Alpine Pipeline River Crossing Monitoring 2003

Prepared for

ConocoPhillips

July 2003

Prepared by

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July 18, 2003

Caryn L. Rea
Environmental Studies Coordinator
ConocoPhillips Alaska, Inc.
700 G Street, ATO 1902
Anchorage, AK 99510-0360

Re: Alpine Pipeline River Crossing Monitoring - 2003

Dear Caryn,

On June 13, 2003, Michael Baker Jr. (MBJ), represented by Jon Wolf and Mike Cox, P.E., conducted an inspection of three Alpine pipeline river crossings. This letter report presents the results of the monitoring efforts. Aerial and ground photographs of the sites that were taken on the day of the inspection are provided in Attachment I. A draft version of this report was submitted on June 20, 2003.

Objective: The objective of the monitoring work was to inspect the Alpine pipeline and vertical and horizontal supports at major floodplain crossing sites that included the horizontal directional drilling (HDD) site on the Colville River, and the Miluveach and Kachemach River crossings.

Data: The data that were to be collected during this task included the following:

- Photographs at each crossing location;
- Evidence of support member tilting, settling or jacking;
- Identified bank caving locations;
- Identified channel obstructions;
- Documentation of soil pressure ridges, ponding, depressions, or cracks;
- Identified pipeline leaks.

Results: Results are subdivided by location. At all three sites, a complete inspection was made of the pipeline and vertical and horizontal support members within the floodplain. The inspections were mostly qualitative in nature. A few measurements were made using a pocket rod and hand level.

Horizontal Directional Drilling Crossing Site – Colville River

Prior to inspection at the HDD site, MBJ was informed by ConocoPhillips Alaska, Inc. that a detailed bank erosion study by another subcontractor was ongoing at the site and, therefore, a generalized inspection of the bluff faces was all that would be required for this survey.

The HDD site was inspected from both the air and the ground (see attached Figures 1-12). On the day of the inspection, the west bank was free of snow while some areas of the east bank were obscured by drifts. Vertical Support Members (VSMs) and Horizontal Support Members (HSMs) on the east and west banks appeared plumb and level. No evidence of jacking or subsidence was noted. No evidence of scour was noted. Shallow standing water from localized melt was observed around many of the VSMs on the west bank. VSMs on the east bank were generally dry with no standing water. VSMs on both banks were free of debris. A loose pipeline insulation jacket was observed on the southernmost pipeline on the east bank. No pipeline leaks were found.

Localized slumping and sloughing of bank material was noted on both the east and west banks. On the west bank, it appeared that high water had caused minor undercutting of the bank in a number of locations, and small portions of the face had slumped. On the east bank, large cracks were noted along the top of the bank, and it appeared that larger sections of the bank (relative to the west bank) had or were in the process of slumping. Previously identified ice wedges on the east bank were not observed from the ground or the air, likely due to the snow cover. No indication of soil pressure ridge formation was observed on either bank. No indications of channel obstructions were observed.

Kachemach River Crossing

The Kachemach River pipeline crossing was inspected from both the ground and the air (see attached Figures 13-24). On the day of the inspection, the west bank was entirely free of snow while the majority of the east bank was still snow-covered. Water within the active channel was shallow enough to wade. Flow was relatively uniform bank-to-bank with a defined thalweg noted beneath the double set VSM No. 1715 near the east bank.

VSMs and HSMs on the east and west banks appeared plumb and level. No evidence of jacking or subsidence was noted. Three instream VSMs were examined for scour. VSM No. 1716 had no measurable scour. Scour at VSM No. 1714 was measured at 2.1 ft. (upstream side) and 1.7 ft. (downstream side). Scour was also noted around the double set VSM No. 1715, however, it was not possible to measure the scour due to the depth of water in that location. Further survey efforts would be required in order to define the magnitude and extent of scour around this VSM.

A small isolated scour trench was observed between VSM Nos. 1714 and 1715. The scour trench was approximately six to seven feet in length. It was not possible to measure the depth of the trench due to the depth of water at that location. The trench does not appear to be related to scour around in-stream structures. One small area of localized scour was documented on the west bank near the apparent high water mark outside the active channel. No evidence of significant scour was noted on VSMs outside the active channel. VSMs on both banks and in the active channel were free of debris. No pipeline leaks were found.

The remains of the ice bridge just upstream from the pipeline crossing were still very much in evidence. Remaining ice appeared to be groundfast and as such, posed no threat to the pipeline. Trenches that had been cut through the ice bridge to facilitate drainage had become enlarged by the floodwaters. On the east bank, relatively significant bank damage was noted in an area where floodwaters had been directed towards the bank by one of the trenches. Diminished, but still relatively large blocks of the ice bridge still covered a large portion of the channel, but the blocks were not impeding flow, as the stage was relatively

low. Other than the ice bridge remains, no indication of channel obstructions were observed. With the exception of minimal slumping, no bank damage was noted on the west bank.

Miluveach River Crossing

The Miluveach River pipeline crossing was inspected from both the ground and the air (see attached Figures 25-32). On the day of the inspection, both the east and west banks were entirely free of snow. Water within the channel was shallow enough to wade. Flow was relatively uniform bank-to-bank with no defined thalweg noted.

VSMs and HSMs on the east and west banks appeared plumb and level. No evidence of jacking or subsidence was noted. Two instream double set VSMs were examined for scour. Scour on instream VSMs was minimal, ranging from 1.8 to 0.3 ft. No evidence of significant scour was noted on VSMs outside the active channel. VSMs on both banks and in the active channel were free of debris. No pipeline leaks were found.

Both the east and west bank appeared to be stable; only minimal slumping was noted. No indications of channel obstructions were observed. It was not possible to make an assessment of potential bank migration in the meander bend located approximately 300 feet upstream from the pipeline crossing due to snow drifts that covered the entire outside of the bend in that area.

We hope that this monitoring report is sufficient for your needs. Please feel free to call should you have any questions or comments.

Sincerely,
Michael Baker Jr., Inc.

[Original signed by:]

Hans R. Arnett
Senior Hydrologist

Attachment I: Aerial and Ground Photography

Attachment I -
Aerial and Ground Photography

Figure 1 – Colville River HDD west bank

Figure 2 – Colville River HDD west bank

Figure 3 – Colville River HDD west bank

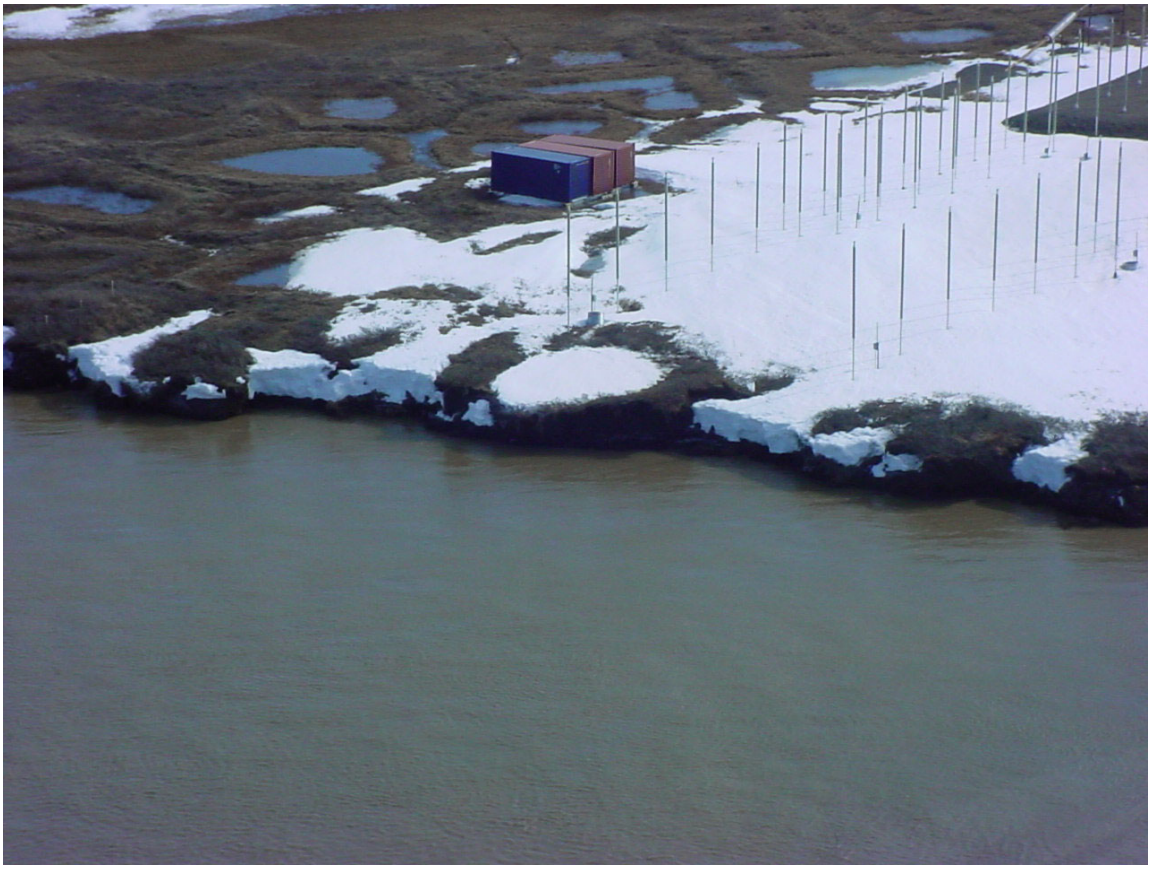

Figure 4 – Colville River HDD east bank

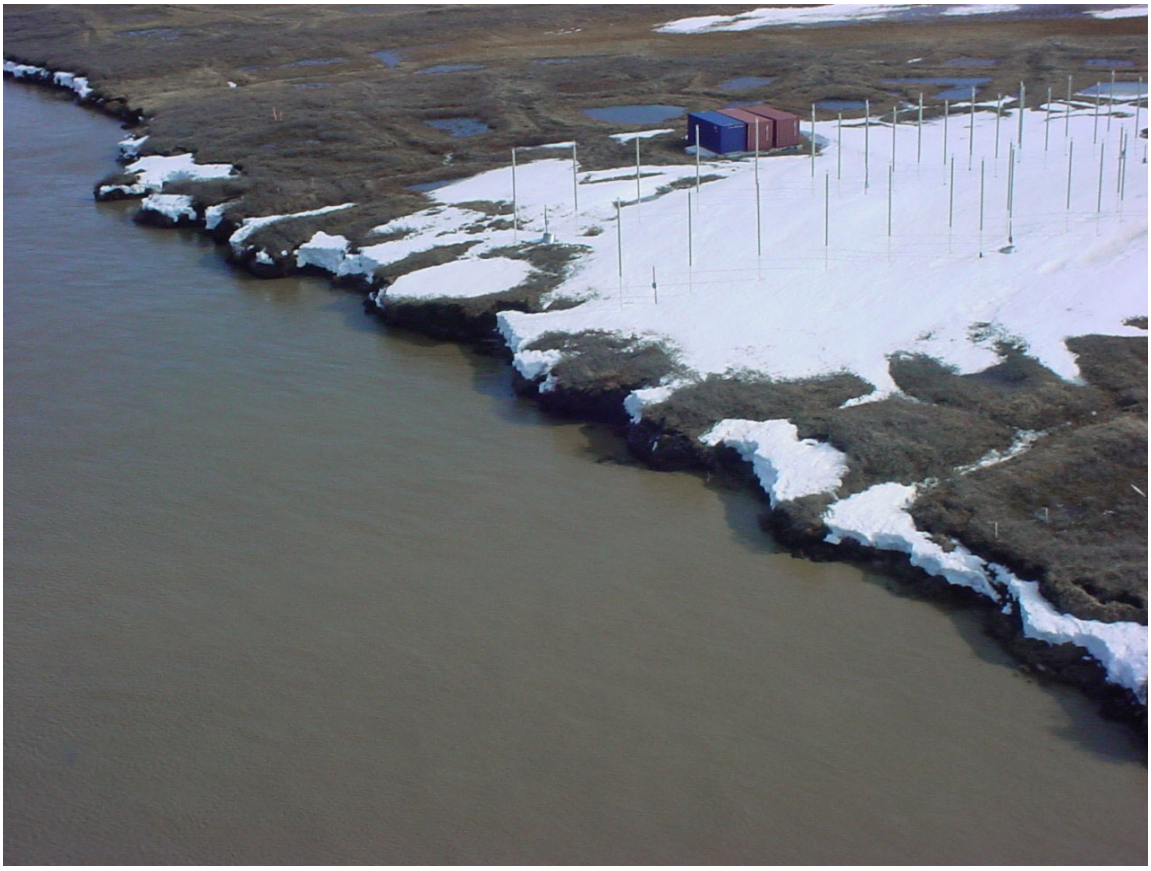

Figure 5 – Colville River HDD east bank

Figure 6 – Colville River HDD east bank

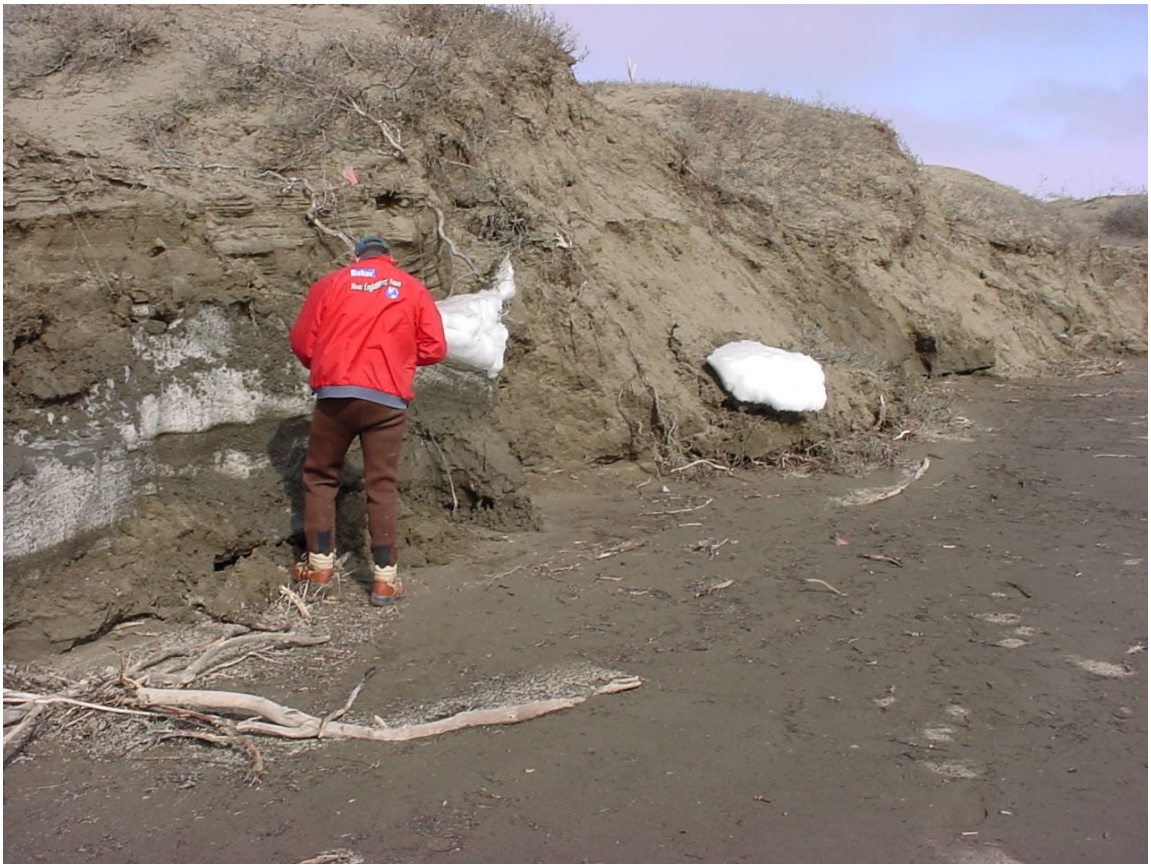

Figure 7 – Colville River Along pipeline alignment, HDD west bank

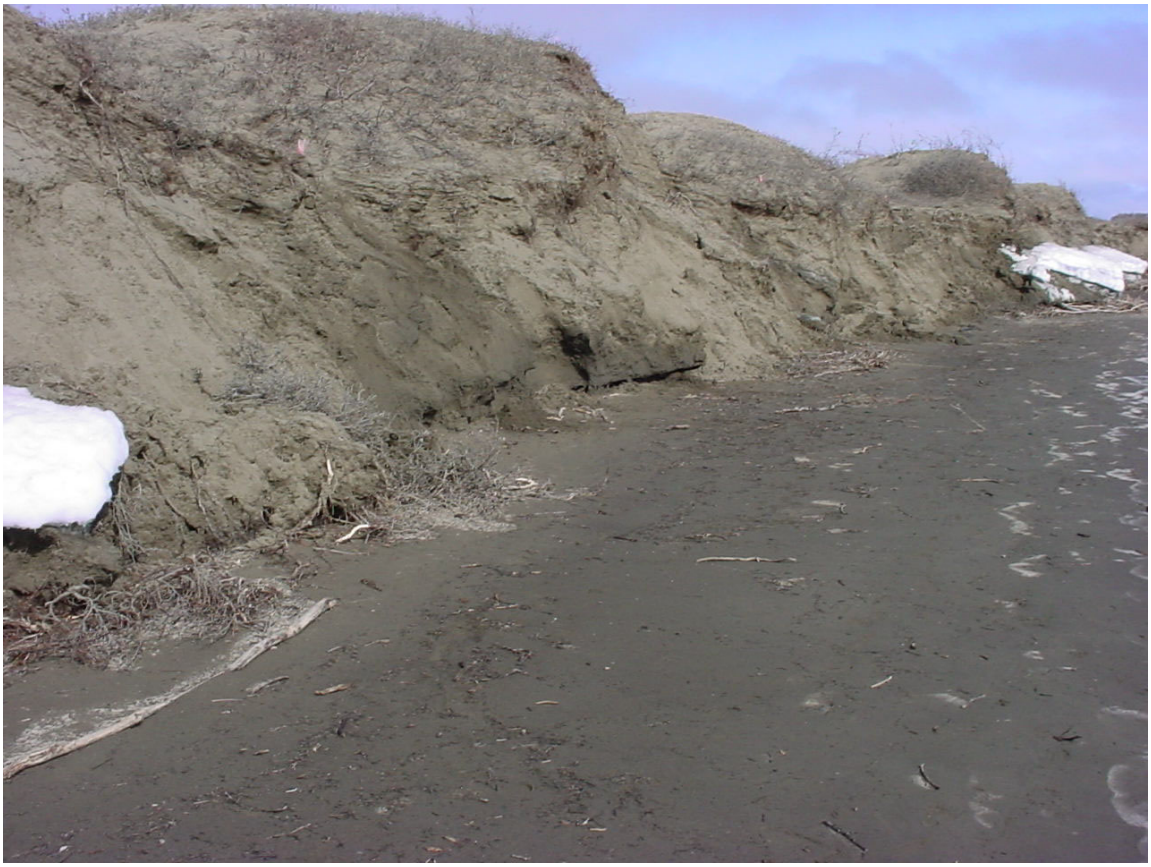

Figure 8 – Colville River HDD west bank - along pipeline alignment

Figure 9 – Colville River HDD east bank

Figure 10 – Colville River HDD east bank

Figure 11 – Colville River HDD east bank, cracking along the top of the bank

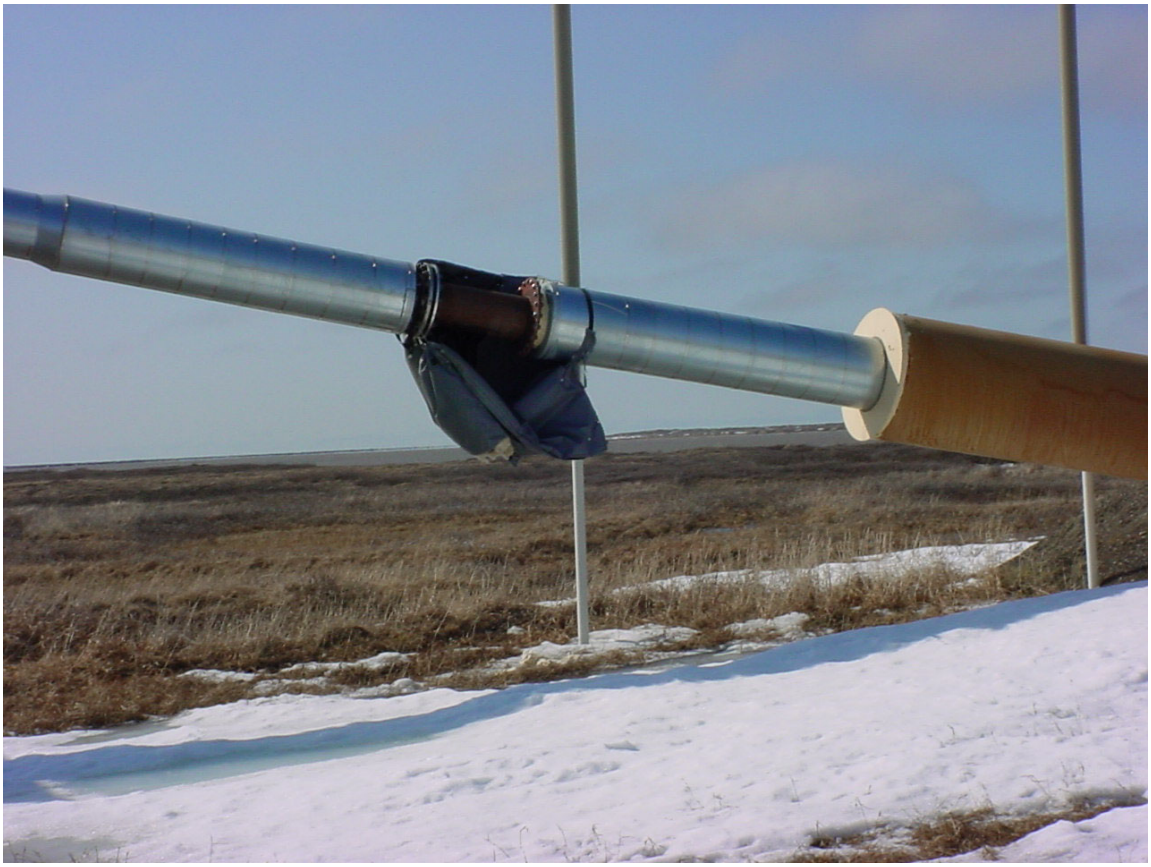

Figure 12 – Colville River HDD east bank, loose pipeline insulation jacket

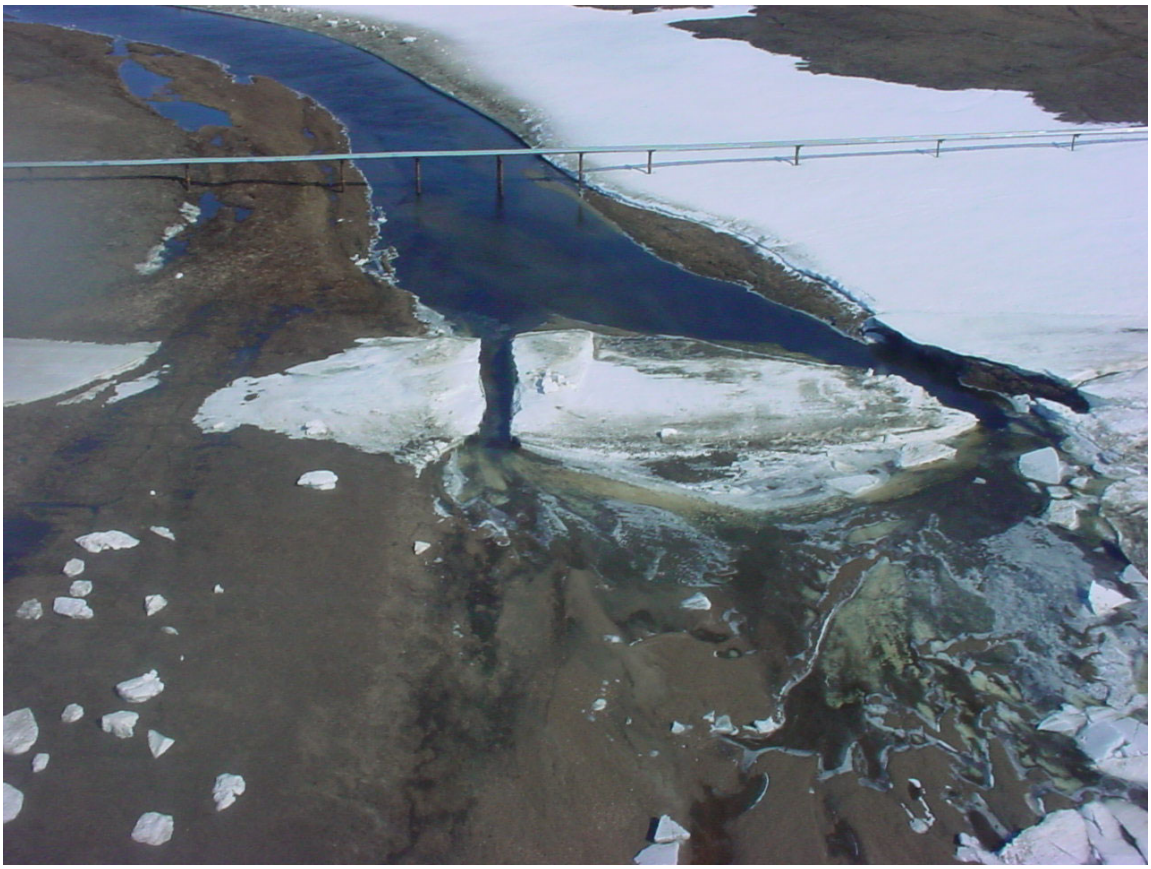

Figure 13 – Remains of the ice bridge, Kachemach River looking downstream

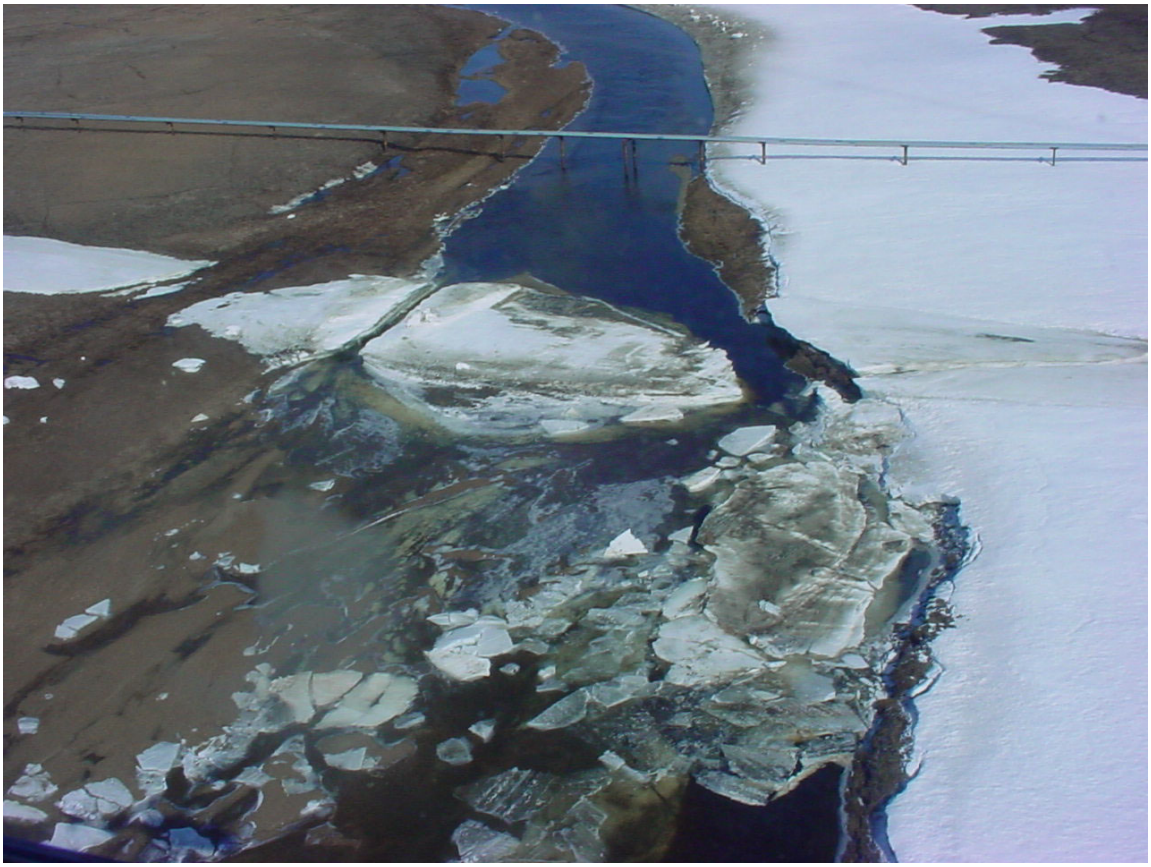

Figure 14 – Remains of the ice bridge, Kachemach River looking downstream

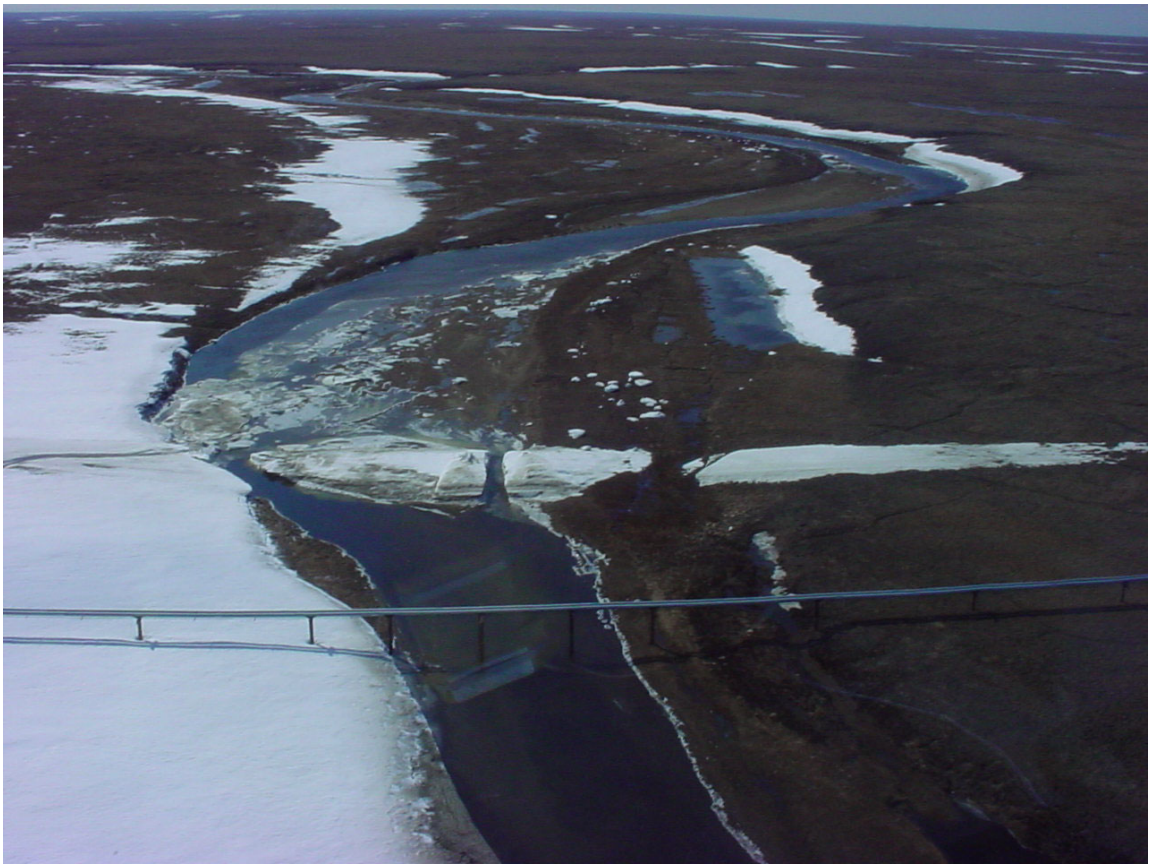

Figure 15 – Kachemach River pipeline crossing looking upstream

Figure 16 – High water mark on VSM 1714, Kachemach River looking downstream

Figure 17 – Approximate high water mark on VSM 1714, Kachemach River looking downstream

Figure 18 – VSM alignment and vertical loop, Kachemach River west bank

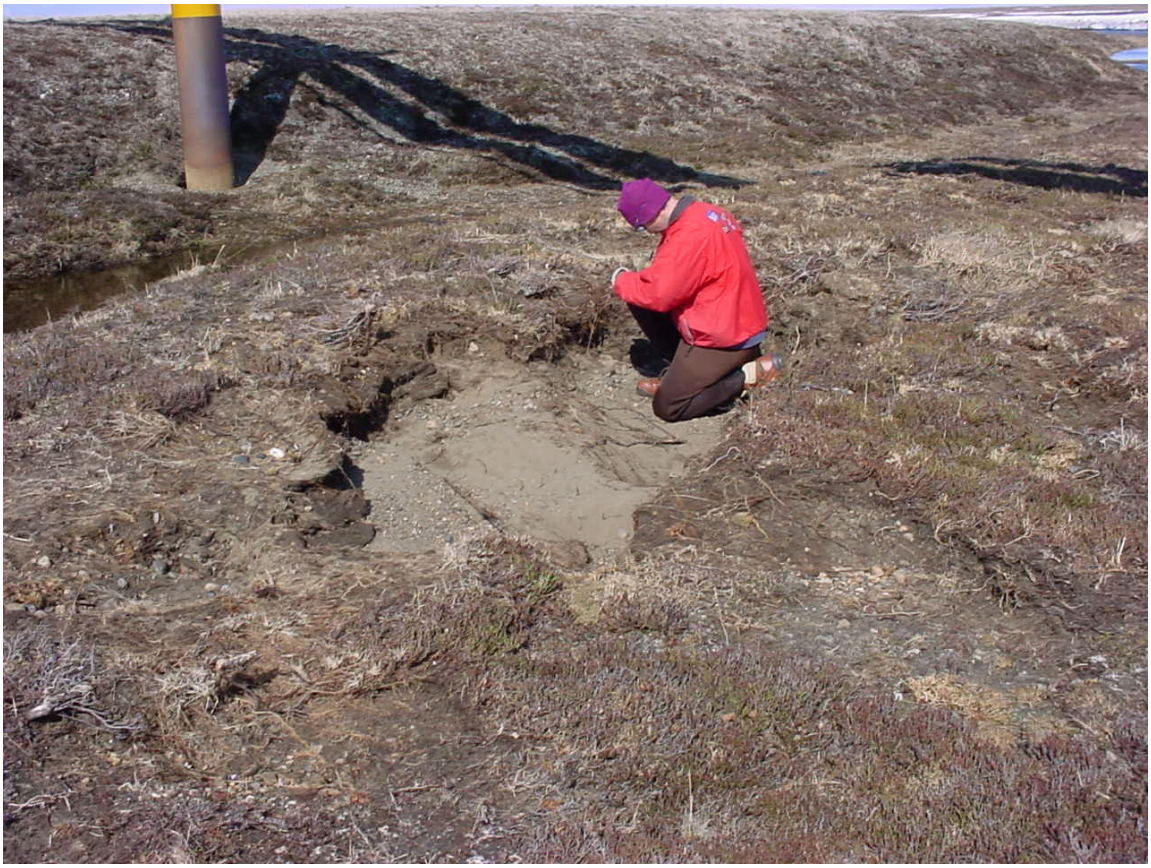

Figure 19 – Localized scour near high water mark, Kachemach River west bank

Figure 20 – VSM alignment, Kachemach River east bank

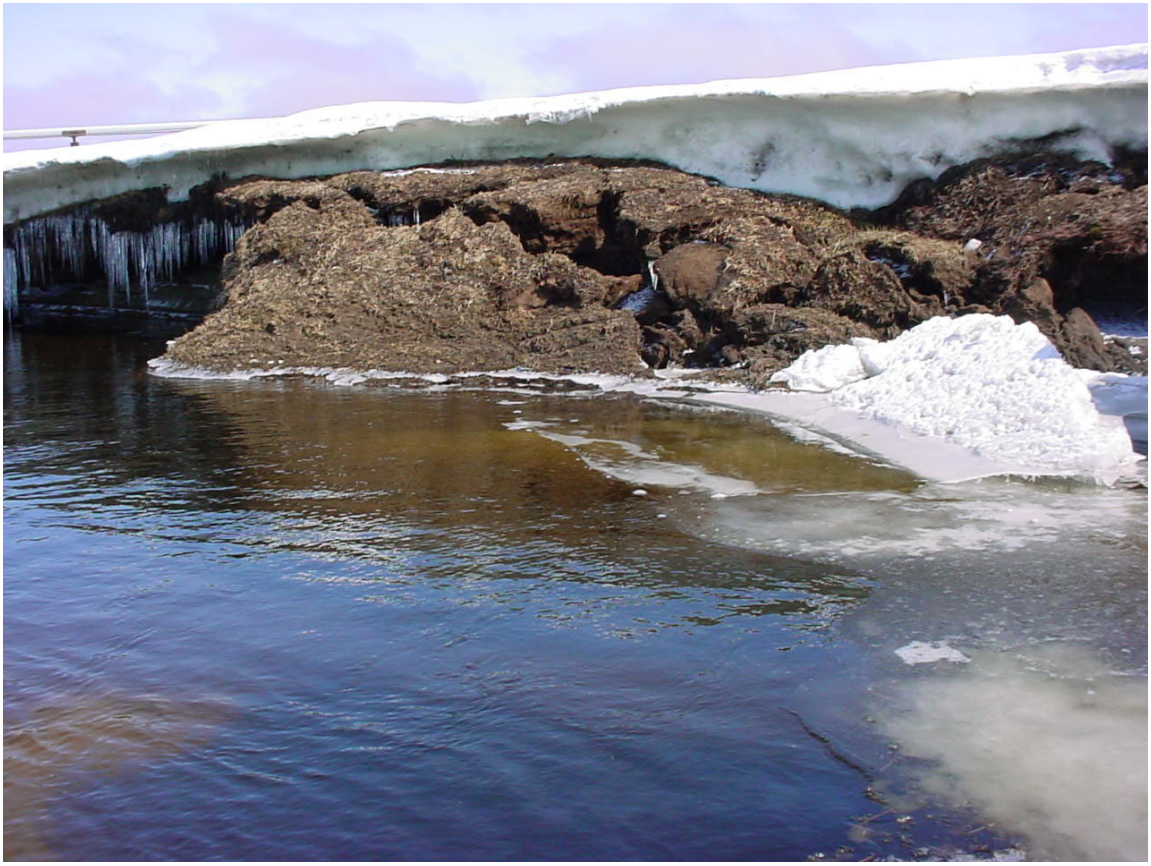

Figure 21 – Erosive damage resulting from flow directed toward the bank by a trench cut through the ice bridge, Kachemach River east bank

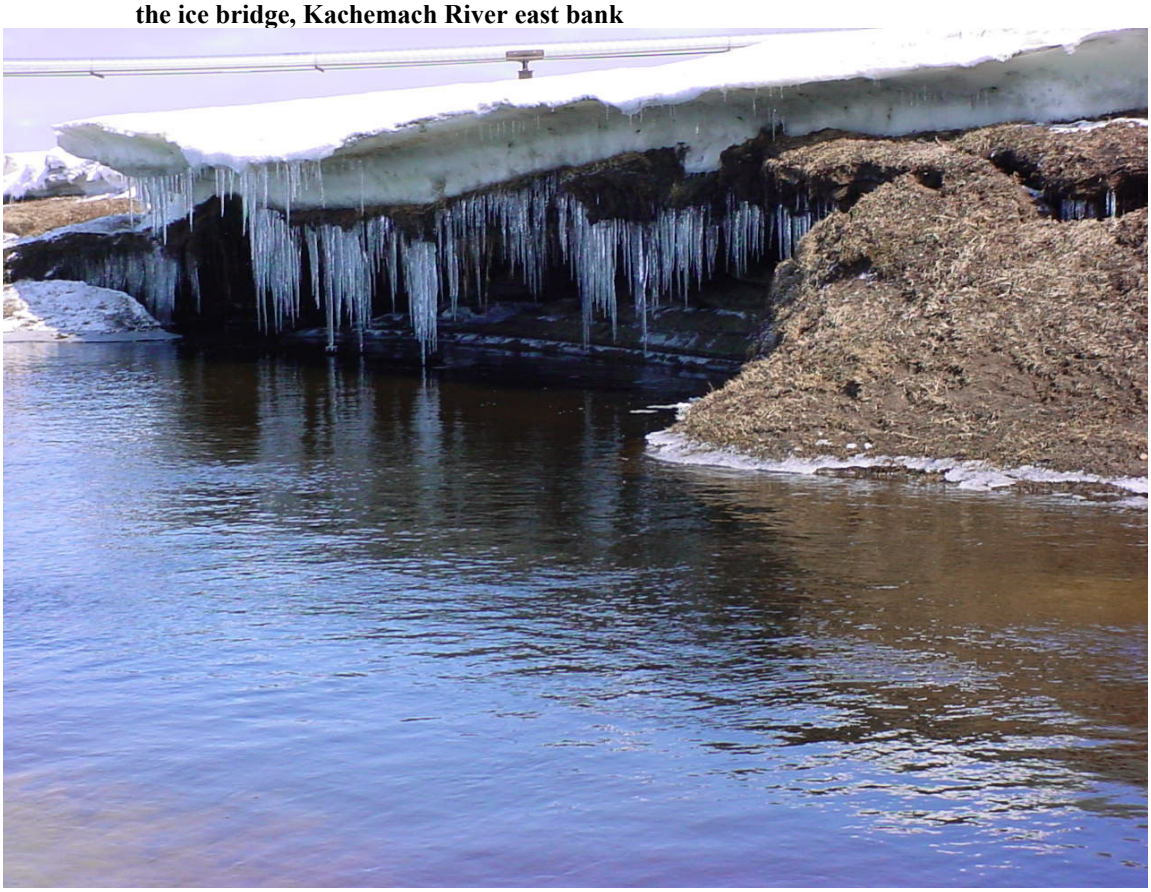

Figure 22 – Erosive damage resulting from flow directed toward the bank by a trench cut through the ice bridge, Kachemach River east bank

Figure 23 – A trench cut through the ice bridge and expanded by floodwaters, Kachemach River active channel

Figure 24 – Remnants of the ice bridge, Kachemach River west bank

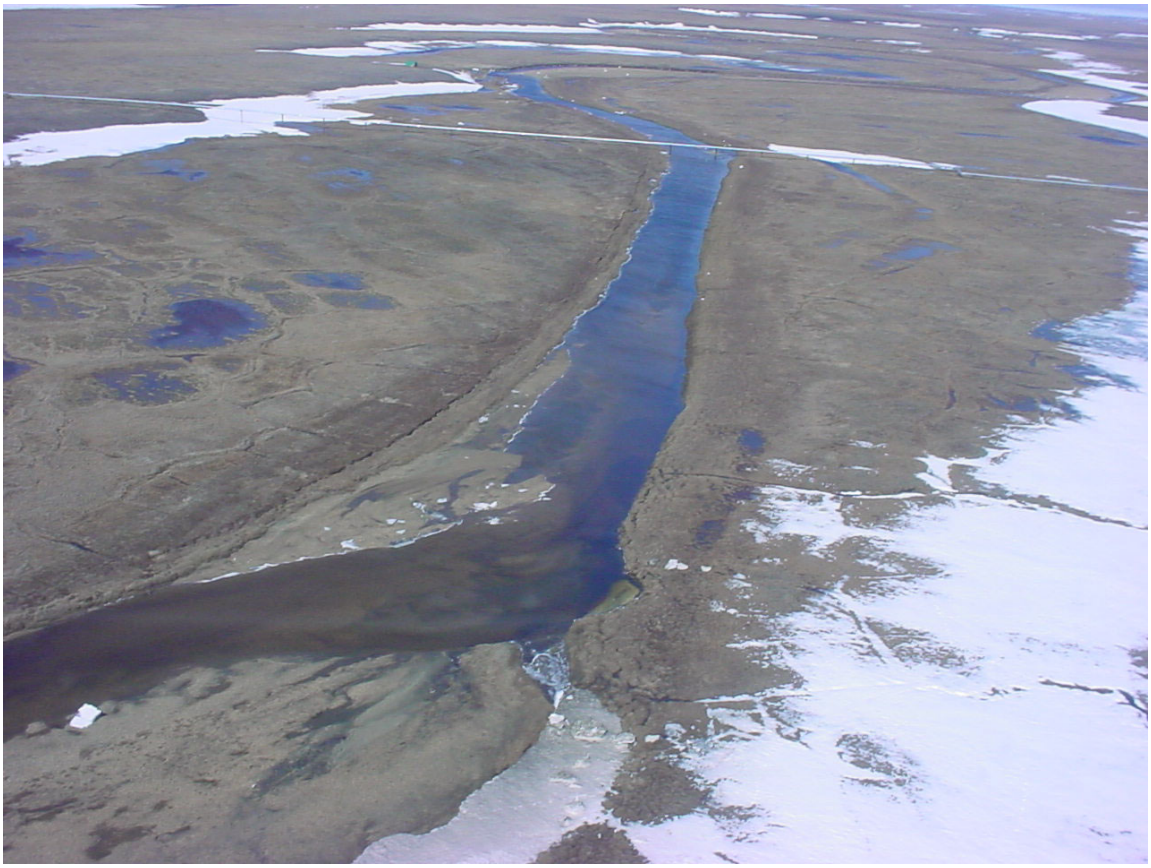

Figure 25 – Miluveach River pipeline crossing looking downstream

Figure 26 – Miluveach River pipeline crossing looking downstream

Figure 27 – Miluveach River pipeline crossing looking upstream

Figure 28 – Typical flow depth, Miluveach River east bank

Figure 29 – Approximate high water mark on VSM 2047, Miluveach River looking downstream

Figure 30 – VSM alignment and vertical loop, Miluveach River west bank

Figure 31 – VSM alignment and horizontal loop, Miluveach River east bank

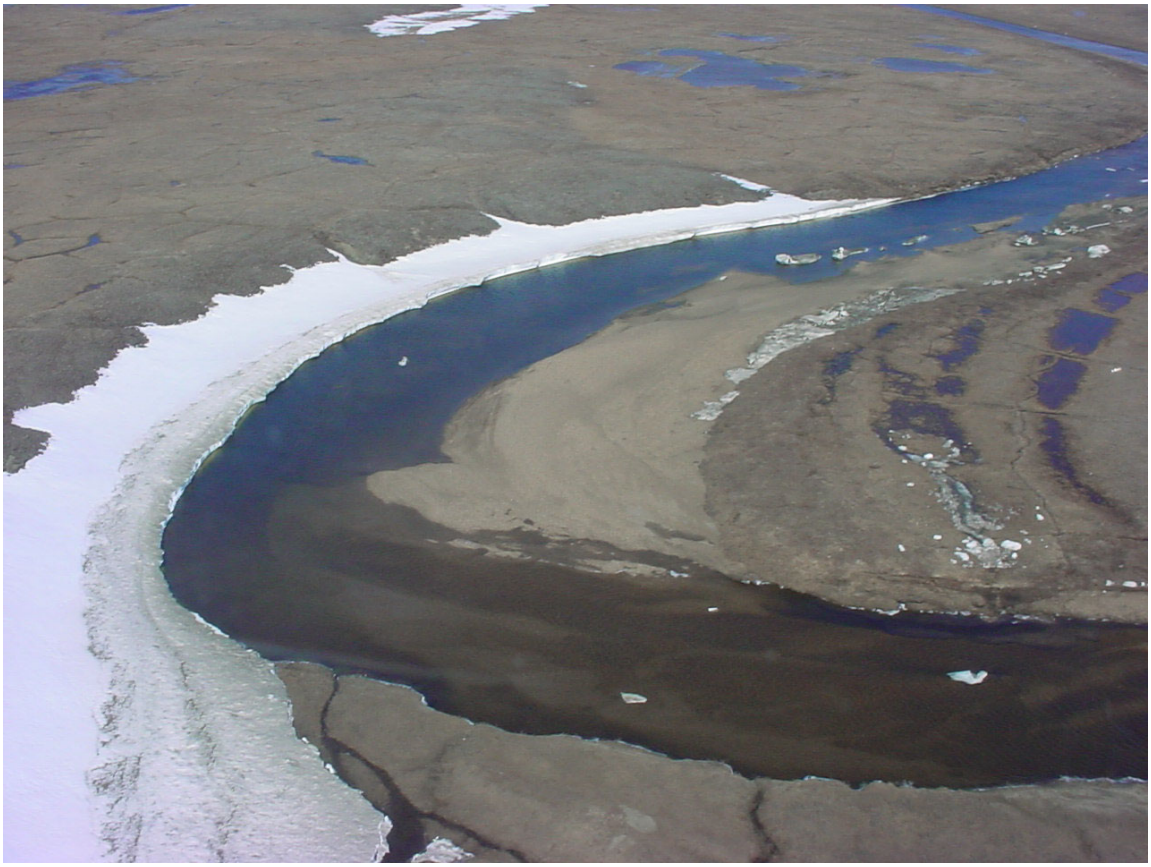

Figure 32 – Meander bend located approximately 100 yards upstream from the pipeline crossing, Miluveach River

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