks. The majority are empty. There are also two 30,000 gallon propane tanks at the 930 level portal. These are presently ~50% full.

The propane tank farm in the main yard would be rehabilitated since it may be used to provide additional heat to the underground, if required. The two 30,000 gallon tanks located at the 930 portal would be moved to the farm. The farm would be fenced off.

Ancillary Diesel Tanks

A number of small diesel storage tanks exist. An un-used 5,000 gallon tank is present on the east wall of the Mill. A 500 gallon tank is located on the south side of the Mill presently used for camp power generators. Another 500 gallon tank is located on the north-west corner of the Administration Building.

A 5,000 gallon tank would be needed on the north side of the Mill next to the new DMS plant and would be connected, by insulated pipe, to the Water Storage Pond to supply emergency water for fire suppression. The existing tank on the east wall of the Mill may be suitable.

6.3.6 Water Treatment Facilities

Underground in the 870 Level, 200 metres in from the portal, a sump was excavated and a water treatment plant using lime was installed in 1981. This plant functioned for one year and has since fallen into disrepair.

CZN constructed a water treatment plant next to the 870 portal in 2006. This is a 10 m x 10 m shack with mixing facilities and pumps. This plant will remain operational until a new, commercial scale plant is built and commissioned for Mine operations, following which the existing plant will be decommissioned.

6.3.7 Water Storage Facilities

A tailings impoundment area is located immediately to the north-west of the Mine site, adjacent to Prairie Creek. The bordering dykes are constructed of compacted gravel excavated from the storage area with an inner facing of compacted clay. The impoundment floor is also underlain by clay. An A-frame floating pump-house is presently in the pond.

The Catchment Pond was constructed within the flood dyke system just above Harrison Creek in the south part of the site. This pond collects all site runoff, and has a gated culvert.

The Polishing Pond is located near the 870 portal area and was constructed in 2005 to receive treated mine water. The pond has a capacity of 1,500 m^3 with a 1 m freeboard.

The existing tailings pond would be converted into a Water Storage Pond, with remedial works to stabilize the backslope, and a new synthetic liner.

The existing Catchment Pond would be used as at present. The present outlet from the Catchment Pond to Harrison Creek would be maintained for emergency purposes. A new outlet directly into Prairie Creek will be constructed. The outlet will include a pipe into the creek connected to a diffuser. A pipeline to pump water from the Catchment Pond back to the Water Storage Pond in an emergency will be laid.

With the new water management scheme, the existing Polishing Pond will become redundant. The pond would be converted into a temporary ore storage pad.

6.3.8 Coarse Ore and Waste Rock

Ore from the original (Cadillac) underground developments was placed in a 50,000 ton coarse ore stockpile on a prepared pad in the central part of the yard, just south-west of the Mill.

Waste rock from development of the 930 and 970 levels was dumped down-slope from the portal staging areas. Waste rock from development of the 870 level was placed at the staging area of the 870 portal. Waste rock from development of the Decline in 2007/8 was stockpiled on a prepared pad on the staging area of the 870 portal.

The existing 50,000 ton coarse ore stockpile would be completely processed through the Mill and will disappear.

6.3.9 Waste Treatment Facilities

Sewage Treatment Plant

The existing Sewage Treatment Plant ("STP") is a steel-framed metal-clad building to the west of the accommodation complex. The design throughput is 30,000 L/day using aerobic biological digestion with the addition of air, and ultraviolet radiation. The plant has not been used since 1982.

The STP will be used for operations essentially as is. An additional tank is to be added to increase sewage residence time improve treatment.

Incinerator

A forced-air diesel- fired incinerator with a 30 ft stack is presently used for disposing of refuse. The unit has been customized to burn used oil. A new incinerator will be used for operations

6.3.10 Cement Plant

A cement batch plant complete with a loading silo, a 20 ton hopper, weigh scales, screen and conveyors was set up to use during construction in 1980 and is located east of the Tank Farm.

If a dedicated cement plant is deemed necessary to complete site structures, the existing cement batch plant would be assessed to determine if upgrading of equipment and electrics would be cheaper than a new plant.

6.3.11 Storage Pads and Other Structures

Reagent Storage Pad

The eastern part of the mine Surface Lease contains a clay-lined engineered pad built to store chemical reagents for use in the milling process (refer to Figure 6-2). There are currently 200 crates of copper sulphate, 80 pallets of xanthate and minor amounts of MIBC stored under heavy tarpaulins. These reagents will be used during operations, or taken off-site for disposal if not of

CANADIAN ZINC CORPORATION

Date:	October 2009
Drawn By:	C. Reeves
Scale:	Not Shown
Drawing:	DAR Fig 6–2.dwg

FIGURE 6-2: Reagent Storage Pad (During Cyanide Re-Pack)

suitable quality. No further use of the storage pad is expected at present, however it will be retained in the event overflow storage is required. Six barrels of PCB contaminated gravels are stored in a covered trailer nearby, awaiting access road opening and off-site disposal.

Other Structures

Two small shacks cover water wells installed in the Prairie Creek Aquifer. A carpentry shop in the north-east corner of the yard has been converted into a core shack. A tire replacement shop has been converted into a carpenters shack in the central part of the yard.

The existing Atco foldaway building next to the workshops would be upgraded for future storage.

6.3.12 Airstrip

A 1,000 m long, 30 m wide gravel airstrip (CBH-4) is located on the Prairie Creek floodplain just less than a kilometre north of the Mine site. The south end contains a clay lined pad for 45 gallon drum temporary storage. The basic airstrip would remain the same, but safety upgrades to assist in electronic navigation including lights and beacons would be considered. Additional gravel surfacing would also be needed.

6.3.13 Explosive Magazines

In the eastern part of the mine Surface Lease there are 4 covered trailers used previously, and a 30 x 30 ft steel magazine used recently, to store explosives. The existing customized trailer magazines are not compliant with today's code and could not be used as magazines, but could be used as storage facilities elsewhere on site. New steel magazines that comply with the Canada Mines Regulations would be brought in by road and set up in the same vicinity as the existing magazines. The economics of an emulsion plant on site verses transporting explosives will be investigated.

6.3.14 Underground Facilities

There are presently 3 levels (all level numbers refer to metres above sea level) of underground development at Prairie Creek; the 880, 930 and 970 m Levels.

The highest underground level is referred to as the 970 m Level and contains 6 crosscuts with a limited staging area at the portal.

The mid-level, referred to as the 930 m Level, contains 32 crosscuts, over 2 km of workings along with ore passes, waste passes and man-ways connecting to the lower level.

The lower level, referred to as the 880 m Level, has rail tracks and contains 7 crosscuts, 1 decline and over 1.5 km of development. This level contains a refuge station, day magazine storage areas, a sump system, tool crib and hydraulically controlled loading pockets which extend from the upper level. The mine will eventually be developed on 6 main levels (from bottom to top, 640, 720, 800, 880, 930 and 970 levels. The sub 880 levels are to be accessed through a trackless ramp system with a collar for the portal immediately adjacent and to and west of the existing 870 portal entrance. An underground repair shop will be excavated near the top of the ramp. The tracked system on the 870 level would continue to be utilized along with the ore and waste passes dropping from the 930 level.

6.3.15 Site Ancillary Facilities

Electrical service to the site is sourced from the Mill and is delivered to the site in both overhead (supported by posts) and underground cables. Insulated pipes from the Mill to the tailings pond run along the main flood berm. The main fuel line from the Tank Farm to the Mill runs overhead Harrison Creek on a steel trestle.

The camp draws potable water from a well 20 m north-west of the Administration Building. A similar well is located on the north side of the coarse ore stockpile.

Fire suppression systems, including roof sprinklers and audible alarms, are installed in the Administration Building and trailers with a central monitoring control board in the Administration Building.

Heat traced pipe will be installed both above ground and buried (where appropriate) to carry process water to and from the WSP and WTP. The piping containing the glycol for heating will be installed within utilidors. Electrical wires to the various site services will be delivered underground where possible, and the existing hydro poles and overhead lines would be removed.

The fire detection and suppression system is partly installed. The hardware already installed will be re-used if it can operate with the new, modern fire control panel. Each plant facility and arctic walkway will include a fire detection and/or suppression system appropriate to the application..

Water for fire suppression will be taken from the water ring main. The suppression system will remain dry until demand for filling is received from the fire detection system.

6.3.16 Road Camps

There were two camps and fuel caches (Cat and Grainger Camps, refer to Figures 5-2 and 5-3) established when the access road was built and operated. Cat Camp is located at Km 38, and Grainger Camp is located at Km 143. Refer to Section 5.1 of this report for details of these camps.

The existing Cat and Grainger Camp sites would be reclaimed. If the access road re-alignments are approved, a small tote road (Figures 6-23) would be required to the Grainger Camp in order to access the site, remove equipment and reclaim the land. Cat Camp may be retained to support road construction, but without significant fuel storage. In order to expedite the movement of large volumes of concentrate across the ice bridge on the Liard River, 2 new storage facilities would be constructed along the access road, the Tetcela Transfer Facility ("TTF") and the Liard Transfer Facility ("LTF").

6.4 Changed Levels of Existing Infrastructure Use

This section describes changes to the level of use of the existing infrastructure between the exploration period and the proposed operating period.

In 2006/2007 when CZN was developing the Decline underground, and conducting surface exploration drilling, up to 50 people were on site, summer and winter. For Mine operations, the number of on-site personnel is expected to be 110. Changes to the level of infrastructure use will be related to these differing numbers of personnel.

Use of the Administration Building will not change significantly because it was used as a kitchen and change house for exploration. The kitchen function will revert to an office function, with a new kitchen being added with the new accommodation block. The existing accommodation trailers will be used for construction and on-going exploration in a similar fashion as before also.

With the additional people, there will be more water drawn for potable use. Sewage will be sent to the STP which has remained idle, as opposed to a sump near the Administration Building. Electricity will be supplied by new generator sets in the Mill as opposed to the individual generator sets used at present. The Fuel Tank Farm will see more activity in the form of refuelling as this has not occurred since Cadillac's insolvency in 1982.

Surface water diversion, collection and discharge structures, such as the Catchment Pond, will not change materially. The Polishing Pond will be converted from its current use of polishing water to temporary ore storage.

Maintenance shops will be used more extensively because of the greater number of service vehicles in operation.

The airstrip will not see a significant increase in activity. During the busy exploration period, flights into site averaged 2-3 per week, and were daily at peak times. During operations, 3-4 flights a week are expected for crew changes, bringing in food, and occasional visitors.

6.5 Permits Required

CZN applied to the MVLWB for a Class 'A' Water Licence and a Class 'A' Land Use Permit ("LUP") to mine and process ore at the Mine. CZN also applied to the MVLWB for Class 'A' LUP's to operate the two transfer facilities. CZN did not apply for a new Water Licence and LUP for the access road from the Mine to the Liard Highway because CZN already has these permits, and it was not expected that the road would be scoped into the EA. As the road was scoped into EA, new or amended road permits will be required.

The MVLWB would issue all of the above noted permits, except for the LUP for the Tetcela Transfer Facility since this is inside the expanded NNPR. This permit would be issued by Parks Canada. In addition, Parks Canada would need to issue a Water Licence and LUP for that portion of the access road that crosses the park.

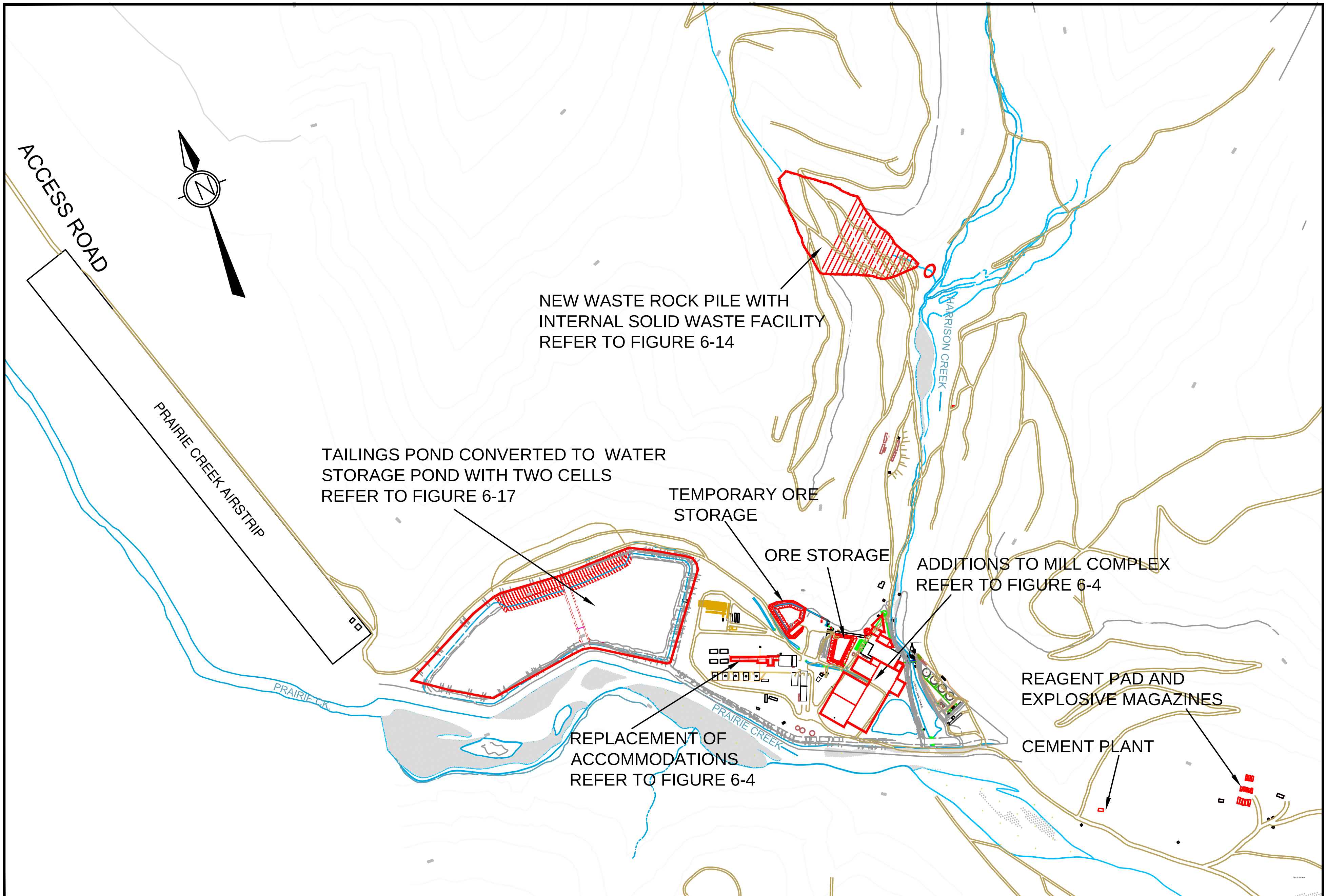
An authorization will be required from Environment Canada to discharge effluent to receiving waters. A permit will be required from the GNWT Workers Compensation Board ("WCB") to store and use explosives. CZN is not aware of any other permits or authorizations required for operations. A number of regulations and guidance documents exist which the Mine will need to follow, for example, for the operation of a solid waste facility and a bio-treatment cell for the remediation of soil contaminated with hydrocarbons.

In terms of inspections and certificates for the use of existing or upgraded infrastructure, it is our understanding that these are dealt with as conditions of a Water Licence. This was the case for the Water Licence for the Decline Development, in which conditions required that the existing Fuel Tank Farm containment and facilities be inspected by a qualified engineer (and were deemed fit for future use), and that the maximum probable flood be re-assessed and the suitability of flood protection works be confirmed. These requirements were completed and approved by the MVLWB.

6.6 Other Required Developments

New or improved developments that will be required for Mine operations are listed below, and most are shown in Figures 6-3 and 6-4. A conceptual view is given in Figure 6-5. These developments will be discussed in the sub-sections below.

- A new portal immediately west of the existing 870 portal
- A 20,000 tonne ore stockpile for the start-up period
- Conversion of the Polishing Pond for use as a temporary ore stockpile
- A Dense Media Separation ("DMS") plant
- A DMS rock (float) stockpile
- A Paste Backfill plant
- A concentrate bagging plant
- A concentrate storage shed
- Cement and reagent storage buildings
- A Water Treatment Plant with acid storage containment



CANADIAN ZINC CORPORATION

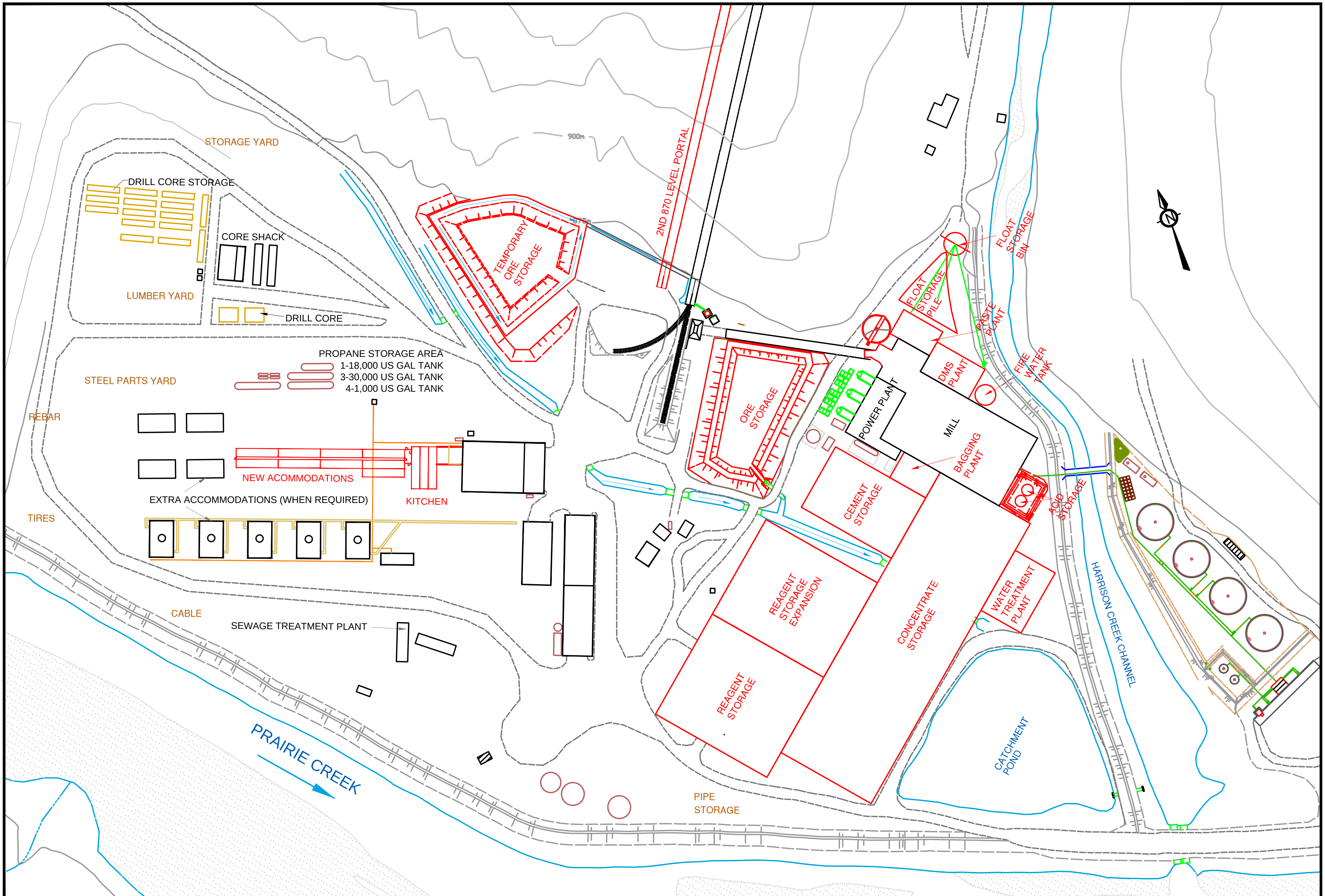
Date:	October 2009
Drawn By:	C. Reeves
Scale:	As Shown
Drawing:	DAR Fig 6–3.dwg

Note:
Proposed changes in mine site infrastructure are highlighted in red.

SCALE
0 100 250 500
METRES

PRAIRIE CREEK MINE

Figure 6-3:
Location of Modified or Additional Infrastructure At Prairie Creek Mine Site



CANADIAN ZINC CORPORATION

Date:	October 2009
Drawn By:	C. Reeves
Scale:	As Shown
Drawing:	DAR Fig 6-4.dwg

Note:
Proposed changes in mine site infrastructure are highlighted in red.

SCALE

0 25 50 100
METRES

PRAIRIE CREEK MINE

FIGURE 6-4:
LOCATION OF UPGRADED AND MODIFIED INFRASTRUCTURE; MAIN YARD

CANADIAN ZINC CORPORATION

Date:	October 2009
Drawn By:	C. Reeves
Scale:	Not Shown
Drawing:	DAR Fig 6-5.dwg

FIGURE 6-5: Conceptual View of Upgraded Facilities at Prairie Creek Mine Site

- A new kitchen/accommodation block
- Explosives magazines
- Conversion of the tailings pond to a Water Storage Pond
- A Waste Rock Pile with a solid waste management area and a new incinerator
- New generator sets with a glycol-based heat recovery system and new electrical system
- Two new transfer facilities along the access road near the Tetcela River and the Liard Highway

6.7 Underground Facilities

The Prairie Creek deposit will be mined 100% by underground mining methods. The combination of the surface topography and location of the mineralization has enabled all access by adit entrances located on the north side of Prairie Creek or west of Harrison Creek.

The development of the mining operation will require one additional portal at the same elevation, but to the west of the current 870 Level portal, which is currently the lowest level (Figure 6-6). The new 870 Level adit/portal and the current 870 Level adit/portal will be the entries from which 870 Level ore will be delivered to surface; the ore mined above the 880 Level will be accessed by the existing portal, while all the ore below the 880 Level will be accessed by the new portal. The existing adit will continue to utilize track haulage for the Upper Mine. This track haulage will continue to be extended to the full strike length of the 880 Level, but this will be carried out over the life of the Mine as the mining schedule for the Upper Mine requires.

The new 870 Level portal will provide the ramp access to the Lower Mine and will utilize trackless equipment. The initial development of this Lower Mine portal will be at a small positive grade to permit water drainage and collection. As soon as suitable rock conditions exist, a maintenance shop/garage will be excavated adjacent to the new haulage. This will facilitate lube and small maintenance work on the trackless equipment. This facility and a fuelling station will require its own ventilation circuit.

The primary development for the Lower Mine will be a ramp at -15% grade, 4.3 m high and 4.5 m wide, to accommodate 20 tonne capacity trucks and services. The ramp decline will be commenced on the 880 Level, and will be mined initially down to the 800 Level. After development on 800 Level has been advanced, the ramp will be continued down to the 720 Level. Similarly, after initial development has been advanced, the ramp will be continued to the 640 Level. The 640 Level will provide access to the Stratabound ore as well as the Vein ore.

Ventilation

Both 870 Level adits will be used to provide intake ventilation to the mine. Ventilation controls with low-pressure fans, and facilities to heat the air in winter, will be installed inside both 870 Level entrances. Heating the air in winter time is necessary so that the temperature is above freezing.

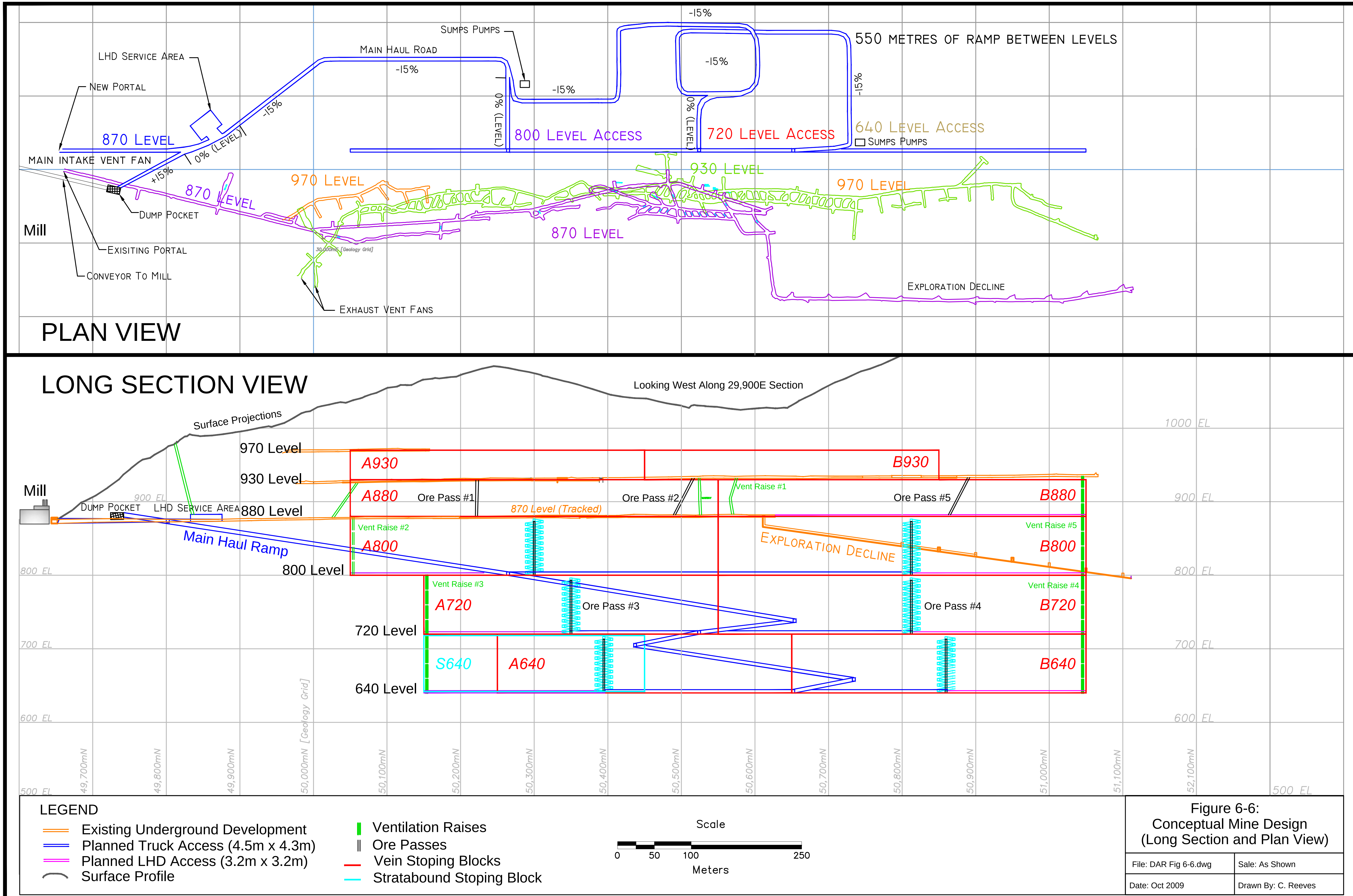


Figure 6-6:
Conceptual Mine Design
(Long Section and Plan View)

Booster fans inside both the Upper and Lower Mines will assist in the splitting of the total volume of ventilation, with the higher volume supplying the Lower mine. The booster fans will also direct the ventilation to the working faces, as required. Two exhaust fans will be located at the 930 Level Adit to exhaust the air from both the Lower and Upper Mines.

Mine Drainage

Currently, water drains from the 880 Level to surface. As the Mine is developed, holes will be drilled from each new level prior to mining the ore to drain the Vein structure. Sumps and pumps will be installed. Permanent pumping stations are planned for the 640 Level and 800 Level. Each pump station will consist of one or more sumps to contain the water and allow for sludge settlement. Water will be pumped from the 640 Level sump to the 800 Level sump. Water from the 800 Level sump will be pumped to a sump on the 880 Level for delivery to surface.

Ore Dump and Storage

Adjacent to the 880 Level track haulage inside the 870 Upper Mine portal, the drive will be widened on the east side to provide room for a storage bin to be excavated in the rock below track level. This will allow mine cars to dump into this bin. On the portal side, a scraper will move ore from the bin to a conveyor. The conveyor will transport the ore to a bin outside of the portal. The Lower Mine ore will be routed to the same bin inside the portal.

Other Mine Facilities

The Upper Mine was designed to utilize compressed air and water for mining, and electrical connections for fans. Similarly, the Lower mine will require compressed air and water feeds, but the planned use of electric drill jumbos will require additional electricity, and thus increased electrical feeder/transformer stations.

6.8 Explosives

Skid-mountain explosive magazines will be transported on the access road into the Mine, followed by trucks transporting the explosives. It is anticipated that these will be sourced from Alberta. During mine development, areas are expected to be wet and dry. Stick explosives will be used in wet areas. If areas are dry, Amex may be used. Amex is a pre-mixed, dry form of ammonium nitrate and fuel oil ("ANFO"), and comes in bags of prills. The problem with Amex is the soluble ammonia residues that can contaminate water. If Amex is used, ammonia concentrations in adjacent site waters will be monitored closely.

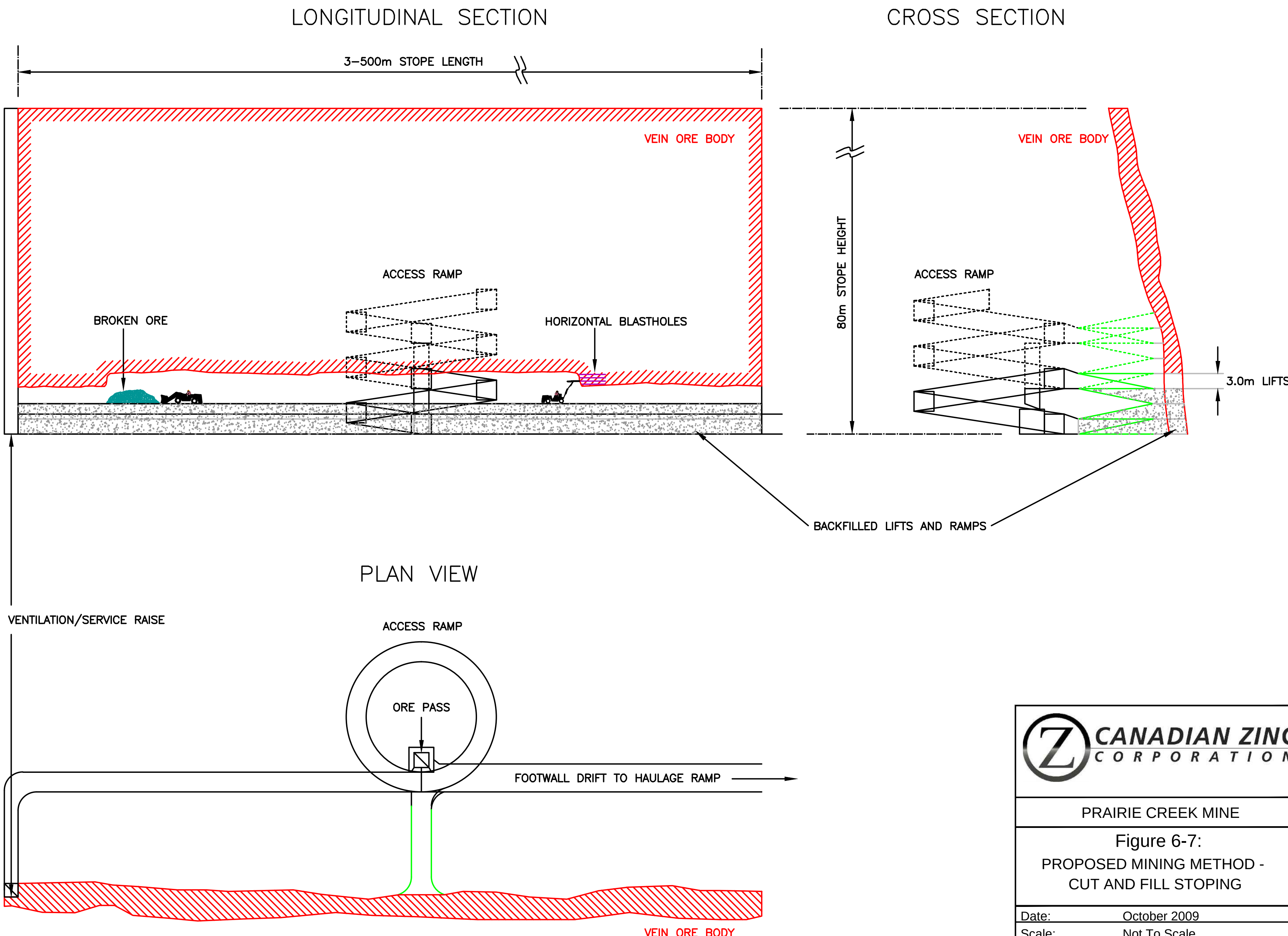
The only explosives planned for the production stage (ore extraction) will be sticks because of water. CZN will consider the viability of an emulsion explosives plant for the production stage. Emulsion explosives do not have an ammonia contamination issue and may be cheaper than sticks considering transport requirements. It is estimated that, at maximum production, 550,000 kg/annum of sticks would be needed..

A licenced contractor will be responsible for hauling the explosives in by truck to the on-site magazines. Trained and authorized CZN people will oversee the daily transfer of explosives to secure, temporary underground storage locations. The explosives remain in their packages until arrival at the blasting location.

6.9 Mining Methods

The majority of mining will be by the cut-and–fill method, or some variation thereof (see Figure 6-7). Cut-and-fill mining is one of the preferred mining methods to reduce 'dilution' of ore by wallrock. Shrinkage-type mining may be used within the Upper Mine as some areas have already been developed with this method. Three major factors will determine the mining method used: grade, thickness and the local rock conditions of Vein ore. Drilling has indicated that Stratabound ore has potential to be mined by a higher productivity, bulk mining method.

Current planning is for 3 m slices of ore to be exacted, however size dimensions will be determined by conditions in mining areas. A second slice may be extracted prior to the placement of paste backfill in the void of the first slice. If deemed necessary, a partial fill of up to 50% height of the first slice may be carried out prior to mining of the second slice.



CANADIAN ZINC CORPORATION

PRAIRIE CREEK MINE

Figure 6-7:
PROPOSED MINING METHOD - CUT AND FILL STOPING

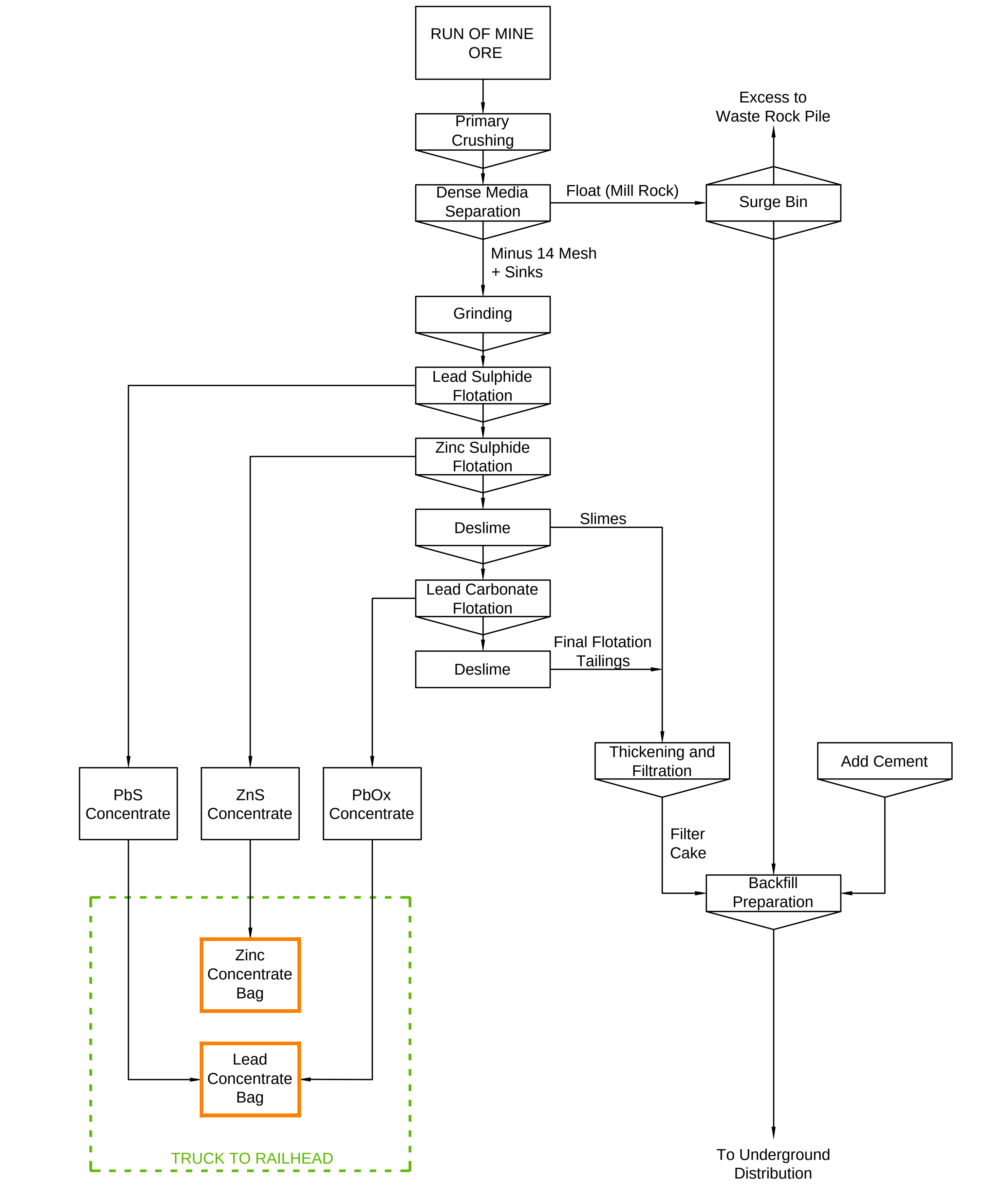
Date:	October 2009
Scale:	Not To Scale
File Name:	DAR Fig 6-7.dwg
Drawn By:	C. Reeves

6.10 Mill Process

6.10.1 Ore Processing

The existing crushing plant is adequate for a 1,200 tonnes per day throughput. The Mill process flow-sheet is based on metallurgical testing from a number of bulk samples collected from Vein and Stratabound ore samples over the course of the 2005-2007 underground exploration and development program at the site. Extensive mineral processing studies have been carried out off-site by SGS Lakefield, Golder Paste Technology Inc., Confidential Metallurgical Services and other consulting engineers. The flow sheet consists of crushing, dense media separation ("DMS") of low density (float) rock from mineralized rock, followed by grinding and sequential flotation of lead sulphide, zinc sulphide and lead carbonate concentrates. The flow sheet is equally applicable to Vein or Stratabound ores, as well as a blend of the two. A simplified flow sheet is shown in Figure 6-8. The main unit operations in the flow sheet are:

- Jaw and cone crushing to a nominal 12 mm size.
- Screening to produce streams of two sizes, one minus 14 mesh, and a second plus 14 mesh/minus 12 mm.
- DMS of the plus 14 mesh/minus 12 mm material. At a SG of 2.8, approximately 18% of the ore reports to the "float" portion (1 to 10 mm in size), and the heavier "sink" material and the minus 14 mesh fraction are combined for further processing.
- The upgraded ore is then ground in a ball mill to 80% passing 80 microns.
- The ground ore is treated in a lead sulphide flotation circuit. Reagents are used to promote flotation of the lead sulphide and suppression (sinking) of the remainder. A lead sulphide concentrate is produced, and the remaining material (the flotation tailings) reports to the zinc sulphide flotation circuit.
- The zinc sulphide flotation circuit similarly produces a concentrate and the flotation tailing is the feed for the lead carbonate flotation circuit.
- After lead carbonate flotation, there is no more processing of the remainder and it becomes the final flotation tailings. These final tailings are pumped to the Paste Backfill plant, thickened, filtered and mixed with DMS float and cement to form a backfill mix. The mix is transported underground via truck or pipeline to backfill previously mined out areas.
- Each of the concentrates listed above are separately thickened and filtered. The concentrate filter cake is taken by conveyors to the concentrate bagging plant and then the concentrate storage building.



CANADIAN ZINC CORPORATION

PRAIRIE CREEK MINE

DATE: OCTOBER, 2009

FILE: DAR Fig 6-18.dwg

Figure 6-8: Simplified Metallurgical Process Flow Sheet

6.10.2 Reagents

The following reagents have been used in the test work to develop the current flotation flow sheet, and will be used during operations:

Reagent	Purpose
Lead Sulphide Circuit	
Na_2CO_3 (soda ash)	pH modifier
P82 (mixture of $ZnSO_4$, $Na_2S_2O_3$ and $Na_2S_2O_5$)	zinc depressant
AQ4 (mixture of Na_2SiO_3, Acumer 9000 and $NaPO_4$)	slime dispersant
SIBX (sodium isobutyl xanthate)	collector
DF067 (Dynafloat 067)	frother
MIBC (methyl isobutyl carbinol)	frother
Zinc Sulphide Circuit	
Na_2CO_3 (soda ash)	pH modifier
$CuSO_4$ (copper sulphate)	activator
AQ4 (mixture of Na_2SiO_3, Acumer 9000 and $NaPO_4$)	slime dispersant
SIBX (sodium isobutyl xanthate)	collector
3894 (Cytec 3894)	promoter
Lead Carbonate Circuit	
Na_2S (sodium sulphide)	lead sulphidizing agent
RTR3	depressant
SIL N (sodium silicate)	depressant
SIBX (sodium isobutyl xanthate)	collector
DF067 (Dynafloat 067)	frother
AQ4 (mixture of Na_2SiO_3, Acumer 9000 and $NaPO_4$)	slime dispersant

Most of the reagents are organic, and all are non-hazardous. Their residues will be contained in the final tailings solids and water after processing, and pose no significant environmental risks.

6.10.3 Concentrate Bagging and Storage

The concentrates from the Mill will be bagged and stored in a newly constructed concentrate storage shed next to the Mill (see Figure 6-4).

The intent is to produce bagged concentrates which are clean on the outside, and there is no tracking of concentrates outside the bagging area other than in the bags. Each bulk bag will contain approximately 3.5 tonnes of concentrate. The bags will remain sealed after bagging and during storage in the shed until the winter haul season.

A concentrate bagging unit will be located at the end of each of the conveyors. Filtered concentrate will contain 8 to 9% moisture which is high enough to prevent dust generation during the bag filling operation. The filtered concentrate will discharge down a bag feed chute fitted with a splitter which allows the concentrate to be directed to either of two bag loading frames holding open bulk bags (refer to Figure 6-9, 6-10, 6-11, 6-12).

The bag loading frame sits on a roller conveyer to facilitate the replacement of full bag frames with empty ones. The full concentrate bag is then closed and sealed using ties, as shown in Figure 6-10.

The sealed bags are then moved by bridge crane and front end loader to the concentrate storage building where they are stacked. Figure 6-11 shows the bag lifter which is fitted with a portable scale. In the concentrate storage area, it is anticipated the bags can be stored up to 6 bags high.

6.11 Backfill Process

A high priority in the planning of mining method for the Prairie Creek Mine has been the requirement to utilize all Mill tailings for filling underground voids and have no tailings on surface after mine closure. As processing in the mining industry has developed over many years, metallurgical recoveries have increased with finer grinding of the ore. However, the resulting finer tailings are less suitable for use as hydraulic fill because of poor drainage properties. Paste fill was developed to overcome the problem. Paste filling has been developed over 3 decades. Paste can be considered non-segregating slurry, which means that it has negligible excess water when stationary and remains essentially as a homogenous single phase product.

Golder PasteTec was commissioned by CZN to conduct a laboratory evaluation of mine tailings for use as backfill at the Prairie Creek project. The results from this test work (refer to Appendix 15) have shown that a paste that can meet the necessary design criteria can be produced at the Prairie Creek Mine. The backfill mix will consist of filtered tailings, float rock from the DMS plant, and cement. The mix is similar to concrete in that the tailings represent the sand fraction and the DMS rock is the aggregate.

A Paste Backfill plant will be constructed adjacent to the Mill and will operate as a batch plant. Tailings and DMS rock will be temporarily stored to feed the plant when mined voids are available for filling. This provides flexibility in the start-up period of the mine when developed areas requiring fill will be limited, but during later years if scheduling problems arise.

Bulk paste fill will consist of approximately 80% tailings, 19% DMS rock and 1% cement. In cut and fill mining, successive ‘cuts’ use the top of the fill as a working floor to cut ore from above. Therefore, the floor has to be stable to support equipment. To achieve this, a three foot layer of approximately 50% tailings, 47% DMS rock and 3% cement will be used at the top of a fill.

CANADIAN ZINC CORPORATION

Date:	October 2009
Drawn By:	C. Reeves
Scale:	Not Shown
Drawing:	DAR Fig 6-9.dwg

FIGURE 6-9: Bulk Bag Frame

CANADIAN ZINC CORPORATION

Date:	October 2009
Drawn By:	C. Reeves
Scale:	Not Shown
Drawing:	DAR Fig 6-10.dwg

FIGURE 6-10: Sealed Concentrate Bags

CANADIAN ZINC CORPORATION

Date:	October 2009
Drawn By:	C. Reeves
Scale:	Not Shown
Drawing:	DAR Fig 6-11.dwg

FIGURE 6-11: Bag Lifter with Portable Scale

CANADIAN ZINC CORPORATION

Date:	October 2009
Drawn By:	C. Reeves
Scale:	Not Shown
Drawing:	DAR Fig 6-12.dwg

FIGURE 6-12: Stacked Bags in Concentrate Storage Building

A combination of low-profile ready-mix trucks will haul paste from surface to the underground. Truck capacity will be 8 m^3, and 2 trucks will be required. A series of 3 or more boreholes over the length of the orebody will be drilled. The trucks will discharge paste into hoppers located above a borehole, and the paste will flow by gravity via the boreholes into a hopper feeding a pump. The pump will then deliver the paste into the stopes via short discharge pipelines. For stopes that are easily accessible, the trucks may be able to dump directly into the stope. A maximum horizontal pumping distance of approximately 200 m will limit pump pressure to less than 45 Bar. Limiting the pressure will reduce maintenance requirements.

The physical properties of paste fill significantly reduce the need for the type of bulkheads required for hydraulic fill. Also, mines using paste fill do not have the issue of handling the water draining from the fill. However, CZN plans to use bulkheads to limit the transmission of groundwater through backfilled areas after mine closure. In each panel of ore, fill is placed in successive cuts and the fill level progresses up to the final roof. At that point, it is difficult to ensure complete filling to the roof. Bulkheads will be placed in strategic locations to ensure that the top of the backfilled areas do not become conduits for groundwater movement, potentially carrying metals leached from either the wallrocks or the backfill.

Paste backfill technology is not new. It has been employed in the mining industry for at least 15 years (since 1995) by at least 20 projects all over the world (see Table 6-3).

6.12 Mine Waste Management

Mined material streams that will require on-site management during operations include waste rock, DMS coarse reject rock, and tailings. The management plans for these streams are described below.

6.12.1 Waste Rock and DMS Rock

Waste rock will be produced from both the Mine and the Mill.

Waste rock from the mine will be produced when tunnels are driven through barren country rock to gain access to the mineralized zones on different mine levels. Some of this rock may be left underground to avoid haulage to surface. However, most will be brought to surface for disposal.

The DMS circuit in the Mill will also produce waste rock as a coarse rock reject with a moisture content of approximately 6%. The waste rock will average ¼ inch, and consist mostly of the host rock being mined with minimal metal values.

CZN engaged MESH Environmental Inc. (“MESH”) to conduct a thorough geochemical assessment of all country rock units that will be intersected and will produce waste rock during mining, as well as the other mine waste streams. MESH conducted an extensive static testing program (acid base accounting, metals) and initiated kinetic testing (shake flask tests and humidity cells). The results of this work were presented previously with CZN’s Project Description Report (“PDR”).

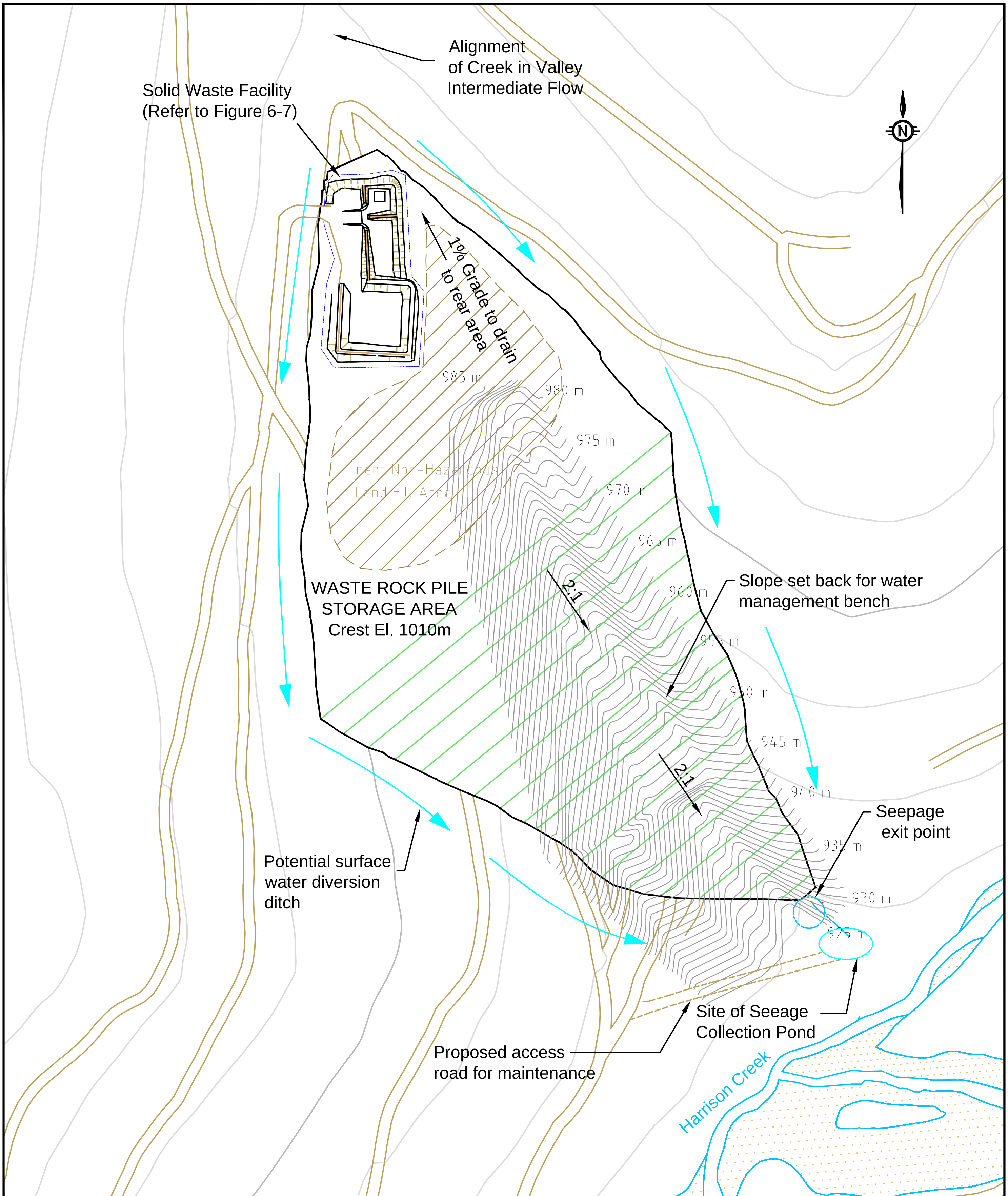
Table 6-3: Paste Backfill Projects

Project	Location	Start Year	Capacity (tph)	Binder Type	Fill Material	Tailings Transport	Transfer to Plant
Xstrata Nickel - Kidd Creek	Timmins, ON Canada	2005	400	Furnace slag / cement	Tailings, sand, rock	Truck	Tails - truck
Campbell Mine - Placer Dome	Red Lake - Ontario - Canada	1998	75	Cement / fly ash	Tailings only	Adjacent to Mill	45% solids
Cayeli Paste Plant - CBI	Black Sea - Rize – Turkey	1998	90	Cement	Tailings only	Conveyor	Pumped at 55% solids
Hudson Bay Mining & Smelting	Flin Flon, MB, Canada	2003	70	Cement	Classified Tailings	Pipeline	Gravity
Lisheen - Anglo Base Metals	Tipperary - Ireland	2002	210	Cement	Tailings only	Pipeline	Adjacent to mill
San Rafael - Minsur S.A.	Peru	2005	100	Cement / slag	Tailings	Pipeline	Pumped at 55% solids
Diavik Diamond Mine (inc. crushing & grinding plant)	Northwest Territories, Canada	2009	200	Cement	Crushed & milled aggregate	Belt Conveyor	Dry
Iscaycruz	Peru	2002	40 m3/hr	Cement	Tailings only	Pipeline	40%
Garson Mine - Vale Inco	Sudbury ON Canada	1995	105	90/10 Slag	Tailings only	None	Dry
Greens Creek Mine - Kennecott	Juneau - Alaska – USA	2003	75	Type I/II	Tailings only	Trucking	Filter cake
Zinkgruvan Mine - Lundin	Zinkgruvan - Sweden	2000	135	Cement	Tailings only	Adjacent to mill	Pumped at 32% solids
Mineracao Caraiba	Brazil	1997	185	Cement	Tailings only	Conveyor	Pumped at 55% solids
Red Lake Mine - Goldcorp Inc.	Red Lake - Ontario - Canada	1999	60	Cement / fly ash	Tailings only	Adjacent to mill	45% solids
Freeport	Indonesia	2009	300	Type 10 Portland	Tailings	Pump / pipeline	60% solids
BHP Cannington Paste Plant	Mount Isa - Queensland – Australia	1997	175	Cement	Tailings only	Pump / pipeline	45% solids
Bulyanhulu Gold Project - Barrick/ Kahama Gold Corp	Victoria Greenstone Belt - Tanzania	2000	200	Cement	Tailings+ crushed aggregate	Adjacent to Mill	45% solids
Milpo Cerro Lindo	Peru	2007	105 m3/hr	Cement / fly ash	Tailings	Pipeline	Filter cake
Coeur Kensington	Alaska	2010	50	Slag / Cement	Tailings	Pump / pipeline / conveyor	Filter cake

While there are some differences between the country rock units in terms of geochemistry, all are expected to be non-acid generating ("NAG"), and will not require special management plans during operations because of their high neutralization potentials. The humidity cell data indicate that waste rock runoff (leachate) may not contain significant metal concentrations. Irrespective of this, CZN has conservatively assumed that waste rock leachate cannot be discharged without management, and has planned accordingly. The waste rock from mine development will be placed near the 930 level portal in a compact, engineered facility. The specific location of the Waste Rock Pile ("WRP") is 400 m to the north of the 930 level portal on the north-west slope of the Harrison Creek valley. A design report by Golder Associates for the WRP is given in Appendix 11. The WRP location and design is shown in Figures 6-13 and 6-14. The design includes upslope clean runoff diversion around the pile, and pile leachate collection during operations in a seepage collection pond. The collected water will be routed via pipeline (to the main site) or borehole (to the underground) into the overall site water management system.

The DMS coarse reject rock will be geochemically similar to the waste rock from mine development. Approximately three-quarters can be used in the backfill underground. The remainder will be deposited in the WRP. A surge pile of the DMS rock will be maintained near the Mill to provide feed to the backfill mix process. A location has been chosen for the surge pile immediately behind (north) the Mill. The storage site will consist of a gravel pad with underliner and lock-block walls. Provision will be made for the collection and management of any leachate.

An analysis of waste quantities has been made based on the projected mining plan. The quantities are given in Table 6-4. It is projected that approximately 277,000 m^3 of development waste rock and 163,000 m^3 of DMS rock will be placed in the Waste Rock Pile, a total of 440,000 m^3. The capacity of the pile is not limited to that shown in Figures 6-13 and 6-14. There is considerably more storage available upslope for pile expansion, should this be necessary.



Legend

- Waste Rock Boundary
- Surface Roads
- Contour (Surveyed 2009)
- Watercourse

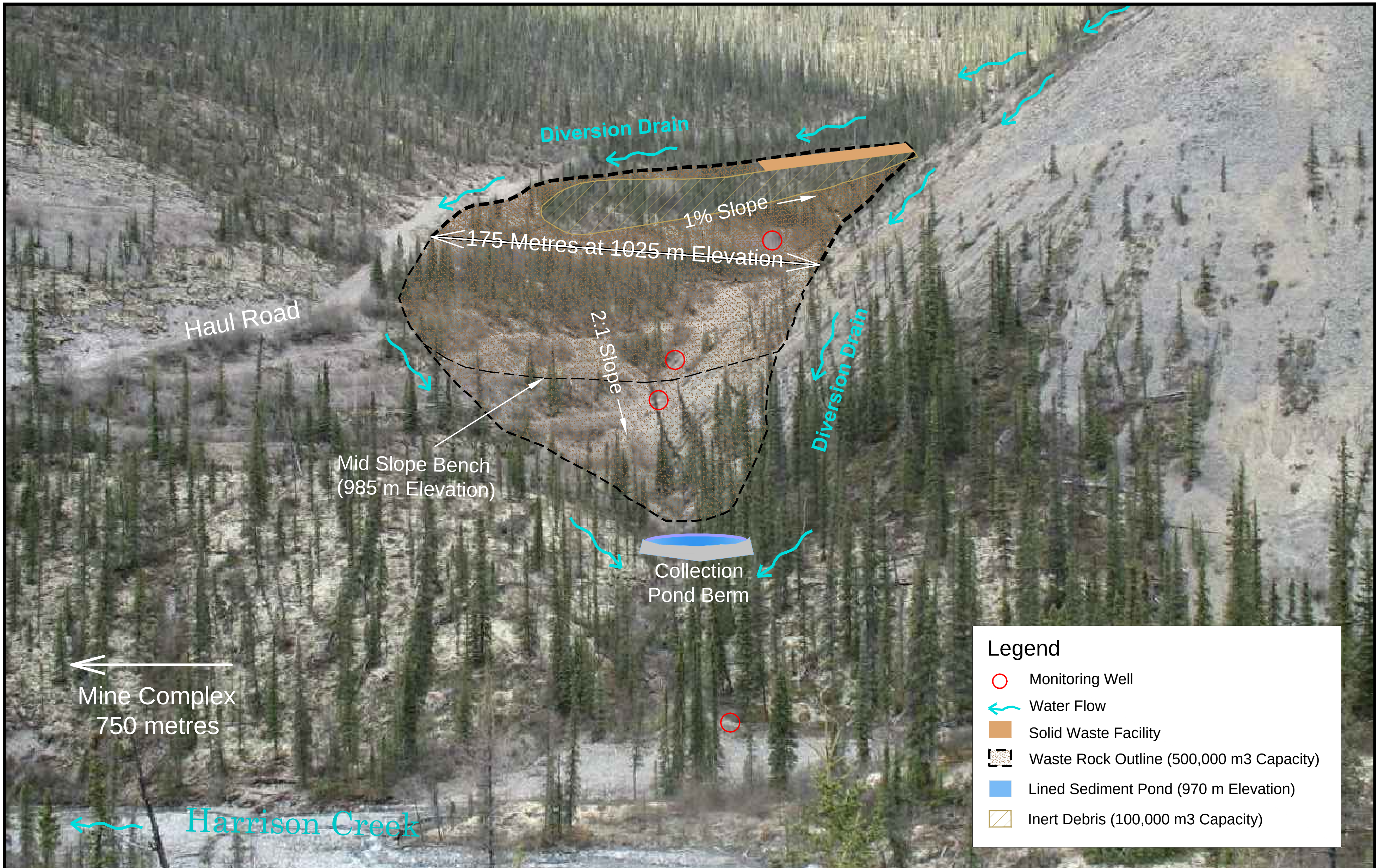
Scale in Metres: 0 20 40 60

CANADIAN ZINC CORPORATION

Scale: As Shown
Drawn By: C. Reeves
File Name: DAR Fig 6-13.dwg
Date: October 2009

PRAIRIE CREEK MINE

Figure 6-13:
LOCATION AND DESIGN
OF WASTE ROCK PILE



CANADIAN ZINC CORPORATION

Date:	October 2009
Drawn By:	C. Reeves
Scale:	Not Shown
Drawing:	DAR Fig 6–14.dwg

FIGURE 6-14: Waste Rock Pile; Conceptual Layout

Table 6-4: Life of Mine (Years 0-14) Waste Quantities

Item	Tonnes	%	t/m^3	M^3	Comment
Mill Feed	4,995,000	100%			
DMS Rock (DMS)	1,203,750	24%			
Flotation Tailings (FT)	2,506,222	50%			
Concentrates	1,285,028	26%			
Unplaced Backfill (DMS+FT)	3,709,972	26%			
Voids (stopes & development)				1,799,720	
Density Backfill			2.24		wet density
Solids Content		84%			
Placed Backfill (DMS+FT)	3,401,470		1.89		dry density (1.89 dry tonnes/m^3)
Backfill not placed u/g	308,502			163,229	
Proportion DMS not		26%			
Ratio Tails to DMS in			2.8		
Development waste rock				276,470	
Total to Waste Rock Pile				439,699	waste rock plus DMS rock

6.12.2 Tailings

CZN plans to place all of the tailings underground in a backfill mix with DMS rock and a 1-3% cement binder. The flotation tailings product will be non-potentially acid generating due to low sulphide content and excess buffering capacity (refer to the MESH Report, 2008). Due to the very high proportion of economic minerals in the ore, it will be possible to place all of the tailings and approximately 75% of the DMS rock underground (see Table 6-4).

When mining voids are available underground to be filled, the backfill mix will be delivered to the fill site directly from the backfill plant. However, voids will not always be available underground. The DMS rock can be taken to the WRP, but temporary storage for the filtered tailings will be required. The greatest storage requirement will be on start-up, when it may be several months before stopes (mining areas) are available for backfill. During the first 5 months of operations, approximately 50,000 tonnes of tailings is expected to be produced (see Table 6-5). While stopes should be available for backfill within this period, it is considered prudent to provide for temporary storage of this quantity of tailings.

Table 6-5: Temporary Start- Up Storage Quantities

Temporary Storage	Tonnes	%	t/m^3	m^3
Mill Feed 1st 5 months	100,000	100%		
DMS Rock (DMS)	24,099	24%	2.12	11,367
Flotation Tailings (FT)	50,175	50%	2.08	24,122
Unplaced Backfill (DMS+FT)	74,274	74%		

In providing for temporary tailings storage, consideration was given for the possibility that some of the tailings may need to be re-handled during the winter period. Consequently, two temporary storage sites are planned. One site will be a building adjacent to the concentrate shed which will have a concrete floor and heating from the glycol heat recovery system associated with power generation. This site will have capacity for 10,000 tonnes. A second temporary storage site will consist of the western cell of the Water Storage Pond. The tailings will be discharged into the lined cell, and will primarily occupy the north-western corner of the cell. These tailings will be reclaimed later by pumping a slurry back to the Mill for filtration and the production of a cake for supply to the backfill plant.

6.13 Aggregates

Aggregate material will be required as roadbed both at the Mine site and on the access road.

The mountainous sections of the Mackenzie Mountains have produced significant natural talus slopes which contain various sizes of aggregate material in the proximity of the Mine site and access road. The talus material is primarily “slabby”, with many natural parting planes, and would need to be crushed and screened to a consistent size to be utilized as roadbed material. A portable crusher would be brought into the operation to generate aggregate material both at the Mine site and along the access road.

Sources of talus material are limited along the access road between the Mackenzie Mountains and the Nahanni Range, and east of the Nahanni Range. While a number of possible sources have been identified in the area, follow up evaluation needs to be carried out.

Sundog Creek near Cat Camp consists of a very wide, outwash alluvial floodplain, which contains thick deposits of stream/river gravels. Possible sources of gravel may exist here outside of the stream and riparian zone. West of Cat Camp, there are substantial talus fans containing significant quantities of aggregate. These locations need to be further evaluated.

6.14 Hazardous/Non-Hazardous Materials

A summary of expected hazardous and non-hazardous materials management is given in Table 6-6. Projections of quantities have been made for the expected operations, but these are estimates. Apart from fuel, the largest volume of materials brought in will consist of Mill reagents and water treatment chemicals. The Mill reagents are non-hazardous. MSDS sheets were provided for these at the time of applications to the MVLWB, and were posted to the MVLWB website. Water treatment chemicals include sulphuric acid and sodium sulphide. MSDS's for these are provided in Appendix 33, as is the MSDS for ethylene glycol, to be used to recover and use heat from the generator sets.

CZN will operate a Waste Transfer Area where drummed hazardous waste will be collected for off-site disposal. Wastes will include cleaners/degreasers, oil filters, paint, batteries, grease, glycol and biomedical waste. Management and transport of these wastes will comply with GNWT"s *Guideline for General Management of Hazardous Waste*. CZN will adopt a waste colour code system similar to that developed and used by Diavik Diamond Mines Inc. (see Figure 6-15). The waste will be transported off-site by a registered hazardous waste carrier to a registered receiver approved to manage the wastes, and with the appropriate manifests. The transportation of all hazardous materials transported to and from the site will be conducted in accordance with existing territorial and federal regulations, including the Transportation of Dangerous Goods guidelines.

Waste motor and lubricating oil will either be blended with diesel for supply to the generators, or used in the incinerator. CZN will ensure that either practice complies with the NWT *Used Oil and Waste Fuel Management Regulations*.

CZN intends to have the existing infrastructure surveyed for asbestos-containing materials (ACM's) before construction of new or modified facilities. If any ACM's are found, a removal program will occur, and waste will be buried in a landfill within the footprint of the WRP. The GNWT"s *Environmental Guideline for Waste Asbestos* will be followed.

CZN intends to operate 3 waste management facilities on-site: a solid waste landfill; a sewage sludge landfill; and, a landfarm for hydrocarbon contaminated soil. All 3 will be located within the footprint of the WRP within a solid waste facility (refer to Figures 6-13 and 6-16). The Solid Waste Facility will be for inert material, including any ACM's, and will ultimately be buried by waste rock. The sewage sludge landfill will be in a location accessible on mine closure since the sludge may be used as a soil amendment in reclamation. The contaminated soil landfarm will also be accessible as the soil will be re-used after the completion of remediation. The landfarm will comply with Environment Canada's *Federal Guidelines for Landfarming Petroleum Hydrocarbon Contaminated Soils* (December 2005).

Table 6-6: Hazardous and Non-Hazardous Material Quantities

Waste Stream	Description	Volume	Unit	Storage	Handling	Disposal	Key Considerations/ Observations
Construction							
Construction Debris and Rubble	Off-spec concrete, waste concrete, cement, aggregates			Steel Parts Yard		Reuse/Recycle/ Landfill	Attempt to reuse as much suitable debris as possible as aggregate for future and ongoing development
Wood	Wood pallets, packing waste, wood working waste				Pallets	Reuse/Composting/ Landfill	Unusable wood, burned and ashes transferred to landfill
Scrap metal	Metal off-cuts, electrical cabling, piping rebar					Recycling/Landfill	Reuse as much as possible, landfill remainder.
Plastics	Plastic wrapping. PET bottles					Recycling/Landfill	Examine potential to recycle as project develops
Paint containers	Empty cans (any size, empty, dry)					Reuse/Landfill	Crush and landfill
Compressed gas cylinders	Empty compressed gas cylinders					Reuse/Recycle/ Landfill	Reuse/Recycle through gas suppliers. Landfill only those that cannot be recycled (expired refill dates)
Paint and coatings	Extra paint, paint chips					Reuse/Landfill	Store for maintenance purposes to minimize amount requiring disposal. Allow excess to dry out for landfilling.

Table 6-6 (cont'd)

Waste Stream	Description	Volume	Unit	Storage	Handling	Disposal	Key Considerations/ Observations
Asbestos	Asbestos					Seal in bags and Landfill	Follow special handling procedures.
Reagents/ Consumables							
Empty chemical containers	Empty chemical containers			Reagent Storage		Reuse/landfill	Reuse where possible. Rinse, drain, landfill rest.
Glycol 60/40 EG Coolant	Waste Heat Chemical				Drums	Off-site	
Flocculant	Flocculant	0.03	t/yr		25kg bags		
DF067	Flotation Reagent	10.2	t/yr				
SIBX	Flotation Reagent	38.3	t/yr				
MIBC	Flotation Reagent	0.7	t/yr				
Soda Ash	Flotation Reagent	489.8	t/yr				
P82	Flotation Reagent	44.5	t/yr				
AQ4	Flotation Reagent	171.1	t/yr				
Copper Sulphate	Flotation Reagent	448.6	t/yr				
3894	Flotation Reagent	5.1	t/yr		Plastic totes		
RTR3	Flotation Reagent	3.7	t/yr				
SIL N	Flotation Reagent	118.5	t/yr				
Na2S	Flotation Reagent	204.4	t/yr				
Ferro Silicon	DMS Reagent	150.5	t/yr				

Table 6-6 (cont'd)

Waste Stream	Description	Volume	Unit	Storage	Handling	Disposal	Key Considerations/ Observations
Sulphuric Acid 93%	Water Treatment	655.0	t/yr				
Lime, Mine Water	Water Treatment	131.0	t/yr				
Lime, Mill Water	Water Treatment	231.0	t/yr				
Sodium Sulphide (Na2S)	Water Treatment	39.0	t/yr				
Ferric Sulphate (FeSO4)	Water Treatment	86.9	t/yr		Plastic totes		Non returnable
Flocculant WTP	Water Treatment	0.8	t/yr		25kg bags		
Cement (1.7%)	Paste Plant binder	4355	t/yr		25kg bags		
Jaw Crusher Liners	Liners	12.9	t/yr			Landfill	No special disposal requirements.
Cone Crusher Liners	Liners	25.8	t/yr			Landfill	No special disposal requirements.
Ball Mill Liners	Liners	7.6	t/yr			Landfill	No special disposal requirements.
Grinding Balls	Grinding Media	116.0	t/yr			Landfill	No special disposal requirements.
Conveyor Belts	Conveyor belts			Steel Parts Yard		Landfill	
Camp/ Offices							
General/ Domestic	Organic: kitchen waste, leftover food from meals, including any packaging with food residues			Camp Food Waste Storage		Incineration	

Table 6-6 (cont'd)

Waste Stream	Description	Volume	Unit	Storage	Handling	Disposal	Key Considerations/ Observations
General/ Domestic	Inorganic: clean food packaging, plastic water bottles, paper, cardboard, glass, bottles, cans, window panes, containers			Camp Inert Waste Storage		Recycle/landfill	Recycle if practical. Landfill rest.
Styrofoam	Styrofoam					Landfill	
Incinerator ash	Ash			Drum		Backfill mix	Added to mix in the Backfill Plant
Sewage treatment sludge	Sludge from sewage treatment plant.			Sludge Holding Tank		Landfill	Could be used as a soil amendment during reclamation.
Medical wastes	Bio-hazardous waste (needles, syringes, blood, medications, bandages, etc.)			Waste Transfer Area	Drum	Off-site	
Maintenance							
Tires	Damaged and spent tires			Steel Parts Yard		Refuse/landfill	Retread if possible, landfill if not.
Welding residues	Welding rods/grinding or cutting wheels			Maintenance Facility	Drum	Landfill	
Non-oily fabrics	Non-oily fabrics (rags, gloves, clothing etc)			Maintenance Facility		Landfill	No special disposal requirements.

Table 6-6 (cont'd)

Waste Stream	Description	Volume	Unit	Storage	Handling	Disposal	Key Considerations/ Observations
Oil fabrics	Oil fabrics (rags, gloves, clothing etc)			Waste Transfer Area	Drum	Incineration	Handled as a hazardous material
Solvents/ Degreasers	Paint thinner, acetone, varsol			Waste Transfer Area	Drum	Off-site	
Diesel Fuel	Fuel	8 Million	l/yr	Tank Farm		Consumed in gensets and mobile equipment	
Gasoline	Fuel			Tank Farm		Consumed Mobile equipment	
Motor Oil	Oil - Mobile equipment	24,200	l/yr	Tank Farm	Drum	Reuse or incinerate	Blend with diesel for genset feed or incinerate
Hydraulic Oil	Used hydraulic oil, brake fluids, etc.	30,200	l/yr	Tank Farm	Drum	Reuse or incinerate	Blend with diesel for genset feed or incinerate
Oil Filters	Oil Filters			Waste Transfer Area	Drum	Off-site	
Grease	Grease	750	l/yr	Waste Transfer Area	46 gallon Drums	Off-site	Off-site recycling
Mobile & Stationary Equipment Batteries	Batteries	20	Units/yr	Maintenance Facility	Pallets	Off-site	Off-site recycling
Florescent tubes	Florescent tubes			Maintenance Facility	wood crate	Landfill (glass); off-site recycling (mercury)	Use tube crusher and mercury recovery unit..

CANADIAN ZINC CORPORATION

Figure 6-15: Waste Management Code System

Disposable Batteries

Stored in Drums

Transfer to the Waste Transfer Area

Oily Rags, Grease Tubes & Used Absorbent Pads

Stored in Drums

Transfer to the Waste Transfer Area

Used Floor Dry

Stored in Drums

Dispose in Lined Area in Waste Transfer Area

Oil Filters

Stored in Drums

Transferred to the Waste Transfer Area

Used Grease

Stored in Drums

Transfer to the Waste Transfer Area

Aerosol Cans (Do not puncture)

Stored in Drums

Transfer to the Waste Transfer Area

Used Glycol

Store in Drums

Transfer to the Waste Transfer Area

Burnable Wood, Cardboard, Paper and Air Filters

Burned

Ashes Transferred to Approved Landfill

Landfill Waste Steel, Plastic, and Glass

Disposal

Approved Landfill

Waste	Container	Disposal
Oil Filters	Labeled 45 Gallon Drum	Waste management Building
Batteries	Labeled 45 Gallon Drum	Waste Transfer Area
Large Equipment Batteries	Place on Pallets	Waste Transfer Area
Tires		Recycle or dispose in Landfill

Batteries and Aerosol cans in camp (found in dorm laundry rooms)

If you are uncertain about a specific waste, contact the Environmental Department or Waste Management Personnel.

Note: All food waste must be in incinerated. This includes paper plates, paper cups, and lunch bags! These can NOT go into burnable or non-burnable bins!

*Source: Diavik Diamond Mines Inc.

6.15 Water Requirements

Ore processing will occur at a maximum rate of 1,200 tonnes/day, and will require approximately 1,900 m^3/day (22 L/sec) of process water. This water will be drawn from the Water Storage Pond ("WSP"). The pond will receive both mine water and process water flows.

After the completion of a Decline underground in 2007, pumped flows reached a peak of 20 L/sec, but reduced to 14 L/sec over the winter. During the start-up phase of the mine, access to several locations of ore extraction (stopes) will be developed on the existing levels and deeper levels. Therefore, the combined flow of water from these locations is expected to be in excess of 20 L/sec. This water, together with recycled process water, will provide for process water needs.

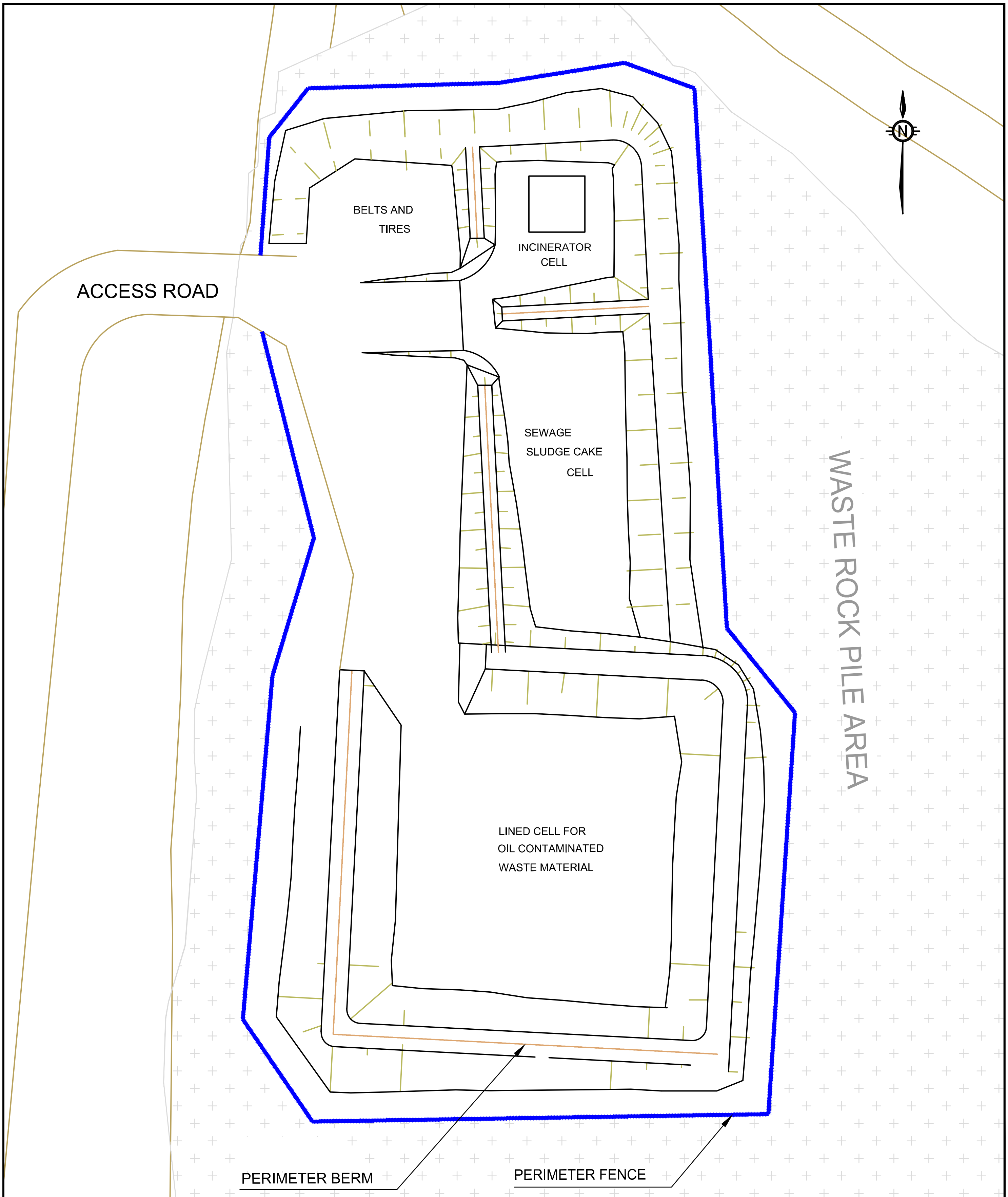
The on-site manpower requirement is expected to be approximately 110 persons at any point in time. This number may increase somewhat from time to time with visitors and with seasonal road operations. Industry guidelines indicate that potable water requirements are 270 L/day/person. Assuming an average daily total of 120 persons, potable water needs will be 32,400 L/day, or approximately 33 m^3/day. This water will be drawn from the Prairie Creek alluvial aquifer from wells, as at present. A small quantity of water will also be needed periodically for vehicle/equipment washing and potentially dust suppression. This will also be drawn from the well supply.

An emergency water supply tank would be located near the Mill and would feed the emergency water pipeline throughout the site for fire suppression. This water would be drawn from the WSP.

6.16 Water Management System

There will essentially be 2 types of water to be managed at the Mine site: runoff from snowmelt and rainfall events; and, water from the Mine and Mill.

Site runoff management will be the same as at present. Ditches route all site runoff into the Catchment Pond. Treated water from the Mine and Mill will also discharge to the Catchment Pond. The Catchment Pond will be the location of final discharge for all site flows to the receiving environment. CZN is proposing to use a diffuser located on the bed of Prairie Creek for this discharge for reasons that will be explained in Section 8.



Legend

- Waste Rock Boundary
- Surface Roads
- Perimeter Fence

Scale in Meters: 0 5 10 20

CANADIAN ZINC CORPORATION

Scale: As Shown

Drawn By: C. Reeves

File Name: DAR Fig 6-16.dwg

Date: October 2009

PRAIRIE CREEK MINE

Figure 6-16:
SOLID WASTE FACILITY LAYOUT

The site runoff management structures (see Figure 1-2) have performed well for nearly 30 years since their construction in 1980. In addition, the WSP design will include upstream diversion structures to prevent runoff from entering the pond. Similar diversions will be installed around the footprint of the WRP. More details of these structures can be found in the engineering reports contained in Appendices 11 and 12. The remainder of this section discusses potentially contaminated water flows from the Mine and Mill.

6.16.1 Mine Drainage

Mine water currently flows out of the 870 Level portal, this being the gravity drainage from the lowest elevations of the existing parts of the underground workings, which include drifts with exposures of vein mineralization. Measurements taken by CZN during the warmer months of the year (June to August) in 2005 and 2006 consistently recorded mine water flows at 6 L/sec, including after the development of several hundred metres of a new Decline. CZN staff also observed that drainage flows reduce significantly over the winter, from approximately late October to late March. This suggests that the source of the observed flows is currently the relatively recent infiltration of snowmelt and rainfall, and that this source is curtailed once freezing conditions set in. A review of maximum and minimum daily temperature readings recorded at the Prairie Creek weather station (Figure 4-2) shows that the period of observed reduction of mine water flows coincides with the period of temperatures well below zero.

A new underground Decline was collared near the current end of the 880 Level during the fall and early winter of 2006. Inflows were encountered when fractures or old drill holes were intersected, but flows readily dissipated, presumably after the limited quantity of water in storage had drained. Discharge from the 870 portal from November onwards was measured at 2 L/sec, almost entirely from the Decline. However, flows increased in the spring to 18 L/sec, and reached a peak of 20 L/sec (1,728 m^3/day) in August coinciding with the resumption of Decline development. By the end of 2007, the Decline was completed and pumped flows had reduced to 14 L/sec. The Decline was allowed to flood and peak flows in 2008 and 2009 were 14 L/sec, declining to 1-2 L/sec in the winter.

The above information relates to the flows that have occurred to date. In order to plan for operations, it is necessary to consider how these flows could change with mine development over a larger horizontal and vertical area, and with successively deeper levels. A visual inspection of the existing underground workings reveals that mine drainage flows occur primarily in proximity to the mineralized Vein. Development tunnels driven to access the Vein are relatively dry, apart from relatively minor joints and fractures. The host rocks consist of shales, dolostones, chert and sandstones. It appears these rocks have very little primary permeability (pores). In the workings and in all drill holes completed on the site, there has been no evidence of solution cavities in the dolostones. Therefore, mine hydrology appears to be dominated by secondary permeability in the form of fractures, which have limited storage capacity. Where such fractures extend to surface and are intersected underground, inflows occur. This explains why inflows occur near the Vein, since it is a fault structure, and at active faces. Surface water is exploiting the same fractures which were likely also exploited by mineralizing fluids responsible for the formation of the Vein.

As mine development progresses and Vein mineralization is removed, the mined-out stopes will be filled with a backfill mix. However, water-carrying fractures that are not isolated by the backfilling will still be present, and mining to greater depths will mean a greater hydraulic head from surface to the lowest mining level. As a result, CZN has planned for increased mine flows so that the water can be managed appropriately.

CZN's groundwater consultant, Robertson Geoconsultants, have conducted investigations of the Mine area (refer to Appendix 1). They conclude that inflows of up to 100 L/sec as an annual average (8,640 m^3/day) are possible. Therefore, CZN has developed a water management plan for this flow, with contingencies should a greater flow occur. Mine water chemistry was discussed in Section 4.5.

6.16.2 Mill Process Water

Ore processing at the maximum rate of 1,200 tonnes/day will require approximately 1,900 m^3/day of process water. The majority of this water will become process water effluent and will require management. A fraction of the process water reports to and remains with the DMS float rock, the filtered tailings and the filtered concentrates.

Bulk samples of Prairie Creek ore from the 880 Level and the 930 Level were processed off-site previously. Final process water results are given in Table 6-7. The table provides results for both total and dissolved metals. During operations, the water will be filtered in the Mill to separate the tailings from the process water, with the tailings going to the Paste Backfill plant. The filtered water will be treated for discharge, or stored for later re-use. Therefore, the dissolved metal results in Table 6-7 are relevant for environmental consideration. The dissolved metal concentrations shown are not particularly high, including those for zinc. This is perhaps to be expected given the elevated pH (above 10) due to lime addition in the process. However, a number of metal concentrations are sufficiently elevated to be of environmental concern, including cadmium, copper, lead, selenium and zinc.

In 2009, further metallurgical work was undertaken, and process water effluent was produced for water treatment testing by SGS-Canadian Environmental & Metallurgical Inc. ("SGS-CEMI"). Their report is given in Appendix 2. Representative process water effluent quality is given in Table 4 of SGS-CEMI's report. Concentrations of metals were similar to those before, including those of environmental concern.

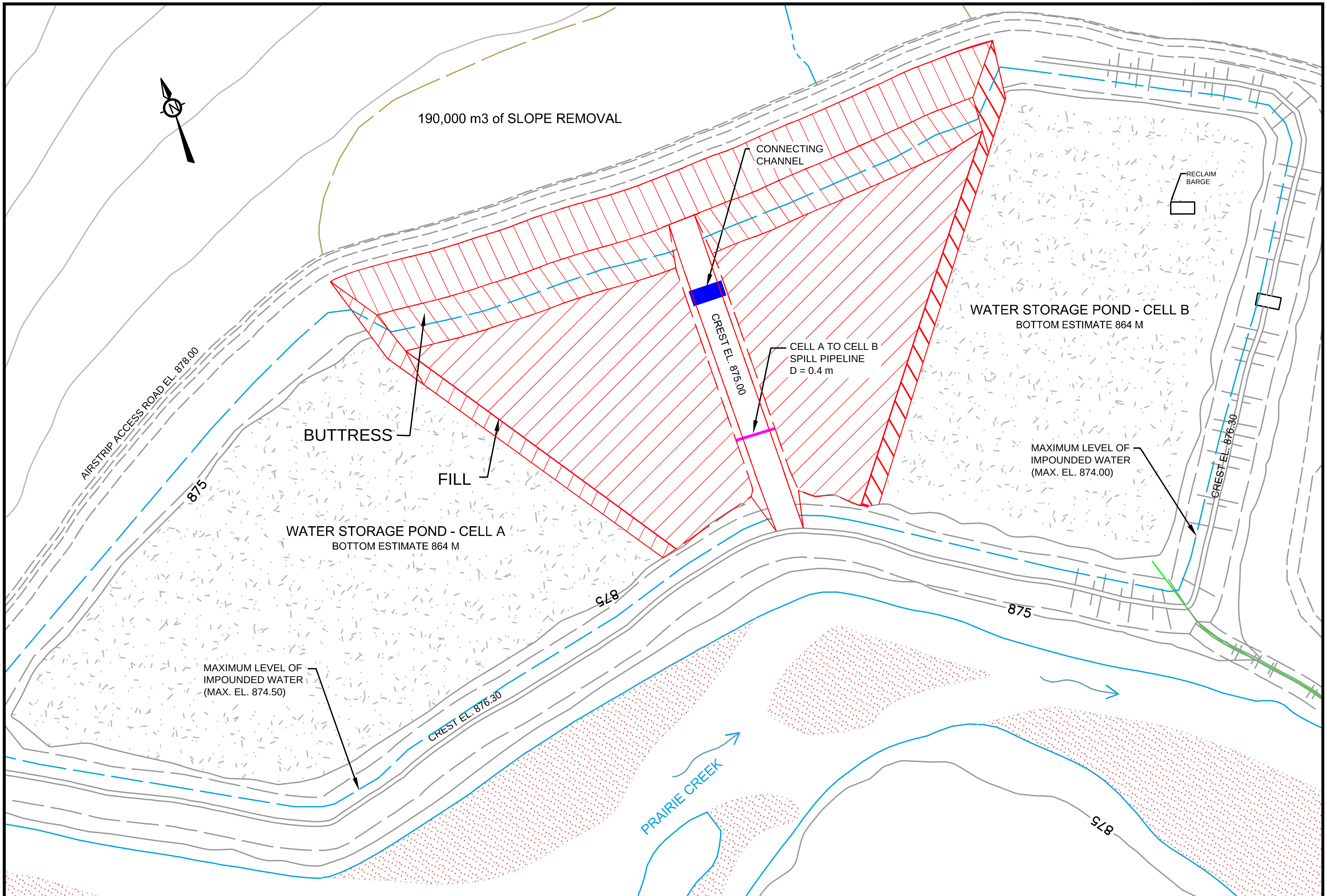
6.16.3 Waste Rock Pile

The Waste Rock Pile ("WRP"), to be located in a 'draw' of the Harrison Creek valley, will generate seepage from snowmelt and rainfall percolation. A lined collection pond will accumulate this seepage. The seepage may contain dissolved metals, and therefore provision will be made to incorporate the water into the water management system.

The seepage is expected to resemble mine water in terms of chemistry, although concentrations of metals should be lower. Geochemical studies have been conducted by MESH and pHase Geochemistry Inc. Appendix 3 provides a report by pHase which gives estimates of flow and chemistry for WRP seepage.

Table 6-7: Tailings Water Quality from Metallurgical Testing

Parameter		930 Level		870 Level	
Date Sampled	**Unit**	05-Nov-05		12-Dec-05	
Physical Tests					
Conductivity	uS/cm	3500		2910	
TDS	mg/L	3530		3020	
pH		10.9		10.7	
TSS	mg/L	5		500	
Dissolved Anions					
Acidity (to pH 8.3)	$mgCaCO_3/L$	<2		<2	
Alkalinity-Total	$mgCaCO_3/L$	1510		>640	
Cl	mg/L	21		19	
F	mg/L	1.25		0.15	
SO4	mg/L	230		170	
Nutrients					
NH3-N	mg/L	0.1		<1	
NO3-N	mg/L	<0.5		<0.5	
NO2-N	mg/L	<0.6		<0.6	
NO2+NO3	mg/L	<0.6		<0.6	
Metals		**Total**	**Dissolved**	**Total**	**Dissolved**
Ag	mg/L	0.0095	0.0005	0.0087	0.0001
Al	mg/L	0.55	0.46	0.94	0.33
As	mg/L	0.85	0.15	0.65	0.01
B	mg/L	0.053	0.063	0.067	0.057
Ba	mg/L	0.035	0.032	0.042	0.028
Be	mg/L	<0.005	<0.005	<0.005	<0.005
Bi	mg/L	0.0003	<0.0003	0.001	<0.0003
Ca	mg/L	46.4	48.3	60.2	39
Cd	mg/L	0.0233	0.0070	0.1830	0.0151
Co	mg/L	0.001	0.0007	0.0022	0.0005
Cr	mg/L	0.002	0.002	0.018	0.003
Cu	mg/L	0.775	0.145	3.000	0.003
Fe	mg/L	1.1	0.8	7.2	1.44
Hg	mg/L	0.069	0.047	0.183	0.062
K	mg/L	4.95	4.58	5.25	4.84
Li	mg/L	<0.005	<0.005	<0.005	<0.005
G	mg/L	6.0	5.2	20.6	8.9
Mn	mg/L	0.084	0.088	0.245	0.086
Mo	mg/L	0.048	0.007	0.009	<0.0003
Na	mg/L	949	962	804	780
Ni	mg/L	0.009	0.019	0.044	0.021
Pb	mg/L	1.5	0.5	7.7	0.702
Sb	mg/L	0.21	0.05	0.73	0.011
Se	mg/L	0.039	0.039	0.028	0.030
Sn	mg/L	<0.001	<0.001	<0.001	<0.001
Sr	mg/L	0.12	0.11	0.11	0.091
TI	mg/L	0.0003	<0.0002	0.0006	<0.0002
Ti	mg/L	0.04	0.04	0.03	0.019
U	mg/L	0.0028	0.0029	0.0052	0.0032
V	mg/L	0.0061	0.0076	0.0159	0.0052
W	mg/L	0.01	0.0105	0.0003	<0.0002
Y	mg/L	0.0044	0.0041	0.0058	0.0043
Zn	mg/L	2.22	0.85	19.40	1.5



CANADIAN ZINC CORPORATION

Date:	October 2009
Drawn By:	C. Reeves
Scale:	As Shown
Drawing:	DAR Fig 6–17.dwg

SCALE

0 20 40 60 80 100

METRES

PRAIRIE CREEK MINE

FIGURE 6-17:

RECONFIGURED WATER STORAGE POND

6.16.4 Dense Media Separation Pile

A dense media separation ("DMS") circuit will be added to the Mill to screen out the un-mineralized rock. The DMS rock will be fed into a bin, which when full will overflow to a small surge pile. The pile will be located on a 400 m^2 pad lined with impervious geotextile. Runoff will be collected and fed into the water management system. Runoff chemistry is expected to be similar to waste rock.

6.16.5 Ore Stockpiles

The existing Polishing Pond will not be required for treated water polishing during operations, and will instead be used as an ore stockpile location. The pond is lined and has an area of approximately 1,250 m^2. Runoff will collect in the pond, and will periodically be drained using the existing drain valve. The water will be fed into the water management system, and is expected to be similar in chemistry to mine water.

There will be a temporary storage pad for approximately 20,000 tonnes of ore during the start-up period. The pad will have an area of approximately 2,600 m^2 and will also be lined. Pad drainage will report to a sump and will then be fed into the water management system. The stockpile will grow over a few months and will be consumed in a few weeks during the Mill start up period.

6.16.6 Sewage Treatment

The existing Sewage Treatment Plant ("STP") was based on an estimated average inflow rate of 30,000 L/day. The plant will be refurbished to treat sewage based on 120 persons producing 270 L/day/person, or 32,400 L/day total.

Sewage treatment is based on a biochemical oxygen demand (BOD_5) of 220 to 300 mg/l, and will involve aerobic biological digestion with the addition of air. After the solids settle, the effluent is pumped out and disinfected with a UV system. The design parameters for treated sewage effluent quality are BOD_5 <20 mg/l, and TSS <20mg/l. The use of only non-phosphate based detergents in the camp will be mandatory to avoid nutrients in sewage effluent. Effluent will be pumped to the WSP.

Sewage will be transported within each building and pumped to the STP from strategically located lift stations through force mains in a utilidor. Any sewage generation in outlying areas will be collected in local holding tanks and removed via a sewage collection tanker truck for treatment at the STP.

6.16.7 Water Storage and Treatment

The key components of CZN's proposed water management plan are the Water Storage Pond ("WSP") and the Water Treatment Plant ("WTP"). CZN proposes to use mine water and aged Mill process water effluent as feed water for the Mill process. Water will be stored in the WSP in order to feed the Mill. Excess water will be treated in the WTP for discharge to the environment. The existing Water Storage Pond will be divided into two connected cells. A submerged divider berm will create separation between the cells (see Figure 6-17). In reality, the pond will be compartmentalized by the use of baffles which will be anchored on the floor of the pond and float on the surface. Both cells will be lined with a new geosynthetic liner.

The proposed water management strategy is illustrated in Figures 6-18 and 6-19. Mine water flows will be split into two streams, one going to the WTP for treatment and the other going to the WSP. Mill process water effluent will similarly be split into two streams and managed the same way.

The proposed treatment processes for Mine water and Mill process water effluent in the WTP are explained in the SGS-CEMI report (Appendix 2). The WTP will house two treatment circuits. Mine water will be treated with lime to at least pH 9, followed by pH reduction to 8.5 using sulphuric acid. Mill water will be acidified to pH 5 using sulphuric acid followed by sodium sulphide addition. Iron will then be added with lime to raise the pH to 9, followed by flocculant addition. After primary treatment of the two water streams, the streams will merge for the suspended sediment removal step (clarification) before discharge to the Catchment Pond.

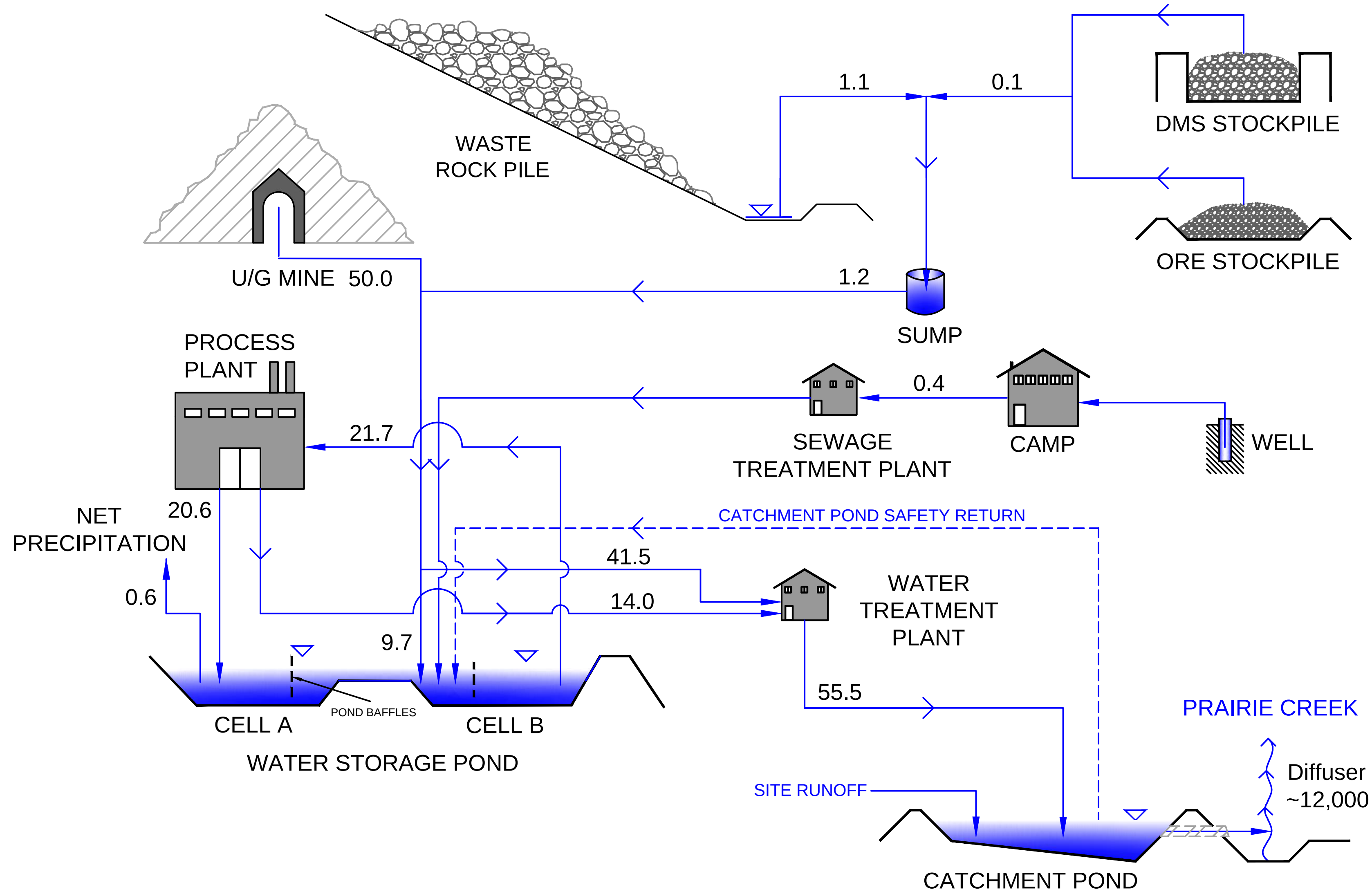
The second Mill process water effluent stream will be pumped into the western end of Cell A in the WSP. The second mine water stream will be pumped into the western end of Cell B, along with flows from the WRP, DMS pile, ore stockpiles and STP effluent. Water for the Mill process will be drawn from the eastern end of Cell B. The reason for this is Mill process water effluent contains organic reagent residues from the process, and these would interfere with the Mill process if the water was re-used immediately in the Mill. By maximizing the residence time and dilution of this water in the WSP, the water can be re-used in the Mill.

Mill process and STP effluent flows will not vary seasonally. Mine flows may vary to some degree seasonally, being lower in winter. WRP and stockpile flows will vary seasonally, being zero in winter. The WSP will be kept in balance by varying the proportions of Mine water and Mill process water effluent sent to the WSP. Flows to the WTP will increase in the open water season when those water sources with seasonal flows have higher flows. This is considered further in Section 6.17 below.

6.16.8 Water Transfer

Mine water will collect at the base of the workings and will be pumped up to internal sumps on higher underground levels. This will allow suspended matter to settle out. The final 'lift' of the water will be to the 880 m level where it will flow by gravity in a ditch towards the 870 m portal, as at present. The water will discharge into an existing primary collection sump which is approximately 270 m from the portal. The sump is 40 m long, 3 m wide and 2.5 m deep, for a volume of 300 m^3. The water will then be pumped from this location in 2 lines, 1 to the WTP and one to the WSP. Back-up pumps will be available at the sump.

In the unlikely event of total pump failure at the primary sump, the pump at the highest lift station will be shut off. If the primary sump should overflow, the water will continue in the existing ditch to the portal. There it will enter a culvert and be carried in lines to the Polishing Pond, as at present. This arrangement will provide temporary storage until the sump pumps are back on-line.



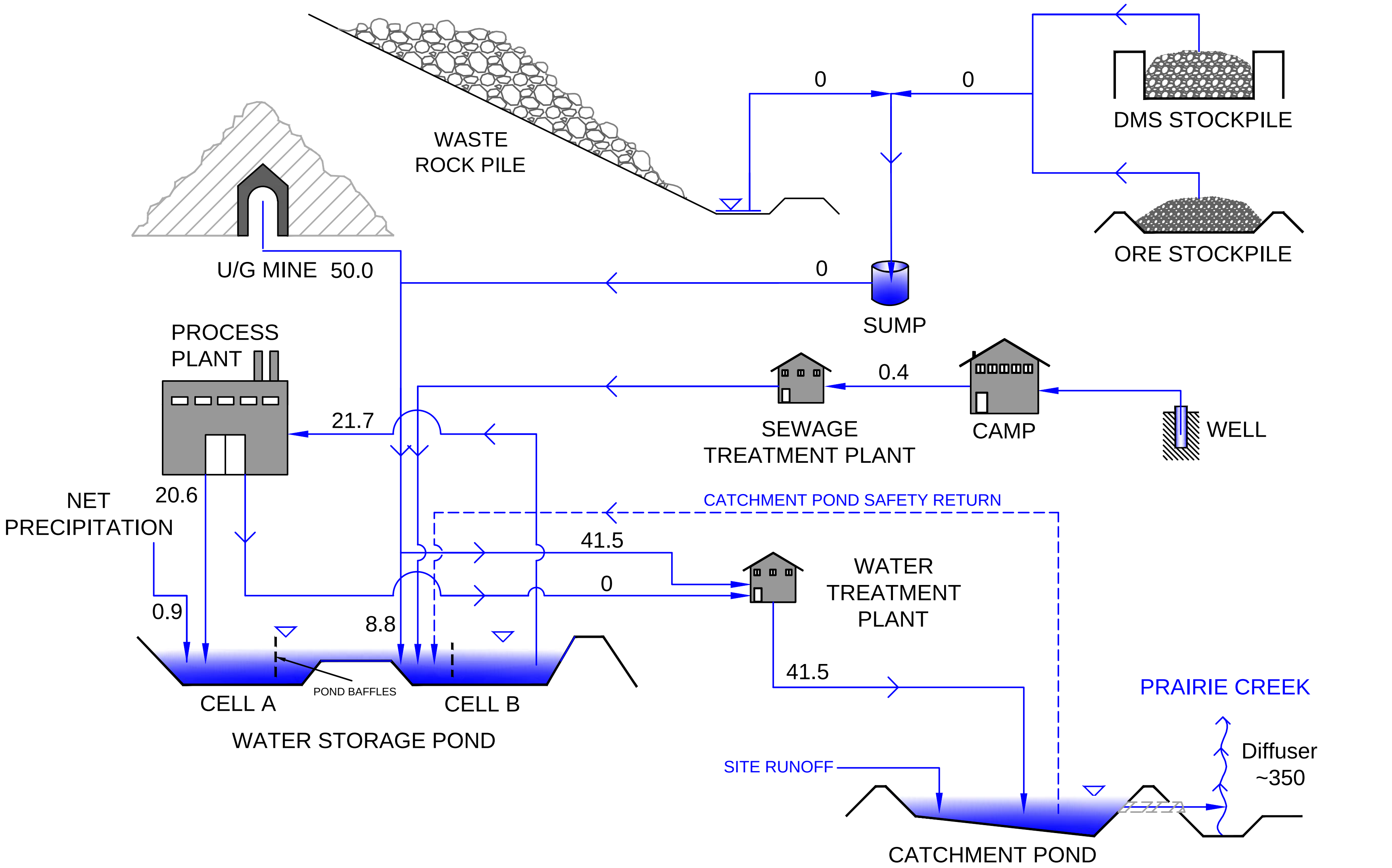
CANADIAN ZINC CORPORATION

Date:	October 2009
Drawn By:	C. Reeves
Scale:	As Shown
Drawing:	DAR Fig 6–18.dwg

Note:
Numerical values are flow volumes of Litres/ Second

PRAIRIE CREEK MINE

FIGURE 6-18:
SITE WATER BALANCE - SUMMER



CANADIAN ZINC CORPORATION

Date:	October 2009
Drawn By:	C. Reeves
Scale:	As Shown
Drawing:	DAR Fig 6–19.dwg

Note:
Numerical values are flow volumes of Litres/ Second

PRAIRIE CREEK MINE

FIGURE 6-19:
SITE WATER BALANCE - WINTER

After the Mill final tailings have been filtered, the process water effluent will be pumped in lines to the WTP and WSP. All water transfer lines to/from the WSP will be located along the toe of the backslope of the site.

Seepage from the Waster Rock Pile will be collected in a lined seepage collection pond at the toe of the WRP. If this water is deemed not suitable for release, it will be transferred to the site water management system. Transfer will occur either by using a nearby borehole connected into the underground workings, or by a surface pipeline to the Mill.

Drainage from stockpiles (DMS rock, Ore Storage) will be collected and fed into the site water management system.

Treated effluent from the Sewage Treatment plant will be pumped into Cell B of the WSP.

6.17 Water Balance

As discussed in Section 6.16, a combination of Mine water and Mill process water will be used as feed water for the Mill process, drawn from the Water Storage Pond ("WSP"). Excess Mine water and Mill process water will be treated and discharged. Site water balances are shown in Figures 6-18 and 6-19 for summer and winter, respectively. For these balances, mine flows of 50 L/sec have been assumed. A more detailed explanation of the derivation of these balances is given in Appendix 9.

The largest flow of water comes from the Mine. Other site flows, from the WRP, stockpiles and STP, are relatively small by comparison.

The main difference in the balances is the rate of water treatment. In the summer, Mill process water is treated at the full rate and the water level in the WSP is drawn down a few metres. In the winter, only the Mine water is treated, and the water level in the WSP rises. Precipitation and evaporation have very little effect on pond water level because their volumes are small by comparison. In summer, evaporation is higher, and in winter snowfall accumulates and there is no evaporation.

The WSP water balance is achieved by adjusting the rate of mine water treatment, which also adjusts the amount of mine water reporting to the WSP. Mine flows are expected to vary by a degree by season, being somewhat less in winter (mine flows are expected to increase on an annual basis as mine workings penetrate deeper laterally and vertically into the mountain). If Mine flows are less than the 50 L/sec, less Mine water will be treated to maintain a pond water balance. Conversely, flows greater than 50 L/sec will mean higher rates of Mine water treatment.

6.18 Water Monitoring

Mine operations would include the monitoring of water flows and quality according to a Surveillance Network Program ("SNP") associated with a Water Licence issued by the Mackenzie Valley Land and Water Board ("MVLWB"). While CZN recognizes that the content of the SNP is determined by the MVLWB, an outline is provided here for consideration.

In developing the SNP outline, consideration is given to the following factors:

- The frequency of monitoring needs to be appropriate for the probable magnitude of fluctuation in conditions at a particular location, and for the consequence of fluctuation;
- Locations contributing to the final discharge to the environment, and the final discharge itself, require more frequent and detailed monitoring;
- The nature of flow monitoring needs to be appropriate for the water conveyance occurring at a particular location; and,
- Water quality parameters need to be appropriate for the potential contaminants present.

The SNP outline is given in Table 6-8 and is explained in the following text:

- Wells will supply potable water to the camp. The rate of water extraction is determined by the number of people on site. The quality of this water is not prone to great variation, as is normal for groundwater. Parameters for analysis are those that could potentially cause human health issues. Sewage effluent is to be discharged to the Water Storage Pond ("WSP") and is a relatively small flow compared to others. The water should also not be prone to great variation. Therefore, flow monitoring is not deemed necessary and monitoring need not be frequent. The effluent is a potential source of ammonia and nutrients. Other constituents are not of concern because of the residence time and dilution in the WSP.
- Monitoring of WSP water quality is intended to track the concentrations of potential contaminants to ensure that no unacceptable build-up occurs. As the WSP feeds the Mill and water quality is unlikely to vary significantly, a monthly monitoring frequency is considered acceptable.
- Monitoring at the final sump underground is intended to track the rate of inflows. Water quality need not be monitored here because it is done on mine flows into the WTP. However, the rate of flow into the WTP is monitored again in order to track volumes to the WTP and the WSP, the latter by subtraction of WTP inflows from final sump flows. Similar flow and water quality monitoring is performed on Mill effluent flows to the WTP. The rate of Mill effluent flow to the WSP is then also known because the total Mill effluent flow is known and is constant.

- WTP effluent discharge and Catchment Pond discharge require frequent and detailed monitoring of flow and water quality because these are the final discharge streams to the environment. Mill and site ditch flows also contribute to the Catchment Pond, but their contaminant loads will be low and their water qualities are not expected to vary significantly. Catchment Pond discharge is proposed as the compliance point for Water Licence criteria.

Harrison Creek and Prairie Creek would be monitored upstream and downstream for water quality, with parameters reflecting the possible contaminants present for the location. CZN plans to re-activate the old Water Survey of Canada flow monitoring station on Prairie Creek opposite the WSP. Water levels will be calibrated to flow volumes (stage-discharge curve). Water level data will be logged automatically and relayed to site staff to assist with water treatment and discharge planning.

Table 6-8: Surveillance Network Program Outline

Location	Frequency	Flows	Water Quality
Well House	Quarterly	No	BOD, coliforms, N species, diss. metals
Sewage Effluent	Quarterly	No	Ammonia, nutrients
Water Storage Pond	Monthly	No	Total & diss. metals, ammonia
Final Underground Sump	Weekly	Weir	No
Waste Rock Pile Seepage	Monthly	Weir	Diss. metals, ammonia
Mine Water into WTP	Weekly	Meter	pH, TSS, diss. metals, ammonia, EPH
Mill Effluent into WTP	Weekly	Meter	pH, TSS, diss. metals
WTP Effluent	Weekly	Meter	pH, TSS, total & diss. metals
Mill Ditch	Monthly	Weir	TSS, total metals
Site Ditch	Monthly	Weir	TSS, total metals
Catchment Pond discharge	Weekly	Meter	pH, TSS, total & diss. metals, ammonia, nutrients, EPH
Harrison Creek upstream	Monthly	No	TSS, total metals
Harrison Creek at Prairie	Monthly	No	TSS, total metals, ammonia
Prairie Creek upstream	Monthly	No	pH, TSS, total & diss. metals
Prairie Creek at WSP	Weekly	Auto	No
Prairie Creek downstream	Monthly	No	pH, TSS, total & diss. metals, ammonia, nutrients, EPH

6.19 Power and Fuel

Currently, there are 4 Cooper Bessemer 1150 kW diesel generators in the Mill. These would have produced 4.6 megawatts of power. These units are outdated and will be replaced with more fuel-efficient low emission Caterpillar (model 3516) diesel generators. Performance data for the new generators, including emissions specifications, are given in Appendix 23B. There will be 5 units, 3 running, 1 on standby and 1 under maintenance. A glycol-based heat recovery system will also be installed to provide heating to various site facilities.

Alternative forms of producing electrical power to supplement site demands and lessen the dependency on diesel supply have been evaluated. Wind and solar potential appear insufficient to warrant further study. Run-of-river hydro-generated power potential is a possibility, and further study is being considered regarding this alternative. Evaluation data on these alternatives can be found in Appendix 23A.

The projected diesel fuel consumption and storage requirement is given in Table 6-9. The annual diesel fuel requirement is estimated to be approximately 6.5 million litres. The existing four tanks in the Tank Farm have a combined capacity of approximately 6.8 million litres. Note that the period between fuel re-supply will be approximately 9.5 months (the access road will be in operation from mid-January to March). Low sulphur diesel fuel would be sourced from Fort Nelson or Hay River, and would be winter diesel (P40).

Table 6-9: Diesel Fuel Consumption and Storage

FUEL CONSUMPTION (L)		
Total (Year)		6,500,000
Total (Month)		541,667
Total (10 Months)		5,416,667
FUEL STORAGE		
Existing Tanks (4)	bbl	42,800
Existing Tanks (4)	USgal	1,797,600
Existing Tanks (4)	L	6,804,656

1 barrel [US, petroleum] = 42 gallon [US, liquid]

1 gallon [US, liquid] = 3.7854118 litre

The Tank Farm was previously inspected by geotechnical and mechanical engineers (EBA Engineering, August 5, 2004, and Roosdahl Engineering Enterprises July 22, 2005 and September 21, 2008) and approved for future use subject to completion of minor repairs and upgrades. Inspection reports are on file with the MVLWB. The minor repairs and upgrades to the Tank Farm have since mostly been completed, and one of the tanks has been painted. For operations, Tank 4 needs to be placed on a 6" high footing, and the 3 remaining tanks painted.

6.20 Other Infrastructure and Activities

The Prairie Creek airstrip will receive air traffic 3-4 times a week to bring in both supplies and people. The 3,000 ft length of the present gravel strip precludes use by major aircraft. Also, there are topographic limitations to significantly extend the airstrip. Aircraft that have used the strip recently include the DHC-5 Buffalo, the DHC-6 Twin Otter, Dash 7-100, and Hawker Siddeley 748. One or more of these would likely be used for crew changes. Many smaller aircraft access the strip, including Caravan, Beaver, Islander and Beechcraft.

6.21 Access Road

The existing access road from Lindberg Landing to Prairie Creek Mine was constructed in 1980 and operated for 2 winter seasons carrying over 800 loads into the developing Mine site (Figure 6-20). The route is an essential lifeline for the Mine operation and, as is the case with any base metal mine, significant volumes of material need to be moved out and supplies brought in on an annual basis. Seasonal road operation provides significant challenges because of the quantities to be moved in a short period of time. Optimization of the route is necessary to reduce environmental, logistical and economic risks. The road now also crosses the expanded NNPR, from Wolverine Pass in the Silent Hills west to the Sundog Creek-Funeral Creek Pass.

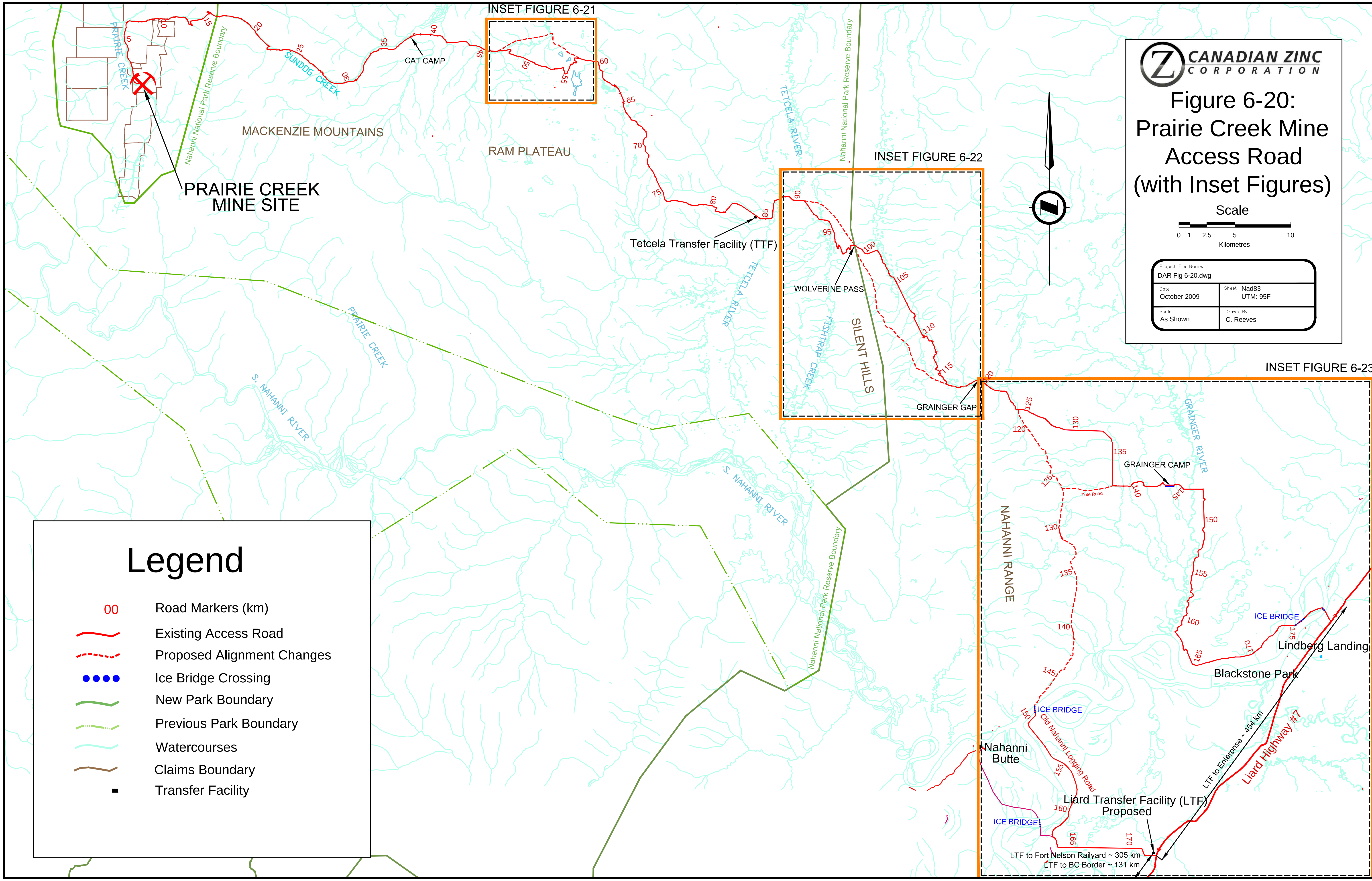
6.21.1 Access Road Alternatives

Re-Alignment Alternatives

The Review Board included use of the access road into the scope of development for this EA. In addition, the TOR provided for review of modifications proposed to the road. During road operations in the 1980's, a number of problematic areas were identified, primarily steep grades and sharp turns. In addition, during CZN's consultations with First Nations, the Nahanni Butte Dene Band specifically ("NBDB"), and Parks Canada, changes to the route alignment were requested for environmental and cultural reasons. As a result, CZN has investigated road re-alignments (see Figure 6-20) to reduce environmental impacts and promote road safety. Four re-alignments are proposed as follows (starting from Prairie Creek Mine site):

- Polje By-Pass, within the expanded NNPR.
- Silent Hills Alternative, within the expanded NNPR.
- Wolverine-Grainger Gap Alternative.
- Nahanni Front Range Alternative.

The four alternate routes have been studied in detail by Golder Associates (terrain assessment, Appendix 16) and by Dillon Consulting (stream crossing fish and fish habitat, Appendix 14). A description of the areas and rationale for the new routes follows:


CANADIAN ZINC CORPORATION
Figure 6-20:
Prairie Creek Mine Access Road
(with Inset Figures)
Scale
0 1 2.5 5 10
Kilometres
Project File Name: DAR Fig 6-20.dwg
Date October 2009
Sheet Nad83 UTM: 95F
Scale As Shown
Drawn By C. Reeves
INSET FIGURE 6-21
INSET FIGURE 6-22
INSET FIGURE 6-23
PRAIRIE CREEK MINE SITE
MACKENZIE MOUNTAINS
RAM PLATEAU
CAT CAMP
SUNDOG CREEK
PRAIRIE CREEK
Nahanni National Park Reserve Boundary
Tetcela Transfer Facility (TTF)
TETCELA RIVER
WOLVERINE PASS
FISHTRAP CREEK
SILENT HILLS
GRAINGER GAP
S. NAHANNI RIVER
NAHANNI RANGE
GRAINGER CAMP
GRAINGER RIVER
Tote Road
ICE BRIDGE
Old Nahanni Logging Road
Nahanni Butte
Lindberg Landing
Blackstone Park
Liard Transfer Facility (LTF) Proposed
LTF to Enterprise ~ 454 km
Liard Highway #7
LTF to Fort Nelson Railyard ~ 305 km
LTF to BC Border ~ 131 km
Legend
00 Road Markers (km)
Existing Access Road
Proposed Alignment Changes
Ice Bridge Crossing
New Park Boundary
Previous Park Boundary
Watercourses
Claims Boundary
Transfer Facility

Polje By-Pass (Km 48 to Km 59)

This area is wholly within the expanded NNPR. The existing route at Km 48 crosses a fish bearing creek 3 times and then climbs a very steep grade via switchbacks onto a plateau (refer to Figure 6-21). This plateau is characterized by karst development, including sinkhole and dissolution features, in various stages of development. The plateau falls away abruptly to the north in the form of a steep bluff where evidence of recent mudflows occurs (Golder Associates Appendix 16) related to degradation of ice-rich ground. At Km 55, the road descends via a steep grade into a valley and crosses between the First and Second Poljes, then climbs up a steep grade back onto higher ground.

In consultations with Parks Canada, CZN was asked to consider road re-alignment options north or south of the poljes. After aerial and ground investigations, CZN ruled out a southern route because of difficult terrain, but identified a northern route.

An 8.9 km Polje By-Pass route is proposed which would deviate from the existing route at Km 48 (Figure 6-21) and skirt the northern fringe of the Polje drainage. The route would cross Polje Creek downstream from the poljes. The significant advantages of this by-pass are:

- Avoids the Poljes;
- Avoids three steep gradients;
- Avoids degrading terrain (prone to mudslides);
- Reduces the number of significant creek crossings to one;
- Shortens the road.

A description of stream characteristics and photographs of each crossing location assessed in the Polje Bypass route is given in Appendix 16 (photosheets 17-21). Polje Creek was the only stream identified to have high quality fish habitat characteristics. A span crossing is being considered at this location.

Silent Hills Alternative (Km 90 to Km 99)

This area is located at the base of the Silent Hills range after crossing Fishtrap Creek from the west, and climbs up to Wolverine Pass (refer to Figure 6-22). This particular section of road is wholly within the expanded NNPR. During earlier road operation, this area was identified as challenging due to the steep gradient and tight switchbacks climbing up to Wolverine Pass. Recent investigation of this area has also located recent mudslides and slope instabilities created by degradation of the ice-rich ground.

To reduce further degradation of the terrain and provide a safer road, a re-alignment is proposed that ascends the slope more gradually from the north. The advantages of this alternative are:

- Lower gradient and no sharp turns makes the road safer;
- More direct crossing of Fishtrap Creek;
- Shorter route.

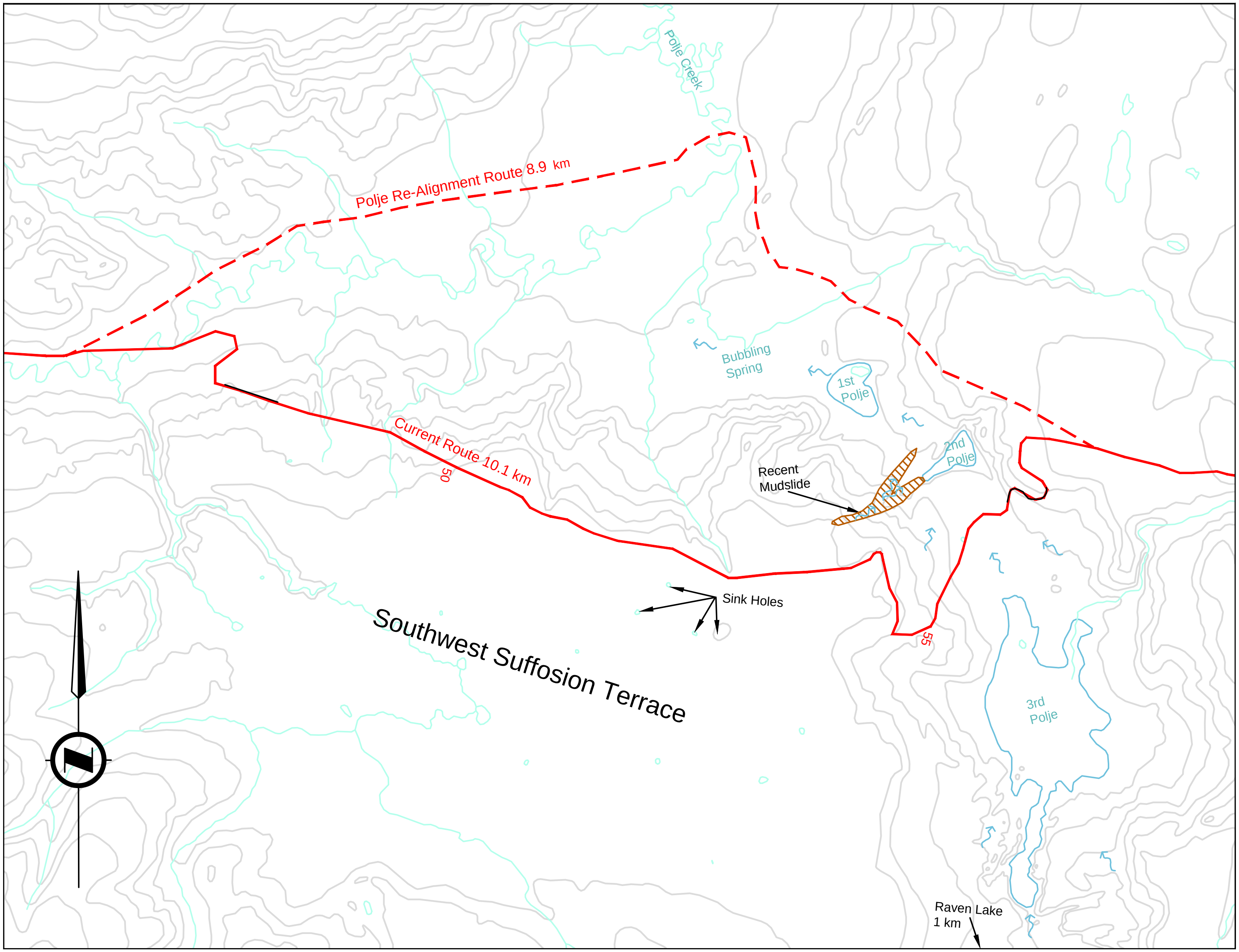


Figure 6-21: Access Road;

Polje By-Pass Alternative

Legend

00 Road Markers from Minesite(km)

Existing Access Road

Proposed Alignment Changes

Watercourses

Contour Interval (100 ft)

Subsurface Water Flow

Scale

0 0.25 0.5 1

Kilometres

CANADIAN ZINC CORPORATION

Project File Name: DAR Fig 6-21.dwg	
Date October 2009	Sheet Nad83 UTM: 95F
Scale As Shown	Drawn By C. Reeves

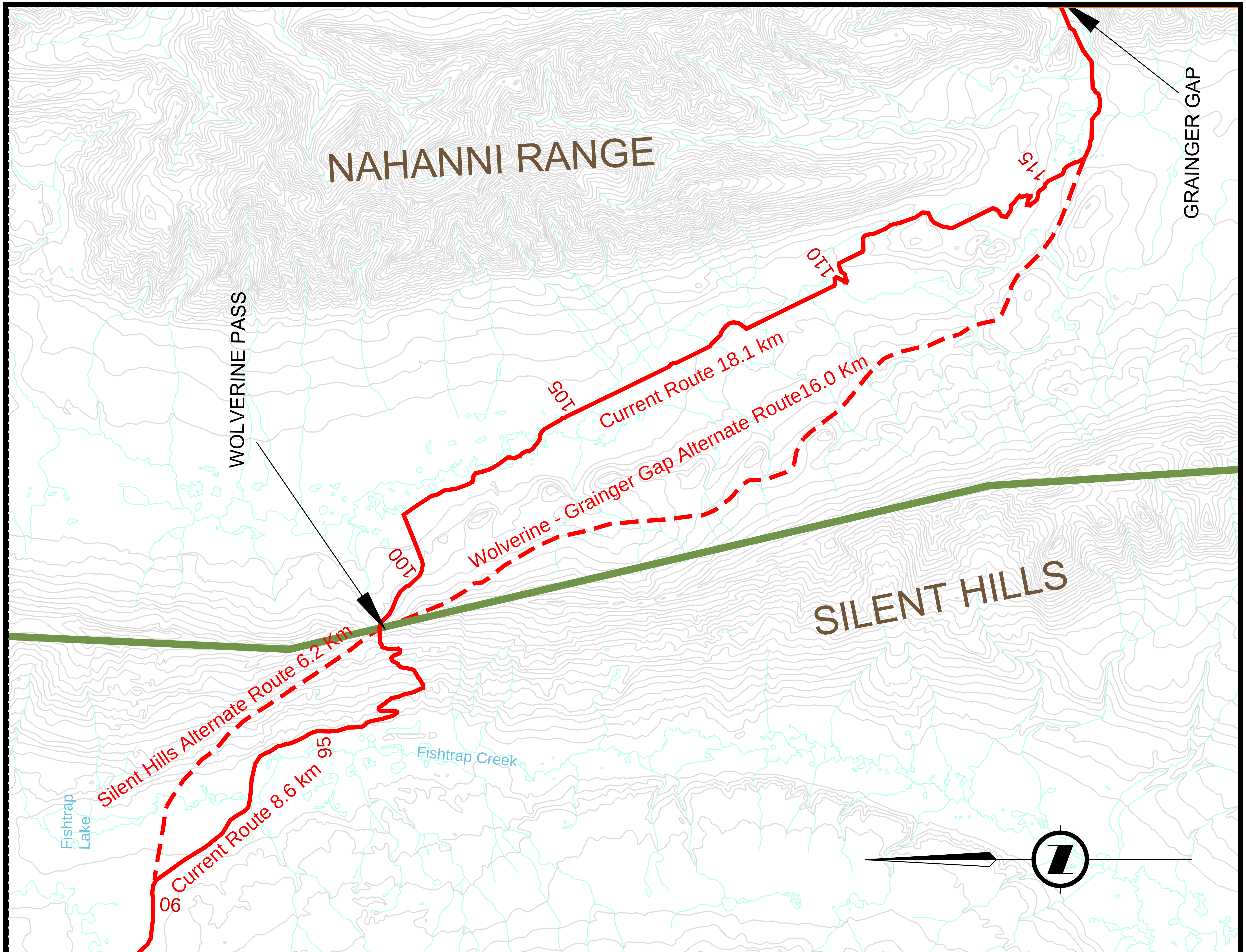


Figure 6-22: Access Road;

Silent Hills and Wolverine - Grainger Gap Alternative

Legend

- 00 Road Markers from Mine Site (km)
- Existing Access Road
- Proposed Alignment Changes
- Nahanni National Park Reserve Boundary
- Watercourses
- Claims Boundary
- Contour Interval (100 ft)

Scale

0 1 2.5
Kilometres

CANADIAN ZINC CORPORATION

Project File Name: DAR Fig 6-22.dwg	
Date: October 2009	Sheet: Nad83 UTM: 95F
Scale: As Shown	Drawn By: C. Reeves

A description of stream characteristics and photographs is given in Appendix 16 (photosheet 29). Fishtrap Creek is considered to support fish and provide fish habitat, although not necessarily in the boggy headwater terrain crossed by the road.

Wolverine Pass-Grainger Gap Alternative (Km 99 to Km 118).

Poor drainage between the Silent Hills range and the Nahanni Range has resulted in prolific wetlands. The NBDB expressed their desire for the road to avoid these wetlands by re-routing of the road out of the wetlands.

CZN has proposed the Wolverine Pass-Grainger Gap alternate route along the base of the eastern slope of the Silent Hills range (refer to Figure 6-22). This route is 16 km long and by-passes the majority of the wetland area before crossing into the Grainger Gap area. The advantages of this alternative are:

- Accommodates the NBDB's wishes;
- Avoids the wetlands area;
- The route is shorter and more direct;
- Operational road maintenance is easier due to better drainage.

A description of stream characteristics and photographs is given in Appendix 16 (photosheets 22-28). A total of seven streams were studied and while some were deemed to have potential to support fish, the low quantity of water negatively affects habitat quality and potential utilization.

Nahanni Front Range Alternative (Km 125 to Km 170).

Once the road exits Grainger Gap in the Nahanni Range it enters lowlands which contain abundant wetlands that support wildlife. The NBDB expressed their desire to avoid these wetlands, and would prefer the road to turn south along the eastern slope of the Nahanni Range (refer to Figure 6-23). This would avoid the Grainger River drainage area. In addition, it was noted that some residents of Lindberg Landing expressed concerns regarding road traffic on the existing route.

The new route would cross the Liard River via an ice bridge in the vicinity of Swan Point. After crossing the ice bridge, the route joins an old logging road which follows the east side of the Liard River to join into the existing Nahanni Butte all season road and its junction with the Liard Highway #7. The Liard Transfer Facility would be located at the junction.

The new 50 km route would have the following advantages:

- Accommodates the NBDB's wishes;
- Mitigates the concerns of Lindberg Landing residents;
- Avoids the wetlands;
- Takes advantage of an existing logging road and the Nahanni Butte access road;
- Better drainage along the route provides easier maintenance;
- The road and the Liard Transfer Facility are more accessible to Nahanni Butte enhancing potential economic benefits;
- Eliminates 27 km of haulage on Highway #7;

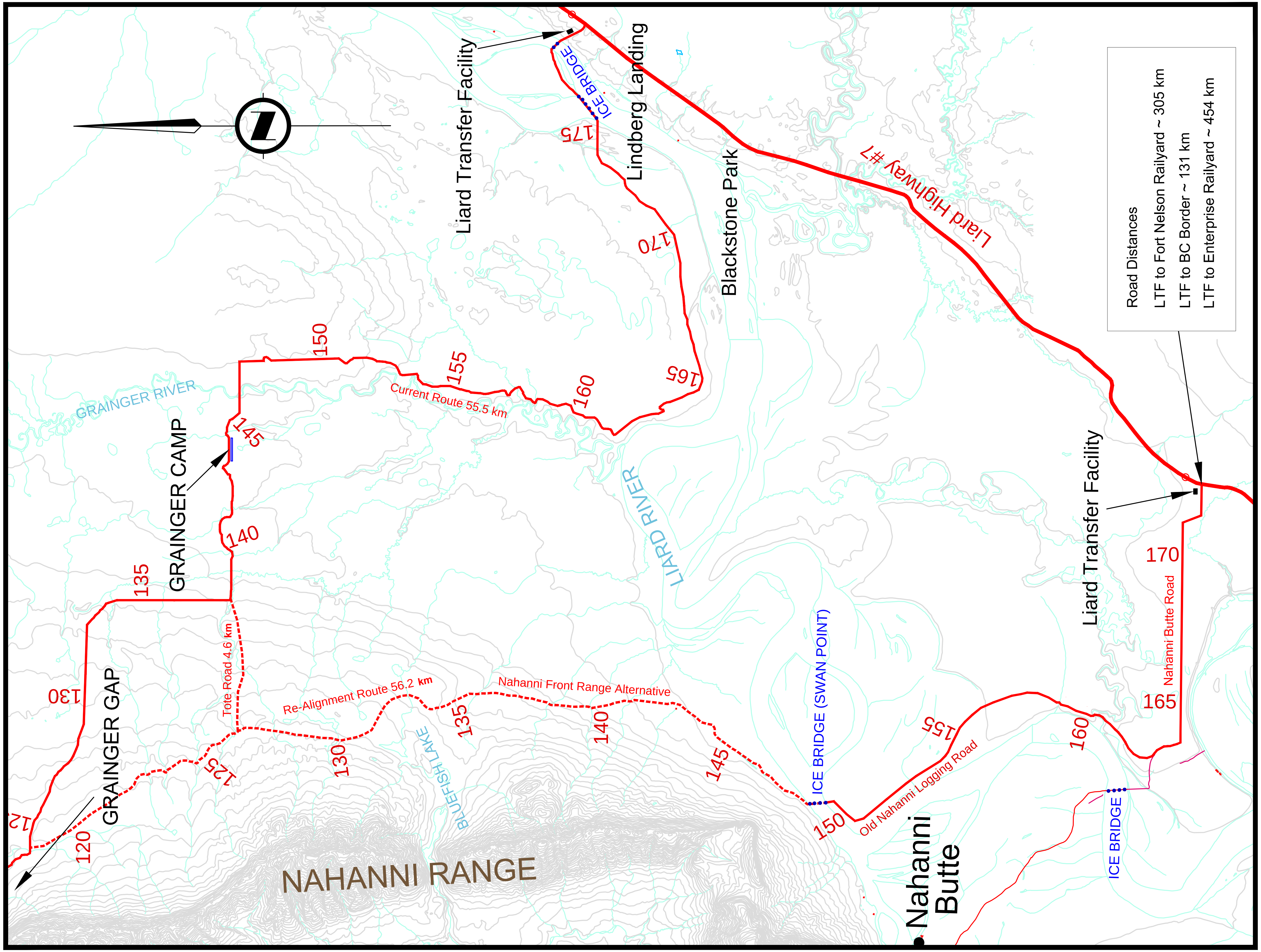


Figure 6-23: Access Road; Nahanni Front Range Alternative

Legend

- 00 Road Markers (km)
- Existing Access Road
- Proposed Alignment Changes
- Ice Bridge Crossing
- Watercourses
- Contour Interval (100 ft)
- Transfer Facility

Scale

0 1 2.5 5

Kilometres

CANADIAN ZINC CORPORATION

Project File Name: DAR Fig 6-23.dwg	
Date: October 2009	Sheet: Nad83 UTM: 95F
Scale: As Shown	Drawn By: C. Reeves

- The new route is shorter;
- Facilitate road monitoring by NBDB.

A description of stream characteristics and photographs is given in Appendix 16 (photosheets 1-15). A number of streams were assessed along the proposed route and deemed to have potential for fish habitat. However, they are headwater streams prone to low flows and freezing.

6.21.2 Road Construction

Construction of the access road will follow best standard industry practice and comply with all current safety regulations, and at the same time minimize environmental impacts.

Sections of the existing road route to be used and approved alternative will need to be cleared of trees and brush. Clearing will only be carried out along the approved right-of-way, and should reflect the minimum width necessary to conduct operations. CZN may use a chipper, either on the end of a backhoe boom or a self propelled unit. The chips would be left on the road bed where an insulation layer is deemed appropriate. Alternatively, vegetation will be cleared with a bulldozer. If trees are significant in size, these would be cut and piled in windrows parallel to the route, with periodic breaks for wildlife access. Windrows can also be used to enhance snow accumulation in certain sections of the route.

A significant portion of the route is on sloped ground. A level road bed will need to be established by limited cut and fill, where necessary. Cut and fill is used to reduce slope angles and build a driveable road surface. Fills on slopes should utilize cut material from upslope. Alternatively, fills can be made using borrow materials from an approved borrow source.

As outlined in the INAC draft “Northern Land Use Guidelines: Access Roads and Trails, October 2008, key requirements are:

- Construct on stable terrain, where possible;
- Avoid disturbance of permafrost, where possible;
- Management of Drainage.

Cuts should not be made on slopes in ice-rich permafrost or in loose material, because thawing will promote slumping. If a cut is unavoidable in permafrost terrain, the backslope will be made nearly vertical to allow the ground to thaw and slough, establishing its final position. A wide ditch would be made at the base of the cut so that sloughed material can be removed, as required.

Fills can be used for road construction in muskeg and ice-rich permafrost terrain, but to avoid disturbance, the fill should be end-dumped from an established roadbed.

In level areas underlain by permafrost, the organic layer will be retained in a viable and uncompacted state to help maintain the thermal status of the ground along the route. The existing access road route appears to have generally performed well in this regard, and has very few examples of thaw settlement. Maintaining an organic layer along the road route where ground ice is suspected is preferred, where possible.

A Fuel Spill Contingency Plan similar to one in effect for the Mine site (refer to Appendix 28) would be developed for the access road and put in place prior to construction.

6.22 Access Road Water Management

6.22.1 Construction

Very little water will be required for the seasonal construction of the access road between the Mine and the Liard Highway. The existing alignment was built by clearing and roughly levelling the bed, and then allowing the ground to freeze. As such, the road is not an ice road but a frozen soil bed, apart from the Liard River crossing. Where incised creeks need to be crossed, these will be snow-filled with or without the use of temporary culverts. In certain cases, temporary span structures may be used. Water may be used in some locations to make an even bed. In this case, local sources of water will be used, such as lakes. CZN understands that no more than 10% of the volume of a water body may be used for this purpose, and that appropriately sized screens on pump intakes are required to avoid the entrainment of fish.

Seasonal road construction crews will operate from the Mine, Cat Camp, and the Tetcela and Liard Transfer Facilities. Each location will likely have day-use trailers equipped with potable water and washrooms. The potable water will be brought in by tanker. Tanker water will be sourced from the Mine supply, or at the eastern end of the road from a local well source. If the latter poses any issues, an alternate source will be sought, which might include the drilling of a supply well at the Liard Transfer Facility. Sewage from the trailers will be held in temporary tanks which will periodically be pumped out into a sewage truck and taken to the Sewage Treatment Plant at the Mine.

6.22.2 Operations

Similar to the construction period, road maintenance crews will operate from the Mine, Cat Camp, and the Tetcela and Liard Transfer Facilities, and will continue to use the trailers equipped with potable water and washrooms. Transfer Facility staff will also use the trailers. Water supply and sewage disposal will be as for construction.

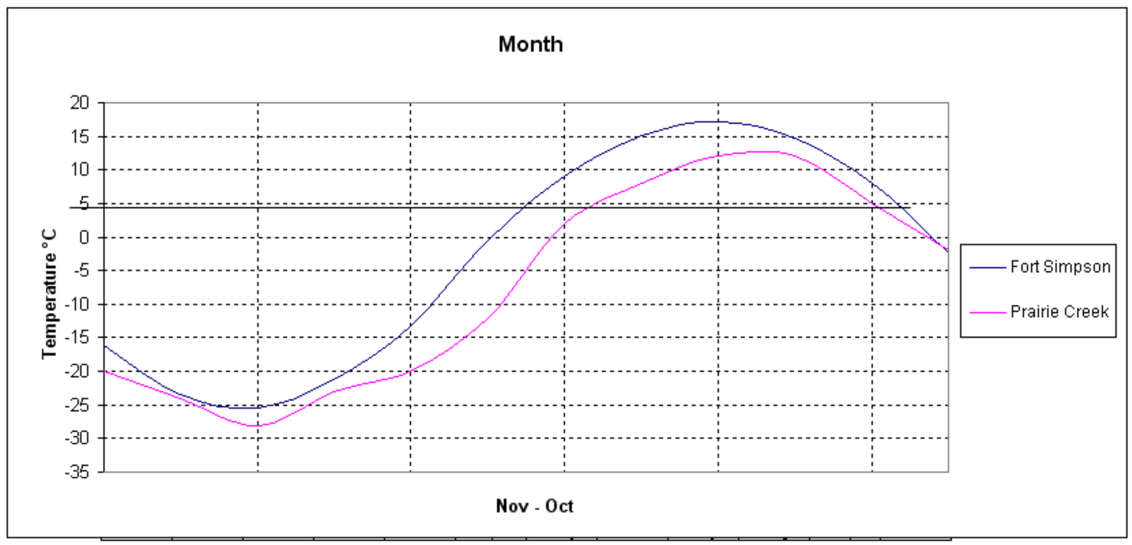
6.23 Concentrate Haul

Table 6-10 outlines the estimated traffic that would occur during haulage operations on the access road. Separate data is given for the period prior to ice bridge construction over the Liard River, during full haulage operations when the ice bridge is open, and haulage on Highway #7 after the ice bridge has been closed for the season. The scenario depicted in Table 6-10 is based on the production and movement of 120,000 tonnes of concentrate per annum when the Mine is producing at maximum capacity, probably after 4 years of operations.

Table 6-10 Transportation Schedule, Prairie Creek Mine, Canadian Zinc Corporation

30 tonne loads over the winter road

	tonnes	trips/day	fleet size	~days	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sept	Oct
Ice Bridge Open																
Hwy 7 Load Restrictions (NWT + BC)																
Construction Operations																
Minesite to TTF																
TTF to Ice Bridge																
Ice Bridge Installation																
Haulage Operations - Concentrate																
Mine site to TTF - CZN Fleet	50,000	37	13	45												
TTF to LTF - Contractor	50,000	37	13	50												
Minesite to LTF - CZN Fleet	56,000	21	13	60												
Minesite to LTF - Contractor	14,000	16	9	30												
LTF to Fort Nelson - **Winter/Summer**	120,000	12	7	240												
Haulage Operations - Re-supply: Ft. Nelson to LTF then to Minesite																
Fuel	8,000	<2		75												
Operating Supplies	15,000	8		75												



Description of Concentrate Transportation Plan

The Concentrate Transportation Plan is based upon the following concepts:

- The section of the Prairie Creek access road between the Mine and the TTF can be constructed in the late fall/early winter and used to transport concentrate approximately half way to the LTF prior to construction of the eastern segment of the road and opening of the Liard ice bridge;

- The Liard ice bridge is available for concentrate haulage traffic on average from mid-January to the end of March;

- The highway between the LTF and Fort Nelson is subject to road restrictions on average from mid-March to mid-June;

- The Transportation Plan requires sufficient flexibility to take into account variance in the various haulage windows caused by temperature fluctuation; and,

- The principle haulage equipment combination would be a tandem-drive tractor pulling a tri-axle flat deck trailer carrying minimum 30-tonne loads of bagged concentrate. These units would typically have a GVW of less than 60-tonnes and would be capable of hauling up to 40-tonne loads.

The concentrate transport and resupply haulage fleet will comprise a fleet of 13 operating tractor/trailer units owned and operated by CZN and a Contactor fleet of 13 similar units. The CZN fleet will be stranded at the Mine site during the summer in order to be available to haul concentrate to the TTF early in the winter.

The Concentrate Transportation Plan, which also includes the annual re-supply of fuel and operating supplies on the back-haul, is detailed in Table 6-10 and is sub-divided into 3 operational sections; winter road construction, concentrate haulage, and re-supply haulage. The sequence of events is summarized as follows:

- Construction of the access road from the Mine site to the TTF between November 1 and December 15. November 1 was selected as the average start date on the basis of the temperature profile for the Mine site (Figure 4-1). As soon as this first section of road is constructed, the CZN fleet will commence concentrate haulage from the Mine site to the TTF.

- Road construction from the TTF to the Liard Ice Bridge will continue, and would be carried out simultaneously with the Liard Ice Bridge being established. Both the road to the ice bridge and the ice bridge itself are scheduled for completion by January 15. The construction window is based upon the history of Nahanni Butte ice bridge construction.

- By January 15, 50,000 tonnes of concentrate will be at the TTF, 70,000 tonnes of concentrate will be at the Mine site, and 15,000 tonnes of operating supplies and 400,000 litres of fuel will be at the LTF (the remainder of the fuel requirement will be supplied to the LTF over the re-supply period).

- From January 15 on, the CZN fleet will begin concentrate haulage from the Mine site to the LTF, and will back-haul operating supplies and fuel without stopping at the TTF in either direction. The Contractor fleet will collect concentrate from the TTF and deliver it to the LTF. When the contractor fleet has moved all of the concentrate from the TTF to the LTF, they will join the CZN fleet in moving the last of the concentrate from the Mine site to the LTF.

- Concentrate will be hauled from the LTF to the Fort Nelson staging area as highway conditions dictate over the period from the middle of January. No haulage will be scheduled when weight restrictions are typically in effect (mid-March to mid-June). Figure 6-24 shows a typical highway concentrate haul truck.

Note, all dates are subject to weather and road conditions, and the usual conditions specified in operating permits. CZN has evaluated these conditions from records and considers the above schedule to be feasible.

Road Operation Contingency Plans

In the event that the road haulage window shrinks for any reason, the following contingency plans will be implemented individually or together:

- Contract additional haul trucks to increase the haulage capacity. At this time of year, this may be difficult because all winter and ice roads in the area will be active and excess trucking capacity may not be available. If 4 additional tractor-trailer units were added to the fleet between the Mine and LTF, the increased haul capacity would be 230 tpd.

- The transportation plan is based upon 30 tonne loads whereas the truck fleet is rated for 40 tonne loads. Increasing the load to 40 tonnes increases the haul capacity by 250 tpd. However, extra towing capacity may be required for steep road sections.

- A variation of the above strategy would be to haul 30-tonne loads to the TTF and then increase the load to 40-tonnes from the TTF to the LTF.

CANADIAN ZINC CORPORATION

Date:	October 2009
Drawn By:	C. Reeves
Scale:	Not Shown
Drawing:	DAR Fig 6-24.dwg

FIGURE 6-24: Photo of Typical Highway Concentrate Haul Truck

6.24 Transfer Facilities

6.24.1 Locations

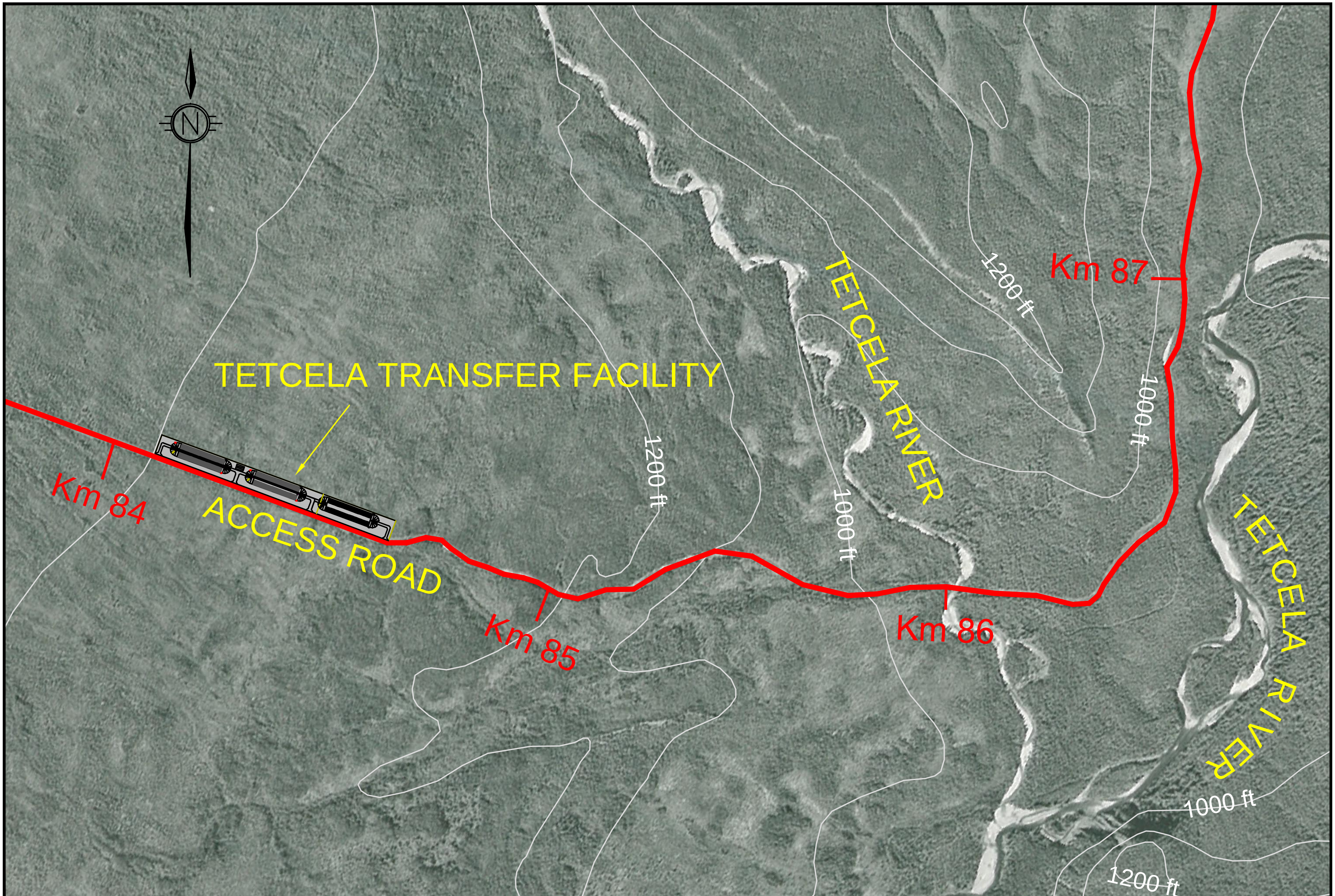
As explained in Section 6.23 above, CZN propose to operate two transfer facilities along the access road, one near the mid-point of the road, called the Tetcela Transfer Facility ("TTF"), and one near the junction with the Liard Highway, called the Liard Transfer Facility ("LTF"). The locations of these are described below.

The proposed location of the TTF is at road marker Km 84 (measured from the Mine), adjacent to the existing access road alignment. Figure 6-25 provides a topographic map of the area but with a 1994 air photograph base to illustrate surface features. The more precise location of the TTF is Km 84.4.

Facility location selection was based on three considerations:

- It is the eastern-most location along the access road that can readily be accessed early in winter. The road from the Mine to Cat Camp at Km 38 was built and permitted to all season standards. Creek crossings along this section are expected to be dry early in the winter period. From Cat Camp to the TTF, there is only one significant creek to cross on the proposed new alignment north of the poljes, and very little boggy ground;
- The area under the TTF is underlain by Fort Simpson Formation rocks, according to Geological Survey of Canada (GSC) Map 1377A, Geology, Sibbeston Lake. The rocks are described as "shale, dark grey and greenish grey fissile; siltstone, thinly bedded". Therefore, the TTF will not be located on potentially permeable dolomitic rocks, but quite low permeability shales and siltstones; and,
- While the topographic maps indicate there is an abundance of surface drainage in the region of the TTF in proximity to the Tetcela River, most likely as a result of the underlying low permeability shales, there are no surface drainage features in the immediate area of the TTF. The area is a broad, flat spur between tributaries of the Tetcela River, the nearest one being approximately 260 m away. Surface drainage would not affect the TTF in the winter when it is in operation. Auger investigation indicates that the site consists of approximately 150 mm of muskeg underlain by stiff clay, which should readily freeze in the winter.

If the existing road alignment to the Liard Highway is utilized, the proposed location of the LTF is near Lindberg Landing, approximately 200 m north-west of the Highway, adjacent to the existing access road alignment, and approximately 600 m south-east of the Liard River. Figure 6-26 shows the topography of the area superimposed on a 1994 air photograph base to illustrate surface features. Soils are derived from Fort Simpson Formation shale bedrock and silts from the river floodplain.



CANADIAN ZINC CORPORATION

Date:	October 2009
Drawn By:	C. Reeves
Scale:	As Shown
Drawing:	DAR Fig 6-25.dwg

CONTOUR INTERVAL: 100 FT

TOPO DATA FROM NRCAN DIGITAL TOPO DATABASE: NTS MAPSHEET 95 F/9

SCALE : METRES

0 50 100 250 500

PRAIRIE CREEK MINE

FIGURE 6-25:
LOCATION AND TOPOGRAPHY OF TETCELA TRANSFER FACILITY AREA

CANADIAN ZINC CORPORATION

Date:	April 2008
Drawn By:	CH
Scale:	As Shown
Drawing:	DAR Fig 6–26.dwg

CONTOUR INTERVAL: 50 FT

SCALE : METRES

0 50 100 150 200 250 300

PRAIRIE CREEK MINE

FIGURE 6-26:
LOCATION AND TOPOGRAPHY OF
LIARD TRANSFER FACILITY - LINDBERG LANDING

The location selection was based on three considerations:

- Proximal to the junction of the access road and Liard Highway;
- There are no surface drainage features in the immediate area, which appears to be a gentle slope towards the river; and,
- The location is just behind a large stand of trees which will obscure visibility from the highway.

If the new road alignment to the Liard Highway is utilized, the proposed location of the LTF will be on the north side of the Nahanni Butte access road in a clearing in the forest, approximately 100 m west of the Liard Highway (Figure 6-27). This area is also flat and well drained, and is expected to be underlain by ancient floodplain silts.

6.24.2 Construction

The TTF will consist of two prefabricated framed structures with stressed membrane (fabric) covers (see Figure 6-28). Fabric colour will be selected to blend into summer surroundings. Each structure will be approximately 130 m long and 30 m wide. The facility will cover an area with dimensions of approximately 350 x 40 m, an area of 1.4 ha. The base of the structures will consist of a graded and lined pad, with approximately 30 cm of suitably sized gravel on top. This will provide a firm surface for truck traffic. Figure 6-28 shows a similar structure at the Ekati Diamond Mine, NWT, as well as the inside of a similar structure at the Minto Copper-Gold Mine in the Yukon. The proposed TTF layout is shown in Figure 6-29.

The structures will not be heated to maintain the frozen state of concentrate bags which will be temporarily stored. Each structure will have the capacity to store 25,000 tonnes of concentrates. Mobile, diesel powered lighting plants will provide both outdoor and storage shed lighting. A small fuel tank and generator will be located within a bermed and lined area. A fuel spill kit will be on hand. This generator will also provide power for a day-use trailer equipped with a potable water tank and washroom, with sewage collection in a temporary storage tank.

The LTF will be bigger than the TTF and consist of the following components (see Figures 6-30):

- A 400,000-litre, dyked temporary fuel storage tank which would be capable of storing 1.5 days of fuel transfer capacity;
- A fuel transfer module capable of simultaneously allowing a fuel B-train to unload into the temporary fuel storage tank, refuelling a waiting tractor, and filling a 10,000-litre fuel transfer tank on the trailer hooked-up to the tractor;
- A lay down area for incoming operating supplies; and,
- Two 25,000 tonne capacity concentrate sheds, with space for an additional shed.

The concentrate sheds, and the pads on which they sit, will be the same as those at the TTF.

The LTF will cover an area with dimensions of approximately 180 x 120 m, an area of 2.16 ha. The structures will also not be heated.

CANADIAN ZINC CORPORATION

Date:	October 2009
Drawn By:	C. Reeves
Scale:	As Shown
Drawing:	DAR Fig 6-27.dwg

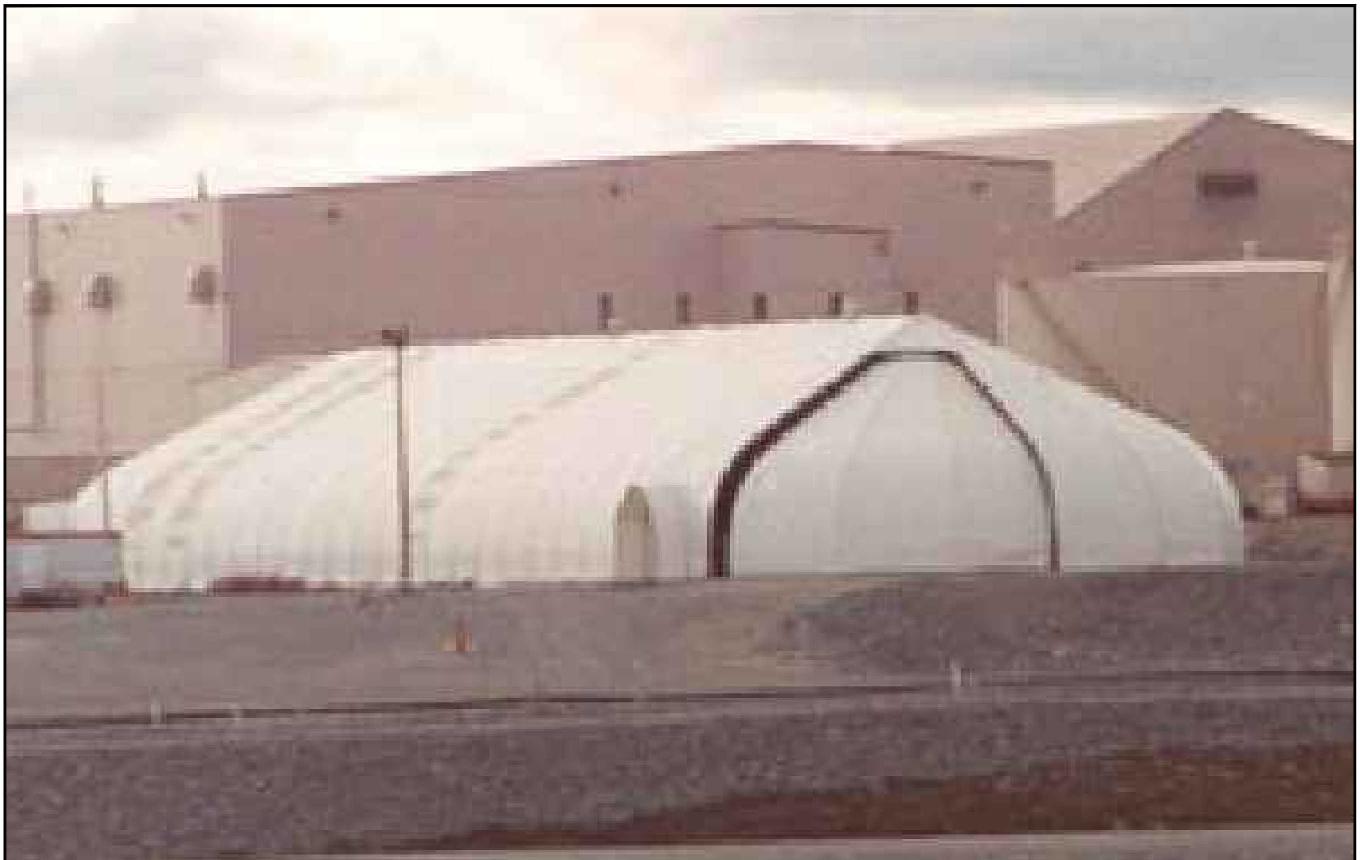
Approximate Scale

0 60 120 180 240

Metres

PRAIRIE CREEK MINE

FIGURE 6-27: LOCATION AND TOPOGRAPHY OF LIARD TRANSFER FACILITY - NAHANNI BUTTE



CANADIAN ZINC CORPORATION

Date:	October 2009
Drawn By:	C. Reeves
Scale:	Not Shown
Drawing:	DAR Fig 6-28.dwg

FIGURE 6-28: Proposed Concentrate Storage Structure

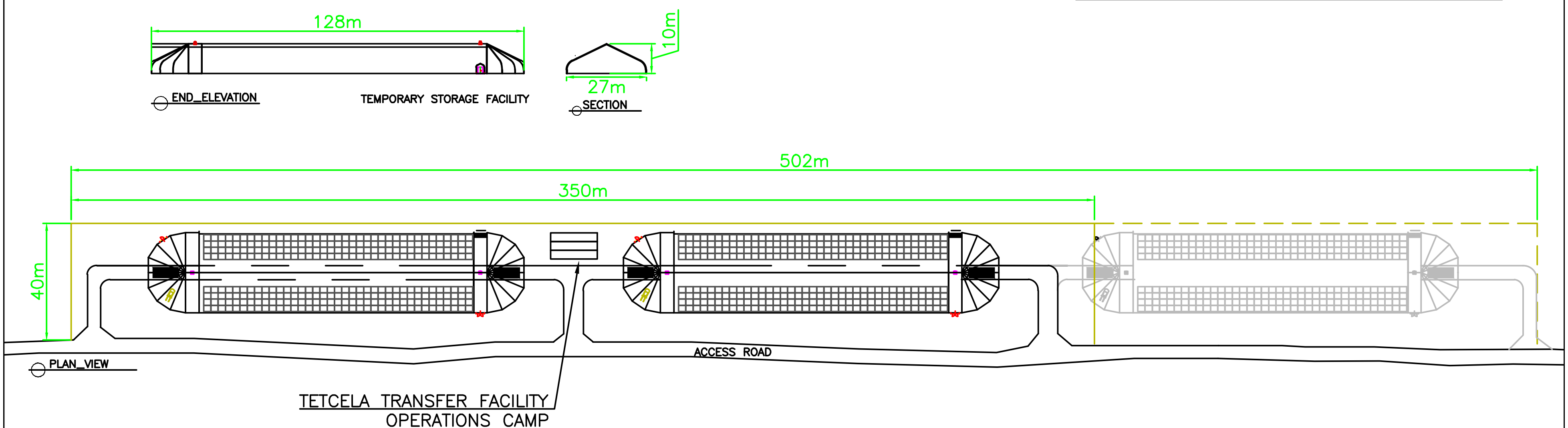
TTF AREA MEASUREMENTS

TTF (WITHOUT EXPANSION)

14,000 m2 = 3.46 Acres = 1.40 Hectares

TTF AREA (WITH EXPANSION)

20,080 m2 = 4.96 Acres = 2.01 Hectares



CANADIAN ZINC CORPORATION

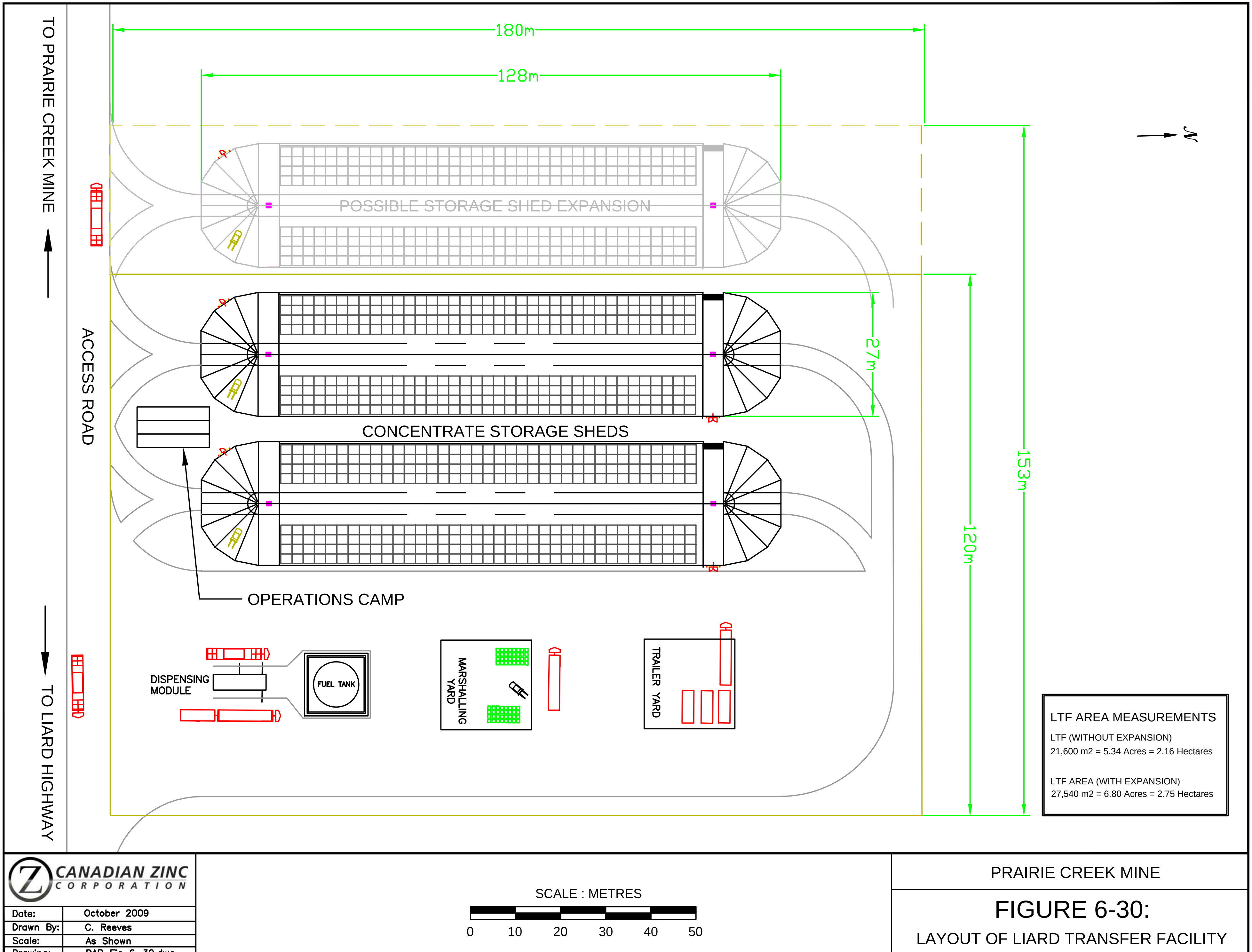
Date:	October 2009
Drawn By:	C. Reeves
Scale:	As Shown
Drawing:	DAR Fig 6–29.dwg

SCALE : METRES

0 25 50 75 100

PRAIRIE CREEK MINE

FIGURE 6-29:
TETCELA TRANSFER FACILITY
DESIGN AND LAYOUT



LTF AREA MEASUREMENTS

LTF (WITHOUT EXPANSION)
21,600 m2 = 5.34 Acres = 2.16 Hectares

LTF AREA (WITH EXPANSION)
27,540 m2 = 6.80 Acres = 2.75 Hectares

CANADIAN ZINC CORPORATION

Date:	October 2009
Drawn By:	C. Reeves
Scale:	As Shown
Drawing:	DAR Fig 6–30.dwg

PRAIRIE CREEK MINE

FIGURE 6-30:

LAYOUT OF LIARD TRANSFER FACILITY

The 400,000 litre fuel storage tank will be contained within a 440,000 litre capacity dike. The fuel dispensing module will be located such that any spillage would flow into the dyked containment berm. As for the TTF, mobile diesel powered lighting plants will provide both outdoor and storage shed lighting. Two trailers, an 8 man sleeper and a wash/diner, will be located nearby for facility operations staff. Power will be supplied by a small diesel-fuelled generator located within the containment berm. A fuel spill kit will be available on the site.

6.24.3 Operations

The TTF will operate from December to early March each year. The haul of concentrates by the Mine truck fleet will commence from the Mine once the portion of the road from the Mine to the TTF is open, which is expected to be in early December. When the remainder of the road opens, which is expected to be by mid-January, contractor trucks will collect the concentrates in storage and truck them out to the LTF, with an expected completion by early March.

The only mobile equipment necessary to operate the TTF will be a forklift. Fuel will be periodically delivered by truck from the Mine, and a maintenance grader will dress the access roads periodically, as required. During operations, the TTF will be manned by 2 operators and 1 labourer. A single day-use trailer will be sufficient to support operating crews, with sewage and waste being periodically transported to the Mine for disposal in the appropriate facilities.

Concentrate bags can be stacked 3-high and in multiple rows on both sides of the structures. Trucks will be able to drive down the centre to either offload or be loaded by the forklift. Trucks will enter one end of the structure and exit from the other end. Road-bed outside the structures will also be made from gravel to avoid rutting. The operating premise of the facility will be that the concentrate bags are clean on the outside, and that the trucks are also clean. To maintain this situation, any torn bags will be double bagged immediately, and any associated losses of concentrate will be completely cleaned-up to preserve a clean operating situation.

The main LTF operating period will be from mid-January, when the facility starts receiving concentrates, to mid-March, covering the main concentrate transfer to Fort Nelson via B-trains until weight restrictions apply on the highway. The LTF will continue to receive concentrate from the Mine until the Ice Bridge is closed in late March/early April. After spring break up and the lifting of highway weight restrictions (mid-June), concentrates remaining at the LTF will be hauled to Fort Nelson. LTF activities will cease when all of the concentrates have been removed. Activities will commence again in the subsequent mid-winter when supplies are being brought to the facility for the haul into the Mine.

The following equipment is expected to be needed to operate the LTF:

- 14E grader
- Two fork-lifts
- Fuel Truck
- Sewage Truck
- Two Snow Plow & Sand Trucks
- Flat Bed Truck
- Two Pick up Trucks

Facility operating personnel are expected to be as follows:

• Operators	4
• Foremen	1
• Labourers	2
Total	**7**

For both the TTF and LTF, all forms of waste, including sewage, will be periodically transported off-site for disposal. Communications will be supported by satellite phone to monitor road traffic and keep in contact with the Mine site and elsewhere.

At the end of each winter operating season, the doors of the structures will be closed to prevent the ingress of rainfall, and entry of wildlife. The fuel tanks will be emptied, and all food and waste will be removed, including sewage.

6.25 Manpower

Personnel needs are estimated to be approximately 220 staff in total (see Table 6-11). Only half of this number would be on-site at one time. CZN's policy is to maximize employment of First Nations people.

All personnel will receive appropriate training. Training will focus on 2 primary areas:

- Safety, Health and Environment
  - Mandatory training to ensure employees are fully aware of health, safety and environmental policies and practices and able to perform tasks in compliance with established policies and legislation; and,
  - Training to ensure employees are fully aware and trained to respond to an emergency.

Table 6-11: Direct Manpower Requirements for Prairie Creek Mine

Position	On Site	Total
Mine		
Miner Development Jumbo Op.	2	4
Miner Development Scoop Op.	2	4
Miner Development Rock bolt etc	2	4
Truck and Scoop Op.	4	8
Raise miners	2	4
Stoping crew 880L and above	5	10
Mine services crew	6	12
Stoping crew below 880L	9	18
Fill prep. Crews	4	8
Fill placement	2	4
Haulage 880 L trains	2	4
Totals	**40**	**80**
Mine Staff		
Mine Supt / Ass. Mine Supt	1	1
Mine Foreman	1	2
Mine Supervisor	3	6
Mine Engineer	1	1
Planning Engineers	1	2
Survey Crews	2	4
Chief.Mine Geol /Assist Mine Geo	1	2
Geologist	1	2
Samplers	2	4
Totals	**13**	**24**
Mill and Sampling Lab		
Crushing Crew DMS	3	6
Mill Operators	4	8
Assistant Operators / Helpers	3	6
Labourers	2	4
Lab Sample Prep	2	4
Paste Plant	2	4
Conc. Storage Op.	2	4
Totals	**16**	**32**
Mill Staff		
Mill Supt / Ass. Mill Supt.	1	2
Mill Foreman	1	2
Metallurgist	1	2
Technicians On line process	1	2
Chief Assayer	0.5	1
Ass. Assayer	0.5	1
Assayer	2	4
Totals	**6**	**12**

Position	On Site	Total
Mine Maintenance		
Foreman	1	2
Heavy Duty Mechanic	3	6
Welders	2	4
Lube/ Service	1	2
Drill Doctor	1	2
Electrician	1	2
Labourer	1	2
Totals	**10**	**20**
General Maintenance		
Maint Supt/Foreman	1	2
Millwright/ Welders	2	4
Pipefitter	1	2
Electrician	2	4
Instrum. Tech	1	2
Maint Planner	1	2
Labourer	1	2
Carpenters	1	2
Totals	**10**	**20**
Control Plant & Power Generation		
Electricians/Operators	2	4
Totals	**2**	**4**
G & A		
General Manager	1	1
Supt. Admin.	1	1
Senior Accountant		1
Accounts Payable		1
Purchasing Agent		1
Buyer		1
Safety/ Mine Rescue Coord.	1	2
First Aid	1	2
Environmental Manager	1	2
Environmental Tech	1	2
Totals	**6**	**14**
Camp Services		
Catering Staffing	7	14
Totals	7	14
GRAND TOTALS	**110**	**220**

- Technical
  - Practical training to ensure employees attain the required skills to perform all tasks included in their job description in accordance with industry standards and regulations; and,
  - Training in the regulatory codes, acts, regulations and industry standards as they apply to the tasks in their job description to help employees gain an understanding of the basis for standards and requirements.

Training will be prioritized as mandatory and supplementary. Mandatory training courses are necessary to ensure employees perform their duties safely while promoting environmental protection, and must be undertaken before the employee can work on-site. Mandatory courses will include:

- Occupational Health and Safety;
- Safety Oriented First Aid and required levels of Mine Rescue;
- Driver Education;
- Environmental Awareness;
- Workplace Hazardous Material Information;
- Hazardous Materials Handling, Storage and Transport;
- Waste Management;
- Spill Response and Reporting, ensuring employees know the site layout, and where to find safety, medical and environmental help;
- Emergency response procedures and responsibilities;
- Review of wildlife policies, and specifically how to respond to bear encounters; and,
- Review of drug and alcohol policies, and where to find help if needed.

The Safety Coordinator will be responsible for course content, scheduling and employee participation.

In addition to the above, every employee will be encouraged to participate in supplementary orientation seminars upon arrival at the site for the first time. Seminars will include, but may not be limited to, guidance on personal financial management, and review of employee benefits packages.

6.26 Worker Transportation/Scheduling

Personnel that are not area residents will be flown-in to site on charter flights originating from 1 or 2 locations, such as Fort Nelson, Edmonton, Yellowknife or Vancouver. Employees will make their own way to these locations for pick-up. Personnel from local communities will be flown in on charter flights from Nahanni Butte, Fort Liard or Fort Simpson. NWT residents beyond these communities will make their own travel arrangements to these pick-up points. In the event of flight delays due to weather, out-going crews will continue to work until incoming crews arrive. Remuneration adjustments will be made for days gained or lost over a year.

Site mining and milling operations will continue year round, with the possibility of a short winter break. Personnel will work a rotating work schedule comprising 3 weeks on-site followed by a 3 week break, with schedules staggered in order to maintain continuity through shift changes and reduce the intensity of flight traffic. Administration and mining staff will work 10 hour shifts. Mill staff will work 12 hour shifts. Both mine and mill operations will work day and night shifts, while administration will be day shift only.

The construction crew for seasonal road construction from the Mine east will also be flown in as above, as will the road haul crew for the Mine to TTF haul. Crews operating from the eastern end of the road will drive to the LTF. Road construction crews will likely not rotate for a break due to the short duration of the activity. Day and night shifts are likely. The Mine road haul crew will rotate on the 3 week in, 3 week out schedule, and will also work day and night shifts. However, rotations may be by road once the full length of the road is open.

7.0 PUBLIC ENGAGEMENT

7.1 Engagement Methods

CZN has a long history of communications with the affected parties. Since the inception of the MVRMA in 1999, CZN has had many formal and informal meetings related to its numerous Land Use Permit and Water Licence applications. The majority of these applications to the MVLWB were subsequently forwarded to Environmental Assessment. Additional meetings were held, both within the affected communities and region.

The extensive consultation that has occurred, is demonstrated by the Consultation Record for Land Use Permit MV2003F0028 (access road) which was compiled in February 2007. This lists over 100 formal consultations relating to this single permit. These consultation documents are readily available through the MVWLB and MVRB registry files posted on their websites (www.mvlwb.com, www.reviewboard.ca).

CZN has had a regional office based in Fort Simpson for many years. CZN had a community liaison officer based in Ottawa, Dan O'Rourke from 2003-2007, who would visit Dehcho communities frequently every year. CZN also had a regional representative in Fort Simpson, Rita Cli. After Dan O'Rourke had medical issues in 2007 and could not continue his responsibilities, Mr. Joseph Lanzon, also based in Ottawa, replaced Mr. O'Rourke. CZN also hired Wilbert Antoine as its Manager of Northern Development, based in Fort Simpson. Mr. Antoine has assumed the main community interaction function on behalf of CZN and has a great amount of experience in mining. Consultation personnel are listed in Table 7-1.

CZN has also been working with the NBDB to set up a community liaison office in Nahanni Butte. When CZN negotiated a memorandum of understanding ("MOU") with the NBDB in 2008, one component of it was CZN's agreement to hire a NBDB member as a community liaison. George Betsaka initially filled this role, until it was assumed by Jim Betsaka who is continuing in the position. CZN's designated contact person in their head office (Vancouver) is Chris Reeves. CZN has a toll free number, and Dehcho residence can call the head office directly. Many of the local communities' immediate concerns have been addressed this way. The main method of daily communication is via telephone and meetings.

Table 7-1: Consultation Personnel Details

Personnel	Location	Consultation Responsibilities
Jim Betsaka	Nahanni Butte	Community Information Representative, Nahanni Butte Dene Band
Wilbert Antoine	Fort Simpson	Regional communities and territorial governments
Bob Norwegian	Fort Simpson	Regional communities and slavey interpretation services as required
Joseph Lanzon	Ottawa/ Toronto	Territorial and federal Governmental Agencies
Chris Reeves	Vancouver	Regional communities and Governmental Agency

Over the past 15 years, CZN has provided numerous tours of the Mine site for local communities (Figure 7-1), and various governmental agencies. CZN strongly encourages these tours in order for people to experience the site first hand and for them to fully understand what is there. CZN has found many prior misconceptions about the project are cleared up upon such visits. In addition, many government officials and the MVLWB and MVRB have toured the Mine.

CZN views itself as a valued member of the community and maintains a visible presence by sponsoring events and attending regional functions. CZN has sponsored the annual Canadian Zinc Open in Fort Simpson since 2003. The community regard this as one of the highlights on the year, and the event is attended by CZN representatives, including the President.

The first annual Winterfest was held in Nahanni Butte on January 26, 2010. CZN provided food and prizes, and activities were held for all ages.

7.2 Engagement Summary

7.2.1 Pre-Application Consultation and Community Support

Prior to CZN's involvement with the Prairie Creek Mine, the local affected communities had a somewhat limited understanding of the project's significant existing infrastructure. CZN (then known as SARC) first began consultation with the affected parties in 1992, which led to the first cooperative working agreement. The Prairie Creek Development and Cooperation Agreement was signed between the NBDB and CZN in 1996.

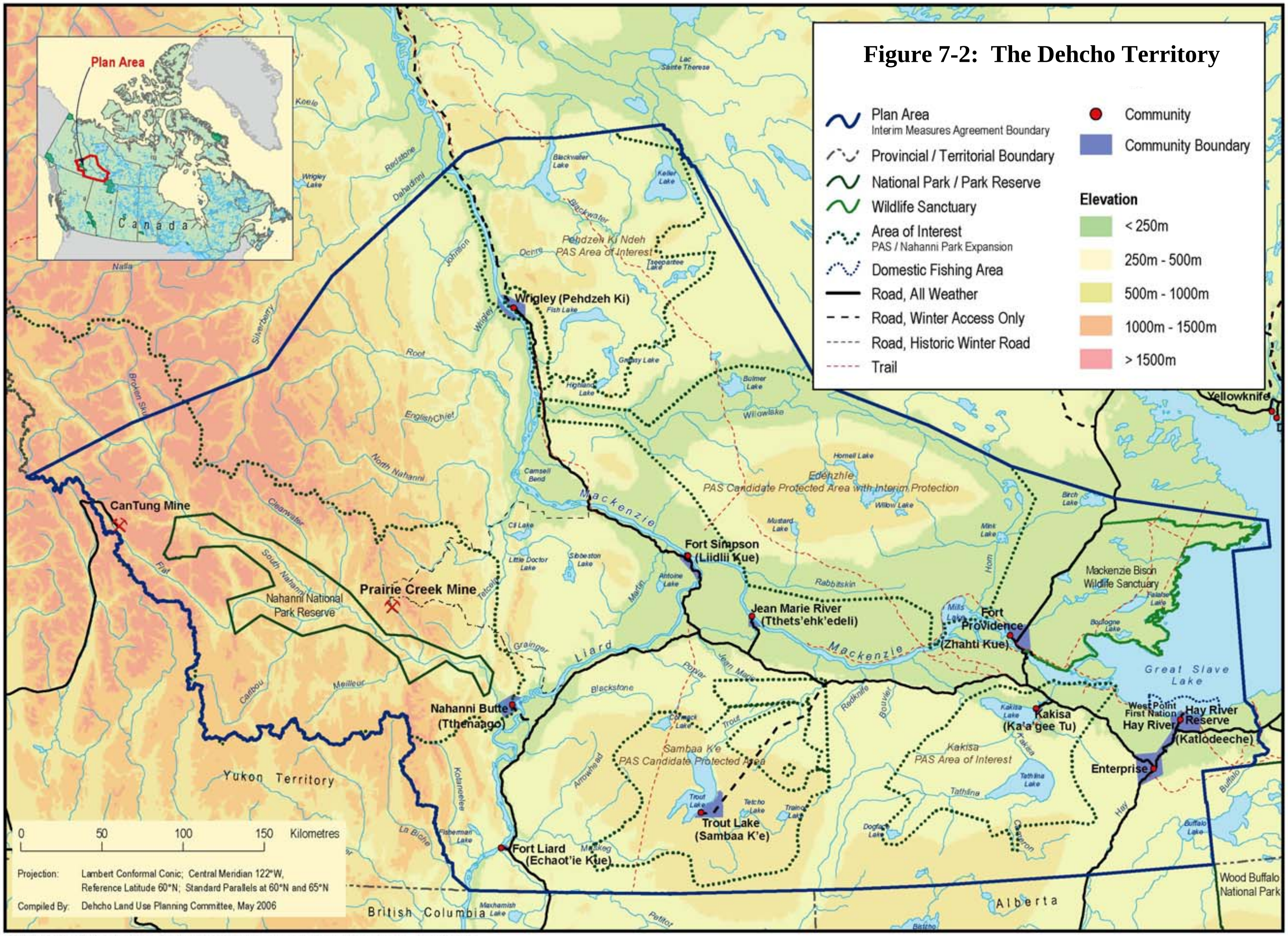
Figure 7-2 shows the location of the surrounding regional communities in relation to the Prairie Creek Mine. Nahanni Butte is the closest community with an approximate population of 120. Fort Simpson has the largest population with 1300 residents.

Over the past 15 years, CZN has expanded dialogue with local groups, including the Dehcho First Nations ("DCFN"), Acho Dene Koe Band (Fort Liard), Sambaa K'e First Nation (Trout Lake), Jean Marie River First Nation (Jean Marie River), Village of Fort Simpson, Lindberg Landing, Parks Canada, local businesses, and various territorial and federal government agencies.

CANADIAN ZINC CORPORATION

Date:	October 2009
Drawn By:	C. Reeves
Scale:	Not Shown
Drawing:	DAR Fig 7–1.dwg

FIGURE 7-1: Mine Tour for Nahanni Butte Dene Band, 2005



Note: Derived from Map 1 of the Dehcho Land Use Plan, Final Draft, June 2006

Source: Dehcho First Nations

Before CZN submitted applications for operating permits, community open house meetings were held in November 2007 in all Dehcho communities except Wrigley. A Wrigley meeting was planned but poor weather prevented it. The meetings provided details of the project and plans for operations.

7.2.2 Post-Application Consultation and Community Support

CZN submitted LUP and Water Licence applications for operation of the Prairie Creek Mine to the MVLWB in June 2008. This section describes CZN's consultations since that time. A consultation log can be viewed in Appendix 26.

Agreements

In 2008, CZN signed a MOU with Parks Canada relating to the Expansion of the Nahanni National Park Reserve and the future operation of the Prairie Creek Mine.

In the MOU:

- Parks Canada and Canadian Zinc (the "Parties") agree to work collaboratively to achieve their respective goals of an expanded Nahanni National Park Reserve and an operating Prairie Creek Mine.
- Parks Canada recognizes and respects the right of Canadian Zinc to develop the Prairie Creek Mine and will manage the expansion of Nahanni National Park Reserve so that the expansion does not negatively affect development of, or reasonable access to and from, the Prairie Creek Mine.
- Canadian Zinc accepts and supports the proposed expansion of the Nahanni National Park Reserve and will manage the development of the Prairie Creek Mine so the mine does not negatively affect the Nahanni National Park.

The Parties agreed to make every reasonable effort to address issues of common interest and build a strong working relationship, including convening a Technical Team which will better identify, define and consider issues of common interest, such as access to and from the Prairie Creek Mine through the proposed expanded Park and the park boundaries around the Prairie Creek Mine property. The Parties also agreed to share any existing technical and scientific information relevant to a discussion and analysis of issues of common interest.

In 2008, CZN signed MOU's with local First Nations, the NBDB and the Liidlii Kue First Nation ("LKFN"). The objectives of the MOU's were:

- To provide a process through which CZN can consult with and accommodate the interests of the NBDB and the LKFN with a view to amicably reconciling any issues that might arise;
- To establish a relationship through which the NBDB and the LKFN can identify opportunities for its businesses and members to participate in the project's exploration and development activities; and,

- To set out the objectives, process and topics for the negotiation of Impact Benefits Agreements ("IBAs") between the NBDB and CZN, and the LKFN and CZN, specifically intended to cover Prairie Creek Mine operations.

CZN has commenced IBA negotiations with both the NBDB and the LKFN, and these are continuing.

Scholarships/ Training

CZN has offered annual post-secondary academic scholarships for Aboriginal members of the Dehcho region since 2004. The amount CZN has contributed to the scholarship has totalled $35,000 (~ $6,000 per year). These scholarships were publicly advertised in the Northern News Service and Dehcho Drum. The selected recipients were chosen in partnership with LKFN's Training Co-ordinator and CZN's Manager of Northern Development.

The annual academic scholarship compliments CZN's on-going training partnership with the Mine Training Society ("MTS") and Aurora College. Local community concerns regarding the environment prompted CZN, MTS, and Aurora College to provide 2 Environmental Monitor Training Programs at the Prairie Creek Mine in 2006 and 2008. CZN will continue to provide training opportunities in fields where the Mine will require workers.

Local communities are encouraged by the upcoming training of its members. For example, DCFN has conveyed its interest in several training programs because transferable skills will be provided and could replenish the dwindling numbers of tradespersons available in the region.

Youth Workshops

CZN's Manager of Northern Development has participated in 5 recent presentations to local youths about the potential opportunities at the Prairie Creek Mine. These presentations were carried out at:

- Thomas Simpson Secondary School - May 2009
- Aurora College – April 2009 and December 2009
- NBDB Band Office – December 2009
- Aurora College – January 13, 2010

The presentations provided a project update followed by a Question and Answer period. The frequently asked questions at these gatherings included:

- "What kind of jobs are available?"
- "What kind of trades positions are available?"
- "What kind of jobs are available for women?"
- "Does the company provide training for the jobs?"

NNPR Expansion

The Prairie Creek Mine area is now enclosed within the newly expanded NNPR. The Parks Canada/CZN/Dehcho Technical Committee meets every 4 months, and has had 4 meetings since October 2008. Discussions have included environmental oversight, regulatory issues, access road realignments, and permit applications.

Traditional Knowledge and Other Consultation

CZN contacted First Nation communities in relation to their Traditional Knowledge ("TK") concerns. LKFN communicated to CZN it had no TK concerns regarding the proposed development.

CZN participated in a TK program undertaken for the NBDB by Crosscurrents Associates Ltd ("Crosscurrents"). Crosscurrents had already documented relevant TK information. During 2 meetings in Nahanni Butte, CZN provided details of the proposed mine project, and the NBDB provided comments and concerns. This information was subsequently summarized by Crosscurrents in a TK Addendum Report dated August 2009 which is on file with the MVRB. The main issues raised, and how these were addressed, are as follows:

- Contamination of Prairie Creek and creeks crossed by the access road: CZN explained that this was a primary concern and would be considered at length in the DAR;

- Protection of the wetlands and wildlife habitat east and west of the Nahanni Range: CZN presented road re-alignment alternatives to move the road out of the wetlands. Investigations were subsequently undertaken to support approval of the alternatives;

- Heritage resources in the road alignment near mountain passes and river crossings: Specific locations were identified where the NBDB felt heritage resources might exist. CZN engaged a consultant to investigate; and,

- Control of unauthorized use of the road by non-local hunters: CZN proposed to re-align the road nearer to Nahanni Butte to be better able to control access, and encouraged the participation of NBDB members in the monitoring of road use.

CZN will be continuing communications with the NBDB and other First Nations throughout the EA process, and addressing any concerns when they arise.

7.3 Environmental Agreements

CZN has had initial discussions with the NBDB and Parks Canada regarding environmental monitoring and management for Prairie Creek Mine operations. These discussions are at an early stage and no decisions have as yet been made. It is expected that discussions will continue throughout the EA process. At this stage, CZN wishes to share ideas to move the discussion forward.

As the Mine area is encircled by the expanded NNPR, and half of the access road is within the park, it is understandable that Parks Canada will have a significant vested interest in environmental oversight, extending beyond responsibilities for administering permits. Parks Canada locally has a number of well trained staff in various scientific disciplines, in addition to a considerable number of professionals in the organization in other locations. As such, Parks Canada is well equipped to review Mine monitoring data and comment on environmental protection. Having said that, CZN recognizes that there are limited resources available to Parks Canada. CZN certainly does not expect Parks Canada to perform any duties that are the responsibility of CZN.

The Mine area in general is the traditional area of the NBDB, and therefore they have an oversight interest for the whole area, both inside and outside of the expanded NNPR. CZN understands there is a difference between monitoring studies undertaken by CZN and those undertaken by an 'arms-length' third-party, at least in perception. The NBDB will wish to be assured that the appropriate environmental protection is occurring.

A wide range and considerable number of environmental studies and inspections have been undertaken over the last 30 years associated with the project. These serve as a valuable basis to consider future monitoring plans.

Environmental monitoring and oversight studies are usually undertaken by consultants. The question of impartiality arises when consultants are engaged by the proponent without input from other parties. CZN expects that the existing Parks Canada/CZN/Dehcho Technical Committee will evolve over time, with local representation and input increasing. CZN believes this forum would be a suitable venue to manage and review the results of monitoring studies, and consider adaptations as necessary. The appointment of consultants would be based on consensus, and the consultants' 'client' would be the committee. Regulatory representatives would be invited to participate in committee meetings, as appropriate. Many of these would already have an independent oversight function, and their views could be shared with committee members. CZN believes this would strengthen the independence of the third-party review function, and provide for an efficient means of environmental oversight with a high level of involvement by, and information transfer to, the parties involved.

7.4 Traditional Knowledge Information Collection

As noted in Section 5.7.1, a detailed traditional knowledge ("TK") study was undertaken for the NBDB by Crosscurrents Associates Ltd in 2008, funded by Indian and Northern Affairs Canada ("INAC"). A study report was produced but is confidential. A TK Addendum report was produced which included TK information from the 2008 study relevant to the Prairie Creek Mine project. The MVRB has a copy of the addendum report, which has non-confidential and confidential portions. CZN received a full copy after signing a confidentiality agreement with the NBDB. Excerpts from the confidential portion were given in Section 5.7.1. Table 7-2 indicates how the TK obtained was used in the information collection and analysis for Sections 8 through 13.

Section 5.7.1 also notes that CZN contacted the Liidlii Kue First Nation ("LKFN") and the Acho Dene Koe First Nation ("ADK") in connection with their TK for the project area. CZN was informed by Allan Bouvier of LKFN that the Band had no concerns with the project, and did not offer relevant TK information. The ADK advised that they were in the process of compiling traditional knowledge data for the area, but this was not available at the time of completion of this DAR.

Table 7-2: Use of Traditional Knowledge

Traditional Knowledge Item	DAR Section	
	Used In	How Used
There are concerns that any polluting of Prairie Creek would negatively impact fish using the lower portion of the creek, big game using licks in the vicinity of the mouth of the creek, and harvesters using the river for fishing, hunting, or camping purposes.	8.6-8.8, 9.1-9.3, 10.1-10.2	Operations water management and treatment strategy and schedule that minimizes receiving water metal concentrations. Plans to backfill the Mine and cover the Waste Rock Pile for closure to do same. Focus on spill avoidance, ability to stop discharge, and intention to monitor closely
A primary concern is the possibility of long-term or sudden contamination of the S. Nahanni River or Fishtrap Creek from potential spills of fuel or other contaminants along the haul road.	9.2, 10.1, 10.7	All trucks to have spill kits, knowledge from spill contingency plan, ability to contact coordinators for help. Road re-alignments would take road away from S Nahanni watershed, avoid Poljes and area of groundwater draining to S Nahanni.
High traditional use of the wetland valleys running north from S Nahanni, Tetcela River, and on both sides of the Nahanni Range, areas particularly sensitive to industrial development	9.3, 9.4, 10.2, 10.3, 10.6, 11.4	Road re-alignments have been proposed to move the alignment away from wetlands, as much as possible

Table 7-2: Use of Traditional Knowledge (cont'd)

Traditional Knowledge Item	DAR Section	
	Used In	How Used
Increased access to this area by outside people using the haul road for winter hunting activities may affect wildlife populations.	9.4, 10.3, 11.4	CZN has proposed access control, and is encouraging the NBDB to take an active role
Wildlife over-wintering in the area may be disturbed by winter hauling and transfer activities (particularly sensory disturbances), and winter and spring habitat may be damaged by haul road construction and possible contaminant spills.	9.2, 9.4, 10.3, 10.7, 11.4	Wildlife impact assessment notes a low potential for significant sensory disturbance. Habitat damage will not be significant because of the small area, and intent to move the road out of wetlands. Spill response planning is noted above.
the mountain passes that provide easy access into and between valleys are potential areas for pre-historic and historic artifacts. It would be useful to carry out archaeological work prior to any redevelopment of the winter haul road.	11.4	An archaeological study was completed at the locations identified of concern by the NBDB.
The mine haul road runs directly through the lowland area between Second Gap and the Liard River.It is important to fully assess the current alignment of the road to ensure that it is not affecting important wildlife habitat.	9.4, 10.3, 11.4	With the NBDB's assistance regarding a new alignment, a re-alignment has been proposed taking the road south towards Nahanni Butte and avoiding the Grainger lowlands.
Monitoring of Mine site discharges should be more frequent than monthly	8.9	CZN's current monitoring requirements for site discharge are weekly, and it is likely to be at least this frequent for operations.
Mine site discharges in winter should not lead to ice build-up and possible impacts in spring	8.3, 8.6, 10.1, 10.2	CZN is proposing to use a diffuser in Prairie Creek to avoid icing and minimize other possible impacts.

8.0 IMPACT ASSESSMENT – MINE SITE WATER QUALITY

8.1 Historic Impact

8.1.1 Mine Water Chemistry

Mine water chemistry was discussed in Section 4.5. Tables were presented summarizing data from CZN's Surveillance Network Program ("SNP") for the period 2006-2009. Table 8-1 provides data covering the total period of available Mine water sample results. No data is available for the Cadillac era or immediately thereafter. Select data has been included from the SNP record, 1 sample for each quarter. Recent data from groundwater studies (Robertson Geoconsultants) has also been included.

Table 8-1 shows that the dominant metal in Mine water is zinc, with a peak concentration of 16 mg/L in June-July during the freshet, and lower concentrations thereafter. This pattern is repeated throughout the period of record. At present, the Mine water flow regime is dominated by recent infiltration of precipitation. Flows peak in spring and during periods of intense rainfall, and are negligible in winter. It appears the mineralized vein is a conduit for water flow. In spring time when higher flows occur, accumulated metal salts are 'flushed' out leading to peak concentrations.

Other metals follow the trend of zinc, but at lower concentrations. Notable metals include cadmium, copper and lead. When dissolved metals samples have been taken, they have confirmed that the majority of the metal in solution is in the dissolved form. Values of pH were in the range 7.5-8 over the period 1992-1998. Since 2002, pH values have been in a relatively consistent range of 8-8.3. The reason for the apparent pH increase is unclear. Previous pH readings may have been erroneous.

Table 8-1 also shows that there are 2 different mine water chemistries, as discussed in Section 4.5. A sample was collected from the flooded Decline on September 28, 2008. The Decline was driven from the 880 m level in 2006-2007, and allowed to flood after the completion of underground drilling. The sample had significantly less metals overall, particularly zinc. Most metals were non-detectable, including copper and selenium. The water had a much higher hardness and conductivity compared to water from the Vein. The influence of 'Decline water' can be seen in other samples collected from the 870 m portal, on 29 December 2006, 28 March 2007 and 7 December 2007 for example. These samples were collected at times when flows from the Vein were low and pumping from the Decline was in progress. When mining commences and progresses to deeper levels and further into the mountain, the water chemistry encountered may become progressively similar to the Decline water. As noted previously, the extent of oxidation of the Vein mineralization decreases with depth, and this should mean a reduction in metal concentrations.

Table 8-1: Historical Mine Water Quality

Date	pH	EC	TSS	Arsenic	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Selenium	Zinc	Ammonia	Sulphate	Source
Jun 30 92	7.5	950	<3	0.0008	0.075	0.010	0.098	0.027		0.017		15.2			MCP
Sep 15 93	7.7	936	<3	<0.0003	0.0169	0.0001	0.047	0.0253		0.017		9.1			MCP
Jun 23 94	8.0	943			0.041	0.0034	0.021	0.014		0.02		7.2			MCP
Jul 31 94				<0.2	0.043	<0.015	0.012	<0.05		<0.2		1.9			MCP
Jul 31 94				<0.2	0.041	<0.015	<0.01	<0.05		<0.2		1.2			MCP
Jul 31 94	7.7	1100	5	0.003	0.084	0.00025	0.062	0.040	0.00004	0.02		15.8			MCP
Oct 18 94	8.0	963		0.002	0.038	0.0031	0.033	0.020		0.01		8.0			MCP
Jun 15 95	7.7	1010		0.0011	0.0416	<0.0002	0.0230	0.0213		0.0169		8.4			MCP
Aug 3 95	7.8	1030	<3	0.0028			0.0846	0.0397		0.0173		16.0			MCP
Sep 28 95	7.9	1020		0.0021	0.0679	0.0032	0.0489	0.0272		0.0162		12.4			MCP
Aug 18 88	7.9	1110	12	0.0013	0.0638	<0.003	0.0345	0.0254	<0.00001	0.0147		9.8			MCP
Aug 30 01	8.2	1090	<3	0.0006	0.0384	<0.001	0.0133	0.0140	<0.00005	0.0100		7.1	<0.005		MCP
Jun 28 02	8.1	1070	<3	0.0004	0.0446	<0.001	0.0121	0.0107	<0.00005	0.0120		5.7	0.027		MCP
Jun 22 04	8.5	1090	6	0.003	0.047	<0.005	0.062	0.025	<0.0002	0.014	-	9.04	<0.05	-	PDR
May 29 05	8.0	1020	-	0.001	0.0431	<0.005	0.027	0.0237	-	0.021	0.017	9.67	-	353	PDR
Oct 18 05	8.2	1090	<4	0.002	0.0429	<0.005	0.023	0.0169	<0.00005	0.017	0.006	6.44	0.007	349	PDR
Jun 30 06	8.2	1290	5	<0.05	0.046	<0.005	0.022	0.04		<0.008	<0.03	4.44	<0.005		SNP
Sep 26 06	8.2	1450	112	0.06	0.031	0.006	0.083	0.52	0.0045	0.022	<0.03	7.6	12.2		SNP
Dec 29 06	8	1570	11	<0.05	<0.002	<0.005	<0.005	<0.03	<0.00005	0.023	<0.03	0.496	0.222		SNP
Mar-28 07	8.3	1620	7	<0.05	<0.002	0.006	0.005	0.05	<0.00005	0.019	<0.03	1.04	0.466		SNP
Jun 26 07	8.2	1280	36	0.12	0.007	<0.005	0.026	0.24	0.0029	0.014	<0.03	1.9	0.066	444	SNP
Sep 24 07	8.3	1360	865	0.08	0.027	0.01	0.078	0.52	0.0067	0.027	<0.03	6.39	0.73		SNP
Dec 7 07	8.3	1400	14	0.035	0.00117	<0.001	0.0045	0.0478	0.00011	0.018	0.0002	0.964	0.094		SNP
Jun 24 08	8.0	1200	14	0.0068	0.0716	<0.001	0.0962	0.0577	<0.00002	0.021	0.0098	15.8	0.068		SNP
Sep 23 08	8.1	1200	<4	0.0077	0.0536	<0.001	0.0734	0.0281	0.00003	0.017	0.0067	10.3	0.045		SNP
Sep 28 08*	8.1	1200		0.0038	0.0497	<0.01	0.1	0.0116	<0.00002	0.015	0.0067	8.78	0.037	420	RGC
Sep 28 08*D	8.0	1700		0.0154	0.00003	<0.01	<0.0002	0.0002	<0.00002	0.04	<0.0001	0.302	0.098	480	RGC
Dec 3 08	8.2	1200	5	0.0056	0.0379	<0.001	0.0529	0.0287	0.00004	0.018	0.0076	8.45	0.062		SNP
Jun 22 09	8.1	1200	4	0.0056	0.0432	<0.001	0.0616	0.0237	0.00003	0.017	0.0059	9.72	0.035		SNP
Jul 30 09	8.1	1190	8	0.0073	0.0489	<0.01	0.0689	0.0283	<0.00002	0.017	0.0072	10.7	0.016	410	RGC
Jul 30 09*				0.0027	0.042	<0.01	0.0375	0.0053	<0.00002	0.014	0.0062	8.34			RGC

See next page for notes.

Table 8-1: Historical Mine Water Quality (cont'd)

EC = Electrical Conductivity
D=Decline
SNP=Surveillance Network Program
All results mg/L except pH (units) and EC uS/cm
All metals results are totals, except where marked * which are dissolved
TSS = Total Suspended Solids
MCP=Minewater Contingency Plan
RGC=Robertson Geoconsultants

8.1.2 Contaminant Loads

Contaminant loads discharging to Prairie Creek from historic Mine water discharge can be estimated from existing data. Table 8-2 provides an estimate for total zinc. Mine flows are based on measurements taken during the summer prior to the development of the Decline. Peak flows were measured at 6 L/sec, reducing to near zero in winter. Total zinc concentrations are based on the values listed in Table 8-1, with a peak concentration of 16 mg/L coinciding with freshet, and lower values at other times. The estimated annual load is approximately 1.3 tonnes. This load is likely representative of discharge from about 1980, when the underground mine was developed, until 2006 when CZN commenced treatment of Mine water. This treatment has reduced the zinc concentration in treated mine water to significantly less than 1 mg/L. However, if this concentration is assumed for discharged water, the annual zinc load reduces to 115 kg.

Table 8-2: Contaminant Loads - Zinc

Month Units	Mine Flow m^3/s	Pre-2006		Post-2006		Prairie Creek Upstream			S Nahanni @ Virginia Falls		
		Conc. mg/L	Load kg/mo	Conc. mg/L	Load kg/mo	Flow m^3/s	Conc. mg/L	Load kg/mo	Flow m^3/s	Conc. mg/L*	Load kg/mo
Jan	0.001	4.0	11	1.0	3	0.530	0.0048	7	38.93	0.015	1564
Feb	0.001	4.0	10	1.0	3	0.381	0.0048	5	31.70	0.017	1469
Mar	0.001	7.0	19	1.0	3	0.309	0.0048	4	29.35	0.021	1685
Apr	0.003	10.0	78	1.0	8	0.819	0.0048	11	34.76	0.020	1862
May	0.006	13.0	209	1.0	16	12.358	0.0048	159	276.78	0.010	7413
Jun	0.006	16.0	249	1.0	16	17.237	0.0048	222	824.47	0.003	6810
Jul	0.006	14.0	225	1.0	16	11.780	0.0048	151	577.52	0.010	15344
Aug	0.006	12.0	193	1.0	16	9.336	0.0048	120	388.10	0.010	10395
Sep	0.005	10.0	130	1.0	13	6.318	0.0048	81	252.77	0.010	7093
Oct	0.004	8.0	86	1.0	11	2.762	0.0048	36	139.29	0.013	4831
Nov	0.003	6.0	47	1.0	8	1.294	0.0048	17	63.96	0.014	2398
Dec	0.001	4.0	11	1.0	3	0.838	0.0048	11	49.83	0.015	2002
Mean/ Sum	0.0036	9.0	1265	1.0	115	5.319	0.0048	822	225.62	0.0133	62867

* dissolved

For comparison, the zinc load in Prairie Creek upstream of the mine was estimated. Flows are based on the Water Survey of Canada ("WSC") station that operated over the period 1974-1990 (Table 4-2). Total zinc concentrations are based on samples collected by Environment Canada over the period 2003-2009 (Appendix 10, Table A10-9). Variations in concentrations do not appear to be correlated with season, so a single average concentration for all months was assumed. The estimated annual load is 822 kg. A similar procedure was followed for the South

Nahanni River above Virginia Falls. In this case, dissolved zinc concentrations were used because total zinc values are significantly elevated by suspended sediment. The dissolved zinc concentrations appear to correlate with season, and therefore seasonal values were assumed in the calculation. The estimated annual load is approximately 63 tonnes.

The same process as above was followed to obtain loads for cadmium and sulphate (Tables 8-3 and 8-4). The estimated annual total cadmium load from the Mine from 1980 to 2006 is 6 kg. This reduces to approximately 0.5 kg from 2006. By comparison, the upstream Prairie Creek total cadmium load is 5.1 kg, and the South Nahanni above Virginia Falls dissolved cadmium load is 742 kg. The estimated annual sulphate load from the Mine from 1980 to 2006 is 40 tonnes. This increases to approximately 50 tonnes from 2006 because Decline water appears to have higher sulphate content. By comparison, the upstream Prairie Creek load is 9.15 tonnes, and the South Nahanni above Virginia Falls load is 349 tonnes.

CZN has not monitored the concentrations of total dissolved solids ("TDS") or nutrients apart from ammonia in Mine water because it is not a requirement of the current Water Licence. TDS values are expected to be similar to sulphate in terms of magnitude of loads and comparisons to watercourses. During initial Decline development, ammonia concentrations in Mine water became elevated due to the use of ammonium nitrate-fuel oil ("ANFO") based explosives. Concentrations peaked at 18 mg/L, and were in the 11-16 mg/L range from August to November, 2006 (see SNP data). After a hiatus, Decline development continued in 2007, but with mainly non-ANFO based explosives. Ammonia concentrations were mostly much less than 1 mg/L from August to October. Mine water pH has remained consistently alkaline, usually in a narrow 8-8.3 range. A similar pH range has been recorded in Prairie Creek by CZN and Environment Canada.

Table 8-3: Contaminant Loads - Cadmium

Month	Mine Flow	Pre-2006		Post-2006		Prairie Creek Upstream			S Nahanni @ Virginia Falls		
		Conc.	Load	Conc.	Load	Flow	Conc.	Load	Flow	Conc.	Load
Units	m^3/s	mg/L	kg/mo	mg/L	kg/mo	m^3/s	mg/L	kg/mo	m^3/s	mg/L*	kg/mo
Jan	0.001	0.020	0.1	0.004	0.01	0.530	0.00003	0.0	38.93	0.00020	21
Feb	0.001	0.020	0.0	0.004	0.01	0.381	0.00003	0.0	31.70	0.00019	16
Mar	0.001	0.020	0.1	0.004	0.01	0.309	0.00003	0.0	29.35	0.00020	16
Apr	0.003	0.040	0.3	0.004	0.03	0.819	0.00003	0.1	34.76	0.00016	15
May	0.006	0.050	0.8	0.004	0.06	12.358	0.00003	1.0	276.78	0.00010	74
Jun	0.006	0.080	1.2	0.004	0.06	17.237	0.00003	1.4	824.47	0.00007	159
Jul	0.006	0.070	1.1	0.004	0.06	11.780	0.00003	0.9	577.52	0.00005	82
Aug	0.006	0.060	1.0	0.004	0.06	9.336	0.00003	0.8	388.10	0.00010	104
Sep	0.005	0.050	0.6	0.004	0.05	6.318	0.00003	0.5	252.77	0.00017	115
Oct	0.004	0.040	0.4	0.004	0.04	2.762	0.00003	0.2	139.29	0.00021	79
Nov	0.003	0.030	0.2	0.004	0.03	1.294	0.00003	0.1	63.96	0.00020	34
Dec	0.001	0.030	0.1	0.004	0.01	0.838	0.00003	0.1	49.83	0.00020	27
Mean/ Sum	0.0036	0.043	6.0	0.004	0.46	5.319	0.00003	5.1	225.62	0.00015	742

*dissolved

Table 8-4: Contaminant Loads – Sulphate

Month	Mine Flow	Pre-2006		Post-2006		Prairie Creek Upstream			S Nahanni @ Virginia Falls		
		Conc.	Load	Conc.	Load	Flow	Conc.	Load	Flow	Conc.	Load
Units	m^3/s	mg/L	kg/mo	mg/L	kg/mo	m^3/s	mg/L	kg/mo	m^3/s	mg/L	kg/mo
Jan	0.001	350	937	430	1,152	0.530	85.0	120,548	38.93	70	7,298,122
Feb	0.001	350	847	430	1,152	0.381	87.0	88,723	31.70	70	5,929,966
Mar	0.001	350	937	430	1,152	0.309	100.1	82,711	29.35	74	5,818,176
Apr	0.003	350	2,722	430	3,455	0.819	70.0	153,459	34.76	60	5,585,535
May	0.006	350	5,625	430	6,910	12.358	36.3	1,201,469	276.78	50	37,066,464
Jun	0.006	350	5,443	430	6,910	17.237	45.7	2,107,591	824.47	38	83,545,516
Jul	0.006	350	5,625	430	6,910	11.780	54.3	1,713,249	577.52	40	62,491,496
Aug	0.006	350	5,625	430	6,910	9.336	60.0	1,500,373	388.10	50	51,973,920
Sep	0.005	350	4,536	430	5,759	6.318	63.0	1,066,433	252.77	64	43,193,253
Oct	0.004	350	3,750	430	4,607	2.762	85.0	628,888	139.29	67	24,810,075
Nov	0.003	350	2,722	430	3,455	1.294	85.0	294,490	63.96	70	11,991,108
Dec	0.001	350	937	430	1,152	0.838	85.0	190,823	49.83	70	9,342,346
Mean/ Sum	0.0036	350	39,705	430	49,524	5.319	71.4	9,148,757	225.62	60	349,045,976

8.1.3 Impacts of Historic Mine Water Discharge

The analysis of contaminant loads in Section 8.2 indicates that conditions in Prairie Creek downstream of the Mine require assessment for potential impacts, but that impacts on the South Nahanni River are very unlikely because of the overwhelming magnitude of the loads in the river by comparison. In reality, the load of contaminants being discharged is not as important to the protection of aquatic life as contaminant concentrations. The potential for concentration increases exists in Prairie Creek, but not in the South Nahanni River.

Data from an Environment Canada ("EC") monitoring station on Prairie Creek approximately 850 m downstream of the Mine (Appendix 10, Table A10-10) shows that total zinc concentrations have been consistently well below the CCME guideline for the protection of aquatic life of 0.03 mg/L (30 μg/L), apart from on February 23 2005, a time when the Mine was closed and no discharge was occurring. Similar results have been obtained by CZN at its downstream monitoring station, approximately 450 m downstream from the EC station. Zinc concentrations are mostly well below the guideline (Appendix 10, Tables A10-4 and A10-5). There have been 2 exceedances of the zinc guideline over the period 2006-2009, and on both occasions this was due to naturally high suspended sediment loads in the creek.

Marginal increases in total zinc concentrations have been observed between CZN's upstream and downstream monitoring stations on Prairie Creek over the period 2006-2009. The increases are negligible in the spring when creek flows are high, but are more noticeable in the fall when flows are lower. The increase is usually in the 2-4 μg/L range, although a peak increase of 15 μg/L occurred in October 2007. Increases in cadmium concentrations are not as marked, and in fact mostly do not occur. Sulphate concentrations are not monitored in the SNP sampling.

The zinc concentrations indicate that increases in concentrations in Prairie Creek downstream are possible due to release of Mine site discharges, particularly during low flow conditions. The increases were observed even though CZN was treating Mine water. Consequently, the future treatment and release of site waters will need to be effective and efficient to limit impacts, and consideration will need to be given to the assimilative capacity of receiving water flows.

The best data on historic impacts on Prairie Creek from Mine water discharge are contained in the study initiated by INAC/University of Saskatchewan in 2006, as described in Section 4.7.4. That study determined that there have been no significant impacts on the creek, and the only identified impact is a mild nutrient enrichment.

8.2 Waste/Material Characterization

8.2.1 Mined Waste/Materials

Mining will produce ore, which will be temporarily placed in a stockpile, as well as development rock, which will be placed in the Waste Rock Pile ("WRP"). Processing of the ore will create dense-media separation ("DMS") rock, tailings and mineral concentrates. The tailings will be mixed with most of the DMS rock and a little cement to make a paste mix for backfill. Each of these waste/material streams has been geochemically characterized following the collection of representative samples and detailed testing. A characterization report was submitted previously with CZN's PDR when permit applications were made to the MVLWB (MESH Environmental Inc. (2008), Geochemical Characterization Report for the Prairie Creek Project). Since that time, 2 additional reports have been completed as follows:

- *pHase Geochemistry Inc. (2009) Humidity Cell Data Report Update, Prairie Creek Project.*
- *pHase Geochemistry Inc. (2009) Geochemical Characterization of Paste and Paste Components, Prairie Creek Project.*

These reports are given in Appendices 3 and 4. The geochemical properties of each of the mined waste/materials is summarized in the section below. The ability of each of these to generate contaminants which could be available for release to the environment will be discussed in the following sub-section.

8.2.2 Mined Waste/Materials Geochemical Properties

<u>Host Rock</u>. All of the host rock units and existing waste rock are classified as non-potentially acid generating ("non-PAG") due to generally low amounts of sulphur and substantial effective buffering capacity provided by reactive carbonates, reflecting the carbonate-rich nature of the host rock material. This behaviour is demonstrated by the mixed waste rock exposed on surface for over 25 years that does not have acidic pH values, and has remained non-PAG. Slow buffering carbonates such as iron carbonates do not appear to be present, but slowly reactive metal carbonates (smithsonite and cerussite) can be present in significant amounts, particularly in close proximity to the ore and/or in the upper host rock units closer to surface.

Metals elevated above background include silver, cadmium, mercury, lead, antimony and zinc in all host rock and waste rock units. Elevated lead and zinc in host rock are indicative of sphalerite/galena mineralization and metal carbonates (cerussite and smithsonite). Metal values roughly reflect the proximity to ore and to surface (higher metal carbonates). Sulphide oxidation and re-distribution of metals from ore to adjacent host rock as metal carbonates is more prevalent in the upper host rock units nearer to surface, with "oxidized" metals present as metal carbonates in the deposit, and amounts generally decreasing with depth (i.e. vertical gradation). This is likely due to the movement of oxygenated groundwater through the upper part of the profile and occasionally at depth along fractures.

Ore. The majority of Vein and Stratabound ore samples tested classify as potentially acid generating due to an abundance of sulphide mineralization in both ore types. However, it is likely to take a substantial amount of time for acidity to be generated in much of the ore (on the order of several decades) due to a significant amount of effective buffering capacity available from the carbonates present. This tends to be variable as substantial lead and zinc carbonates in both ore types provide less effective, slower-reacting buffering than calcite or dolomite. The solids chemistry of both ore types indicated elevated contents of the metals silver, arsenic, cadmium, chromium, copper, iron, mercury, lead, antimony, wolfram and zinc compared to host rock. The high metal contents are expected in association with metal sulphide and metal carbonate mineralization.

DMS Rock. The DMS rock is non-PAG and contains relatively low sulphur values. Given the low sulphur content, lead and zinc is primarily present as metal carbonates. Metal content was slightly higher than host rock, but fairly similar to metal content in host rock in close proximity to ore. DMS rock has the potential to leach elevated concentrations of cadmium, copper, lead, mercury, antimony, selenium and zinc in neutral pH conditions.

Tailings. Final tailings generated from the Mill flotation circuit will be non-PAG due to low sulphide content and excess buffering capacity. Elevated contents of silver, arsenic, cadmium, copper, mercury, molybdenum, lead, antimony and zinc are expected. This is typical of tailings produced from a lead-zinc deposit. Similar to DMS rock, low sulphur content in the tailings solids indicates that metals are present as metal carbonates.

Concentrates. Economic mineral concentrates were classified as potentially acid generating (lead and zinc sulphides) or uncertain (lead carbonate) due to slightly elevated pyritic sulphur content and very little neutralization capacity. As expected, concentrates were elevated in metals other than the metals of economic interest, as appropriate for a lead-zinc-silver-copper deposit. Leach testing indicated that sulphate, cadmium, lead and zinc may be in a relatively soluble form at neutral pH.

8.2.3 Mined Waste/Materials Contaminant Release

The nature and amounts of contaminants potentially released by the mined waste/materials, called source terms, have been estimated from site monitoring data (mine water and surface water samples) and laboratory testing results. The source terms are given in the following report which can be found in Appendix 5: *pHase Geochemistry Inc. (2009) Source Term Water Quality Predictions, Prairie Creek Project*. A brief summary is given below.

The predicted source term concentrations represent the estimation of potential pore water quality, or seepage from the various sources, including the WRP and stockpiles at their largest footprint on surface, as well as anticipated water quality from seepage emanating from the covered WRP (at Mine closure) and the backfilled underground Mine. Predictions suggest that relatively similar water quality might be expected from the WRP, the existing coarse ore stockpile (which will be processed through the Mill during the early years of operations) and the ore stockpile (which will be located in a lined pond), while slightly better water quality is predicted for the DMS rock and the backfilled underground Mine. Values of pH are expected to remain near neutral in all facilities. Moderate sulphate concentrations may develop in the WRP and stockpiles, and pore water concentrations of parameters such as arsenic, copper, lead and nickel might be near or just above the metal mine effluent regulation (MMER) concentrations, while zinc is anticipated to consistently exceed the MMER concentration.

The management and impacts of the predicted contaminant releases will be discussed in a subsequent section.

8.2.4 Hazardous and Non-Hazardous Products/Waste

The Mine will use a number of hazardous and non-hazardous products during operations and hazardous waste will be generated from some. Products will include the following:

- reagent chemicals
- water treatment chemicals
- fuel and oil
- explosives
- cleaners/degreasers, oil filters, paint, batteries, grease, glycol and biomedical waste.

The likelihood of contaminant release and consequences for each of the above are discussed below.

Reagent Chemicals. All of the reagent chemicals used in the Mill process are non-toxic solids and will be packaged in bags or drums and strapped to pallets. Full pallets will be off-loaded from delivery trucks into storage buildings to be erected on site. Separate pallets will be taken into the Mill as required. Quantities of some of the reagents required have been stored on the Reagent Storage Pad south of the main site area since the mid-1980's. These reagents will also be brought to the Mill for use, or if not suitable for use, will be taken off-site for disposal. Any spills of reagent material will be immediately completely cleaned-up. Reagent transfer within the site will not be in proximity to surface waters, other than internal road crossings of 2 drainage ditches. The risk of release to receiving waters is considered to be small, and the consequence if such release occurred is also assumed to be low given the nature of the materials.

Water Treatment Chemicals. Water treatment chemicals will include lime, sodium sulphide, ferric sulphate and sulphuric acid. All except the acid will be delivered as solids in bulk bags.

The bags will be handled in the same way as the Mill reagents, and pose a similarly low risk. The acid will be delivered by tanker truck in liquid form. It will be transferred to two tanks inside a lined and bermed enclosure via a pumping station and delivery line. The transfer will occur in the winter in a matter of hours, thereafter the pumping station and delivery line will remain empty and idle. The acid storage tanks will be located immediately adjacent to the Water Treatment Plant ("WTP"). A supply line will feed the acid directly into the plant. The liquid form and highly corrosive nature of the acid means it poses a greater risk to the environment in the event of a release. Therefore, great care and precautions will be taken to limit the potential for spills and leaks during the acid transfer and storage. In the event of a leak, there would not be a release to the environment because the only discharge during the winter is planned to be directly from the WTP via a closed line, and in the summer the Catchment Pond discharge pipe can be closed.

Fuel and Oil. Diesel fuel will be brought to site in the winter on the back-haul by concentrate trucks, each carrying a dedicated tank. Fuel transfer will occur at the pumping station adjacent to the Tank Farm. The station has a concrete apron and sump. Any spills will collect in the sump and will be recovered. The Tank Farm bermed containment and the tanks and pipes themselves have been inspected by a qualified engineer in the last few years and, following some relatively minor repairs and replacements, have been approved for on-going fuel containment. As such, the potential for diesel fuel release to the environment is considered to be low. Nevertheless, site crews will be trained to respond to spills and appropriate spill response materials will be available, as is the case at present. Motor and lubricating oil will be transported in drums for use in the shops. Waste oil will be collected in drums and disposed of in either the incinerator or the gensets.

Explosives. CZN expects to use mainly stick-type explosives to avoid the production of ammonia in mine drainage. ANFO (ammonium nitrate-fuel oil in the form of Amex) may be used if some stopes (ore locations) are found to be dry. However, CZN is not expecting dry stopes. If ANFO is used, it will be brought to site in bags of dry prills (Amex), and taken underground in that form. Mine drainage will be monitored very closely for ammonia content if ANFO is used, and such use will be immediately scaled back if ammonia is detected in significant concentrations.

Cleaners/Degreasers, Oil Filters, Paint, Batteries, Grease, Glycol and Biomedical Waste. As explained in Section 6.14, all hazardous waste will be collected in a dedicated area and stored in drums or on pallets, as appropriate. All such waste will be periodically removed from site.

8.2.5 Other Materials

Other materials that could be stored on surface at the Mine site are relatively inert and pose little risk in terms of contaminant release. Sewage sludge will be stored in a fenced facility within the footprint of the WRP. Seepage from the WRP will report to a collection pond at the toe of the pile. The facility will also have provision for metal waste and tire disposal, as well as a lined cell for temporary storage of any granular material contaminated with hydrocarbons.

If aggregates are required, they will be sourced from the existing quarry at the north end of the airstrip. Rock was recently removed from the quarry for use in armouring the access road along Prairie Creek. A screen was erected on the north side of the quarry to separate rock of different sizes. This area is adjacent to the access road, and there is a raised berm on the outside of the road consisting of armour rock to prevent erosion from high creek flows. The road and berm also serve as a buffer between the rock separation area and the creek, and a filter for runoff. If crushing of quarried rock is required, a crusher will be established nearby set back from the creek and with a buffer for runoff, as for the quarry.

8.3 Discharges During Operations

Potential and actual discharges during Mine operations are as follows:

- Mine water;
- Waste Rock Pile ("WRP") seepage;
- Runoff from stockpiles;
- Process water from the Mill;
- Sewage effluent;
- Groundwater recharge to Harrison Creek; and.
- Site runoff.

The site water balance described in Section 6.17 shows that the 2 most significant discharges during operations will be treated process water and treated Mine water. WRP seepage and runoff from stockpiles will be relatively small flows, likely containing elevated metals. These flows will be sent to the Water Storage Pond ("WSP"). Sewage effluent will also be sent to the WSP. This flow will also be small, and should not contain nutrients (because of the use of non-phosphate detergents) or bacteria (following UV radiation).

Groundwater from the Mine area is currently thought to be discharging to Harrison Creek. This discharge may be from 2 locations: from the Vein fault which intersects the creek just upstream of the Mill (see Appendix 1A); and, from leakage from the 880 Level into fractured rock and by-passing collection at the 870 Portal. During operations, both of these potential sources will disappear. As mining progresses to deeper levels, pumping will create of cone of groundwater level depression around the Mine, and discharge from the Vein fault to surface will not occur. Mine drainage will be pumped up to the 880 Level, and from the final sump, pumped to either the Water Treatment Plant ("WTP") or the WSP. The water will be transported via pipeline, negating the possibility of losses to fractured rock near the portal. However, any by-pass would infiltrate into the fractured rock and be caught by the cone of groundwater level depression.

Site runoff should be of good quality, as at present, and will continue to be managed by the existing drainage ditches and Catchment Pond, where any suspended sediment will settle out. Therefore, the treated Mine water and treated process water are the 2 remaining flows to be managed.

A Mine area hydrogeological investigation has been carried out by Robertson Geoconsultants Ltd ("RGC"). Their report is contained in Appendix 1A. RGC have estimated that Mine drainage flows will reach an annual average peak of 100 L/sec when the Mine has been developed to its deepest levels. Mine water quality is expected to improve as mining progresses to deeper levels where the mineralization is less oxidized. Therefore, the Mine water quality described in Section 4.5 is considered a worst case. The concentrations of the major ions (chloride, sulphate) and pH should remain much the same, but metals concentrations should reduce. However, changes in Mine water quality will likely not affect the quality of water discharged to the environment because all Mine water will either be re-used in the Mill or treated for discharge. It is the quality of treated Mine water that is the relevant issue in terms of discharge.

After processing in the Mill and separation of mineral concentrates, the tailings are separated from the process water which becomes an effluent. The quantity of the effluent will remain constant at a rate of 74 m^3/hour (21 L/sec). Data on the expected effluent quality is given in Table 6-7. Like mine water, the process water effluent will either be re-used or treated for discharge, and therefore, the quality of the treated process water is the primary concern for discharge.

As explained in Section 6.16, SGS-Canadian Environmental & Metallurgical Inc. ("SGS-CEMI") were contracted to conduct treatability tests on Mine water and process water. Their report is contained in Appendix 2. Mine water will be treated using lime to raise the pH to 9.3. Process water will first be acidified to pH 5 using sulphuric acid, followed by sodium sulphide addition. Iron is then added, followed by lime to raise the pH to up to 9.3. A flocculant is then added to assist in settling fine particles. These Mine water and process water treatment steps will occur in separate circuits. However, the 2 circuits will merge for the final water clarification step when suspended sediment is removed. Table 8-5 provides the water quality of the Mine water and process water before and after treatment in the SGS-CEMI report. Note that SGS-CEMI considers the treated water quality to be conservative in that superior quality is expected in a full-scale treatment plant. However, impact predictions in Section 8.6.1 are based on the treated water quality in Table 8-5.

Table 8-5: Mine Water and Process Water Before and After Treatment

	Mine Water		Process Water	
	Feed	**Treated**	**Feed**	**Treated**
pH	7.6	9.28	9.1	8.38
Aluminum (Al)	<0.001	0.015	0.017	0.008
Antimony (Sb)	0.0238	0.0229	0.273	0.0112
Arsenic (As)	0.0009	0.0028	0.509	0.0018
Cadmium (Cd)	0.0208	0.00001	0.0825	0.00262
Chromium (Cr)	<0.001	<0.001	<0.001	<0.001
Copper (Cu)	0.0128	0.0072	0.0032	0.0021
Iron (Fe)	0.014	<0.005	0.147	0.043
Lead (Pb)	0.0006	<0.0002	5.26	0.0932
Molybdenum (Mo)	0.003	0.004	0.073	0.023
Nickel (Ni)	0.018	0.007	0.008	0.004
Phosphorous (P)	<0.01	0.17	1.09	0.721
Selenium (Se)	0.0028	0.0033	0.104	0.0392
Uranium (U)	0.0341	0.0228	0.0162	0.0002
Zinc (Zn)	4.25	0.017	3.42	0.039

8.4 Discharges After Mine Closure

After Mine closure and reclamation, the Mine will be completely filled with the backfill mix, including all underground levels. There will be no gravity flow of Mine drainage from the 870 Portal to surface. Groundwater levels in the area will rise in the absence of pumping. The WRP will be covered with a clayey soil to promote clean runoff. Two potential sources of contaminated discharge from the site are anticipated:

- After groundwater levels in the Mine area have risen to an equilibrium, groundwater is expected to discharge from the Vein fault into Harrison Creek; and,
- The cover on the WRP is expected to allow some infiltration, and the resulting seepage from the waste rock is expected to also discharge to Harrison Creek.

Studies have been completed to estimate the flows and qualities of these discharges, as follows:

- Mine area hydrogeology was characterized by RGC (Appendix 1A);
- WRP infiltration was estimated by O'Kane Consulting Inc. (Appendix 22); and,
- Geochemistry and water quality for the sources terms was estimated by pHase Geochemistry (Appendix 5).

The combined results of these studies are the flows rates and water qualities for the above noted 2 discharges shown in Table 8-6. The Vein fault discharge is expected to be a combination of 2 sources, 1 is flow through the un-mined Vein structure (Vein fault), and the other is groundwater that has come into contact with the backfilled Mine workings (Backfilled Mine). The values in the table are considered to be conservative estimates during normal climatic conditions. Flows values may be less during unusually dry periods. The relevant appendices should be consulted for the derivation of the values. The impact of these discharges on receiving water quality is discussed in Section 8.6.2 below.

Table 8-6: Discharge from Mine Area after Closure

		Backfilled Mine	Vein Fault	WRP
Water Quality				
SO^4	mg/L	265	244	1500
Cadmium	ug/L	18	0.55	200
Copper	ug/L	25	1.55	375
Lead	ug/L	30	7.46	50
Selenium	ug/L	2.5	1.62	300
Zinc	ug/L	1,300	1,185	30,000
Mean monthly Flows				
Jan	L/sec	1.4	2.9	0.00
Feb	L/sec	1.4	2.3	0.00
Mar	L/sec	1.3	2.7	0.00
Apr	L/sec	1.3	2.2	0.00
May	L/sec	1.2	2.5	0.53
Jun	L/sec	2.1	2.4	0.48
Jul	L/sec	3.7	2.7	0.19
Aug	L/sec	4.2	3.1	0.15
Sep	L/sec	3.4	3.3	0.12
Oct	L/sec	2.1	4.3	0.24
Nov	L/sec	1.8	2.4	0.02
Dec	L/sec	1.6	3.3	0.00
Mean	**L/sec**	**2.1**	**2.9**	**0.14**

8.5 Water Quality Objectives

As stated above, the two most significant discharges from the Mine will be treated process water and treated Mine water. The major constituents of these waters from treatability testing (Table 8-5) are compared to generic water quality objectives in Table 8-7. The generic objectives were developed to be conservative, intended to protect all types of aquatic life for all life stages. The comparison is intended to indicate those constituents in the treated waters that exceed a generic objective, and therefore require further consideration in terms of applicable water quality objectives. The constituents so indicated are cadmium, copper, lead, mercury, selenium and zinc.

The Saskatchewan Research Council ("SRC") was contracted to develop water quality objectives specific to the Mine site. The objectives of their work were to: assess the natural levels of key metals at a collection of reference sites in the Prairie Creek watershed; and, to calculate site-specific objectives based on statistics (the 90th percentiles of the reference condition) for each variable (cadmium, copper, lead, mercury, selenium and zinc). SRC's report is given in Appendix 7. The results are summarized in Table 8-8. The derived site-specific objectives are used to determine the impacts of discharges from the Mine site on receiving water quality in the next section.

Table 8-7: Generic Water Quality Objectives

		Treated Water		BC AQ	CCME	US EPA
		Process	Mine			
Antimony (Sb)	mg/L	0.0112	0.0229	0.2	-	-
Arsenic (As)	mg/L	0.0018	0.0028	0.05	0.005	0.15
Cadmium (Cd)	mg/L	**0.00262**	0.00001	0.0006*	0.000017#	0.00025
Chromium (Cr)	mg/L	<0.001	<0.001	0.01	0.001	0.011
Copper (Cu)	mg/L	0.0021	**0.0072**	0.09*	0.004*	
Lead (Pb)	mg/L	**0.0932**	<0.0002	0.11*	0.007*	0.0025
Mercury (Hg)	mg/L	**0.00004**	<0.00002[1]	0.001	0.000026	0.00077
Molybdenum (Mo)	mg/L	0.023	0.004	10	0.073	
Nickel (Ni)	mg/L	0.004	0.007	1.5*	0.15*	0.052
Selenium (Se)	mg/L	**0.0392**	**0.0033**	0.01	0.001	0.005
Sulphate (SO^4)		200[2]	450[1]	1,000		
Uranium (U)	mg/L	0.0002	0.0228	3	-	
Zinc (Zn)	mg/L	**0.039**	0.017	1.65	0.03	0.12
pH	units	8.38	9.28		6.5-9	6.5-9
Hardness	mg/L	150	479			

Prairie Creek hardness typically 190-340 mg/L

[1] From untreated mine water sampling

[2] From untreated process water sampling

Bold = Treated process or mine water exceed the water quality objective

CCME = Canadian Water Guidelines for the Protection of Aquatic Life

US EPA = US National Recommended Water Quality Criteria

* hardness dependent

interim guideline

Table 8-8: Site Specific Water Quality Objectives

		Treated Water		CCME	SRC 90th %
		Process	Mine		
Cadmium (Cd)	mg/L	**0.00262**	0.00001	0.000017	0.000172
Copper (Cu)	mg/L	0.0021	**0.0072**	0.004	0.00253
Lead (Pb)	mg/L	**0.0932**	<0.0002	0.007	0.00113
Mercury (Hg)	mg/L	**0.00004**	<0.00002[1]	0.000026	0.000034
Selenium (Se)	mg/L	**0.0392**	**0.0033**	0.001	0.00216
Zinc (Zn)	mg/L	**0.039**	0.017	0.03	0.02195

CESI = Canadian Environmental Sustainability Indicators

[1] From untreated mine water sampling

Bold = Treated process or mine water exceed the SRC water quality objective

8.6 Potential Impacts

8.6.1 Mine Operations

In Section 8.3, it was explained that the only significant discharges of contaminated water from the Mine during the operations period will be treated process water and treated Mine water. The resulting in-stream or receiving water concentrations for the metals of concern (cadmium, copper, lead, selenium, zinc) have been modelled for Prairie Creek at Harrison Creek (see Appendix 10). The input parameters for the modelling are based on the water management strategy explained in Section 6.16, the Water Storage Pond ("WSP") water balance explained in Appendix 9, the treated Mine water and treated process water quality in Table 8-5, and historical Prairie Creek flows and background water quality. Results are summarized in Table 8-9.

None of the predicted in-stream metals concentrations exceed site specific objectives in any month with average creek flows. This is because of the assimilative capacity of the creek flows, and the process water treatment strategy where the rate of treatment is matched to receiving water flows. However, if creek flows are abnormally low in the winter months, some predicted metal concentrations could exceed the objectives (copper, lead, selenium). CZN proposes to monitor creek flows, and to curtail water treatment and discharge temporarily if abnormally low flows occur, Storage capacity in the WSP would be utilized to temporarily suspend discharge. With this approach, creek metals concentrations should remain below the site specific objectives, which are intended to be protective of all aquatic life in the creek. Harrison Creek will not be affected because the site discharge would be directly to Prairie Creek. Note that historical, untreated mine water discharge from the Mine between 1980 and 2006 has not caused any significant contamination of water quality, sediments, fish or other aquatic organisms (see Section 8.1).

Results for Prairie Creek at the new NNPR boundary downstream are much the same as for Harrison Creek, except concentrations are somewhat lower because of the approximate 10% increase in natural Prairie Creek flow. These results take no account of natural attenuation reactions which inevitably lead to lower in-stream concentrations.

It is premature to consider what criteria might be included in a Water Licence for operations to protect receiving water quality. However, it is clear from the modelling that a simple list of parameter concentrations that site discharge should not exceed will not be practical because of the seasonally large range of fluctuation in creek flows. To provide the greatest capacity for site discharge, and still minimize receiving water parameter concentrations, a different regulatory approach will be required.

While the treated water will have a pH higher than that in Prairie Creek, the discharge will not affect in-stream pH greatly because of the differential in flow rates. Treated water will likely have a pH of approximately 9 when it leaves the Water Treatment Plant ("WTP"). However, it could periodically be as high as 9.3. The background pH in Prairie is on average 8.3 (Appendix 8, Table A8-9). For average flows in Prairie Creek, the greatest predicted pH increase occurs in March (the low flow month) and is 8.5. This compares with a Canada-wide (CCME) objective of 9.0.

Table 8-9: Predicted in-Stream Concentrations During Mine Operations, Prairie Creek at Harrison Creek

			Average Prairie Creek Flows						Low Prairie Creek Flows					
			Mine Drainage Flow 29 L/sec						Mine Drainage Flow 29 L/sec					
Month	Process	Mine	PC	Cadmium	Copper	Lead	Selenium	Zinc	PC	Cadmium	Copper	Lead	Selenium	Zinc
Jan	0.000	0.019	0.540	0.000047	0.000795	0.000226	0.001233	0.006731	0.148	0.000044	0.001325	0.000215	0.001404	0.007580
Feb	0.000	0.019	0.388	0.000046	0.000879	0.000224	0.001260	0.006866	0.049	0.000037	0.002423	0.000194	0.001758	0.009341
Mar	0.000	0.019	0.315	0.000046	0.000947	0.000223	0.001282	0.006975	0.039	0.000036	**0.002750**	0.000187	0.001864	0.009866
Apr	0.002	0.019	0.835	0.000053	0.000721	0.000444	0.001296	0.006682	0.080	0.000092	0.001853	0.002054	**0.002321**	0.009027
May	0.020	0.019	12.608	0.000052	0.000582	0.000377	0.001223	0.006438	7.999	0.000054	0.000589	0.000461	0.001260	0.006476
Jun	0.020	0.019	17.587	0.000051	0.000579	0.000335	0.001205	0.006418	11.019	0.000053	0.000584	0.000398	0.001232	0.006447
Jul	0.020	0.019	12.019	0.000052	0.000583	0.000384	0.001226	0.006441	6.081	0.000056	0.000596	0.000533	0.001291	0.006510
Aug	0.020	0.019	9.526	0.000053	0.000586	0.000424	0.001244	0.006459	5.224	0.000058	0.000600	0.000583	0.001312	0.006532
Sep	0.019	0.019	6.446	0.000055	0.000594	0.000502	0.001278	0.006497	3.734	0.000061	0.000611	0.000698	0.001362	0.006588
Oct	0.007	0.019	2.818	0.000054	0.000618	0.000458	0.001268	0.006521	1.571	0.000059	0.000656	0.000636	0.001352	0.006639
Nov	0.003	0.019	1.320	0.000053	0.000667	0.000436	0.001275	0.006593	0.845	0.000056	0.000721	0.000549	0.001339	0.006716
Dec	0.002	0.019	0.855	0.000053	0.000717	0.000439	0.001293	0.006675	0.259	0.000064	0.001031	0.000885	0.001577	0.007324
Mean	**0.0094**	**0.019**	**5.427**						**3.785**					
			Mine Drainage Flow 100 L/sec						**Mine Drainage Flow 100 L/sec**					
Jan	0.000	0.090	0.540	0.000043	0.001517	0.000211	0.001466	0.007888	0.148	0.000034	**0.003078**	0.000181	0.001969	0.010391
Feb	0.000	0.090	0.388	0.000041	0.001817	0.000206	0.001563	0.008369	0.049	0.000023	**0.004864**	0.000146	**0.002546**	0.013254
Mar	0.000	0.090	0.315	0.000040	0.002044	0.000201	0.001636	0.008734	0.039	0.000021	**0.005204**	0.000139	**0.002656**	0.013799
Apr	0.002	0.090	0.835	0.000050	0.001217	0.000418	0.001450	0.007472	0.080	0.000058	**0.004065**	0.001245	**0.002726**	0.012326
May	0.020	0.090	12.608	0.000052	0.000619	0.000375	0.001235	0.006497	7.999	0.000054	0.000647	0.000458	0.001278	0.006568
Jun	0.020	0.090	17.587	0.000051	0.000605	0.000334	0.001214	0.006461	11.019	0.000052	0.000626	0.000396	0.001246	0.006515
Jul	0.020	0.090	12.019	0.000052	0.000622	0.000382	0.001239	0.006503	6.081	0.000056	0.000671	0.000528	0.001314	0.006630
Aug	0.020	0.090	9.526	0.000053	0.000635	0.000422	0.001259	0.006537	5.224	0.000057	0.000688	0.000576	0.001339	0.006672
Sep	0.019	0.090	6.446	0.000055	0.000665	0.000498	0.001300	0.006611	3.734	0.000060	0.000733	0.000687	0.001398	0.006780
Oct	0.007	0.090	2.818	0.000053	0.000778	0.000449	0.001317	0.006776	1.571	0.000057	0.000934	0.000613	0.001435	0.007080
Nov	0.003	0.090	1.320	0.000051	0.000996	0.000419	0.001377	0.007116	0.845	0.000053	0.001211	0.000515	0.001487	0.007495
Dec	0.002	0.090	0.855	0.000050	0.001203	0.000414	0.001444	0.007449	0.259	0.000053	0.002278	0.000726	0.001925	0.009280
Mean	**0.0094**	**0.090**	**5.427**						**3.785**					
SRC Objectives mg/L				**0.000172**	**0.00253**	**0.00113**	**0.00216**	**0.02195**		**0.000172**	**0.00253**	**0.00113**	**0.00216**	**0.02195**

Bold = Value exceeds site specific objective

Process, Mine and PC (Prairie Creek) flows in m^3/sec

Note: Mine water flow for treatment is approximately 10 L/sec less than total mine drainage flow

Concentrations in mg/L

Table 8-10: Predicted in-Stream Concentrations Post-Mine Closure and Pre-Mine Prairie Creek at Harrison Creek

	Post-Mine Closure						Pre-Mine					
Month	Cadmium	Copper	Lead	Selenium	Zinc	SO_4	Cadmium	Copper	Lead	Selenium	Zinc	SO_4
	Mean Prairie Creek Flows						**Mean Prairie Creek Flows**					
Jan	0.098	0.63	0.41	1.19	16.1	93	0.052	0.57	0.35	1.19	15.8	93
Feb	0.115	0.66	0.44	1.19	18.1	97	0.053	0.57	0.36	1.19	17.7	97
Mar	0.127	0.67	0.47	1.19	21.7	100	0.055	0.58	0.38	1.19	21.3	100
Apr	0.077	0.60	0.35	1.19	11.5	81	0.051	0.57	0.32	1.18	11.4	81
May	0.059	0.58	0.30	1.20	8.0	36	0.049	0.56	0.29	1.18	6.8	36
Jun	0.056	0.58	0.30	1.19	7.6	46	0.049	0.56	0.29	1.18	6.7	46
Jul	0.057	0.58	0.30	1.19	7.6	55	0.049	0.57	0.29	1.18	7.0	55
Aug	0.060	0.58	0.31	1.19	7.8	60	0.049	0.57	0.29	1.18	7.3	60
Sep	0.062	0.58	0.31	1.19	8.3	63	0.049	0.57	0.30	1.18	7.6	63
Oct	0.080	0.62	0.33	1.21	11.7	85	0.050	0.57	0.31	1.18	9.1	85
Nov	0.077	0.61	0.34	1.19	10.8	88	0.050	0.57	0.31	1.18	10.2	88
Dec	0.083	0.61	0.37	1.19	13.2	92	0.051	0.57	0.33	1.19	13.0	92
	Low Prairie Creek Flows						**Low Prairie Creek Flows**					
Jan	0.138	0.81	0.50	1.20	**24.00**	97	0.063	0.59	0.49	1.20	**40.0**	96
Feb	**0.306**	1.25	0.86	1.24	**51.33**	107	0.084	0.63	0.80	1.21	**90.0**	106
Mar	**0.354**	1.38	1.01	1.25	**66.28**	112	0.095	0.66	0.96	1.22	**117.0**	112
Apr	**0.195**	0.96	0.62	1.21	**32.80**	87	0.070	0.61	0.59	1.20	**56.3**	87
May	0.057	0.59	0.29	1.20	7.70	36	0.049	0.57	0.29	1.18	7.0	36
Jun	0.055	0.59	0.29	1.20	7.33	46	0.049	0.57	0.29	1.18	6.9	46
Jul	0.057	0.59	0.30	1.19	7.54	55	0.049	0.57	0.30	1.18	7.7	55
Aug	0.059	0.60	0.30	1.19	7.72	60	0.049	0.57	0.30	1.18	8.1	60
Sep	0.060	0.60	0.31	1.19	8.01	63	0.049	0.57	0.30	1.18	8.5	63
Oct	0.077	0.66	0.32	1.23	11.19	86	0.050	0.57	0.32	1.18	11.2	86
Nov	0.071	0.63	0.33	1.19	9.85	88	0.051	0.57	0.32	1.18	12.3	88
Dec	0.106	0.72	0.42	1.20	17.64	94	0.058	0.58	0.42	1.19	**28.0**	94
SRC objectives	**0.172**	**2.53**	**1.13**	**2.16**	**21.95**	**n/a**	**0.172**	**2.53**	**1.13**	**2.16**	**21.95**	**n/a**

Bold = Value exceeds site specific objective

Concentrations in µg/L

8.7 Water Management Facilities

The adequacy of the existing and proposed water management and treatment facilities in terms of their ability to function as planned during operations is discussed below.

8.7.1 Sewage Treatment

The existing Sewage Treatment Plant ("STP") can be used for operations with only minor modifications. The design capacity for the plant was based on an estimated average inflow rate of 30,000 L/day. The plant will be refurbished to treat sewage based on 120 persons producing 270 L/day/person, or 32,400 L/day total. An aeration tank will be added to accommodate this flow and ensure complete biological digestion. The treatment process is quite simple, biological digestion with the addition of air, solids filtration and ultra-violet ("UV") radiation of the effluent. Only pumps and motors are required, and these can be changed out with spares on stand-by in the event of malfunction.

UV radiation of the effluent is to destroy bacteria. This is not really required as the effluent will be pumped to the Water Storage Pond. The flow will be very small compared to other pond inputs, and the dilution and residence time would satisfactorily manage the water. Settled solids will be returned to the aeration tank if needed, and the excess will be dried and taken to the sewage sludge cell in the Solid Waste Facility.

Sewage will be transported within each building and pumped to the STP from strategically located lift stations through force mains in utilidors. Any sewage generation in outlying areas will be collected in local holding tanks and removed via a sewage collection tanker truck for treatment at the STP. Should any lift station be temporarily inoperable, the sewage can also be transferred by tanker truck.

8.7.2 Polishing Pond and Catchment Pond

The Polishing Pond will not be required for water management during operations because its function will be superseded by the presence of a clarifier in the Water Treatment Plant ("WTP"). The pond will be converted into the run-of-mine ore stockpile.

The Catchment Pond will function more or less as it does at present. All site runoff in the camp area together with discharges will report to the pond. As explained above, the mode of pond discharge will be changed from the current penstock and culvert discharging to Harrison Creek to a new weir leading to a culvert connected to a diffuser in the bed of Prairie Creek. During summer, all pond flows will enter the culvert and diffuser. During winter when the only pond input would be treated water, the treated water will enter the culvert directly from the WTP to avoid icing in the pond. The culvert will have a gate similar to the existing culvert which can be closed to stop discharge in the event of a spill on site. The ditches carrying site runoff into the pond have performed well for 30 years. Flows from the Mill ditch are expected to reduce slightly because some of the ditch recharge is expected to be captured by the Mine cone of groundwater level depression as pumping occurs from deeper levels. Inflows to the Catchment Pond from Mine water and process water treatment will be greater than before, but will be managed by sizing the outlet culvert and diffuser appropriately. The existing culvert location will be retained for possible emergency use, but will be closed during normal operations.

The Catchment Pond is not required as a water treatment location. Treated water from the WTP will already be polished. The pond provides a further level of assurance in that settling of any suspended sediment in site runoff can occur (although these flows are normally clear), and the outlet can be closed to stop discharge to the environment if necessary. If pond water quality is unacceptable for discharge, the water can be pumped back to the Water Storage Pond until the water quality improves.

8.7.3 New Water Treatment Plant

The new Mine water treatment plant will be sized to treat 134 L/sec (480 m^3/hour). This capacity is based on a flow of 112 L/sec plus a 20% contingency. The plant includes 2 lime treatment tanks that can be operated half full (67 L/sec) during initial operations. In addition, the plant can be expanded to double the capacity (268 L/sec) with the addition of 2 more lime treatment tanks and an associated clarifier. The expansion will occur if inflows to the Mine continue to increase, and predictions indicate that the installed capacity could be exceeded. Inflows will be closely monitored for this purpose. The process water treatment plant is sized to treat 26 L/sec (92 m^3/hour), which is more than twice the average annual demand. This will allow flexibility to treat process water at a higher rate during open water months to compensate for a winter hiatus in process water treatment.

The water treatment plants have been designed with double pumping systems (one operating and one on stand-by). There will be a monorail over the centre-line of all of the agitation tanks to facilitate agitator maintenance. Stand-by power could also operate both plants if power supply was lost from the main power plant. This is unlikely as the main power plant has its own back-up systems. These systems will ensure minimal shut-down of the treatment plants.

Treated water quality will be monitored closely to ensure discharge quality meets specified criteria. In the event monitoring detects that the water quality is unacceptable, discharge would be stopped by re-circulating the treated water inside the plant. If this occurs, either the treatment capacity (rate of inflow) will be increased, or inflows from outside the plant will be stopped. In the latter case, the water flows will be diverted to the Water Storage Pond. Treated water discharge would commence once monitoring has determined that the specified criteria can be met.

8.7.4 Water Collection Systems

Water collection systems for the main camp area were discussed in Section 8.7.2 above. The Waste Rock Pile ("WRP") will be located in a valley and seepage from the pile will be collected at the toe in a lined seepage collection pond. The pond will be connected to the site water management system, either by pipeline to the Mill or 870 Portal, or by borehole to the underground Mine workings. While pile flows and potential water quality are sufficient to require collection and management, they are relatively small in terms of the flows contributing to the overall site water management system. Therefore, rapid snowmelt or intense rainfall events will not significantly affect the site water balance. The collection pond will be sized to accommodate flows from the 1 in 100 year storm event. The pond will have a spillway to discharge flows that exceed pond capacity. The spillway will be located to discharge the peak flows entering the pond without displacing the water already in the pond. This way, WRP seepage with very low metal content will be released as opposed to seepage requiring management.

The WRP will have diversions around the pile footprint to prevent runoff from outside the footprint reporting to the pile collection pond. Any leakage or inefficiencies in the diversions will mean more runoff reporting to the pond for management.

8.7.5 Water Storage Pond

The water level in the Water Storage Pond (“WSP”) will need to be carefully managed for the life of the operation. The level will fluctuate by season because process water treatment will be suspended in the winter and all Mill process water flows will be sent to the pond. The pond level will be drawn down in the open water season when process water treatment is occurring, and rise during the winter.

A 1 metre freeboard will be maintained above the upper pond operating water level. This is to provide additional assurance for water storage, and substantial capacity to absorb the most extreme precipitation event. A lower operating level will be selected to maintain pond volume to provide residence time for the aging of Mill effluent, and to assist with pond backslope stability.

Runoff from upslope of the pond will be diverted around the pond. The pond backslope will be graded to promote runoff, and lined ditches adjacent to the site access road will collect and carry runoff east and west around the pond. The western ditch will discharge to Prairie Creek. The eastern ditch will feed into the main camp ditch.

8.8 Accidents and Malfunctions

This section discusses the likelihood and consequences of accidents, malfunctions, or impacts of the environment on the development that might influence water quantity and quality and the ability of the water management system to function.

8.8.1 Floods

The Prairie Creek site is well equipped to manage extreme precipitation events and floods, now and during operations. The Water Storage Pond (“WSP”) will have a freeboard (space above the maximum operating water level) of 1 m. This is considerably more than any possible extreme precipitation event. The pond will have upstream diversions to carry upslope runoff and snowmelt out to Prairie Creek. A greater than usual snowpack and snowmelt will mean more diverted runoff. The water level in the WSP will be closely monitored during operations to ensure it remains within the desired operating range.

The Waste Rock Pile will also have diversions to prevent upslope runoff from reporting to the seepage collection pond. Excess precipitation on the pile will lead to very dilute seepage, and the collection pond will have a high water level spillway to divert this seepage to Harrison Creek. Note that in such an excess precipitation event, flows in local creeks will also be abnormally high, and will be sediment laden. Seepage flows and the water level in the collection pond will be monitored regularly.

An extreme precipitation event may lead to marginally higher inflows to the underground. Spare capacity in the mine water treatment plant will be maintained at all times. Higher inflows will be addressed by increasing the rate of mine water treatment. A higher rate of treated water discharge will also be possible because flows in Prairie Creek will be abnormally high.

The remainder of the site inside the flood protection berm adjacent to Prairie Creek has a limited catchment area, and the existing drainage ditches and Catchment Pond have functioned well for nearly 30 years. Over that time, a number of floods have occurred from intense rainfall (2006 and 2007, for example), with seemingly no visible impacts or difficulties in management of the increased runoff observed.

8.8.2 Geologic Instability

Based on a review by Golder Associates (Appendix 16) of available airphotos, historic, large scale rock slope failures are not evident in the Prairie Creek valley in the vicinity of the Mine site, nor along the access route within the Funeral Creek and Sundog Creek valleys.

Local areas around the site and parts of the access road are prone to active small scale rock falls. These areas occur in the mountainous terrain at site and to Km 35 (near Cat Camp area) where the location of infrastructure is constrained by topography and the road is exposed to these events. Operational practices, such as on-going monitoring and maintenance, can mitigate the effects of these relatively small events.

Seismic activity (earthquakes) might affect the Mine workings in terms of loosening rock in the roof of the workings. From a water management perspective, the Vein structure is known to occur in a fault zone which is also known to be a conduit for groundwater movement. Inflows to the Mine respond relatively quickly to rainfall events, indicating that the Vein structure is permeable. If the Vein structure were not permeable, seismic activity might lead to increased permeability. However, given that the Vein structure is already permeable, seismic activity is unlikely to significantly increase permeability and/or significantly increase inflows.

8.8.3 Failure of Water Retention Structures

This section considers the potential for failure of existing water retention structures between Prairie Creek and the Mine site, or between the WSP and the remainder of the Mine infrastructure. As noted above, the flood protections berm and pond dykes have performed well for 30 years, with only superficial degradation. Three possible scenarios that might cause failure are as follows:

- Earthquakes

- Floods
- WSP at full capacity

Each of these is discussed below.

Earthquakes: Earthquakes have occurred in the area previously (refer to Appendix 25), and since the Mine was originally built. No earthquake damage is evident in the berms and dykes. The structures have been inspected annually for 4 years and found to be stable. Recent geotechnical studies (see Appendices 12 and 18) by Golder Associates have confirmed the suitability of the structures for their intended purpose during normal conditions and during seismic events.

Floods: The maximum probable flood level in Prairie Creek was re-evaluated previously as a condition of the Water Licence for Decline development. The levels projected were less than those assumed for design and construction of the main pond dykes and flood protection berm. Both structures adjacent to Prairie Creek have been armoured up to the maximum flood level. The structures might sustain some damage to the armour during a maximum flood event, as would be expected, but complete failure is unlikely.

WSP at Full Capacity: The original geotechnical design, and subsequent re-evaluations, has confirmed that the dykes should not perform as intended. One possible mode of dyke degradation is if ponded water finds a weakness, and flow occurs through the weakness, gradually increasing the size of it, called ‘piping’. The clay lenses in the dykes are intended to prevent such a weakness from occurring. There are also stand-pipe piezometers in the dykes which monitor water levels. The clay lenses are intended to keep the water-levels low in the dykes. Monitoring would confirm this. As an added precaution against seepage, CZN has proposed to re-line the whole pond with a synthetic liner. This will prevent water loss and exploitation of weaknesses even if they occur in the dykes.

In addition to considering the potential for dyke and berm failures, it is also appropriate to consider the consequence of failures. If the flood protection berm failed, water from Prairie Creek could potentially flood the Mine site. There would undoubtedly be some damage to the accommodation block and other buildings, but there would be very limited impact in terms of contamination. The 870 portal is above a bench which is at a higher elevation than the flood protection berm. The ore stockpile will be in the Polishing Pond, the dykes of which are at elevations comparable to the berm. Mineral concentrates will be in bags in the storage shed. In any event, any contamination will be extremely dilute because of the quantity of water on-site if a flood occurs, not to mention the magnitude of flows in Prairie Creek receiving the site flood water as it leaves the Catchment Pond. The latter should not be damaged as it will have an emergency release outlet in addition to the usual outlet. If the dyke between the WSP and the Mine site were to fail, contaminated water would be released. In this case, the Catchment Pond outlets would be closed to contain the release. The Mill would stop operating so that process effluent is not being sent to the WSP or the treatment plant. The treatment plant would treat only Mine water and the water released from the WSP until the pond is repaired. As such, in the unlikely event that a dyke or berm failure occurs, the consequences are manageable with no significant impact on the environment.

8.8.4 Freezing Effects

CZN is aware of the difficulties of operating water management systems on site during winter from past site activities during exploration. Supply lines frequently require heat-trace cables to avoid freezing. Some supply conduits will not freeze provided flows are maintained. Those that are susceptible to freezing will be heat-traced. Back-up lines will be available in the event freezing occurs. All lines will be inspected frequently to ensure proper operation. All delivery lines to and from the WSP will run along the access road as opposed to the berm adjacent to Prairie Creek so that any pipe bursts will spill water to the site rather than the environment.

It should be noted that freezing will only be an issue on surface as ambient temperatures underground will be above freezing during winter (mine air will be heated).

Possible freezing of the Catchment Pond outlet during winter will be addressed by the plan to connect the treatment plant discharge to the outflow culvert. This way, treated mine water will flow through the culvert directly during winter, and is not reliant on an un-frozen Catchment Pond.

8.8.5 Mine Water Treatment

This section considers how mine water will be dealt with if the water treatment system malfunctions, with a focus on retention capacity timelines for water storage facilities and contingency water treatment plans. The WSP will have a water surface area of approximately 108,000 m^2. If the 1 m freeboard needs to be used in an emergency, this represents a volume of 108,000 m^3. If mine water flows are 25 L/sec, it would take 50 days to reach this volume. Conversely, if mine water flows are 50 L/sec, it would take 25 days to reach the volume. It is highly unlikely the treatment plant would be inoperable for this period of time. In addition, greater storage would likely exist in the WSP as the water level would likely be below the maximum operating level, which does not include the freeboard.

There are many reasons why the mine water treatment plant is unlikely to be inoperable for a significant period of time. The plant will have back-up power available. The primary treatment system will consist of at least 2 tanks, operating at less than full capacity. If a problem occurred on one tank, operations could switch to full utilization of the other tank. In the event both tanks were inoperable, and in the highly unlikely event storage was not available in the WSP, the process water treatment circuit could stop treating process water and switch to mine water. This would necessitate stopping the Mill process, but would be possible.

8.9 Water Quality Monitoring and Management

8.9.1 Contingency Plans

The Terms of Reference requests a conceptual contingency plan in case metals leaching and acid rock drainage occurs. Studies have shown that for mine waste, metal leaching will occur whereas acid rock drainage will not occur. The mine waste management plans and related impact assessments are all based on the expected occurrence of metal leaching. The potential magnitude of metal leaching has also been addressed. Therefore, CZN does not believe a contingency plan is required for an outcome that is expected and has been planned for.

Run of mine ore and the mineral concentrates from processing both have the potential to generate acid rock drainage if left exposed to the elements for a significant period of time (years). This will not occur as the ore will be processed within a matter of weeks, and the mineral concentrates will be temporarily stored for less than a year. In any event, runoff management controls will be in place for both, the ore being stored in a lined pond and the concentrates in bags under cover.

An update to a previous site *Fuel Spill Contingency Plan* ("FSCP") is provided in Appendix 28. CZN recommends that this plan be considered a draft and subject to review and revision at the permitting stage. CZN will develop a suitable final FSCP that incorporates the operating mine and access road once the parameters are fully determined. The existing FSCP is considered an appropriate template.

8.9.2 Conceptual Surface Water and Groundwater Monitoring Plans

CZN's proposed operations stage surface water monitoring was detailed in Section 6.18. The receiving water quality stations identified in the suggested SNP outline would be retained for post-closure monitoring. Details for post-closure monitoring are given in Table 8-11.

Table 8-11: Post-Closure Surface Water Monitoring

Location	Water Quality
Harrison Creek upstream (3-9)	TSS, total metals
Harrison Creek below WRP	TSS, total metals
Harrison Creek at Prairie	TSS, total metals
Prairie Creek upstream (3-10)	pH, TSS, total & diss. metals
Prairie Creek downstream (near-field)	pH, TSS, total & diss. metals
Prairie Creek downstream (far-field)	pH, TSS, total & diss. metals

After closure, it is assumed that potential sources of ammonia, nutrients and petroleum hydrocarbons will no longer exist, and these constituents need not be included in sample analyses. The frequency of monitoring is indicated in Section 8.9.4 below.

It is likely that some groundwater wells will be included in post-closure monitoring to track groundwater levels and quality. Which, and how many, wells will be determined during the operating period.

8.9.3 Community Involvement in Monitoring

Environmental staff will be on site at all times during the operation of the Mine, and will be responsible for monitoring, sample collection, operations oversight and reporting. It is CZN's preference that at least some of the environmental staff be Dehcho residents. CZN has facilitated two environmental monitor training courses at the Mine in conjunction with Aurora College and the Mine Training Society, and this was for the specific purpose of training local individuals for possible future employment at the Mine.

As stated above, CZN currently participates on a Technical Advisory Committee with Parks Canada, and the committee includes Dehcho First Nation representation. It is CZN's view that this committee should evolve and become more regionally-focused and include more First Nation representation. CZN proposes to share all environmental monitoring results and reports with committee members, and to discuss these and any issues that arise at regular committee meetings. We suggest these meetings be held every 4 months, and the location be rotated between Nahanni Butte, Fort Simpson and the Mine. The latter meeting would include a site inspection.

8.9.4 Post-Closure Monitoring

The magnitude of post-closure monitoring is dependent on site requirements at that time. Post-closure monitoring will include inspection of Mine access barricades, the WRP cover and runoff controls, observation of reclaimed surfaces for erosion, and the collection of water samples. Samples will be collected from Harrison Creek and Prairie Creek, and a limited number of groundwater wells.

For the first 3 years after closure and reclamation, monitoring and inspections will occur monthly over the period March to November. Annual reports will be produced. In the following 5 years, monitoring and inspections will occur bi-monthly from May to September. In the final 5 years, monitoring and inspections will occur once a year in July (post-freshet). The intent with this program is to monitor conditions at site until they have reached equilibrium and it has been confirmed that conditions are as expected and there are no significant environmental impacts occurring. Assuming this occurs within the monitoring schedule identified, CZN believes it might then be appropriate for the area to be included into the NNPR, unless Dehcho communities and Parks Canada reach agreement on a different land use and prefer to retain a non-NNPR designation.

9.0 IMPACT ASSESSMENT –NNPR

9.1 Water Quality

This Section discusses the potential for impacts on the ecological integrity of the NNPR from contamination of groundwater or surface water flowing into the NNPR from all possible sources associated with the Prairie Creek Mine.

9.1.1 Water Quality of Prairie Creek entering NNPR

The assessment of receiving water quality detailed in Section 8 above has shown that, during mine operations, discharge from the Mine should not increase parameter concentrations in Prairie Creek above site-specific objectives that are protective of all forms of resident aquatic life. This is true for creek locations immediately downstream of the point of discharge from the Mine to the creek. Groundwater in the Mine area that could contain elevated metals will flow into the Mine and be managed with Mine drainage. All surface waters that could contain metals will be collected and fed into the site water management system. Contaminated water is either re-used or treated and released, with strict controls on treated water flows and quality. Impacts on receiving water are avoided by not treating Mill process water during the winter when creek flows are low, and by adjusting the treatment rate depending on creek flows in other months.

Constituent concentrations in receiving water are expected to progressively reduce downstream. At the NNPR boundary approximately 7 km downstream, water quality is expected to be well within the site-specific objectives because of the increase in natural flows by approximately 10%, in addition to natural attenuation. As such, the risk of impacts on ecological integrity during normal operations is considered to below.

Post-Closure

Post-closure receiving water quality in Prairie Creek at Harrison Creek was discussed in Section 8.6.2 above. Post-closure metal concentrations in Prairie Creek are predicted to be less than the site specific objectives for all months during normal monthly flows. When monthly flows are lower than normal from January to April, concentrations of cadmium and zinc could exceed the objectives in Harrison Creek. It is expected that attenuation will reduce concentrations of cadmium below the site specific objectice before the water enters Prairie Creek. Zinc concentrations could remain above the objective in Prairie Creek for a short distance downstream. At the NNPR boundary downstream, concentrations will be much less due to higher natural creek flows, and further natural attenuation. The predicted ‘low flow’ concentrations were considered an ‘extreme case’ by RGC.

In-stream concentrations before the Mine existed (pre-Mine) were estimated (Appendix 1C). Pre-Mine zinc concentrations are thought to have been very similar to the predicted post-Mine values, and therefore, any impacts associated with the post-Mine elevated zinc concentrations likely occurred naturally before Mine development. However, these impacts, if they occurred, may have been quite localized, and because of increased creek flows and attenuation, may not have extended downstream to the present NNPR boundary.

Therefore, post-Mine impacts to NNPR water quality ecological integrity are not expected. There is a small risk of slightly elevated zinc concentrations during abnormally dry conditions and low creek flows, but these concentrations, would be similar to those that likely occurred naturally before Mine development.

9.1.2 Worst-Case Scenario

The potential for accidents and malfunctions and impacts is discussed in Section 9.2 below. This sub-section considers the potential for water management and treatment upsets, and worst-case discharge scenarios.

As explained in Section 8, the site water balance is dependent on the operation of the Water Treatment Plant ("WTP"). A problem with the process water treatment circuit in the WTP could be resolved by diverting all process water to the Water Storage Pond ("WSP"). If the WSP is full to capacity, a last resort would be to stop the Mill process. If a problem with the Mine water treatment circuit in the WTP occurs, the water could similarly be diverted to the WSP. Even at full capacity, the 1 m WSP freeboard could be used in an emergency for 50 days with mine flows of 25 L/sec, and 25 days for mine flows of 50 L/sec. However, as explained in Section 8, there are many reasons why either circuit in the WTP is unlikely to be inoperable for a significant period of time.

If either water treatment circuit malfunctions and water not meeting requirements has already been released to the Catchment Pond, discharge from the pond can be halted, and the water can be pumped from the pond to the WSP until water quality returns to the prescribed range.

The assessment of receiving water quality in Section 8 indicated that site specific objectives could be exceeded during Mine operations in the low flow winter months if flows are abnormally low. Hence, the discharge strategy will include provision for monitoring flows in Prairie Creek and adjusting the discharge accordingly so that exceedences do not occur. This might include temporarily reducing or suspending discharge. This will be done to avoid potential impacts near the Mine, and given the distance of the NNPR boundary downstream, risks are minimized by the added level of protection provided.

Metals that could be elevated above objectives in creek water during abnormally low flows are copper, lead and selenium. Most metals typically attenuate in the natural environment due to various reactions. Therefore, concentrations predicted at the park boundary are likely to be greater than actual concentrations, and another level of protection and risk reduction is thus provided.

It is also worth noting that toxicity tests on treated Mine water determined that there was no acute toxicity, and very little chronic toxicity (Appendix 2). Therefore, Prairie Creek flows could be near zero and there would only be a small, short-term impact. This illustrates the low risk to NNPR water quality ecological integrity.

9.1.3 Mitigation, Monitoring and Contingency Planning

Mitigation, monitoring and contingency plans to minimize risks to water quality ecological integrity have been noted above, but are summarized here as follows:

- Adjusting the rate of process water treatment depending on flows in the creek to minimize receiving water concentrations;
- Diverting Mine water and/or process water to the WSP in the event of WTP malfunction;
- Stopping Catchment Pond discharge and pumping pond water back to the WSP if Catchment Pond water quality exceeds requirements;
- Reducing or suspending discharge if creek flows during the winter low flow months are abnormally low; and,
- Monitoring treated water flows and quality, and Prairie Creek flows, closely.

9.2 Unforeseen Events

This section discusses the risks and consequences of accidents, malfunctions, or impacts of the environment on the development that might impact the ecological integrity of the NNPR. Information is drawn from Sections 8 and 10.

Floods

In Section 8, it was explained that the Prairie Creek site is well equipped to manage extreme precipitation events and floods, now and during operations. The Water Storage Pond ("WSP") will have a freeboard (space above the maximum operating water level) of 1 m. This is considerably more than any possible extreme precipitation event. The water level in the WSP will be closely monitored during operations to ensure it remains within the desired operating range. Therefore, the risk of an unplanned overflow from the WSP is considered to be low. Water would be drawn from the WSP before an overflow occurred.

The remainder of the site inside the flood protection berm adjacent to Prairie Creek has a limited catchment area, and the existing drainage ditches and Catchment Pond have functioned well for nearly 30 years. Over that time, a number of floods have occurred from intense rainfall (2006 and 2007, for example), with seemingly no visible impacts or difficulties in management of the increased runoff observed. The rock armour of the dyke has functioned as intended. Limited erosion is in the process of being repaired by the placement of more armour rock. Further repairs would be made if erosion occurred in future flood events.

Geologic Instability

The terrain assessment by Golder Associates (Appendix 16) noted a low risk of significant slope failure for the mountainous areas above the Mine, and along the road alignment from the Mine to Cat Camp. If a failure occurred upslope of the WSP, putting it out of commission, Mill operations may be stopped and all Mine water will be treated and discharged until the WSP is back in operation.

The access route as it currently exists is not expected to have a material effect on the potential for re-activation of large scale soil slope failures, provided that drainage is not adversely changed by the presence of the road. Careful planning of drainage, with particular emphasis on avoidance of concentrated discharge into former slide areas, should be part of detailed road planning and design. The stability of areas where large scale failures could potentially occur can be improved if surface drainage is directed away from the slide area reducing the potential for infiltration into the slide mass. Excavations near the toe of such slopes can have detrimental effects on overall stability and should be avoided.

It is not thought likely that seismic activity (earthquakes) will significantly increase the permeability of the underground workings and/or significantly increase water inflows.

Major slope failure has occurred in the South Nahanni catchment previously, and caused a temporary blockage of a tributary creek (Clearwater Creek, 11 km downstream of Virginia Falls, upstream of Prairie Creek, winter 1996-97). CZN has considered the risk of a similar occurrence in Prairie Creek. The upstream valleys of Prairie Creek appear to be quite broad and not susceptible to failure. Even if a failure occurred that reduced creek flow, the impact on the Mine would be a loss of receiving water, potentially requiring a temporary adjustment of water treatment and discharge. Monitoring of Prairie Creek flows would detect a loss of flow and prompt investigation to determine the cause.

The Prairie Creek valley downstream does become quite narrow, with steep slopes. There is a canyon section lower down near the South Nahanni River. A slope failure there could block creek flows and cause the formation of a temporary lake. CZN examined topographic elevations downstream, and determined that the maximum elevation of a failure and subsequent lake would likely be 2800 feet, or 853 m above mean sea level ("AMSL"). The lake would extend upstream almost to the Harrison Creek confluence (see Figure 9-1). The elevation of the Mine flood protection berm is 866 m. Hence, slope failures in Prairie Creek are unlikely to significantly affect the Mine, and risks posed to the NNPR from effects on the Mine are low.

The treated water will undergo clarification in the WTP before discharge. This will remove sediment. Site runoff in open water months will be collected in the Catchment Pond, as at present, before discharge. Therefore, treated water and Catchment Pond discharges are expected to have low suspended sediment levels.

Ammonia levels in discharge will be controlled by the use of stick-type explosives as opposed to ANFO, unless certain mining areas are dry and ANFO (in Amex form) can be used without dissolution of residues from blasting. Consequently, ammonia levels are expected to be low in discharges.

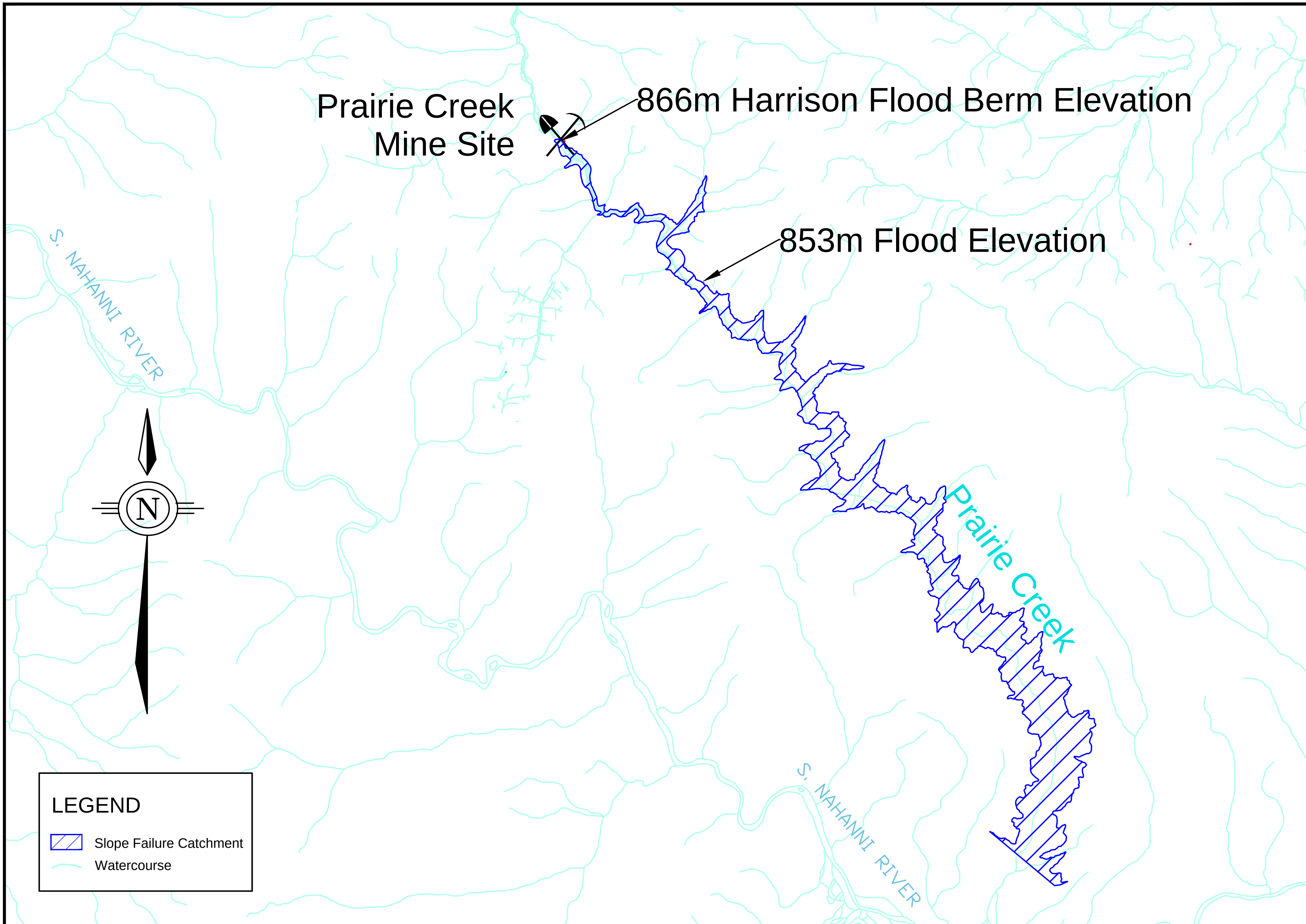
8.6.2 Mine Closure

Appendix 1C provides predictions by Roberson Geoconsultants Inc. ("RGC") for receiving water quality after Mine closure in Prairie Creek at Harrison Creek. These predictions are based on average and low Prairie Creek flows, and the flows and water qualities of the source terms provided in Table 8-6. A summary of the results is provided in Table 8-10. Predicted concentrations during low flows after Mine closure have been adjusted for an expected decrease in source flows containing metals.

Post-closure metal concentrations in Prairie Creek are predicted to be less than the site specific objectives for all months during normal monthly flows. When monthly flows are lower than normal, from January to April concentrations of cadmium and zinc could exceed the objectives. Note that cadmium is not conservative in the natural environment, and concentrations readily reduce due to various natural attenuation reactions. Also, the predicted 'low flow' concentrations are considered an 'extreme case' by RGC. The maximum cadmium concentration was 0.354 μg/L. We note that the US EPA criterion is 0.25 μg/L, and the BC aquatic life criterion is 0.6 μg/L (Table 8-7)

The potentially contaminated water sources would discharge to Harrison Creek. For this creek, impacts on aquatic life are unlikely because it has been defined that the creek has poor habitat due to an alluvial fan with low, braided flows near the mouth, and a steep section with numerous steps upstream. Groundwater discharge to the creek in the winter would likely flow within the alluvial fan gravels, as it does at present during lower flows in open water months. This would promote attenuation of metal concentrations. If the metal concentrations remain elevated upon arrival of the water at Prairie Creek, a narrow 'plume' may flow along the eastern edge of Prairie Creek for an un-determined distance until complete mixing occurs.

Table 8-10 also shows estimated in-stream concentrations before the Mine existed (pre-Mine). These concentrations were estimated by assuming the 'Backfilled Mine' source term in Table 8-6 has the same water quality as 'Vein fault' water. Pre-Mine low flow concentrations were not adjusted for lower source flows. Note that zinc concentrations are estimated to have been very similar to the predicted post-Mine values for normal flows. A similar comparison in Appendix 1C shows that the same is true for low flows. Therefore, we conclude that any impacts associated with the post-Mine elevated zinc concentrations likely occurred naturally before Mine development. The highest zinc concentration was 66.3 μg/L. We not that the US EPA criterion is 120 μg/L, and the BC aquatic life criterion is 1,650 μg/L (Table 8-7).



CANADIAN ZINC CORPORATION

Date:	October 2009
Drawn By:	C. Reeves
Scale:	As Shown
Drawing:	DAR Fig 9-1.dwg

Scale

0 2.5 5 10

Kilometres

FIGURE 9-1:

LOWER PRAIRIE CREEK

SLOPE FAILURE SCENARIO

Failure of Water Retention Structures

Section 8 also considered the potential for failure of existing water retention structures between Prairie Creek and the Mine site.

Earthquakes have occurred in the area recently, and no earthquake damage is evident in the berms and dykes. Recent geotechnical studies by Golder Associates have confirmed the suitability of the structures for their intended purpose during normal conditions and during seismic events (Appendices 12 and 18). The berms and dykes are inspected annually by a geotechnical engineer, and this is expected to continue.

The maximum probable flood level in Prairie Creek was re-evaluated previously as a condition of the Water Licence for Decline development. The levels projected were less than those assumed for design and construction of the main pond dykes and flood protection berm. Both structures adjacent to Prairie Creek have been armoured up to the maximum flood level. The structures might sustain some damage to the armour during a maximum flood event, as would be expected, but complete failure is not considered likely.

Based on the original geotechnical design, and subsequent re-evaluations, there is no reason why the WSP dykes should not perform as intended. CZN has proposed to re-line the whole pond with a synthetic liner as a precaution to eliminate the risk of seepage.

In terms of the consequence of failure, if the flood protection berm failed, water from Prairie Creek could potentially flood the Mine site. There would undoubtedly be some damage to buildings, but there would be very limited impact in terms of contamination because sources are contained and isolated.

Spills

If a spill occurred at the Mine site, Catchment Pond discharge would be temporarily stopped and water pumped back to the WSP, if necessary. No off-site impacts are expected.

In Section 10, it was noted that the potential for spills on the access road is a significant concern. Trucks will be carrying concentrates, fuel, reagents and chemicals, including acid. However, the frozen winter environment during the operating period is a significant ally in limiting the risks posed by spills. Spills are usually not able to travel far in winter conditions, are easily contained and can be readily completely cleaned-up with minimal risk to surface water and groundwater. There is a risk to groundwater from a large spill if the spill is not completely absorbed by snow and surficial soil, and the underlying bedrock is permeable. The dolomitic rocks of the Ram Plateau represent probably the only part of the road where these criteria could be met. Risks can be reduced by proper planning and procedures, including design and construction of the road, with avoidance of steep terrain and hairpin turns where possible. CZN has found that improvements can be made to the existing road alignment to enhance safety and environmental protection. Re-alignment north of the Poljes is being recommended to avoid them, but also to eliminate two hairpin turns at approximately Km 49, and avoid crossing an area of sensitive groundwater susceptible to contamination from spills.

Controlled use of the road will also reduce the risk of spills. Appropriate speeds for all sections of the road will improve safety. Every truck using the access road will be required to carry a spill response kit. All trucks using the access road will have communications so they can be alerted to on-coming traffic, and accidents can be called in.

Leaks

The potential for fuel/oil leaks will be minimized by properly maintaining and inspecting vehicles, and using drip pans for standing equipment. The risks posed by small leaks are not considered to be significant. The quantity of the contaminant is quite small, and there is little potential for a significant distance of transport to a waterbody. Areas of staining can also be collected and disposed of appropriately.

Concentrate Dispersal

CZN has recognized the risks posed by concentrate loss along the road route, and has addressed this risk with plans to place all concentrates in sealed bags, with an emphasis on dust avoidance during the bagging process. Haul trucks collecting the bags will pass through a wheel wash before leaving the concentrate storage shed as an added precaution. Any spills of concentrate will be immediately clean-up.

Erosion and Runoff

For the most part, the access road will consist of a graded bed of frozen soil and packed snow. Major watercourse crossings are few. From the Mine to the headwaters of Sundog Creek, the road has an all weather road bed with two watercourse crossings. The first is Casket Creek at Km 6 where a bridge structure has been built. The second crossing is a tributary of Funeral Creek at Km 13, and CZN is planning another span structure there.

The upper Sundog Creek section from Km 22 to 31 includes five crossings. The first two of these are upstream of a major waterfall. The three other crossings are downstream of the falls and also at-grade. Temporary span structures may be used for the at-grade crossings during road use.

There are several crossings of Sundog Creek from Km 30 to Cat Camp at Km 39. The creek is characterized by gravel outwash over this stretch, and simple snow-fill crossings will be used to create a road bed.

There are four creek crossings from Km 42 to 49. The first would be a snow-fill crossing. The latter three will be eliminated with the Polje re-alignment. The new alignment includes the crossing of a significant stream, and use of a temporary span structure is planned.

There are Tetcela River tributary and main channel crossings at Km 86 and 88.5, respectively. These are reasonably broad channels with low banks. Snow-fill crossings are likely, although temporary spans may be considered. The Fishtrap Creek crossing at Km 93 is a frozen wetland crossing.

The above description indicates that there will be little disturbance of the terrain for road use and watercourse crossings. Water passage structures (temporary spans, culverts) will be used as necessary. These and snow-fills will be removed at break-up. The risk of significant erosion and sedimentation is considered to be low.

9.3 Aquatic Ecosystems

9.3.1 Downstream Prairie Creek

Operations

As noted in Section 9.1.1 above, during Mine operations, discharge from the Mine should not increase parameter concentrations in Prairie Creek above site-specific objectives that are protective of all forms of resident aquatic life. The latter was confirmed in the discussion given in Section 10.2.2. Impacts on receiving water will be avoided by not treating and discharging Mill process water during the winter when creek flows are low, and by adjusting the treatment rate to match creek flows in other months. Constituent concentrations in receiving water are expected to progressively reduce downstream. At the NNPR boundary approximately 7 km downstream, water quality is expected to be well within the site-specific objectives because of the increase in natural flows by approximately 10%. Natural attenuation reactions will further reduce these concentrations. As such, the risk of impacts to aquatic ecological integrity during operations is considered to be low.

Post-Closure

Post-closure metal concentrations in Prairie Creek at Harrison Creek are predicted to be less than the site specific objectives for all months during normal monthly flows. When monthly flows are abnormally low from January to April, concentrations of cadmium and zinc could exceed the objectives if natural attenuation reactions are not sufficient to lower the concentrations.

From Section 10.2.3, post-closure cadmium ("Cd")concentrations in Prairie Creek at Harrison Creek during abnormally low flows were predicted to reach a peak of 0.354µg/L. Based on the 120-h LC50 range for bull trout from 0.83 to 0.88 µg/L, this concentration should not be acutely toxic. In terms of chronic exposure, the peak concentration should not cause reduced growth and survival because it is less than 0.786 µg/L which was found to cause these effects over a 55-day exposure period. Concentrations as low as 0.052 µg/L were found to cause elevated Cd concentrations in whole body samples, but the abnormal flows should be short-term, and not significant in terms of fish life span. In addition, Cd concentrations will likely be much less at the NNPR boundary due to increased natural flows and attenuation, and most likely well below the site specific objective..

The peak Cd concentration in Prairie Creek at Harrison Creek during abnormally low flows exceeds a cadmium range where effects on growth and lethality were observed (0.052 µg/L to 0.383 µg/L). Cd concentrations are likely to be below, or at worst within, this range at the NNPR boundary.

It is noted again that the metals discharging from the Mine area will be significantly less toxic than the values indicated in the toxicity test literature because the natural hardness of Prairie Creek water is considerably higher than that used in the tests. Therefore, it is likely that no chronic effects will occur near the Mine site, and so the NNPR has a higher relative level of protection..

Post-closure zinc concentrations in Prairie Creek at Harrison Creek during abnormally low flows were predicted to reach a peak of 66.3 µg/L, whereas the 120-h LC50 for bull trout exposed to Zn ranged from 36 to 80 µg/L. Peak zinc concentrations are expected to be below this range at the NNPR boundary due to increased natural flows and attenuation. Again, natural hardness will also reduce the toxicity of the peak values. As noted in Section 8, the natural peak zinc concentrations that occurred before the Mine was developed were likely similar to those predicted for post-closure. Therefore, any impacts on fish from Mine development and closure are not likely to be incrementally greater than those that may have occurred before Mine development.

9.3.2 Access Road

Beak Consultants Ltd. conducted aquatic studies along the winter road in 1981. Ice bridge surveys indicated minimal disturbance to aquatic habitat from road crossings over 2 winters. As explained in Section 10.1, stream crossings by the access road are limited in number and most are easily accomplished by fording or simple snow fill with no bank alterations. Temporary span structures are being considered for those locations where stream channels are incised. Again, no bank alterations will be required to place the spans. For the most part, road bed for crossings can be made at-grade utilizing snow and ice. Access road operations will not affect creek flows in any way.

CZN is in the process of addressing potential sediment issues along the access road in Prairie Creek and Funeral Creek. Several sections were eroded by flood waters. The erosion problems arose because the all season road bed was not armoured when it was originally built by Cadillac, although the floods in 2006 and 2007 were abnormally high. Road sections in Prairie Creek have been repaired with a combination of side-hill cut-and-fill and slope armouring, and one section in Funeral Creek has also been repaired. Several sections in Funeral Creek still require repair, which will be completed in 2010. When these repairs are completed, no further potential sediment issues are expected along the access road.

Access road operations are not expected to affect NNPR aquatic ecosystems, fish habitat and population structures in any negative way.

CZN is committed to the following actions to minimize potential for impacts to fish or aquatic habitat:

- Minimize disturbance of stream banks and riparian areas at stream crossings;
- Remove temporary crossing structures and snow-fills at break-up to avoid blockage and erosion;

- Construct a stable road bed adjacent to creeks and providing for runoff control to minimize the dispersal of sediment during precipitation events; and,
- Promote revegetation of riparian areas to further reduce the potential for sedimentation.

9.4 Terrestrial Ecosystems

9.4.1 Wildlife and Vegetation

This section is a summary of relevant text from Sections 10.3 and 10.6.

The original access road has been in existence since 1980 with the start of construction of the Mine site. CZN has proposed approximately 15 km of road realignment in the NNPR in the first winter of operation. Removal of existing vegetation (trees, brush) along the roadway will be necessary, however, the organic layer will be left where possible. Construction of new sections with some limited cut-and-fill will be necessary in steeper terrain to establish a properly graded roadway. Annual construction activity will consist of initial blading to remove snow and preparation for stream crossings. Some stream crossings may be constructed with ice, or where necessary, with culverts or temporary structures. Maintenance of the access road will consist of scraper and grader pushing and blading of the road surface. The Tetcela Transfer Facility ("TTF") will be 2.0 ha in area. The Cat Camp is a small existing facility (less than 1 ha). The total area of disturbance related to the road and facilities is minor in terms of the common ecosystems involved with respect to the regional setting.

Air Quality

Operation of the access road will produce emissions resulting from heavy equipment, transport trucks, and smaller trucks on the road. Dust is not expected to be generated given that road use will take place when the ground is frozen and under snow.

Air quality dispersion modelling has assessed the magnitude of dust and gas emissions from operation of the access road. Emissions from trucks will disperse widely and will not appreciably settle onto the snow adjacent to the roadway. With snow melt, the limited amount of particulates will settle onto ground cover vegetation. The potential for effects of emissions on wildlife is expected to be limited since most forms of wildlife in the area range widely and are not restricted in their occurrence to locations in immediate proximity to the access road. Mitigation measures are not considered necessary.

Contamination Potential

Hauling along the access road will be primarily of mineral concentrates. Concentrates will be bagged securely and handled carefully to minimize the risk of rupture or spillage. Diesel fuel and other supplies will be delivered to the Mine on back hauls in industry standard tanks.

Potential effects on vegetation and subsequently on wildlife are limited from operation of the access road and TTF. If a spill occurs, the effects would be localized and of short duration until the spilled material is recovered. In the unlikely event that a diesel spill was not completely cleaned up, it would not affect vegetation until the spring. Ingestion of hydrocarbon contaminated soil or vegetation by wildlife is unlikely given the unpalatable nature of diesel fuel.

Effects on water-bodies and wildlife they support are a primary concern with respect to contamination from accidental spills and leakage of materials. Sections of the access road between the east slope of the Mackenzie Mountains to the Silent Hills have streams, ponds and wetlands adjacent to the road that contain beaver or muskrat. These have historically been used for trapping and subsistence by First Nations. These water-bodies also support breeding populations of waterfowl, including trumpeter swans.

Appropriate materials management systems will be in place to minimize the risk of accidental spills or leakage. The existing spill management plan will be reviewed and improved, as necessary, prior to road operation.

Sensory Disturbance

Noise generated from road vehicles is assumed to be similar to that generated by highway transport trucks at 99 dBA. This is expected to reduce to 35 dBA at 0.5 km from source, and 25 dBA at 1.5 km from source. Use of the road by non-Mine related traffic will be deterred by Mine operations management procedures.

Mitigation options for reducing the potential for effects on wildlife from sensory disturbance are not considered to be necessary. In any event, given the seasonal constraints that the hauling operation is faced with, there are no reasonable or practical measures that can be implemented to reduce sensory disturbance.

Wildlife Movements

Access road activities (construction, operation and closure) will potentially occur from early November to mid-April. Early activities will involve road construction from the Mine to the TTF. Concentrate hauling to the TTF could commence in early December, depending on road conditions. Road construction eastwards would continue. Hauling from the TTF would start in mid-January. Hauling in the NNPR would potentially continue until mid-April.

Woodland caribou, moose, wolves and wolverines could be encountered any time along the road, although moose are more commonly found from the Poljes eastwards.

Given the limited exposure of wildlife along the access road during the construction and operation period, several mitigation strategies are planned. The logging of large wildlife sightings (Dall's sheep, woodland caribou, wood bison and carnivores) will be implemented with respect to location along the access road, numbers observed and reaction to road activity. If a problem area is identified, corrective measures will be discussed with GNWT Environment and Natural Resources ("ENR") representatives. Snow removal along the access road will ensure that high banks are avoided so that wildlife can flee from traffic. Failing this, lower snow banks will be left every 100 m to facilitate wildlife to move off the road surface.

Wildlife Mortality

Safe transport truck haul speeds will be set according to road section, which will limit the risk of wildlife-vehicle collisions. Use of the road will be controlled so that the potential for mortality associated with non-Mine related traffic can be minimized.

The following wildlife has a potential to be affected through mortality due to vehicle-wildlife collisions along the access road: Dall's sheep, woodland caribou, moose, wood bison, wolves and wolverine. The mitigation measures above related to wildlife movements are applicable here. In addition, problem areas will be addressed in CZN's Controlled Road Use Plan, in which speed limits will be set for each road section.

Non-Native Plant Species

Non-native or invasive plants can enter a site in a number of ways, primarily being inadvertently transported by road vehicles. Invasive plants are usually brought into a site (or along an access road) in seed form via dirty vehicles/equipment operating during the non-winter period. During the winter period, there is limited exposure of vehicles/equipment to seed sources, and therefore a much lower risk of seed introduction. Invasive plant species were not found during a 2009 survey for rare plants along the access road by EBA Engineering Consultants Ltd. (S. Moore, pers. comm.).

9.4.2 Terrain and Stability

Potential affects of the Terrain on the access road and vice versa are discussed in Appendix 16 (Golder Terrain Assessment Report). The following text provides excerpts relevant to karst along the access road and inside the NNPR.

Closed depressions exist in the vicinity of the access road between approximately Km 50 and Km 75. The closed depressions are understood to originate from the loss of ground overlying the Nahanni Limestone Formation into solution cavities within the limestone, and are identified in the literature as suffosion sink holes. The hazard related to the suffosion sink hole features is that renewed subsidence (associated with existing closed depressions) could take place during the life of the road, leading to partial loss of the road grade.

During a reconnaissance, no evidence of subsidence at any location along the existing access road route was noted. The presence of the road provides a specific means to date any movements that may have occurred, however, none were noted to have affected the existing road bed within the 30 year timeframe that the road has existed.

It is recommended that the area of the Poljes be avoided by re-aligning the road route to the north as proposed between Km 48 and Km 59 on the existing road. It is further recommended that review of these features be carried out at a frequency to be determined to document any changes that may take place.

Depending on the nature of changes that are noted, if any, there may be a future need to specifically investigate some location to better understand the operative mechanisms and, if needed, take remedial action.

A number of recent small scale soil slope failures were noted in relatively steep terrain near the crests of the valley slopes adjacent to the intense karst land. Some had failed, exposing glacial soils and/or shale while others had moved only of the order of 1 m forming local tension cracks on the hillside. At 1 location near Km 54.5 on the access road, a slide scarp several tens of meters long with vertical displacement of approximately 1.5 metres was noted. These appear to be related to groundwater seepage. The increased seepage may be due to extended periods of wet weather and/or to extended periods of warm weather. It is possible that ice rich ground exists in the vicinity of some of these failures and melting weakens the ground locally and adds extra water to the soil. Some of the failures may also be adversely affected by surface drainage flowing into the unstable area. It is believed that this type of failure presents the most significant risk to the access road through the karst valley near Km 56, hence the recommendation that the proposed route re-alignment be followed in order to avoid this terrain.

9.5 Collaborative Programs

CZN and Parks Canada ("PC") have held numerous discussions and worked together on many aspects of the Prairie Creek Mine that were applicable to both the Mine and to the NNPR. The relationship was formalized with the signing of a Memorandum of Understanding ("PCMOU") with regard to the expansion of the NNPR and the development of the Prairie Creek Mine.

Amongst other things, the PCMOU includes recognition that CZN accepts and supports the proposed expansion (now officially completed) of the NNPR, and will manage the development of the Prairie Creek Mine so that the Mine does not, in its own right, negatively affect the expansion of NNPR or operation of an expanded NNPR. In turn, PC recognizes and respects the right of CZN to develop the proposed Prairie Creek Mine and will manage the expansion of the NNPR so that the expansion does not, in its own right, negatively affect development of, and reasonable access to and from, the Prairie Creek Mine.

Furthermore, CZN and PC have agreed to work collaboratively, within their respective areas of responsibility, authority and jurisdiction, to achieve their respective goals of an expanded NNPR and an operating Prairie Creek Mine.

The PCMOU also formed the basis for making reasonable efforts to address issues of common interest and for building a strong working relationship, including convening a formal technical committee to meet from time to time. The Dehcho First Nations were invited to participate in the meetings (see Table 9-1).

Table 9-1: CZN/PC/DCFN Technical Team Meeting Schedule

Date	Location	Represented Parties
October 21, 2009	Vancouver	CZN/PC/DCFN
May 29, 2009	Ottawa	CZN/PC/DCFN
February 3, 2009	Ottawa	CZN/PC/DCFN
October 24, 2008	Vancouver	CZN/PC/DCFN
July 3, 2008	Vancouver	CZN/PC

The intent is for the Technical Committee to continue with on-going meetings, allowing the parties to work together to minimize impacts on the ecological integrity of NNPR. The issues and participants within the Technical Committee are expected to evolve as both the NNPR and the Prairie Creek Mine progress. A change of PC representation has already occurred since the expansion of the NNPR was finalized, with a more regional focus. With a greater focus on operations, a more local representation at the committee table is logical. The committee will include future consideration of joint monitoring programs, management plans etc., as the Prairie Creek Mine advances towards operation. CZN believes the committee should evolve into more of a public advisory committee.

10.0 IMPACT ASSESSMENT – OTHER

10.1 Off-Site Water Quality and Quantity

This section provides an impact assessment on water quality along the transportation route, including the access road and the Liard Highway.

10.1.1 Sources of Contamination

Potential sources of contamination to surface water and groundwater exist with the construction, operation and annual decommissioning of the access road. These are as follows:

- Spills and leaks from road construction, maintenance and decommissioning;
- Spills and leaks from vehicles using the access road;
- Dispersal of concentrates from haul trucks; and,
- Erosion and runoff during spring break-up, particularly at water crossings.

Potential sources of contamination to surface water and groundwater exist with the operation of the transfer facilities. These are as follows:

- Spills and leaks from fuel tanks;
- Spills and leaks from vehicles using the transfer facilities; and,
- Dispersal of concentrates.

Potential sources of contamination to surface water and groundwater exist with transportation along the Liard Highway. These are as follows:

- Spills and leaks from vehicles using the road; and,
- Dispersal of concentrates from haul trucks.

The potential for impacts from these sources of contamination, and opportunities for mitigation, are discussed in the next sub-section.

10.1.2 Potential Impacts and Mitigation

Spills

The potential for spills on the access road is a significant concern. Trucks will be carrying concentrates, fuel, reagents and chemicals, including acid. The frozen winter environment during the operating period is a significant ally in limiting the risks posed by spills. This is because spills are usually not able to travel far, are easily contained and can be readily completely cleaned-up with minimal risk to surface water and groundwater. Risks to surface water are likely less because surface contamination is visible and can be cleaned up. There is a risk to groundwater from a large spill if the spill is not completely absorbed by snow and surficial soil, and the underlying bedrock is permeable. The dolomitic rocks of the Nahanni Formation that form the Ram Plateau represent probably the only part of the road where these criteria could be met.

Risks to surface water and groundwater can be reduced by proper planning and procedures. Proper planning starts with the design and construction of the road. Avoidance of steep terrain where possible, both side slopes with precipitous ledges and grades for vehicles to ascend or descend, is important. Avoidance of hairpin turns is also important to minimize the risk of overturns. CZN has found that the original road alignment was well planned and engineered considering the terrain. However, certain improvements can be made to enhance safety and environmental protection. Re-alignment north of the poljes is being recommended to avoid the poljes, but also to eliminate two hairpin turns at approximately Km 49. This re-alignment is also important because this part of the road crosses dolomitic rocks. The existing alignment crosses karst terrain that is believed to host groundwater that flows southwards towards the South Nahanni River. The proposed alignment further north crosses terrain that drains to a stream (dubbed Polje Creek) that flows north. Thus, the new alignment avoids crossing an area of sensitive groundwater susceptible to contamination from spills.

The Silent Hills re-alignment is also being proposed to avoid sharp turns in the existing alignment. Other re-alignments propose to move the road further away from wetlands, and in doing so, the risk of contamination of surface water from spills will be reduced.

Controlled use of the road is the next step in reducing the risk of spills. Appropriate speeds for all sections of the road will be important for a number of reasons, the main one being safety. CZN plans to post speed limits by road section to minimize the risk of overturns due to excessive speed.

Every truck using the access road will be required to carry a spill response kit, and drivers will be required to read CZN's spill contingency plan. Spill kits will also be available at the transfer facilities.

Communication will also be an important tool to minimize risks. All trucks using the access road will have communications so they can be alerted to on-coming traffic. The trucks will also be in communication with a road operations controller. Accidents can be called in and a spill response team dispatched if necessary.

Contractors bringing fuel and chemicals on the Liard Highway will be professionals with appropriate spill response training.

Leaks

Leaks are considered to be on-going small losses of fuel or oil mainly from vehicles using the access road, transfer facilities and Liard Highway. Such leaks can be minimized by properly maintaining and inspecting vehicles, ensuring all seals are effective. For equipment that stands periodically, such as construction equipment, the use of drip pans is a way to minimize impacts from small leaks. CZN will be responsible for operating construction equipment and haul trucks from the Mine end of the road. CZN will ensure these are properly maintained. Contractor construction equipment and haul trucks will operate from the highway end. These will be inspected for leaks before they are allowed to operate, and corrective measures taken if necessary. The risks posed by small leaks are not considered to be significant. The quantity of the contaminant is quite small, and there is little potential for a significant distance of transport to a water body. Areas of staining can also be collected and disposed of appropriately. Contractor trucks using the Liard Highway will be responsible for maintaining their trucks in good repair. However, CZN will have limited ability to enforce this as the highway is a public road and CZN does not have jurisdiction.

Small fuel tanks will be used at the transfer facilities to feed generator sets. One large tank will operate at the LTF to receive fuel and dispense to haul trucks. All tanks will be above ground and within lined containments. The containments will collect any leaks, but will also have a volume of at least 110% of the tank to retain the fuel in the event of tank failure.

Concentrate Dispersal

The continuous loss of a small quantity of concentrate during the haul along the access road and the Liard Highway would contaminate the road bed and adjacent land with metals, and this could lead to contaminated soil and runoff. With this process, there is a potential for metal uptake in vegetation and elevated metals levels in waterways and aquatic life. Metals are naturally present in all environmental media, some in the form of essential minerals, but the loss of concentrate could elevate metals concentrations to the point that they could cause impacts.

CZN has recognized the risks posed by concentrate loss early on. CZN has chosen to address this risk by placing all concentrates in sealed bags, with an emphasis on a bagging process that ensures bag exteriors are clean. Haul trucks collecting the bags will pass through a wheel wash before leaving the concentrate storage shed as an added precaution to avoid the tracking of contaminated material along the haul route. Any spills of concentrate will be immediately clean-up. The concentrates are dark in colour and have a sugary texture. The material should be readily visible in winter conditions. Note, concentrate retains process and will be frozen during transport.

Erosion and Runoff

For the most part, the access road will consist of a graded bed of frozen soil and packed snow. Major watercourse crossings are few. From the Mine to the headwaters of Sundog Creek, the road has an all weather road bed with two watercourse crossings (Figure 4-11). The first is Casket Creek at Km 6. A bridge structure has been built at this location. The second crossing is a tributary of Funeral Creek at Km 13. Culverts were used previously by Cadillac at this location, but these washed-out. CZN is planning another span structure here.

The upper Sundog Creek section from Km 22 to Km 31 includes 5 crossings. The first two of these are upstream of a major waterfall. The first crossing is an incised tributary which the road ramps down into and out of. The second is a crossing at-grade. Sundog Creek is a high-energy ‘flashy’ stream with gravely alluvial sediments. Fine sediment is minimal. The 3 other crossings along this section are downstream of the falls and are also at-grade. Temporary span structures may be used for the at-grade crossings during road use.

There are several crossings of Sundog Creek from Km 30 to Cat Camp at Km 39. The creek is characterized by gravel outwash over this stretch, and it is common for a flowing creek to be absent in the late fall as water levels have dropped into the gravel. The creek channel is also seasonally dynamic, changing course on an annual basis. Simple snow-fill crossings will be used to create a road bed.

There are 4 creek crossings from Km 42 to Km 49. The first would be a snow-fill crossing. The latter three will be eliminated with the polje re-alignment. The new alignment includes the crossing of a significant stream (Polje Creek) , and use of a temporary span structure is planned.

Crossings of a Tetcela River tributary and the main channel occur at Km 86 and Km 88.5, respectively. These are reasonably broad, shallow channels. Snow-fill crossings are likely. The Fishtrap Creek crossing at Km 93 is a frozen wetland crossing.

All creek crossings between Wolverine Pass and Grainger Gap are relatively minor and snow-fill will be used as necessary. This applies to the existing and proposed re-alignment. The same is true for the re-alignment south to Nahanni Butte, which avoids the Grainger lowlands and the Grainger River crossing on the existing alignment.

The above description indicates that there will be little disturbance of the terrain for road use and watercourse crossings. Water passage structures (temporary spans, culverts) will be used as necessary. These and snow-fills will be removed at break-up. The risk of significant erosion and sedimentation is considered to be low.

10.1.3 Mitigation Summary and Monitoring

The following is a summary of planned mitigation actions to minimize risks to water quality related to the access road, transfer facilities and Liard Highway:

- Proper design and construction of the access road, avoiding steep terrain and hairpin turns;
- Road re-alignment north of the poljes to avoid the poljes, eliminate two hairpin turns, and avoid karst groundwater susceptible to contamination from spills;
- Controlled use of the road with posted speed limits;
- Requiring each truck to carry a spill response kit and drivers to read CZN's spill contingency plan;
- In-vehicle communications to warn of on-coming traffic and call for a spill response team if necessary;
- Properly maintaining and inspecting vehicles for leaks, and using drip pans for stationary equipment;
- Locating fuel tanks in lined containments with a volume of at least 110% of the tank;
- Placing all concentrates in sealed bags with clean exteriors and a wheel wash for haul trucks leaving the Mine; and,
- Using water passage structures (temporary spans, culverts) as necessary, and removing these and snow-fills at break-up.

Access road use will be continually monitored using remote means (radio) and frequent inspection along the route. The latter will include looking for evidence of spills, leaks or tracking of material along the route.

Road bed soil samples will be collected from several locations along the route prior to Mine operations and the first concentrate haul. The same locations will be re-sampled at the end of the haul season to assess and confirm mitigation actions are effective in limiting concentrate dispersal.

10.2 Fish and Aquatic Habitat

10.2.1 Fish-Bearing Water Bodies

This section presents a summary of fish-bearing water bodies in the EA study area. For further details, refer to Section 4.7 above, and the references provided.

Prairie Creek upstream: Both bull trout (*Salvelinus confluentus*) and mountain whitefish (*Prosopium williamsoni*) spawn in good numbers in Prairie Creek upstream of the Mine site, particularly bull trout in Funeral Creek. Spawning bull trout were found in Funeral Creek on August 15, 2005 (ref. DFO). Slimy sculpin (*Cottus cognatus*) are common, particularly in the main channel of Prairie Creek. The fish are thought to be resident species, over-wintering in the area.

Prairie Creek downstream to the old NNPR boundary: Potential spawning habitat for bull trout and mountain whitefish is limited or absent (Beak, 1982). No spawning has been found. Arctic grayling (*Thymallus arcticus*) do not appear to migrate upstream of lower Prairie Creek (probably because of higher spring flows when this fish spawns).

Lower Prairie Creek: Other species known to utilize the lower reach of Prairie Creek within the NNPR and near the confluence with the South Nahanni River include Arctic grayling, round whitefish (*Prosopium cylindraceum*), northern pike (*Esox lucius*), burbot (*Lota lota*), white sucker (*Catostomus catostomus*) and lake chub (*Couesius plumbeus*).

Harrison Creek: This creek has low utilization potential because of low stream flows outside of the spring period, and a steep grade upstream of an alluvial fan. Usable habitat is limited to the 10-20 m reach between Prairie Creek and the main discharge from the Prairie Creek Mine site, and would be absent without Mine discharge..

Access Road: Arctic grayling were found to use Grainger River, Tetcela River and Sundog Creek and it's tributaries. Northern pike appeared to be using the Grainger River (Beak, 1981). Mosquito Lake (just east of the Poljes) contains fish, but specific data is not available (Ker Priestman, May 1981). Tetcela and Grainger River are considered to have over-wintering habitat. The creek draining north from the Poljes, a tributary of Sundog Creek, may have over-wintering potential. Smaller creeks in this area, the Fishtrap Creek headwaters, and the headwater creeks along the eastern side of the Nahanni Range have low utilization potential and are likely not fish-bearing (Dillon, 2009).

10.2.2 Impacts from Operations

Impacts from past operations appear to be minimal based on studies conducted. Projects in the Prairie Creek Mine area and discharges from the site have had almost no impact on fish and aquatic habitat. A summary of the studies initiated in 2006 by the University of Saskatchewan was provided in Section 4.7. To recap briefly, water and sediment quality, algal, benthic invertebrate and fish community studies were conducted upstream and downstream of the Prairie Creek Mine. No significant differences in metal concentrations in water or sediment samples were found. More species of algae were found downstream indicating a mild nutrient enrichment. No other significant differences were found. Beak Consultants Ltd. conducted aquatic studies along the winter road in 1981. Ice bridge surveys indicated minimal disturbance to aquatic habitat from road crossings over 2 winters. The remainder of this section will address the potential for impacts from future operations.

Changes to Flow or Habitat

The only changes to flow in receiving waters from mine operations will be a moderate increase in winter due to the discharge of treated mine water. The increase may be up to 30% during seasonal low creek flows. The increased stream flow is considered to be a positive effect in terms of habitat utilization. Access road operations will not affect creek flows in any way.

As explained in Section 10.1.2 above, stream crossings by the access road are limited in number and most are easily accomplished by fording or simple snow fill with no bank alterations. Temporary span structures are being considered for those locations where stream channels are incised. Again, no bank alterations will be required to place the spans. For the most part, road bed for crossings can be made at-grade utilizing snow and ice.

Water Quality

It was demonstrated in Section 8 that, with the water treatment and discharge management scheme planned to be used by CZN, there is very little potential for impacts to water quality downstream of the mine, including during the low flow winter months, and when flows in those months are abnormally low. This is because of CZN's plan to monitor flows, and adjust water treatment and discharge rates during those times. Site-specific objectives for metals were determined for local receiving waters based on the range of background concentrations occurring in the system. CZN has demonstrated that site discharges can be managed to keep in-stream concentrations below the objectives. Relevant excerpts from the document in which the objectives were developed (Appendix 7) are given below to demonstrate they are protective of the aquatic life in the system, and that hence, no impacts to aquatic life are expected.

"Experiments examining the acute toxicity thresholds of bull trout suggest that they are more tolerant of elevated Cd and Zn than rainbow trout, while the two species show a similar sensitivity to elevated Cu. The 120-h LC50 for bull trout exposed to Cd ranged from 0.83 to 0.88 µg Cd/L, whereas the 120-h LC50 for bull trout exposed to Zn ranged from 36 to 80 µg Zn/L.

Bull trout were more sensitive to a mixture of Cd and Zn as opposed to Cd only, but in general were more tolerant of Cd and Zn exposure than rainbow trout. Meanwhile, in water with a nominal hardness of 220 mg/L, bull trout exposed to elevated copper had 120-h LC50 values ranging from 205 to 219 µg Cu/L.

The acute toxicity thresholds reported in the literature are therefore higher than the site-specific objectives determined using the reference condition approach for Cd (0.172 µg/L), Cu (2.53 µg/L), and Zn (21.95 µg/L). Furthermore, the LC50 results were obtained in relatively soft water (nominal hardness of 30 mg/L and 90 mg/L) compared to the hardness of water in Prairie Creek (average = 256 mg/L). Therefore, given the inverse relationship between hardness and cadmium toxicity, as well as between hardness and zinc toxicity, the site-specific objectives are expected to protect bull trout from the effects of acute toxicity.

In terms of chronic exposure, bull trout exposed to 0.786 µg/L Cd over a 55-day exposure period suffered reduced growth and survival. Although concentrations as low as 0.052 µg/L caused elevated Cd concentrations in whole body samples, no effects on growth and lethality were observed at concentrations ranging from 0.052 µg/L to 0.383 µg/L. These results suggest that the site-specific objective of 0.172 µg/L for Cd determined using the reference condition approach may cause elevated tissue concentrations, but are unlikely to result in long-term effects on growth and survival of bull trout. This conclusion is further supported by the inverse relationship between hardness and Cd toxicity and the fact that the experiments were conducted at a hardness of 30 mg/L whereas average hardness in Prairie Creek is 256 mg/L.

Therefore, for the metals for which information exists on the toxicity thresholds of bull trout, the site-specific objectives appear to be protective of bull trout. However, acute and chronic toxicity thresholds for the other metals of interest were not found in the literature and therefore could not be compared with the site-specific objectives. While predicted concentrations do not approach the individual acute and chronic toxicity thresholds, these experiments do not consider the potential additive and synergistic effects of all the elevated metals that will occur downstream of the effluent discharge."

The additive and synergistic effects of all of the elevated metals were considered in the toxicity tests conducted on representative samples of mine water and process water for Prairie Creek Mine operations (see Appendix 2). The tests on 100% mine water showed no acute toxicity and only minor chronic toxicity. Zoplankton (*Ceriodaphnia dubia*) reproduction, measured as the average number of young per female, was reduced by 25%. The concentrations of the metals in mine water will always be subject to significant reduction in receiving waters. Process water did exhibit acute toxicity, hence the plan to curtail treatment and discharge from January to March, and tailor treatment rates to flows in Prairie Creek.

Site discharges will generally be a small fraction of the receiving water flow in Prairie Creek. This fraction could be as high as 30% during lowest creek flows if mine drainage flows reach 100 L/sec. However, the average fraction annually will be about 2%.

Mine drainage leaving the 870 level portal in October 2009 had a dissolved oxygen concentration of 11.5 mg/L. The mine receives significant infiltration in the open water months which is likely to maintain oxygen levels in mine discharge.

Treated process water and mine water will have a pH of approximately 9.0. The pH of receiving waters is in the 8.2-8.5 range. The CCME pH limit for the protection of aquatic life is 9.0, and downstream receiving water pH will remain well below this limit. Therefore, it is clear from flow comparisons alone that there is limited potential for variances in oxygen levels and pH in site discharges to influence those levels in receiving waters, and in any event, oxygen levels and pH in site discharges will likely be similar to those in the receiving environment.

Sediment

CZN has been able to control sediment levels effectively on site, and this is expected to continue during mine operations. The Catchment Pond is an effective final control on runoff leaving the main site area. The Waste Rock Pile (“WRP”) in the Harrison Creek valley represents a new potential source of sediment. However, the WRP site will have diversions to direct upslope runoff around the site, and WRP seepage will flow into a collection pond where sediment can settle out and the water can be managed for dissolved metals.

CZN is in the process of addressing potential sediment issues along the access road in Prairie Creek and Funeral Creek. Several sections were eroded by flood waters. The erosion problems arose because the all season road bed was not armoured when it was originally built by Cadillac, although the floods in 2006 and 2007 were abnormally high. Road sections in Prairie Creek have been repaired with a combination of bank cutting and slope armouring, and one section in Funeral Creek has also been repaired. Several section in Funeral Creek still require repair, which will be completed in 2010. When these repairs are completed, no further potential sediment issues are expected along the access road.

It should be noted that past studies indicate that by far the greatest factor influencing sediment levels in watercourses is water level. Spring flows and periods of rain can quickly turn local streams from gentle clear flows to torrents of muddy water. In such circumstances, any sediment losses from CZN’s facilities would be trivial by comparison, although they are not expected to occur. Hence, the risk of significant impact is low.

10.2.3 Impacts after Mine Closure

Changes to Flow or Habitat

CZN’s intent is to avoid disruption of Prairie Creek and the creeks along the access road after mine closure and during reclamation. Harrison Creek will be returned to its pre-mine state as much as possible by removing artificial works, and restoring the natural alluvial fan. Natural flows and runoff in this area will be re-established.

Water Quality

Section 8 discussed, and Appendix 1C provided predictions for, water quality after mine closure. In summary, post-closure metal concentrations in Prairie Creek are predicted to be less than the site specific objectives for all months during normal monthly flows. When monthly flows are abnormally low, from January to April concentrations of cadmium and zinc could exceed the objectives if natural attenuation reactions are not sufficient to lower the concentrations predicted to be released from the Mine area.

Post-closure cadmium concentrations during abnormally low flows were predicted to reach a peak of 0.354 µg/L. Based on the 120-h LC50 range for bull trout from 0.83 to 0.88 µg/L, this concentration should not be acutely toxic. In terms of chronic exposure, the peak concentration should not cause reduced growth and survival because it is less than 0.786 µg/L which was found to cause these effects over a 55-day exposure period. Concentrations as low as 0.052 µg/L were found to cause elevated Cd concentrations in whole body samples, but the abnormal flows should be short-term, and not significant in terms of fish life span. The peak concentration is within a cadmium range where effects on growth and lethality were observed (0.052 µg/L to 0.383 µg/L), however, peak values would be for a short duration only. It should also be noted that the metals discharging from the Mine area will be significantly less toxic than the values indicated in tests because the natural hardness of Prairie Creek water is considerably higher than that used in the tests. This, in combination with natural attenuation which will in all probability significantly lower concentrations, should ensure that no chronic effects will occur.

Post-closure zinc concentrations during abnormally low flows were predicted to reach a peak of 66.3µg/L, whereas the 120-h LC50 for bull trout exposed to Zn ranged from 36 to 80 µg/L. Again, natural hardness will reduce the toxicity of the peak values. However, some chronic effects might occur. As noted in Section 8, natural peak zinc concentrations before the Mine was developed were likely similar to those predicted for post-closure. Therefore, incremental impacts on fish from Mine development and closure are not likely to occur compared to pre-Mine conditions.

Sediment

Reclamation activities near creeks will focus on avoiding sediment losses, and will be designed to provide stable non-erodable surfaces in the short and long term. Impacts to fish should be minimal.

10.2.4 Commitments

CZN is committed to the following actions to minimize potential for impacts to fish or aquatic habitat:

- Replace any habitat losses to the satisfaction of Fisheries and Oceans Canada ("DFO") (this is a requirement of the *Fisheries Act*, and CZN is aware of requirements as compensation habitat is being developed for losses during repair of the access road);

- Make use of DFO's *Operational Statements* for creek crossings, including span structures and culverts:
- Minimize disturbance of stream banks and riparian areas at stream crossings;
- Remove temporary crossing structures and snowfills at break-up to avoid blockage and erosion;
- Construct a stable road bed adjacent to creeks and providing for runoff control to minimize the dispersal of sediment during precipitation events;
- Promote re-vegetation of riparian areas to further reduce the potential for sedimentation;
- Avoid disruption of the only known spawning location in the area (bull trout in Funeral Creek) during the spawning period (mid-August);
- Continue the site policy of no fishing or any other unnecessary disturbance of the aquatic environment;
- Use a diffuser in the bed of a single, deep channel in Prairie Creek for site discharge to ensure complete mixing with receiving water;
- Closely monitor discharge water quality and the receiving environment's ability to absorb the discharge;
- Ship all concentrates in bags free of external concentrate dust;
- Develop and follow a detailed spill contingency plan; and,
- Modify the existing Controlled Road Use Plan for access road operations to promote safety and minimize the risk of accidents.

10.2.5 Best Management Practices

The use of a diffuser for site discharge to Prairie Creek is considered a best management practice (BMP) because it promotes complete mixing with receiving water and should avoid impacts associated with non-mixed, 'neat' solutions. A 'timing window' for the discharge will also be used as a BMP in that process water treatment will be managed according to the magnitude of seasonal flows in Prairie Creek.

BMP sediment controls will be adopted at the Mine and along the access road. The only known spawning location in the area is in Funeral Creek. Bull trout are a fall spawner (mid-August), and the annual winter haul will not have commenced at that time. It is not known if bull trout over winter in Funeral Creek, however there is a possibility of incubating eggs being present during the winter haul period. Possible impacts are unknown. There is little to no opportunity to mitigate these impacts, should they occur.

10.2.6 Accidents and Malfunctions

CZN has considered the potential for accidents and malfunctions, as well as impacts of the environment on the development, elsewhere in this report. To recap, the following is a list of possible occurrences and CZN's planned responses/contingency plans:

- On-site spills – invoke spill contingency plan. Close gate on Catchment Pond discharge and pump-back water to Water Storage Pond ("WSP"), if necessary. No off-site impacts expected;

- Treatment Plant malfunction – stop treatment or recycle water, divert all mine and mill flows to the WSP. No off-site impacts expected;
- Off-site spills – invoke spill contingency plan. Clean-up any spilled material and transport to suitable disposal location. Winter conditions will minimize the risks of impacts, and complete clean-up will avoid impacts;
- Major flood event – inspect and repair any damage to erosion protection and runoff diversion structures. Incremental impacts during the flood event will be minor because of natural sediment levels, future impacts will be minimized by rapid and full response to repair damage; and,
- Slope failure – response is dependent on the location and magnitude of the failure, should it occur. If the failure is upslope of the WSP putting it out of commission, mill operations may be stopped and all mine water will be treated and discharged until the WSP is back in operation.

10.3 Wildlife

This section is a summary extracted from a report by Golder Associates Ltd. (Golder) contained in Appendix 17. For further detail, the reader is directed to the appendix.

10.3.1 Mine Site Operations

Footprint

The Prairie Creek Mine site has been in existence since 1982 with an established footprint including all surface facilities required for full scale mining, with the exception of the proposed 6 ha waste rock pile ("WRP"). Once fully operational, the Mine will have a footprint of approximately 59.5 ha, which is a relatively small and compact area of disturbance. The additional footprint of 6 ha for the WRP will remove a small area of the Spruce-Lichen habitat, which is common in the Prairie Creek valley in the vicinity of the Mine. As the Mine is a relatively compact development with underground mining, the effects of additional habitat fragmentation with full operations are expected to be limited and not of significance for wildlife.

Particulate Matter and Emissions

Sources of surface dust are ore extraction from underground, the ore stockpile at surface, ore processing, the backfill plant and batch operations, local truck and equipment operation around the site and to and from the airstrip, and use of the airstrip.

Gaseous emission sources are from power generation, truck and equipment operation around the Mine site and to and from the airstrip, and the garbage incinerator.

Emissions of exhaust and combustion gases (i.e., NO_2, SO_2 and CO) are not expected to affect local wildlife populations due to the relatively low intensity of these gases and predicted dispersion conditions. The air quality assessment (Appendix 20) found that exhaust gasses are not likely to pose a risk for any receptor included in the assessment within the lease area, and are unlikely to affect food sources of wildlife outside of the lease area.

The potential for effects of airborne dust and particulate emissions would be indirectly through intake of food or water that has been affected by uptake of particulate matter, and has the potential to affect individuals or populations of wildlife. Given the results of the dispersion modelling and analysis, total suspended particulates and lead emissions are not likely to affect food sources for local receptor wildlife species at and beyond 0.2 km from the surface lease boundary.

Within this area of influence, wildlife includes a resident population of Dall's sheep, occasional woodland caribou, moose and wolves, and frequent grizzly bears (spring and summer). For these larger forms of wildlife, the effect of ingestion of vegetative matter with deposited particulate matter is expected to be limited, given the rate of deposition onto the ground surface. Dall's sheep have some potential to be affected, as do small mammals such as hare and grouse/ptarmigan.

Mitigation measures to manage dust and emissions include watering of surface roads as required, the control of dust in the Mill and batch plant using filters, and the use of exhaust systems

Contamination Potential

Potential sources of contamination that can affect wildlife include fuel and other hydrocarbons stored at the Mine site, chemicals used in the Mill or Water Treatment Plant, explosives storage and use, sewage disposal, landfill for refuse, lead and other batteries, rock and tailings from the Mine and Mill, and concentrates from the Mill.

Local resident populations of wildlife, such as Dall's sheep, or those that are present on a seasonal basis, have the highest potential to be exposed to contamination. Sheep are known to lick soda ash from pallets in the Mine yard. Other large mammals that are present on an infrequent basis are less likely to be exposed.

Mitigation measures to manage potential contamination include:

- Fuel storage in tanks within bermed areas ;
- Keeping other hydrocarbons in approved containers in designated locations;
- Any spills will be immediately cleaned up;
- Chemicals used in the Mill and Water Treatment Plant will be transported and stored in approved containers;
- Explosives used will be primarily of the stick-type, not those producing ammonia residues;
- Sewage sludge will be stored in a dedicated, fenced solid waste facility. This, together with frequent site activity will minimize wildlife attraction;

- Items to be sent to the Mine landfill will be screened to separate any kitchen waste which will be incinerated daily;
- Placing Mine rock in a prepared site with water management, and putting tailings underground in a backfill mix;
- A lined cell to bio-remediate soil contaminated with hydrocarbons;
- The collection of used batteries at a hazardous waste storage location; and,
- The bagging of mineral concentrates with dust control.

Sensory Disturbance

The Prairie Creek Mine site was fully developed in 1982. Exploration has been in progress since then, with associated activity in terms of human presence, air traffic, and surface equipment at the Mine camp and airstrip. Most of this recent activity has taken place between April and October of each year, with the camp closed during the remainder of each year. There has not been any documentation of disturbance related effects on wildlife since exploration or development work started.

Full Mine operation activities have the potential to affect local wildlife populations due to sensory disturbance from the following:

- Year round aircraft traffic of 3 flights per week;
- Vehicle (light truck and crew bus) traffic between the Mine camp and airstrip to meet flights (3 round trips on flight days);
- Truck traffic between the Mine camp and airstrip to move equipment and supplies (numerous trips on flight days, unless transferred with passengers).
- Light and heavy truck traffic around the shops and supply storage areas, and nearby Mine facility locations (numerous trips daily but confined to the immediate Mine site area);
- Waste rock hauling between the Mine portal and the Waste Rock Pile (one shift per day); and,
- Human presence associated with all of the above on a year-round basis (average of about 110 persons on site).

Sensory disturbance related to the Mine activities noted above will manifest itself as noise emanating from motor engines, track/wheel surface contact, and loading-unloading operations. The underground Mine operation will result in little if any sensory disturbance potential to wildlife.

Local wildlife, such as Dall's sheep, appear to have been little affected by sensory disturbance associated with recent activities, as the local population still frequents areas adjacent to the Mine site and airstrip. There is no specific documentation of reaction of sheep to aircraft traffic and any potential consequent effects on key life cycle events (i.e., effects on lambing success and lamb survival rates) or how the local distribution and habitat use have been affected. Woodland caribou are occasionally observed near the airstrip or near the Mine site, and are known to inhabit the adjacent mountain slopes and ridges on both sides of the Prairie Creek valley. There is no direct documentation that woodland caribou calve near the Prairie Creek Mine, however, anecdotal observations of cows with calves have been recorded in June and July, suggesting that calving occurs nearby. The small number of caribou observed near the Mine site are not expected to be affected by sensory disturbance associated with the Mine.

Grizzly bears are recorded occasionally near and passing through the Mine site. Once full Mine operation is underway, the increase in activity may deter bears from venturing through the Mine site. Frequent equipment and vehicle traffic could alienate bears from the immediate Mine site area, but this cannot be predicted with any degree of certainty. However, bears may continue to move up and down the valley on the other (west) side of Prairie Creek.

Mitigation for sensory disturbance is not warranted for the Prairie Creek Mine operation. The Mine site is compact, and little can be done to reduce equipment and vehicle traffic and related activities associated with an underground mine. Air traffic is the only source of sensory disturbance that is variable in terms of frequency and type of equipment that could be used; however, weather conditions and safety requirements override all other considerations. The approach and take off lines are limited by topography and do not allow for much variance. Flight paths during the Dall's sheep lambing season (mid-May to mid-June) may be able to accommodate this sensitive period for sheep, and partly mitigate for potential adverse effects on the local population which are believed to lamb on the hillsides adjacent to the airstrip. A suspected lambing area is located on the steep slopes of Folded Mountain, and this area should be avoided when possible. The existing flight impact management plan (FIMP) should be reviewed with respect to Dall's sheep, particularly to confirm lambing areas and to develop operational flight guidelines that can be safely implemented.

Wildlife Habituation

Habituation of wildlife is defined as attraction of wildlife to the Mine area. For most of the species in the area, habituation to the Mine site is not likely to occur. Dall's sheep are already habituated to the presence of the Mine, and regularly enter the site to lick for soda ash stored in the equipment storage yard.

With full production, the duration and frequency of daily human presence and Mine related activity will increase from recent levels. Sheep are relatively tolerant of human presence and equipment noise for much of the year, but the lambing period is a key life cycle period when disturbance can be problematic for sheep. It is possible that sheep may be lambing in proximity to the Mine and have not been affected by Mine-related activity to date.

Woodland caribou and moose are only occasionally present and move through the Prairie Creek valley and adjacent hillsides on a seasonal basis, and are not likely to be attracted to the Mine site for shelter or food. Wolves occur occasionally moving through the area and are not likely to be attracted to the Mine facilities generally, but may be attracted to food wastes if not properly handled. Wolverine may be impacted through habituation to the Mine site in that they may be attracted to camp areas for shelter under buildings, or to a food source. Given the infrequency of wolverine observations at and near the Mine site, and the large home ranges of wolverines, this is not likely to result in a significant impact to wolverine populations.

Grizzlies may be attracted to potential food sources associated with waste food disposal and general refuse disposal. Habituated individuals of either species can be highly problematic for industrial camps, although there have been no issues at the Prairie Creek Mine to date.

Habituation of birds is not anticipated. Some waterfowl are known to use the large pond in the spring and summer and mew gulls have been observed to nest near the Mine site, although they may have done so historically.

The following mitigation measures should be implemented:

- The storage of soda ash on site should be secured to prevent the attraction of sheep; and,
- Food wastes and other putrescible matter should be incinerated on a daily basis to reduce the risk of attracting wildlife, particularly grizzlies.

Wildlife Movements

The Prairie Creek Mine is situated on one side of a north-south valley that affords a natural movement corridor for wildlife. The Mine site takes up much of the valley bottom on the east side of the valley. The west side of the valley is in a natural state and affords passage for wildlife. The airstrip is located on the east side of the valley, several kilometres north of the Mine camp, but takes up a limited amount of space and does not interfere with wildlife movements.

Most wildlife, in their movements north and south through the Mine site, and potentially east and west across the valley, can still move freely along the slopes above the Mine site while travelling north-south and can skirt the Mine site in their movements east-west if they want to cross Prairie Creek. Grizzly bears are expected to continue their movements along the valley floor, passing through or adjacent to the Mine site.

There is little that can be done to mitigate the potential for impact to wildlife movements until the Mine site is shut down and reclaimed. For grizzly bears in particular, management measures will need to be continued specific to Mine site operations.

Wildlife Mortality

Wildlife mortality related to the sources of potential impact and risk is expected to be minimal and not of significance, with the exception of grizzly bears where encounters with humans are expected to increase with full production. However, there have been no problem bears to date. Given their propensity for movements through the Prairie Creek valley floor and the potential for bear-human encounters, bear awareness and safety training should be continued as a high priority for all Mine employees, contractors and visitors. The existing plan for the management of bear encounters should be reviewed to ensure it includes:

- A designated system for reporting and recording bear sightings;
- Employee training on site entry for the first time and on a regular basis;
- A bear warning system for workers if a bear is spotted in the vicinity;
- A structure for reporting bear-human encounters and resulting incidents to inform Mine management and GNWT Environment and Natural Resources ("ENR") staff;
- A protocol for dealing with problem bears; and,
- Annual reporting of bear observations.

The bear management plan and protocols should receive input from ENR staff.

10.3.2 Access Road

Footprint

The original access road has been in existence since 1980 with start of construction of the Mine site. CZN has proposed 63 km of road realignment in the first winter of operation, resulting in a total road length of 174 km and a width of 5 m. Removal of existing vegetation along the roadway will be necessary, however, the organic layer will be left where possible. Construction of new sections with cut-and-fill methods will be necessary in steeper terrain to establish a properly graded roadway. Annual construction activity will consist of initial blading to remove snow and preparation for stream crossings. Some stream crossings may be constructed with ice or where necessary, with culverts or temporary structures. The Liard River ice bridge will be built with river water. Maintenance of the access road will consist of scraper and grader pushing and blading of the road surface. The Tetcela Transfer Facility ("TTF") will be 2.0 ha in area and the Liard Transfer Facility ("LTF") 2.8 ha. The Cat Camp is a small existing facility (less than 1 ha). The total area of disturbance related to the road and facilities is insignificant in terms of the regional setting.

Air Quality Effects

Operation of the access road will produce emissions resulting from heavy equipment, transport trucks, and smaller trucks on the road. Dust is not expected to be generated given that road use will take place when the ground is frozen and under snow.

Air quality dispersion modelling has assessed the magnitude of dust and gas emissions from operation of the access road. Emissions from trucks will disperse widely and will not appreciably settle onto the snow adjacent to the roadway. With snow melt, the limited amount of particulates will settle onto ground cover vegetation. The potential for effects of emissions on wildlife is expected to be limited since most forms of wildlife in the area range widely and are not restricted in their occurrence to locations in immediate proximity to the access road. Mitigation measures are not considered necessary.

Contamination Potential

Hauling along the access road will consist of primarily mineral concentrates from the Mine to the LTF. Concentrates will be bagged securely and handled carefully to minimize the risk of rupture or spillage. Diesel fuel and other supplies will be delivered to the Mine on back hauls in industry standard tanks.

Potential effects on vegetation and subsequently on wildlife are limited from operation of the access road and transfer facilities. If a spill occurs, the effects would be localized and of short duration until the spilled material is recovered. In the unlikely event that a diesel spill was not completely cleaned up, it would not affect vegetation until the spring. Ingestion of hydrocarbon contaminated soil or vegetation by wildlife is unlikely given the unpalatable nature of diesel fuel.

Effects on water-bodies and wildlife they support are a primary concern with respect to contamination from accidental spills and leakage of materials. Sections of the access road between the east slope of the Mackenzie Mountains to the Liard River have streams, ponds and wetlands adjacent to the road that contain beaver or muskrat. These have historically been used for trapping and subsistence use by First Nations. These water-bodies also support breeding populations of waterfowl, including trumpeter swans.

Appropriate materials management systems will be in place to minimize the risk of accidental spills or leakage. The existing spill management plan will be reviewed and improved, as necessary, prior to road operation.

Sensory Disturbance

Noise generated from road vehicles is assumed to be similar to that generated by highway transport trucks at 99 dBA. This is expected to reduce to 35 dBA at 0.5 km from source, and 25 dBA at 1.5 km from source. Use of the road by non-mine related traffic will be deterred by Mine operations management procedures.

Mitigation options for reducing the potential for effects on wildlife from sensory disturbance are not considered to be necessary. In any event, given the seasonal constraints that the hauling operation is faced with, there are no reasonable or practical measures that can be implemented to reduce sensory disturbance. CZN already has an approved Controlled Road Use Plan. This plan should be reviewed to address the possible presence of the Nahanni Butte wood bison population.

Wildlife Habituation

Habituation of wildlife through attraction to food stuffs and other materials could occur if proper handling and storage procedures are not followed. Access road operation is not anticipated to result in habituation of wildlife, provided that proper handling and disposal of waste food materials is implemented.

Wildlife Movements

Access road activities will potentially occur from early November to mid-April. Early activities will involve road construction from the Mine to the TTF. Concentrate hauling to the TTF could commence in early December, depending on road conditions. Road construction eastwards would continue. Hauling to the LTF would start in mid-January, and potentially continue until mid-April.

Boreal caribou may be encountered in winter nearer to the eastern terminus of the road. Woodland caribou, moose, wolves and wolverines could be encountered any time along the entire road, although moose are more commonly found along the eastern half.

Given the limited exposure of wildlife along the access road during construction and operation, several mitigation strategies are recommended. The logging of large wildlife sightings (Dall's sheep, woodland caribou, wood bison and carnivores) should be implemented with respect to location along the access road, numbers observed and reaction to road activity. If a problem area is identified, corrective measures should be discussed with ENR. Snow removal along the access road should ensure that high banks are avoided so that wildlife can flee from traffic. Failing this, lower snow banks should be left every 100 m to facilitate wildlife moving off the road surface.

Wildlife Mortality

Safe transport truck haul speeds will be set according to road section, which will limit the risk of wildlife-vehicle collisions. Use of the road will be controlled, as such the potential for mortality associated with non-Mine related traffic can be minimized.

The following wildlife have a potential to be affected through mortality due to vehicle-wildlife collisions along the access road: Dall's sheep, woodland caribou, moose, wood bison, wolves and wolverine. The mitigation measures recommended above related to wildlife movements are applicable here. In addition, problem areas should be addressed in CZN's Controlled Road Use Plan, in which speed limits will be set for each road section.

10.3.3 Wildlife Management Plan

A draft wildlife management plan ("WMP") for full-scale mining covering all activities occurring at the mine site and along the transportation corridor is provided in Appendix 32.

The WMP includes the following:

- Which other interested parties have been involved in the development of the WMP;
- The adequacy of all pre-existing wildlife mitigation and management plans and commitments in light of increased activity levels during full-scale operations;
- Efforts to be undertaken to monitor wildlife in the Prairie Creek Mine site area and along the access road and reporting the presence of species to the appropriate authorities, when necessary;
- Identification of adaptive management measures to avoid, minimize, and mitigate potential impacts to wildlife when detected through wildlife monitoring; and
- How monitoring results and mitigation efforts will be reported to regulators, responsible authorities and potentially-affected communities.

10.4 Terrain

10.4.1 Waste Rock Pile Stability

Golder Associates have prepared a preliminary design for the Waste Rock Pile (Figure 6-6) in Appendix 11, which incorporates a Solid Waste Landfill within the footprint of the pile. The design is based on field investigations and laboratory testing, and includes assessment of potential failure modes and stability.

In summary, the native soils underlying the proposed facility consist of colluvial deposits approximately 3 to 5 m thick underlain by bedrock. A number of cut roads and trenches expose the soil horizon. The native soils currently overlying the bedrock will need to be excavated up to an elevation of at least 975 m. This will provide for a suitable foundation at the toe of the Waste Rock Pile ("WRP"). Permafrost is not considered a concern for development of the WRP at this location, but the absence of permafrost will be confirmed when surface vegetation has been stripped and prior to placement of rock on the foundation.

A mid-slope bench, 5 m wide, has been incorporated into the design slope to assist with surface water control. Due to the highly permeable nature of the waste rock materials, a high water table is unlikely. However, construction debris placed in the upper part of the pile may permit a higher water table to develop at the higher elevations, and as a result, additional analyses were performed to verify stability.

Golder recommended placement of waste rock in 6-7 m high benches, starting at lower elevations and working from one side of the valley to the other at specified interim slopes.

10.4.2 Terrain-Operations-Terrain Impacts

Golder Associates were also contracted to complete a Terrain Assessment report. A copy is provided in Appendix 16. Excerpts are provided here in brief answer to the information requests in the TOR. The reader is advised to consult the appendix for details.

This sub-section considers potential effects of the terrain on the Mine and access road and vice versa.

Soil/Hydrological Conditions

The access route as it currently exists is not expected to have a material effect on the potential for re-activation of large scale soil slope failures, provided that drainage is not adversely changed by the presence of the road. Careful planning of drainage, with particular emphasis on avoidance of concentrated discharge into former slide areas, should be part of detailed road planning and design. The stability of large scale failures can be improved if surface drainage is directed away from the slide area reducing the potential for infiltration into the slide mass. Excavations near the toe of such slopes can have detrimental effects on overall stability and should be avoided.

A number of recent small scale soil slope failures were noted in relatively steep terrain near the crests of the valley slopes adjacent to the intense karst land. While these failures were not reviewed individually, they appeared to be located (geologically) near the interface between the surficial glacial soils and the underlying Horn River Shale formation. Some had failed, exposing glacial soils and/or shale while others had moved only of the order of 1 m forming local tension cracks on the hillside. At one location near Km 54.5 on the access road, a slide scarp several tens of meters long with vertical displacement of approximately 1.5 metres was noted. These appear to be related to groundwater seepage. The increased seepage may be due to extended periods of wet weather and/or to extended periods of warm weather. It is possible that ice rich ground exists in the vicinity of some of these failures and melting weakens the ground locally and adds extra water to the soil. Some of the failures may also be adversely affected by surface drainage flowing into the unstable area. It is believed that this type of failure presents the most significant risk to the access road through the karst valley near Km 56. It is recommended that the proposed route re-alignment between approximately Km 48 and Km 59 be followed in order to avoid this terrain.

Karst

The risks to the proposed access route from the potential for renewed subsidence associated with the karst features appears to be small. No evidence of subsidence at any location along the road was noted. Nonetheless, it is recommended that the zone of intense karst terrain that exists in the vicinity of Km 56 be avoided by re-routing the access route to the north of the karst valley (Polje by-pass route). All karst features within 200 m of the access road should be identified and monitored.

Liard Highway Degradation

CZN plans to use the Liard Highway primarily in the winter when there are no load restrictions. The frozen bed should sustain less wear than if traffic were in another season. However, it is unlikely that all Mine trucking requirements can be met in the winter, and a summer hauling period, although less intense, is likely. This will undoubtedly lead to greater ‘wear’ of the highway than if this additional trucking did not occur. We note that the highway is a public road. Also, the NWT Department of Transportation have initiated a study regarding how the highway will perform with additional traffic, and requirements for upgrades. At this time, the study is in its early stages.

Slope Stability

Based on a review of available airphotos, historic, large scale rock slope failures are not evident in the Prairie Creek valley in the vicinity of the Mine site, nor along the access route within the Funeral Creek or Sundog Creek valleys. It appears that the primary mass wasting mechanism that has formed the mountain slopes near the Mine and along the access route is that of incremental rock fall from exposed bedrock faces and accumulation of that material within talus slopes. These slopes have been modified along tributary drainages by small scale debris flows

Evidence of large scale mountain slope failures in the vicinity of the mine site was not identified. This type of terrain stability feature is not expected to affect the mine site during the life of the mine. Local rockfall in the vicinity of the mine site and associated infrastructure may be an issue during operation. It is recommended that this issue be assessed in detail and remedial plans developed and implemented during the design and construction phase of the mine.

Permafrost

It is anticipated that ice rich ground will be encountered along the existing and proposed re-aligned section of the access road. While no specific investigation for ice rich ground was carried out as part of this assessment, it is believed it will be found to exist within the proposed re-alignment between Km 48 and Km 59; in the Tetcela valley between Km 89 to Km 92; possibly along the proposed re-alignment on the western flank of the Silent Hills between Km 92 and Km 99 and along the proposed re-alignment east of the Front Range between Km 125 and Km 155. Maintenance of the organic layer in a viable and uncompacted state helps to maintain the thermal status of the ground along the route. The existing road appears to have generally performed well in this regard and has very few examples of thaw settlement. It is recommended that maintenance of the existing surficial organic layer be part of the planning and design of the road.

Landslides

Landslides are considered to be slope failures, and some comments are already provided above. Past seismic activity does not appear to have caused failures of the slopes along Prairie Creek, Funeral Creek and Sundog Creek, at the scale of the valley slope. Smaller rock fall failures may have been triggered by past seismic shaking, however, these events are not readily distinguished from other forms of small scale rock fall. Future performance of the subject slopes during earthquake events cannot be determined with certainty, but the current evidence indicates that the likelihood of large rock slope failures occurring due to seismic activity is very remote.

10.4.3 Stability of Engineered Structures

The stability of engineered structures has been addressed elsewhere in this DAR, primarily in Section 6. There are three major structures for consideration as follows:

- The Water Storage Pond
- The Waste Rock Pile

- The flood protection berm

Each of these is discussed below.

Water Storage Pond

Re-engineering of the Water Storage Pond ("WSP") is explained in the Golder Associates' report in Appendix 12. Geotechnical requirements and slope stability are addressed, the latter including seismic conditions. The WSP will be well equipped to manage extreme precipitation events. In addition to upslope diversions, the operating 1 m freeboard (empty space) would easily accommodate the most extreme event.

Waste Rock Pile

Engineering of the Waste Rock Pile ("WRP") is explained in the Golder Associates' report in Appendix 11. Geotechnical requirements and slope stability are addressed, the latter including seismic conditions. The WRP will be well equipped to manage extreme precipitation events. In addition to upslope diversions, a seepage collection pond will have an emergency spillway to accommodate extreme precipitation events.

Flood Protection Berm

Repairs are being made to the armour rock protecting the flood protection berm from flood waters (see Appendix 18A,B,C, and D). The suitability of the berm to withstand peak floods was confirmed previously. The relevant reports are posted on the MVRB website for this EA (refer to letters from Hay & Company dated March 10 and June 25, 2004).

10.4.4 Mitigation and Monitoring

Access Road

As noted above, mitigation for access road construction should include adequate drainage to prevent water pressure build-up which could trigger small slope failures or mudflows, avoidance of cut and fills on unstable slopes, avoidance of the Poljes by using the new by-pass, and building the road bed without removing the organic layer to avoid permafrost degradation.

Potentially unstable areas along the access road will be monitored at a frequency suitable for the rate of change in conditions, and the potential consequences of an event. This will include unstable slopes, permafrost areas and karst features. Once conditions have been adequately documented, and do not appear to change from year to year, monitoring frequency may be progressively relaxed.

Mine Site

The Water Storage Pond ("WSP"), Waste Rock Pile ("WRP") and Flood Protection Berm are major structures that require annual geotechnical inspection, as at present (except for the WRP as it does not yet exist). Major slopes and terrain features in and around these structures can be inspected at the same time. It is considered that permafrost likely no longer exists in the backslope of the WSP. However, because of the historic instability in this area, it will be an important aspect of annual geotechnical inspection. Inspections will continue until the structures are no longer in use.

Erosion Control

Erosion control measures have already been discussed above for the specific Mine components.

Reporting of Results

Results of the above inspections and monitoring will be reported to the MVLWB and relevant regulatory agencies. Reports will also be circulated to members of the proposed committee that evolves out of the current Parks Canada-CZN-Dehcho Technical Committee, and discussed in subsequent meetings.

Adaptive Management/Contingency Measures

Relevant and appropriate measures are assumed to have been provided in the various engineering consultants' reports already. These will be followed. Any need for additional measures will be determined in response to subsequent inspections and monitoring.

10.5 Air Quality

An air quality assessment has been completed by Golder Associates Ltd. in accordance with the TOR. Golder's report can be found in Appendix 20. The text below is an extract from the executive summary of the report. The report should be consulted for further details.

The objectives of the assessment were to evaluate potential impacts of Prairie Creek Mine construction, operation and reclamation (the Project) emissions on local air quality; and propose appropriate monitoring, mitigation and management strategies to minimize any impacts.

The evaluation of potential impacts of the Project on local air quality included an assessment of pre-development conditions associated with air quality, preparation of an air emission inventory for the construction, operation and closure phases of the Project, determination of predicted air concentrations resulting from emissions of the Project, comparison of predicted concentrations with air quality standards, and discussion of potential links of air quality with other components. Air concentrations considered included total suspended particulates ("TSP"), particulate matter with a diameter less than 10 µm ("PM_{10}"), particulate matter with a diameter less than 2.5 µm ("$PM_{2.5}$"), nitrous dioxide ("NO_2"), nitrogen oxides ("NO_X"), sulphur dioxide ("SO_2"), carbon monoxide ("CO"), lead and zinc.

Air concentrations resulting from Mine site emissions have been determined using the CALPUFF dispersion model. Concentrations resulting from off-site (i.e., winter road and transfer facilities) emissions have been determined using the SCREEN3 dispersion model.

Maximum predicted concentrations of TSP, PM_{10}, $PM_{2.5}$ and lead resulting from on-site emissions are expected to exceed the respective air quality standards for receptors located within the surface lease that encompasses the Prairie Creek Mine, at the surface lease boundary, and in an area extending 200 m from the surface lease boundary (called the buffer zone). Maximum predicted concentrations of TSP, PM_{10}, $PM_{2.5}$ and lead are expected to be lower than the respective air quality standards for receptors located beyond the outer part of the buffer zone (i.e., from 200 m from the surface lease boundary and beyond).

Maximum predicted concentrations of NO_2, SO_2 and CO resulting from on-site emissions are expected to be lower than the respective air quality standards for all receptors assessed within and beyond the surface lease.

Maximum concentrations of TSP, PM_{10}, $PM_{2.5}$, NO_2, SO_2 and CO resulting from off-site (access road and transfer facilities) emissions are expected to be lower than the respective air quality standards. No lead or zinc emissions are expected from off-site activities.

The report in Appendix 20 explains how the predicted ambient air quality concentrations have been used to design an appropriate monitoring program, and will be used to develop mitigation and adaptive management strategies and plans to minimize emissions related to fugitive dust and incineration. A table of contents for each plan is included in the report in Appendix 20. The appropriate regulators (Environment Canada and the GNWT)) have indicated that the contents of the plans can be prepared and reviewed at a later date.

10.6 Vegetation

This section is a summary extracted from a report by Golder Associates Ltd. contained in Appendix 17. For further detail, the reader is directed to the appendix.

10.6.1 Land Clearing

A limited amount of additional land clearing or vegetation removal will be necessary for the Prairie Creek Mine site. The proposed waste rock pile will result in removal of 6 ha of the Spruce-Lichen vegetation unit, which is common in the region. The total cleared footprint area at the Prairie Creek Mine site will then be approximately 59.5 ha, which is relatively insignificant in comparison to the occurrence of the common ecosystems involved.

For upgrades to the access road, approximately 63 km of new alignment will be required. The proposed realignment of the access road will result in a shorter road (173.4 km versus 181.1 km) and a revised footprint. The road has naturally re-vegetated since it was initially constructed in 1981, and therefore potential vegetation impacts associated with the 63 km of roadway that will not be used have diminished.

The TTF will occupy 2.0 ha of the Mixed Coniferous-Deciduous vegetation unit, and the LTF 2.8 ha of the Aspen-Liard Floodplain vegetation unit. Both vegetation units are common in the region and the locations should readily re-vegetate upon the end of the Mine’s life.

10.6.2 Rare Plants

The potential for impacts to rare plant species is assessed as low. No rare plants were found in the footprint of the new WRP (Appendix 13). Re-establishment and upgrades to the access road should not be a concern. Two ENR ranked 'May Be at-Risk' species identified along the access road (Hornemann willowherb and linear-leaved willowherb) have restricted distribution in the NWT with limited known occurrences, but are globally secure. Six ENR ranked Sensitive plant species identified adjacent to the access road have small regional distributions in the NWT with a small number of known occurrences, but are globally secure.

10.6.3 Harvested Plants

Given the remote location of the Mine site, its relatively small footprint (59.5 ha), and distance to the nearest community, the Mine is not expected to result in an impact on present cultural use of plant species. The access road traverses terrain accessible to First Nation peoples for hunting or gathering activities, especially the eastern half. As such, plants such as berries, wild onions, and others may have been sought and collected for food stores in the summer and fall. However, the road occupies a small area, and plants are likely mostly harvested closer to Nahanni Butte, and not proximal to the access road (refer to Section 5.8)

10.6.4 Emissions

The air quality assessment predicted that total suspended particulates (TSP) will have dispersed at 200 m outward from the Prairie Creek Mine surface lease boundary. Settlement of particulates will occur on vegetation within this zone, with decreasing levels from the Mine site outward. Exhaust gases are not expected to result in effects beyond the immediate Mine area. Dispersal of lead (as particulates) will have occurred within 200 m outward from the surface lease boundary. The operation of the access road will result in release of particulate matter and exhaust gasses, but these will disperse widely and are not expected to have a significant effect on vegetation.

10.6.5 Dust

Dust generation from the Mine will be limited as it is underground, but will be produced from the Mill vehicles operating on surface. Effects of dust generated by Mine related activities will settle on local vegetation in a limited area (approximately 200 m out from the immediate Mine site). Plant species affected are common in the Spruce-Lichen vegetation unit and will be "washed" during annual snow melt and summer rainfall.

10.6.6 Invasive Plants

Invasive plants can enter a site in a number of ways, primarily being inadvertently transported by road vehicles. Invasive plants are usually brought into a site (or along an access road) in seed form via dirty vehicles/equipment operating during the non-winter period. During the winter period, there is limited exposure of vehicles/equipment to seed sources, and therefore a much lower risk of seed introduction.

10.6.7 Mitigation and Best Management Practices

The key mitigation measures to minimize further disturbance to vegetation are: minimizing the mine footprint; avoiding hydrocarbon and other substance spills, but conducting thorough clean-up if they occur; and, avoiding wetlands (which CZN is proposing with road realignments).

General best management practices (BMP's) related to mitigating further potential impacts to vegetation along the access road include: preparation of an appropriate spill contingency plan for the access road; following industry standards for fuel tank construction, location and spill containment; transporting fuel and chemicals in industry standard containers; and, conducting refuelling away from any stream, lake, wetland or other water body.

10.7 Monitoring and Management Plans

10.7.1 Collaborative Monitoring and Adaptive Management

Significant monitoring of operations and the environment will occur during and after the Mine's life. CZN expects individuals from local communities to be involved in this, preferably as employees. CZN undertakes to share the monitoring results. Discussion of future monitoring requirements and reporting has been initiated with the NBDB and Parks Canada, but it is at an early stage. CZN will actively support appropriate collaborative monitoring initiatives with First Nations, Parks Canada and other regulatory agencies.

10.7.2 Existing Monitoring and Management Plans

A list of CZN's existing monitoring and management plans is given below, with comments on whether the plan will remain the same or change in response to mine operations:

- Fuel Spill Contingency Plan. A revised version for the Mine and access road is given in Appendix 28. Further development is required.
- Controlled Road Use Plan. This plan was approved for use of the access road. The plan needs to be upgraded for Mine operations to incorporate safety and security, communications, road use monitoring, and wildlife response and reporting.
- Wildlife Management Plan. A revised version for the Mine and access road is given in Appendix 32. Further development is required.
- Health and Safety Plan. A revised version for the Mine and access road is required, with emphasis on bear encounters.
- Mine Water Contingency Plan. This plan will become obselete with the new water management strategy, and a new plan will be developed.
- Flight Impact Management Plan. A revised version for Mine operations is required.

10.7.3 Conceptual Monitoring and Management Plans

The following monitoring and management plans are expected to be developed during the EA process, and/or at the permitting stage assuming the MVRB recommends approval of the project:

- Water Storage, Treatment and Discharge Monitoring and Management Plan
- Solid and Hazardous Waste Management Plan
- Explosives Management Plan
- Aquatic Effects Monitoring Plan
- Fugitive Dust Mitigation Plan
- Incinerator Operation and Mitigation Plan

10.7.4 Communication of Results

CZN's desire is for the current CZN-Parks Canada-Dehcho Technical Committee to evolve into a more public, inclusive committee that meets frequently in the region, and is used as a forum to review Mine performance and monitoring data, to discuss and address concerns, and to consider adaptive management.

10.7.5 Summary of Monitoring and Management Systems

Table 10-1 presents a summary of biophysical environmental monitoring and management systems, where they are described in this DAR, the length of time the monitoring is proposed for, and a rationale for each timeline.

Table 10-1: Environmental Monitoring and Management Summary

Monitoring and Management System	DAR Section	Monitoring Timeline	Rationale
Surveillance Network Program	6.18	Operations and post-closure	Monitor site and receiving water conditions until post-mine equilibrium is reached
Aquatic Effects Monitoring	8.3	Operations	Period of water treatment
Wildlife observations along the access road	9.4.1	Operations	Period of concentrate haul
Karst and other terrain features along the access road	9.4.2	Operations	Period of concentrate haul
Wildlife observations at the Mine	10.3	Construction to post-closure	Monitor wildlife until post-mine equilibrium is reached
Annual geotechnical inspections of major structures (Water Storage Pond, Waste Rock Pile, Flood Protection Berm) and terrain in and around them	10.4	Operations and post-closure	While the structures are in use, and until they are either removed or confirmed stable with no change
Inspections of potentially unstable areas and karst features along the access road at a frequency determined by observed conditions	10.4	Operations	Period of concentrate haul
Particulate and Gaseous Emissions	10.5	Construction and operations	Period of largest emissions
Road bed sampling along the access road	10.5	Operations	Period of concentrate haul

11.0 IMPACT ASSESSMENT – HUMAN ENVIRONMENT

11.1 Socio-Economic and Social Impacts

A Socio-Economic Impact Assessment {"SEIA") for the Prairie Creek Mine has been completed for CZN by Impact Economics. A copy is located in Appendix 19. The SEIA provides the socio-economic and social information requested in Sections 3.4.1, 3.4.2 and 3.4.3 of the TOR. Rather than repeat content from the main body of the SEIA here, a summary is given below as an overview of the assessment and the conclusions drawn.

"Because much of the property was previously developed, the Project's construction phase will be modest at $59 million. This investment will raise the Northwest Territories gross domestic product (GDP) by $24 million when considering the direct and indirect impacts. Construction activities will span two years with the majority taking place in the second year and will require a workforce of up to 120 people at its peak.

Once into its operations phase, the Project will employ approximately 220 people, working a three-week in/three-week out schedule. The known lead and zinc deposit is expected to sustain an underground mining operation for 14 years. Total expenditures will approach $1 billion (based on 2008 prices) over this time frame. This will raise the Territory's GDP by an average of $68 million annually, create 138 additional jobs, and raise labour income by a total of $28.4 million.

The real economic and social impact of this project will be generated through the participation of local labour and business from within the Project's defined Study Area which includes the communities of Nahanni Butte, Fort Simpson, Fort Liard, Wrigley and Lindberg Landing. Participation will come in the form of direct employment, direct supply of goods and services, and through spin-off activities described as indirect and induced effects of the mining expenditures.

Local labour and business will be given preferential treatment when accessing jobs and goods and services contracts. This measure will help raise the level of participation over time. Based on a review of the existing labour pool and a projection of the potential workforce, direct employment at the mine could rise to as many as 70 Study Area residents over the medium to long term. When coupled with participation of local business and the related employment opportunities, the Project could increase overall employment across the Dehcho region by 153 jobs and result in an $11 million rise in labour income.

The participation by labour and business will have positive and negative impacts for the Study Area communities. In assessing potential economic and social impacts, CZN has studied in great detail the socio-economic conditions present in the region including an assessment of the prospects for economic and social performance should the Prairie Creek Mine not go ahead. Poor education, high unemployment, low income levels, inadequate housing and high crime rates are well known socio-economic realities in these communities. These conditions, when considered in combination with the lack of any new economic growth opportunities over the medium term, elevates the importance of the Prairie Creek Mine from the perspective of economic, social and long-term sustainability.

Similar to what occurred in communities affected by the rise of the diamond industry, there will be a period of adjustment as people and communities integrate into the wage economy. The negative impacts will be mitigated in part through what will likely be a gradual increase in local participation and through a commitment from the proponent to implement its mitigation program in full over the entire life of the Project. CZN has proposed a mitigation strategy specific to the needs of the Study Area communities that will include Impact and Benefit Agreements with local First Nation groups, supports long-term, sustainable growth of the Study Area communities, and will reduce or eliminate potential negative social impacts that might occur as a direct, indirect or induced effect of the mining operations. Regardless of residency, all employees of CZN will receive a competitive compensation package and will be supported by a modern human resource management plan.

CZN is confident that the Study Area communities will succeed in increasing their resilience to outside pressures and become better able to cope with and benefit from future projects. The rise in financial wealth and all that it affords directly and indirectly will more than offset the anticipated adjustment period. For those living in the Study Area, the Prairie Creek Mine offers an opportunity for a generation of employment, leaving as a legacy a population that is better educated, better trained and better able to cope with, adapt to and capture new opportunities in the future. Through the individual and collective efforts of employees and their families, communities and their residents, and with cooperation from governments at all levels in providing the right network of support, including effective implementation of existing public programs, the economic growth that the Prairie Creek Mine will bring to the region offers an opportunity to initiate positive and sustainable socio-economic change throughout the Study Area."

CZN has prepared a draft Human Resource Management Plan for operations, and a copy can be found in Appendix 30.

11.2 Cultural Impacts

Heritage Resources

Section 5.9 provided details on CZN's engagement of traditional knowledge ("TK") holders in the area and the Prince of Wales Northern Heritage Centre. Section 5.9 also explained that sites of potential heritage resources were identified by the NBDB in proximity to CZN's access road, and that CZN subsequently hired an archaeological consultant to investigate the identified areas (see Appendix 21). No heritage resources were found. Therefore, CZN is not aware of any heritage resource issues outstanding with respect to the Mine and access road, including alternatives proposed to re-route the road. However, CZN realises that the area in general has great cultural significance for First Nations, and that environmental protection is critically important. CZN intends to undertake its activities with a great deal of care, attention and respect. Activities will be confined to the Mine site area and the immediate confines of the access road. During those activities, if anything is discovered that might have heritage or cultural significance, the discovery will be protected and the relevant authorities notified.

Traditional Land Use and Wildlife Harvesting

A description of traditional land use and wildlife harvesting and the potential for impacts from an operating mine and access road is given in Section 7.8 of the Impact Economics report in Appendix 19. Excerpts relevant to the requests made in Section 3.4.4 of the TOR are given below.

In their support of the proposed Project, the Nahanni Butte Dene Band has looked at the potential impacts on their harvesting activities in the areas in and around the seasonal access road. They are of the opinion that the road has the potential to improve their harvesting activities because of the improved access. This is the greatest impediment to their harvesting at present. The NBDB were directly involved in plans to re-align the road to avoid areas they consider sensitive to wildlife. Therefore, mitigation has effectively been applied to limit impacts, including mortality and disturbance of wildlife. The changes proposed should lead to the monetary value of NBDB harvesting activities in the area adjacent to the access road improving. CZN has initiated Impact Benefits Agreement ("IBA") negotiations with the NBDB, and harvesting is one of the issues being discussed.

CZN is in the process of consulting with the NBDB and government regarding control of the use of the access road. CZN believes this is important for safety reasons, and to minimize the potential for hunting pressures on wildlife. The expansion of the NNPR will mean big game outfitting will be phased out of the park. Therefore, non-Aboriginals would potentially only have access to that part of the road outside the park boundary. CZN's intent is to work with the NBDB to discourage use of the access road by non-residents. When the road is open, traffic will be heavy, and un-authorized road use will pose safety risks. CZN will be able to impose rules for its employees and contractors (i.e. no hunting or straying off the access road alignment), but does not have jurisdiction to impose rules on others. Road use will be monitored, and changes regarding access control will be considered if negative issues are recorded

11.3 Monitoring and Management Plans

Section 9 of the SEIA in Appendix 19 discusses human environment monitoring and management plans. Excerpts are provided below.

"CZN has long been engaged with the Study Area communities and has built solid relationships with the different levels of government in Nahanni Butte, Fort Liard and Fort Simpson. It is now in negotiations with these communities to establish Impact and Benefit Agreements that will become a principal component of the company's mitigation strategy.

In addition to formalising the company's hiring and contracting practices, CZN aims to establish a formal process for communications and reporting within its IBA's. These reports would be generated annually for the Study Area communities. The goal is to ensure each community understands the Project's current and future activities, its labour needs, and upcoming procurement opportunities. CZN also hopes to include detailed feedback on mine employment such as new hires, terminations, length of employment, training, promotions, and overall and relative payroll. It will also report on its contracts to local businesses and their total value. Traffic reports will be a regular component of these reports. It will be a matter of the IBA negotiations to determine which portions, if any, are to be withheld from the public. Otherwise, these reports will form the basis of the company's responsibilities to report to the regulators and government authorities.

CZN is also interested in developing a system whereby the hiring practices of contractors can also be reported. This will be subject to their agreement.

CZN views its reporting requirement as one centred on the economic activities flowing from its expenditures on labour and capital, and its management of the access road and mine site. CZN is not in the best position to produce data in macro-economic areas or in social areas. The NWT Bureau of Statistics has this mandate and produces reports that are more than adequate in helping the company and communities understand social trends. Coupled with the Canadian Census administered by Statistics Canada, which will take place in 2011, 2016 and 2021, the two statistical agencies cover most if not all relevant variables.

Canadian Zinc currently employs a community information representative. This position will continue to exist should the Project move forward. This employee will have a very important role within the company, assisting community members to interact with company officials on a wide range of matters. This employee will also be able to comment on the statistical evidence produced by the NWT Bureau of Statistics and Statistics Canada.

The TOR asks for a description on monitoring and management plans related to wildlife harvesting and practice of traditional culture on the land. CZN will meet this requirement, in part, by close management of the access road. This access is a subject of current negotiations. Should access be open, CZN will monitor public traffic on the road. More extensive wildlife harvesting results and participation in traditional activities will require the cooperation of the First Nation groups themselves. For example, a community survey could be conducted by the community information representative, but the quality of its results would be dependent on the cooperation of the First Nation people themselves."

A summary of CZN's proposed monitoring and management systems is presented in Table 11-1 below. The background for these Socio-Economic systems is explained in the SEIA report.

Table 11-1: Socio-Economic Monitoring and Management System

Impact and Benefit Agreement Reporting	Detailed reporting to communities with Impact and Benefit Agreements. The contents of these reports are subject to ongoing negotiations
Employment Reporting	Annual reporting on total workforce, new hires, terminations, length of employment, labour income
Procurement Reporting	Annual reporting on total expenditures for goods and services, list of goods and services required, upcoming requirements, total spending on First Nation businesses and NWT businesses
Communication Strategy	Working with the communities through the IBA negotiations, establish a communication strategy with each community
Annual Socio-Economic Report	Detailed report on mining activities, and the economic, social, cultural and socio-economic performance on the Study Area.

12.0 CLOSURE AND RECLAMATION PLAN

A draft preliminary closure and reclamation plan ("CRP") has been developed, and is provided in Appendix 27. The CRP is considered appropriate for the project and this stage of the regulatory process. However, the CRP may not necessarily answer all of the items contained in Section 3.5 of the TOR. Consequently, the text below provides responses specific to the items listed in the TOR:

CZN referred to "*Mine Site Reclamation Policy for the Northwest Territories"* (INAC, 2002) *and "Mine Site Reclamation Guidelines for the Northwest Territories"* (INAC, 2007) for the preparation of the CRP;

Reclamation objectives, standards and criteria are described in the CRP;

- Closure and reclamation components and activities are described in the CRP. Reclamation options were few because the reclamation strategy has largely been pre-determined by the plan to place all tailings and most of the DMS rock underground, and completely fill the mine workings. A natural cover for the WRP was selected to limit infiltration and seepage and promote revegetation. The final composition of the cover will be based on WRP monitoring during operations. Other reclamation activities are intended to restore stable surfaces suitable for revegetation with minimum disturbance to riparian areas, and ensure the long-term physical integrity of features;

- On-site disposal of reclamation materials is explained in the CRP. Off-site disposal requirements will depend on the nature of the materials requiring disposal after salvageable material has been removed;

- Progressive reclamation will only be possible for the underground workings in the form of continuous backfill during operations. Progressive reclamation may be possible for the downslope portion of the WRP later in the mine life, provided this does not interfere with runoff diversion and seepage collection works;

- A monitoring plan and reporting strategy is included in the CRP. This is intended to address potential post-closure contamination pathways. A selected monitoring end-date is based on expectations on when groundwater levels around the mine will have reached equilibrium and any resulting impacts on surface water can be observed or detected;

- Testing has confirmed that mine and mill wastes will not be acid generating. The closure and reclamation strategy has been selected specifically to minimize metal leaching, primarily by placing tailings and DMS rock underground and covering the WRP;

- Groundwater movement through the underground backfill and the WRP is a highly technical subject, and has been discussed at length in Section 8. The CRP does not seek to repeat this discussion, but the closure and reclamation measures selected are based on the outcome of the assessments;

- A visual depiction of the Mine site and transfer facility areas after closure and reclamation based on one year, ten years and 25 years after closure is given in Figures 12-1 and 12-2, respectively. The transfer facility depicted is the TTF, and conditions will be similar for the LTF. Present conditions for each site can be seen in Figure 6-1 (Mine site) and Plate 1 of the TTF Project Description Report, respectively;

- Revegetation of the Mine site will rely on natural invasion to avoid introducing exotic species. Reclamation will focus on providing conditions conducive to revegetation. Judging by revegetation along old drill access roads, it will take approximately 20-30 years for vegetation to be fully restored to an undisturbed condition;

- CZN plans to avoid disruption of Harrison Creek, Prairie Creek and Funeral Creek as much as possible. Artificial structures need to be removed from Harrison Creek, but otherwise the bed will be left as at present, an alluvial fan which is believed to be how it existed before site development. Studies have determined that the habitat potential for fish in this creek is low. Prairie Creek and Funeral Creek will not be disturbed. Reclamation actions will focus on maintaining stable banks and the avoidance of erosion and sedimentation;

- Judging by the natural revegetation of the existing access road alignment, the transfer facility sites will readily revegetate. Access road construction will focus on avoidance of bank alteration, with at-grade crossings and the use of temporary spans and culverts. Very little stabilization is expected to be required; and,

- CZN has requested comment from the Nahanni Butte Dene Band and Parks Canada regarding future uses, and reclamation, of the site. No comments have been received as yet.

CANADIAN ZINC CORPORATION

Date:	October 2009
Drawn By:	C. Reeves
Scale:	Not Shown
Drawing:	DAR Fig 12-1.dwg

FIGURE 12-1:
Conceptual View of Closure Stages of the Prairie Creek Mine

CANADIAN ZINC CORPORATION

Date:	December 2009
Drawn By:	C. Reeves
Scale:	Not Shown
Drawing:	DAR Fig 12-2.dwg

FIGURE 12-2:
Conceptual View of Closure Stages of Tetcela Transfer Facility

13.0 CUMULATIVE EFFECTS

13.1 Water Quality

This section considers if, and how, water quality effects from the Cantung Mine on the Flat River will likely combine with those of the Prairie Creek Mine in the South Nahanni River watershed.

In Section 8.1, zinc, cadmium and sulphate loads in the South Nahanni watershed were estimated based on water sampling by Environment Canada over the period 2003-2009 (Appendix 8). Estimated annual loads were presented for Prairie Creek upstream of the Mine, and for the South Nahanni River above Virginia Falls. In Table 13-1, these loads are reproduced, and the sampling location on the Flat River at the mouth has been added. The Flat River loads are based on mean flows and dissolved constituent concentrations. Constituent loads expected to be discharged during the operating stage of the Mine have also been added to the table. These loads are based on a combination of treated process water and treated mine water, the latter based on flows from underground of 100 L/sec. The table shows that cadmium, zinc and sulphate loads discharging from the Mine will comprise only 0.6-1.3% of the loads occurring naturally upstream. A similar result was found comparing Mine loads to the Flat River. The fraction of Flat River loads relating to Cantung Mine is likely very small but is unknown. However, even if it were 100%, the addition of Prairie Creek Mine loads would be insignificant. Comparing Mine loads to the South Nahanni River shows that Mine loads would comprise only 0.01-0.03%. These comparisons show that constituent loads expected to discharge from the Mine will be extremely small relative to those occurring naturally, and therefore there is no potential for a cumulative effect with the Cantung Mine.

13.2 Wildlife

This section is a summary extracted from a report by Golder Associates Ltd. contained in Appendix 17. For further detail, the reader is directed to the appendix.

The cumulative effects assessment (CEA) for wildlife was performed in the context of residual effects from the Prairie Creek Mine and associated access road operation, and how the potential residual effects could be additive to residual effects from other resource development projects in the immediate vicinity or broader geographic region (*i.e.,* southern Mackenzie Mountains). Three mining projects were identified by the MVRB for consideration in the CEA: the Howard's Pass district, the Cantung Mine in the Yukon; and, the Mactung development proposal in the MacMillan Pass area. Increased road access related to these three mining projects was also to be considered in the CEA.

The regional perspective with respect to the above and the Prairie Creek Mine and access road is illustrated in Figure 3-1. The Cantung Mine is the closest to the Prairie Creek Mine (186 km).

There are very few residual effects identified for the Prairie Mine and access road. These are summarized as follows:

- Potential for effects on Dall's sheep lambing activity during the spring (May-June) with air traffic in proximity to the slopes above the airstrip and on Folded Mountain;
- Potential for mortality of Dall's sheep, woodland caribou and wood bison associated with access road use (November to mid-April) when populations are present in proximity to the road alignment; and,
- Potential for grizzly bear-human encounters at the Mine site, and resulting mortality of bears from necessary destruction to manage risk to mine workers and contractors.

Given the spatial separation between the Prairie Creek Mine and access road, and the three mine projects in the Mackenzie Mountains to the north, the potential for the identified residual effects from the Prairie Creek Mine and access road to result in a cumulative effect on the species discussed is unlikely.

It is unlikely that cumulative effects on Dall's sheep habitat or populations would occur with full operation of the Prairie Creek Mine and access road. The Prairie Creek access road will only be open and operable in the winter time, and will be severed by the Liard River at its southern terminus. This should appreciably eliminate the risk of increased hunting access to Dall's sheep along the Nahanni Range and the Mackenzie Mountains.

The environmental assessment for the Mactung Project has predicted that there will be limited local residual effects on caribou habitat. The impact assessment predicts that there will be no effects on the overall health and migration of the Redstone caribou population (which is likely the herd that partly occupies the Prairie Creek valley, and the Mackenzie Mountains to the east to the Nahanni Range). The present footprint of the Howard's Pass project area is limited in size and when brought to production, would likely have a limited effect on caribou habitat or movements. Further, the caribou populations between that project area (Finlayson population and Nahanni population) and the Prairie Creek Mine and access road are separate populations but likely with some overlap. Cumulative effects from the other mine projects and the Prairie Creek Mine and access road are not anticipated to occur. With respect to increased road access and the potential for cumulative effects on regional caribou populations, the Prairie Creek Mine access road will be controlled-access, therefore, the potential for increases in hunting-associated caribou mortality is expected to be limited.

Wood bison only occur in the south-eastern part of the Prairie Creek Mine access road along the Liard River floodplain. There is a risk of collisions and mortality of wood bison, but it is not cumulative with the other mine development projects, or with their road access.

The environmental assessment for the Mactung Project has predicted that there will be limited local residual effects on grizzly bear habitat. Baseline data for the Howard's Pass project has been collected but assessment of impacts relate to the exploration program, not full mine development. Considering the spatial separation between the Prairie Creek Mine site and the other mine site and development areas, and their respective road access', cumulative impacts in terms of habitat effects with the Prairie Creek Mine are not expected, especially considering the small size of the Prairie Creek Mine (41.5 ha footprint plus 178 ha for the access road and transfer facilities). The Prairie Creek Mine development is very small in comparison to home ranges of grizzly bears. However, grizzlies roam widely and there is a potential for interaction with grizzly populations in the other mine areas. Mortality associated with bear-human encounters is a risk to regional grizzly populations. Management measures, including a Bear Management Plan for the Prairie Creek Mine, can go a long way to reduce the risk of cumulative impacts to regional grizzly populations.

13.3 Air Quality

Section 10.5 noted that maximum predicted concentrations of TSP, PM_{10}, $PM_{2.5}$ and lead resulting from on-site emissions are expected to be lower than the respective air quality standards for receptors located beyond the outer part of the buffer zone (i.e., from 200 m from the surface lease boundary and beyond). We also learned that maximum predicted concentrations of NO_2, SO_2 and CO resulting from on-site emissions, and maximum concentrations of TSP, PM_{10}, $PM_{2.5}$, NO_2, SO_2 and CO resulting from off-site (access road and transfer facilities) emissions, are expected to be lower than the respective air quality standards for all receptors everywhere. Therefore, it is clear that impacts from Project emissions are very localized to the Mine site, and there is no cumulative aspect to the impacts.

13.4 Socio-Economic

Impact Economics provides the following commentary from their study (Appendix 19, Section 10.2) regarding potential cumulative effects on social and economic impacts in the Dehcho region if the Mackenzie Gas Project ("MGP") and the Prairie Creek Mine proceed at the same time:

"Some hope remains for the possibilities associated with the proposed MGP, though prices are not currently in its favour. If and when it moves ahead, the labour and business demand for its construction phase will exceed the capacity of the entire territory, and will represent a major shock to the economic and social landscape of every region along the Mackenzie Valley.

From the perspective of CZN, the best action it can take to mitigate the impacts of this enormous shock, should it occur, is to offer Study Area residents a stable, relatively-permanent alternative to the four-year, seasonal economic flurry from the pipeline. CZN is confident that it will maintain its local workforce in this situation because of its offer of steady employment year round and the fact that camp life at the Prairie Creek Mine will be much more family-like (everyone will know everyone) than that of the seasonal, temporary camps established for the pipeline construction.

The Prairie Creek Mine will ultimately benefit from the MGP because it will bring an increased number of NWT residents into the workforce and provide them training. This newly-trained workforce will be eager to find work once the pipeline is built and the presence of the Prairie Creek Mine might help keep some of these recently-trained workers in the region.

For the communities, the early lessons learned in coping with and adapting to the relatively small Prairie Creek Project will be good training for those times when the pipeline construction is taking place. As much as the construction crews will be stationed at their camps and contact with residents is to be minimal, there can be no doubt that the small and isolated communities in the Dehcho region will be easily overwhelmed by the volume of economic activity the pipeline construction will bring. The best way for a community to plan for this event is to have some experience in dealing with something similar but in a much smaller, more manageable format, such as the one offered by the Prairie Creek Mine."

13.5 Access Road and Liard Highway

13.5.1 Access Road Management

With respect to the access road and use by non-Mine traffic, CZN is discussing options with the NBDB on a management system regarding access. CZN's preference is for the NBDB to control access for safety reasons.

Different options for monitoring traffic and harvesting are being discussed. One option is to monitor activities in a manner similar to that of the Tibbitt-to-Contoyto Ice Road and the Tlicho Ice Road to Wha ti, Gameti and Wekweeti. Users could be asked to report to a controller upon entering and exiting the road, probably at the Swan Point Ice Bridge over the Liard River. Users would be asked their purpose of travel, and if they are hunting, determine the location and success rate. If the number of vehicles on the road was to increase to a point where public safety was at risk, or harvesting pressures on wildlife were too great, a temporary or permanent closure to the public would be considered. Such action would take place in discussions with the NBDB, and officials with the Government of the Northwest Territories. Thresholds would need to be determined through consultation with the NBDB, Parks Canada and government officials. Should the road be closed to the public, a monitor might still be required to enforce the ruling. If necessary, a gate might be needed as a deterrent.

Some form of control on the use of the access road is imperative for road and wildlife safety. It is expected that whatever control is implemented, this will deter unauthorized use for hunting or tourism to a sufficient extent that cumulative impacts associated with road use are limited. Also worthy of note is the fact that when the road is in operation, it will be very busy with heavy traffic 24/7. This alone may prove to be a significant deterrent to unauthorized road use.

13.5.2 Liard Highway

This section considers the potential cumulative impacts from increased use of the Liard highway.

The small population of the Study Area, its remoteness relative to large centres, and distances between communities, all contribute to low traffic volumes. The Government of the Northwest Territories' Department of Transportation surveys the traffic on an annual basis in different locations throughout the NWT, including traffic just south of Fort Liard on Highway 7 and south of the junction of Highways 1 and 7, which is just past the turn-off for those travelling north to Fort Simpson or west to Lindberg Landing, Nahanni Butte, or Fort Liard. The results of this survey work were presented in Table 5-1. The table shows that traffic outside Fort Liard has averaged 110 vehicles per day for the last few years, while traffic between the junction of Highways 1 and 7 and Nahanni Butte has averaged 50.

In short, the Liard Highway is under-utilized, and from a capacity perspective, is well placed to accommodate the traffic associated with the Mine. This use will inevitably mean changes to road maintenance requirements. CZN plans to use the highway primarily in the winter when there are no load restrictions. The frozen bed should sustain less wear than if traffic were in another season. However, it is unlikely that all Mine trucking requirements can be met in the winter, and a summer hauling period, although less intense, is likely. In terms of road safety, there will undoubtedly be an adjustment period when road users in the region come to terms with the increased traffic. Apart from traffic advisories, little can be done to mitigate this concern.

13.6 Historic Developments

The TOR requests consideration of the contribution of other historic developments associated with the Prairie Creek Mine to cumulative effects within the EA Study Area on specific valued components.

Cat and Grainger Camps

The Cat and Grainer Camps are old road construction camps along the access road that pre-date the tenure of CZN and its predecessor. As such, the camps are abandoned or orphaned sites. Cat is at approximately Km 38, and Grainger is at Km 137. At each site, large fuel tanks and a considerable number of steel culverts are present. Accommodation trailers are also present at Cat. The fuel tanks previously stored diesel, but the fuel was disposed of by incineration by a contractor to Indian and Northern Affairs Canada ("INAC"). This action was taken because the tanks were leaking.

INAC subsequently contracted EBA Engineering Consultants Ltd. to investigate the sites for contamination. EBA produced reports for each site in January, 2007. The Cat site was found to have approximately 155 m^3 of contaminated soil, in addition to some lead-based paint on the trailers and asbestos tiles. The Grainger site was found to have 20 m^3 of contaminated soil. The contaminants do not appear to be mobile and an imminent threat to water quality. The limited extent means a low risk of significant effects on vegetation and wildlife.

INAC approached CZN with the intent of resolving responsibility for the sites. CZN has voluntarily assumed responsibility. CZN's intent is to remediate the sites when the access road is opened. CZN does not consider the sites to represent a potential cumulative effect because the sites will be remediated during the early part of Mine operations.

Historic Transfer Facility

A transfer and loading facility within a few hundred metres of the east bank of the Liard River on the access road was previously operated by Cadillac. This site was abandoned much like the Cat and Grainger sites. However, the site appears to be completely devoid of any residual development based on recent aerial reconnaissance, and there is no obvious evidence of environmental degradation. CZN is not proposing to re-use this site, and is proposing to change the road alignment to join the Liard Highway near Nahanni Butte.

Mine Area Roads and Clearings

The majority of roads, drilling pads and clearings in the Mine area also pre-date CZN's tenure. These may still be used for on-going exploration by CZN. Further Mine development is not expected to add to the existing clearings in any significant way, therefore, a cumulative aspect does not exist. The concern here is potential cumulative impacts in the form of soil erosion and water course sedimentation, habitat fragmentation or other impacts on wildlife, contamination of water and soil, and effects on vegetation. During the Phase 3 drilling program, great emphasis was placed on sediment prevention and monitoring. It was determined that drilling operations had no discernible impact in terms of sediment production, and by far the greatest control was exerted by the magnitude of creek flows. Wildlife and vegetation studies described elsewhere in this DAR concluded that impacts from Mine development will be minimal, largely because of the large areas involved and availability of similar habitat. As such, there are no significant residual impacts with which to be cumulative on.

13.7 Human Activities

Past human activities in the area include traditional hunting and trapping and mineral exploration. Present activities are the same, with the addition of hunting by outfitters. Other sections of this DAR have described that traditional hunting in the Mine area is less than historically recorded, and with the expansion of the NNPR, outfitting will cease in 2019. Other sub-sections of this chapter have defined that there is no significant cumulative aspect to Mine operations in terms of water quality and wildlife. In this assessment, mining projects on the NWT-Yukon boundary were considered, despite the fact these are almost 200 km away and further. No rationale was found to consider any other developments.

A potential cumulative aspect exists associated with impacts on wildlife from access road operations and use of the road for hunting by persons outside of the region. As explained above, CZN is discussing options with the NBDB to control access and use of the road, primarily for safety concerns. It is hoped that this will keep un-authorized road use to a minimum.

13.8 Monitoring/Adaptive Management

In the above text, potential cumulative effects have been assessed to be minimal. Consequently, the need for monitoring and adaptive management is considered to be limited. Situations that are considered to require a degree of monitoring, which might lead to adaptive management, are as follows:

- If the Mackenzie Gas Project ("MGP") occurs during the life of the Mine, or vice versa, labour conditions will require additional monitoring to limit the loss of Mine workers, disruption of the workforce, and potential problems associated with having to acquire workers from further away, and re-hiring workers after the MGP construction phase is over; and,

- Use of the access road will be closely monitored for safety reasons. In addition, use by hunters from outside the region will be monitored to assess the potential for impacts to wildlife. Changes to the control of road use may need to be made if hunting pressures, or safety issues associated with it, are considered to be too great.