PEBBLE PROJECT
ENVIRONMENTAL BASELINE DOCUMENT
2004 through 2008

CHAPTER 28.
PHYSIOGRAPHY
Cook Inlet Drainages

PREPARED BY:
Knight Piésold Ltd.

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28. PHYSIOGRAPHY

28.1 INTRODUCTION

This chapter discusses the physiography of the Cook Inlet drainages study area including topography, landforms, stream drainage patterns, and coastal features. This discussion is based on review of published information and oblique aerial photographs taken during reconnaissance and mapping exercises. More detailed investigations of coastal physiography and marine habitat are presented in Chapter 36.

28.2 STUDY OBJECTIVES

The objective of the physiography study is to describe the physiographic characteristics of the study area in the Cook Inlet drainages.

28.3 STUDY AREA

The physiography study area is located within the southern part of the Alaska Range physiographic division, as defined by Detterman and Reed (1973), within a subordinate mountain range called the Chigmit Mountains. The study area is defined by the drainage boundaries of Iliamna and Iniskin Bays, two fjords with a common mouth on the west side of Cook Inlet. An unnamed drainage basin comprising much of the peninsula between the two bays is referred to as “Y Valley” in this document. The physiography study area for the Cook Inlet drainages is shown on Figure 28-1.

28.4 SCOPE OF WORK

The information in this chapter is based on a review of published information and reconnaissance photographs. Work was conducted by Knight Piésold Ltd.

28.5 METHODS

The information presented in this chapter is based on a review of the following published information and reconnaissance photographs:

- *Bathymetric and Geophysical Survey*—Iniskin Bay, Alaska (Golder Associates Inc., 2005).
- *Dredge Slopes in Iliamna Bay near Williamsport,* Alaska (Golder Associates Inc., 1995).
- *Navigation Channel Feasibility Report and Environmental Assessment,* (U.S. Army Corps of Engineers (USACE), 1995).
- *Surficial Geology of the Iliamna Quadrangle,* Alaska (Detterman and Reed, 1973).
- Regional topographic information obtained from the U.S. Geological Survey (USGS).

- Oblique aerial photographs taken by Eagle Mapping Ltd. during mapping work in 2004, and by Knight Piésold Ltd. during site reconnaissance in 2008. The approximate location of the camera and the direction of the photo views for each photograph are shown on Figure 28-2.

28.6 RESULTS AND DISCUSSION

The physiography study area falls within the southern part of the Alaska Range physiographic division in the Chigmit Mountains. This is an area of rugged mountains, glacially carved valleys, and fjord inlets created by glacial valley scour to depths below present sea level. The mountains rise abruptly along the coast and form a climatic barrier between the coast and the interior. The general landscape of the two main fjords in the study area, Iliamna Bay and Iniskin Bay, and the glacially carved valley on the peninsula between them ("Y Valley"), are shown in Photos 28-1 to 28-3, respectively.

Shoreline terrain along the sides of the fjords is generally steep and rocky. In contrast, broad tidal mud flats are located at the heads of the fjords due to sediment deposition from tributary watercourses. The largest watercourses in the study area are the Iniskin River, which flows into the head of Iniskin Bay; Cottonwood Creek, which flows into the head of Cottonwood Bay, an arm of Iliamna Bay; and the unnamed stream that drains the "Y Valley". A stream called Williams Creek flows parallel to the existing road from the pass between the Bristol Bay and Cook Inlet drainages down to Iliamna Bay at Williamsport. Numerous small glaciers and alpine lakes occupying glacial cirque basins are present in the Iliamna Bay and Iniskin Bay drainages.

The Cook Inlet/Bristol Bay drainage divide lies to the west of Iliamna Bay and is shown on Photos 28-4 and 28-5. Williamsport is located on the western shore of Iliamna Bay as seen on Photo 28-6. Mountains east of Iliamna Bay rise to 2,735 feet above sea level (Detterman and Reed, 1973). Tidal flats occupy the upper portion of Iliamna Bay as shown on Photos 28-7 and 28-8. Mountains in the "Y Valley", shown in Photo 28-9, rise to 2,805 feet above sea level (Detterman and Reed, 1973). The rocky headlands to the west and east of the "Y Valley" mouth are called North Head and Knoll Head, respectively. The western coastline of Iniskin Bay is shown in Photo 28-10. The tidal mud flats near the head of Iniskin Bay are seen in Photo 28-11. The tidal flats and floodplain near the mouth of the Iniskin River, and the glacially carved valley of the Iniskin River, are shown in Photos 28-12 and 28-13. Several rocky islands and reefs are located near the mouths of Iliamna Bay and Iniskin Bay. The physical characteristics of the islands, reefs, and coastal shorelines are described in more detail in Chapter 36.

A preliminary evaluation of the physiography of the Iniskin Bay channel offshore of Knoll Head can be based on a geophysical investigation report by Golder Associates Inc. (2005), which included a bathymetric investigation of Iniskin Bay offshore of Knoll Head. Water depth measurements were acquired at a rate of ten measurements per second as the survey vessel followed a series of parallel transects. The bathymetric survey indicates that the bay floor offshore of Knoll Head drops off at approximately a 10 percent grade from the western shoreline to a maximum depth of 80 feet near mid-channel, then gradually slopes up to the eastern shoreline from mid-channel. More details of the bathymetric and geophysical survey of Iniskin Bay can be found in Golder Associates Inc. (2005).

Another site investigation program completed by Golder Associates Inc. (1995) assessed the geotechnical conditions of the sediments in Iliamna Bay to support the dredging of a channel to the Williamsport dock. The water depth in the vicinity of Williamsport is very shallow, and vessels having a draft of 5 feet or

greater will likely be beached between high tides. Seismic refraction survey data indicates that there are approximately 100 to 130 feet of unconsolidated sediments in Iliamna Bay within approximately 3,000 feet of the existing dock at Williamsport. Colluvial boulders originating from the cliffs are present on the tidelands in Iliamna Bay and also should be expected to occur in the estuarine deposits. More details of the site investigation completed in Iliamna Bay can be found in Golder Associates Inc.(1995).

28.7 SUMMARY

The information in this chapter is based on a review of published information by others and primarily focuses on the area surrounding Iliamna Bay and Iniskin Bay on the west coast of Cook Inlet. The study area falls into the southern part of the Alaska Range physiographic division, an area consisting of rugged mountains and glacially carved valleys with numerous bays along the shoreline.

Tidal flats are found in Iliamna Bay and Iniskin Bay, especially near the heads of the inlets. The water depth in the vicinity of Williamsport, located at the head of an arm of Iliamna Bay, is very shallow.

Several rocky islands and reefs are found near the mouths of Iliamna Bay and Iniskin Bay. The floor of Iniskin Bay descends to 80 feet below water level at approximately mid-channel offshore of Knoll Head.

28.8 REFERENCES

Detterman, R.L., and B.L. Reed. 1973. Surficial Geology of the Iliamna Quadrangle, Alaska. U.S. Department of the Interior. Geological Survey Bulletin # 1368-A.

Golder Associates Inc. 2005. Bathymetric and Geophysical Survey—Iniskin Bay, Alaska. Ref. No. 053-5727. August.

Golder Associates Inc. 1995. Dredge Slopes in Iliamna Bay near Williamsport, Alaska. August.

U.S. Army Corps of Engineers (USACE). 1995. Navigation Channel Feasibility Report and Environmental Assessment. December.

28.9 GLOSSARY

Bathymetry—the measurement of the depth of the ocean floor from the water surface, the oceanic equivalent of topography.

Colluvial deposits—material transported by gravity, typically deposited and accumulated on lower slopes and/or at the base of slopes.

Draft (nautical)—the depth of a vessel's keel below the water line, especially when loaded.

Estuarine—relating to a semi-enclosed coastal body of water which has a free connection with the open sea and where fresh water, derived from land drainage, is mixed with sea water due to tidal action.

Physiography—the study of the physical features of the earth’s surface.

Quadrangle—a USGS 7.5-minute quadrangle map.

Seismic refraction—a type of seismic survey that measures the refraction of seismic waves from a surface source back to a geophone array.

Tidal flat—a sand flat, mud flat, or marshy area that is alternately covered and uncovered by the tide.

FIGURES

1,580,000 1,640,000 1,700,000 1,760,000 1,820,000

2,250,000 2,200,000 2,150,000 2,100,000 2,050,000

Lake Clark National Park and Preserve

Lake Clark National Park and Preserve

Mt. Iliamna

Pedro Bay

Pile Bay

Iliamna Lake

Williamsport

Iniskin Bay

Iliamna Bay

Oil Bay

Iniskin Peninsula

Cook Inlet

1,580,000 1,640,000 1,700,000 1,760,000 1,820,000

THE pebble PARTNERSHIP

Figure 28-1
Physiography Study Area
Cook Inlet Drainages

Legend

- Study Area Boundary
- National Park and Preserve Boundary
- BB / CI Drainages Boundary
- Existing Roads
- Population Centers

Notes

1. BB/CI refers to Bristol Bay/Cook Inlet drainages.

0 5 10 15 Miles

0 4 8 12 16 20 Kilometers

N

Scale 1:300,000

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

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Version: 2008-2	Author: Knight Piesold Ltd.

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1,660,000 1,680,000 1,700,000 1,720,000 1,740,000 1,760,000 1,780,000 1,800,000

2,140,000 2,120,000 2,100,000 2,080,000 2,060,000 2,040,000

Iniskin River
28-12
28-13
28-11
28-4
28-5
28-6
Williams Creek
Williamsport
28-7
28-8
"Y" Valley
AC Point
Iliamna Bay
Diamond Point
Cottonwood Creek
Cottonwood Bay
Entrance Rock
28-10
Mushroom Islets
Mount Pomeroy
Oil Bay
Iniskin Bay
Knoll Head
Scott Island
North Head
28-9
28-2
28-3
Iniskin Island
White Gull Island
28-1
South Head
Cook Inlet

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Figure 28-2
Physiography Study Area
Photograph Locations
Cook Inlet Drainages

Legend

- Camera Location
- Photo Direction
- Study Area Boundary
- BB / CI Drainages Boundary
- Existing Roads
- Population Centers

Notes

1. BB/CI refers to Bristol Bay/Cook Inlet drainages.

0 0.9 1.8 2.7 3.6 4.5 5.4 Miles

0 1.5 3 4.5 6 7.5 9 Kilometers

N

Scale 1:150,000

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

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PHOTOGRAPHS

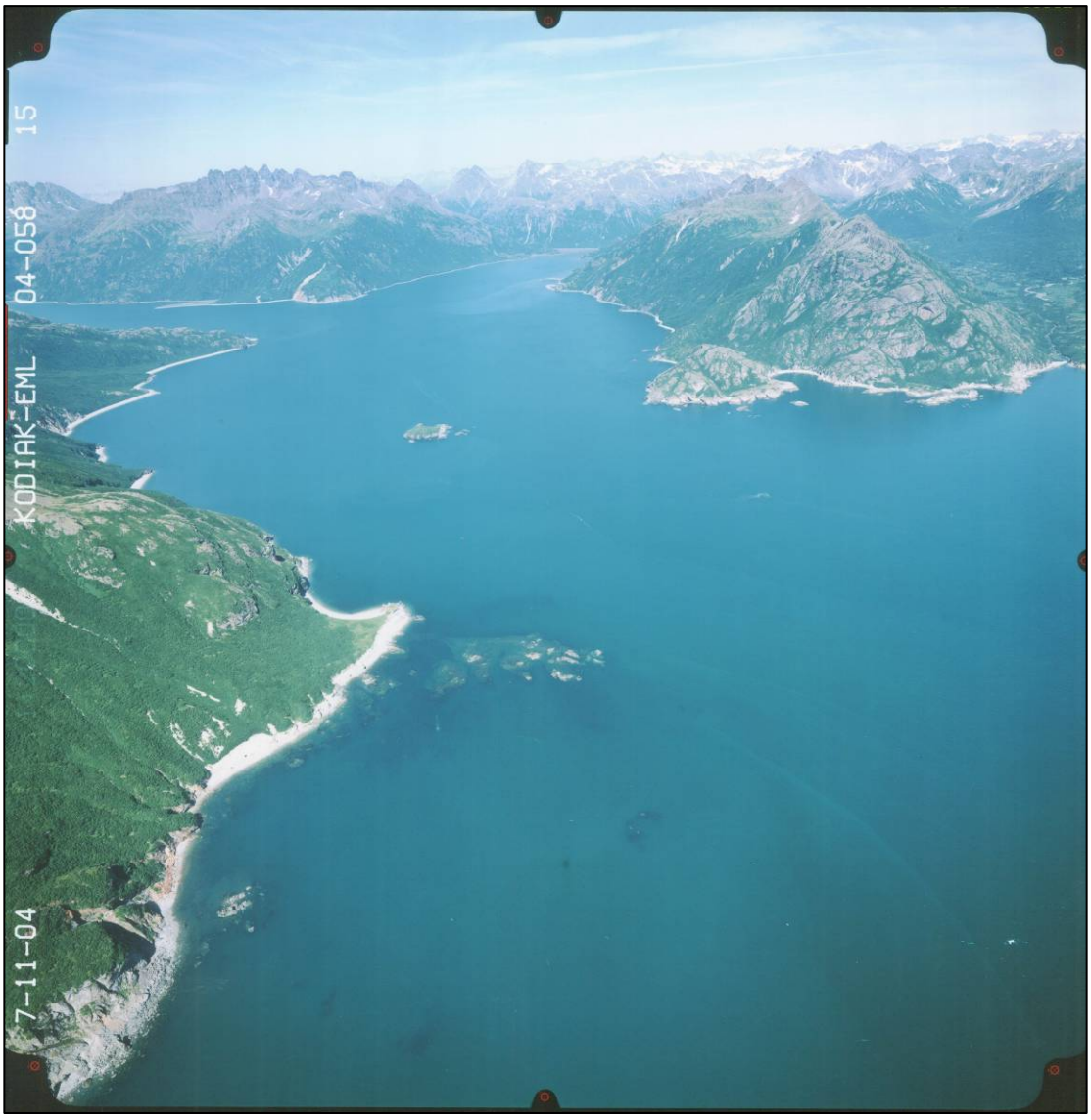

PHOTO 28-1: View to the northwest into Iliamna Bay, July 2004.

PHOTO 28-2: View to the northeast toward the entrance to Iniskin Bay, July 2004.

PHOTO 28-3: View to the north toward North Head (on left) and the mouth of “Y Valley” on the peninsula between Iniskin Bay and Iliamna Bay, July 2004.

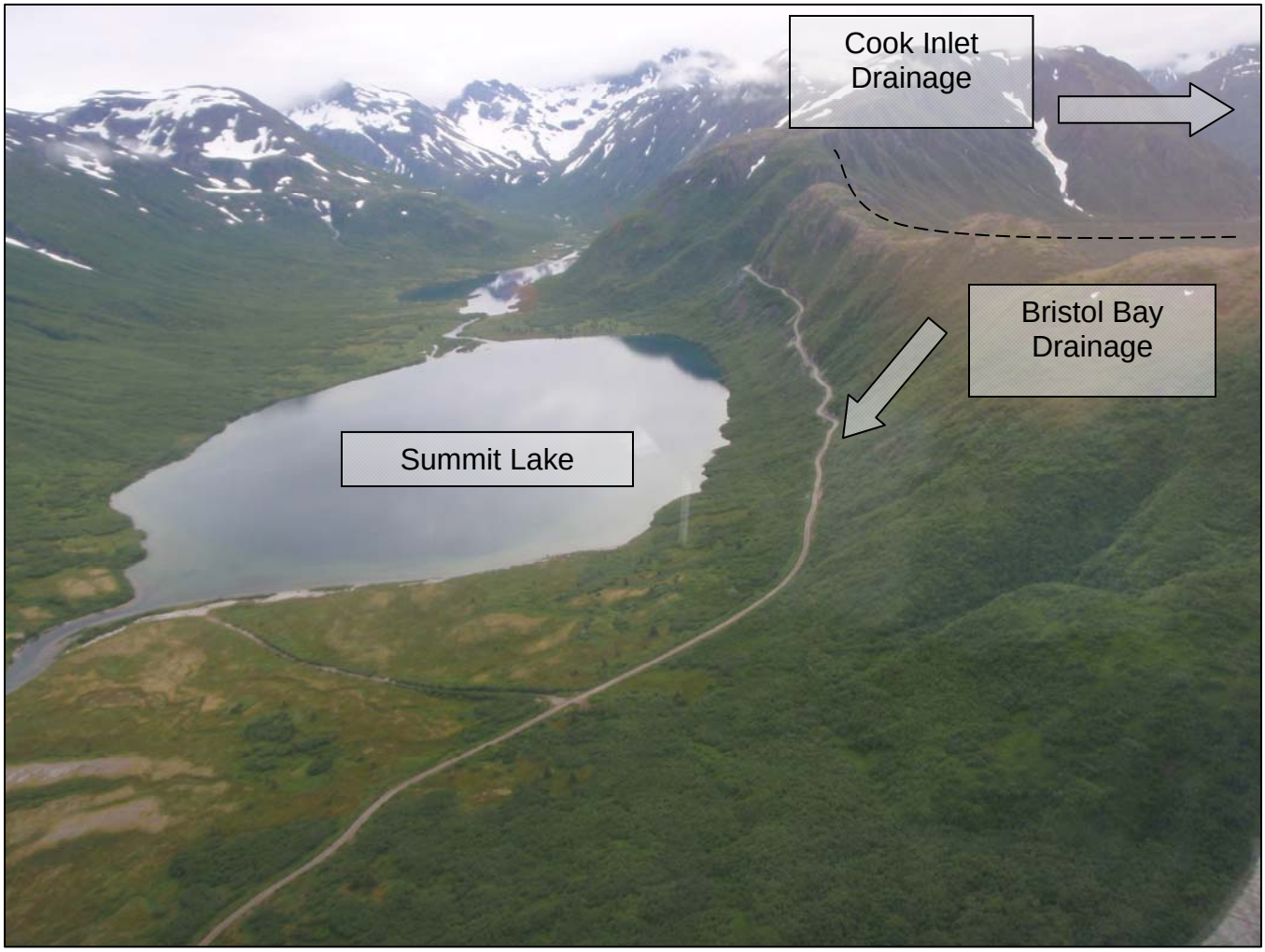

PHOTO 28-4: Summit Lake and the Bristol Bay / Cook Inlet drainage divide, July 2008.

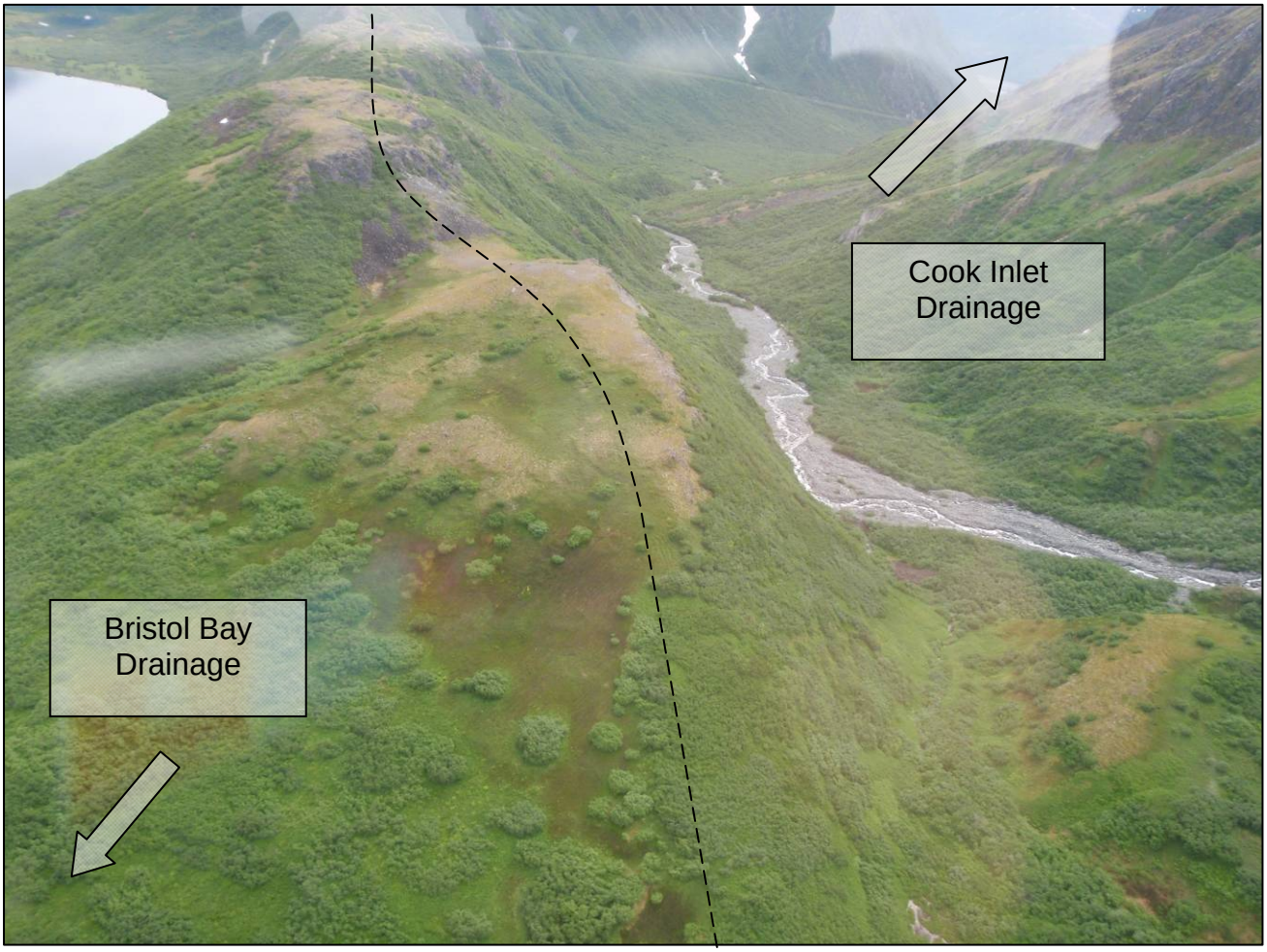

PHOTO 28-5: Bristol Bay / Cook Inlet drainage divide near Summit Lake (Bristol Bay drainage) and the headwaters of Williams Creek (Cook Inlet drainage), July 2008.

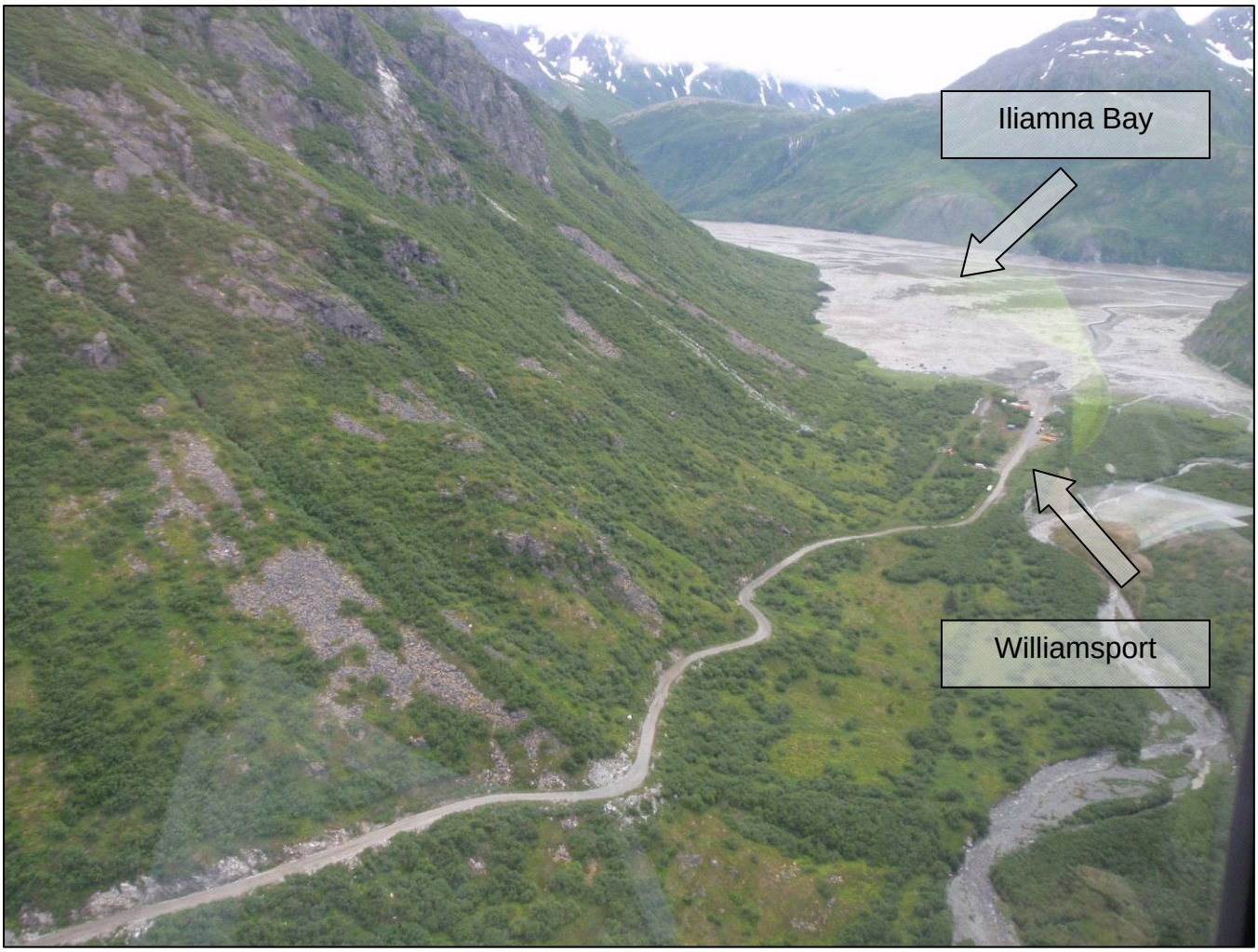

PHOTO 28-6: View to the east along existing road and Williams Creek to Williamsport and Iliamna Bay, July 2008.

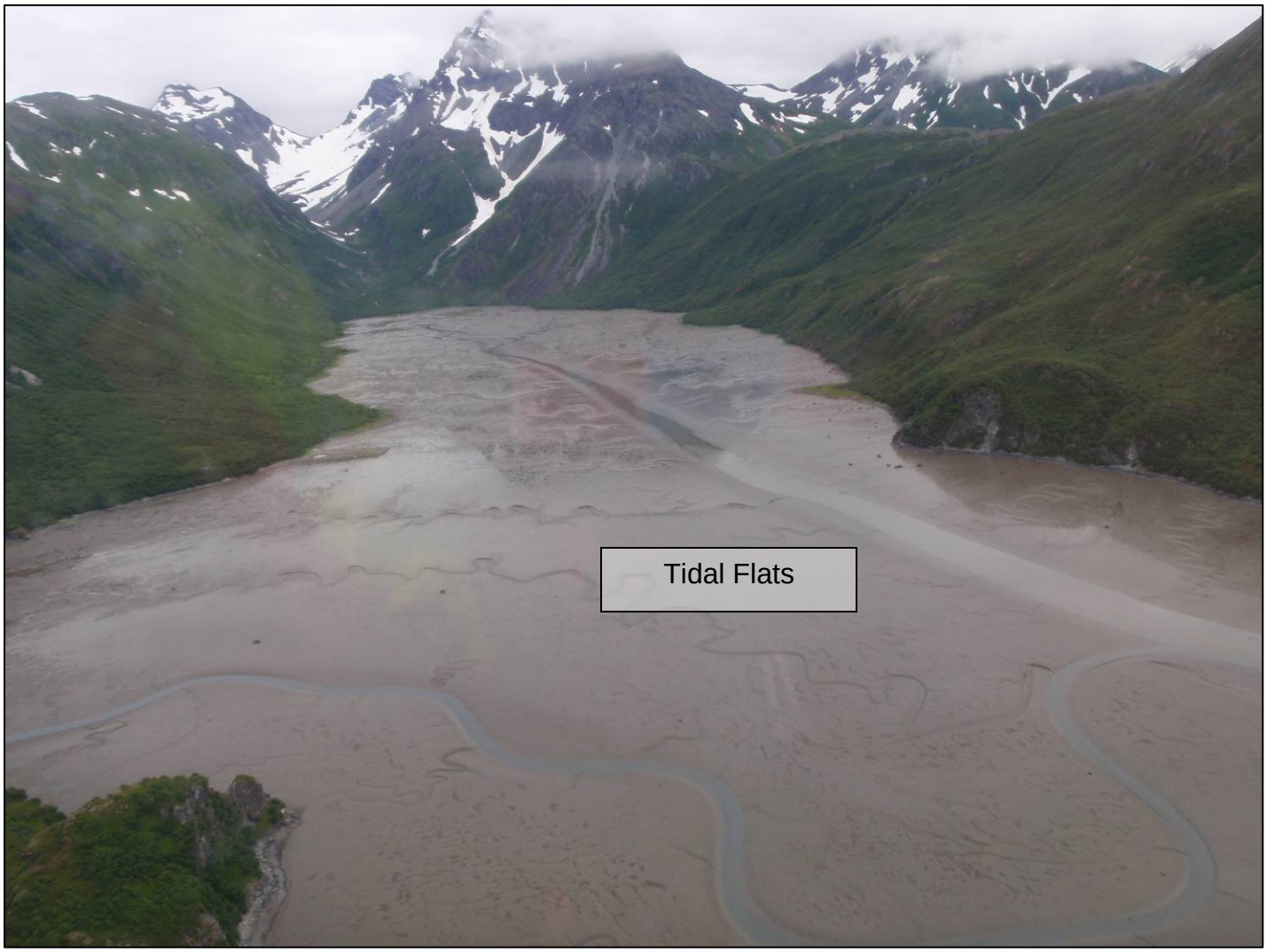

PHOTO 28-7: View to the northeast toward the head of Iliamna Bay, July 2008.

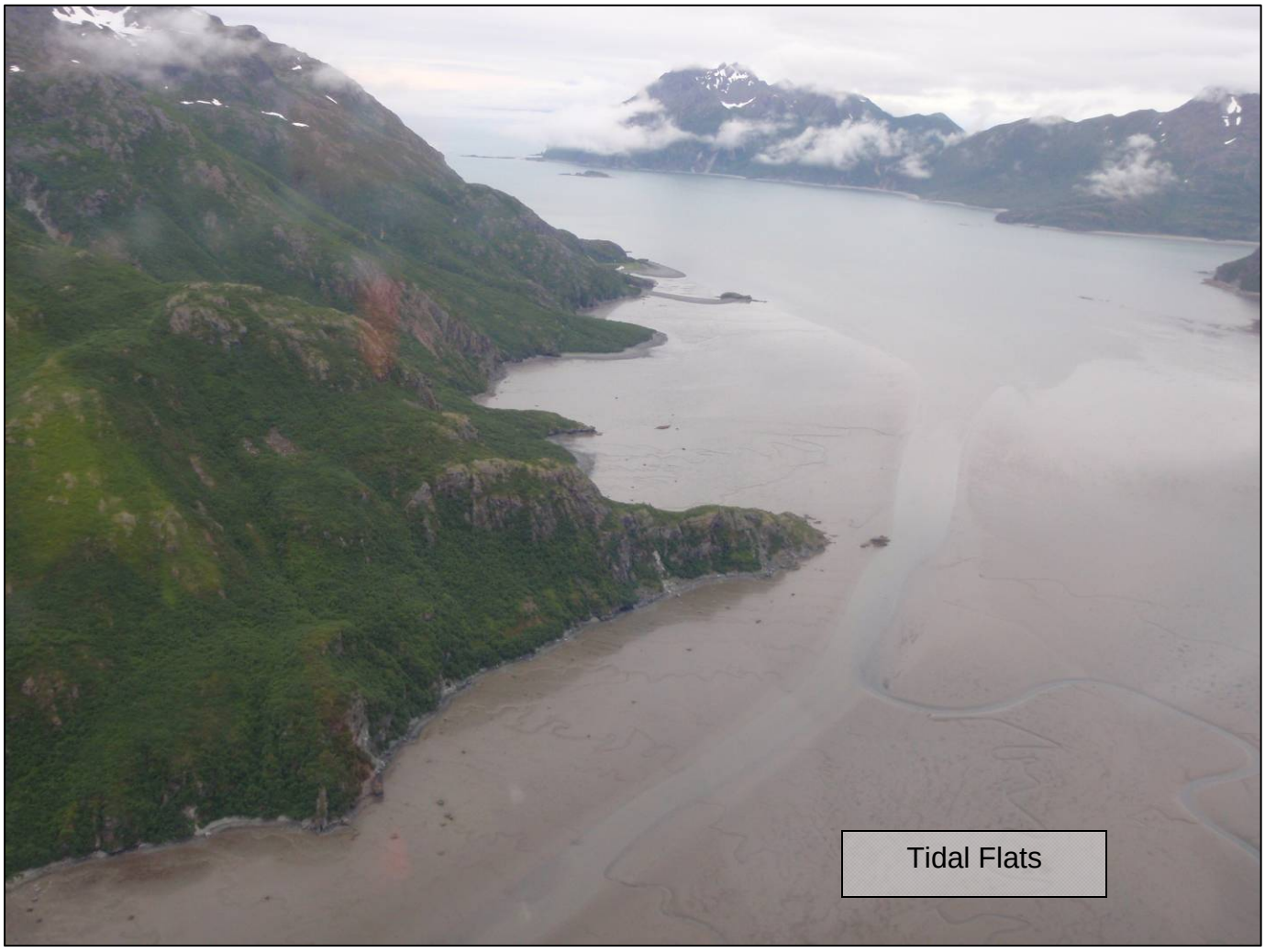

PHOTO 28-8: View to the southeast along the eastern coast of Iliamna Bay, July 2008.

PHOTO 28-9: View to the northeast across the mouth of the “Y Valley” on the peninsula between Iliamna Bay and Iniskin Bay, July 2008.

PHOTO 28-10: Coastline of Iniskin Bay, July 2008.

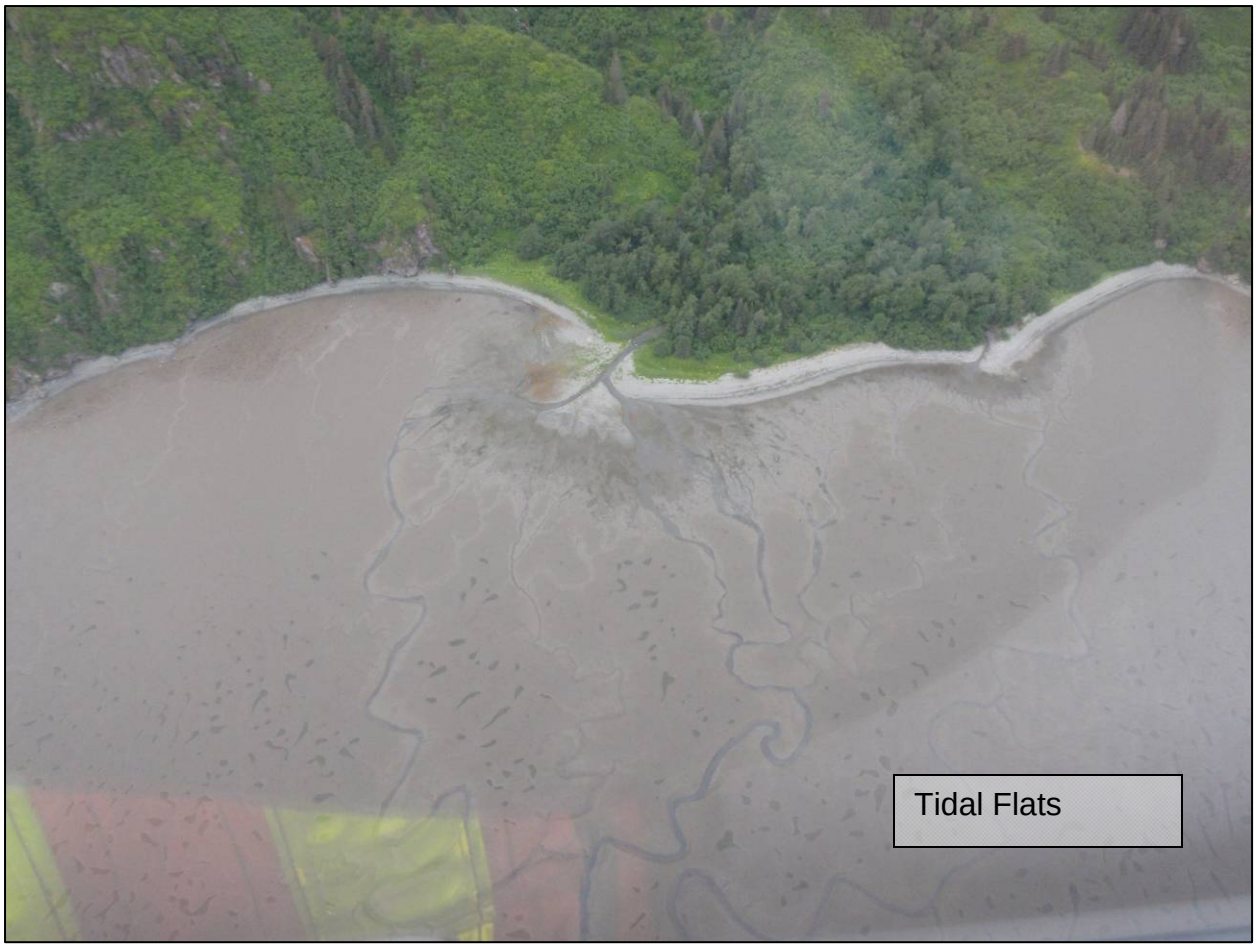

PHOTO 28-11: Tidal Flats in Iniskin Bay, July 2008.

PHOTO 28-12: View to the north up the Iniskin River valley from Iniskin Bay, July 2008.

PHOTO 28-13: View to the south down the Iniskin River valley toward Iniskin Bay, July 2008.