CODES PhD Research Project

Ore Genesis of the Greens Creek VHMS Deposit, Alaska: Implications for Mining, Milling, and Exploration

LOCATION | FORMATION | DISCOVERY | RECOVERY | TECHNOLOGY

Project Outline

The Greens Creek volcanic-hosted massive sulfide (VHMS) deposit is located on northern Admiralty Island, southeastern Alaska.

The Greens Creek deposit is a polymetallic, stratiform, massive sulfide deposit. The host rock consists of predominantly marine sedimentary, and mafic to ultramafic volcanic and plutonic rocks, which have been subjected to multiple periods of deformation. These deformational episodes have imposed multiple folding of the orebodies to create a complex geometry. Mineralization occurs discontinuously along the contact between a Early Carboniferous footwall sequence of quartz- mica-carbonate phyllites (originally altered mafic footwall with minor sedimentary rocks), and a Late Triassic hangingwall package of graphitic and calcareous argillite with minor volcanic rocks.

Ore lithologies fall into two broad groups: massive ores with over 50% sulfides and white ores with less than 50% sulfides. The massive ores are further subdivided as either being base-metal or pyrite dominant. Massive ores vary greatly in precious-metal grade from uneconomic to bonanza Au (>.5 opt) and Ag (>100 opt). White ores are subdivided into three groups by the dominant gangue mineralogy; white carbonate, white siliceous, and white baritic ore. These ores tend to be base-metal poor and precious-metal rich. Major sulfide minerals are pyrite, sphalerite, galena, and tetrahedrite/tennanite. The global resource of Greens Creek is approximately 24 million tonnes at an average grade of 14% Zn, 5% Pb, 600 g/t Ag and5 g/t Au with insignificant Cu. Greens Creek has the highest grades of silver of any known VHMS deposit.

The aims of this project are to examine the underground workings, drill core and computer database at Greens Creek in order to:

- Characterize the ore types of the Greens Creek deposit and their inter-relationships.
- Describe the mineralogy, assemblages, and textures of all ore types.
- Determine the geochemical (major and trace elements) characteristics and signature of the ore types.
- Fully characterize the mineralogy and geochemistry of the ore types, in order to optimise mining and aid in beneficiation of the ores.
- Relate the ore types to the hydrothermal fluid upflow (i.e. stringer) zones within the footwall phyllite.
- Test existing ore genetic models and provide, if necessary, an improved genetic model for the Greens Creek ore types and deposit.
- Develop useful criteria, based on characteristics the ore types, for exploitation of the deposit and exploration in the Greens Creek district.

To accomplish these aims the following investigations will be undertaken.

A. Characterization
- Characterise the ore types based on underground mapping and core logging.

B. Structure
- Determine the post-depositional deformation (faulting and folding) and their effect on the ore types.

C. Mineralogy And Geochemistry
- Detailed identification of ore mineralogy, assemblages and textures.
- Identification of relic mineralogy and textures, if preserved.
- Determine distribution and inter-relationships of various ore types.
- Characterize the chemical variation and zonation in individual mineral phases using the electron microprobe and laser ablation ICP-MS

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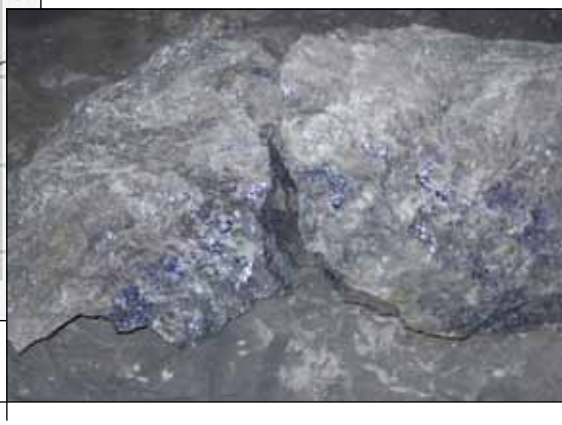
Plan view of the Greens Creek deposit



- Determine the major and trace element geochemical signature of the ore types.
- Develop 2D and 3D zonation of ore types, minerals and metals within the deposit.
- Examination of metal dispersion within the footwall in order correlate hydrothermal fluid upflow (i.e. stringer) zones with known locations of mineralization.

D. Implications for Ore Genesis
- Test existing ore genetic models and propose, if necessary, an improved genetic model for the Greens Creek ore types and deposit.

E. Implications For Mining And Milling
- Characterize the mineralogy and major and trace element geochemistry of the ore types, in order to help optimisation of mining of specific ore types. Detailed mineralogy and mineral chemistry may aid in the milling of specific ore types.

F. Implications for Exploration
- Propose exploration vectors based on the mineralogy, zonation, and geochemistry of the ore types for use within the Greens Creek district.

Project Supervisors

This project will be supervised by Prof. J. Bruce Gemmell and Prof. Ross Large of CODES, and Prof. Mark Hannington (University of Ottawa) with company supervision by appropriate Hecla employees as nominated.

Project Timetable

This project will begin in 2012 and is to be completed in 3½ years. It is anticipated that the student will spend 3 months in the field at Greens Creek and 9 months at CODES each year for the first 3 years. The student will be based at CODES during the fourth year. Fieldwork will be primarily underground mapping and drill core logging.

Funding

This project is funded by the Hecla Mining Company (www.hecla-mining.com) and includes a PhD scholarship of Aus$28,000 per year and all field and analytical costs.

For Further Information or How To Apply

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