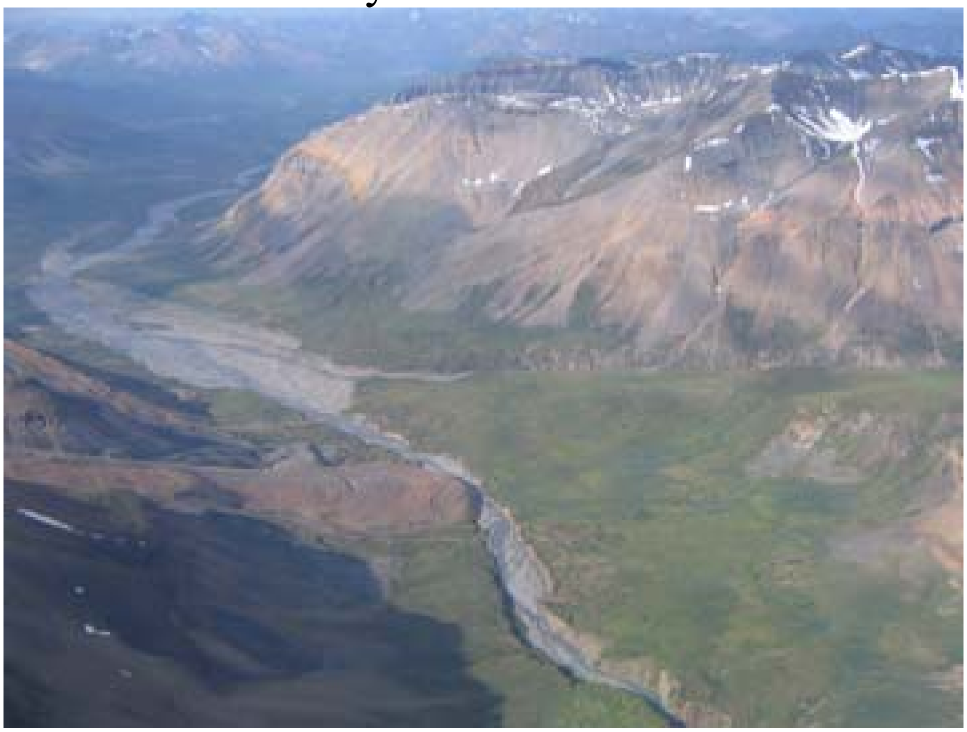
Gayna River **(Pb, Zn, Gallium)**

The Gayna River property is located in the Northwest Territories at the headwaters of the Gayna River, centred at 64058’ N latitude and 130041’ W longitude, UTM Zone 9, 419641E and 7203425N. Access to the claims is provided by helicopter from either Norman Wells, NWT, 186 km to the east of the property or from Mayo, Yukon Territory, 298 km to the west.

Gayna River Area



The Gayna claims lie above the tree-line and cover a broad alpine valley and the flanking mountains. Elevations vary from 1100 m in the valleys to 2239 m at the mountain peaks.

The Gayna River claims are underlain by Neoproterozoic rocks containing numerous significant Zn-Pb showings and several areas containing brecciated, carbonate-hosted low-grade Zn-Pb deposits. The mineralogy of the deposits is simple, consisting predominantly of sphalerite and galena with minor pyrite. Significant gallium, germanium and silver contents are also associated with the Zn-Pb mineralization.

Work done during the 2006 field season focused on re-checking the surface showings and collecting samples for confirmation assaying. Prospecting for new Zn-Pb showings and mineralized float was also done and several soil geochemical lines were put in to test soil responses in covered areas containing mineralized float.

During the 2006 field season surface showings and historical core remaining from Rio Tinto were extensively sampled. A number of these rock samples were analysed for by ICP geochemical methods at a commercial laboratory while some were sent on to the University of Alberta to support geological, geochemical and isotopic research carried out by B. Wallace as part of her M.Sc. Thesis. Stable isotope analyses at the U of A returned a range of δ13C and δ18O values. Low δ13C values in the late calcite phase could be a result of interaction of fluids with organic matter in the rocks. Variable δ18O values could be a result of several source fluids having different initial isotopic compositions. Microprobe analyses done at the U of A show that anomalous values of gallium exist in the Gayna sphalerites, especially those at the B Showing. Additional work has also revealed that gallium is enriched in the Gayna galenas as well.

Property Location and Access
The Gayna River property is located in the Northwest Territories at the headwaters of the Gayna River. The claims are centred at 64058' N latitude and 130041' W longitude, UTM Zone 9, 419641E and 7203425N. Access to the claims is provided by helicopter from either Norman Wells, NWT, 186 km to the east of the property or from Mayo, Yukon Territory, 298 km to the west. Fixed-wing access into the area is provided by two airstrips near the claims. The Gayna airstrip is 19.3 km to the east and the Mountain River airstrip is 45.1 km to the southwest of the Gayna River claims. In winter months, ski-equipped Twin Otter aircraft can land on both airstrips as well as in the valley directly southeast of the claims. Tundra-tire-equipped Twin Otters can land at the Mountain River airstrip only in summer. The shorter Gayna River airstrip can accommodate only smaller, tundra-tire-equipped light aircraft.

The Gayna claims are above tree-line, extending from the bottom of a broad alpine valley and over the side of a rugged mountain. The elevation in the region varies from 1100 m in the valleys to 2239 m on the mountain peaks.

The alpine vegetation consists of sparse shrubs in the valley with grass, sedge and moss meadow giving way to rocky talus and barren rock outcrop on the mountain sides. The claims are snow-free from mid-June to mid-September. Numerous locations in the valley bottom are suitable for a base camp.

The property is 80 km west of the proposed Mackenzie Valley pipeline route, which could supply access and power to any future mine development on the claim group.

Tenure
The property consists of 15288.4 acres owned 100% by Eagle Plains Resources. It carries no royalties or other encumbrances.

History and Previous Work
1974 - Initial staking by Cordilleran Engineering Limited on behalf of Rio Tinto Canadian Exploration Limited (Rio Canex).
1975 - Property-scale reconnaissance mapping, geochemical sampling and 2,136.6 m (7,010 ft) of diamond drilling around "A" showing.
1976 - Geological mapping, geochemical sampling, Winkie drilling plus 68 other diamond drill-holes totalling 9,183.9 m (30,131 ft) on a 609.6 m (2,000 ft) grid spacing to test the potential of known showings.
1977 - Detailed mapping, geochemical sampling, 85 diamond drill-holes totalling 13,838 m (45,400 ft) on a 61 m (200 ft) grid centred on the seven best intersections from the 1976 drilling. Two 305 m (1,000 ft) diamond drill-holes were drilled on the western side of the property to test a large soil geochemical anomaly. - Hewton (1978) reported that 13% of the diamond drill-holes had an average grade of 4.58% Zn, 0.52% Pb with an average thickness of 4.54 m (14.9 ft), using a 2% cutoff and an average grade of 5% Zn+Pb. A large tonnage reserve was estimated.
1978 - Geophysical surveys consisting of induced polarisation (IP) and a limited amount of gravity surveying were carried out around the main Zn-Pb showings.
1979 - Extensive gravity surveying, focusing on anomalous IP results from the 1978 program. 22 diamond drill holes totalling 3,031.8 m (9,947 ft) tested high-priority geophysical, geochemical and

geological targets. Drilling intersected only minor amounts of mineralization with the best intersection of 23.2 m (72.7 ft) grading 2.55% Pb+Zn.
Mid 1980's – Rio Tinto Claims Lapsed.
2000 - Claims staked by Eagle Plains Resources. Geological mapping and sampling.
2003/04 - Sampling of surface showings. - Core relogging and sampling, Laboratory research: fluid inclusion work, lead isotope dating, hydrocarbon content.
2006 - Prospecting, mapping and sampling of surface showings. Core relogging and sampling. Rock and soil geochemical sampling in selected areas of the claim group. Laboratory research: fluid inclusion work, lead isotope dating, hydrocarbon content as part of Bronwen Wallace's M.Sc. Thesis at the University of Alberta.

Regional Geology
The regional geology of the district around Gayna River was published by Aitken (1974, 1982). Hewton (1982) discussed the local geology of the Gayna River Zn-Pb claims and provided an excellent summary of the Rio Tinto geological work. More detailed descriptions and interpretations of the stratigraphic units are provided by Aitken (1981) and Turner et al. (1997; 2000).

Zn-Pb mineralization at Gayna River is hosted predominantly by the Little Dal Group of the Neoproterozoic Mackenzie Mountains Supergroup. The succession consists of shallow to deep-water carbonate, terrigenous clastic and evaporitic rocks. The Little Dal Group on the property and to the northeast of the claims is unconformably overlain by basal quartzose redbeds and overlying grey-weathering dolostone of the upper Cambrian Franklin Mountain Formation. The unconformity locally reaches as low as the quartz arenite of the Katherine Group, which underlies the Little Dal Group.

Property Geology
Figures 3a and 3b show a plan of the regional geology and the geologic legend respectively. The strata that host the Zn-Pb mineralization are in the upper part of the Little Dal Group (Fig. 4). The host rocks are shallow-marine dolostones that were deposited in a high-energy, open-marine setting. A generalized stratigraphic column is provided in the property geology map on the Gayna River Project Page (PDF).

The work in this report focused on the mineralised parts of the claim group. The part of the stratigraphy that was examined in detail was within the central part of the Little Dal Group and extends from the Lower Limestone unit upward through the Grainstone formation ("host units") and into the overlying "silty dolostone".

Scattered Zn-Pb mineralization is present in most of the stratigraphic units throughout the area but the showings in the host unit (Grainstone formation of informal GSC stratigraphic nomenclature) of the Little Dal Group are the most important in terms of size and grade. Past exploration work focused on this stratigraphic interval and the Zn-Pb showings that it contains.

The stratigraphy on the property was mapped in detail (1:5000 scale) by Rio Tinto and brief descriptions were published by Hewton (1982). Hardy (1979) discussed the stratigraphy on the property in her M.Sc. thesis.

Stratigraphically detailed work by Aitken (1981), Turner (1999) and Turner et al. (1997; 2000) provide a more modern context for the mineralization. The following stratigraphic descriptions are extracted from their work. Understanding the stratigraphy of the lower Little Dal Group (Mudcracked fm. to Gypsum fm.) is essential to accurately mapping the property, delineating and interpreting the mineralization, and making the best predictions of where further mineralization may be present in the subsurface. The following summarises the units encountered on the property that should be acknowledged by any future mapping program.

Stratigraphy from Aitken (1981) Turner (1999) and Turner et al. (1997, 2000)
(comparison to obsolete property stratigraphy of Hardy (1979) and Hewton (1982) also provided)

Neoproterozoic

Katherine Group (300-1700 m thick)
The oldest rocks exposed on the property, in the vicinity of the old Rio Tinto camp, consist of white fine- to medium-grained, cross-bedded quartz arenites of the Katherine Group. The group is several kilometres thick and consists of seven formation-scale informal members that alternate between fluvial and shallow marine. Only the uppermost unit is exposed on the property. Although these strata consist of massive layers, in situ outcrops are sparse, and exposures are characterised by slopes of large quartz arenite talus blocks.

Little Dal Group
The Little Dal Group consists of seven informal formations (Aitken, 1981), informally grouped into lower and upper parts: (1) Mudcracked formation; (2 and 3) Platformal and Basinal assemblages (=2 laterally equivalent units); (4) Grainstone formation; (5) Gypsum formation; (6) Rusty Shale formation; and (7) Upper Carbonate formation. All except the Platformal assemblage are present on the property, but units 1 to 4 (=lower Little Dal Group) are most relevant to mineralization.

Mudcracked formation (informal) (~9-65 m thick; approximately 60 m thick at Gayna River)
The Katherine Group quartz arenite is conformably but abruptly overlain by dark grey-weathering siltstone and shale, white quartz arenite, and interlayered carbonate rocks of the Mudcracked formation. A restricted shallow-water origin is indicated by an abundance of trough cross-bedding, wave ripples, halite casts, mudstone intraclasts, synaeresis cracks, hummocky cross-stratification, and graded beds deposited by storms. The top of the formation is marked by a very conspicuous, dark orange-weathering quartz sandy pisoid dolograinstone several metres thick, rarely with associated stromatolite bioherms. This unit is well exposed beneath the west end of Table Reef (for reef details see Aitken (1989) and Turner et al. (1997, 2000)).

Basinal assemblage (425-631 m thick; approximately 430 m thick at Gayna River)
The Basinal assemblage consists of deeper-water limestone and shale that is temporally equivalent to platformal carbonates in the distant southeastern part of the basin. It consists of four subtle members, each containing a shaly lower part and a carbonate-dominated upper part; the thickness of each member varies regionally, and member contacts are gradational. Each member records sea-level rise (deep-water shale deposition) followed by shallowing to a level that was generally below storm wave-base (lime mudstone deposition, largely as water-column precipitates). Recognition of these members will aid in mapping at the Gayna River property. The Basinal assemblage also contains enormous calcimicrobial reefs whose attributes are critical to mineralization.
- ***Basinal member 1*** (~40 m at Gayna River)
Grey siltstone and shale that sharply overlie the pisoid grainstone of the Mudcracked fm. Has increasing carbonate mudstone interbeds upwards and culminates in a distinctive, resistant stromatolite biostrome

(~2-6 m, but thicker in the vicinity of calcimicrobial reefs; see below) containing isolated to linked bioherms of branching columnar stromatolites (either medium grey limestone or orange-buff-weathering dolostone).

- ***Basinal member 2*** (~200 m at Gayna River)

Basinal member 2 is regionally variable in its nature, colour and thickness, but always consists of lime mudstone and shale. Intraclast floatstone to rudstone overlying the stromatolite marker of Basinal member 1 pass upward into predominantly red-coloured shale with subordinate grey, green and black parts (shale may be of different colour in other localities). The shale contains variable amounts of decimetric, oblate lime mudstone nodules and sparse, thin- to medium-bedded, continuous lime mudstone layers. Interlayers of current-rippled quartzose sand and silt are rare but conspicuous in the lower part. Continuous lime mudstone layers predominate in the uppermost part of the member (~upper 25 m). Mechanical sedimentary structures are almost entirely absent in the limestone. (The shale-dominated part of Basinal member 2 was formerly referred to as "dead-end shales", and the lime mudstone-dominated part (together with basinal member 3) was called the "lower limestone".)

- ***Basinal member 3*** (~30 m at Gayna River).

This is the subtlest of the members to distinguish. The upper, carbonate-dominated part is characterised by the intermixture of quartz silty material into the carbonate, and its intercalation between carbonate layers. Parallel lamination and ripple cross-lamination are rare.

- ***Basinal member 4*** (~ 150 m at Gayna River).

Dark grey shale is overlain by dark grey-weathering argillaceous lime mudstone containing the uniquely Proterozoic sedimentary structure known as molar-tooth structure. This is a poorly understood type of subaqueous shrinkage crack that was filled with microcrystalline calcite cement prior to sediment compaction. The deformation of the lithified crack-fills during dewatering and compaction of the matrix resulted in ptygmatic folding and breakage of the dark grey, several millimetre-thick sheet-crack fills into thin plates that were collapsed and rotated within the matrix of lime mudstone, and locally reworked to be deposited as intraclast layers. Sometimes the matrix is dolomitised, which highlights the dark-coloured crack fill. (This unit was informally known as "sharpstone breccia" and "china rock" in the obsolete Rio Tinto terminology).

Calcimicrobial reefs (thickness equivalent to entire Basinal assemblage, plus several 10s of metres into Grainstone fm.) Understanding the nature of the reefs and their relationship to laterally equivalent, enclosing strata of the Basinal assemblage and Grainstone fm., and to the overlying Grainstone fm. is essential to mapping the property and delineating mineralization. The reefs consist of a unique, vaguely stromatolite-like framework built by calcified cyanobacteria; the framework is generally difficult to see in outcrop except where it has been water-washed. Reef growth surfaces were considerably higher (tens to over a hundred metres) than the surrounding sea-floor, and were in the photic zone and above storm wave-base. The reefs nucleated on the top of the Mudcracked fm. during transgression, and their growth patterns were closely tied to sea level. They grew upwards during sea-level rise (when basinal shale was deposited in off-reef areas), and prograded and expanded in plan view during sea-level lowstand, shedding boulders of reef talus down their flanks; their complex internal facies also reflect the changing paleobathymetry recorded by off-reef stratigraphic patterns. The carbonates of Basinal members 1 to 3 are associated with increased shedding of reef talus, manifest as haloes of boulders around exhumed reefs or as wedges of boulders that intertongue with off-reef carbonates at reef margins.

Terminal reef growth is likely critical to the history of mineralization. During the marked sea-level rise recorded by Basinal member 4 shale, reefs grew upward, forming almost vertical pinnacles. The shallowing that eventually followed resulted in deposition of Basinal member 4 molar-tooth lime mudstone on the sea-floor below the reef flanks, and planed off the upper surfaces of reefs, forming a flat upper surface that intersects the almost vertical reef margins at a right angle. The paleotopography of dead reefs persisted as shallowing continued, and eventually the Basinal assemblage passed gradationally over 2-3 m to the Grainstone fm. (described below). Several small sea-level fluctuations that took place during deposition of the lowermost Grainstone fm. resulted in accumulation of microbialite and oncolite units (total of <10 m) across the bare, dead reef tops when the surfaces were flooded. These reef-capping microbialite facies also prograded over the immediately surrounding off-reef areas on the slopes surrounding reefs, such that they are now preserved within the lower Grainstone fm. as laterally restricted microbialite layers interbedded with dolomitised ooid grainstone. One of these small sea-level excursions is recorded by brief resumption of molar-tooth lime mudstone deposition; this unit is part of the reef-capping facies and is interlayered with ooid grainstone of the lower Grainstone fm.; it should not be equated with the molar-tooth lime mudstone of upper Basinal member 4 (this will result in an erroneous and misleading map pattern).

Grainstone formation (~425 m; thickness at Gayna River uncertain) The conformable basal contact is gradational over several metres. The formation consists of dolomitic ooidintraclast grainstone, stromatolitic dolostone, and minor interlayered argillaceous dolostone and/or quartzose dolostone, with considerable lateral variation in facies. The carbonate particles and stromatolites can be very difficult to discern owing to fabric-destructive dolomitization. Rio Tinto geologists divided the formation into 4 units at Gayna River.

(1) The "lower host" (~60 m) is an orange-buff-weathering, finely crystalline, cross-bedded ooid dolograinstone (ooids next to invisible owing to dolomitization). Layering is 20-70 cm thick. Interlayered stromatolites and other microbial lithofacies are present. Randomly distributed "sedimentary breccias" consist of fragments of dolostone, shale and argillaceous dolostone cemented by finely crystalline, dark grey dolomudstone; these may be more common in the immediate vicinity of reefs.

(2) The "argillaceous marker" (~15 m) consisting of dark grey, thinly parted silty and locally pyretic limestone. The uppermost part contains a 3 m thick conglomerate. The argillaceous marker represents a brief interval of deeper water sedimentation between energetic, shallow-water intervals.

(3) The "upper host", consisting predominantly of orange-buff-weathering ooid dolograinstone (~80 m) that is almost identical to that of the "lower host". It contains a marker unit of chert nodules near its top.

The lower and upper host units commonly contain cavity-filling, late, white sparry calcite, dolomite or barite, referred to as “influx”. The colour contrast confers distinct appearance to the rock. In the Upper Host the influx tends to fill breccia interstices, whereas in the lower host, it forms bedding-parallel veins. The upper host generally contains more numerous sphalerite occurrences, but occurrences in the lower host contain greater concentrations of sphalerite. The presence of impermeable units in strata overlying the mineralised host rocks was likely an important control on mineralization. The argillaceous marker and the silty dolostone likely acted as aquitards that trapped fluid beneath them, constraining its movement to the upper parts of the lower and upper hosts, respectively.

(4) The "silty (or flaggy) dolostone" consists of yellow-buff-weathering, rippled, cross-bedded, stromatolitic, oolitic and desiccation-cracked silty dolostone. The thickness of this unit is uncertain,partly because Rio Tinto geologists believed that the overlying Gypsum formation was a local, lateral equivalent of the Grainstone formation, and included the interval up to the base of the Rusty hale (i.e., including the Gypsum formation) in the Grainstone formation. This perception of the Gypsum fm. as a local facies variant of the Grainstone fm. has since been proven untrue, and so an unknown thickness of evaporite rocks may be present under cover on slopes above the Grainstone formation and below the basal Rusty Shale at the Gayna River property – this thickness would have been erroneously included in the thickness of the "silty dolostone" by Rio Tinto and mapped accordingly.

Gypsum formation (>550 m; thickness at Gayna River uncertain) This formation is regionally poorly exposed, but one of the few good exposures of it is just northwest of Gayna River, where the (stratigraphically incomplete) exposure is >375 m thick. The formation is in excess of 550 m thick elsewhere. It contains thick, regionally traceable members, and consists in large part of banded and intermittently multidirectionally current-rippled white to pale grey gypsum with minor red, grey or green gypsiferous siltstone and dolostone, particularly near the base. A regional subtidal marker unit with nodular and molar-tooth carbonate is present near the top of the formation (~10 m). Nodular and enterolithic gypsum fabrics are common in some sections. The formation was deposited under subtidal conditions with intermittent influence of currents. No evidence of subaerial exposure is present, except in carbonates at the very base of the formation. See note under Grainstone fm. regarding the Rio Tinto geologists' perception of its stratigraphic relationship with the Gypsum fm.

Rusty Shale formation (115-260 m; ~240 m NW of Gayna River) Recessive, desiccation-cracked, ripple-marked, black to rusty-grey, shaly mudstone, siltstone and very fine grained pyritic or dolomitic quartz arenite. Five regional members: basal dolostone(~40 m), lower varicoloured shale (<80 m), middle sandstone (,50 m), upper shale (<50 m) and upper dolostone (<50 m) (Aitken et al., 1978a; Aitken, 1981). Abrupt but conformable basal contact (This unit was called the "variegated clastics" by Rio Tinto geologists.)

Upper Carbonate formation (up to 720 m; thickness at Gayna River variable owing to sub-Cambrian erosion) This unit comprises cliff-forming, poorly preserved, grey and tan-weathering stromatolitic to oolitic dolostone and limestone, and grey to brown nodular mudstone. The formation is unconformably overlain by a variety of late Neoproterozoic to Paleozoic units.

Paleozoic – Cambrian to Devonian

Sub-Cambrian Unconformity and Franklin Mountain Formation

At Gayna River, the Little Dal Group is truncated by a sub-Upper Cambrian unconformity that cuts progressively stratigraphically downward into the Katherine Quartzite to the northeast of the Gayna River Property. Elsewhere on the property, this unconformity intersects the Little Dal succession anywhere between the Rusty Shale and the upper host unit of the Grainstone fm. An irregular, 1 m thick conglomerate bed is present locally on the unconformable surface and is overlain by interbedded red, orange, and green poorly sorted terrigenous clastic rocks and thick beds of grey dolostone of the Franklin Mountain formation. Trilobites are present at lower levels, and tetracorals and brachiopods are present near the top.

Delorme, Arnica, Landry, Hume, Hare Indian, Canol Formations

Thick accumulations of medium-bedded Devonian dolostone and limestone are present in the claim area. Variable terrigenous silt content yields conspicuous colour variations. These upper Devonian units are the youngest in the vicinity of the property

Depositional History and Environments

The early Neoproterozoic Mackenzie Mountains Supergroup was deposited in a failed rift or sag basin. The lower part of the succession is unexposed. Of the exposed interval, lowermost carbonates and mudstones of the H1 unit and Tsezotene Fm. are overlain by fluvial and marine sandstone of the Katherine Group. The Little Dal Group records predominantly shallow-water carbonate deposition, with the exception of the deeper-water basinal assemblage shale and lime mudstone and associated reefs.
Unconformably overlying the Little Dal Group in parts of the Mackenzie Mountains is the younger Neoproterozoic Coates Lake Group of the Windermere Supergroup, which records localised, initial rifting and sediment deposition in alluvial fans, playas, and shallow subtidal environments. It consists of basal volcanics (the "Little Dal lavas", which are not related to the Little Dal Group), immature terrigenous rocks of the Thundercloud Fm., evaporites, siltstones, quartz arenites and minor carbonates of the Redstone River Fm., and carbonates and siltstones of the Coppercap Fm. These units are not present at Gayna River. Intervening units of latest Neoproterozoic to mid-Cambrian age are not present at Gayna River. The oldest Paleozoic rocks preserved belong to the Franklin Mountain Formation, representing a transgressive shoreline overlain by lagoonal shallow-marine carbonate rocks. By upper Devonian times a deep-marine environment existed, recorded by black shale of the Hare Indian and Canol formations.

Structural Geology

The property is situated at the transition from intense folding and thrust-faulting of the main mountain ranges to gentle folding of the foothills. The Neoproterozoic succession at Gayna River is now exposed in the core of a large, open box anticline that trends northwest. Although beds dip at 600 to 700 on the limbs of the anticline, the bedding is nearly flat in central areas. Normal and reverse faults trending 170º and 110º are present in the Proterozoic rocks and are believed to be part of the Racklan Orogeny. Movement on most faults is on the order of 30 m vertically at the most, but two major faults running northwest through the central part of the property, one just west of the “A” showing and one just east of the “F” showing, have displacement on the order of 300 m. Intense shearing, rubble and crackle breccia, and gouge are commonly, but not always, associated with faulting. Conjugate fracture patterns to major fault trends also developed. Minor folding between the Neoproterozoic and the early Cambrian is indicated by small-scale folds truncated by the sub-Cambrian unconformity. A second interval of faulting took place during the Mesozoic to Tertiary Laramide Orogeny. The predominant trend of these normal, reverse, and thrust faults is 800 and 1500. Movement on the normal and reverse faults was on the order of a hundred metres at most, but thrust fault displacement to the south of the claim block was many times greater. Folding during the Mesozoic resulted in large box anticlines and symmetrical anticlines with steep-sided synclines. Fold axes generally trend 1500 (Hewton, 1976).

The claim group lies at the centre of an anticline and most beds have a gentle 5-100 dip to either the SW or the NE. Steeply dipping normal faults have vertical displacements of up to 30 m. Two main fault directions on the claim group trend NW-SE and N-S (Fig. 4). dolomitization and mineralization do not appear to be related to any specific structures identified from surface mapping.

Jointing is not significant either in drill-core or in outcrop. Well-jointed rocks can enhance permeability and result in substantial fluid flow. Data is lacking on any jointing in drill-core or outcrop mapping from previous work and may either be insignificant or not reported. More field work should be done to establish whether any specific generation of jointing, faulting or folding is in any way related to brecciation and mineralization.

Dolomitization in Relation to Zn-Pb mineralization

Dolomitization is important alteration product associated with the carbonate-hosted Zn-Pb mineralization found at Gayna River. Dolomization seen at the surface showings and in diamond drill-core, at Gayna River, shows that much of the dolomite is fine-grained, grey-black to light grey-white or red-brown, and is pervasive throughout the lower and upper host units, the argillaceous marker and the silty dolostone. A later, white dolospar forms pore- and cavity-filling cement and is associated with sphalerite and galena.

Abundant porosity in breccia zones remained after dolospar precipitation ceased. Later calcite spar cement with associated minor barite and fluorite sealed the remaining breccia porosity. This is the sparry dolomite and calcite that was referred to as carbonate "influx" by the Rio Tinto geologists.

Dolomitization commonly accompanies sulphide precipitation in many Zn-Pb deposits. Distinguishing mineralization-related replacive dolomite from regional diagenetic dolomite is important to understanding the mineralising system at Gayna River. The upper and lower host units were initially dolostone and limestone, and were further dolomitised and recrystallised by the mineralising fluids. The overlying silty dolostone shows effects of an early regional dolomitization associated with shallow subtidal conditions and possibly refluxing brines (Machel, 1993) that were not related to the mineralising process.

Most dolomite at Gayna River is a weak to moderate, pervasive, replacive recrystallisation of the host rock. It obliterated many of the primary carbonate textures and locally transformed the replacive dolostone into a white, coarsely crystalline dolospar. Coarse, pore-filling dolospar is present either as a pore- or cavity-filling cement or as a neomorphic transformation of the host dolostone, and forms the substrate on which many of the Zn-Pb sulphides are precipitated. The dolomite at Gayna River is an inherent part of the alteration halo produced by warm to hot, saline ore fluids. Carriere and Sangster (1999) reported salinity of 20.2 equivalent Wt. % NaCl from sphalerite inclusions (range of 15.5 to 26.5 equivalent Wt. % NaCl). Later, post-sulphide, pore-filling dolomite is present in only minor amounts. Most of the infilling cement within fractures, veins, pores and vugs is a late, post-ore, white, coarsely crystalline calcite.

FIELD AND RESEARCH PROGRAM PROCEDURES AND RESULTS

Scope of the 2006 Program

Field work on the Gayna River project was completed between the 15th of June and the 7th of July, 2006. A four person crew was based at a fly camp located on the Gayna River property with off-site helicopter support as weather permitted. Prospecting and sampling of showings and mineral occurrences was preformed to verify grade and dimensions of mineralization as previously reported. Relogging and sampling of core from diamond drilling done in the late 1970's was carried out during the field program.

GPS locations for some historic Rio Tinto drill hole collars were acquired. Four lines of soil sampling were completed over prospective areas as indicated by mineralized float or by the historic Rio Tinto sampling. Microprobe mineralogical anlyses on sphalerite and stable isotope analysis of various carbonate phases was done at the University of Alberta by B. Wallacein conjunction with on-going geologic research as part of an M.Sc. Thesis. .

Rock Geochemistry

Chip samples were taken at the A, B and C showings. At the A Showing, four intervals spanning the length of the showing were sampled. Chip sample returned values of 2.5% Zn over 11 m, 10.8% Zn and 2.4% Pb over 10 m, 14.4% Zn over 9 m, and 6.1% Zn over 9 m. Three chip sample sections, spaced at 20 m intervals, were cut across the B Showing. These samples returned 0.9% Zn over 4 m, 1.4% Zn over 4 m, and 2.7% Zn over 7 m. Four chip samples were taken at the C Showing. The chip samples returned 2.7% Zn and 1.6% Pb over 5 m, 6.7% Zn and 11% Pb over 2 m, 7.1% Zn and 6.7% Pb over 2 m, and 4.5% Zn and 1.6% Pb over 1 m.

Soil Geochemistry

Three soil lines were completed on mineral claim K00198 in the southern portion of the Gayna claim group. This prospective area is underlain by Upper Host grainstones and the extensive overburden blanket here has scattered mineralized float containing significant galena and sphalerite. Several anomalous areas were defined by the three soil lines. Further sampling must be done to delineate upslope cut-offs of the mineralization.

A contour soil line was run along a combination of favorable stratigraphy underlain by Upper Host grainstones cut by a significant normal fault on each of mineral claim K00197 and K00226. These lines did not show significant soil anomalies.

Drill Core Relogging

Seven diamond-drill holes (A30, A32, A33, A34, B28, 77-102, 77-B14) from the 1976 and 1977 Rio Tinto drill programs were relogged at the old Rio Tinto drill core storage site on the Gayna River Property. The drill holes were selected where the Rio Tinto drill logs indicated the following: the presence of mineralization accompanied by either quartz or pyrobitumen; drill site location to give a geographic spread to sample data; and whether the core was still intact, hence representative. All footages were converted to metres, but an Imperial Unit log is also provided for ease of cross-referencing with the old Rio Tinto drill logs, originally recorded in feet.

Drill hole B28 spans the interval from Basinal member 4 molar-tooth lime mudstone to the silty dolostone of the Grainstone formation. Various colours of sphalerite, including orange and green, are present. Veining and brecciation are variable and contain up to 40% spar.
Drill-hole A33 has veins up to 7 cm wide and contains quartz; no mineralization is present.
Drill-hole A30 contains red sphalerite and displays evidence of fluids being controlled by stylolites.
Drill-hole 77-102, orange and red sphalerite is present in calcite veins and octahedral pyrite is present.
Drill-hole A34 is entirely within reef facies. It contains pyrite alteration centred on vertical stylolites and has some large (10 cm) vugs. Drill-hole 77-B14 contains sedimentary breccias and an extremely fractured rubble zone which is interpreted as a possible fault. Orange sphalerite in 77-B14 is associated with dolospar and pyrobitumen.
Drill-hole A32 contains quartz throughout and has pyrobitumen-filled vugs. Red sphalerite is present. A pyrite vein, occurring on a stylolite surface, is associated with yellow sphalerite.

Fracture and vein orientations were measured where possible. This information will help with future structural geology reinterpretation when making cross sections and interpreting structural trends.

Stable Isotope Results

The results for the host dolomite are listed as $\delta 13C$ values of 1.755 to 4.601 per mil relative to PDB and $\delta 18O$ values of 22.113 to 25.239 per mil relative to SMOW. The later dolospar phase had $\delta 13C$ values of 0.696 to 2.471 per mil relative to PDB and δ18O values of 19.964 to 26.632 per mil relative to SMOW. The late calcite space-filling phase had δ13C values of -3.002 to -2.962 per mil relative to PDB and δ18O values of 16.603 to 20.251 per mil relative to SMOW.

Gayna River has a late calcite phase with low δ13C values. This type of result is also known from other deposits such as the Pering deposit of South America. Such values may be explained by oxidation of a small amount of organic CH4 by the circulating fluids (Huizenga et al., 2006). This is a possibility for Gayna River, because pyrobitumen is present throughout the deposit, indicating that hydrocarbons were present as a source for CH4. Hence the low δ13C values in the late calcite phase may have resulted from interaction of the mineralizing fluids with organic matter in the host rocks.

A wide range of δ18O values was present in the Gayna River samples analysed. The dolospar samples had a 6.7‰ spread in δ18O values, and all of the dolomite δ18O values fell within the same range. By analysing formation waters from various sedimentary basins, Clayton et al. (1966) found that the oxygen isotope composition was variable. They proposed that the cause of the variation was different meteoric sources, rock-water exchange, and fractionation. At Gayna River it is plausible that the oxygen isotope variation may be due to differing initial fluid isotope compositions, suggesting that two or more fluids may be involved in the mineralizing processes.

Such a trend is present in many carbonate-hosted Zn-Pb deposits and may be the result of rapid precipitation, higher temperatures, and/or fluid chemistry changes (Spangenberg and Herlec, 2006).

Sphalerite Crystals Containing Gallium

Microprobe Analyses of Sphalerite Crystals

Microprobe analyses show an abundance of trace elements present in the sphalerite at Gayna River, including selenium, cadmium, copper, cobalt, nickel, arsenic, gallium, iron, silver, and manganese. Previous trace-element studies failed to link sphalerite colour to simple elemental impurities. New microprobe data, recently collected at the University of Alberta as part of Wallace's M.Sc. thesis, reveal gallium values in orange sphalerite of up to 0.215 wt %. Mapping of individual sphalerite crystals shows that the gallium distribution is heterogeneous; some crystals show clear growth-zoning with respect to gallium whereas others have uniformly low gallium concentrations.

Copper values have a strong positive correlation with gallium in all sphalerite crystals analysed to date. Additional microprobe work in progress at the U of A has also shown that the gallium is concentrated in galena as well as sphalerite.

CONCLUSIONS AND RECOMMENDATIONS

The Gayna River claims encompass Neoproterozoic carbonate rocks containing numerous significant Zn-Pb showings. The simple mineralogy of the deposits, dominated by sphalerite and galena, should make future mineral processing easy and should yield high Zn and Pb recoveries in concentrate. Additional economic elements of gallium and germanium would report with the sphalerite and silver will report with galena. The low iron sulphide content associated with the mineralized zones means that they will not be acid generating.

Mineralization at Gayna River is loosely considered to be of Mississippi Valley-type. The geological setting, simple mineralogy, dolomitization, dissolution, brecciation and Zn-Pb mineralization all bear similarities to other MVT deposits in northern Canada, such as the Pine Point and Polaris Zn-Pb deposits.

Soil geochemistry shows that zinc and lead anomalies correlate with areas of mineralized float within target formations of the favorable host stratigraphy. Soil sampling is a powerful exploration tool and should be used on the property to locate additional mineralization in areas of overburden cover. A number of old soil geochemical anomalies defined by Rio Tinto should be verified and prioritized for geophysical testing with induced polarization methods.

At Gayna River it is variation in the oxygen isotope compositions may arise from differing initial fluid isotope compositions. This suggests that two or more fluids were involved in the mineralizing processes.

The calcite, dolomite and dolospar sampled in the mineralized areas at Gayna river trend toward lower $\delta 13C$ and $\delta 18O$ values in later paragenetic phases. Such a trend is present in many carbonate-hosted Zn-Pb deposits and may be the result of rapid precipitation, higher temperatures, and/or fluid chemistry changes.

Microprobe analyses show abundant trace elements present in the sphalerite at Gayna River, including selenium, cadmium, copper, cobalt, nickel, arsenic, gallium, iron, silver, and manganese. New microprobe data, recently collected at the University of Alberta, reveal gallium values, in orange sphalerite, up to 0.215 wt%.

Specific recommendations are as follows:

1. Cross and longitudinal geological sections should be prepared to show the relationship between the distribution and shape of Zn-Pb mineralization to the contact area between the algal reefs and surrounding grainstone host unit.

2. Data from historic drill logs should be coded and entered into a digital database that is compatible with a 3D modelling software program. The Rio Tinto diamond drill-hole logs will have to be examined in detail to extract data allowing geological intervals to be coded according to mineralization type, dolomitization type, brecciation, internal sediment content and dissolution features.

3. Historic drill holes in the contact area between algal reefs and grainstone host units should be re-logged and the core re-examined in the field to identify mineralization grade, alteration, host rock dissolution and brecciation and to target the areas of maximum fluid movement.

4. Additional soil geochemical sampling should be done to test new areas as well as to confirm and follow-up past geochemical anomalies and develop geophysical targets. More sampling must be done to delineate the up-slope cut-offs of anomalies defined in the 2006 field season.

5. Geophysical surveying utilizing induced polarization methods should be carried out over geochemical targets with priority given to those areas in the vicinity of algal reef margins.

6. A mercury vapour survey could be carried out over the new and the historic Rio-Tinto geophysical surveys to test for sphalerite-rich areas vs. The predominantly pyrite-rich zones.

7. Diamond drilling should be planned to test combined geochemical and geophysical targets occurring in areas of favorable geology, especially those area near the algal reef margins.

8. Further work should be done to identify the source of the gallium and other trace elements in the hydrothermal system. This can be achieved by characterizing the chemistry of the mineralizing fluids through analyzing fluid inclusions in sphalerite. Fluid inclusion measurements are currently under way as part of Wallace's M.Sc. thesis research work at the U of Alberta and will be published when completed.

This project is available for option.

Updated Aug 13, 2009