

8 DEPOSIT TYPES

8.1 Deposits

The Oyu Tolgoi deposits display copper–gold porphyry and related high-sulfidation copper–gold deposit styles. Copper–gold porphyry deposits are low-grade bulk tonnage deposits where copper sulfides are finely disseminated or deposited in anastomosing veins and fractures in a large volume of rock. These deposits are amenable to large-scale open-pit or underground bulk mining methods.

The Oyu Tolgoi porphyry copper deposits display a range of mineralization styles, alteration characteristics, and deposit morphologies despite having formed in close spatial and temporal association. These distinctions probably reflect differences in structural controls, host rock lithology, and depth of formation. Structural influences account for most differences in shape and distribution of mineralization within the deposits. In general, high-sulfidation mineralization and associated advanced argillic alteration are most common within the basaltic tuff and breccia, in the upper part of the quartz monzodiorite where it intrudes to levels high in the stratigraphic succession, and in narrow structurally controlled zones. In contrast the more typical copper–gold porphyry style alteration and mineralization tend to occur at deeper levels, predominantly within massive augite basalt and quartz monzodiorite.

The Southwest deposit, particularly the gold-rich core zone, occurs as a steep cylindrical body typical of many porphyry copper deposits. Southwest is localized within a dilational transfer zone linking movement between the north-east-striking West Bounding and East Bounding faults. The strong structural control exerted by these faults is reflected in the abundant sheeted veins that show a high degree of preferred orientation, the pipe-like form of the gold-rich core to the deposit, and the spreading of low-grade copper and gold values along the bounding fault zones.

The Central deposit occupies a structurally intact block within which no significant internal fault disruption has been identified. It forms an irregular bowl- to slightly funnel-shaped zone of mineralization characterized by high-sulfidation (pyrite–covellite–chalcocite–enargite) and copper–gold (chalcopyrite–gold) porphyry styles, as well as a chalcocite enrichment blanket. Although the preferred orientation of quartz veins implies strong structural control within the deposit, the geometry of intrusive phases is irregular. Weathering of the Central deposit has produced an oxide zone 40–60 m thick, usually devoid of mineralization, overlying a chalcocite enrichment zone up to 80 m thick.

The South and Wedge deposits are located on the eastern flank of the north-north-east-trending mineralized corridor at Oyu Tolgoi, within several structural blocks cut and bounded by minor north-east-striking subvertical faults. Despite the numerous faults cutting these deposits, the lesser degree of preferred vein orientation relative to other deposits implies that structural control was weaker during mineralization.

The Hugo Dummett deposits have several features unusual to porphyry copper systems, including the following:

- Anomalously high copper and gold grades, particularly in the northern part.

- An unusual, weakly altered, pre-mineral sedimentary cover sequence that lies just above the porphyry system.
- Quartz + sulfide vein contents always exceeding 15%, and commonly over 90%, in the high-grade portion of the deposit.
- A highly-elongate, gently-plunging, tabular shaped, high-grade stockwork system.

The formation of the high-grade portion of the Hugo Dummett deposits as a tabular, intensely veined, subhorizontal body contrasts markedly with most porphyry copper deposits, which tend to have steep, roughly cylindrical or elongate forms. This unusual form could be the result of emplacement within a passive to slightly compressional horizontal stress regime, synchronous with thrust faulting. This would inhibit the upward migration of hydrothermal fluids, leading to the formation of a broad subhorizontal zone of fluid over-pressuring with attendant hydraulic fracturing and vein formation. This fluid focusing also may have contributed to the unusually high copper grades in these deposits.

The main Oyu Tolgoi deposits are described above as “porphyry copper-gold” and “high sulfidation copper-gold”. Heruga is distinctly higher in molybdenum, and is best described as a “porphyry copper-gold-molybdenum” system with a Mo rich carapace at higher elevations overlying Au rich mineralization at depth. Section 7.2.3 provides further explanation of this distinction.

Heruga East Exploration Model

Figure 8.1 shows the relationship of mineralisation along the OT trend with quartz monzodiorite intrusions. It is evident that bornite-rich mineralisation generally occurs on the eastern side of the quartz monzodiorite, as observed at the Hugo North, South Oyu, and Heruga North (OTD1495A). The eastern side of Heruga and Heruga North are the current focus of exploration drilling.