

## Report Series C: Surficial Geology

Alaska-based consulting geologist Thomas D. Hamilton undertook surficial geology study work on behalf of the Pebble Project in 2007, including a review of aerial photography and helicopter supported field surveys.

The resulting surficial geological map of the Pebble Project area, and accompanying report, identify the location and timeframe of glacial activities that contributed to present-day landscape features, surface deposit types and groundwater hydrology.

This data contributes to a more comprehensive understanding of the area's glacial geology and its relationship to the local groundwater regime. It will

assist the Pebble engineering team in defining foundation conditions for project facilities and surface conditions along the proposed road route, as well as in locating suitable sources of fill and other construction materials.

### Study Overview

The surficial geology of the Pebble Project area is dominated by the effects of Ice Age glaciation, which occurred between 26,000 and 10,000 years ago. Landscape features include:

- arcuate end moraines – arched ridges that form at the edges of a melting glacier, running perpendicular to the direction of ice movement;
- meltwater channels – former water courses that form directly beneath a glacier or adjacent to glacial lakes;
- broad outwash aprons with abundant kettle depressions formed by melting isolated glacial ice blocks.

The surficial geology map of the Pebble Project area identifies a broad range of surface deposit and terrain types. These range from well-drained gravelly soils to marshy fine-grained soils, and from smooth terrain to irregular, pitted and boulder-covered areas. These ground conditions ultimately determine the types of soils and fauna present and influence groundwater movement. They can also help guide decisions about future land use.



A characteristic end moraine 5 km east of Pig Mountain at the Pebble Project site.



There are numerous kettle depressions in the glacial outwash aprons that characterize the Pebble Project area.

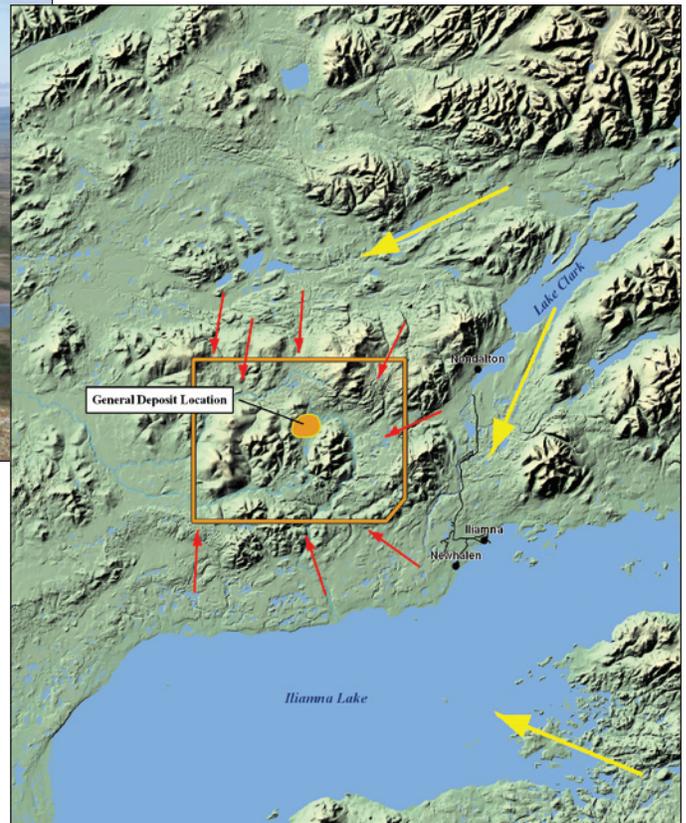
The glacial geology of the Pebble Project area is very complex. Pleistocene-era glaciers from two principal sources – one from the north-northeast and one from the south-southeast – entered the project area over a 16,000-year period.

The first source flowed southwestward down the Lake Clark trough, splitting into separate ice flows along the present-day Chuitna and Newhalen drainages. The second flowed westward from Cook Inlet, filling the broad basin of Iliamna Lake and expanding northward into the southern portion of the Pebble Project area.

At various times, these glaciers occupied each of the three drainages in the project area – Upper Talarik Creek, and the North and South forks of the Koktuli River. Their advance created massive moraines that blocked existing stream courses and created new drainage divides. Many of these moraines are still in evidence today.



Areas of dark green vegetation demarcate former meltwater channels near Koktuli Mountain.



Large yellow arrows illustrate principal routes taken by Pleistocene-era glaciers between 26,000 and 10,000 years ago. Red arrows illustrate routes of glacial flow into the Pebble Project area.

**Complete copies of the Surficial Geology Map and Study Report released as part of the Pebble Partnership’s Pre-Permitting Environmental & Socio-Economic Data Report Series are available online at [www.pebblepartnership.com](http://www.pebblepartnership.com).**