

# Iron Range (au, ag, cu, fe, pb, zn)

## SUMMARY

In 2008 Eagle Plains Resources Ltd carried out a diamond drilling program on its 100% owned IOCG prospect known as the Iron Range Property. The claim group is located in the Nelson/Fort Steele Mining District. The Iron Range property consists of 3681 hectares located in the Goat River area 15km NE of Creston, BC. The claims are owned 100% by Eagle Plains Resources Ltd., and carry no underlying royalties or encumbrances.

## Iron Range Drilling



Eagle Plains has consolidated a large land package which includes all significant claims in the area, including lands suitable for mine infrastructure and tailings areas. The southern and northern parts of the property are road-accessible, and the southern part has been logged extensively. The

claims are situated along a high pressure gas pipeline and a high voltage hydro-electric line which follow the CPR mainline and Highway 3 South.

The Iron Range deposits were originally staked in 1897 and were covered by Crown Grants held by Cominco Ltd and the CPR. When the grants were reverted in 1999, Eagle Plains Resources Ltd. recognized the opportunity to secure the Iron Range deposits and the original FeO and IR claims were acquired. Past work on the Iron Range deposits by Cominco Ltd. was directed toward the considerable iron oxide resource and consisted of trenching and very shallow (20m depth) diamond drilling in the area along the Iron Range fault zone. Ongoing work by Eagle Plains Resources Ltd. is focused on exploring the potential of the Iron Range fault zone and surrounding area as a conduit and host for both Iron-oxide-Cu-Au (IOCG) mineralization and sedimentary exhalative (SEDEX) Ag-Pb-Zn mineralization.

The 2008 Diamond Drilling Exploration Program focused on exploration of the Union Jack, O-Ray, Keepsake, Rhodesia and Unnamed mineral occurrences located within the Iron Mountain Fault Zone (IMFZ). The two primary objectives of the drill program were as follows;

- 1) To test the IMFZ for prospective IOCG mineralization and,
- 2) to define a near surface Iron resource.

High-grade Au mineralization occurs adjacent to the IMFZ at the O-Ray Minfile occurrence. Assay results of the high-grade zone are as follows: 51.52 g/t Au, 2.39 g/t Ag over 7.00 meters; including 89.98 g/t Au, 4.17 g/t Ag over 4 meters; also including 118.45 g/t Au, 5.56 g/t Ag over 3.0 meters (IR08006). The high-grade gold mineralization is hosted within a Chl-Alb-Mt-Hem-Lim metasomatic alteration halo flanking the western margin of the IMFZ. Qtz-Hem-Chl-FI-Ms+/-Py+/-Au+/-Ag crackle veinlets occur as stockwork within the metasomatic alteration. Hydrothermal metasomatism and surficial weathering have altered the high-grade interval to friable albite-limonite gouge.

Further results are documented below, including conclusions and recommendations for the 2009 field program.

The 2008 diamond drilling activities and related exploration on the Iron Range property resulted in a total of \$634,182.26 in expenditures.

### **Property Location and Access**

The Iron Range Property is located 15 km northeast of Creston, B.C. between the Goat River and Arrow Creek drainages (Figure 1). The claims are centered at approximately Latitude 49°12'N, Longitude 116°24'W (NTS 6832001 N / 633500E) on NTS Map sheets 82F018 and 019.

The southern property boundary is located approximately 1 km north of Highway 3. Access to the southern property is via a network of forestry roads (FSRs) including the Arrow Creek and Crackerjack Creek FSRs. The northern and eastern part of the property is accessed via the Iron Mountain and Hall Lake FSRs, which branch off of the main Goat River Forest Service Road north of Kitchener. The property is bisected by a historic Cominco exploration trail which runs roughly parallel to the main Iron Range Fault structure and is easily accessed using an ATV from the south and 4WD vehicle from the north. The town of Creston is approximately 15 kilometers west of the property.

The eastern part of the property in the area of Six Mile and Crackerjack Creek has been extensively logged, and the southern part of the property is partially within the Arrow Creek Community Forest License.

A well developed transportation and power corridor lie at the southern end of the Iron Range claims, where a new high pressure gas pipeline and a high voltage hydro-electric line follow the CPR mainline and Highway 3 south. The rail line provides efficient access to the Cominco Ltd. smelter in Trail, B.C.

The claims cover alpine to sub-alpine terrain within the Iron Range of the southern Purcell Mountains. Elevations range from 800 to 1900 meters, with moderate to very steep topography. Outcrop exposure is good on ridges but generally poor at lower

elevations. The central part of the property is a broad N-S oriented ridge which is bisected by the main Iron Range Fault structure. Past trenching has exposed significant portions of the Iron Range structure along this ridge.

### **History and Previous Work**

The Iron Range prospect was discovered and staked in 1897 along an extensive belt of iron oxide showings. Initial work included several small shafts, adits, and trenches, as well as limited diamond drilling to a maximum depth of 20 meters. Many of the original claims on the Iron Range were established as Crown Grants. In 1939, The Consolidated Mining and Smelting Company of Canada Ltd., along with its parent company Canadian Pacific Railroad (CPR), acquired the main claim block on the northern part of Iron Range Mountain. The claims were evaluated by CM&S (later Cominco Ltd., then Teck Cominco Ltd, and now Teck Ltd.), to assess the potential for a large iron resource. As part of this evaluation, Cominco Ltd. completed an extensive trenching program in 1957, exposing the Iron Range structure and mineralization over more than 4 kilometers strike length.

In the 1980's Cominco Ltd. completed regional-scale work through the area as part of its Sullivan search program. This included reconnaissance-scale mapping, some contour soil geochem, and reconnaissance UTEM. Most of the Iron Range Crown Grants were held by Cominco – CPR until 1999, when they were reverted. Eagle Plains Resources Limited re staked the original Crown Grants as the FeO and IR claims on the day the historic grants lapsed. These claims cover the main part of the Iron Range structure worked by Cominco including the historic Union Jack crown grant in the north and the Rhodesia crown grant in the south. Eagle Plains subsequently staked the TCK claims in the area of Thompson Creek to cover the historic Great War crown grants.

The May Bee MinFile showing has seen historical (pre-1950s) exploration with two levels developed on the south end of the current holdings. This is different mineralization, proximal to the Iron Range fault system, with chalcopyrite and associated gold and silver values in a 0.3m to 1.5m wide quartz vein hosted by a gabbro sill.

The Virginia MinFile occurrence also saw some historic small scale development with two levels developed approximately 40 meters apart on a galena bearing quartz vein. The showing area was also tested by diamond drilling and electromagnetic surveying in the early 1950's.

**2001 fieldwork** by Eagle Plains consisted of grid and contour soil geochemical sampling along the trace of the Iron Range fault system. Results from the work program indicate that the Iron Range structure has a geochemical signature consistent with that associated with other Fe Oxide Cu-Au-U-REE deposits. The total cost of the 2001 geological exploration work on the Iron Range Project was \$62,356.62.

**In 2002** Eagle Plains Resources retained Lucas Marshall to undertake a compilation study on the Iron Range area and to oversee 2002 fieldwork. Mr. Marshall has a PhD

from James Cook University in Queensland Australia with a doctoral thesis on Olympic Dam type deposits. 2002 fieldwork included geological mapping with an emphasis on structural and alteration mapping at a scale of 1:20,000. Grid and contour soil geochemical sampling were aimed at constraining soil anomalies established in 2001 were also conducted. A limited rock geochemical sampling program was undertaken in order to assess the geochemical character of the Iron Range metasomatic ironstones and associated alteration.

Results and conclusions from the 2002 work included:

- Iron Range metasomatic ironstones are marked by significant enrichment in Fe<sub>2</sub>O<sub>3</sub>, Au, V, Co, Cr, Ni, SiO<sub>2</sub> and Sc
- Geochemical targets along and adjacent to the Iron Range fault zone exhibit enrichment in multiple IOCG indicator elements including Cu, Co, Ba, La and P
- Identification of SEDEX style geochemical anomalies within a narrow stratigraphic interval near the contact between the Middle Aldridge and Ramparts facies. This stratigraphic interval is likely the time-equivalent to the Lower-Middle Aldridge contact (LMC), where the Sullivan Ag-Pb-Zn deposit is located.

Mr. Marshall recommended more work on the project, including assessing both SEDEX and IOCG targets. The total cost of the 2002 geological exploration work on the Iron Range Project was \$67,506.36.

**In 2003**, Eagle Plains carried out soil geochemical surveying in areas of interest identified by previous work programs. A total of 624 samples were collected. Total expenditures were \$15,000.00.

**In spring 2004**, GeoTech Ltd. flew a high resolution VTEM geophysical survey over the Iron Range property, centered roughly on the Iron Range Fault Structure, with more detailed lines flown over the inferred LMC. A total of 695 line kilometers was flown, covering 58.2 km<sup>2</sup>. The data was reprocessed and interpreted by Condor Geophysics who identified a number of AdTau conductivity and mag anomalies. During the summer of 2004, Eagle Plains collected 1062 soil geochemical samples and 8 silt samples targeting the area of the inferred LMC.

Doug Anderson, P.Eng. was retained by Eagle Plains to provide geological mapping in the area of the Lower Middle Aldridge (Sullivan Horizon). Late in 2004, a diamond drill program was carried out to test the northern part of the main Iron Range structure in the area of the historic Cominco trenches. Three holes on two sites were completed for a total of 570.4 meters (1870 feet). The drill contractor was FB Drilling of Cranbrook, BC using a Longyear LF70 drill cutting NQ sized core. The drill was moved to the first site using an A Star helicopter provided by Bighorn Helicopters of Cranbrook, BC. The drill was mounted on an enclosed skid shack and moved using a D6 cat. Crews commuted to work from Creston via the Hall Lake FSR and the Iron Range exploration trail established by Cominco in the 1950s. The total cost of the 2004 work was \$242,617.53.

**Work at the Iron Range continued in 2005.** Geochemical coverage was expanded to cover the southwestern part of the property in an area of both geophysical AdTau enhancement and anomalous soil geochemistry. A total of 1870 soils, 15 silts, and 3 rock samples were collected by Bootleg Exploration field crews. Doug Anderson completed further geological mapping in the southwest area. In late spring, Eagle Plains completed a four hole 1377 meter test of geological, geochemical and geophysical targets in the area of the Lower Middle Aldridge contact. Three different sites were tested using NQ sized core. Drill moves and core haul were helicopter supported. The lower drill site was road accessible, and the two upper sites were accessed via the CrackerJack Creek FSR and then by foot to the drill.

The total cost of the 2005 work was \$282,532.99.

## **2008 Exploration Program**

### **Objectives**

The main objectives of the 2008 exploration program were:

- 1) Drilling for prospective IOCG mineralization hosted within the down dip expression of the Union Jack Minfile occurrence.
- 2) Drilling to provide a near surface Iron resource over three kilometers strike length from the Rhodesia Minfile occurrence to the Union Jack Minfile occurrence.
- 3) Obtaining structural information indicating attitude of the IMFZ at depth using the EZ Mark core orientation survey tool.

A. NQ diamond drilling totaling 1684m in 20 holes, was drilled between June 19, 2008 and July 20, 2008.

### **2008 Exploration Results**

Diamond drilling in 2008 focused on exploration of the Union Jack, O-Ray, Keepsake, Rhodesia and Unnamed mineral occurrences located within the Iron Mountain Fault Zone (IMFZ). The two primary objectives of the drill program were as follows;

- 1) To test the IMFZ for prospective IOCG mineralization and,
- 2) to define a near surface Iron resource.

### **Conclusions**

Diamond drilling in 2008, carried out by Eagle Plains Resources Ltd, tested areas of known iron-oxide mineralization over 3.13 km of strike. The following conclusions have been deduced from analysis of the historic and 2008 data:

- High-grade Au mineralization occurs adjacent to the IMFZ at the O-Ray Minfile occurrence. Assay results of the high-grade zone are as follows: 51.52 g/t Au, 2.39 g/t Ag

over 7.00 meters; including 89.98 g/t Au, 4.17 g/t Ag over 4 meters; also including 118.45 g/t Au, 5.56 g/t Ag over 3.0 meters (IR08006). The high-grade gold mineralization is hosted within a Chl-Alb-Mt-Hem-Lim metasomatic alteration halo flanking the western margin of the IMFZ. Qtz-Hem-Chl-Fl-Ms+/-Py+/-Au+/-Ag crackle veinlets occur as stockwork within the metasomatic alteration. Hydrothermal metasomatism and surficial weathering have altered the high-grade interval to friable albite-limonite gouge.



Visible Gold in drill core under microscope

- Continuous elevated Au-Ag mineralization is present adjacent to, and within the IMFZ over a strike length of 1600 meters from the O-Ray zone to the Rhodesia zone. Assays from drill core samples returned values ranging from 0.1 g/t Au to 0.85 g/t Au, and 1.5 g/t Ag to 48.96 g/t Ag. The elevated Au-Ag values are hosted within veined metasomatic alteration/brecciation consistent with that observed in the high-grade zone discovered at the O-Ray.
- Anomalous Cu mineralization is present within the IMFZ at 200 meters vertical depth below the Union Jack Minfile occurrence. One assay returned a value of 1423 ppm Cu over 0.72 meters within a Hem-Mt-Py-Ccp-Chl-Qtz breccia (DDH IR08018). The Fe-oxide + Ccp breccia is hosted within Chlorite-Albite-Fe-Oxide alteration, which has been overprinted by sericite-quartz-hematite hydrothermal alteration. Recent studies by Corriveau et. al. 2008 pertaining to utilizing alteration assemblages as a vector for fertile IOCG mineralization, illustrate that late stage sericite-specular hematite-quartz-chlorite-barite-calcite/siderite-fluorite is a signature of low temperature K<sup>+</sup> alteration. The low-temperature potassic alteration assemblage is considered an important indicator of fertile IOCG mineralizing conditions.
- Anomalous values of the following IOCG trace elements occur within the IMFZ Fe-oxide breccias: V, Co, P, Fe, Cu, Ag, Au, and As.
- A distinct zonation of alteration is observed adjacent to and within the IMFZ and is as follows:

- (i) Distal (Meta-sediments) – quartz+/-sericite+/-chlorite+/-albite+/-Fe-Oxide crackle veins  
(ii) Transitional (IMFZ contact zone) – chlorite+/-albite+/-sericite+/-Fe-oxide+/-carbonate+/-limonite+/-quartz  
(iii) Central (IMFZ) – albite+/-quartz+/-Fe-oxide+/-py+/-chlorite+/-limonite+/- Fe-carbonate+/- apatite+/-muscovite

- The IMFZ ranges in width from 12 meters – 30 meters over the 3.13 km strike length explored by diamond drilling activities in 2008
- Hematite-Magnetite-Pyrite mineralization was observed in all holes drilled in 2008. The observation of both iron-oxide, and iron-sulfide within IOCG deposits is significant in that it tells us that the chemistry of the system was in an intermediate redox state (Skirrow, 2008). IOCG systems having an intermediate redox state chemistry have produced high-grade Au deposits within the Tennant Creek District (Skirrow, 2000).
- Carbonatite and/or lamprophyre breccia pipes have been identified adjacent to and underlying the Union Jack, adjacent to the O-Ray and La Grande, and within the Union Jack, Rhodesia, and May-Bee Minfile occurrences.
- High-grade Au mineralization has a pronounced nugget effect, yielding highly variable Au values within mineralized zones.
- Fe-Oxide mineralization sampled from the IMFZ in 2008 is of sub-economic grade.

The 2008 diamond drilling activities and related exploration on the Iron Range property resulted in a total of \$634,182.26 in expenditures.

### **Recommendations**

A three phase exploration program is proposed for the 2009 field season.

Phase I - Data compilation, Phase II - Detailed geological mapping, Phase III - Diamond Drilling Activities (600 m total).

### **Regional Geology**

The Iron Range property is located on the west flank of the Purcell Anticlinorium, a broad generally northplunging structure in southeastern B.C. that is cored by Middle Proterozoic Purcell Supergroup rocks and flanked by Upper Proterozoic Windermere Group or Paleozoic sedimentary rocks. The Iron Range area is well to the west and in the hangingwall of the Moyie Fault, a major, regional right-lateral reverse fault which to the east becomes part of the Rocky Mountain fold and thrust belt event. The property does however straddle the Iron Mountain (Range) Fault (IMF) complex which consists of a number of north-striking faults which occur across an east-west extent of about 3 kilometers. The core fault zone is thought to link with the St.Mary-Hall Lake Fault systems about 30 kilometers to the north. The IMF cuts the core of the Goat River anticline which is a major secondary fold on the west limb of the anticlinorium. The IMF

continues south into the United States and along its entire length as a mappable structure it is marked by a linear magnetic anomaly on airborne surveys.

The rocks of the Goat River anticline are those of the Aldridge Formation which is the lowest part of the Purcell Supergroup. The Purcell Supergroup comprises an early synrift succession, the Aldridge Formation, and an overlying generally shallow water post-rift or rift fill sequence which includes the Creston and Kitchener Formations and younger Purcell rocks.

The Aldridge is the oldest formation of the Proterozoic Belt-Purcell Supergroup. The Supergroup is a thick sequence of terrigenous clastic, carbonate, and minor volcanic rocks of Middle Proterozoic age. The basal Aldridge Formation, as exposed in Canada, is siliciclastic turbidites about 4000 meters thick. It is informally divided into the Lower, Middle, and Upper members. To the north and east in the basin, the Lower Aldridge (LA), the base of which is not exposed, is about 1500 meters of rusty weathering (due to pyrrhotite), thin to medium bedded argillite, wacke and quartzitic wacke generally interpreted as distal turbidites. The Sullivan ore body occurs at the top of this division. To the south and west in the basin in Canada, the upper part of the Lower Aldridge is dominated by grey weathering, medium to thick bedded quartz wackes considered to be proximal turbidites. The Lower Aldridge is commonly host to a proliferation of Moyie intrusions, principally as sills. The Middle Aldridge (MA) is about 2500 meters of grey to rusty weathering, dominantly medium bedded quartzitic wacke turbidites with periodic inter-turbidite intervals of thin bedded, rusty weathering argillites some of which form finely laminated marker beds (time stratigraphic units correlated over great distances within the Aldridge/Prichard basin). There are several Moyie intrusions as sills within the Middle Aldridge including two of the most consistent, laterally extensive sills. The Upper Aldridge is about 300 meters of thin bedded to laminated, rusty weathering, dark argillite and grey siltite often in couplet-style beds.

### **Intrusive Rocks**

Gabbros and diorites of the Moyie Intrusions are present as sills in the Ramparts facies and the Middle Aldridge with individual widths up to approximately 100m. These sills can be divided into a lower series in the Ramparts facies and lowermost Middle Aldridge, and an upper series in the uppermost Middle Aldridge. Individual sills vary substantially in grain size, color and magnetic character rendering correlation based on these characteristics problematic. Most of the sills are non-to weakly-magnetic, and rarely attract a hand magnet. Adjacent to some sill contacts, Aldridge Formation sedimentary rocks record soft-sediment deformation features consistent with the interpretation that the sills were emplaced into wet sediments. Gabbro is also found as pods within the Iron Range fault zone, suggesting that gabbro was emplaced as a dyke along at least part of this structure.

While granitoid intrusions are not found within the Iron Range map area, the exposed margin to the Cretaceous Bayonne batholith crops out approximately 10km to the northwest. A polymictic lamprophyre breccia dyke with biotite phenocrysts up to 2cm is noted at one locale to be emplaced along the Iron Range fault zone. The matrix to the lamprophyre breccia is non-foliated suggesting it was emplaced late in the fault history. Current studies by Mike Galicki, M. Sc., student of Simon Fraser University, are

investigating the presence of apatite-phlogopite-magnetite alkaline carbonatite intrusives found within and adjacent to the Iron Mountain (Range) Fault Zone.

### **Structure**

The Iron Range fault zone is exposed on the west limb of the Goat River anticline, a regional scale gently northnorthwest plunging fold. The trace of the fault trends approximately north, such that at the northern end of the map area, the fault lies approximately 5km from the axial trace of the Goat River anticline, while at the southern end of the property, the two are approximately coincident. As a consequence, bedding in the northern half of the map area most commonly dips moderately to the west-northwest, with subordinate beds on the eastern limbs of parasitic anticlines dipping to the east-southeast. The southern half of the map area is approximately coincident with the axial trace of the Goat River anticline, and bedding is nearly flat lying. Although east-dipping fold limbs are poorly represented in the map area, an approximately 90° spread in the orientation of east- and west-dipping fold limbs indicates that the Goat River anticline and associated parasitic folds are open folds (Figure 4). The calculated orientation of the axial plane to regional folds is 195/83 (westnorthwest-dipping).

Fold axes to mesoscale folds exhibit shallow to moderate plunges to the north-northwest, that are consistent with the calculated  $\eta$  axis orientation of 07/015. The approximately 30° spread in both the plunge of measured and calculated fold axes and the spread in bedding measurements reflect a non-cylindrical component to the regional fold hinges. A regional foliation is best developed in fine grained siltstones and silty shales, most common in the northern half of the map area. The mean orientation to this regional foliation is 196/61 (west-northwest-dipping). Except where measured along the axial plane of mesoscale parasitic folds, this foliation has a more shallow dip than the calculated axial plane to the Goat River anticline (195/83). This difference can be explained by the common observation that the moderate-dipping regional foliation in fine grained lithologies refracts across coarser grained lithologies to form a sub-vertical fracture cleavage. Thus while the regional foliation is not typically axial planar to regional folds it is a product of the folding event.

### **Property Geology**

The Iron Range deposits are located along the Iron Mountain (Range) Fault system, a regional structural feature which has a strike length of at least 90 kilometers. The fault zone forms a continuous deformation corridor stretching from the southern to northern ends of the property. Stinson and Brown (1995) note that a southern continuation of the fault is exposed 1.5km southeast of Mt Thompson, where it forms an anastomosing set of faults. To the north of the map area the Iron Range fault is cut by the Arrow Creek thrust system (Reesor, 1981).

Within the claim block the Iron Range Fault Zone (IMFZ) is defined by several north-striking faults which cut all three stratigraphic divisions of the Aldridge Formation. The trace of the fault trends approximately north, such that at the northern end of the map area, the fault lies approximately 5km from the axial trace of the Goat River anticline, while at the southern end of the property, the two are approximately coincident. The northern part of the property was mapped by Marshall in 2001. Here, the Iron Range fault zone ranges in width from <50m to approximately 150m. Net displacement is difficult to

constrain due to the lack of distinct stratigraphic horizons, but appears to be minor, based on the apparent offset of a sill in the central portion of the 2001 map area. The fault zone is characterized by a combination of brittle and ductile features, including a central mylonite zone with localized cataclastic breccias. This grades outwards in both the footwall and hangingwall into zones of crackle brecciation, veining and localized shearing. The structural features preserved in the fault indicate at least one period of deformation after the sediments were lithified, and after crystallization of the Moyie Intrusions. Further, crackle breccias in the fault zone are not overprinted by the regional foliation, suggesting that at least some deformation along the Iron range fault zone occurred late- to post-folding and regional foliation development. The range of preserved deformation styles suggests deformation occurred near the elasto-frictional to quasi-plastic transition described by Sibson (1977), which typically occurs at a depth between 10 and 15 km.

The shear fabric developed within the fault zone has a mean orientation of 178/77 (west-dipping) and variation in strike of individual measurements between approximately 160 and 200° reflects anastomosing of the shear fabric within the fault zone. Given the correlation between the mean orientation of the measured shear fabric, and the mapped orientation of the fault, the mean shear fabric is taken as a good approximation of the fault orientation. In the northern half of the map area, the shear fabric has a mean orientation of 181/76 (west dipping) while in the southern half the mean orientation is 168/85 (west dipping).

Drag folding of both sediments and gabbroic sills is noted in both the footwall and hangingwall to the fault. Bedding measurements on both sides of the fault exhibit a consistent shift towards more steeply west-dipping orientations as the fault is approached. This suggests predominantly normal displacement on the fault during at least one ductile (or brittle-ductile) slip event. The occurrence of rare pull-apart structures within banded hematite-quartz mylonite also suggests normal displacement.

2004 - 2005 mapping focused on a 40 square kilometer area on the southern end of the Iron Range north of Highway 3/95 between the Goat River on the east and Arrow Creek on the west. Mapping was done at a scale of 1:10 000 with a generally low percentage of outcrops encountered. The 2004 - 2005 mapping area covers the core of the Goat River anticline reaching significant portions of the limbs on the east and west. Mapping defined the most significant features as the north-trending, numerous faults and the features associated with them. The core of the anticline corresponds to the core of the Iron Range fault complex as well. Here at least three parallel faults occur across 1250 metres east-west. The faults exhibit moderate displacement of the Sullivan Horizon.

They have also influenced the emplacement of Moyie intrusions as dykes and sills, focused iron oxide mineralization as hematite and magnetite with associated alteration as albite and chlorite with tectonic brecciation, localized sedimentary fragmental formation and influenced the development of the Sullivan Horizon and bounding sedimentation. These growth faults, active during the early Proterozoic are also re-activated structures (probably at several different times) until approximately middle of Middle Aldridge (MA) time. There are several other north-striking faults on the map-sheet One fault on the east side of the property also appears to control features such as sill and dyke emplacement, albite/chlorite alteration and sedimentary fragmental formation. It appears

to cut close to the axis of an anticlinal fold on the east limb of the Goat River structure. On the west side, a NNE-trending fault influenced the same type of developments as for other faults. The west side of this structure is not well defined because of a lack of outcrop.

This complex of structure has impacted the Aldridge Formation host rocks and the included Moyie intrusions. The oldest sedimentary rocks are Lower Aldridge encountered at the very base of outcrop along the north flank of the Goat River. The thickness of rusty weathering, thin bedded, argillaceous, distal turbidites is limited, quickly becoming dominated by thick bedded quartzites of the Ramparts Facies (RF) up section. Ramparts Facies is a Lower Aldridge-equivalent section of about 650 metres thickness which defines upper Lower Aldridge in the southwest part of the Canadian portion of the Purcell basin. Ramparts Facies is represented by grey weathering, thick to very thick bedded, fine to medium grained quartz wacke to quartzitic wacke. There are interbedded argillaceous units which approximate 5 to 15% of the section. These are current impacted, often dark colored, biotitic wacke to argillite. Ramparts Facies are proximal turbidites, rapidly deposited in a high energy environment. Intruding the Lower Aldridge and Ramparts Facies are numerous Moyie intrusions as sills and dykes of variably crystalline gabbro to quartz diorite. On the east side, granofels was noted in the lower sill intruding Rampart Facies rocks.

Above the Ramparts Facies are Middle Aldridge sediments exemplified by moderately rusty weathering, interbedded AE or ACE turbidites which are dominantly medium bedded QcW with intervals of thin bedded to laminated wackes. Stratigraphic marker horizons exist within this portion of the Middle Aldridge and one such marker was located on the northeast portion of the map-sheet. This provides some measure of stratigraphic control on the entire section of MA through RF to LA. Moyie intrusions are present as dykes and sills as relatively minor units but major, regionally extensive sills occur higher in the MA, north of the map area.

The Lower/Middle Aldridge Contact (LMC) or Sullivan Time is present on the property and occurs at the interface between Ramparts Facies and the Middle Aldridge. Outcrop is not complete enough to view Sullivan Horizon so a definitive, measurable section of Sullivan Time has not been located but its character would make it naturally recessive.

In 2005, emphasis was given to field examination of the west side along the NNE-trending fault zone as further modeling of the airborne geophysics data indicates an EM conductor occurs at a shallow depth. This west-facing slope into Arrow Creek has little exposure but outcrops in the area suggest some variations from the normal MA rock sequence. Black argillites and quartzites in the area of the anomaly suggest an anoxic sub-basin may be present. As well, tourmaline is ubiquitous as minor disseminations in the sediments. Some float over the northcentral part of the anomaly is black, quartz-rich rock matrix to charcoal grey carbonaceous clasts as fragmental.

The NNE fault appears to project through and impact the shape of the EM response. Mineralization in the map area is represented primarily by the hematite-magnetite zones within the core fault complex of the Iron Range. They are cross-cutting, often breccia zones within the gabbro dominated section.

The main focus of the mapping was to evaluate the possibility of base-metal, sulphide mineralization occurring at Sullivan Time. Presently known sulphide showings are cross-

cutting copper, lead, and zinc localized within Moyie intrusions. There is also the upper sill on the east side which contains quite abundant pyrrhotite locally, some of which is nickeliferous. No additional (new) sulphide occurrences were located as a consequence of the mapping.

### **Early fault history**

In the northern half of the map area, the Iron Range fault lies predominantly on the west-dipping limb of the Goat River anticline, which has a mean orientation of approximately 210/30. By unfolding this limb to horizontal about the regional fold axis, the original orientation of the Iron Range fault in the northern half of the map area is shown to have been approximately 170/50 (west-dipping). In the southern half of the map area the fault cuts near flatlying stratigraphy, and as such the current orientation of the fault of approximately 170/85 (west-dipping) is close to the original orientation.

### **Other fault zones**

A broad zone of weak crackle brecciation and albitization striking approximately 035° with a near vertical dip marks the Black Bear fault. The fault zone is poorly exposed, and timing, sense and magnitude of displacement remain unconstrained. The projected intersection between the Black Bear fault and the Iron Range was the target for DDH IR04-003.

An inferred fault marks the apparent 1100m stratigraphic offset of a sill to the east of the Iron Range fault in the northern half of the map area, and is here named the Alder fault. The Alder fault is not exposed, and it remains uncertain as to whether the apparent offset is a result of the intrusion cutting upsection during emplacement along a growth fault, tectonic displacement, or a combination of the two. The projected intersection of the Alder fault and the Iron Range fault zone was the target for DDH IR04-001 and 002. The Crackerjack fault is described by Stinson and Brown (1995) as a narrow fault zone trending approximately parallel to and east of the Iron Range fault. The Crackerjack fault is marked by a zone approximately 10m wide of crackle to mosaic brecciation within Middle Aldridge quartzite. It remains uncertain if and where the Crackerjack and Iron Range faults intersect.

### **Moyie Sills**

The nature of the gabbroic Moyie sills within and adjacent to the IMFZ remains enigmatic. Pods of gabbro occur along the Iron Range fault zone at stratigraphic positions where sills are absent in regions of the Belt-Purcell Supergroup of similar age. In addition sills placed in structural juxtaposition across the fault zone are not stratigraphically coincident. Furthermore gabbros are anomalously thick and abundant in the vicinity of the Iron Range fault. The Moyie intrusives are widely accepted as having been emplaced into unconsolidated sediments deposited during syn-rifting tectonism.

### **Alteration**

The following descriptions serve to place order to the complex mosaic of hydrothermal and regional metamorphic alteration within and adjacent to the IMFZ. Alteration terms adopted from L. Corriveau, P. Williams, H. Mumin, 2008:

**Chlorite1** – Occurs as regional metamorphic alteration within Middle Aldridge Sediments, observed distal to the IMFZ.

**Chlorite 2** – Occurs with albite and magnetite as psuedo-igneous intrusions enveloping the IMFZ ((Ca(Na)Fe) or Chlorite + Albite Zone). The Chlorite + Albite zone is found at the margins of the IMFZ in the “Crackle Breccia Zone”

**Chlorite 3** – Occurs as clots and wisps with in IMFZ breccias.

**Chlorite 4** – Pervasive chloritization of carbonatite matrix.

**Silica 1** – Silicification of quartz rich sediments and the chlorite+albite zone in proximity to the IMFZ.

**Silica 2** – Hydrothermal silica flooding of the IMFZ as primary cement within IMFZ breccias, and as crackle veins flanking the IMFZ proper.

**Albite 1** – Pervasive albitization of metasediments flanking the IMFZ, original rock type and textures obliterated ((Na(Ca)) or albite zone). Sugary white to brown in color.

**Albite 2** – Framework clasts within tectonic breccia. Clasts are often nucleation sites for pyrite mineralization. White to rose in color.

**Albite 3** – Occurs with chlorite and magnetite as psuedo-igneous intrusions enveloping the IMFZ ((Ca(Na)Fe) or Chlorite + Albite Zone). The Chlorite + Albite zone is found at the margins of the IMFZ in the “Crackle Breccia Zone”.

**Hematite 1** – Specular hematite as fine grained disseminations and fracture fill crackle veins within the Na(Ca) and Ca(Na)Fe zones. Dusty gray to black in color.

**Hematite 2** – Semi-massive growth of hematite within the IMFZ breccias. Occurs as breccia matrix. Often inter grown with pyrite. Blood red to black in color.

**Hematite 3** – Fracture fill veinlets associated with sericite alteration. Red to purple in color.

**Magnetite 1** – Semi-massive to massive growth as primary cement within IMFZ breccias. Often overprinted by pyrite mineralization. Near surface mineralization is vuggy, primarily black in color.

**Magnetite 2** – Euhedral crystals ranging in size from 2 – 10 mm, within carbonatite intrusions.

**Sericite 1** – Occurs as regional metamorphic alteration within Middle Aldridge Sediments, observed distal to the IMFZ.

**Sericite 2** – Overprinting of chlorite within the Ca(Na)Fe zone. Sericite mottles psuedo-igneous envelope. Coupled with red hematite veinlets, quartz veinlets and pyrite mineralization. Milky white to yellow in color.

**Carbonate 1** – Ankerite occurs as fracture fill crackle veins which cross-cut the IMFZ breccias.

**Carbonate 2** – Carbonate matrix – carbonatite intrusions.

**Argillic - Clay** – Intense alteration of Middle Aldridge Sediments within and flanking the IMFZ. Orange-yellow in color, hardness < 2.

### **Breccia Styles**

The IMFZ is characterized by a combination of brittle and ductile features, including a central mylonite zone with localized cataclastic breccias. This grades outwards in both the footwall and hangingwall into zones of crackle brecciation, veining and localized shearing. The following breccia descriptions highlight the textural variations:

**Crackle Breccia** – Albite-chlorite-sericite-hematite mottled, sub-angular to angular framework clasts suspended in a matrix of quartz+/-hematite+/-magnetite+/-pyrite crackle veins. Crackle breccias are found peripheral to the IMFZ core complex. Framework clasts are strongly altered and may be white-orange-greenish-yellow in color. Hematite is disseminated through the framework clasts.

**Jigsaw Breccia** – Albite framework clasts containing disseminated pyrite within a matrix of Fe-Oxide (specular hematite > magnetite) and quartz. Classified as a tectonic crackle breccia, often displaying cataclastic fabrics. Located in the core of the IMFZ complex. The name “jigsaw breccia” is derived from the angular nature of the framework clasts. Framework clasts are white-pink in color.

**Tectonic Breccia** – Hematite+/-Magnetite+/-Pyrite+/-Albite+/-Quartz+/-Chlorite+/-Cb breccia. Fe-Oxide and quartz are the primary cement, with chlorite and carbonate as secondary phases. Tectonic breccias were classified upon the presence of heterolithic framework clasts in conjunction with a pronounced cataclasticmylonitic fabric.

**Late-stage Breccia** – Cross-cutting tectonic features characterized by sub-angular to rounded Fe-oxide-pyrite-chlorite- albite framework clasts in a silica matrix. These features are prominent at the Rhodesia Minfile occurrence.

### **Mineralization**

Mineralization is represented primarily by hematite-magnetite-pyrite-quartz-albite breccias within the core fault complex of the Iron Range. The following text will provide insight into the nature of the breccias observed during the 2008 drill program:

**Oxide Zone Breccia** – Generated from meteoric groundwater interaction or hydrothermal processes. Fe-oxides occur as jet black, semi-massive-massive, vuggy magnetite mottled with reddish-brown specular hematite. Pyrite mineralization is leached from the interval. The leaching process has produced sub-angular to sub-rounded vugs ranging in size from 2 – 30 mm. In some instances the weathered vugs are enveloped by a chlorite-magnetite matrix. Wall rock in contact with the leached Fe-Oxides displays strong limonitic alteration, and in some instances is reduced to an argillitic clay gouge.

**Hematite+/-Magnetite+/-Pyrite+/-Quartz+/-Albite+/-Chlorite+/-Cb+/-Ccp Breccia** – Characterized by semimassive to massive hematite (specularite to blood red amorphous variety) +/- pyrite replacing magnetite. Quartz occurs as the primary cement, with ankerite, sericite, chlorite, and muscovite as secondary accessory phases. Framework clasts consist of albitized meta-sediments, silica, chlorite, and ankerite nodules. Albite framework clasts are commonly found at the margins of the tectonic breccias and/or within siliceous bands of breccia matrix. Pyrite mineralization is common along the IMFZ, and occurs disseminated through albite framework clasts, and Fe-oxide-silica matrix.

### **Mineralization of Economic Importance**

Copper and/or gold, and/or silver and/or lead and/or zinc mineralization have been discovered in at least seven locations adjacent to, and within the Iron Mountain Fault Zone over a distance of 11.60 km. Moving from south to north seven of these zones are as follows:

**May-Bee** (Au-Ag-Cu), **DDH IR05003** (Au-Ag-Pb-Zn), **Rhodesia** (Ag), **Keepsake** (Ag), **O-Ray** (Au-Ag), **Union Jack** (Cu), **Mike-Kennedy** (Cu-Au-Ag).

The principle mineral containing copper is chalcopyrite (CuFeS<sub>2</sub>). Chalcopyrite (Ccp) occurs as macroscopic grains and nodules within quartz and ankerite veins. The relationship between the Cu<sup>±</sup>-Au<sup>±</sup>-Ag quartz veins and the Fe-oxide breccias of the IMFZ is still unclear.

Of significance is the 2008 discovery of Ccp as fine disseminations within Fe-oxide, breccia style mineralization 200 meters below the Union Jack occurrence. The blood red amorphous hematite is intimately associated with sericite alteration observed within the IMFZ in DDH IR08018. Chalcopyrite mineralization in DDH IR08018 occurs within a Hematite-Magnetite-Pyrite-Quartz-Albite-Chlorite-Carbonate breccia adjacent to the sericite alteration zone described above. Chalcopyrite mineralization is disseminated throughout the Fe-oxide mineralization at the foot wall contact and within ankerite crackle veins cross-cutting the interval.

Native gold (Au), occurs in quartz as coarse flakes > 140 microns, with a lesser fraction of fine gold <140 microns. Gold particle size was determined by a 250g screen metallic assay method, performed by EcoTech labs of Kamloops, B.C.

The principle mineral containing silver (Ag) mineralization is undetermined at the present time. The high grade Au-Ag intercept found at the O-Ray zone occurs in a strongly altered shear zone found adjacent to the IMFZ Fe-oxide breccias. The shear zone is sub-vertical and occurs as a series of quartz stockwork veins within friable albite, chlorite, and limonite altered meta-sediments. Fluorite, pyrite, hematite, magnetite, and chlorite were observed within quartz recovered from the high grade gold zone. The high grade Ag intercept found in the hanging wall of the Keepsake zone is of similar width, orientation, and displays alteration characteristic of the O-Ray Au-Ag zone. Although no Au results were obtained from the Keepsake zone, the anomalous Ag values indicate the presence of mineralized fluids within the system.

The relationship between Au-Ag mineralization is still unclear, however it is apparent that both of the metals can occur together as observed at the May-Bee, IR05003, O-Ray and M-Kennedy zones. Anomalous Ag mineralization found at the Rhodesia zone occurs within quartz-magnetite-hematite-pyrite crackle veins hosted by chlorite-albite-carbonate-hematite metasomatic alteration.

Cu-Au-Ag-Pb-Zn mineralization observed in the Mike-Kennedy, IR05003 and the May-Bee zones occurs as polymetallic quartz veins within diorite-gabbro sills or dykes. These veins range in size from 0.3 meters to 2.0 meters in width. Of interest is the reported observation of a lamprophyre dyke adjacent to the mineralized veins of the May-Bee zone. Field reconnaissance is necessary to confirm the observation.

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