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NPAEN-AR

23 August 1968

SUBJECT: Corrosion Studies Report, Dezadeash Lake Area, Haines-Fairbanks POL

Commanding Officer
USARAL Support Command
ATTN: ARCL-F
APO 98749

Transmitted for your information are two copies of supplemental information to subject report.

FOR THE DISTRICT ENGINEER:

1 Incl
as (dupe)

WARREN GEORGE
Chief, Engineering Division

Copies furnished:
USARAL, ATTN: AREN-I
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after it is completely thawed and drained.

RECOMMENDATION

10. After the soil is completely thawed in the Dezadeash Lake area and it is possible to insert temperature probes and resistivity probes to the depth of the pipe, the entire area should be resurveyed to outline areas requiring protection.

11. In the event the 480' section of pipe replaced at Lake Dezadeash is buried, cathodic protection in the form of anode beds such as exist at Lake Kluane should be installed. Corrosion of the new pipe without any protection will be relatively rapid (expected life - 6 years) due to the variation in metallic composition between the original British manufactured steel and the new line installed.

12. The major portion of the line removed could have been renovated by appropriate welding and or filling procedures. The District Engineers are qualified to teach their procedures to POL welding personnel and are prepared to do so upon request.

13. Sleeves of polyethylene such as described in Plate IV (an excerpt from a report on corrosion by W. Harry Smith, Assistant Managing Director for the Cast Iron Research Association) should be secured for protecting replaced pipe during general maintenance of the POL system.

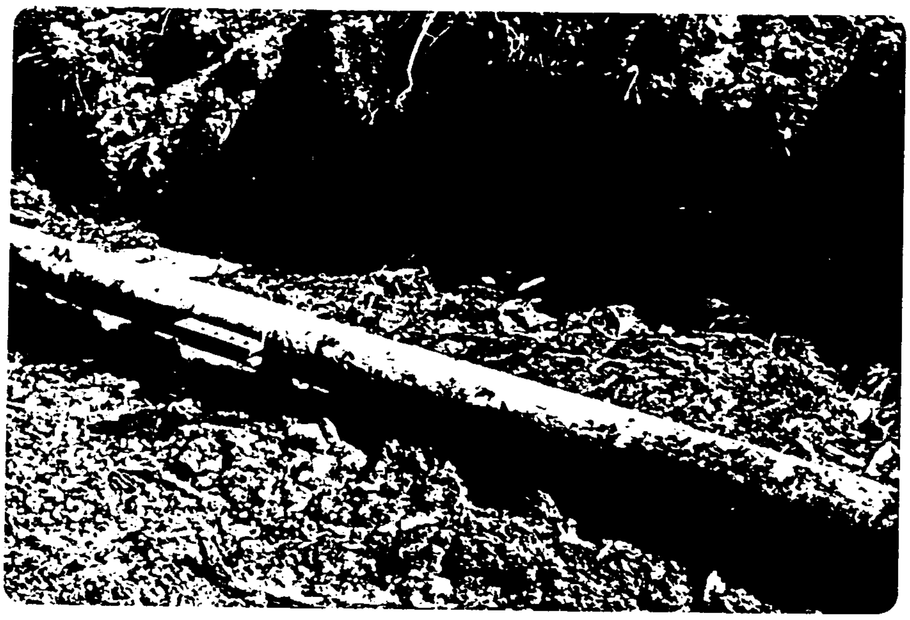
LABORATORY ANALYSES

14. The water analysis shown in Plate 5 indicates a mildly corrosive environment. The pH is 6.6, slightly acid with 15 parts per million sulphates. Generally, sulfates in an acid water indicate the presence of highly corrosive elements. However, these are offset by the hardness factor of 111 parts per million as calcium carbonate.

15. An analysis of soil samples brought to the laboratory indicated no organic type corrosion potential. However, the measured resistivity (laboratory) of the soils was 3600 Ohms per cubic centimeter at a moisture content of 30.4%. At 35.2% water the material had a resistivity decrease to 2,900 Ohms per cubic centimeter. This is relatively a high corrosive condition representative of the clay type materials found adjacent to the pipeline in the corroded areas.

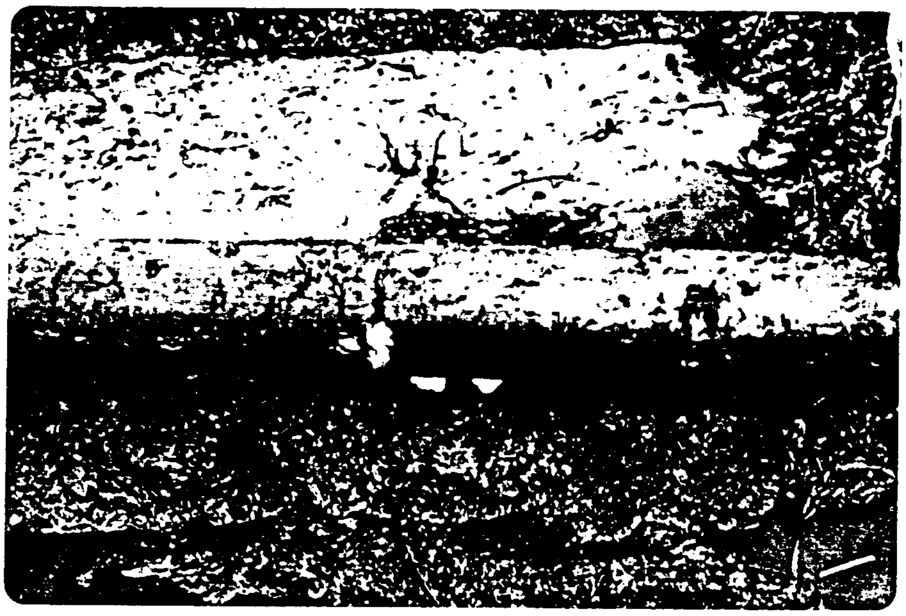
PHOTOGRAPHS

16. The photos shown as inclosures are generally self-explanatory.



This shows the location of the leak in the Desadeash Lake area at Pipeline Milepost 119.1. Note the abundance of fine grain soils and organic materials adjacent to and underlying pipe.

Photo #1



Shows a highly corroded section of pipe at Mile Post 119.092. Over 50% of the original steel has been removed by localized electrolysis in the pit area shown in this photo.

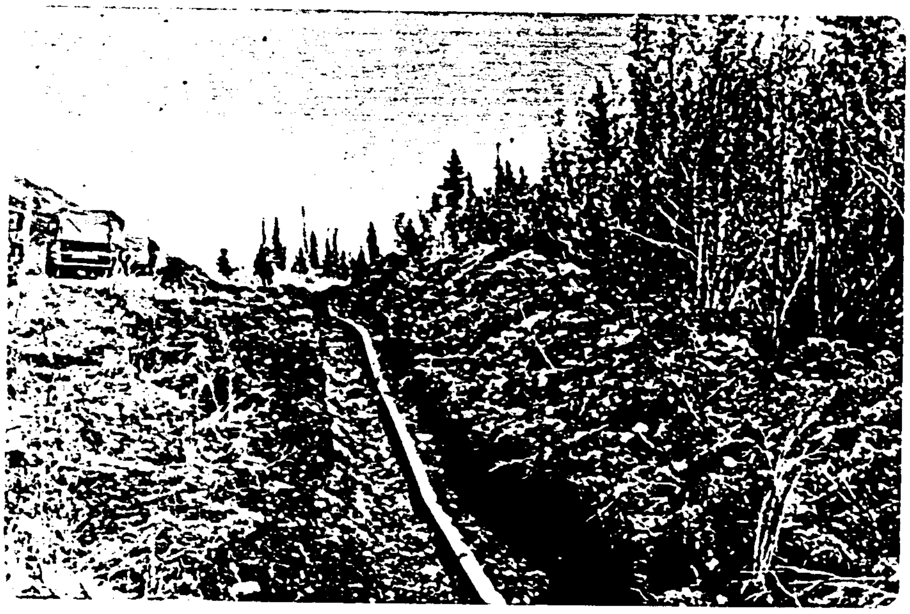
Photo #2

Shows an area uncovered at approximately Mile Post 119.06. The fill material around the pipe is generally sandy gravel and corrosion in this particular area is relatively negligible.

Photo #3

The pipe existing under water is shown above at approximate Mile Post 119.12 and is highly corroded. Pits in this area were located by feeling the surface of the submerged pipe.

Photo #4

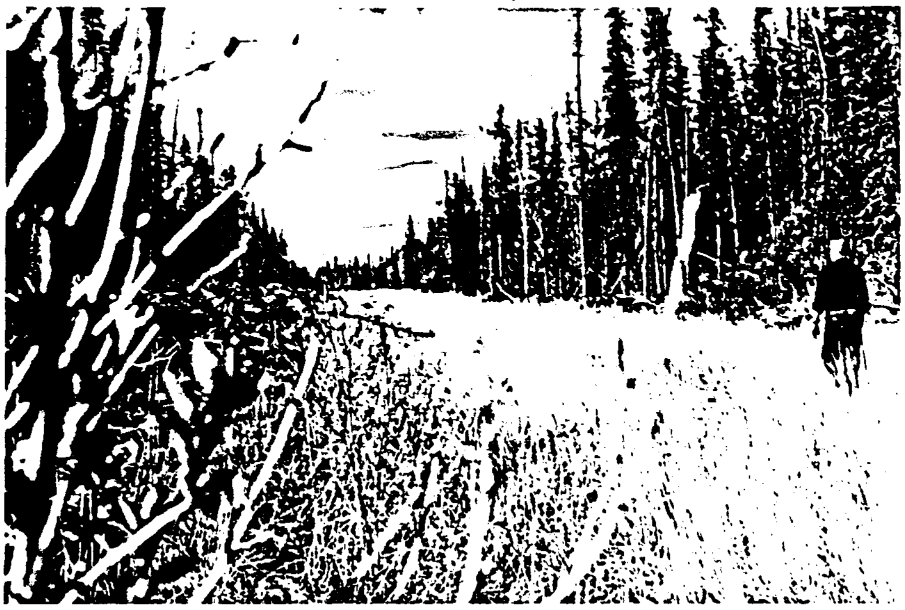


The above photo shows the uncovered petroleum line from approximate Mile Post 119.7 to Mile Post 119.11. This section of the line contains many localized areas of corrosion. The corroded areas were concentrated where varnish has been removed from the original pipe and where fine grain soils existed adjacent to the pipe. Generally the severe corrosion occurred on a horizontal line approximately 90° from the bottom of the pipe and on areas where the varnish had been removed by normal welding procedures.

Photo #5

The above photo shows the transition from buried pipe to surface laid pipe at approximately Mile Post 119.5. Although no serious corrosion was observed in this area concentrated drainage systems such as this subject steel to a high loss of material, when subjected to relatively warm run-off water.

Photo #6

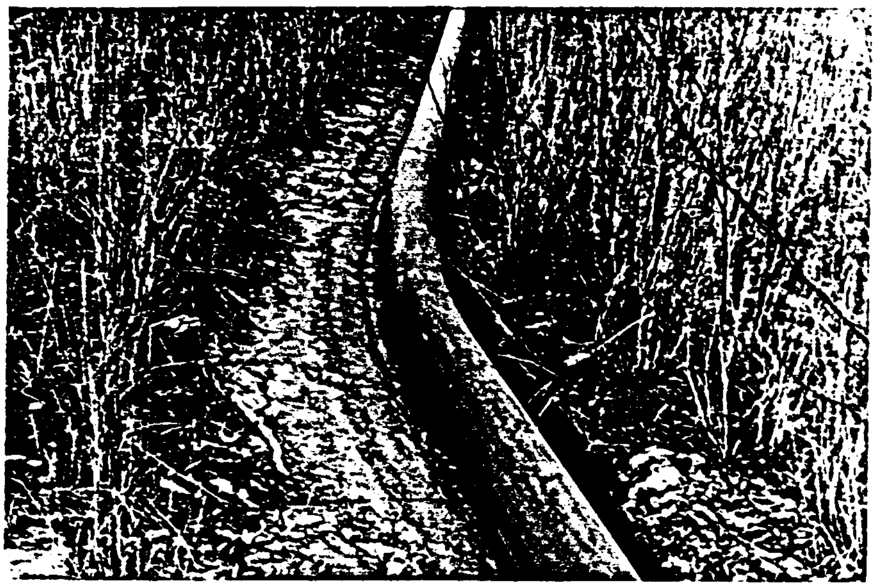


This photo taken at pipeline Mile Post 122 shows well drained soils with the pipe line laying on a thin bed of muskeg. No excessive corrosion was noted where the topography such as is shown above existed.

Photo #7

Soil conditions in this stream crossing at Mile Post 122.8 are generally gravelly in nature. It is doubtful that the waters of this particular stream are corrosive. A short section of line found imbedded in the gravels below the flowing water showed little or no deterioration.

Photo #8



Line movement such as is shown in the above photo contributes to pitting if the soil conditions are favorable for corrosion. A slight film of rust removed from the pipe is shown below and adjacent to the left hand side of the pipe. No excessive corrosion was noted in this particular area.

Photo #9

This picture taken at Pipe Line Mile Post 120.5 demonstrates areas that may corrode under favorable conditions. These are areas where the handling and/or manufacturing of the English steel shows removal of the original protective varnish. Areas similar to this are shown in Photos 1, 2 and 4 and under the environmental conditions are highly susceptible to concentrated corrosion.

Photo #10