

GR-05-004

FILE: 2147-27-0

PROPOSED RIPRAP SOURCES
BLACKSTONE RIVER AREA
Km 139-145

DEMPSTER HIGHWAY

MAY 1989



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BLACKSTONE RIVER AREA
Km 139 - 145

DEMPSTER HIGHWAY

May 1989



INTRODUCTION

A limestone quarry has been developed at Km 195.9 as a riprap source for riverbank protection along the Blackstone and Ogilvie Rivers and Engineer Creek. However, the haul costs to place the material along the Blackstone (km 139 - 145) have proved prohibitive. An alternate source nearer the Blackstone section is needed.

In looking for an alternate source of riprap for the Blackstone I have reviewed the following information:

- satellite spot images to delineate bedrock outcrops;
- geology maps;
- Klohn Leonoff Yukon Ltd.'s report of October 1986 entitled "Geotechnical Investigations of Construction Materials Km 139 to 243, Dempster Highway, Yukon";
- file information on this project.

I have also visited the area with Highways Maintenance staff and discussed past maintenance practices with respect to riverbank erosion along this section of the Dempster Highway.

From this, I have identified two possible sources of riprap for the Blackstone area, one at km 134.5 and one at km 144. Photographs of these are in Appendix A; location plans are in Appendix B. The location plans are taken from the satellite spot images.

SOURCES

Both proposed sources are talus slopes immediately adjacent to the road. This part of the Dempster is unglaciated, and bedrock areas typically have a well-developed mantle of talus -- broken rock fragments produced by weathering of the bedrock surface. (In glaciated areas, this material would have been scraped off the bedrock surface by moving ice sheets.)

Klohn Leonoff's report looks only at bedrock outcrops for riprap sources and does not discuss the possibility of using talus. Given the extremely high costs of hauling rock on the Dempster, I feel these sources should be considered. Highways Maintenance forces have used material from both sources; both types of rock have performed satisfactorily without noticeable deterioration. The installations I saw had been in place for about five years according to Al Close.

In both cases development costs and environmental disturbance would be minimal, especially compared to conventional rock quarrying. No blasting, clearing, stripping or access construction would be required. Some selected hand removal of individual trees might be needed at the Km 144 site, depending on the extent of talus removed.

Exploiting these sources would require selectively scalping the slope surface to a depth of about 0.5 - 1 m. On completion of the works, the disturbed slope surface should be trimmed to eliminate visible equipment scars.

Where material has been removed by past Maintenance operations, principally at the km 144 site, the visual impact is not pronounced, and natural revegetation of grasses and shrubs is occurring in the finer material exposed below the talus (see photos, Appendix A.)

The rock type and particle size at the km 144 site is the most suitable for riprap, and this is the preferred source; however larger quantities are available from the km 134.5 site and this site should also be considered.

In view of the extremely high costs to haul from the Km 195.9 quarry, it would probably be more cost effective to use material from these two sources, and look at other options such as increased riprap thickness, flatter slopes, or more frequent replacement if the talus does not strictly meet the riprap specification.

Durability testing (sulphate soundness) is in progress on samples from both sources to assess the materials' resistance to weathering. The results will be reported separately when they are available.

Km 134.5 source

This source is shown on Photos 89-01-01 to 04 in Appendix A. The rock type is well-indurated, layered argillite with some weaker siltstone layers. The largest sizes noted were about 500 mm equivalent diameter. Because the rock is layered, it tends to break in asymmetric slabby and blocky pieces.

The rock type and particle shape is less than ideal, and the maximum particle size is less than the 800 mm specified for Class II riprap. However, as noted above, the material has been used by Maintenance forces for bank protection and channel works and has performed satisfactorily without noticeable deterioration in the installations I observed.

This is a well-developed talus deposit with a large slope area available for exploitation.

Km 144 site

This material is very hard, pinkish-brown quartzite. The largest sizes noted were about 800 mm equivalent diameter. See Photos 89-01-06 to 10 in Appendix A. The largest rock sizes tend to be slabby, although in general the particle shape is acceptable for riprap.

Again, this material has performed well where Maintenance forces have used it for erosion control.

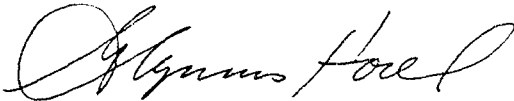
Some select hand cutting of individual trees might be needed to fully exploit this source. As noted above, where Maintenance forces have removed material, natural revegetation is occurring on the slope.

RIPRAP PLACEMENT

Both sites could be exploited with minimal development costs; however, as the process involves selectively scalping the slope surface, and as this area is particularly environmentally sensitive, removal and placement of riprap materials must be strictly supervised. An equipment rental type of contract might be the best approach.

FUTURE USE

As the need for riprap materials for erosion protection is a long term requirement, I recommend that reserves be obtained for these two sites to secure them for future highway use.



Glynnis Horel, P. Eng.
Geotechnical Projects Manager

APPENDIX A



PHOTO 89-01-01
Dempster Highway
Km 134.5
Looking west at
proposed riprap
source (talus slope).

89/05/05
GH



PHOTO 89-01-02
Dempster Highway
Km 134.5

Looking west at talus
slope.

89/05/05
GH



PHOTO 89-01-03
Dempster Highway
km 134.5
Looking northwest
along talus slope.

89/05/05
GH



PHOTO 89-01-04
Dempster Highway
km 134.5

Looking northwest at
talus slope.

89/05/05
GH



PHOTO 89-01-05
Dempster Highway
Km 144

Looking south along
river bank at edge of road.

Riprap placed by Hwys.
Maintenance forces visible
on bank.

Blackstone River

89/05/05
GH

PHOTOS 89-01-06 & 07
Dempster Highway km 144.
Looking west at talus slope
by road. Lower part of slope has
been scalped by Hwys. Maintenance
forces for use as riprap along
adjacent Blackstone River.



89/05/05
GH



PHOTO 89-01-08
Dempster Highway
Km 144
Looking north along
highway. Talus slope
to left, Blackstone
River to right.

89/05/05
GH



PHOTO 89-01-09
Dempster Highway Km 144
Looking southwest at
talus slope.
Lower part of slope has
been scalded by Highway's
Maintenance forces; natural
revegetation of grasses
and brush is occurring.

89/05/05
GH



PHOTO 89-01-10
Dempster Highway Km 144
Proposed riprap source.
close-up of talus materials.
89/05/05
GH

INTER-OFFICE MEMORANDUM

TO Glynns Hovel

OUR FILE _____

FROM Louis Scholder

YOUR FILE _____

DATE 89. 05. 17

DEPARTMENT S-3

SUBJECT

Relative Densities Blackstone Area Samples

Sample (A)

Small rocks, produced from some
larger ones by fracture

R.D.: 2.72

3 larger individual rocks R.D.: 2.74 2.77 2.67

Sample (B)

Rocks were not fractured

From 3 rocks relative density was
determined:

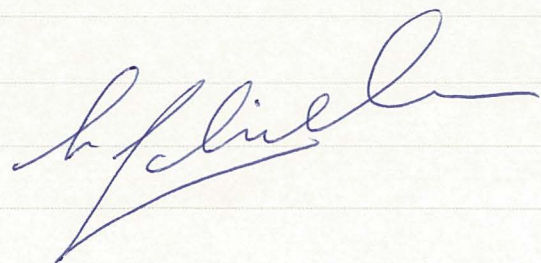
2.89

(more conglomerate type)

2.81

2.78

Material from both samples is ready
for shipment to consultant.



INTER-OFFICE MEMORANDUM

TO [WALT GUTOWSKI, PENG]

OUR FILE 2147-27-0

[]

YOUR FILE _____

FROM

[GLYNNIS HOREL, PENG]

DATE 89/07/06

[]

DEPARTMENT S-3

SUBJECT

DURABILITY TESTING
RIPRAP SAMPLES, BLACKSTONE AREA,
DEMPSTER HIGHWAY.

RESULTS of Magnesium Sulphate Soundness TESTS

SAMPLE A - Argillite km 134 % Loss = 6.3%

SAMPLE B - Quartzite km 144 % Loss = 4.2%

For reference, note that maximum allowable % loss for concrete aggregate in severe exposure conditions (CSA Class A & B) is specified as 12% by CSA Standard CAN3-A23.1-M77.

⇒ The durability of these materials for riprap is satisfactory.

Glynnis



Community and Transportation Services

RECORD OF TELEPHONE CONVERSATION

DATE 89/07/04 FILE NO. _____

TO John Fayronowski Telephone NO. _____
J.R. Paine

FROM G. Houel Telephone NO. _____

SUBJECT MgSO₄ tests Dempster riprap

REMARKS Waiting for results from Edm.
- will call me back.

89/07/06

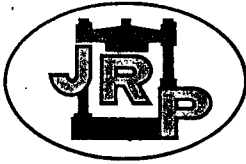
SAMPLE Argillite Bif A 6.3% loss MgSO₄
-20mm.

Kimmy Qtz B 4.2% loss MgSO₄
-20mm.

_____ He will call back

_____ Call him back

APPENDIX B



2147-27-0
GH

J. R. Paine & Associates Ltd.

CONSULTING AND TESTING ENGINEERS
EDMONTON - GRANDE PRAIRIE - WHITEHORSE

ADDRESS ALL CORRESPONDENCE TO:

Government of Yukon
Department of Community and Transportation Services
Transportation Engineering, S-3
P.O. Box 2703
Whitehorse, Yukon Territory
Y1A 2C6

14 Burns Road
Whitehorse, YT
Y1A 4Y9

File No: 8002-200

1989.07.06

Attention: Glynnis Horel, P. Eng.

Dear Ms. Horel:

**Re: Laboratory Testing
Trans. Eng. contract #GE-89093007-00028
Various Projects**

Following are the results of Magnesium Sulphate Soundness tests performed on two samples forwarded to our office May 26, 1989.

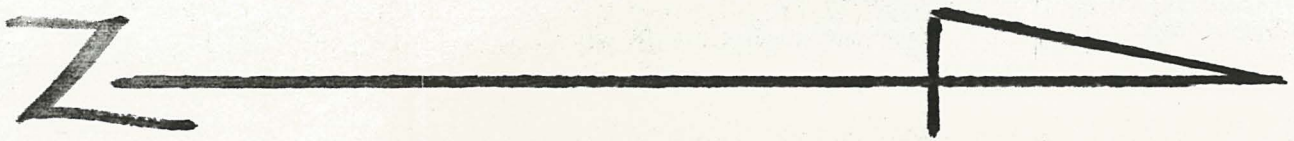
The bulk samples were crushed in the laboratory to a 20 mm maximum size. The tests were performed on the coarse fraction (+5.0 mm) of the sample. The test results are as follows:

Sample Identification	Magnesium Sulphate Soundness (% Loss)
A	6.3
B	4.2

Thank you for utilizing our services. Should any questions arise regarding the contents of this letter, please feel free to contact the undersigned.

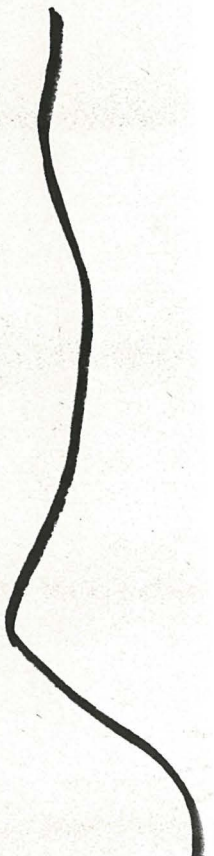
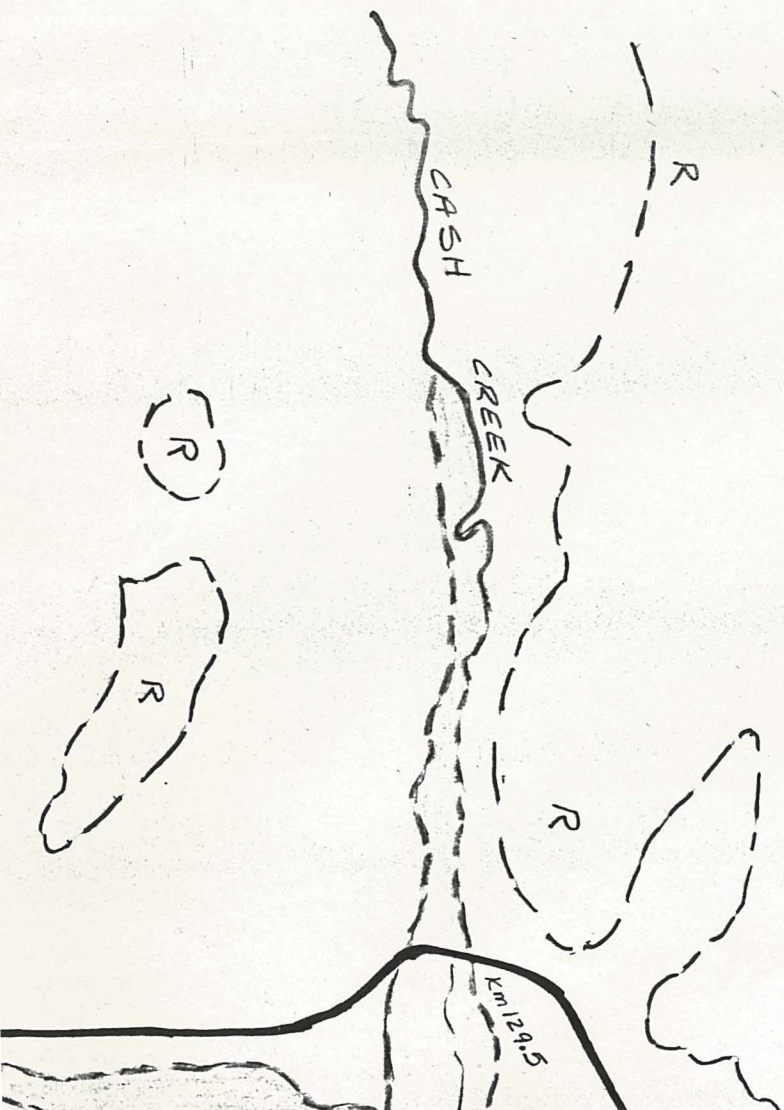
Yours Truly,

Wilbur C. Kofoed, P. Eng.
J.R. Paine and Associates, Ltd.



- used by Maintenance
- riverbank works area appears to be performed satisfactorily.
- no clearing, stripping, blasting or access or construction required
- selectively scalp slope
- trim on completion

TRUSS SLAB
- ARGILLITE
- indurated
blocky
sitstone





WEST BLACKSTONE RIVER

DEMPSTER HIGHWAY

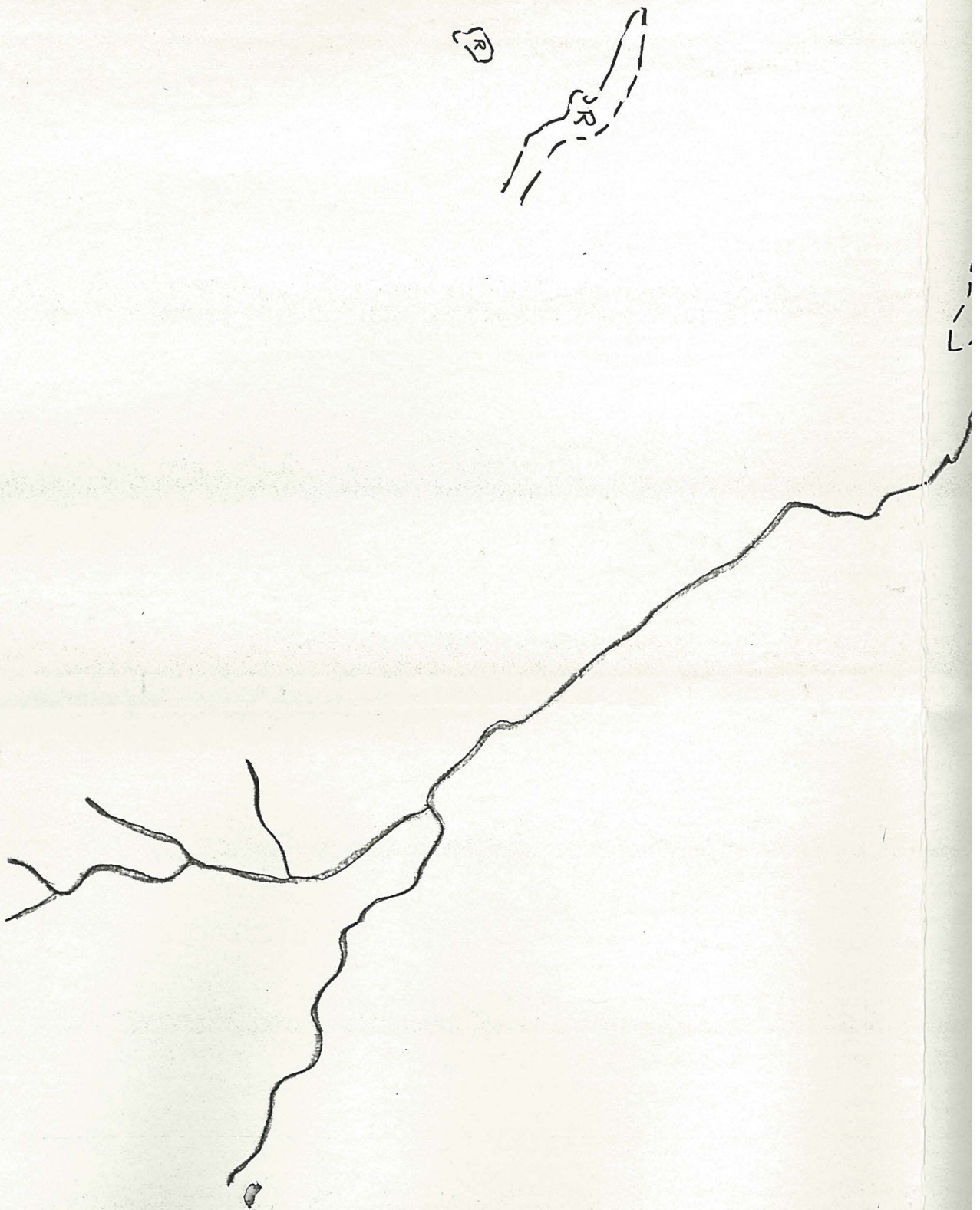
EAST BLACKSTONE RIVER

Km 114.7

CHAPMAN LAKE

BLACKSTONE RIVER

AIRSTRIP



NOTE:

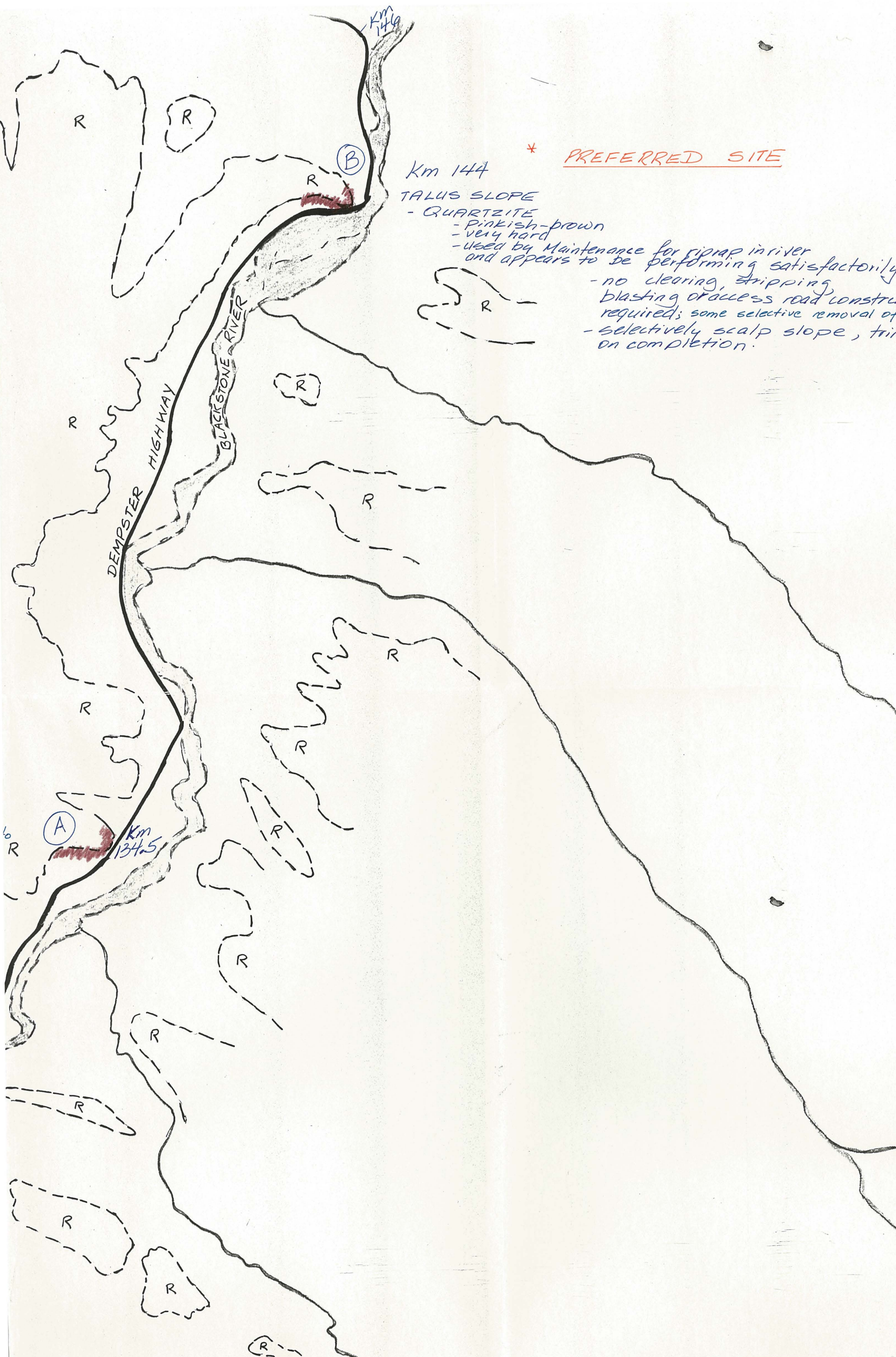
(R) = Rock Outcrop

FROM LANDSAT SPOT IMAGES

PROPOSED RIPRAP SOURCES

89-05-18

~~89-05-18~~



Km 144

* PREFERRED SITE

TALUS SLOPE

- QUARTZITE
- Pinkish-brown
- very hard
- used by Maintenance for riprap in river and appears to be performing satisfactorily.
- no clearing, stripping, blasting or access road construction required; some selective removal of
- selectively scalp slope, trim on completion.

DEMPSTER HIGHWAY

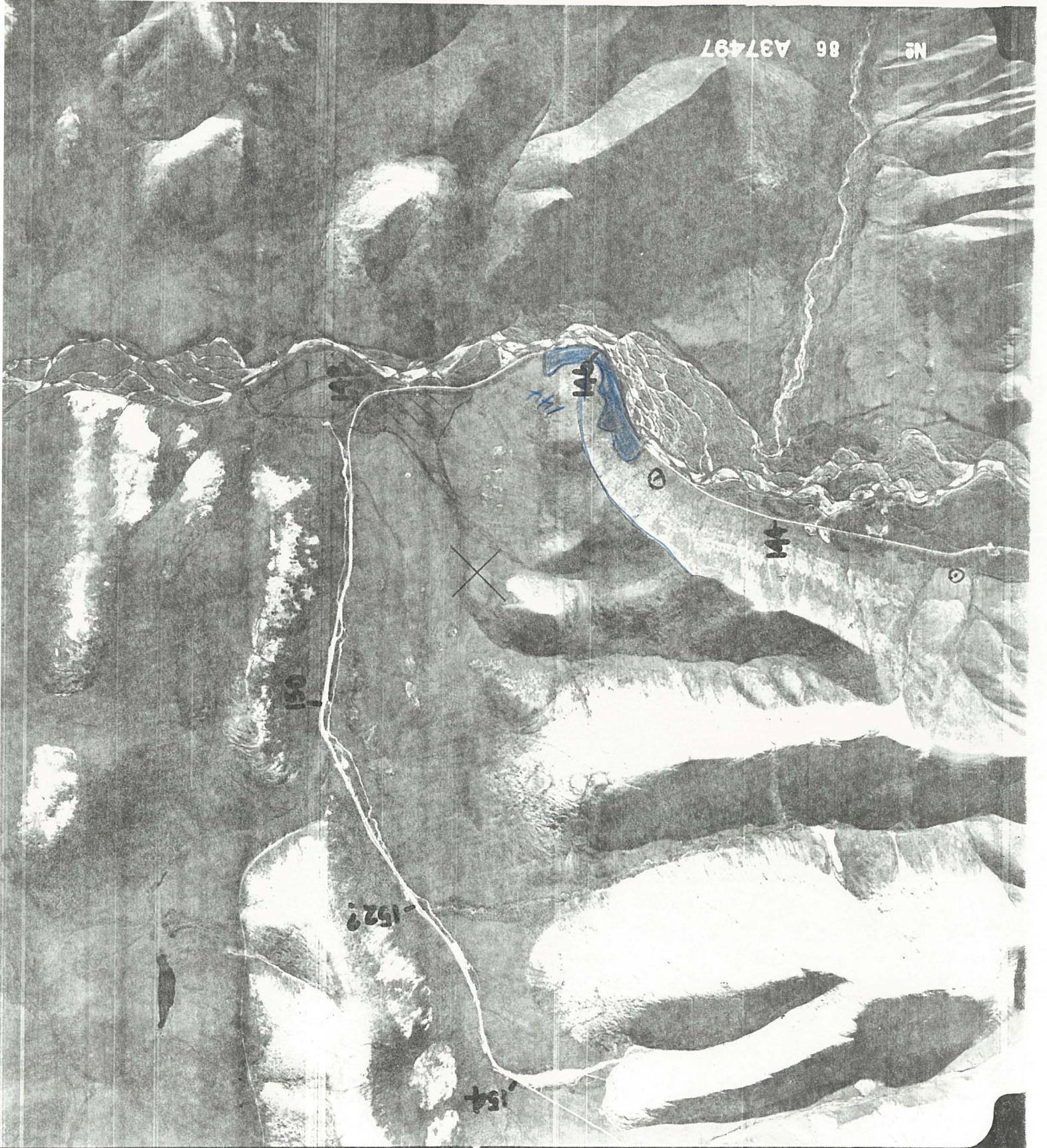
BLACKSTONE RIVER

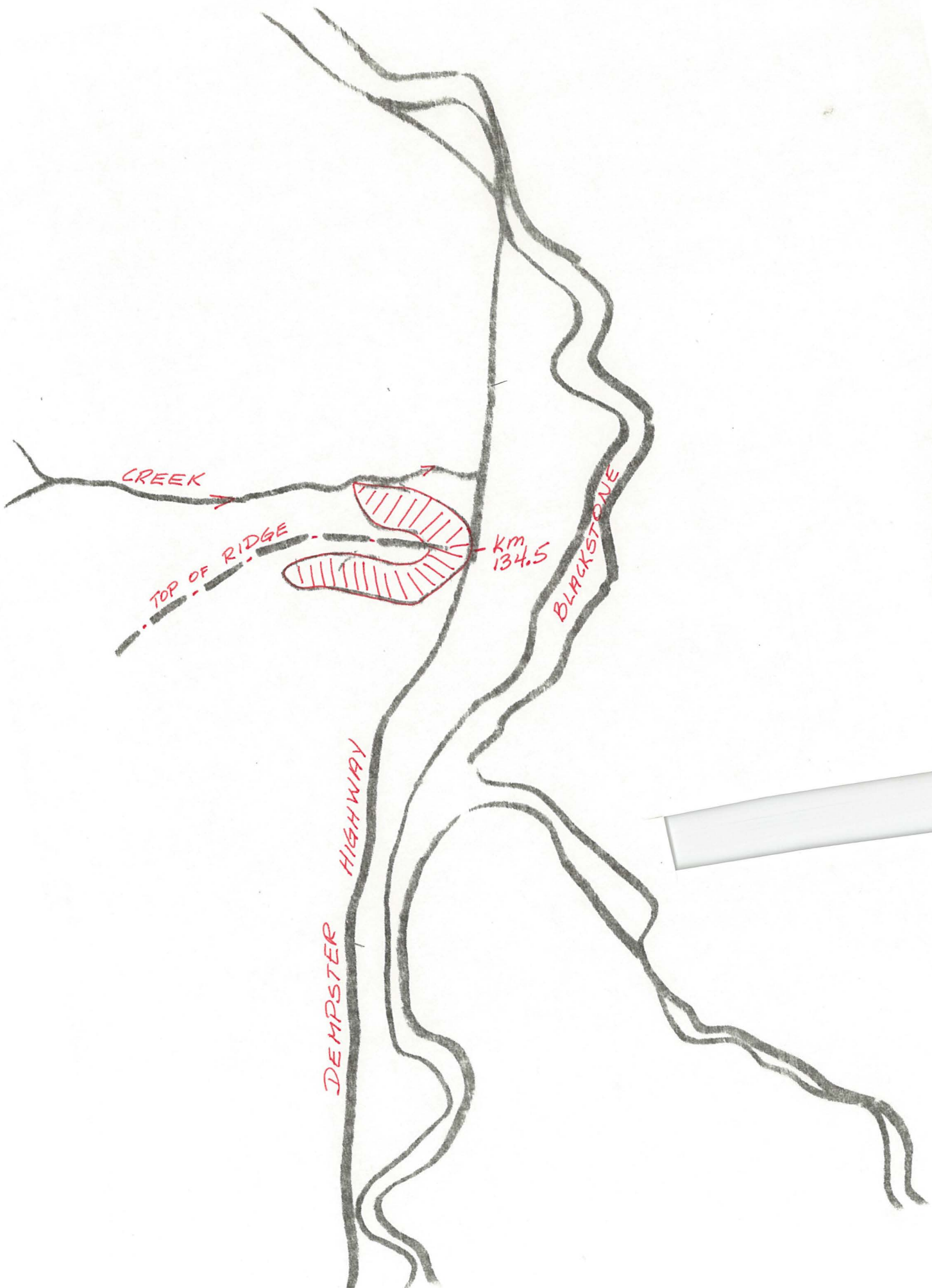
A Km 134.5

Km 144



№ 61 А97497





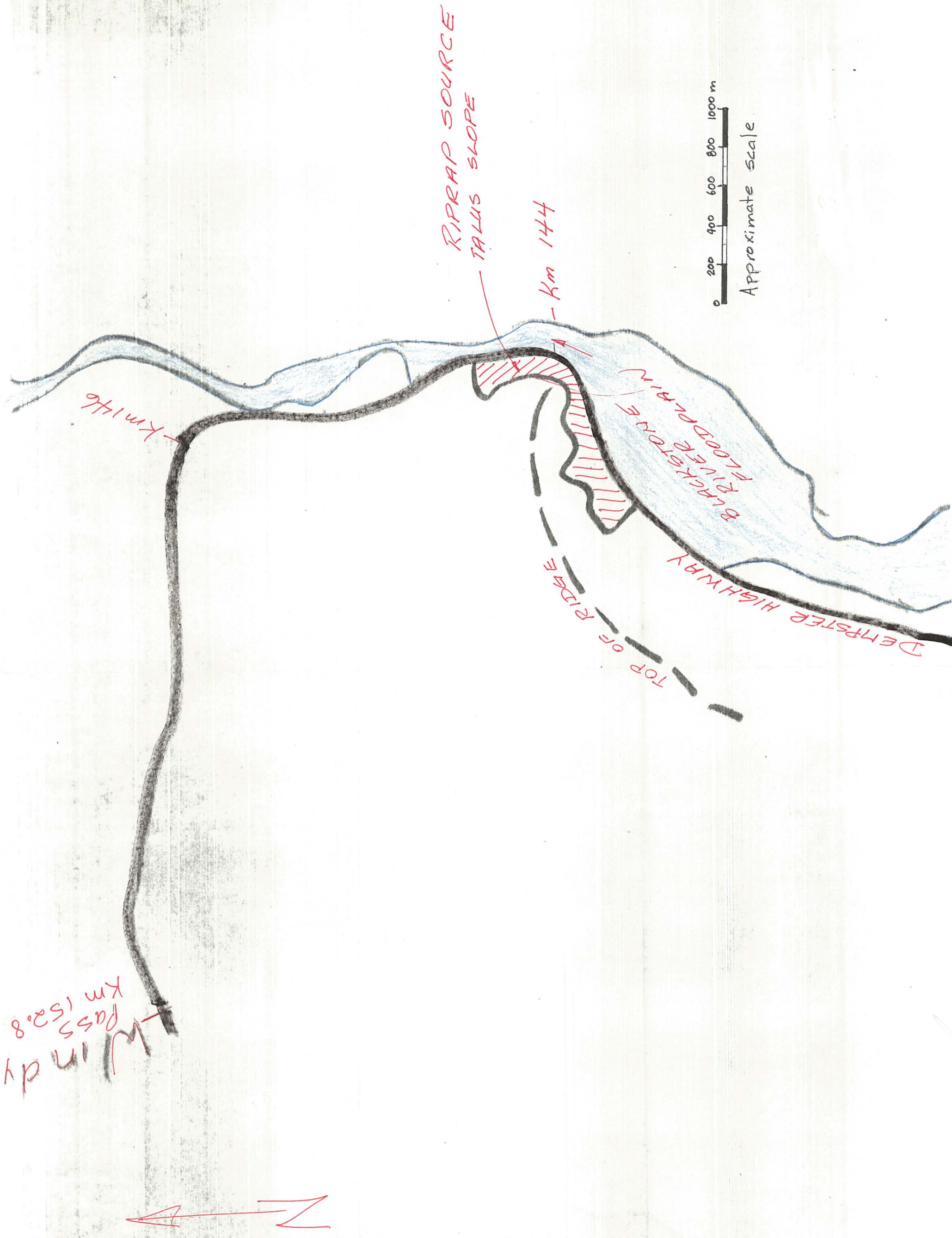
CREEK

TOP OF RIDGE

DEMPSTER
HIGHWAY

km
134.5

BLACKSTONE



0 200 400 600 800 1000 m
Approximate Scale

Windy Pass 152.8

RIPRAP SOURCE
TALUS SLOPE

Km 144

BLACKSTONE
RIVER
FLOODPLAIN

DEMPSTER HIGHWAY
TOP OF RIDGE



Km 146