INTRODUCTION

- The Ernest Henry iron oxide copper gold deposit is located 35 km NE of the township of Cloncurry in NW QLD.
- It is the most significant Cu–Au deposit in the Cloncurry Mineral System.
- The pipe-like Ernest Henry ore body is hosted in brecciated and K-feldspar altered Mount Fort Constantine Intermediate Volcanics (~1740 Ma; Mark et al., 2006) and dips ~45° towards the SSE.
- The pipe-like ore body is structurally bounded by sub-parallel shear zones and is ~250 m thick, ~300 m wide with a down-plunge length of over 1000 m and is open at depth.
- The ore assemblage is dominated by magnetite, chalcopyrite, pyrite, carbonate, quartz and apatite.
- Currently an underground sub-level cave operation with a 2016 underground resource of 87.1 Mt @ 1.18% Cu, 0.60 g/t Au.
- 78% Au recovery – CAN WE IMPROVE THIS?

SAMPLING

- 22 Samples selected from 3 cores at ~700 m depth within the deposit.
- Samples selected on pyrite texture.
- SEM and MLA (Mineral Liberation Analysis) have been used to identify and image gold grains.
- LA-ICP-MS has been used to discriminate trace elements associated to Au.

SEM OBSERVATIONS: WHERE IS THE GOLD?

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LA-ICP-MS OBSERVATIONS: ARSENIC AND GOLD

- Majority (72%) of Au is associated with Vein infill pyrite.
- Majority (69%) of Au is in pyrite microfractures with chalcopyrite infill.
- Average diameter and length of Au grains were 4 μm and 13 μm.
- Au associated with As rich rim.
- Au is NOT associated with high As concentration BUT a steep As gradient.

WHY IS THE GOLD HERE?

Physical Control:

- Microfractures = crystal surface defects
- Surface defects release AsS₄ anions
- Release of AsS₄ anions facilitate Au precipitation

Chemical Control:

- As substitutes for S = p type pyrite
- Co/Ni substitutes for Fe = n type pyrite
- P-type pyrite attracts the Au complexes from the fluid.