Appendix B:
Strip Maps and Photographic Documentation of Lineament Data for Lineaments Mapped by Reger et al. (1990)

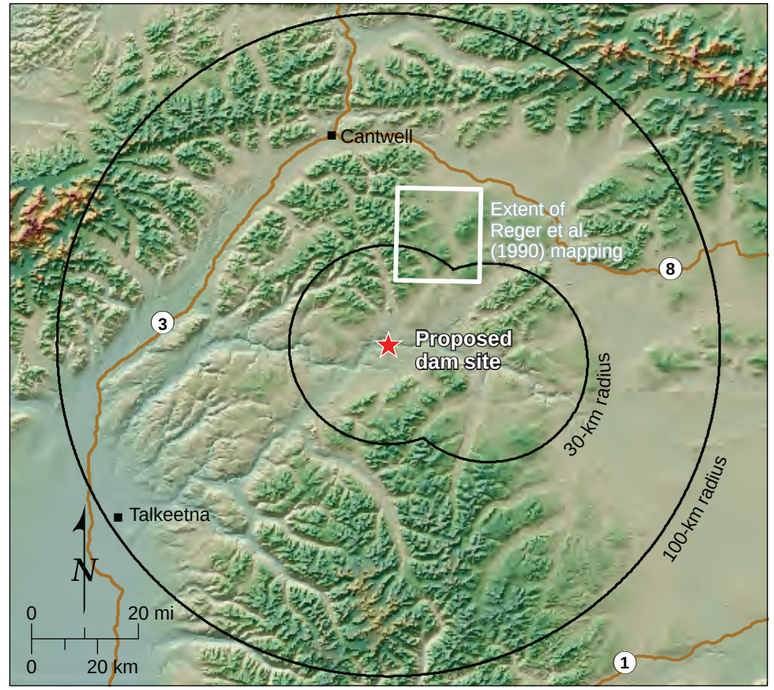
Explanation

- (1) Feature ID
- GPS track
- **21a** No previously mapped fault or lineament coincides with lineament group

Features (Reger et al., 1990)

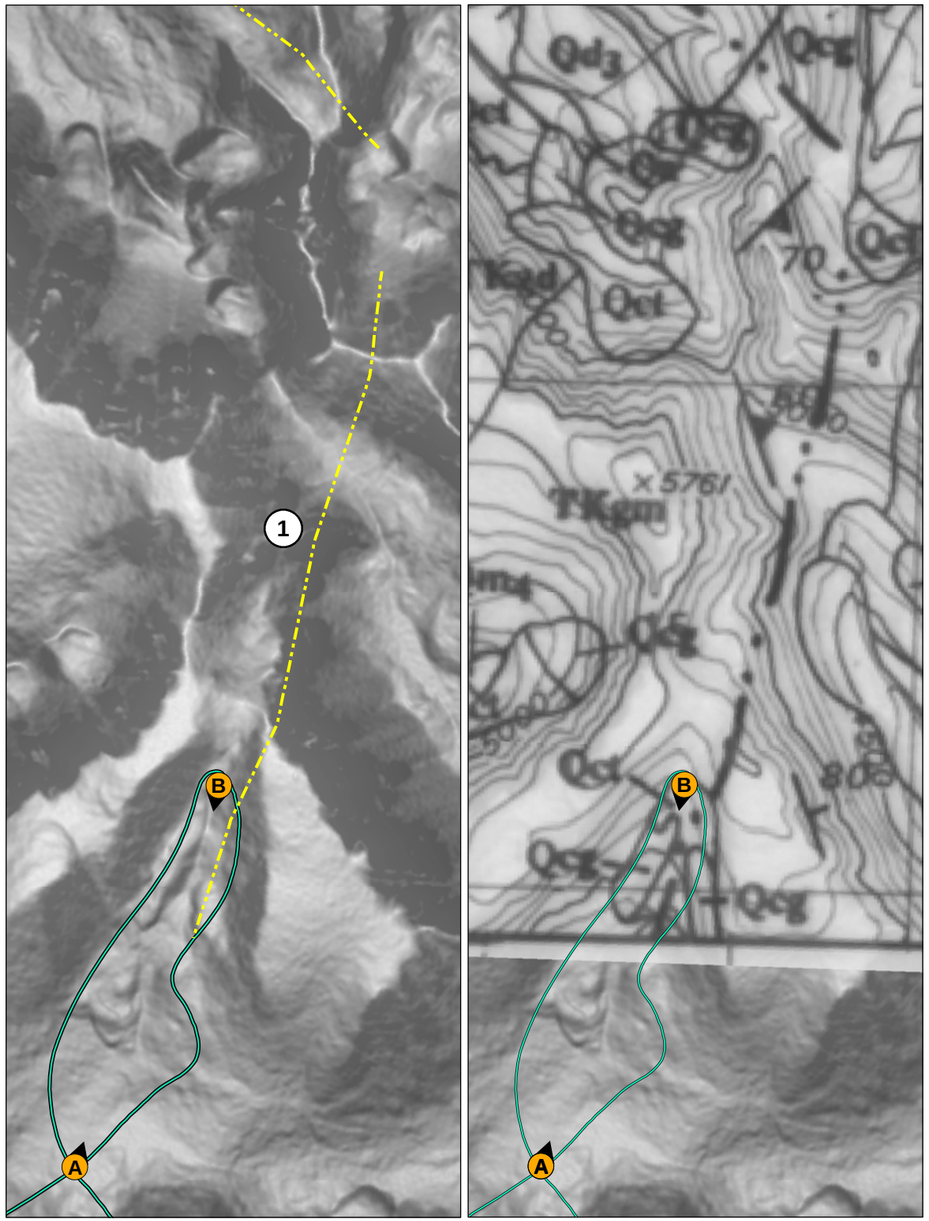
- Photo lineament
- Fault (dashed where inferred)

Feature Number	Appendix B Figure Number
1	B-02
2	B-03
3	B-04
4	B-05
5	B-05
6	B-06
7	B-07a, B-07b
8	B-07a, B-07b
9	B-08
10	B-09a, B-09b
11	B-10
12	B-10
13	B-11a
14	B-11a
15	B-11a, B-11b
16	B-11a, B-11b
17	B-12a
18	B-12a, B-12b
19	B-12a, B-12b
20	B-12a, B-12b
21	B-13
22	B-14a, B-14b
23	B-14a, B-14b
24	B-15
25	B-15
26	B-16
27	B-16
28	B-17



79_218900_Alaska_Railbelt/2189_Lineament Report October 2013, modified 12.19.13

FUGRO Date 12/19/13	STATE OF ALASKA ALASKA ENERGY AUTHORITY ALASKA ENERGY AUTHORITY	SUSITNA-WATANA HYDROELECTRIC PROJECT LINEAMENTS REGER ET AL. (1990)	FIGURE B-01



N

0 0.25 0.5 mi

0 0.25 0.5 km

A)

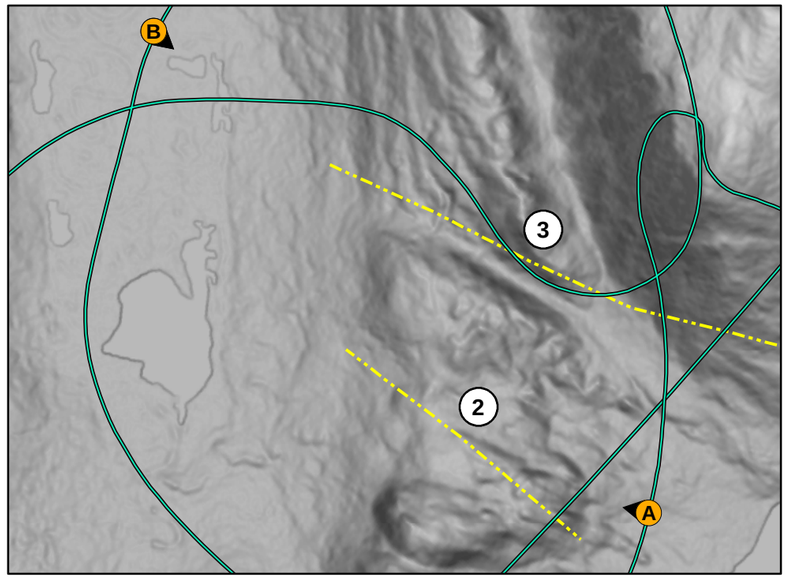
View looking northeast from location A. Arrows show location of mapped trace of lineament.

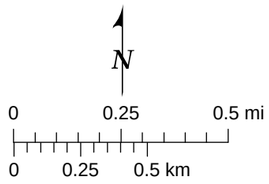
B)

View looking southwest from location B. Arrows show the location of lineament. Note the semi-linear and lobate toe of talus deposit.

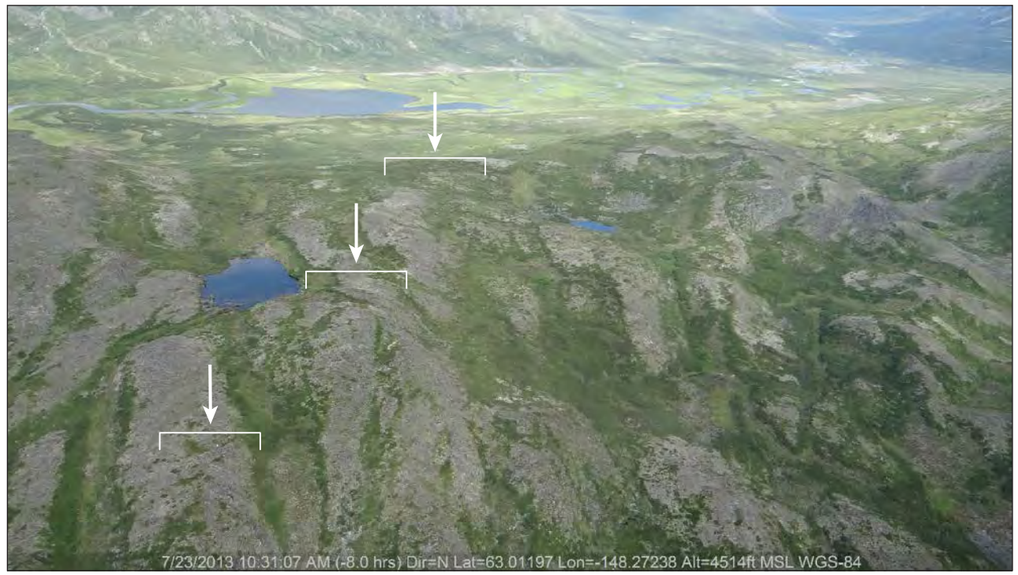
79_218900_Alaska_Railbelt/2189_Lineament Report October 2013, modified 10.18.13

FUGRO Date 10/18/13	STATE OF ALASKA ALASKA ENERGY AUTHORITY ALASKA ENERGY AUTHORITY	SUSITNA-WATANA HYDROELECTRIC PROJECT FEATURE 1 LINEAMENTS ANALYSIS REGER ET AL. (1990)	FIGURE B-02



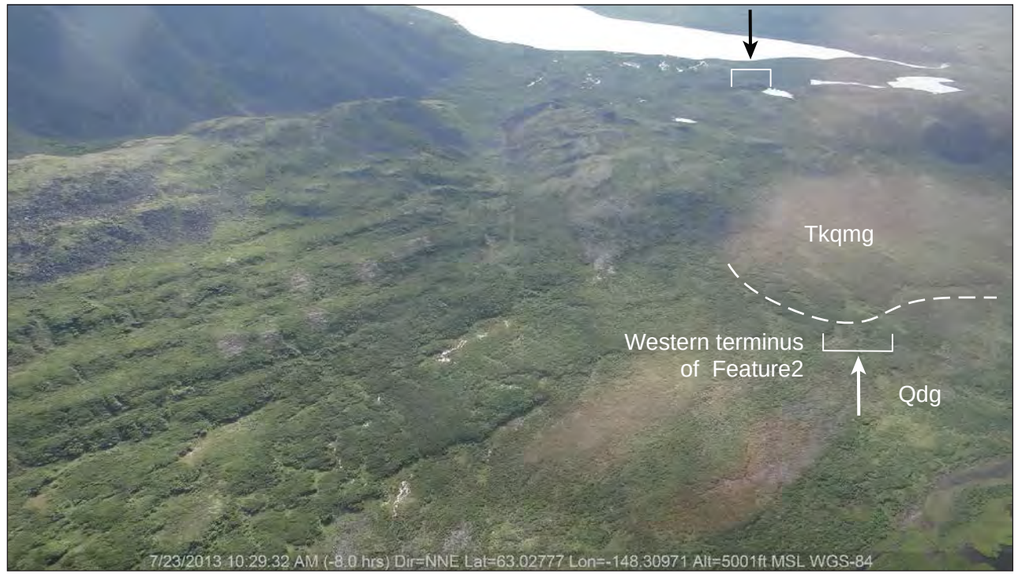


A)



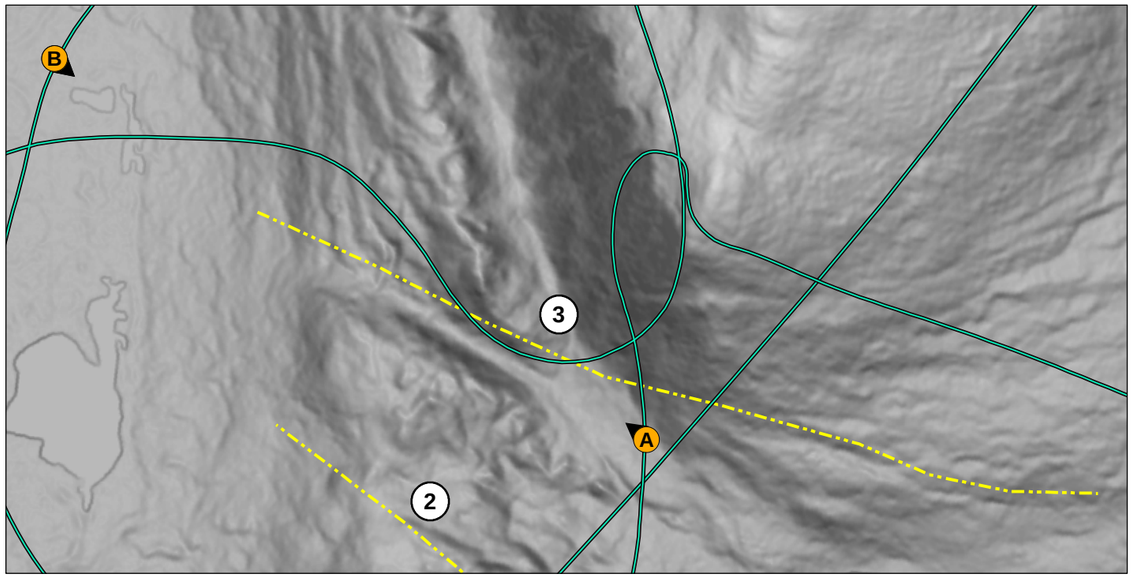
View looking northwest from location A. Arrows and brackets show projected trace of lineament. Note absence of continuous lineament across projected trace.

B)

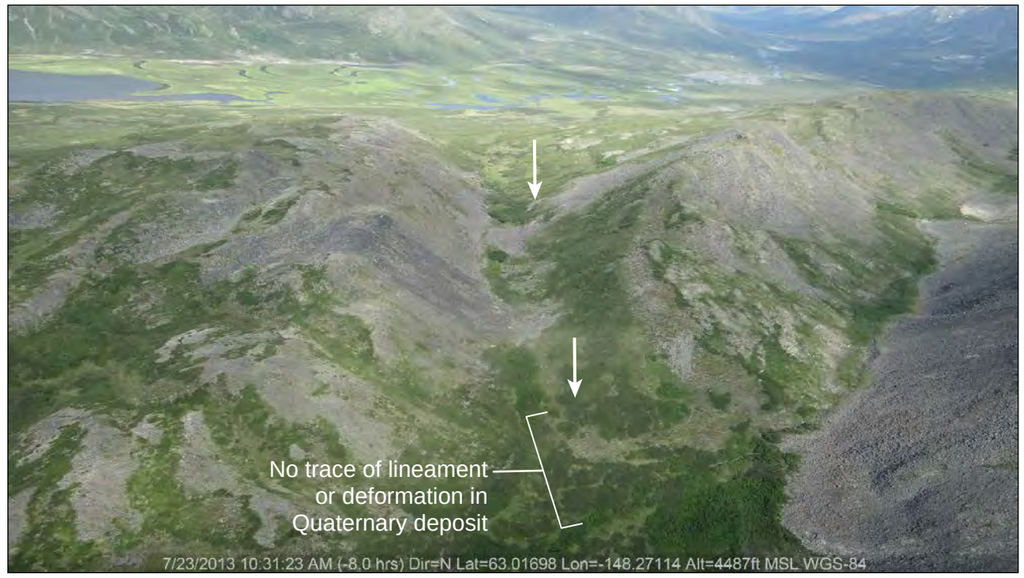


View looking southeast from location B. Arrows and brackets show projected trace of lineament. Note lack of deformation or lineament trace in foreground within Quaternary deposits.

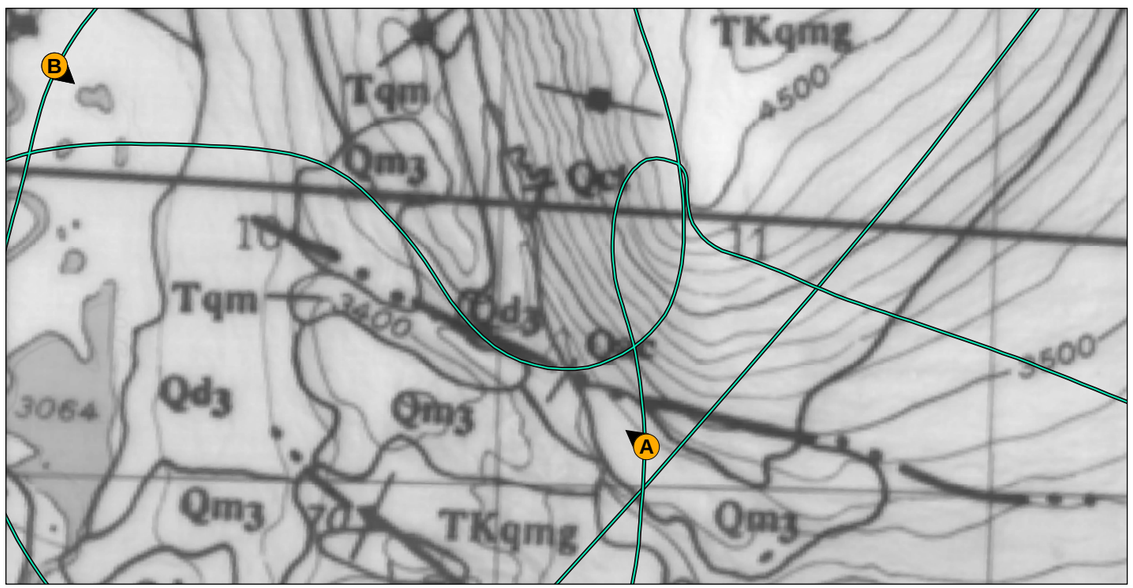
FUGRO Date 10/18/13	STATE OF ALASKA ALASKA ENERGY AUTHORITY ALASKA ENERGY AUTHORITY	SUSITNA-WATANA HYDROELECTRIC PROJECT FEATURE 2 LINEAMENTS ANALYSIS REGER ET AL. (1990)	FIGURE B-03



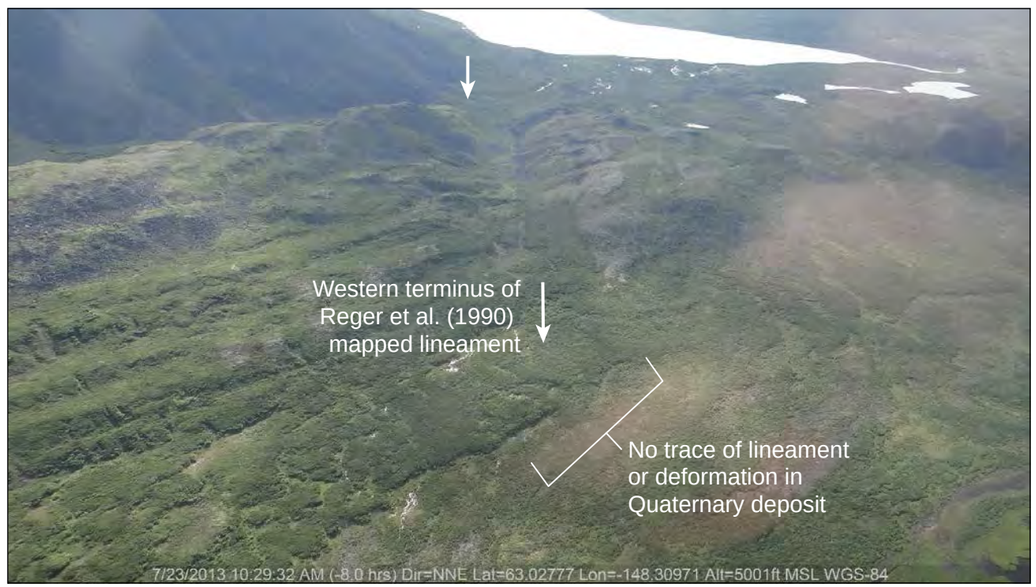
A)



View looking northwest from location A. Arrows show the projected trace of lineament. Note absence of lineament or deformation in Quaternary deposits.

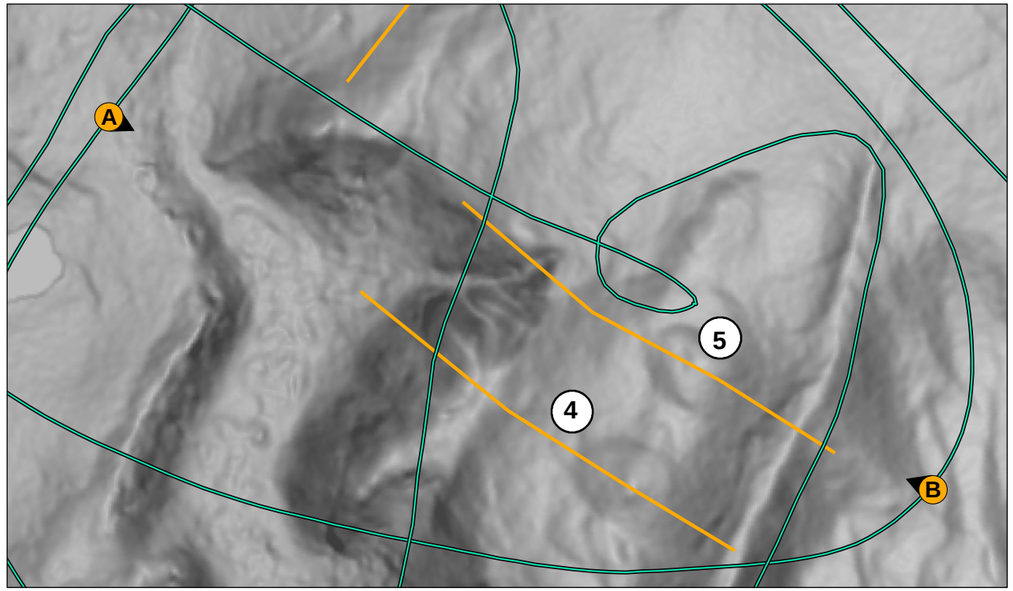


B)

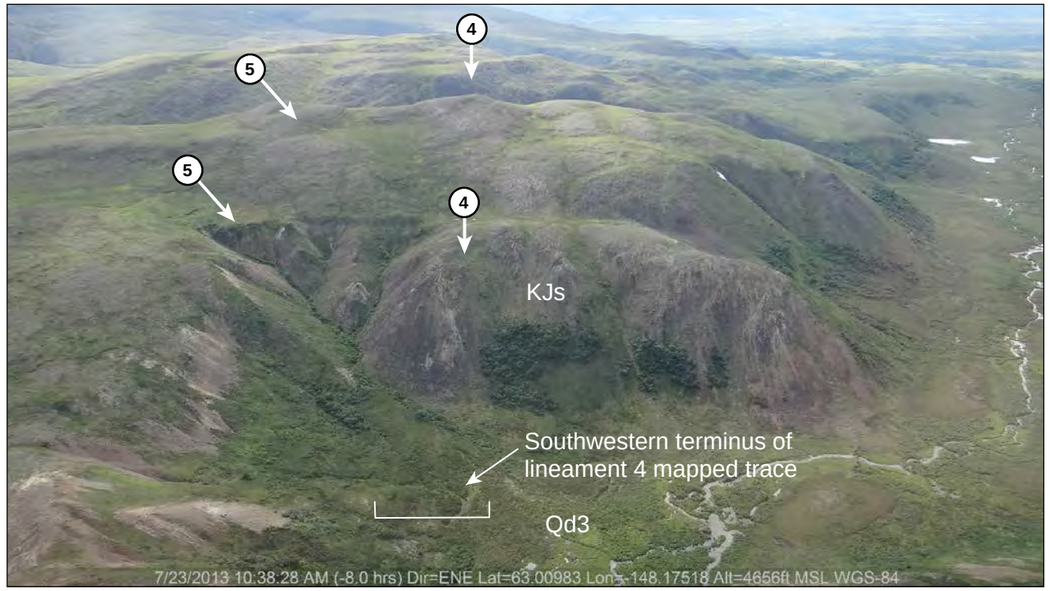


View looking southeast from location B. Arrows show the projected trace of lineament. Note absence of lineament or deformation in Quaternary deposits.

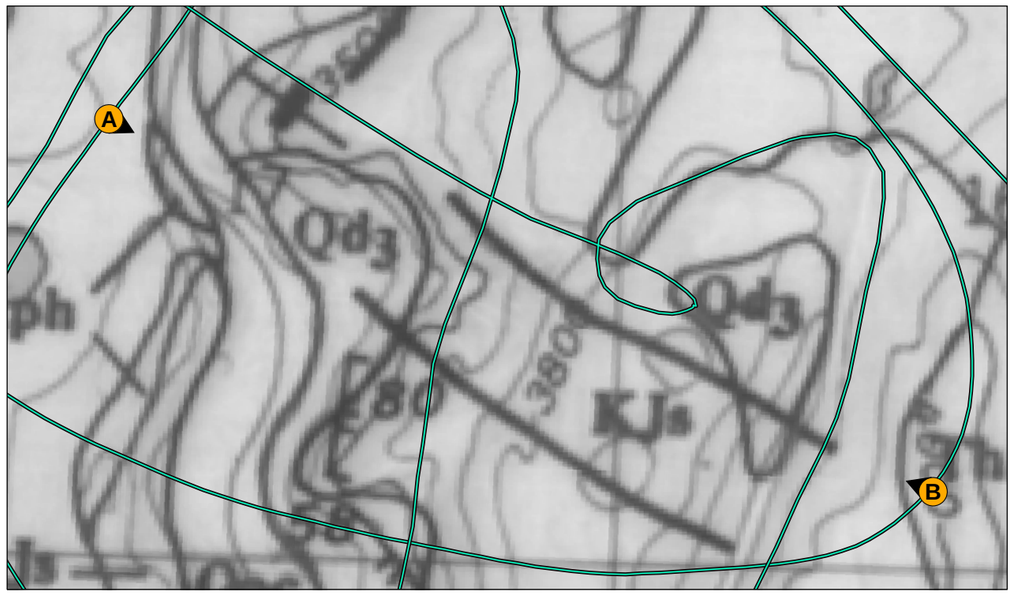
FUGRO Date 10/18/13	STATE OF ALASKA ALASKA ENERGY AUTHORITY ALASKA ENERGY AUTHORITY	SUSITNA-WATANA HYDROELECTRIC PROJECT FEATURE 3 LINEAMENTS ANALYSIS REGER ET AL. (1990)	FIGURE B-04



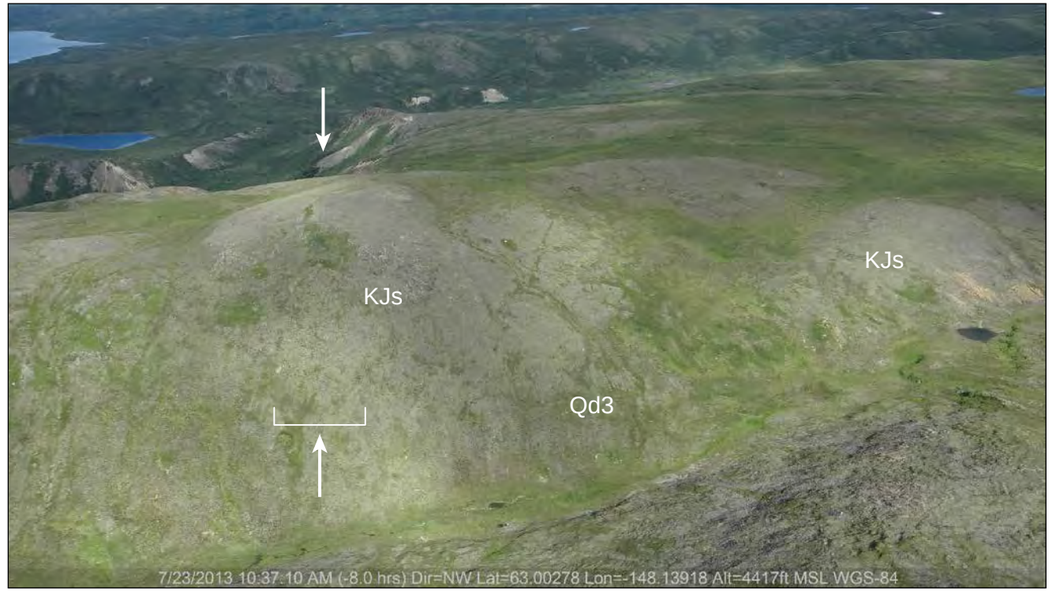
A)



View looking southeast from location A. Arrows show the projected traces of Features 4 and 5. Note absence of lineament or deformation in Quaternary deposits in foreground.



B)



View looking northwest from location B. Arrows show the projected trace of Feature 5. Note absence of discernable lineament along mapped trace.

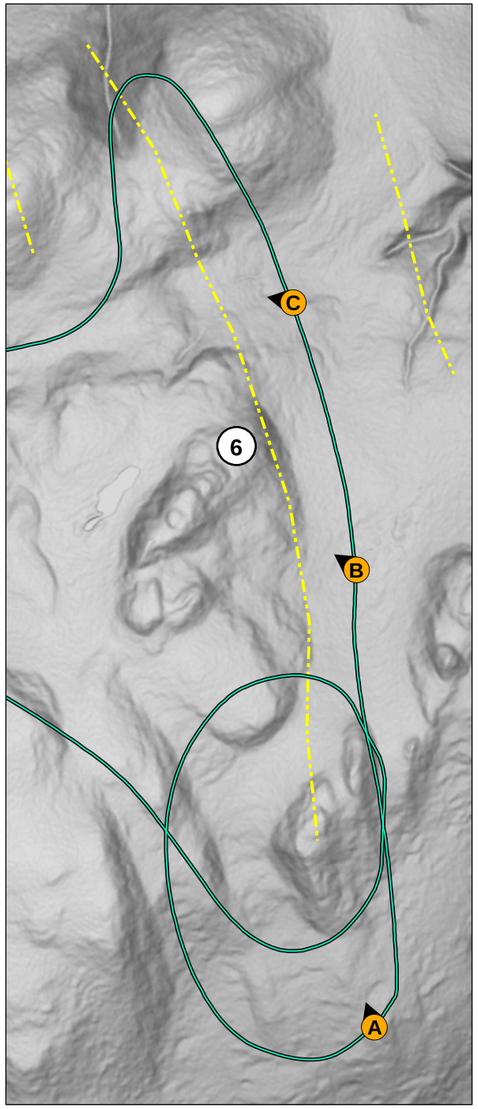
N

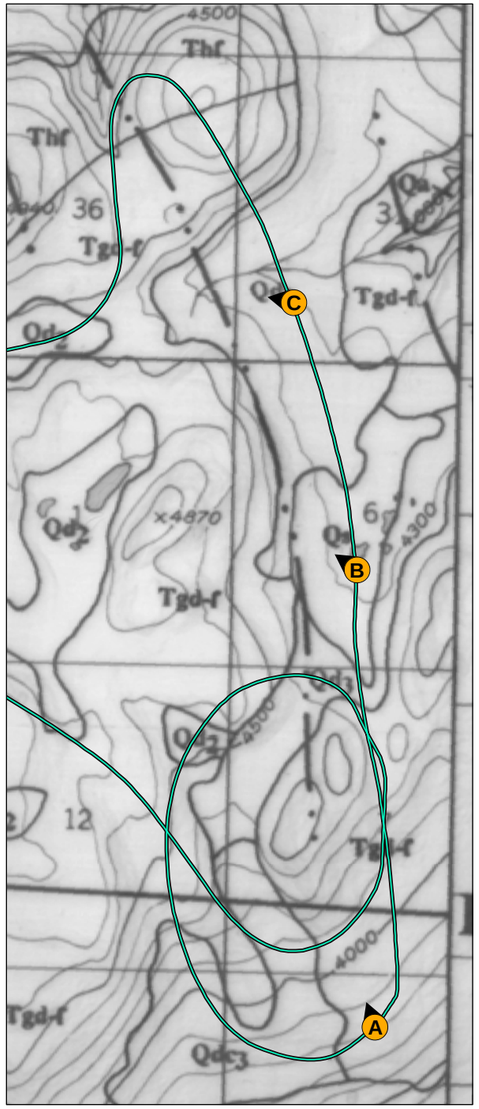
0 0.25 0.5 mi

0 0.25 0.5 km

79_218900_Alaska_Railbelt\2189_Lineament Report October 2013, modified 10.18.13

FUGRO Date 10/18/13	STATE OF ALASKA ALASKA ENERGY AUTHORITY ALASKA ENERGY AUTHORITY	SUSITNA-WATANA HYDROELECTRIC PROJECT FEATURES 4 AND 5 LINEAMENTS ANALYSIS REGER ET AL. (1990)	FIGURE B-05



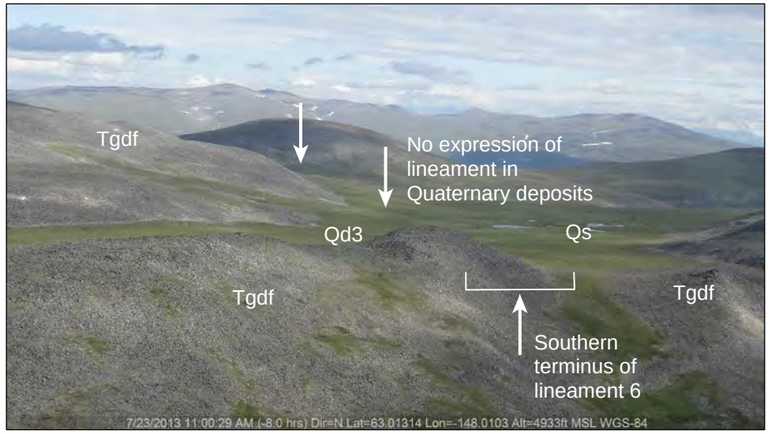


N

0 0.5 1 mi

0 0.5 1 km

A)

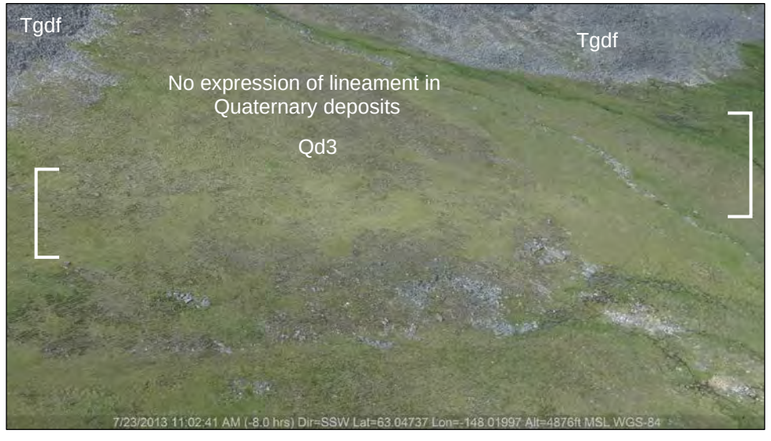


View looking northwest from location A. Arrows and brackets show the projected trace of mapped lineament. Note absence of lineament or deformation in Quaternary deposits.

B)

View looking northwest from location B. Arrows show the projected trace of lineament.

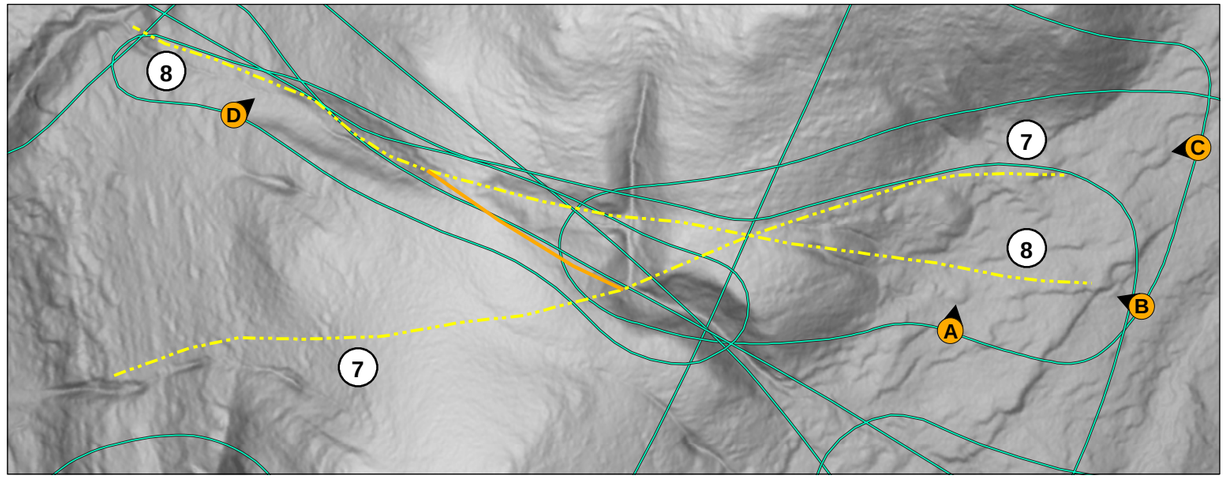
C)

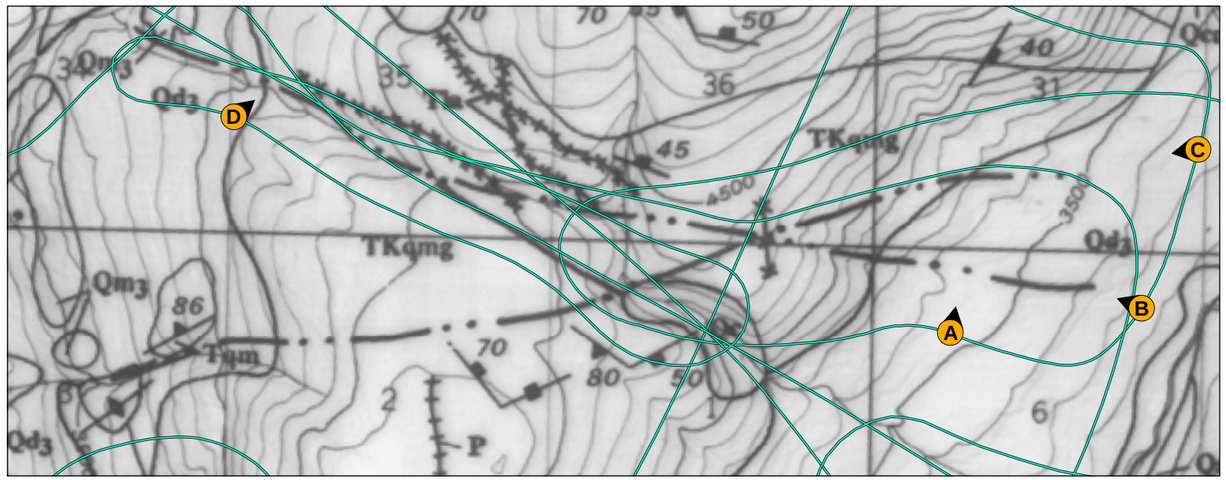


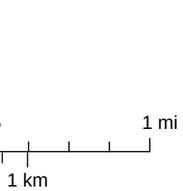
View looking west from location C. Brackets indicate the projected trace of lineament. Note absence of lineament or deformation in Quaternary deposits.

79_218900_Alaska_Railbelt/2189_Lineament Report October 2013, modified 10.18.13

Date 10/18/13	STATE OF ALASKA ALASKA ENERGY AUTHORITY ALASKA ENERGY AUTHORITY	SUSITNA-WATANA HYDROELECTRIC PROJECT FEATURE 6 LINEAMENTS ANALYSIS REGER ET AL. (1990)	FIGURE B-06



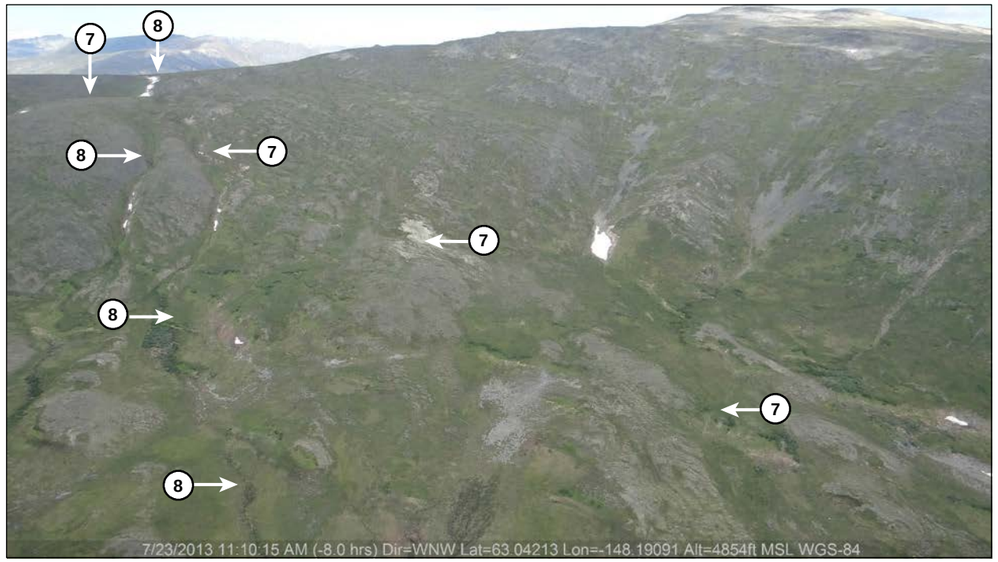




A)

View looking northeast at lineaments 7 and 8 from photograph location A.

B)

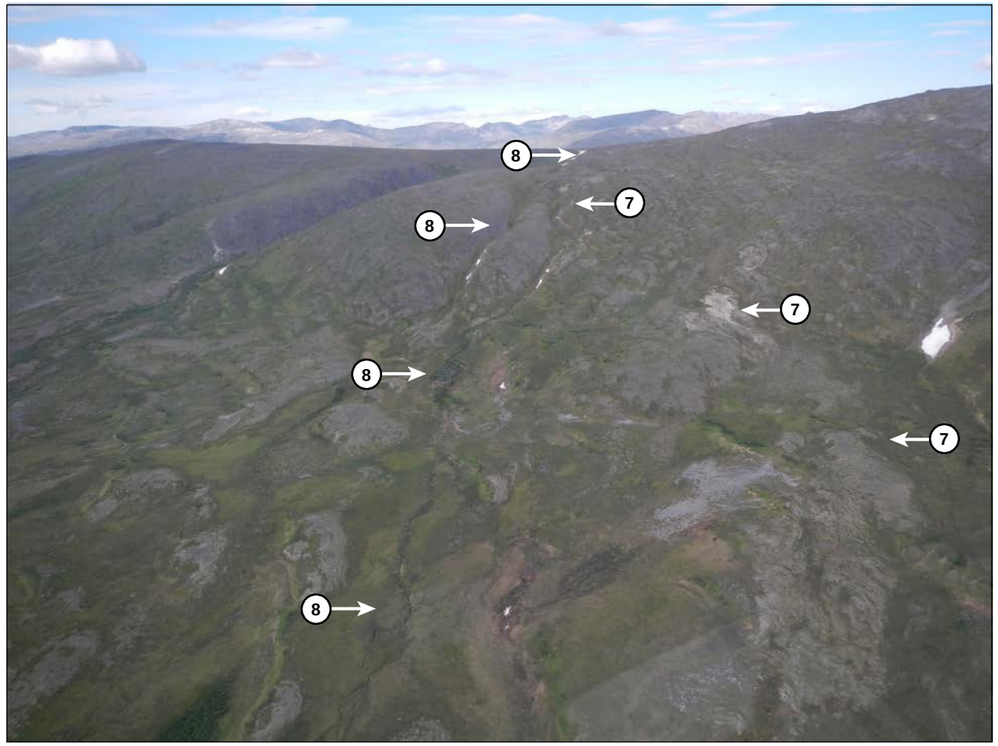


View looking west at lineaments 7 and 8 from photograph location B. Note that lineament 7 is a linear series of unrelated features.

79_218900_Alaska_Railbelt/2189_Lineament Report October 2013, modified 10.18.13

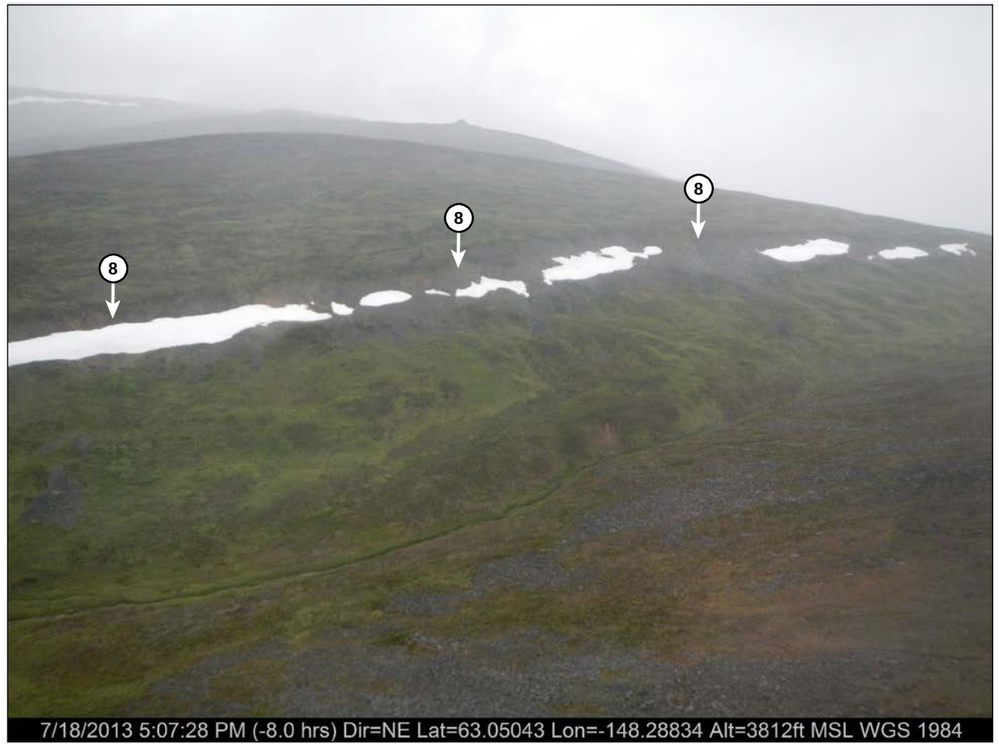
FUGRO Date 10/18/13	STATE OF ALASKA ALASKA ENERGY AUTHORITY ALASKA ENERGY AUTHORITY	SUSITNA-WATANA HYDROELECTRIC PROJECT FEATURES 7 AND 8 LINEAMENTS ANALYSIS REGER ET AL. (1990)	FIGURE B-07a

C)



View looking southwest at lineaments 7 and 8 from photograph location C.

D)



View looking northeast at lineament 7 from photograph location D.

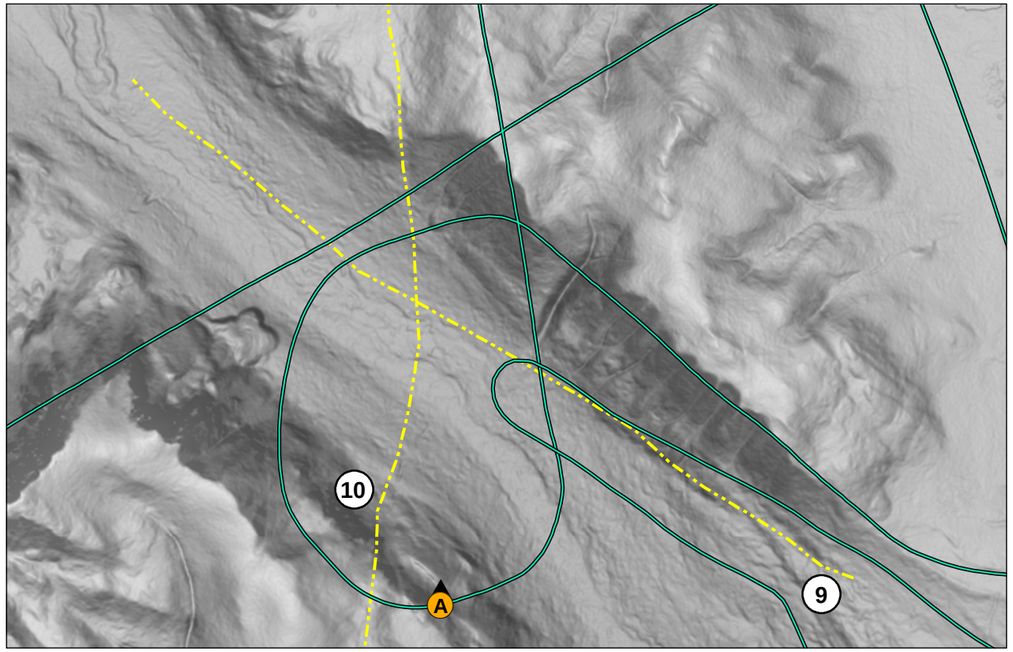
79_218900_Alaska_Railbelt/2189_Lineament Report October 2013, modified 10.18.13

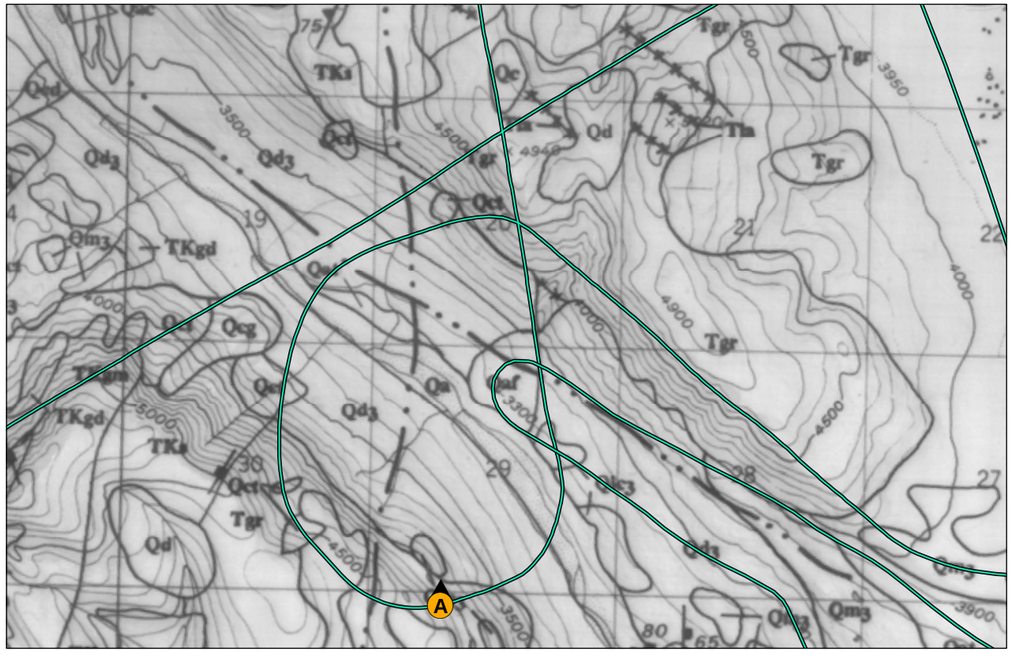
FUGRO
Date 10/18/13

STATE OF ALASKA
ALASKA ENERGY AUTHORITY
ALASKA ENERGY AUTHORITY

SUSITNA-WATANA HYDROELECTRIC PROJECT
FEATURES 7 AND 8
LINEAMENTS ANALYSIS
REGER ET AL. (1990)

FIGURE
B-07b



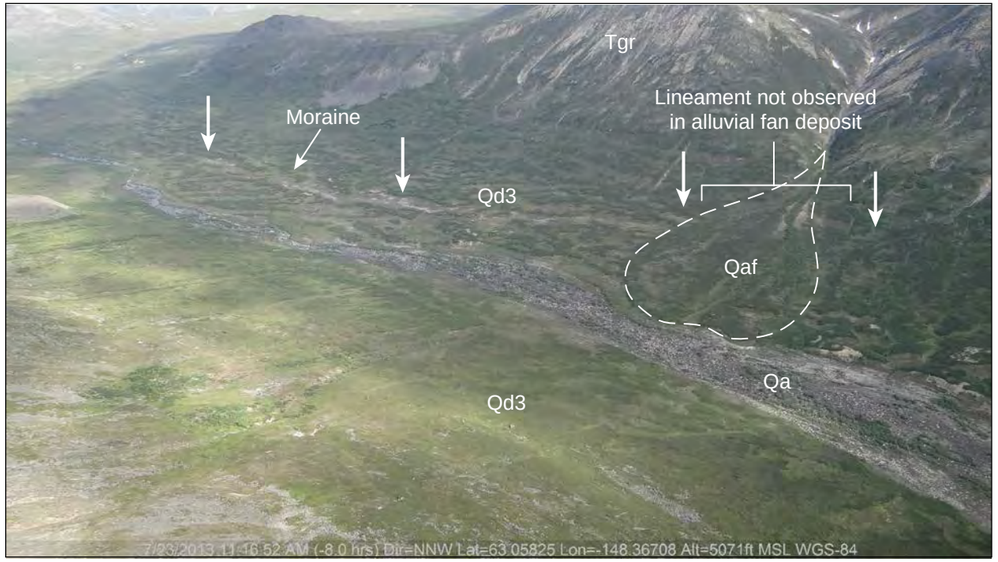


N

0 0.5 1 mi

0 0.5 1 km

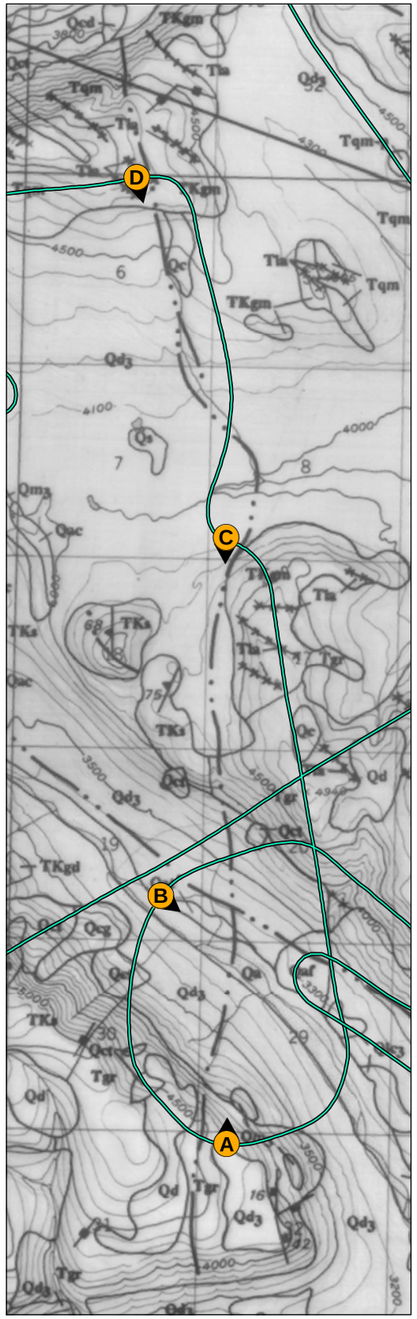
A)

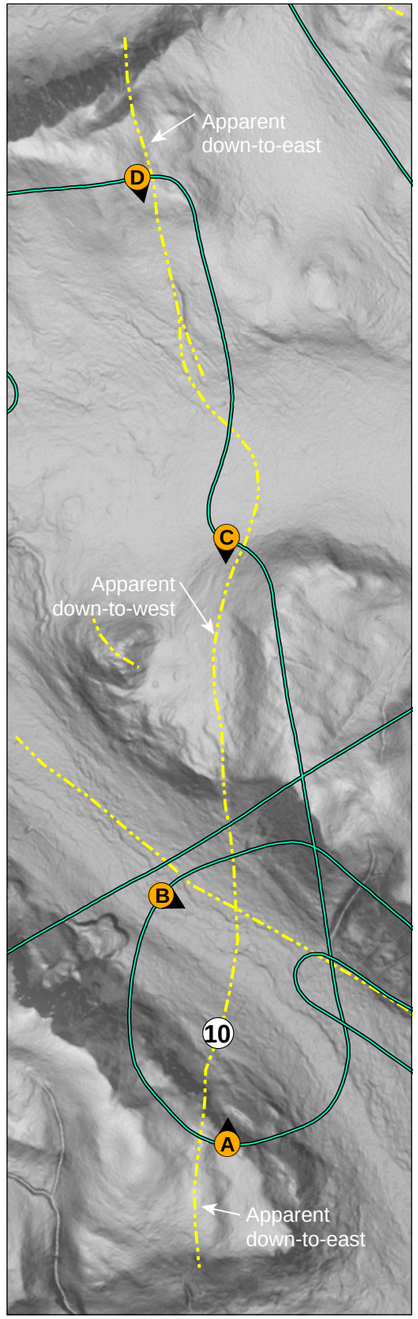


View looking north from location A. Arrows show projected trace of Feature 9 lineament. Note lineament is overprinted with Quaternary alluvial fan deposit.

79_218900_Alaska_Railbelt/2189_Lineament Report October 2013, modified 10.18.13

Date 10/18/13	STATE OF ALASKA ALASKA ENERGY AUTHORITY	SUSITNA-WATANA HYDROELECTRIC PROJECT FEATURE 9 LINEAMENTS ANALYSIS REGER ET AL. (1990)	FIGURE B-08



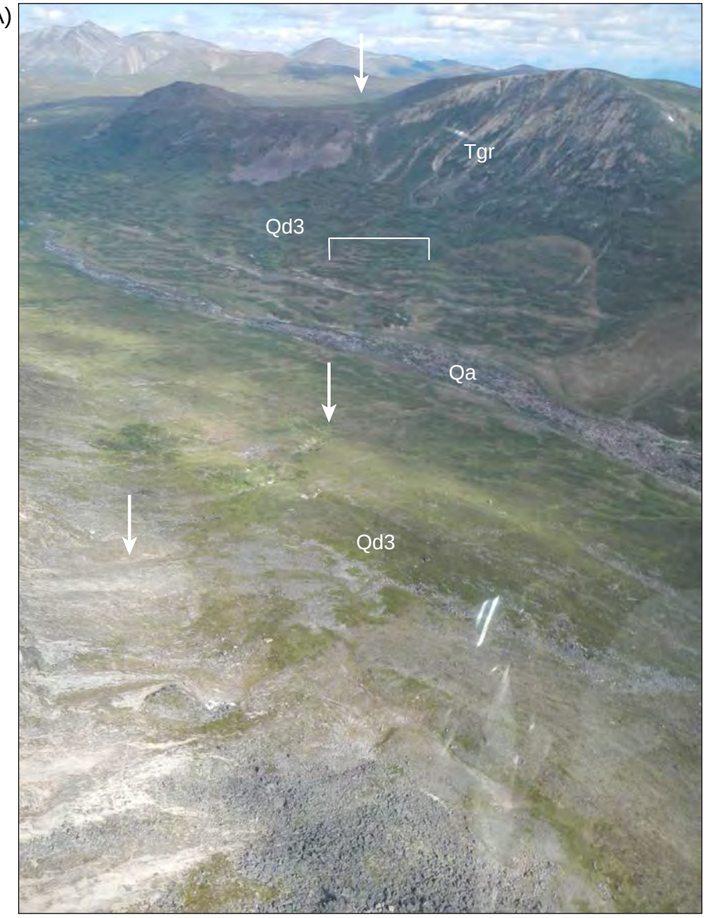


N

0 0.5 1 mi

0 0.5 1 km

A)

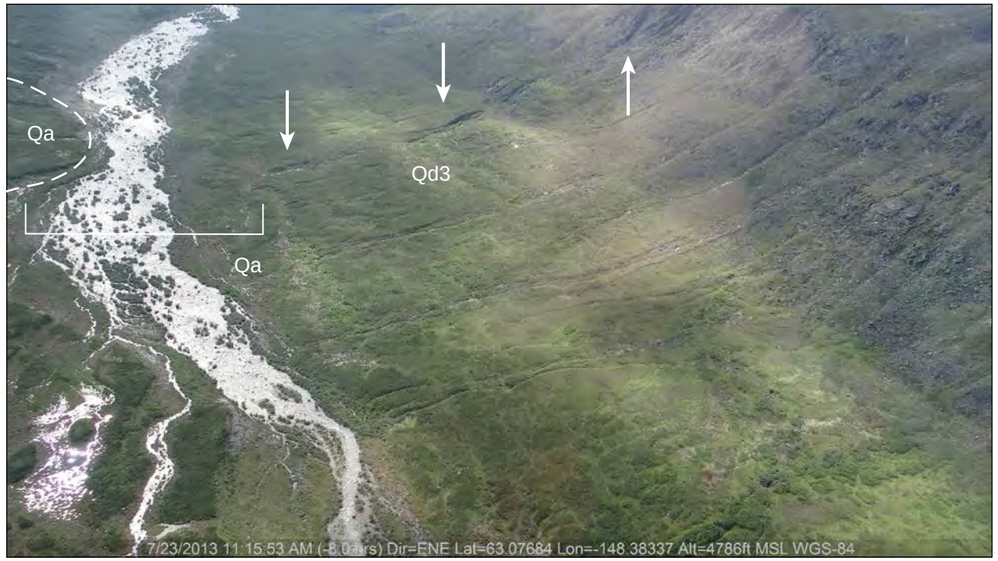


View looking north from location A. Arrows and brackets show the projected trace of lineament.

79_218900_Alaska_Railbelt/2189_Lineament Report October 2013, modified 10.18.13

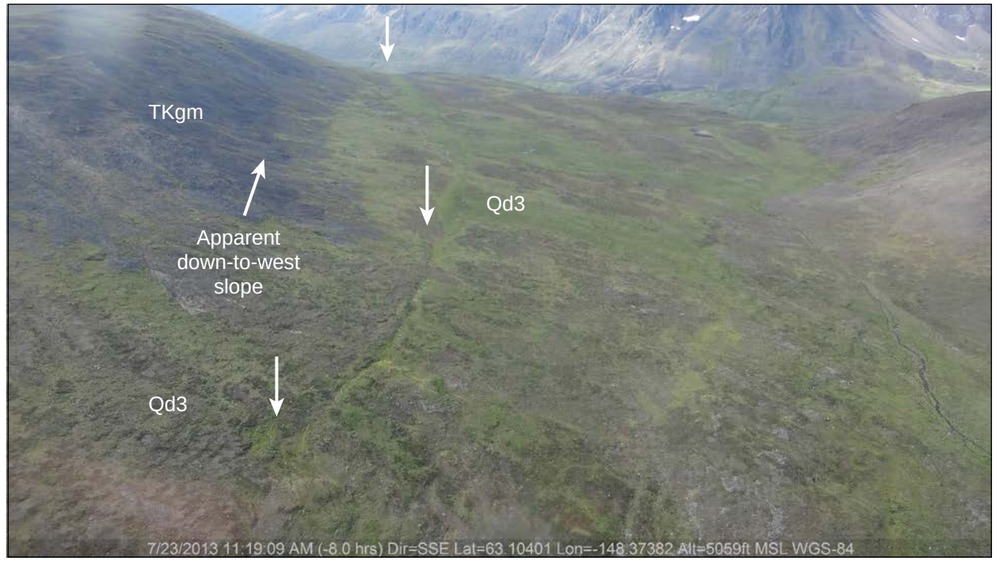
FUGRO Date 10/18/13	STATE OF ALASKA ALASKA ENERGY AUTHORITY ALASKA ENERGY AUTHORITY	SUSITNA-WATANA HYDROELECTRIC PROJECT FEATURE 10 LINEAMENTS ANALYSIS REGER ET AL. (1990)	FIGURE B-09a

B)



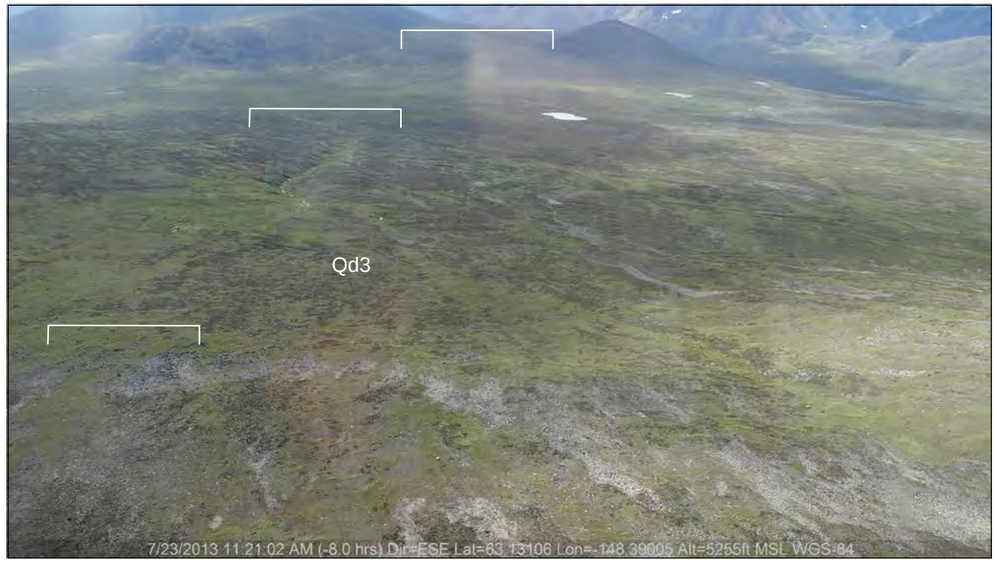
View looking south from photograph location B. Arrows show the projected trace of lineament. In Qd3 (till) the lineament is coincident with linear drainage in till deposit. Note absence of lineament in Qa deposit.

C)



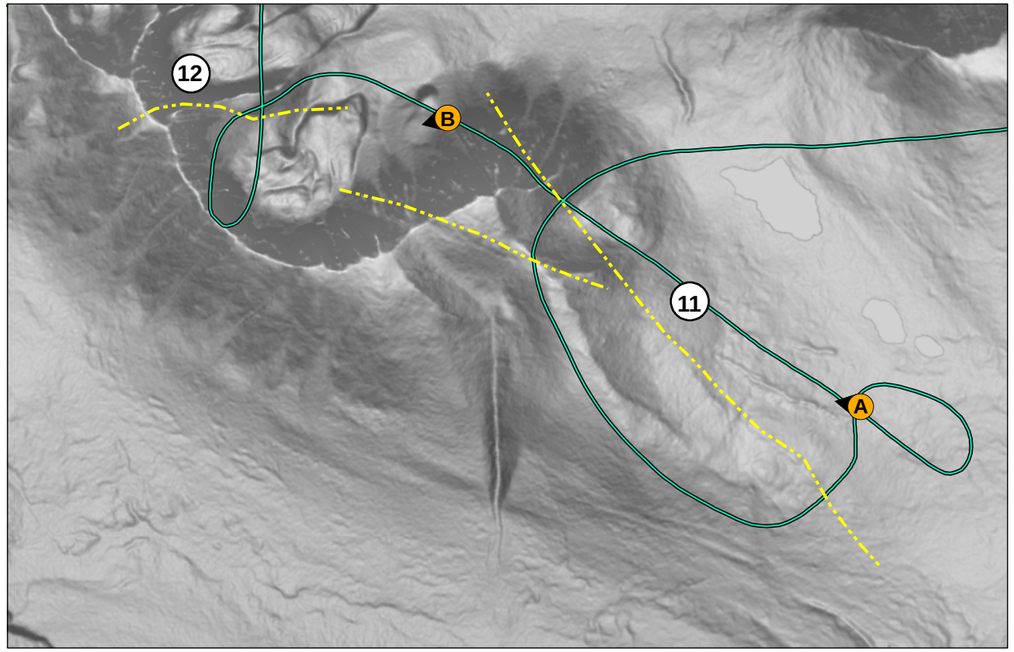
View looking south from photograph location C. Arrows show the projected trace of lineament. Note lineament is coincident with a linear drainage in this view.

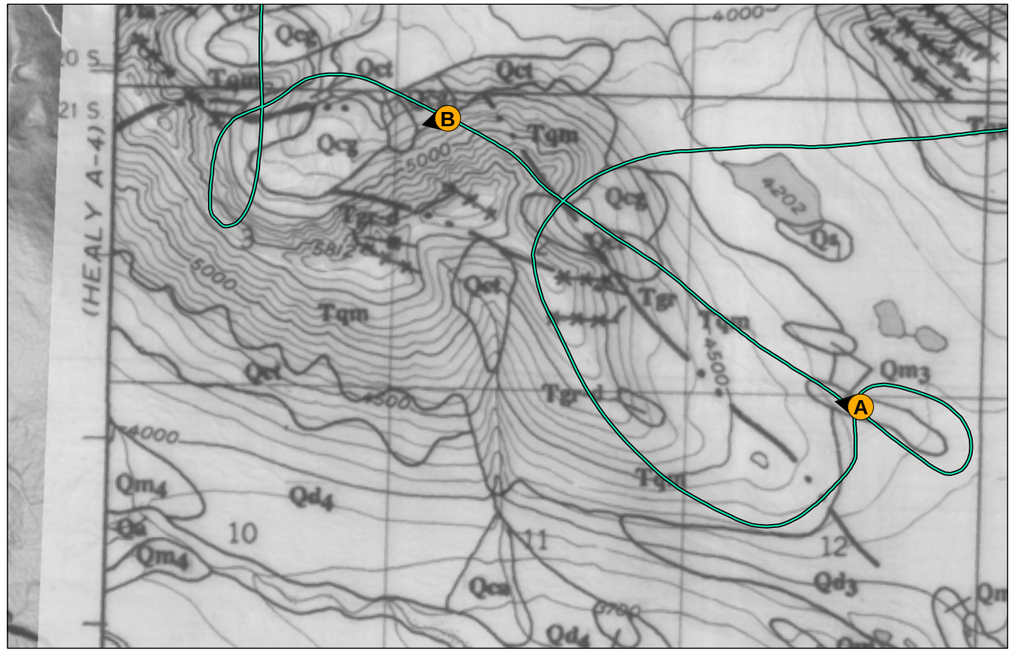
D)



View looking south from location C. Brackets show the projected trace of lineament.

FUGRO Date 10/18/13	STATE OF ALASKA ALASKA ENERGY AUTHORITY ALASKA ENERGY AUTHORITY	SUSITNA-WATANA HYDROELECTRIC PROJECT FEATURE 10 LINEAMENTS ANALYSIS REGER ET AL. (1990)	FIGURE B-09b



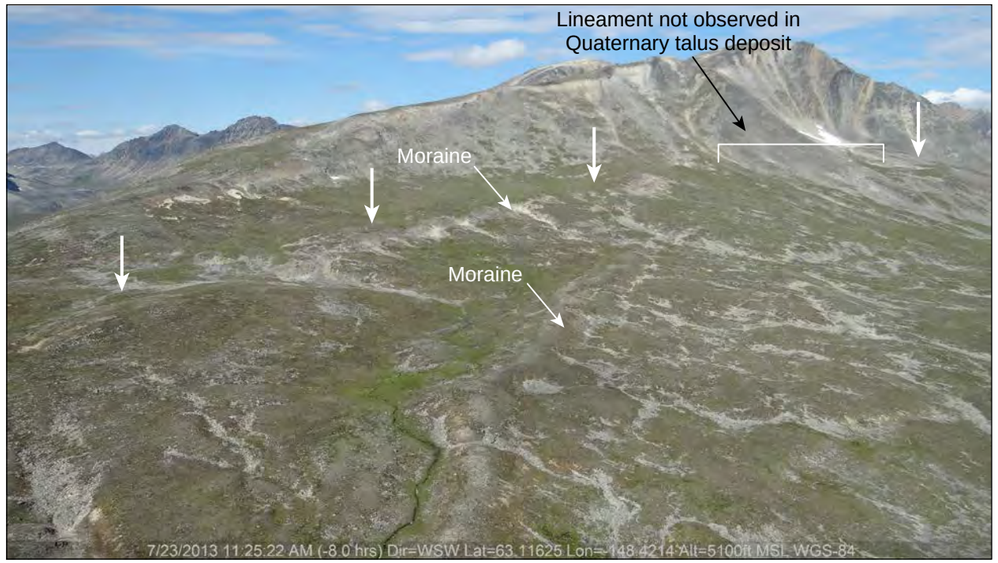


N

0 0.5 1 mi

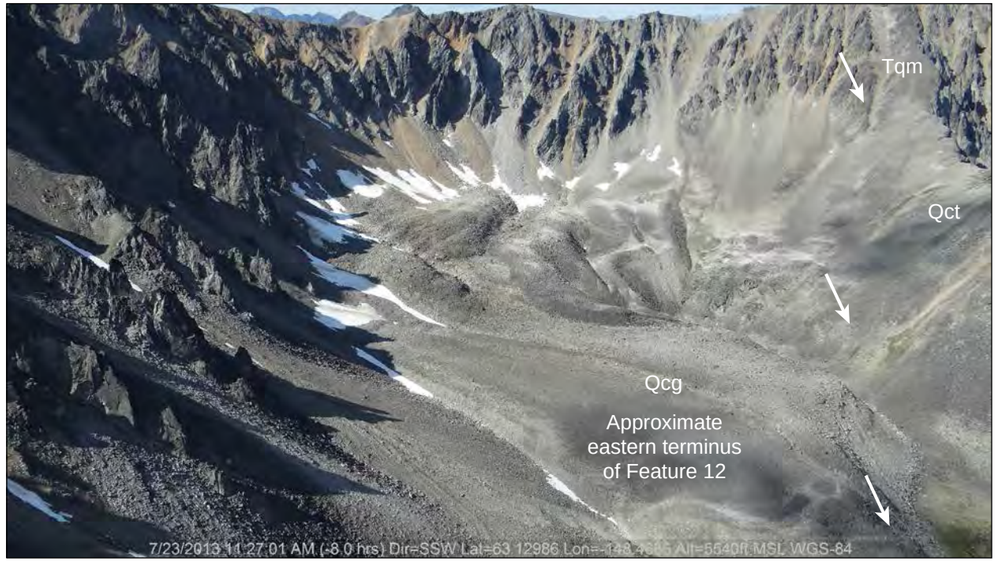
0 0.5 1 km

A)



View looking west from location A. Arrows and brackets show projected trace of Feature 11 lineament. Note the mapped lineament correlates with a moraine crest.

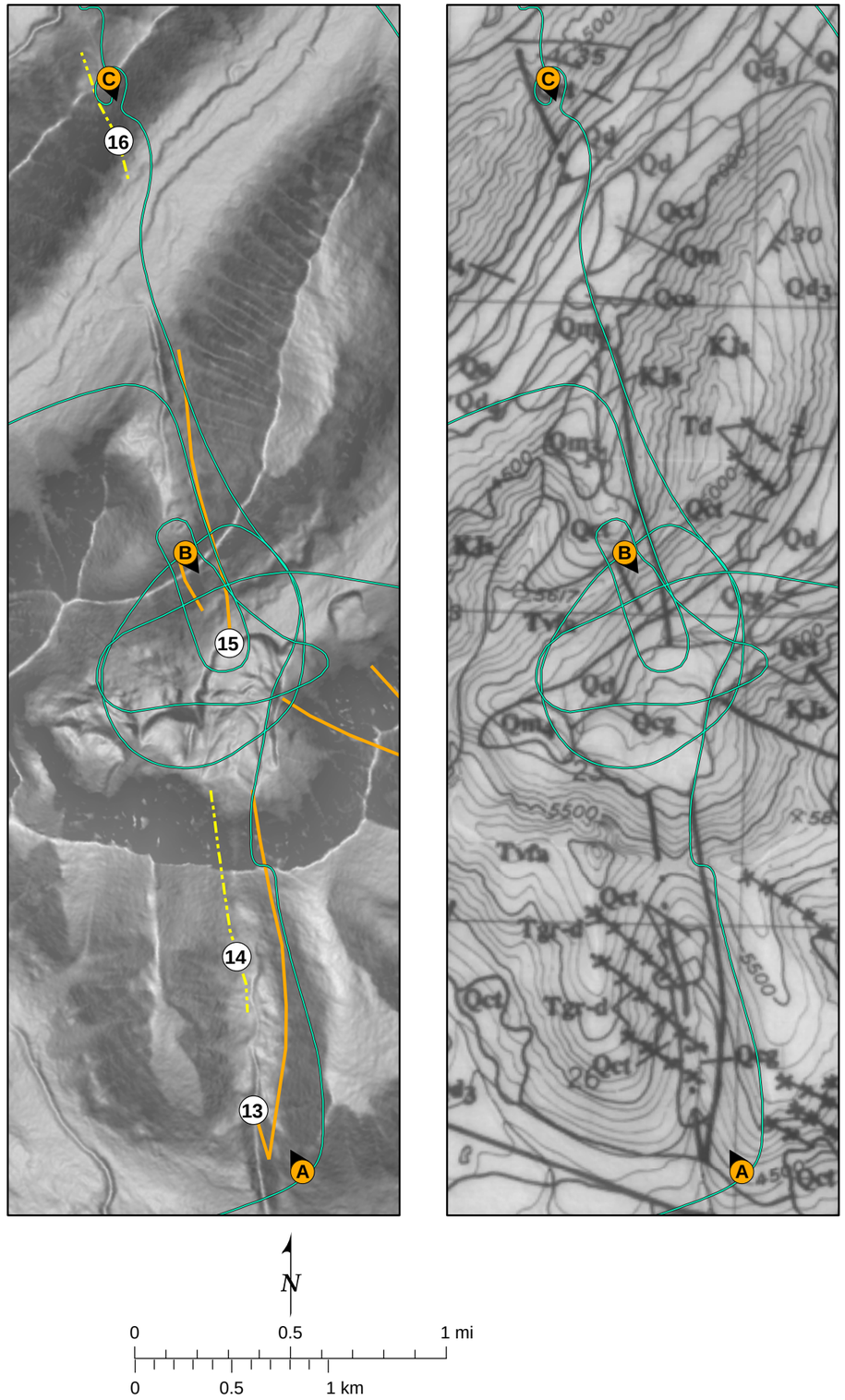
B)



View looking west from location A. Brackets show projected trace of Feature 12 lineament. Note the trace of the lineament is a collection of unrelated features rather than a through-going feature.

FUGRO Date 10/18/13	STATE OF ALASKA ALASKA ENERGY AUTHORITY ALASKA ENERGY AUTHORITY	SUSITNA-WATANA HYDROELECTRIC PROJECT FEATURES 11 AND 12 LINEAMENTS ANALYSIS REGER ET AL. (1990)	FIGURE B-10

79_218900_Alaska_RailbeltI2189_Lineament Report October 2013, modified 10.18.13



A)

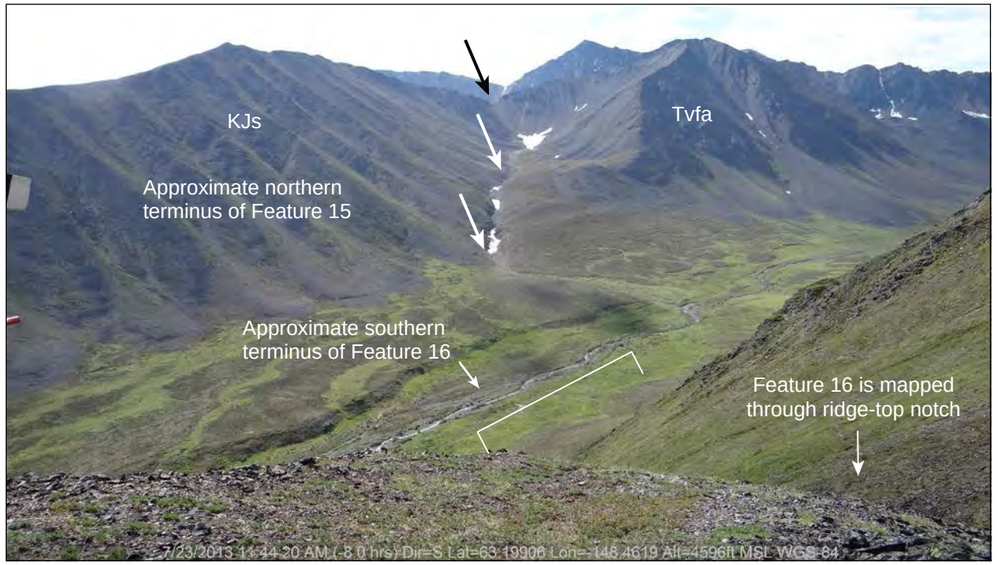
View looking north-northwest from location A. The bracket indicates the projected path of Feature 13 fault. Arrows show the projected trace of Feature 14 lineament. Note absence of evidence of fault under bracket in Quaternary deposits.

B)

View looking southeast from photograph location B. The brackets indicates the projected path of Feature 15 fault. Note absence of evidence of fault under bracket in Quaternary deposits.

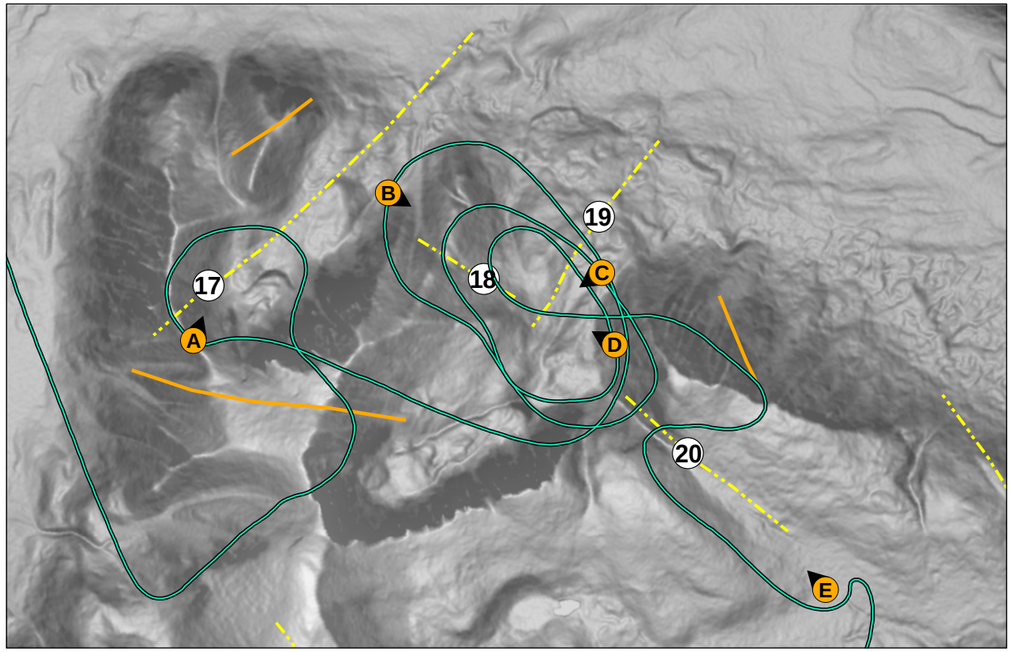
FUGRO Date 10/18/13	STATE OF ALASKA ALASKA ENERGY AUTHORITY ALASKA ENERGY AUTHORITY	SUSITNA-WATANA HYDROELECTRIC PROJECT FEATURES 13, 14, 15 AND 16 LINEAMENTS ANALYSIS REGER ET AL. (1990)	FIGURE B-11a

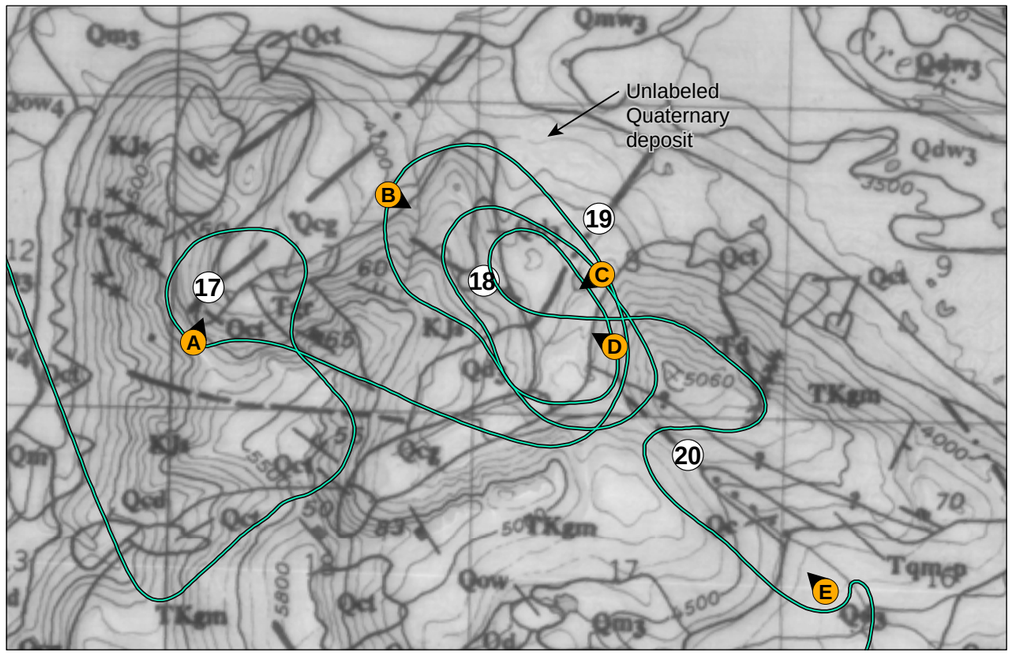
C)



View looking south from location C. The arrows and bracket indicates the projected path of Feature 15 and 16 faults. Note absence of linear expression in valley floor within Quaternary deposits.

FUGRO Date 10/18/13	STATE OF ALASKA ALASKA ENERGY AUTHORITY ALASKA ENERGY AUTHORITY	SUSITNA-WATANA HYDROELECTRIC PROJECT FEATURE 13, 14, 15, AND 16 LINEAMENTS ANALYSIS REGER ET AL. (1990)	FIGURE B-11b

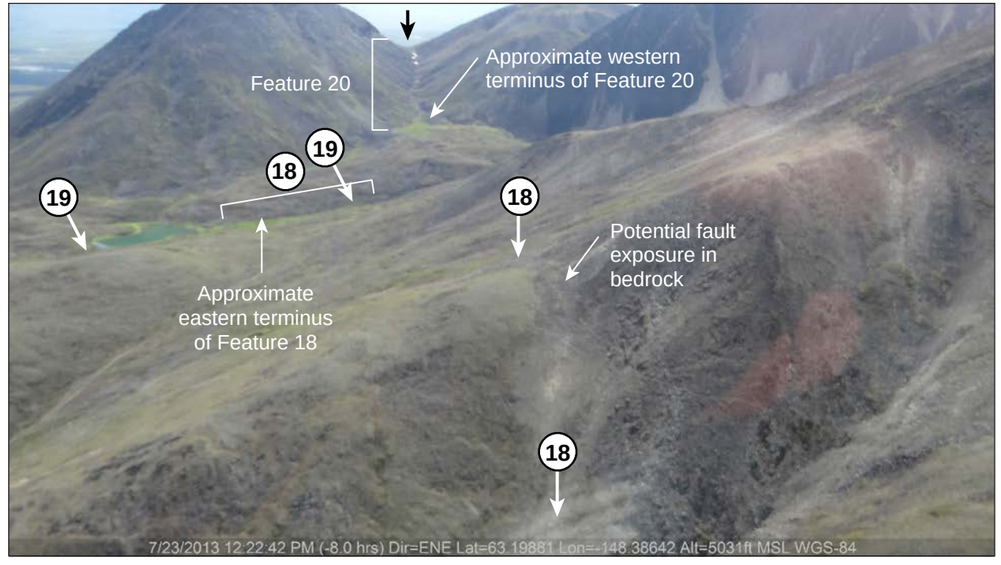




A)

View looking northeast from location A. Arrows and brackets show projected trace of lineament 17.

B)



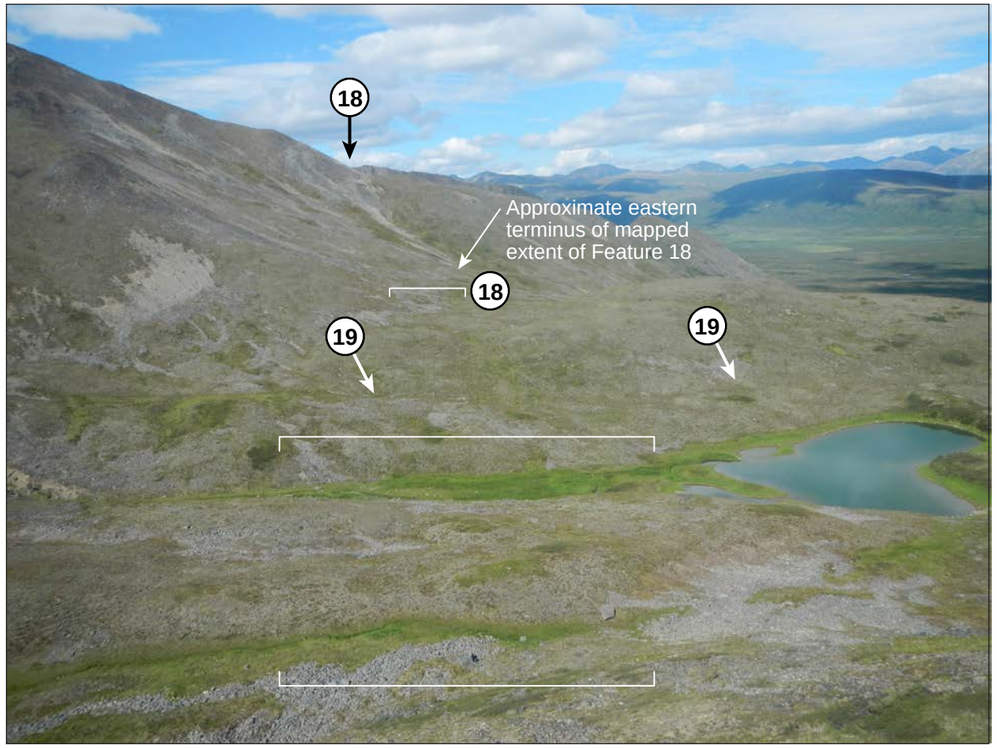
View looking southeast from photograph location B. Arrows and brackets indicated the projected trace of lineaments 18, 19, and 20.

FUGRO Date 10/18/13	STATE OF ALASKA ALASKA ENERGY AUTHORITY ALASKA ENERGY AUTHORITY	SUSITNA-WATANA HYDROELECTRIC PROJECT FEATURES 17, 18, 19, AND 20 LINEAMENTS ANALYSIS REGER ET AL. (1990)	FIGURE B-12a

C)

View looking southwest from photograph location C. The arrows indicate the projected path of Feature 19 lineament.

D)



View looking northwest from photograph location D. Arrows show the mapped trace of Features 18 and 19. Note absence of lineaments or apparent deformation in Quaternary deposits between brackets in lower middle portion of photograph.

E)

View looking northwest from photograph location E. Arrows show the mapped trace of Feature 20 lineament. Note mapped trace of Feature 20 is coincident with linear drainage.

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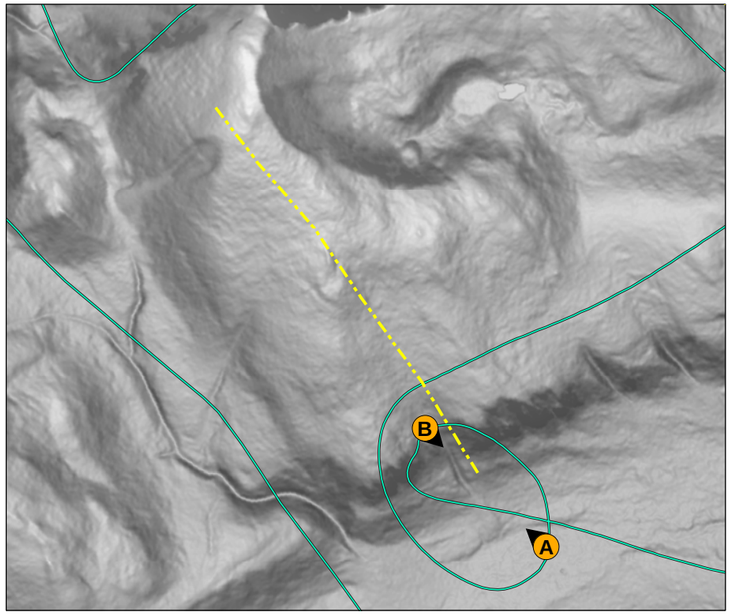
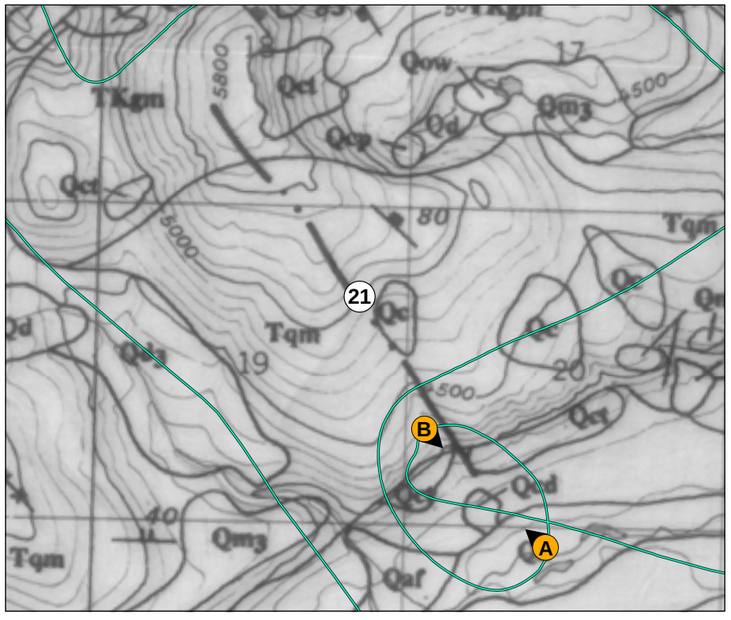
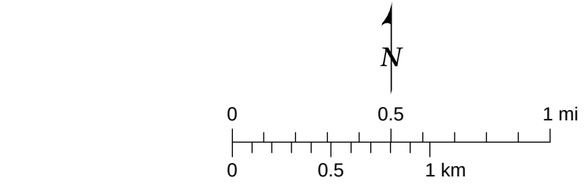
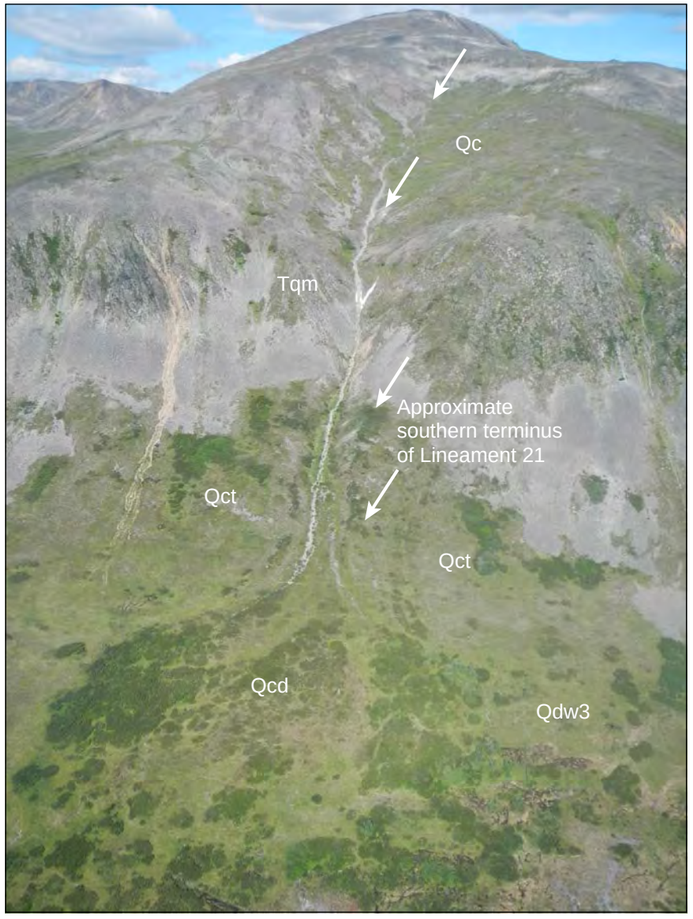
FUGRO Date 10/18/13	STATE OF ALASKA ALASKA ENERGY AUTHORITY ALASKA ENERGY AUTHORITY	SUSITNA-WATANA HYDROELECTRIC PROJECT FEATURES 17, 18, 19, 20 LINEAMENTS ANALYSIS REGER ET AL. (1990)	FIGURE B-12b





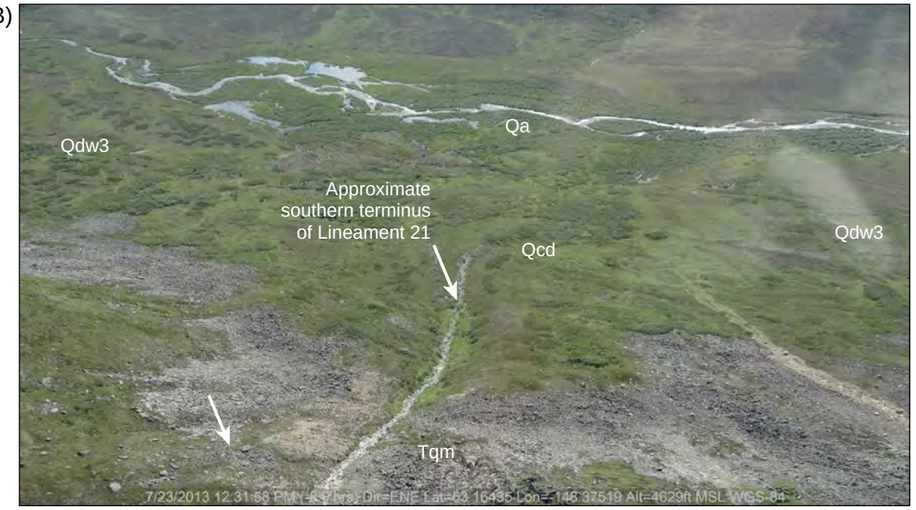


A)



View looking northwest from photograph location A. Arrows indicate the projected path of Feature 21 lineament.

B)



View looking southeast from photograph location B. Arrows show the projected trace of Feature 21 lineament.

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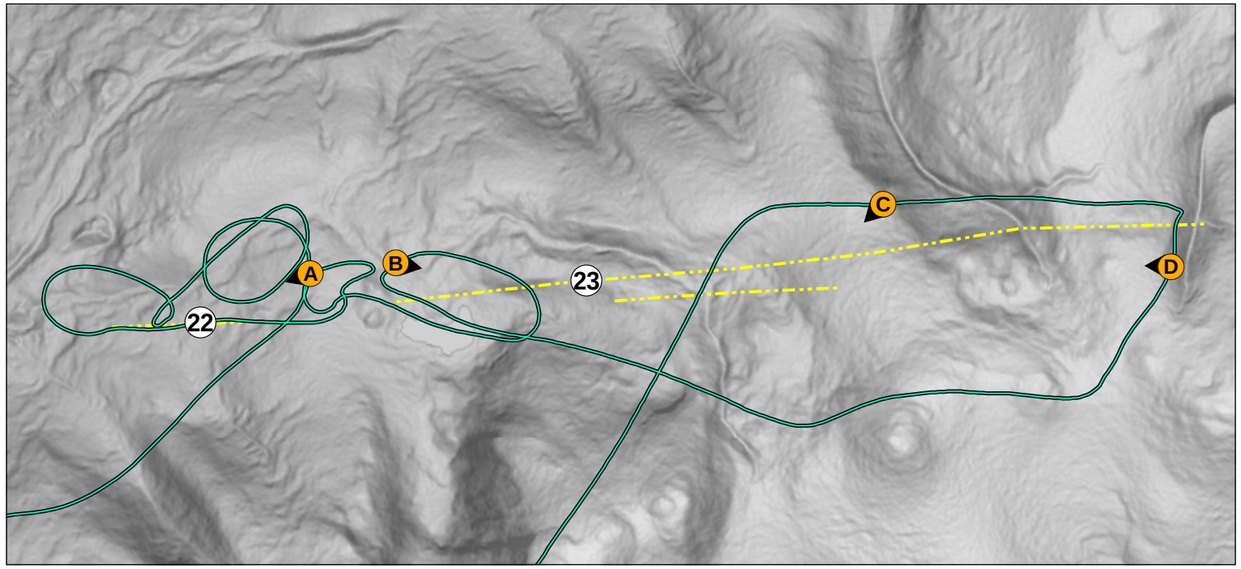
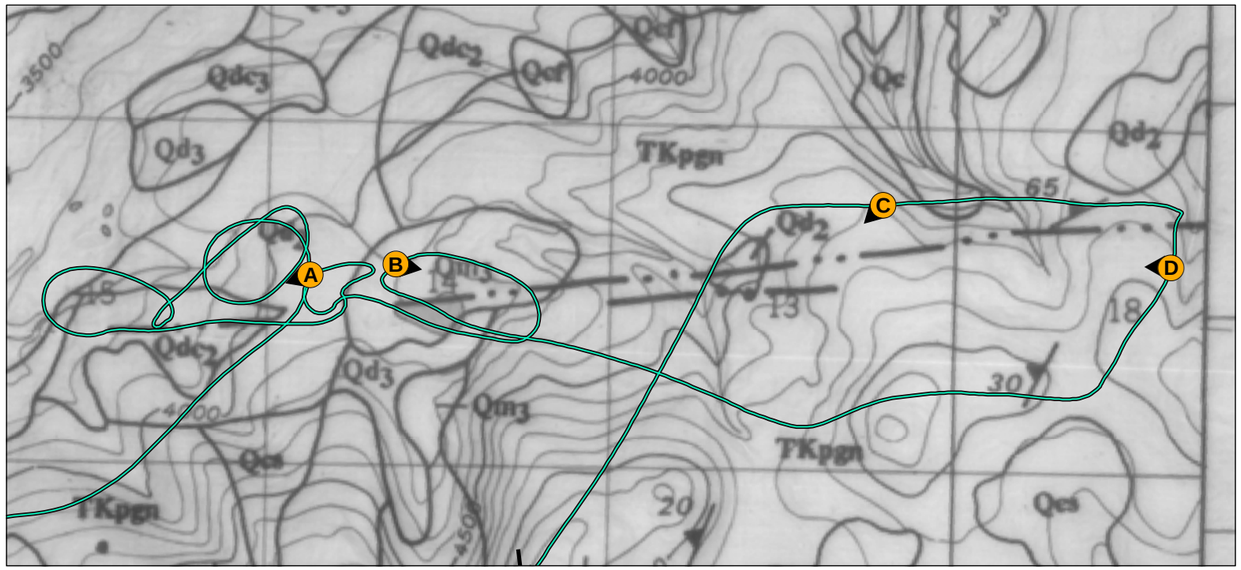
FUGRO Date 10/18/13	STATE OF ALASKA ALASKA ENERGY AUTHORITY ALASKA ENERGY AUTHORITY	SUSITNA-WATANA HYDROELECTRIC PROJECT FEATURE 21 LINEAMENTS ANALYSIS REGER ET AL. (1990)	FIGURE B-13

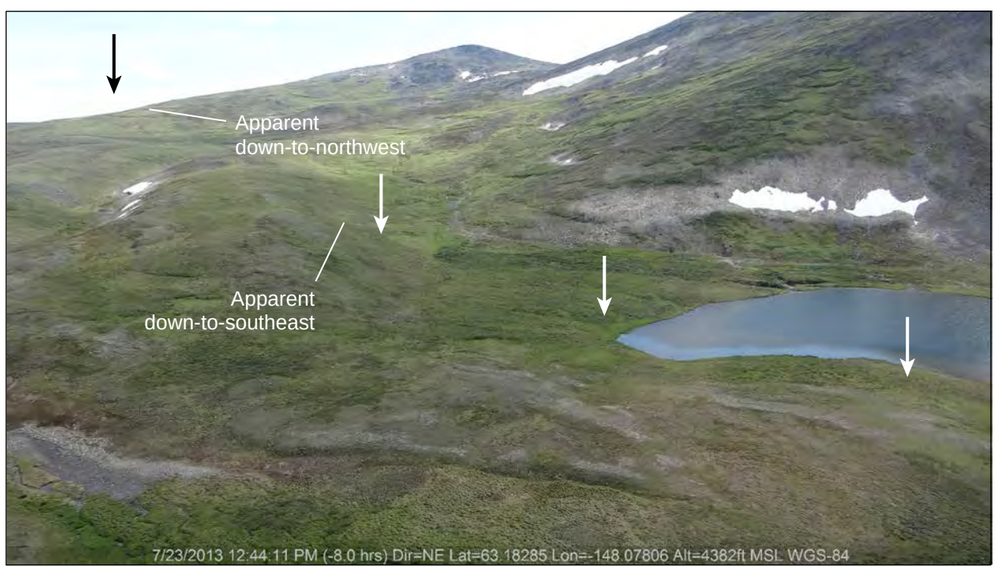


A)

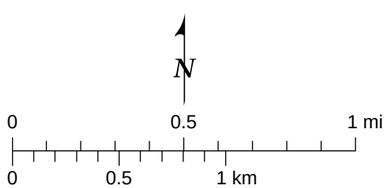
View looking west from photograph location A. Brackets show the projected trace of Feature 22. Note the absence of a continuous lineament along the projected trace and exposed till on low relief ridge crest between drainages.



B)



View looking east from photograph location B. Arrows and brackets indicate the projected path of Feature 22 lineament. Note change in apparent vertical displacement.



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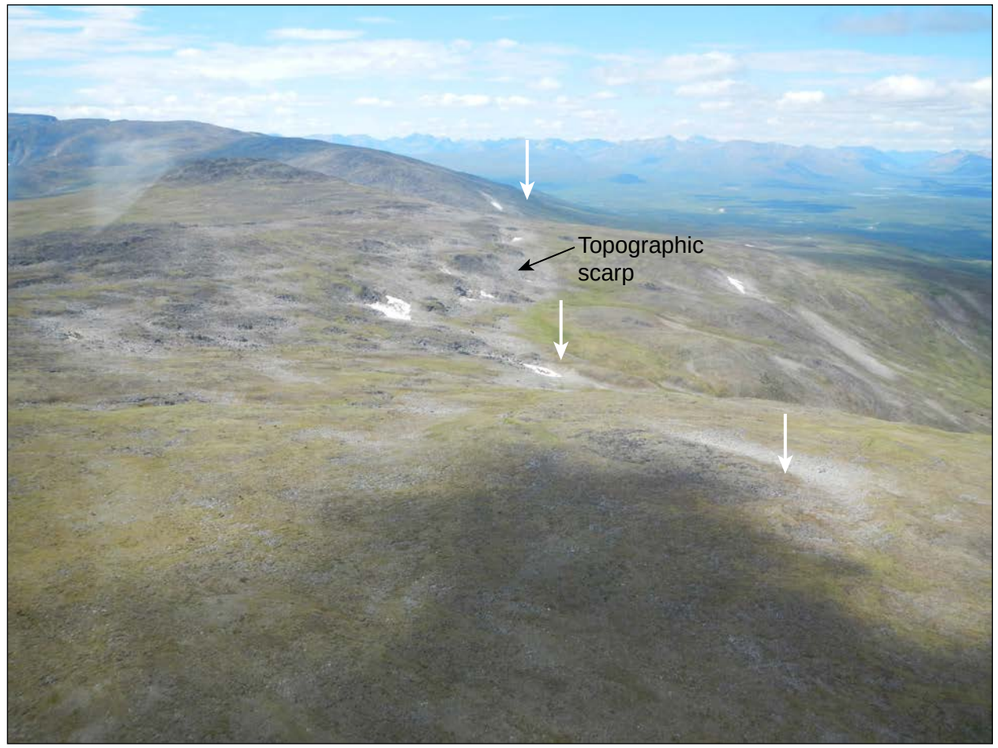
FUGRO Date 10/18/13	STATE OF ALASKA ALASKA ENERGY AUTHORITY ALASKA ENERGY AUTHORITY	SUSITNA-WATANA HYDROELECTRIC PROJECT FEATURES 22 AND 23 LINEAMENTS ANALYSIS REGER ET AL. (1990)	FIGURE B-14a

C)

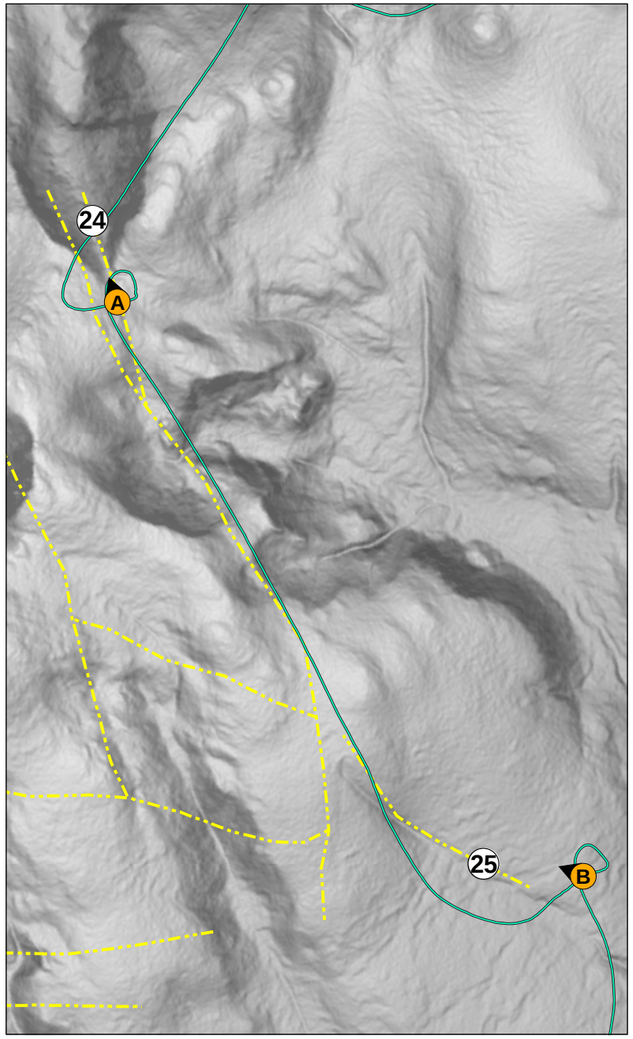
View looking west from photograph location C. Arrows show the projected trace of the Feature 22 lineament. Note linear expression is coincident with solufluction lobes and not continuous.

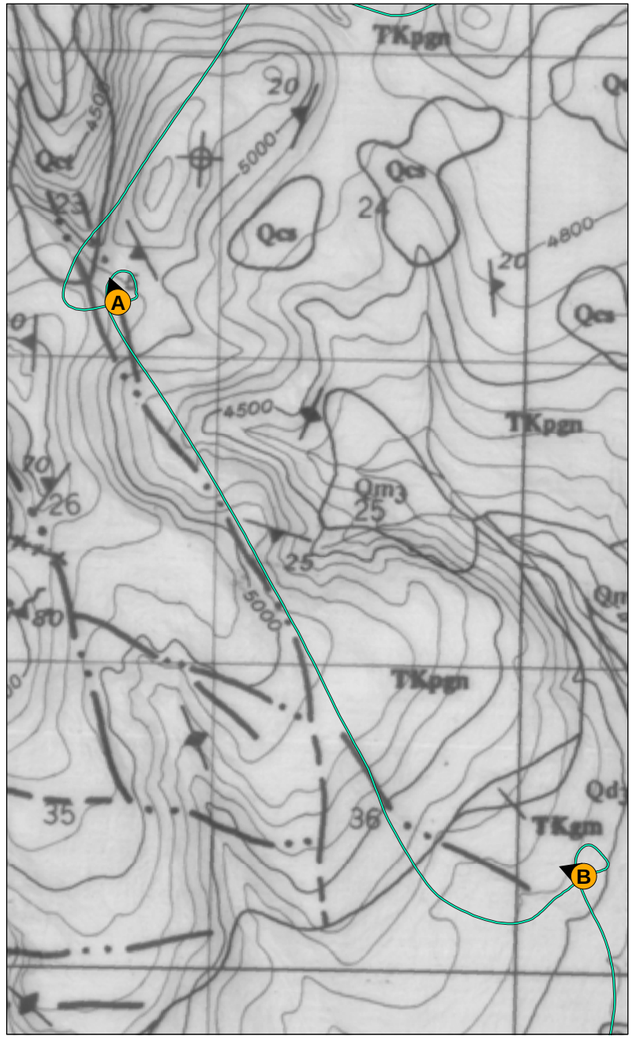
D)



View looking west from photograph location C. Arrows show the projected trace of the Feature 22 lineament. Note topographic scarp in Photograph D is not proportional to minor scarps associated with solufluction in Photograph C.

FUGRO Date 10/18/13	STATE OF ALASKA ALASKA ENERGY AUTHORITY ALASKA ENERGY AUTHORITY	SUSITNA-WATANA HYDROELECTRIC PROJECT FEATURES 22 AND 23 LINEAMENTS ANALYSIS REGER ET AL. (1990)	FIGURE B-14b





N

0 0.5 1 mi

0 0.55 1.1 km

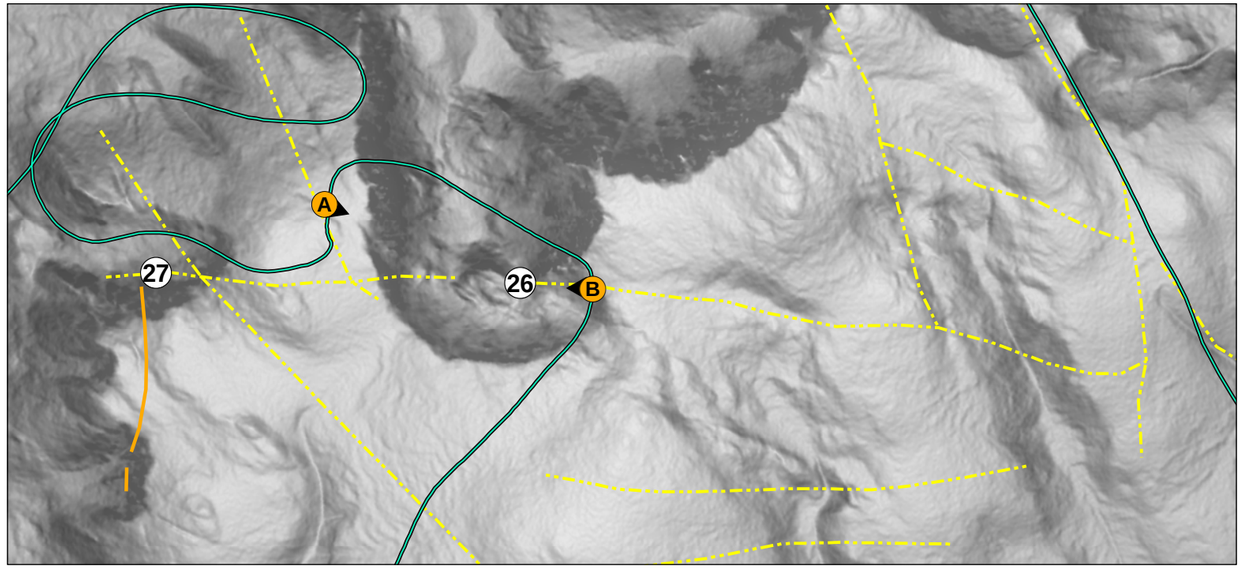
A)

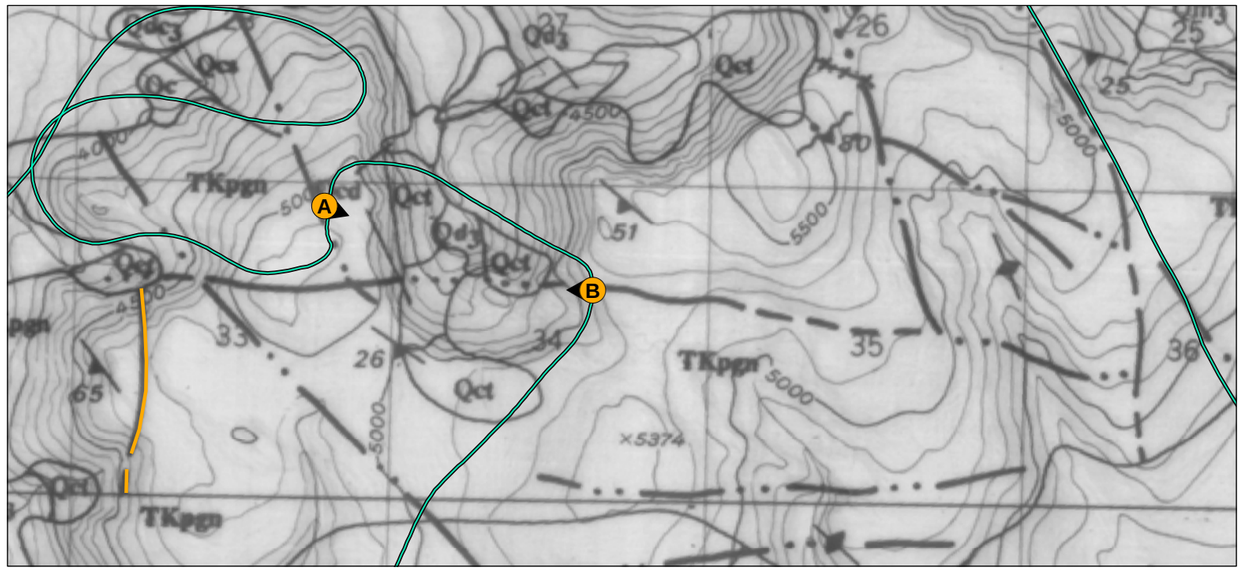
View looking west from photograph location C. Arrows indicate the projected path of the Feature 24 lineament.

B)

View looking west from photograph location C. Arrows indicate the projected path of the Feature 25 lineament.

FUGRO Date 10/18/13	STATE OF ALASKA ALASKA ENERGY AUTHORITY ALASKA ENERGY AUTHORITY	SUSITNA-WATANA HYDROELECTRIC PROJECT FEATURES 24 AND 25 LINEAMENTS ANALYSIS REGER ET AL. (1990)	FIGURE B-15



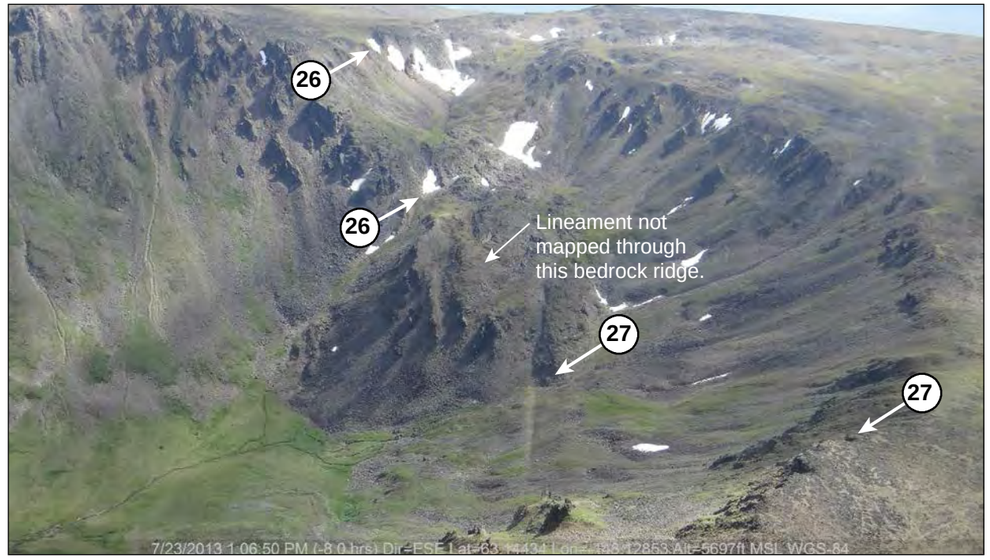


N

0 0.5 1 mi

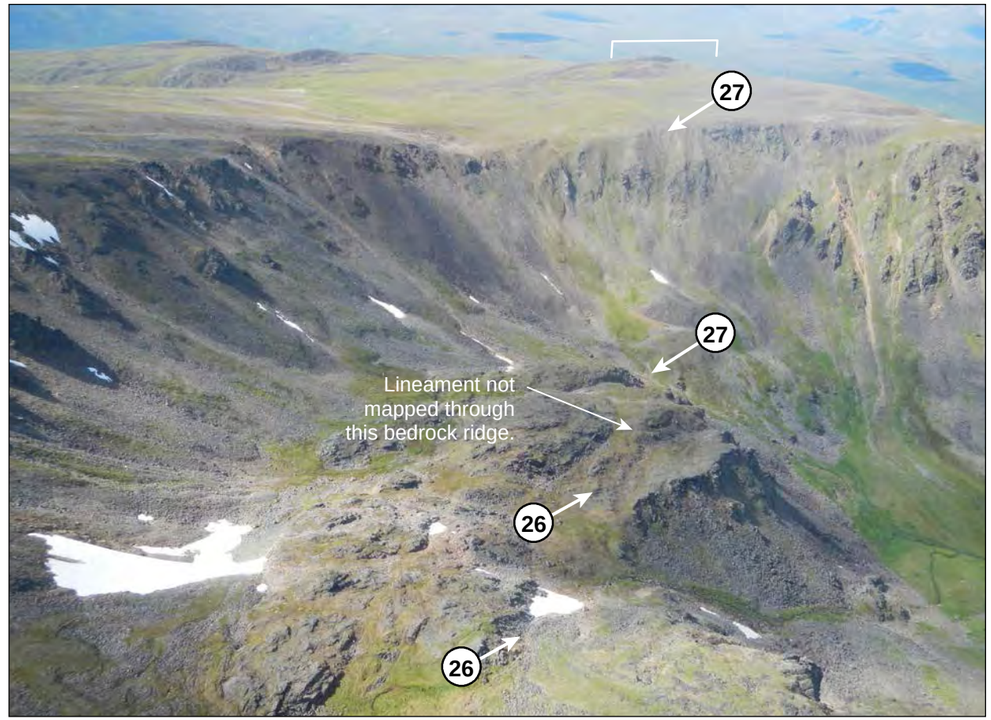
0 0.5 1 km

A)



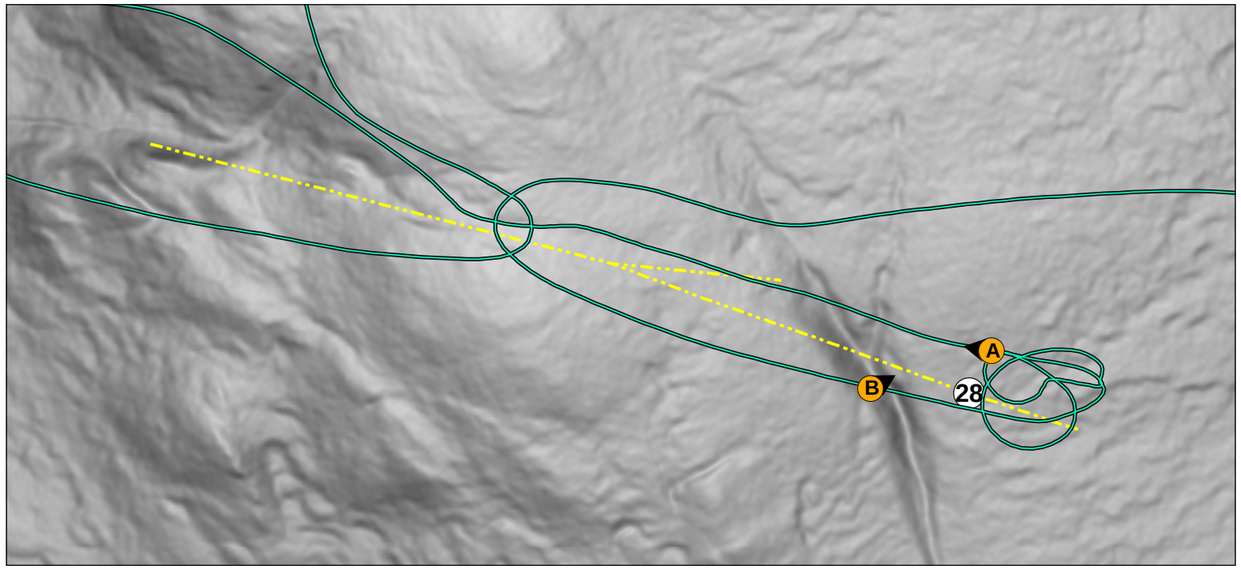
View looking west from photograph location A. Arrows show the projected trace of Features 26 and 27. Note the absence of a continuous and clear lineament along projected traces.

B)



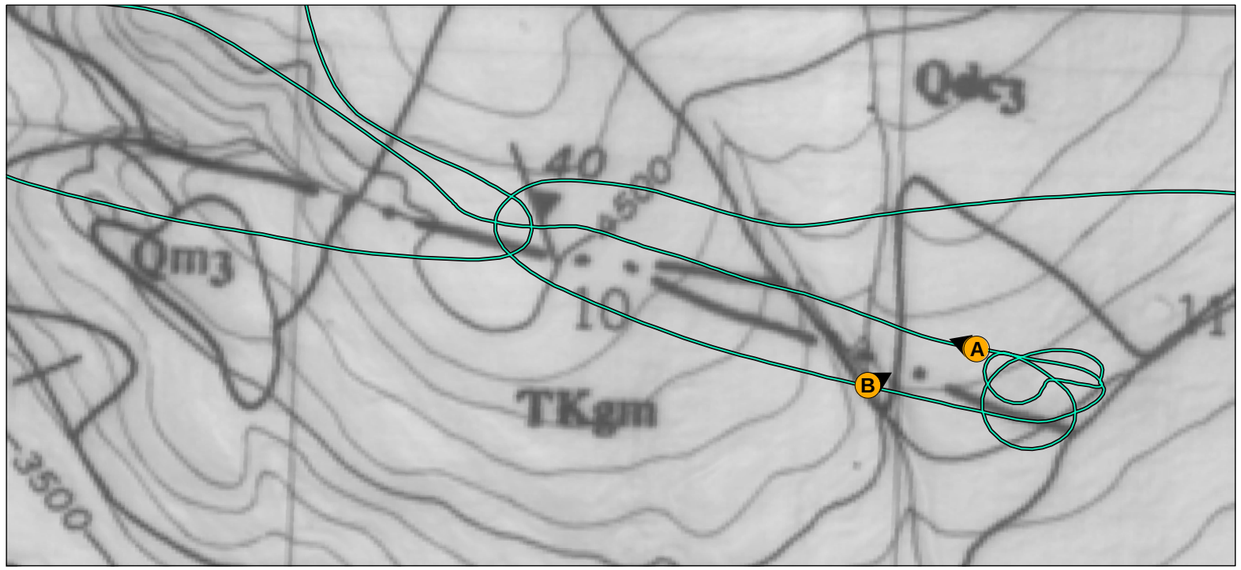
View looking east from photograph location B. Arrows and brackets indicate the projected path of Feature 26 and 27 lineaments. Note the absence of a continuous and clear lineament along projected traces.

FUGRO Date 10/18/13	STATE OF ALASKA ALASKA ENERGY AUTHORITY ALASKA ENERGY AUTHORITY	SUSITNA-WATANA HYDROELECTRIC PROJECT FEATURES 26 AND 27 LINEAMENTS ANALYSIS REGER ET AL. (1990)	FIGURE B-16

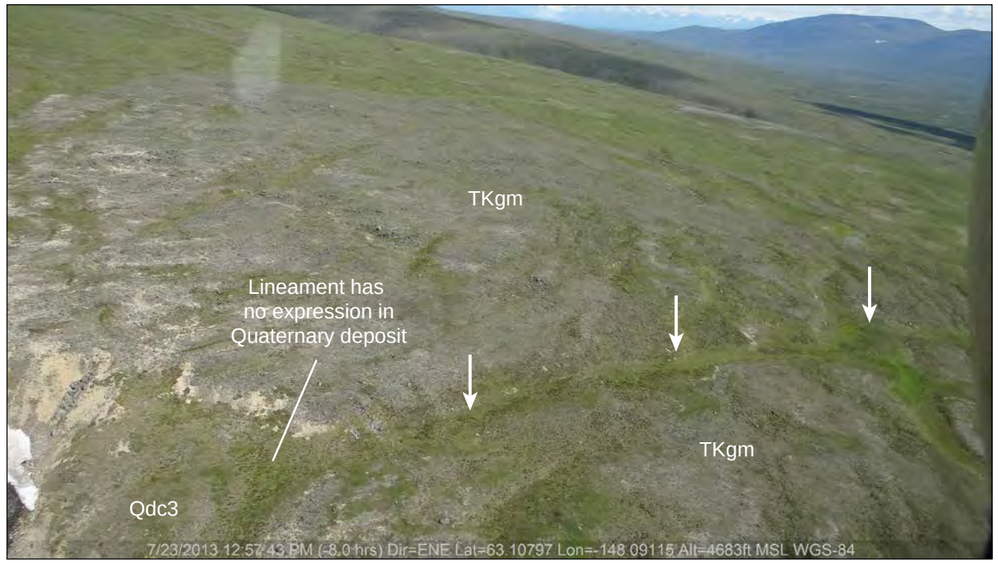


A)

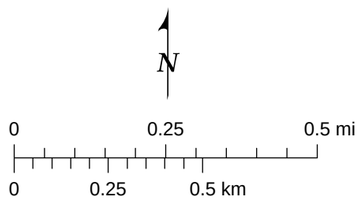
View looking west-northwest from photograph location A. Arrows show mapped trace of Feature 28. Note lineament corresponds to subtle linear trough and linear vegetation trend.



B)



View looking east from photograph location B. Arrows indicate the mapped trace of Feature 28. Note absence of linear expression in Quaternary deposits.



FUGRO Date 10/18/13	STATE OF ALASKA ALASKA ENERGY AUTHORITY ALASKA ENERGY AUTHORITY	SUSITNA-WATANA HYDROELECTRIC PROJECT FEATURE 28 LINEAMENTS ANALYSIS REGER ET AL. (1990)	FIGURE B-17

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Appendix C:

Final Luminescence Age Report, Prepared by Utah State University Luminescence Laboratory

USU LUMINESCENCE LABORATORY
http://usu.edu/geo/luminlab
1770 North Research Parkway, Suite 123, North Logan, Utah 84341

Project: **Susitna-Watana Dam, AK** Project: **204**
Scientist: **Dean Ostenaa, Fugro Consultants** Report date: **March 31, 2015**

Preliminary Luminescence Age Report

Optically Stimulated Luminescence Age Information[1]

Sample num.	USU num.	Depth (m)	Num. of aliquots[2]	Dose Rate (Gy/ka)	D_e[3] ± 2σ (Gy)	OD[4] (%)	*Preliminary* OSL age ± 2σ (ka)
DMC-14-S1-1	USU-1890	0.43	15 (24)	2.49 ± 0.13	34.0 ± 14.2	41.8	**14 ± 6**
DMC-14-S1-2	USU-1891	0.53	17 (24)	2.67 ± 0.14	34.0 ± 3.7[5]	15.7	**13 ± 2**
DMC-14-S1-3	USU-1892	0.85	14 (23)	2.57 ± 0.13	42.8 ± 9.4	14.7	**17 ± 4**
DMC-14-S1-4	USU-1893	1.03	13 (21)	2.44 ± 0.13	37.5 ± 8.4[6]	24.6	**15 ± 4**

[1] Preliminary age analysis using the single-aliquot regenerative-dose procedure of Murray and Wintle (2000) on 2mm small-aliquots of quartz sand.
[2] Number of aliquots used in preliminary age calculation and number of aliquots analyzed in parentheses.
[3] Equivalent dose (D_e) calculated using the Minimum Age Model of Galbraith and Roberts (2012), except where noted otherwise.
[4] Overdispersion (OD) represents variance in D_e data beyond measurement uncertainties, OD >20% may indicate significant scatter due to depositional or post-depositional processes.
[5] D_e calculated using the Central Age Model of Galbraith and Roberts (2012).
[6] D_e calculated using the arithmetic mean.

Dose Rate Information[1]

Sample num.	USU num.	Grain size (µm)	H_2O[2] (%)	K (%)	Rb (ppm)	Th (ppm)	U (ppm)	Cosmic (Gy/ka)
DMC-14-S1-1	USU-1890	125-212	6.1	1.70±0.04	55.5±2.2	6.1±0.6	1.4±1.0	0.19±0.02
DMC-14-S1-2	USU-1891	125-250	20.5	1.74±0.04	55.0±2.2	6.9±0.6	1.8±0.1	0.22±0.02
DMC-14-S1-3	USU-1892	125-250	7.0	1.81±0.05	53.9±2.2	7.4±0.7	1.0±0.1	0.22±0.02
DMC-14-S1-4	USU-1893	90-250	3.3	1.71±0.04	51.4±2.1	6.6±0.6	1.0±0.1	0.21±0.02

[1] Radioelemental concentrations determined by ALS Chemex using ICP-MS and ICP-AES techniques, dose rate is derived from concentrations by conversion factors from Guerin et al. 2011.
[2] *In-situ* gravimetric water content, assumed 6.5±3.0% (average of USU-1890 and USU-1892) for moisture content to represent burial history for USU-1891 and USU-1893.