

ENVIRONMENTAL BASELINE STUDIES

PRELIMINARY SUMMARY STUDIES PERFORMED BY SRK CONSULTING GEOCHEMICAL CHARACTERIZATION

1. OBJECTIVE OF STUDIES

The main objective of the geochemical characterization studies is to assess the potential for acid rock drainage (ARD) and the related phenomenon of metal leaching (ML). ARD is produced when iron sulfide minerals in the wastes oxidize to produce sulfuric acid and insufficient quantities of minerals are available to naturally consume the acid. ML is a process that occurs as part of acid generation, but it can also occur under non-acidic conditions, depending on what types of minerals are present. These two processes are usually referred to jointly as metal leaching/acid rock drainage (ML/ARD).

2. METHODS

Geochemical characterization uses two main types of tests.

- *Static tests* are a group of methods used to assess the potential for ML/ARD. These methods include tests to estimate the potential for ARD—which include acid-base accounting (ABA), tests to measure the total and leachable metal content of wastes, and microscopic examinations to determine the types of minerals. ABA is a procedure that evaluates the potential to generate acid and the capacity to neutralized acid. It results in an estimate of the balance of acid potential and neutralization potential.
- *Kinetic tests* are lengthy methods used to assess the rate at which metals and acidity are released when wastes are exposed to ambient conditions in the disposal areas. Samples of the wastes are placed in plastic containers and leached with water. These tests are performed over periods of many months to years to evaluate how the rate of acid generation and metal leaching changes with time.

Characterization of ML/ARD for the Pebble Project is being performed on rock samples obtained by drilling. Waste rock is characterized by directly testing the cores from drilling. The expected byproducts

of ore processing (“tailings”) are characterized after test processing of samples of ore-grade material by metallurgists. The resulting sand-grain-sized materials are characterized using static and kinetic tests.

In addition to the testwork program, experience from characterization of other similar mineral deposits in northwestern North America will be considered. There are more than 20 similar porphyry deposits in British Columbia, the Yukon, and Alaska, and many of these have been mined to extract copper, gold, and molybdenum, as is planned for Pebble Project.

3. SAMPLING AND ANALYSIS

3.1 WASTE ROCK CHARACTERIZATION

Northern Dynasty Mines Inc. (NDM) and previous owners of the Pebble Project have determined and continue to determine the metal content of the rock as part of the activities to evaluate the economic value of the Pebble Deposit. Over 450 holes have been drilled in the immediate area of the deposit, resulting in the collection of more than 16,000 individual rock samples for testing by NDM and previous owners. Recently, NDM’s test program has included up to 28 chemical determinations on each sample. These tests include all of the parameters that would be considered potential contaminants for the project (based on experience at similar mineral projects), as well as sulfur, which is an important parameter when considering the potential for ARD. As a result, NDM’s database contains hundreds of thousands of chemical results that characterize the metal content of the ore and waste rock at the Pebble Deposit.

Using NDM’s chemical database for the project, more than 600 samples were selected by SRK Consulting (SRK) and tested to determine the ML/ARD potential of the rock. All of these samples have been tested using the ABA method. Ninety-two tests also were performed to evaluate metal leaching potential. Each of these tests involves determination of up to 39 parameters, resulting in nearly 3,600 individual data points. The mineralogy of 26 samples has been determined using optical and sub-optical methods. Special studies have been used to determine the elemental composition of individual mineral grains.

Rates of acid generation and metal leaching have been evaluated in 32 kinetic tests. Some of these tests have now been running for over 500 days. For these lengthy tests, more than 2,800 individual chemical analyses have been obtained for each test. The kinetic test program has produced a database containing tens of thousands of individual water results, which will form the basis for subsequent evaluation of environmental impacts.

3.2 TAILINGS CHARACTERIZATION

Ore from the Pebble Mine will be subjected to conventional flotation processing to recover commodity-bearing sulfide minerals (chalcopyrite and molybdenite), followed by treatment of the iron sulfide (pyrite) for recovery of gold. To date, NDM has tested representative ore-grade composite samples three times to evaluate recovery of the commodity minerals. Each time, samples of the tailings have been provided to SRK to evaluate the potential for ARD and ML, as well as the rate at which acid generation and metal leaching might occur. Twenty individual samples have been tested for the potential for ML/ARD, and four samples have been tested in two different types of kinetic tests. Two samples have been tested for over 500 days, with a similar number of individual data points as described above for the waste rock.