MEMORANDUM

August 21, 2009

To: Diane Lister

From: Robert Stroshein

Re: Geological Considerations at the Brown-McDade Open Pit

The Brown-McDade open pit mine occurs in a major structurally weak zone that began with the emplacement of the felsic dykes that host the mineralization. There have been multiple episodes of faulting since the emplacement of the deposit. The geology of the pit area is controlled by the structural weakness of the generally northwest trending zone.

The host rocks are a layered metamorphic sequence (LMS) in fault or intrusive contact with Cretaceous (?) aged hornblende diorite to hornblende granodiorite. The LMS is composed of metamorphosed sedimentary, volcanic and igneous rocks. The LMS appears to dip to the northat a shallow dip angle. The intrusive suite is coeval with the Mount Nansen volcanic rocks in the area. The mineralization is a late stage event related to hypabyssal rocks (felsic dykes) of the plutonic suite.

The region was unglaciated during the last period of continental glaciation and therefore the rocks a deeply weathered especially the faulted and altered sequences. The deep end of the pit was mined to the depth of weathering. There was increasing sulphide mineralization at depth in the pit. The sulphide mineralization consisted of primairily pyrite with fine grained sphalerite (Zn) and galena (Pb).

Lithologies

The lithological contacts are generally fault or intrusive related. Along the east wall of the pit diorite to granodiorite intrusive rocks are in fault contact with the metamorphic rocks that dominate the west side of the pit. There are locally thin veneers and slices of fault bounded altered and mineralized rock on the east pit wall.

The central portion of the pit is the mined out ore zone that was intensely altered and weathered. Approximately one fourth to one third of the mined material was milled and with the tailings going to the pond the remainder of the removed material was stacked in the waste piles around the pit. The oxidized and sulphide ore material was hosted by clay altered felsic dykes that have been deformed by multiple stage faulting. At the north end the breccia body has been mined below the weathered and oxidized ore and sulphides (pyrite) are exposed in the pit at and below the water level. There are local patches of interstially weathered pyrite mineralization that exhibit a white oxide coating at surface (possibly hydrozincite). Several selvages and veneers of altered and mineralized rock were left in the pit wall above the water level. There are no visible sulphides in these zones but locally also exhibit the white oxide coating.

The west side of the pit is predominantly metamorphic rocks with fault bounded blocks of ganodiorite and felsic dyke material. The dykes tend to be unaltered but locally thin segments contain mineralization. The southern half the pit wall is composed of primarily sedimentary metamorphic rocks (LMS a) with older intrusive rocks that form gneiss and schist. The northern half of the pit wall is predominantly thick bedded, white to tan weathered metamorphic

sandstones (LMS b) that form resistant quartzite. Near the north end of the pit a unit of calcareous quartzite (metamorphosed sandstone) is exposed in the pit wall.

The north end of the pit is made of light weathering grey quartzite overlain by highly weathered metamorphic rocks (unit LMS c) of gneiss and schist.

There is limited rock exposure north of the pit in the Pony Creek drainage. On the northeast side of the creek there are hornblende granodiorite rocks exposed in old exploration trenches. Within the drainage area a number of exploration diamond drill holes have been located. Examination of some of the drill holes and log records indicate the metamorphic units in fault contact with granodiorite and hornblende granodiorite. Multiple fault/shear zones occur within the drilled sequence. The fault zones are commonly coarse granular host rock to sandy with some clay content. The zones range from less than one meter to intervals of five meters and larger zones with multiple faults. The material is strongly weathered and appears to be porous and permeable. The fault zones cut all the rock units including the granodiorite.

Structural Geology

A number of fault surfaces were observed in the open pit. There are two dominant orientations to the faulting and cross cutting relationships suggest that the faulting occurred as separate episodes after the mineralization was deposited.

The most prominently defined faulting trends northwest and contains the deposit within a graben like structure. The two defining faults are exposed in the pit. The footwall (FW) fault juxtaposes unaltered granodiorite/hornblend diorite with the strongly altered rocks enclosing the mineralized zone. The hanging wall (HW) fault occurs within the altered rocks on the west side pit wall face. The FW fault dips steeply west and the HW fault dips steeply east. Slickensides on the fault surfaces indicate vertical and lateral movement along the faults. The structure defines the predominant northwest trending zone of alteration and structural weakness.

The second set of dominant faulting trends northerly and displace the northwest trending FW and HW faults. Movement along the northerly trending faults is vertical with very little lateral movement as indicated by slickensides on exposed faults. The northerly trending faults dip moderately east forming a series of steps. Drill hole intersections at the northern end of the open pit indicate a swarm of these faults cross cutting all rock types.

Summary

The Brown-McDade open pit is located and bounded by a major structural zone. The pit and the structural zone trend northwesterly. The structural zone intersects the Pony Creek drainage between 100 and 200 meters north of the pit. The structural zone is composed of multiple fault sets that intersect at acute angles. The fault zones have variable widths up to five (5) meters observed in drill hole intersections and are composed of coarse to fine granular material and clay. The intersecting faults create a network of porous and permeable channels.

The south end of the pit is poorly exposed but the structure appears to narrow and is at a higher elevation than the north end of the pit.

The quartzite unit (LMS b) is a resistant bed that does not weather readily and although it is no doubt faulted the lack of weathering the unit has a damming effect on the ground water flow. This has been observed at the north end of the pit where water cascades over the resistant quartzite beds. Photo


approximate location of seepage horizon, North end of Brown McDade pit