

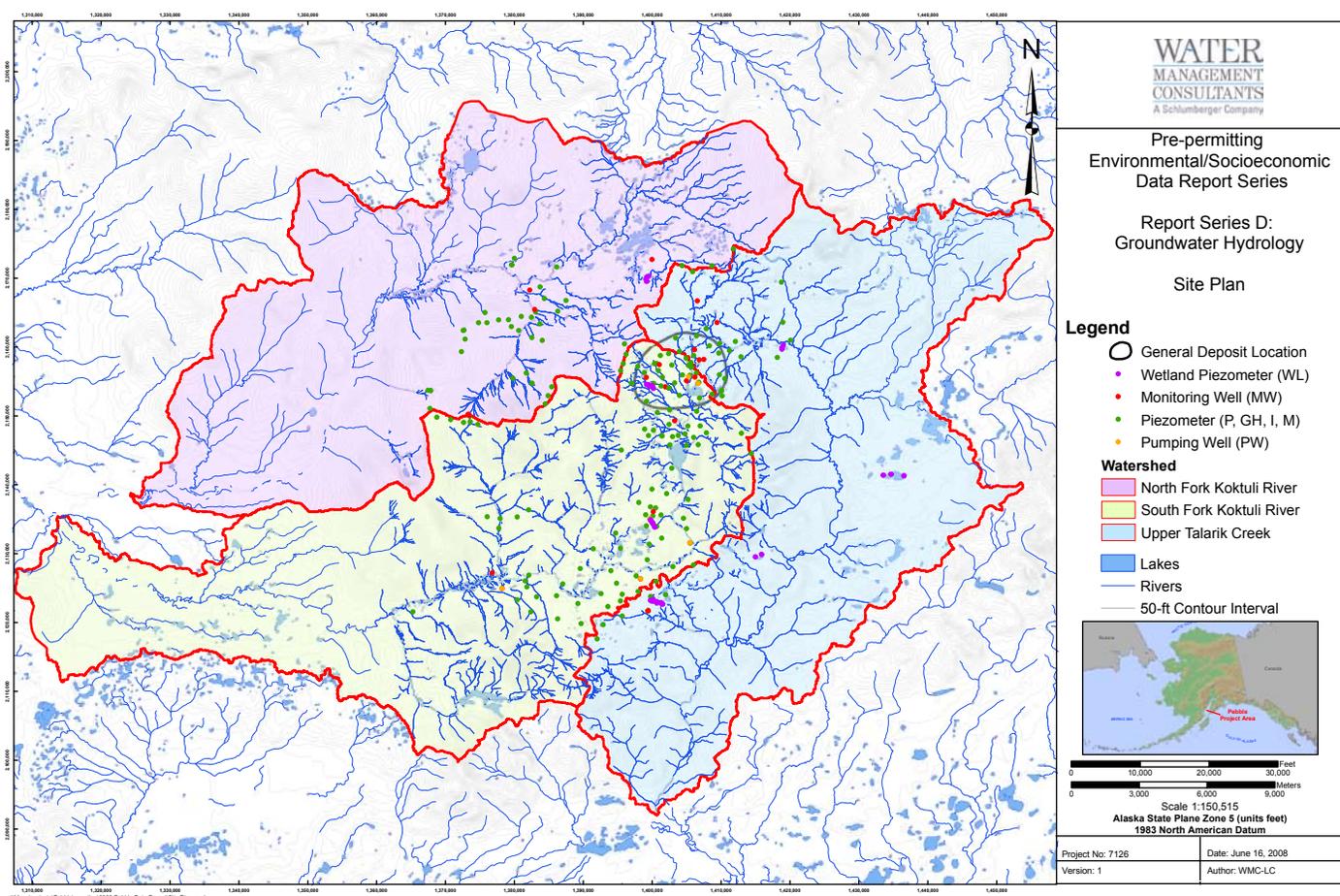
Report Series D: Groundwater Hydrology

Since 2004, the Pebble Partnership has worked with a number of Alaska-based consultants to manage an ongoing program of groundwater hydrology data collection and analysis at key locations throughout the Pebble Project area. Groundwater is water found beneath surface in overburden pore spaces and in the fractures of bedrock formations.

Companies contributing to Pebble Project groundwater hydrology (or hydrogeology) studies between 2004 and 2007 include:

- Water Management Consultants Inc.;
- SLR Alaska;
- HDR Alaska;
- Paug Vik Development Corp.;
- Bristol Environmental & Engineering Services Corp.; and
- CH2M Hill Inc.

Groundwater hydrology studies are designed to characterize the groundwater regime in the Pebble Project area, including water quantity, flow rates and flow directions. The study also includes an evaluation of the interaction between groundwater and surface water.



Pebble Project groundwater hydrology data collection occurred at 259 monitoring wells and piezometers at 196 sites throughout the South Fork Koktuli River, North Fork Koktuli River and Upper Talarik Creek watersheds.

Hydrogeology studies provide valuable input to the Partnership's engineering team, in part by identifying potential changes to the groundwater regime resulting from construction, operation and closure of future mine development. A comprehensive understanding of groundwater conditions will allow project engineers to design a project that minimizes groundwater impacts and incorporates measures to mitigate residual effects.

Groundwater characterization is being undertaken at multiple locations throughout the project area to identify optimal locations for various mine facilities, including the mill, tailings storage area and other mine components. Project facility design and location will also be substantially influenced by related environmental considerations – including effects on surface water, fish habitat and wetlands.

Program Overview: Study Area

The study area for Pebble's groundwater hydrology program includes the North Fork Koktuli River watershed, the South Fork Koktuli River watershed and Upper Talarik Creek watershed. The study included the installation of 259 monitoring wells and piezometers at 196 sites throughout these watersheds.

Monitoring wells are utilized to collect groundwater samples and monitor groundwater levels. Groundwater

levels are recorded hourly in some wells. Piezometers are constructed in the same way as monitoring wells but are used to measure only groundwater levels.

Elements of the Pebble Project groundwater hydrology study include:

- characterization of the subsurface geology to identify fine-grained materials (silts and clays) versus coarse grained materials (such as sands and gravels);
- 94 rising and falling head tests to measure hydraulic conductivity or the rate at which soil or rock allows water to flow;
- seven pumping tests where one well is pumped and several near-by wells are monitored for changes in water level;
- hourly and monthly groundwater elevation monitoring;
- a seep inventory of groundwater discharges to surface (including location and size classification) and flow-rate monitoring at selected seeps throughout the study area.

The information being released as part of the Pebble Partnership's Pre-Permitting Environmental & Socio-Economic Data Report Series in June 2008 includes data and associated figures gathered between 2004 to early 2007 and is organized into the following data groups:

- well, piezometer and drillhole locations;
- monthly groundwater elevations;
- hourly groundwater elevations;
- response tests;
- pumping tests;
- seep inventory;
- seep flow rates.

Additional hydrogeology investigations are planned for 2008. The data from the 2008 field program will be available in 2009.

Drainage	Piezometers and Monitoring Wells	Piezometer and Monitoring Well Sites	Monitoring Wells	Monitoring Well Sites
South Fork Koktuli	160	113	24	12
North Fork Koktuli	65	42	8	5
Upper Talarik Creek	34	20	6	4
TOTAL	259	175	38	21

Complete copies of the groundwater hydrology data reports released as part of the Pebble Partnership's Pre-Permitting Environmental & Socio-Economic Data report Series are available online at www.pebblepartnership.com.