Sulphurets/Bruceside Geology

by

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The following reports outlines the result of 7 days of mapping conducted on the Sulphurets (Bruceside) property for Homestake Canada Ltd. The purpose of the mapping was to address the following specific issues raised by Ron Britten regarding the geology in the Bruceside area.
- The nature of rocks mapped as porphyry south of the outlet to Brucejack Lake that appear to contain sedimentary intervals.
- The origin, stratigraphic position and structural relationships of sedimentary rocks exposed in the Shore zone area.
-The possible extent of the above sedimentary rocks to the south across Bruce Creek
-The possibility of recognizing stratigraphic markers especially within the volcanic stratigraphy.

During 7 days of mapping ,1:1,000 maps were prepared of the area extending along the south shore of Brucejack Lake to the West zone and the area extending from the north end of the Shore zone (Camino Real zone) to the Big Sleep vein and north to two lakes at grid co-ordinates 3700E, 4250S)

Stratigraphy

***Nb Thr field map legend incorrectly reads
2j Hetero.... and should read 2f.. Hetero..***

The following legend was used on the field maps. The same codes have been used as on existing maps but with addition of one unit 1j(ht). They are arranged in descending order from youngest to oldest, except within unit 1 where all volcanic rocks are coeval facies variations.

1. Volcanic rocks ("Betty Creek Formation")
   - 1i Massive to banded hornblende-feldspar porphyritic flows, domes
   - 1j Volcanic conglomerate. Interbedded with 1g, all clasts are porphyry or volcanic sediments
   - 1g Hornblende-feldspar tuff breccia
   - 1f Hornblende-feldspar lapilli tuff

Transitional heterolithic conglomerates

- 1j(ht) Heterolithic conglomerate with abundant porphyry and argillite clasts. Gradational contact with underlying 2f

2. Sedimentary rocks ("Unuk River Formation")
   - 2f Heterolithic conglomerate with argillaceous matrix and abundant argillite clasts. Interfingers with mudstone along strike
   - 2d Mudstone
   - 2b Quartz-rich sandstone (arenite) with quartz granules and pebbles to cobbles of intrusive and volcanic rocks. Interbedded with mudstone, limey mudstone

The following observations are possible regarding the stratigraphy present on the Bruceside property.

The rocks can be broken down into three main packages, the Stuhini Group, the basal Hazelton and Hazelton Group volcanics. The Stuhini Group, comprising both sedimentary and volcanic rocks has been well described by other authors and is present only to the west of the Brucejack fault except for some mudstone in the area of the West zone and west of Galena Hill.

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The basal Hazelton Group rocks (aka Jack Formation, Unuk River Formation) are quartz arenites (2b), pebbly sandstone and conglomerates with a quartz rich sandy matrix. These mark an abrupt change from the underlying mudstone and laminated mudstone,siltstone and sandstone of the Stuhini Group. The arenites are extremely distinctive with abundant clear quartz grains and fine pebbles that are evident even in extremely altered rocks. The arenites are overlain by mudstones (2d) that contain intervals or grade laterally into debris flow deposits (conglomerates) with heterolithic volcanic and sedimentary clasts in a muddy matrix (2f).The most conspicuous clasts are local mudstone rip-up clasts and hornblende-feldspar porphyry cobbles. These rocks grade upsection into similar conglomerates with a higher percentage of porphyry clasts and a less muddy matrix.

The conglomerates are overlain by hornblende-feldspar porphyritic volcanics (aka Betty Creek Formation). The volcanic rocks are predominantly proximal, extrusive, lapilli tuffs (1f), tuff breccias (1g), possible flow domes (1i) and volcanic sediments including mudstone, volcanic sandstone and volcanic conglomerate (1j; laharic deposits). These sedimentary intervals within the volcanic rocks are well exposed in the vicinity of two small lakes (Mine grid 3700E 4250 S) where they are intercalated with tuff breccias. They can be distinguished from the sedimentary rocks that underlie the volcanics by their green colour , even in the finer grained sedimentary rocks and the abundance of angular hornblende feldspar phyric tuff breccia clasts in the laharic deposits.

The porphyry mapped on the south side of the outlet of Brucejack Lake is a homogeneous, coarse, hornblende-feldspar porphyry with locally conspicuous layering defined by resistant siliceous layers in the matrix. The presence of numerous elongate unbroken hornblende phenocrysts suggests that these rocks are not tuffaceous crystal rich tuffs but are part of an extrusive flow banded dome (1i), with flanking co-eval tuff breccia (1g) and lapilli tuff (1f) deposits on the south side of the dome (see maps, south sheet ;5300S,3300E). The east-west band of sedimentary rocks observed by Ron Britten and present on the 1:1,000 compilation maps are interpreted by this author to be a complexly layered andesite dyke of unit 5. This interpretation is made in spite of dramatic textures suggesting a sedimentary origin based on the following observations. Some of the rocks in the unit appear to be vesicular. The unit is unaltered even when hosted by strongly altered volcanic rocks. The unit cuts layering in the porphyry at roughly right angles.

Hornblende feldspar porphyritic intrusive rocks (4j) are also extremely abundant on the property. These rocks are similar in mineralogy to the extrusive rocks described above are distinguished only by crosscutting contact relationships and the absence of extrusive fragmental textures. Intrusive rocks were mapped in the area along the south side of Brucejack Lake, west of Camp Creek and in the area west of Galena Hill. In all cases these rocks intrude the quartz arenites and associated sedimentary rocks. The area mapped as underlain by volcanic rocks along the Shore zone were examined briefly with Steve Roach and the lack of fragmental textures and overall geologic relationships suggest that these rocks are also intrusive. Similar intrusive rocks with coarse orthoclase megacrysts (4jpath) are evident along the west side of Gossan Hill in the vicinity of the PS zone and extending along the sediment volcanic contact through the Grace zone and Claw zone areas.

Stratigraphic and structural relationships

The regional extent of the basal Hazelton and the sediment volcanic contact observed on the Sulphurets property represents a northwest trending , northeast facing stratigraphic contact along the eastern side of the McTagg anticlinorium. In the Bruceside area this contact has been structurally complicated and repeated in a northwest trending syncline or fault bounded panel. The mapping described in this report is too limited in extent to define the overall structure but the following observations are possible.

The western sediment volcanic contact is a steep northwest trending contact that can be traced with several offsets, from northwest of the Brucejack fault to Bruce Creek, through Camp Creek and up to the west side of Galena Hill. In the Galena Hill area, this contact appears to be a

subvertical east facing stratigraphic contact. The location of this contact would imply that the West zone is hosted either by sedimentary rocks or crosscutting intrusives. However volcanic textures have been observed in the host rocks (Steve Roach, pers. comm) implying offset along the West zone. Accurately locating these different protoliths would define the sense of movement on the West zone structure.

Arenites, mudstones and conglomerates are present in two areas not indicated on the current 1:1,000 compilation. 1. Strongly altered rocks immediately east of Camp Creek are arenites and pebbly arenites. 2 The north facing slope northwest of Galena Hill is underlain by sedimentary rocks in stratigraphic contact with volcanic rocks to the east and in intrusive contact with a hornblende-feldspar porphyry (diorite) to the west. These relationships are correctly indicated on the MDRU 1:5,000 field map (Peter Lewis, 1993).

Relationships in the Shore zone area are more complex. A strong northwest trending linear northeast of the Shore zone defines a fault contact between quartz arenites and intrusive rocks to the west and younger volcanic rocks to the east.. A roughly east-west stratigraphic contact with lapilli tuffs overlying polymictic volcanic conglomerates is exposed from the Grace zone along the hillside north of Big Sleep, Big Sleep East and extending along the west side of the road, eventually intersecting the above fault (at 4690S, 3750E), defining the northern limit of units 2b, 2f, 1j(ht) in this area. The Trachsel (sp?)-Big Sleep east and Big Sleep zones have been demonstrated by recent work (Steve Roach, pers. comm.) to be a single zone that defines the eastern limit of units 2b, 2d, 2f in this area . These zones are fault structures that emplaced uplifted sediments (2b,etc..) against younger volcanics of unit 1.

The sedimentary rocks exposed between the Shore and Trachsel zones can be traced across Bruce Creek with roughly 50m of right lateral offset along the east-west Bruce fault. On the south side of the Creek the arenaceous sediments can be traced southwards where they are in fault contact with the extrusive banded porphyry (1i) described above. The sediments are truncated to the east by a fine grained hornblende feldspar porphyry stock that is very similar to the rocks hosting the Shore zone.

Recommendations

Although the Sulphurets property has seen a considerable amount of quality by mapping by many individuals, much of this work has focused on the highly altered and deformed mineralized zones. Mapping focused on stratigraphic relationships has been very limited and was performed independently of the zone mapping leading to separate and at times irreconcilable maps. The 1995 exploration program should devote one geologist for a period of two months to completing 1:1,000 maps of the property integrating the detailed zone maps within stratigraphically designated protoliths. This will define markers that will help define the overall structural style, as well as post mineral faults that offset known mineral zones. The principal areas that require mapping are: 1) The western volcanic sediment contact, from
Gossan Hill north. 2) The area near Bruce Creek, between the West zone and Gossan Hill. 3) The Galena Hill area and west.

The current arrangement of the legend into units 1 and 2 based solely on lithological grounds obscures relationships on the final maps Although it would be foolish to change the established legend at this time, future work could be arranged,into stratigraphic order as done above and on the rough field maps. Any sedimentary rocks that are clearly part of the volcanic sequence should not be designated as unit 2 but as part of unit 1 , the volcanics in order to keep stratigraphic relationships clear on all maps.

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