



## ENVIRONMENTAL BASELINE STUDIES

### PRELIMINARY SUMMARY STUDIES PERFORMED BY HDR ALASKA, INC. FISH RESOURCE STUDY PROGRAM

#### 1. INTRODUCTION

The objectives for the fish resource study program for Pebble Project are to: 1) document the distribution and relative abundance of fish resources in the project study area in sufficient detail to provide mitigation planning and 2) acquire predevelopment baseline data for post-development monitoring. To accomplish these objectives, biologists are conducting several multi-year studies in the mine and transportation corridor study areas, the results of which will be included in an environmental baseline document for the Pebble Project.

The fish resource study program consists of two primary study programs:

- A baseline study program is being completed to document trace elements present in fish tissues, fish abundance, seasonal life history patterns, species distribution and species composition as they occur in the mine and transportation corridor study areas prior to the proposed development.
- A flow habitat study program is being completed in the mine study area, which will evaluate changes to fish habitat as a result of changes in stream flow. The flow habitat study is also interdependent upon other studies such as the fish resource baseline, hydrology, water quality and macro-invertebrate study programs each of which will incorporate key data into the flow habitat study.

#### 2. MINE STUDY AREA

The fish resource study program includes the full length of the North Fork Koktuli River (NFK), South Fork Koktuli River (SFK), a portion of the Mainstem Koktuli River, and the full length of Upper Talarik Creek (UT). The mine study area is shown on Figure HDR-2. The list below provides a brief description of the fish resource study program in the mine study area.

- **Fish Abundance and Density Estimates**—estimates are being completed in areas of direct impact (e.g., proposed impoundment and pit areas) to quantify the amount of fish habitat present and the abundance of each fish species present.
- **Overwintering Fish Use**—surveys are being conducted over the full length of the south and north forks of the Kuktuli River and Upper Talarik Creek to document fish-species composition and habitat use in the study area during winter conditions.
- **Spring Spawning Surveys**—surveys are being completed over the full length of the south and north forks of the Kuktuli River and Upper Talarik Creek to document the spring spawning periodicity and abundance.
- **Arctic Grayling Telemetry Study**—studies are being conducted with in the south and north forks of the Kuktuli River to document spawning periodicity, use of physical habitats, and seasonal occupation of spring and summer feeding habitats.
- **Flow Habitat Analysis**—site-specific surveys are being conducted at more than 90 sample sites (Figure HDR-2) in the south and north forks of the Kuktuli River and Upper Talarik Creek at various flow rates to characterize physical and biological variables to, in turn, allow prediction of effects on fish and fish habitat that may result from altered flow regimes.
- **Snorkel Surveys**—surveys are being conducted at the same locations as the flow habitat sample sites (Figure HDR-2) to correlate fish species and lifestage presence with habitat availability. Surveys also are being conducted to evaluate fish use of off-channel habitats.
- **Salmon Escapement Estimates**—estimates are being completed for the full length of the south and north forks of the Kuktuli River and Upper Talarik Creek to provide an estimate of total fish escapement into the mine study area.
- **Fish Use of the Intermittent-Flow Reach of the South Fork Kuktuli**—studies are being conducted to document fish use in a reach of the South Fork Kuktuli River that experiences periods of low or intermittent flow. This reach is identified as SFK-3 and is shown in Figure HDR-2.
- **Spawning Habitat Suitability Criteria**—surveys are being conducted in the south and north forks of the Kuktuli River and Upper Talarik Creek to document the response of fish species and corresponding lifestages (e.g., coho salmon spawning) to stream-dependent variables (e.g., velocity). This study component is being conducted for multiple fish species, lifestages, and variables.
- **Fixed Site Monitoring (trace metals in fish tissues and index species characterization)**—studies are being conducted in lake and river habitats of the south and north forks of the Kuktuli River and Upper Talarik Creek (Figure HDR-2) to document the occurrence of trace metals in fish tissues. Two consecutive years of fish tissue data have been collected. This study also established a standardized and easily repeatable sampling program (i.e., minnow trapping) for the purpose of developing an index of juvenile fish species that can be monitored over time.

### **3. TRANSPORTATION CORRIDOR STUDY AREA**

The principal objective of this study program is to delineate and inventory fresh-water fish resources and aquatic habitats in the proposed transportation corridor with the intent of aiding the design and permitting of associated stream crossings.

#### **3.1 ROAD CROSSING SURVEY**

In the proposed road corridor extending from the mine-site area to Iniskin Bay (Figure HDR-3), biological field teams collected physical characteristics data and descriptive information at each stream crossing. The data collected included fish presence/absence, water quality information (pH, dissolved oxygen, conductivity, temperature, and turbidity), average depth, width, water velocity, estimated discharge, cover characteristics, bank characteristics, substrate composition, habitat distribution, channel type, and photographs. The information collected from within the proposed road corridor has been entered into a geographical information system (GIS) for each stream.

#### **3.2 TRANSMISSION LINE STUDY**

Reconnaissance-level investigations confirming the presence or absence of resident and anadromous fish species were conducted in the electrical transmission-line corridor (Figure HDR-3). Additional fish sampling related to the electrical transmission line may occur during later phases of the project as needed.

#### **3.3 Y-VALLEY CREEK STUDY**

Seven baseline study sites were established in the Y-Valley Creek located in the potential port development area (Figure HDR-3). Each study site was approximately 100 meters in length. Methods of study included pebble counts, channel morphology, snorkel surveys, and spawning surveys. Habitat in the seven study sections of the Y-Valley Creek were analyzed using the USDA Forest Service Fish and Aquatic Stream Habitat Survey Protocols.

#### **3.4 FISH TISSUE SAMPLING**

Two years of fish tissue samples were collected at five locations (Figure HDR-4) in the proposed road corridor to document levels of trace metals. For purposes of future compatibility, the analytes for fish tissue samples from the transportation corridor were the same as those for the mine study area.