Apparent rock type contrasts

Location of granitic glacial erratic

Glacial lake sediments

Tyone Creek

20

Notes: 1. See Figures A0.2, A0.3, A0.4, and A0.5 for explanation.
2. Data frame has been rotated 45° east of north.
3. Geologic map from Grantz, 1960.

FUGRO Date 10/18/13	STATE OF ALASKA ALASKA ENERGY AUTHORITY	SUSITNA-WATANA HYDROELECTRIC PROJECT LINEAMENT GROUP 20 MAP DATA	FIGURE A20.1

79_218900_Alaska_Railbelt\2189_Lineament Report October 2013, modified 10.18.13

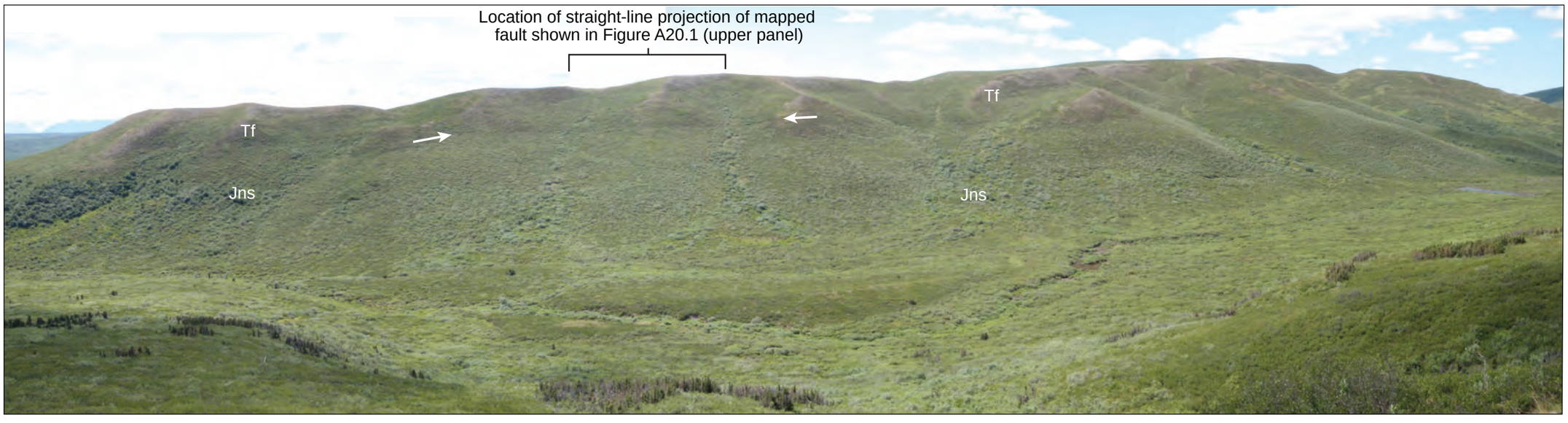
A)

Photograph looking northeast from location A.

B)

Photograph looking west-southwest from location B. Geologist standing in 3- to 6-m deep- and ~30-m-wide swale. Swale only exists in saddle; it does not continue down either side of saddle.

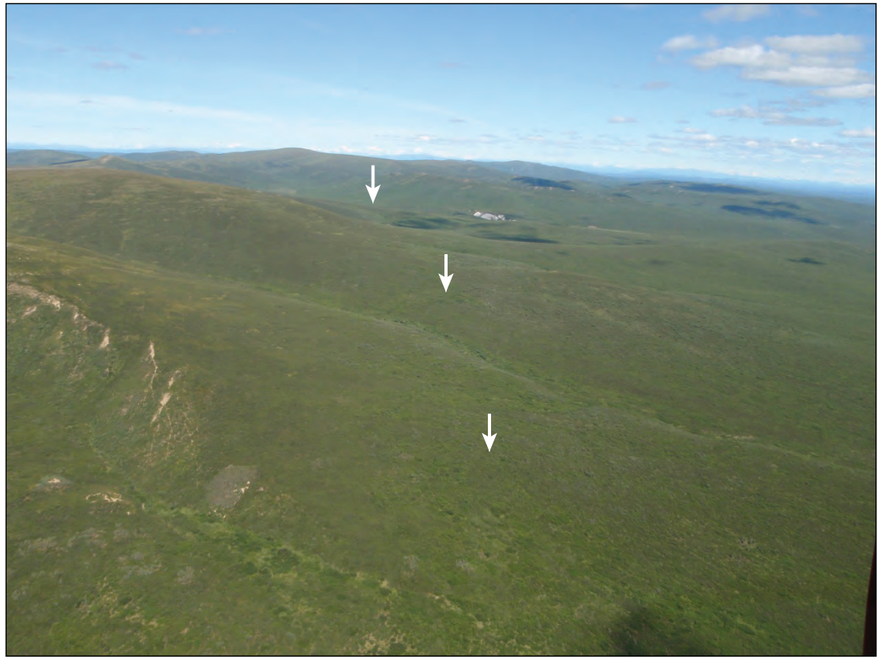
C)



Photograph looking southwest from location C. Basal contact shown by arrows. Note that base of contact is not apparently deformed along projection of fault and that no expression of faulting in valley bottom is apparent.

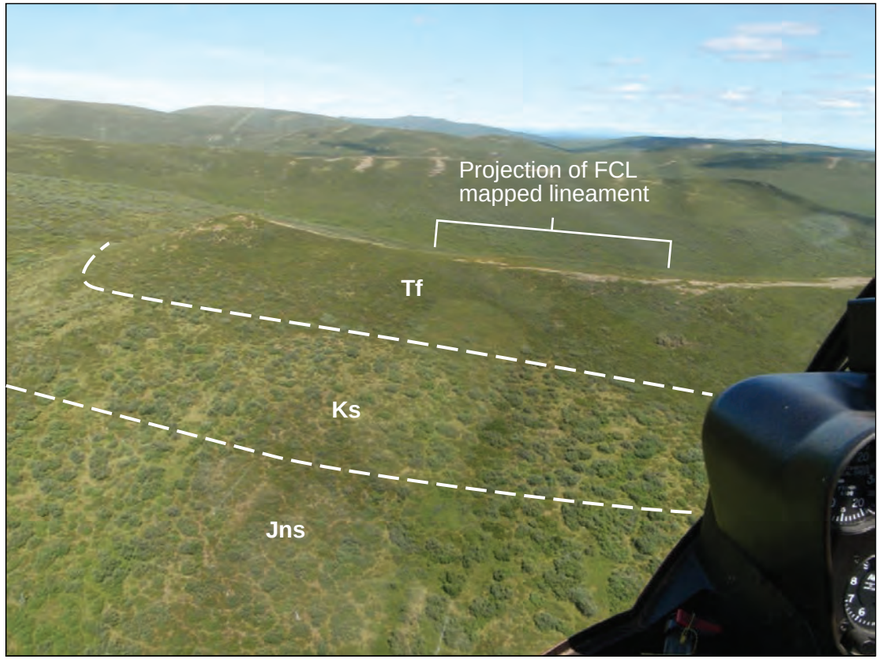
FUGRO Date 10/18/13	STATE OF ALASKA ALASKA ENERGY AUTHORITY ALASKA ENERGY AUTHORITY	SUSITNA-WATANA HYDROELECTRIC PROJECT LINEAMENT GROUP 20 PHOTOGRAPHS	FIGURE A20.2

G)



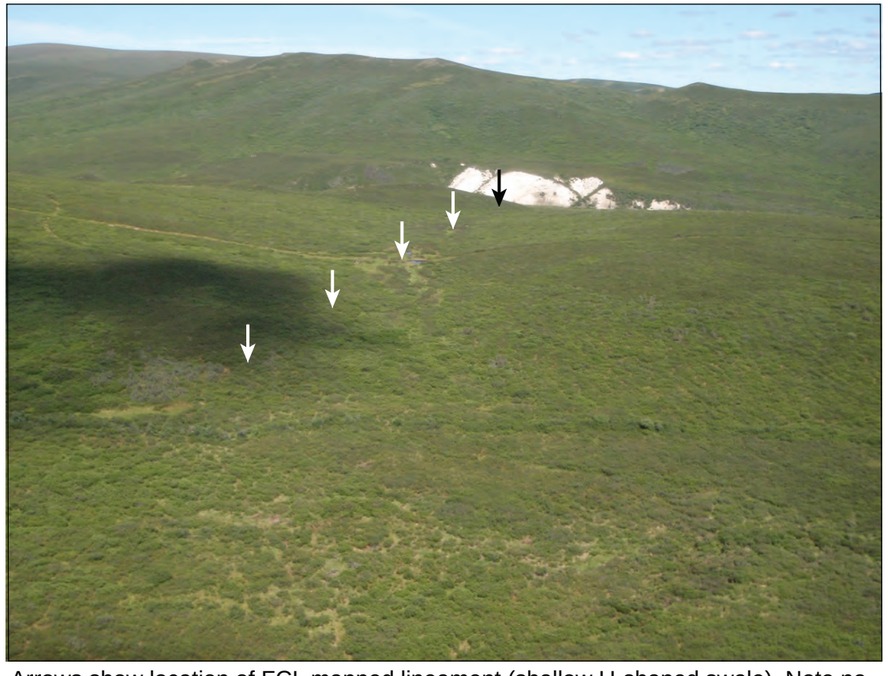
Photograph looking north from location G along mapped fault of Grantz (1960). Arrows point to approximate location of mapped fault. Note absence of apparent geomorphic expression fault.

D)



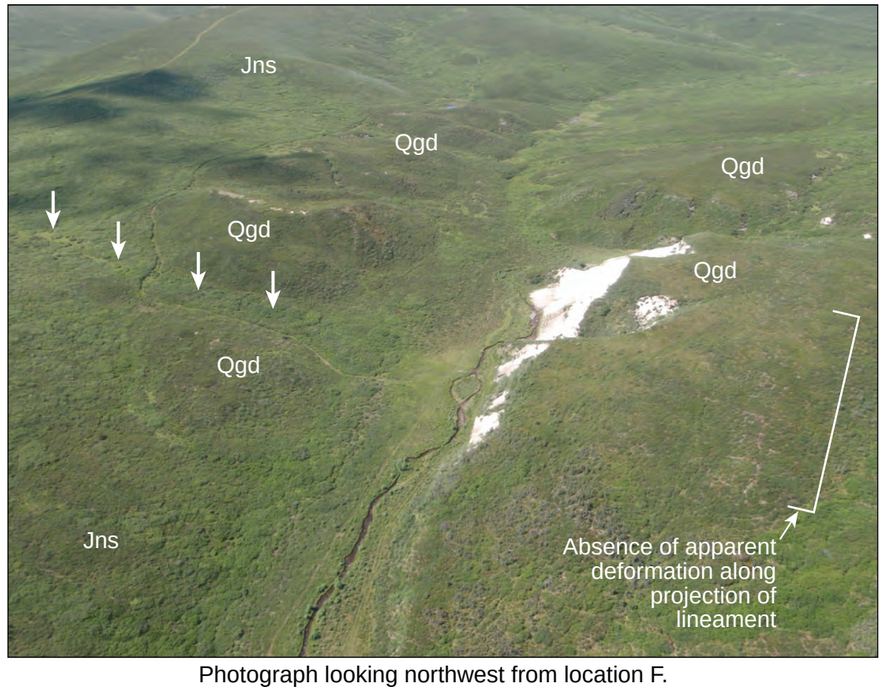
Photograph looking northeast from location D. Note absence of deformation in ridge line of Tf.

E)



Arrows show location of FCL mapped lineament (shallow U-shaped swale). Note no apparent deformation of white-bedded sediments (glacial lake sediments) along projection of lineament.

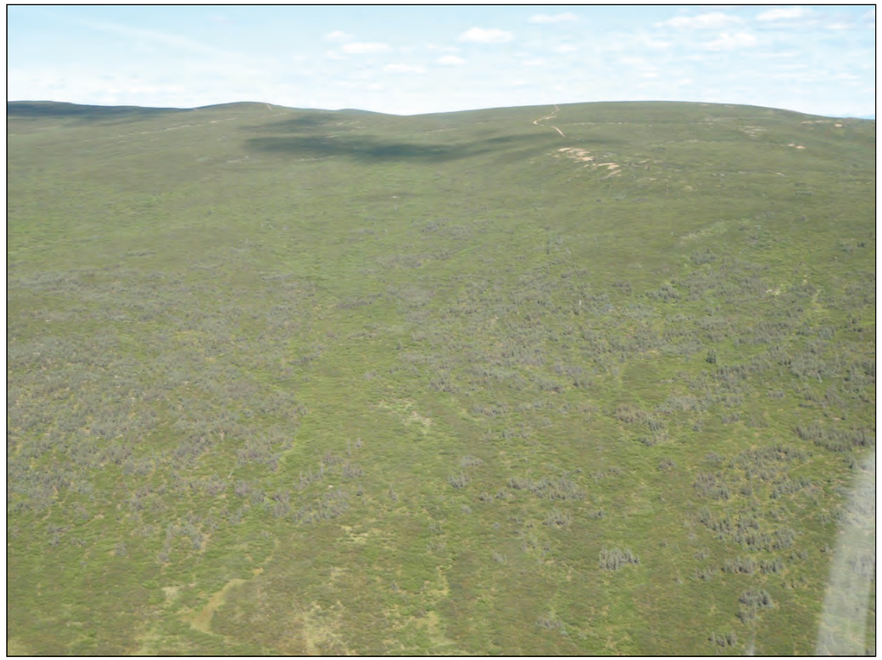
F)



Photograph looking northwest from location F.

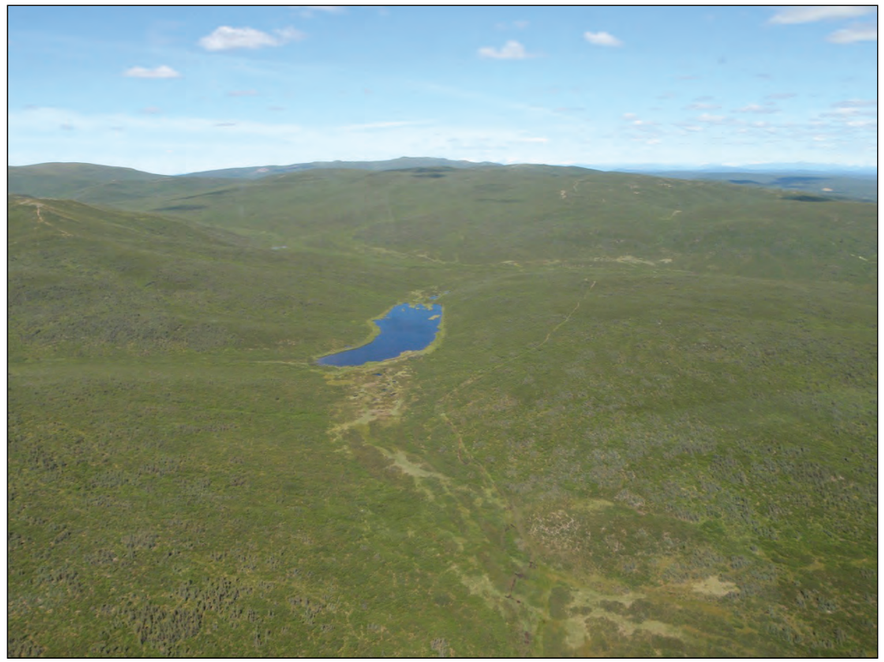
FUGRO Date 10/18/13	STATE OF ALASKA ALASKA ENERGY AUTHORITY ALASKA ENERGY AUTHORITY	SUSITNA-WATANA HYDROELECTRIC PROJECT LINEAMENT GROUP 20 PHOTOGRAPHS	FIGURE A20.3

H)



Photograph looking north-northeast from location H along queried mapped fault of Grantz (1960) that lies outside of lineament group. Note absence of fault expression.

I)



Photograph looking north-northeast from location I along queried mapped fault of Grantz (1960) that lies outside of lineament group. Note absence of fault expression.

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

LINEAMENT GROUP 20
PHOTOGRAPHS

FIGURE

A20.4

460000 470000 480000 490000 500000 510000

6910000

6900000

6890000

Crater Lake

27

Oshetna River

Big Bones Moraine

Little Oshetna River

Fourth of July Creek

Sellick Cr Spillway

Spillway

Drainage divide

Daisy Cr

Curtis Lake Moraine

Stagnent Little Nelchina Lobe

Granitic glacial erratic

Lineament group 20

Yacko Creek

White Sand Creek

Glacial lake sediments

Tyone Creek

Castle Mtn. extension lineament group

Little Nelchina River

Cadoceras Creek

Little Nelchina Lobe

N

0 1km

0 1 mi

Explanation

Glacial drift mantled by glacial lake sediments from 914-975 meter lake

AA Location of radiocarbon sample

Ice boundary (morainal ridge, kame terrace, delta, etc.) marking edge of glacier. Hachures toward glacier

Linear or drumlinoid feature from ice scour. Direction of ice movement indicated by arrow

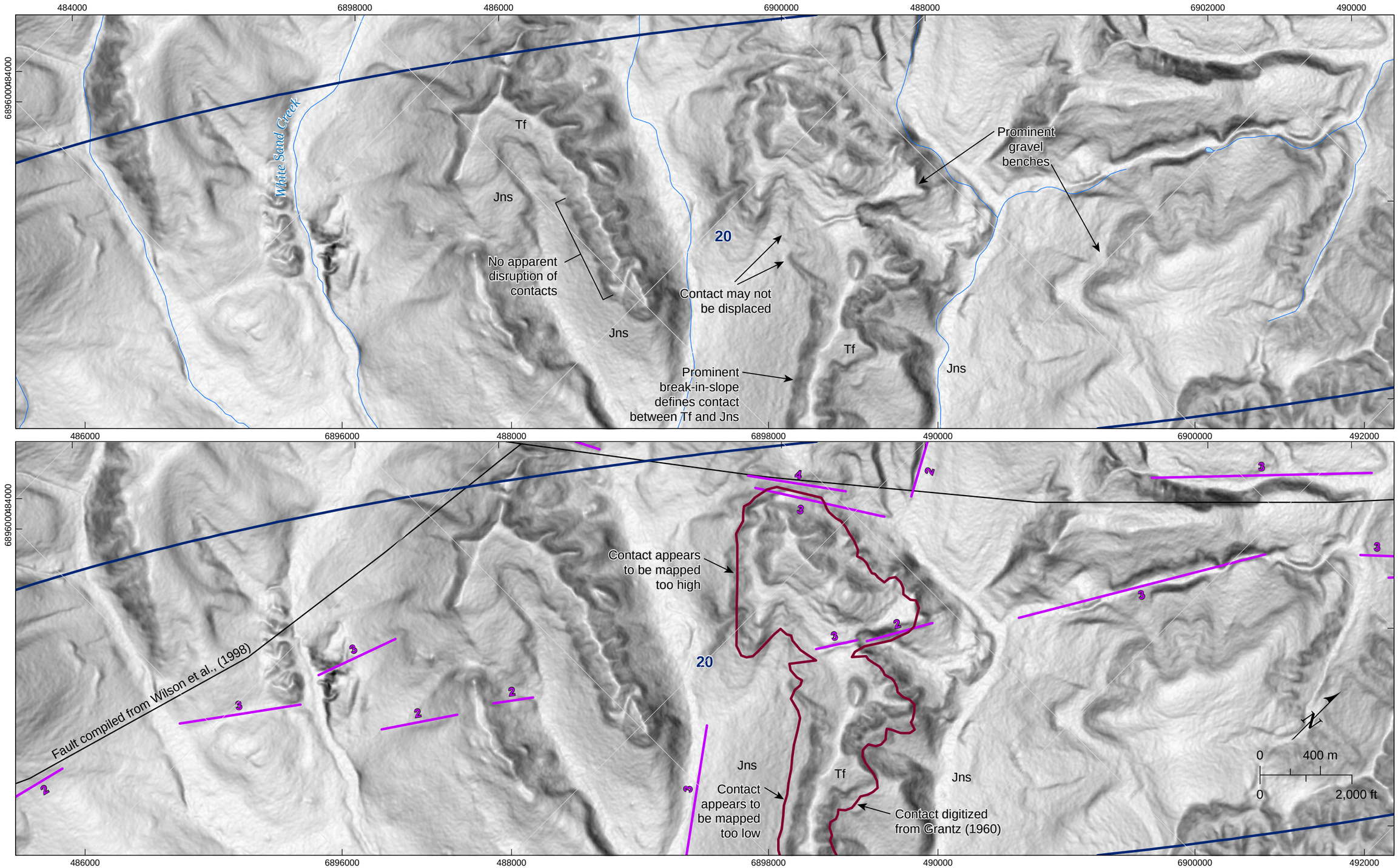
Spillway for glacial meltwater, including that stored in large glacial lakes

Lineament group

Notes: 1. See Figures A0.2, A0.3, A0.4, and A0.5 for explanation.
2. Geologic map from Williams and Galloway, 1986.

79_218900_Alaska_Railbelt/2189_Lineament Report October 2013, modified 10.18.13

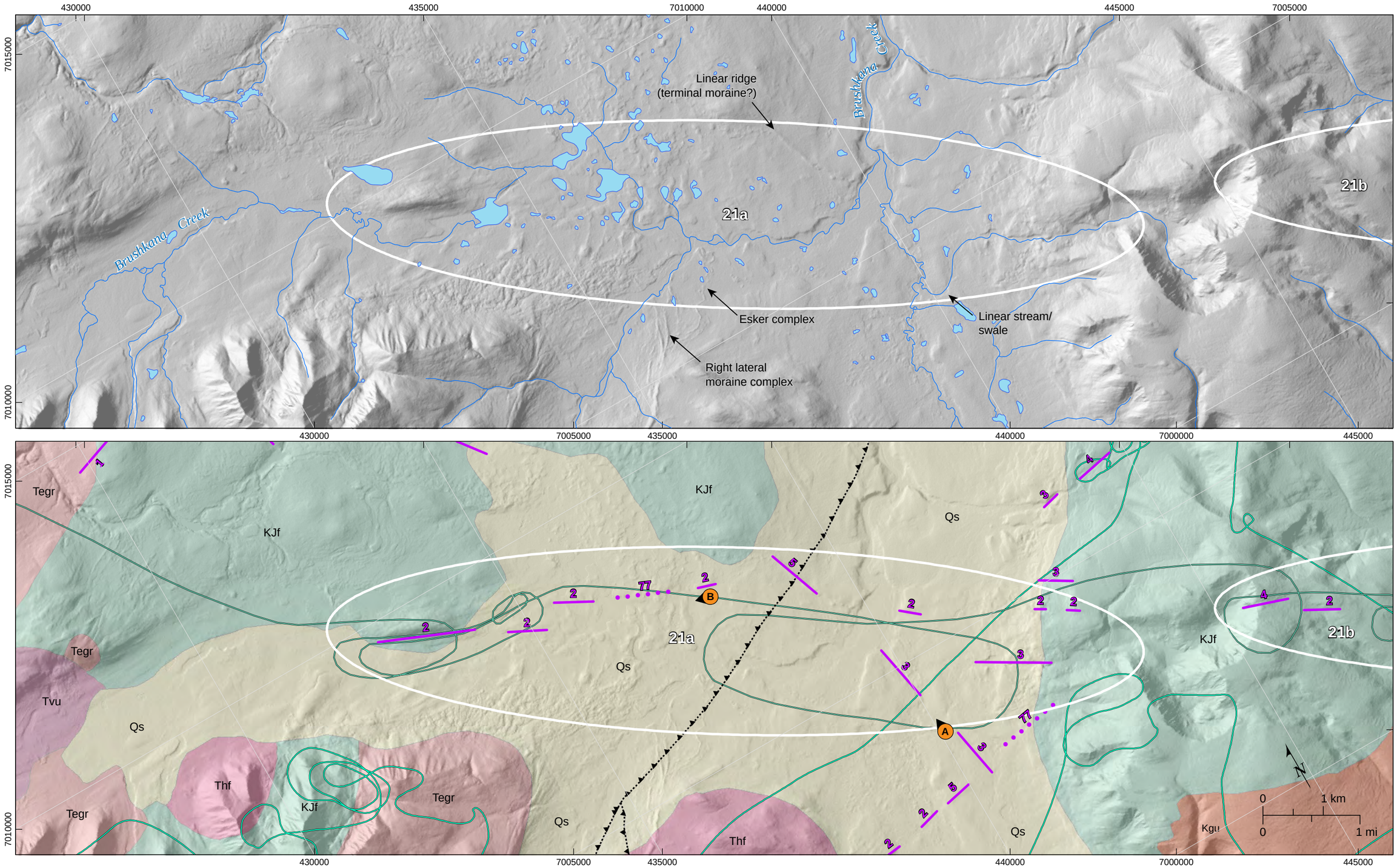
FUGRO Date 10/18/13	STATE OF ALASKA ALASKA ENERGY AUTHORITY ALASKA ENERGY AUTHORITY	SUSITNA-WATANA HYDROELECTRIC PROJECT LINEAMENT GROUP 20 WILLIAMS AND GALLOWAY MAP (1986)	FIGURE A20.5



Notes: 1. See Figures A0.2, A0.3, A0.4, and A0.5 for explanation.
2. Data frame has been rotated 45° east of north.
3. Base map is slopeshade derived from INSAR data.

FUGRO Date 10/18/13	STATE OF ALASKA ALASKA ENERGY AUTHORITY	SUSITNA-WATANA HYDROELECTRIC PROJECT LINEAMENT GROUP 20 MAP DATA	FIGURE A20.6

79_218900_Alaska_Railbelt/2189_Lineament Report October 2013, modified 10.18.13

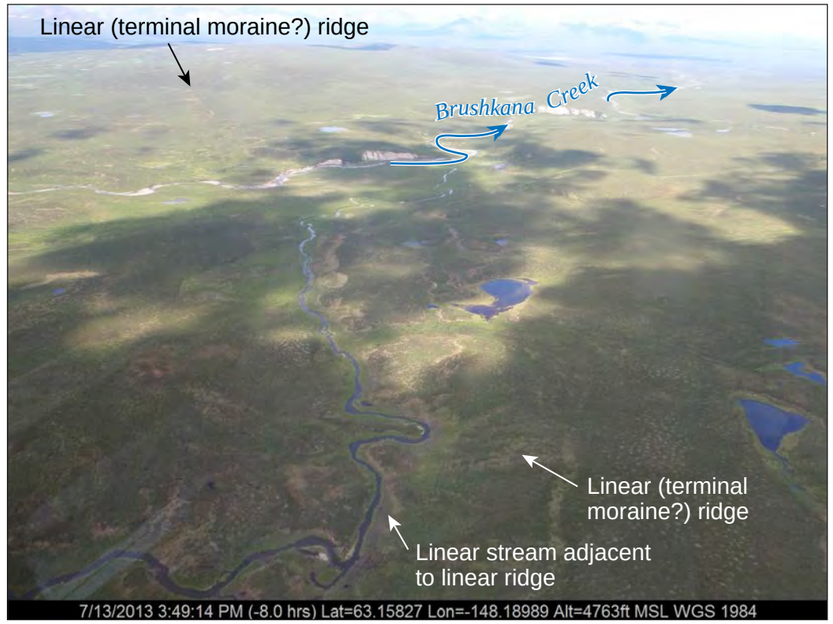


Notes: 1. See Figures A0.2, A0.3, A0.4, and A0.5 for explanation.
2. Data frame has been rotated 30° west of north.
3. Geology by Wilson et al., 1998.

FUGRO Date 10/18/13	STATE OF ALASKA ALASKA ENERGY AUTHORITY ALASKA ENERGY AUTHORITY	SUSITNA-WATANA HYDROELECTRIC PROJECT LINEAMENT GROUP 21a MAP DATA	FIGURE A21a.1

79_218900_Alaska_Railbelt\2189_Lineament Report October 2013, modified 10.18.13

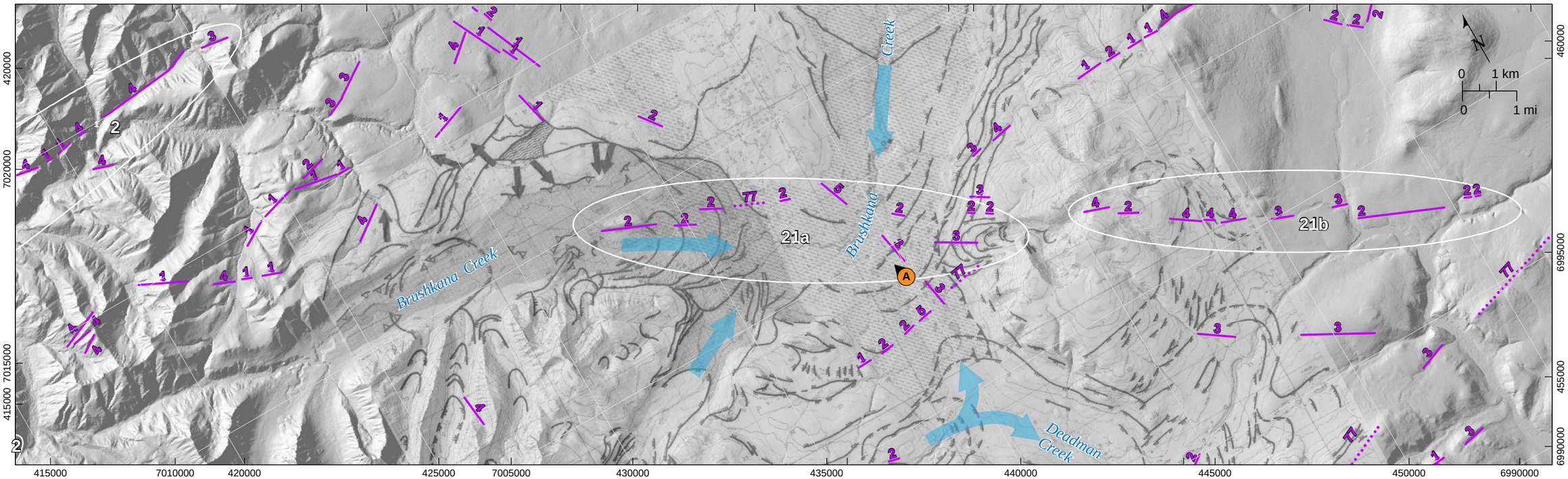
A)



View looking north across Brushkana Creek along north-trending linear ridge and roughly linear stream. Arrows point along alignment of ridges interpreted to be terminal moraine from northeasterly flowing ice.

B)

View looking northwest across western portion of lineament group 21a towards approximately 120-meter-tall rock-cored drumlin. View is looking up the Brushkana Creek valley. Note lack of obvious expression of mapped lineaments in the foreground.



Notes: 1. See Figures A0.2, A0.3, A0.4, and A0.5 for explanation.
2. Data frame has been rotated 30° west of north.
3. Photointerpretive map of glacial extents by Reger, 1990.
4. ➔ indicates ice flow direction.

FUGRO Date 10/18/13	STATE OF ALASKA ALASKA ENERGY AUTHORITY ALASKA ENERGY AUTHORITY	SUSITNA-WATANA HYDROELECTRIC PROJECT LINEAMENT GROUP 21a MAP DATA AND PHOTOGRAPHS	FIGURE A21a.2

445000 7005000 450000 455000 7000000 460000

FCL mapped lineament coincides with concealed contact between Ks and Kph

21a 21b

SUSITNA Butte Creek Gold Creek

TKi TKbam TKbgd Qaf Qa Qdt2 Qdt3 KJa Ks Kph Kp TKcam

440000 7000000 445000 450000 6995000 455000

Qs KJf Kgu Tegr Mzpca

008 009 A B C D E F

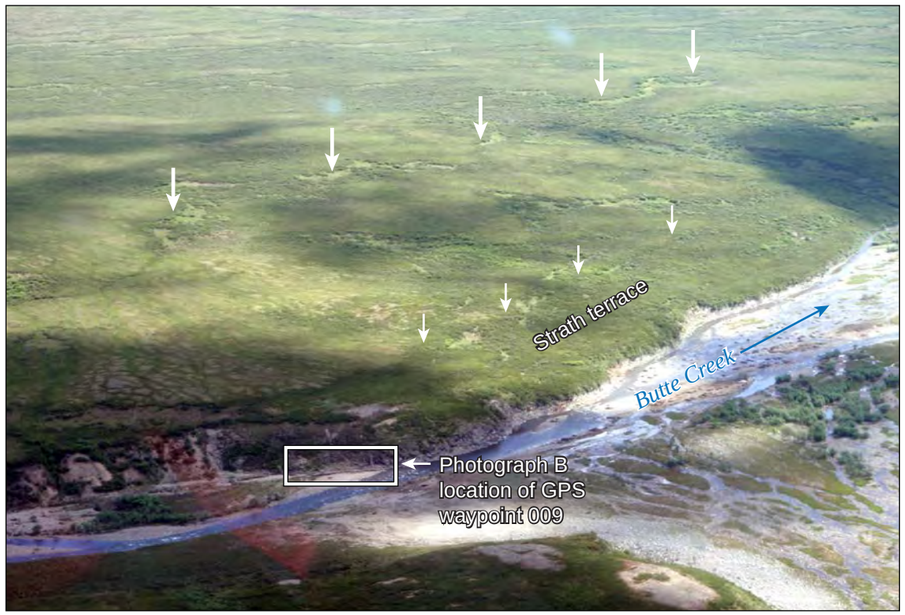
0 1 km 0 1 mi N

Notes: 1. See Figures A0.2, A0.3, A0.4, and A0.5 for explanation.
2. Data frame has been rotated 25° west of north.
3. Map in top panel from Smith et al., 1988.
4. Geology in bottom panel from Wilson et al., 1998

FUGRO Date 10/18/13	STATE OF ALASKA ALASKA ENERGY AUTHORITY	SUSITNA-WATANA HYDROELECTRIC PROJECT LINEAMENT GROUP 21b MAP DATA	FIGURE A21b.1

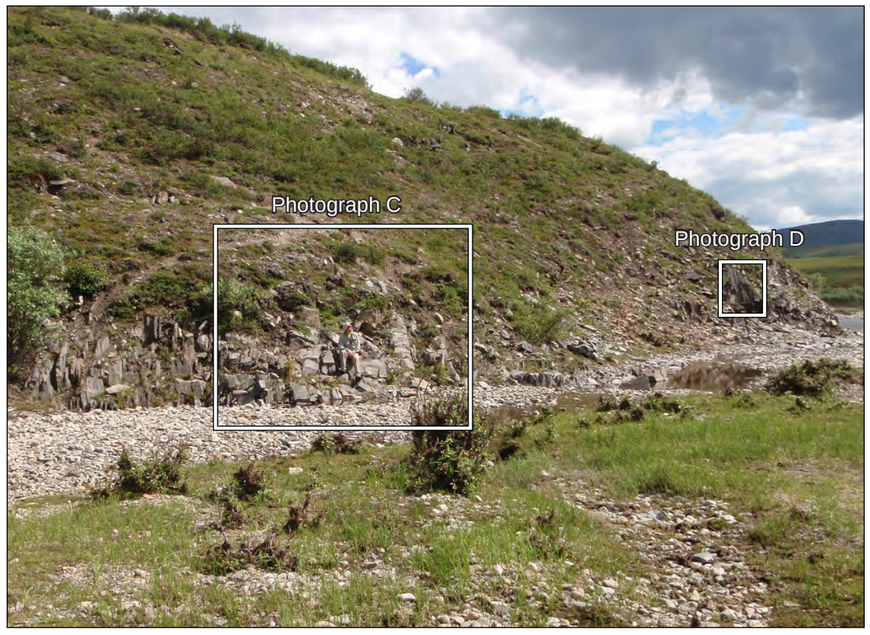
79_218900_Alaska_Railbelt\2189_Lineament Report October 2013, modified 10.18.13

A)



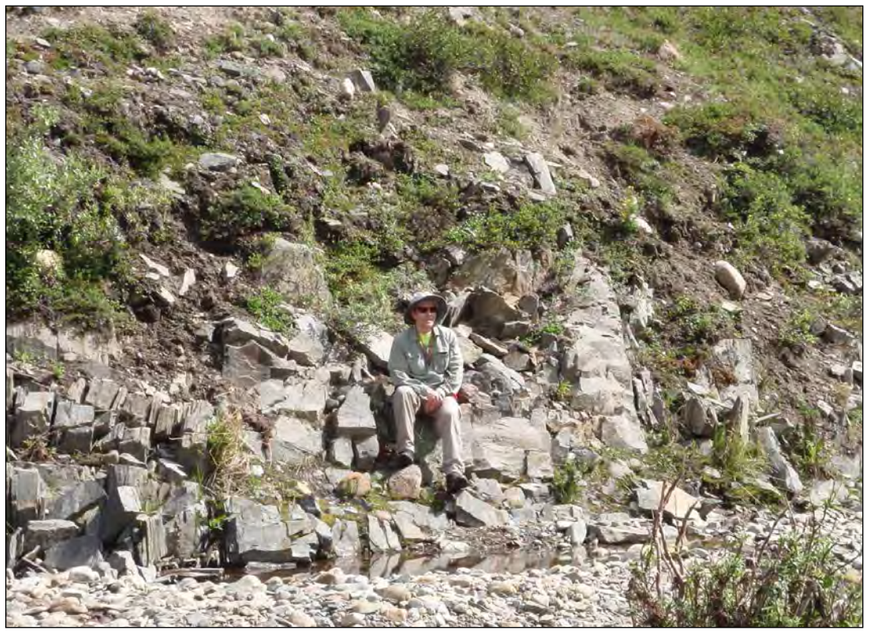
Photograph looking east from location A. Large arrows point to downhill facing slope break visible in INSAR and mapped by Fugro (2013). Field reconaissance revealed smaller lineament (not visible in INSAR data) lies along the small arrows and projects toward the vertically-dipping bedrock exposed in the creek bank shown in Photograph B.

B)



Overview of east-southeast striking, vertically-dipping phyllite exposures located at GPS waypoint 009.

C)



Detail of phyllite exposure showing ~3-meter-wide resistant bed of metamorphosed fine to medium sand. Thick, resistant beds, such as this, are interpreted to create the lineament shown by small arrows in Photograph A above. Geologist for scale.

D)

Detail of vertically-dipping phyllite.

79_218900_Alaska_RailbeltI2189_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

LINEAMENT GROUP 21b
PHOTOGRAPHS

FIGURE
A21b.2

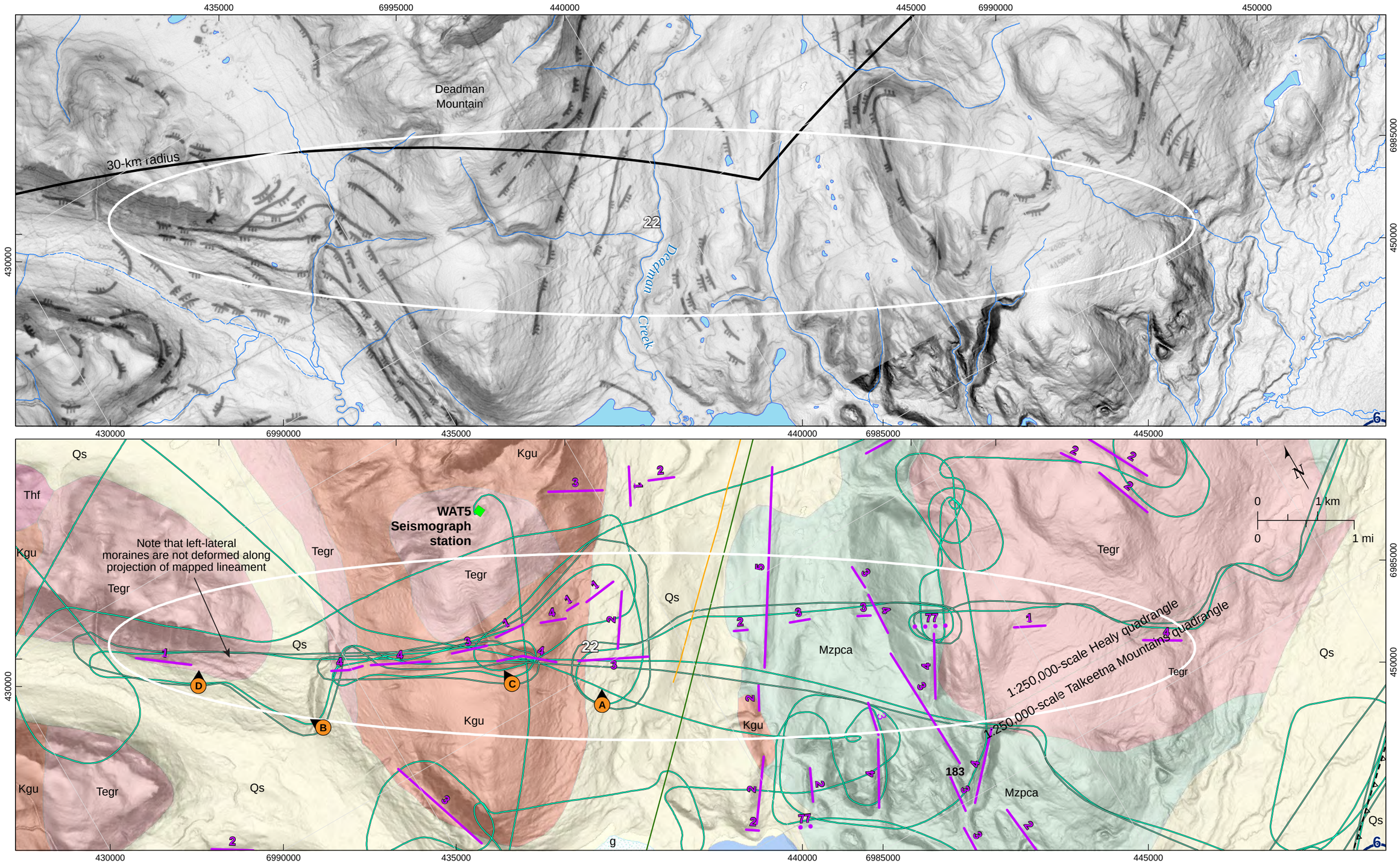
E)

Photograph taken from location E looking east-southeast along trend of FCL mapped lineament (shown by arrows). Note absence of any apparent deformation in surficial deposits or in terrace riser on left bank of Butte Creek.

F)

Photograph taken from location F looking west along trend of FCL mapped lineament to west of Butte Creek. Note no apparent deformation in right bank of stream or any expression of faulting in broad, flat terrace surface mapped as Qdt_3 by Smith et al. (1988).

FUGRO Date 10/18/13	STATE OF ALASKA ALASKA ENERGY AUTHORITY ALASKA ENERGY AUTHORITY	SUSITNA-WATANA HYDROELECTRIC PROJECT LINEAMENT GROUP 21b PHOTOGRAPHS	FIGURE A21b.3



Notes: 1. See Figures A0.2, A0.3, A0.4, and A0.5 for explanation.
2. Data frame has been rotated 30° west of north.
3. Geologic map by Reger et al., 1990 (top) and by Wilson et al., 1998 (bottom)

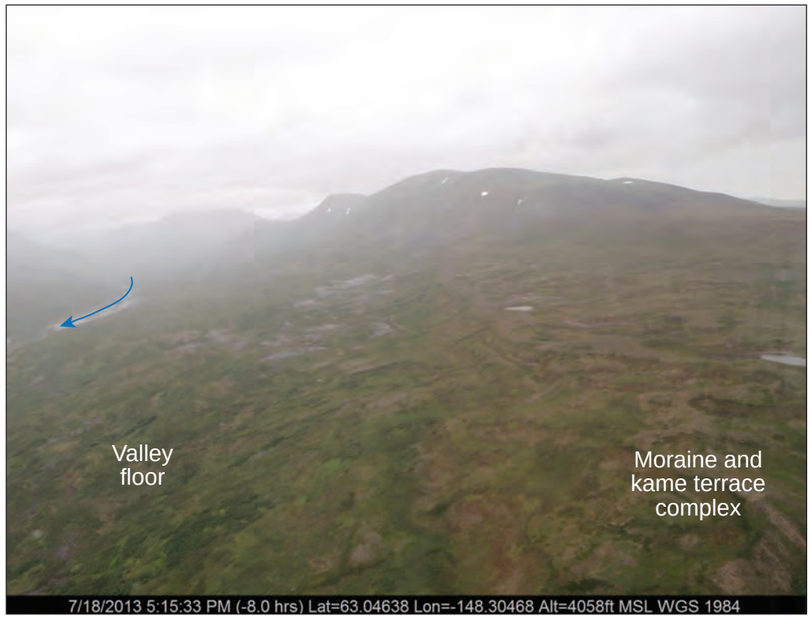
Date 10/18/13	STATE OF ALASKA ALASKA ENERGY AUTHORITY	SUSITNA-WATANA HYDROELECTRIC PROJECT LINEAMENT GROUP 22 MAP DATA	FIGURE A22.1

79_218900_Alaska_Railbelt/2189_Lineament Report October 2013, modified 10.18.13

A)

View looking north-northeast up the Deadman Creek valley. Note the numerous downhill-facing solifluction scarps. Large arrows point along mapped lineaments.

B)

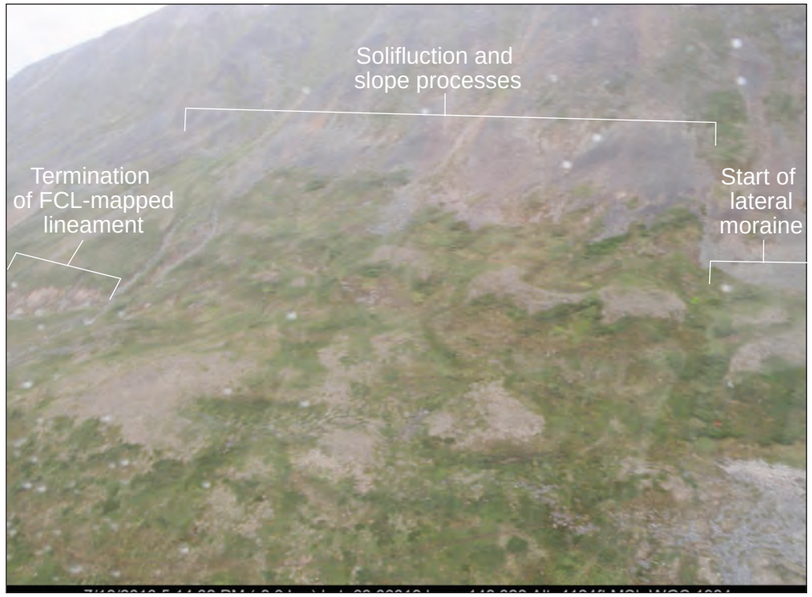


View looking north-northwest up-valley along the margin of the left-lateral moraine and kame terrace complex. No lineaments were observed cutting these deposits.

C)

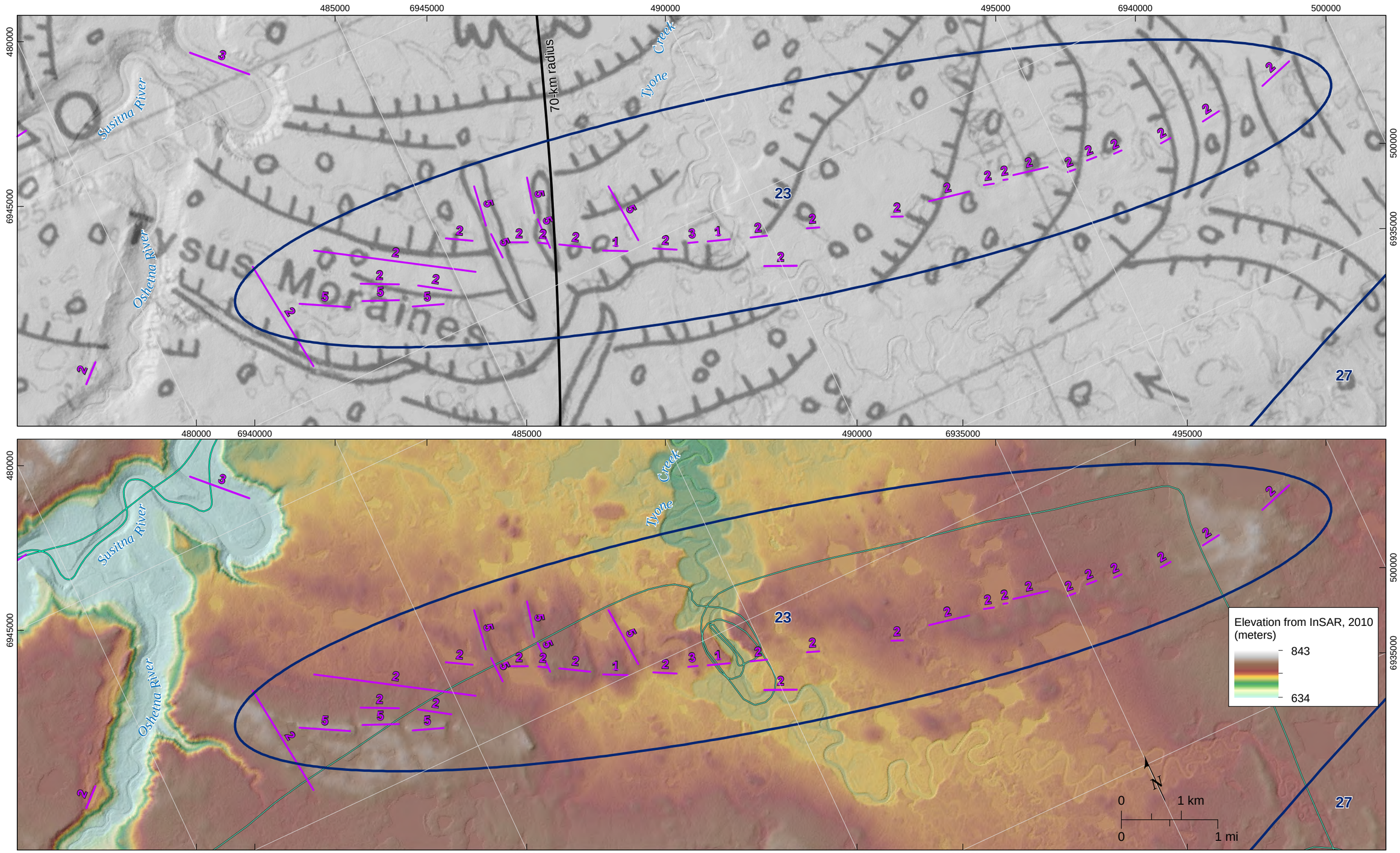
View looking north at deep drainages whose margins coincide with nivation terraces and hollows. The large size of these drainages is inconsistent with the weakly expressed lineaments located east of Deadman Creek. Such deeply incised drainages are interpreted to be a result of sub-ice erosion.

D)



View looking northeast at area of solifluction and termination of mapped lineament.

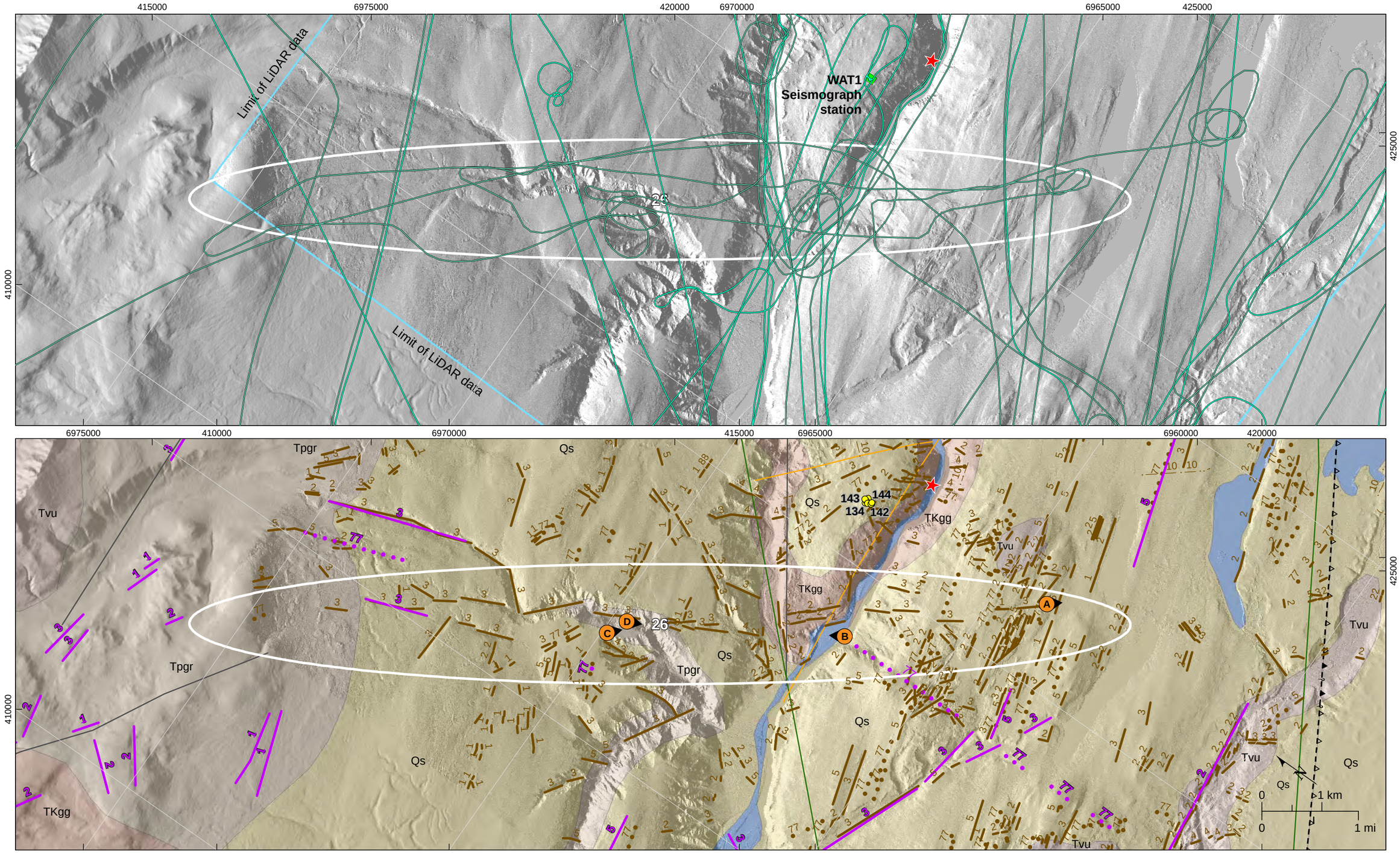
FUGRO Date 10/18/13	STATE OF ALASKA ALASKA ENERGY AUTHORITY ALASKA ENERGY AUTHORITY	SUSITNA-WATANA HYDROELECTRIC PROJECT LINEAMENT GROUP 22 PHOTOGRAPHS	FIGURE A22.2



Notes: 1. See Figures A0.2, A0.3, A0.4, and A0.5 for explanation.
2. Data frame has been rotated 25° west of north.
3. Geologic map in top panel by Williams and Galloway, 1986.

FUGRO Date 10/18/13	STATE OF ALASKA ALASKA ENERGY AUTHORITY ALASKA ENERGY AUTHORITY	SUSITNA-WATANA HYDROELECTRIC PROJECT LINEAMENT GROUP 23 MAP DATA	FIGURE A23.1

79_218900_Alaska_Railbelt/2189_Lineament Report October 2013, modified 10.18.13

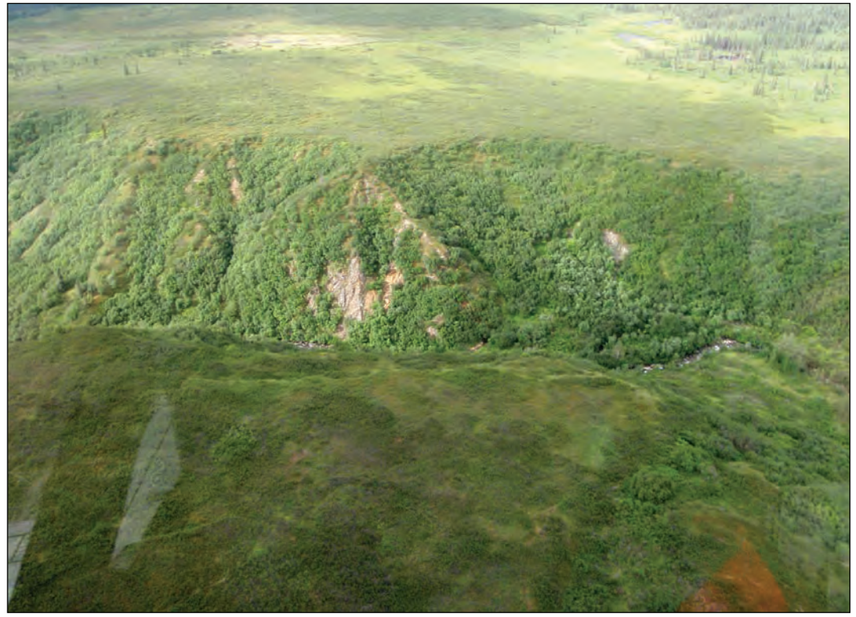


Notes: 1. See Figures A0.2, A0.3, A0.4, and A0.5 for explanation.
2. Data frame has been rotated 55° west of north.
3. Geology by Wilson et al., 2009.

Date 10/18/13	STATE OF ALASKA ALASKA ENERGY AUTHORITY	SUSITNA-WATANA HYDROELECTRIC PROJECT LINEAMENT GROUP 26 MAP DATA	FIGURE A26.1

79_218900_Alaska_Railbelt/2189_Lineament Report October 2013, modified 10.18.13

A)



View looking west at unnamed canyon and smooth Quaternary surface in the background.

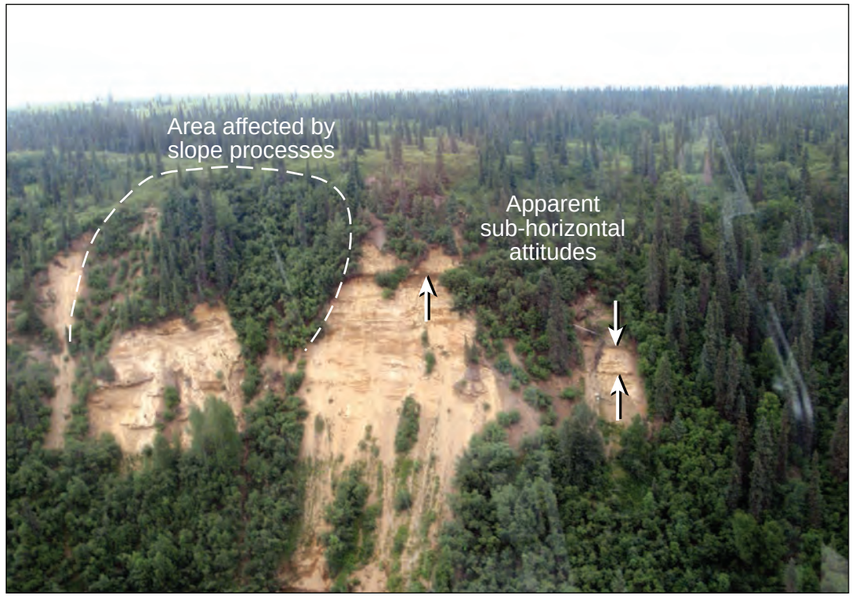
B)

View looking northwest at layered bedrock (on left) with apparently undisrupted horizontally-bedded outwash (on right).

C)

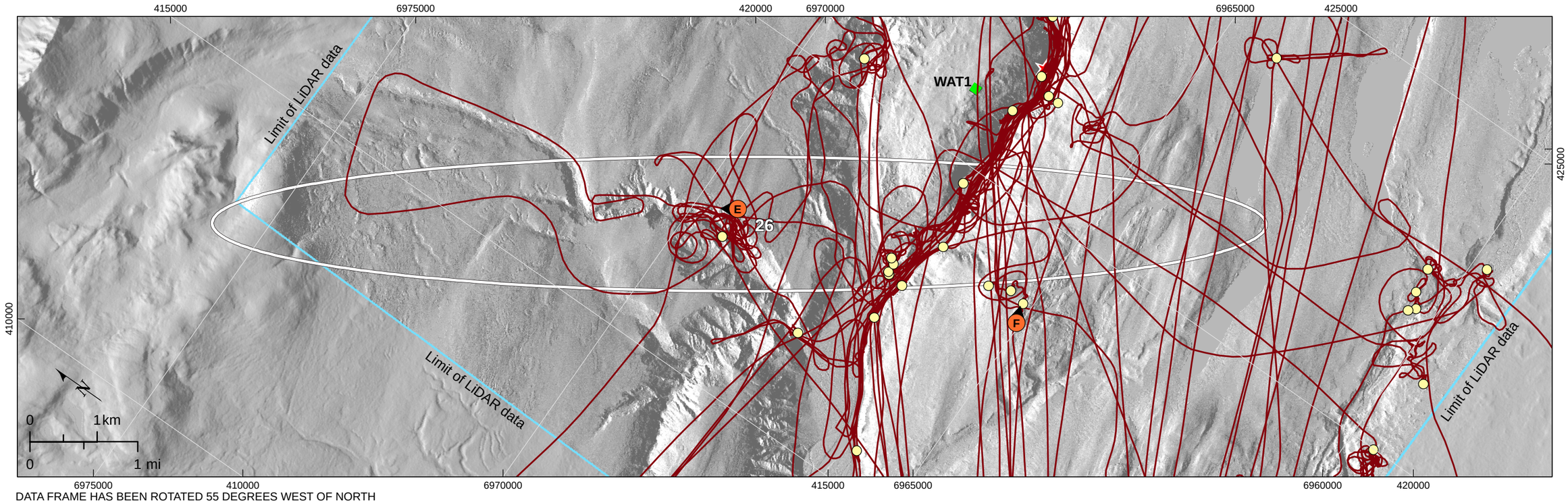
View looking southeast at exposure in left bank of unnamed drainage creek where till apparently overlies lake sediments and fluvial washout gravel. The lenticular beds in the fluvial gravel appear horizontal but are not laterally extensive.

D)



Close up view of exposure shown in Photograph (B). Note the apparently sub-horizontal basal contact between overlying till and underlying lacustrine deposits. Note sediments on the left of the image are influenced by landslide processes and not in-place locally.

FUGRO Date 10/18/13	STATE OF ALASKA ALASKA ENERGY AUTHORITY ALASKA ENERGY AUTHORITY	SUSITNA-WATANA HYDROELECTRIC PROJECT LINEAMENT GROUP 26 PHOTOGRAPHS	FIGURE A26.2



DATA FRAME HAS BEEN ROTATED 55 DEGREES WEST OF NORTH

E)

View looking north at ridge along projection of mapped lineaments. Orange color is attributed to chemical weathering of rock. Lithologies appear consistent across ridge and discontinuities or shear zones absent.

F)

Photograph of fluted ice-scoured rock surface with cracks and joints.

Date 10/28/14	STATE OF ALASKA ALASKA ENERGY AUTHORITY ALASKA ENERGY AUTHORITY	SUSITNA-WATANA HYDROELECTRIC PROJECT LINEAMENT GROUP 26 FIELD DATA AND GEOLOGIC MAPS	FIGURE A26.3

6910000 455000 460000 6915000 465000 470000 6920000

455000

6920000

475000

6915000

Oshetna River

27

70-km radius

Elevation from
INSAR 2010 (m)

1723

894

6905000 460000 465000 6910000 470000 475000

Tvu

Tvu

Jtk

Jtk

Qs

Qs

Jtk

Jtk

Qs

Jtk

27

014

Qs

Jtk

N

0 1 km

0 1 mi

Notes: 1. See Figures A0.2, A0.3, A0.4, and A0.5 for explanation.
2. Data frame has been rotated 30° east of north.
3. Geologic map by Williams and Galloway, 1986 (top) and by Wilson et al., 2009 (bottom).

FUGRO

Date 10/18/13

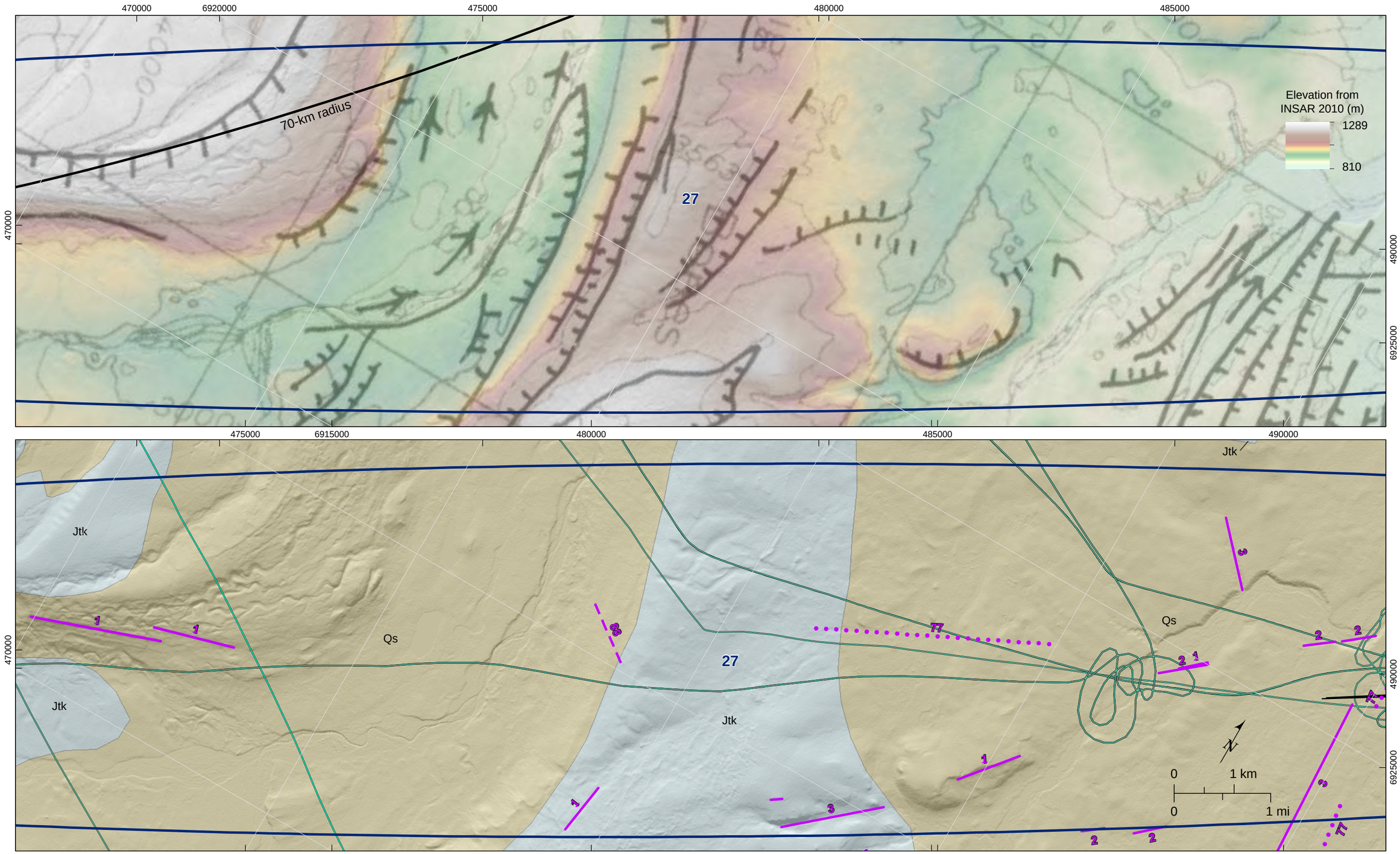
STATE OF ALASKA
ALASKA ENERGY AUTHORITY
ALASKA ENERGY AUTHORITY

SUSITNA-WATANA HYDROELECTRIC PROJECT

LINEAMENT GROUP 27
MAP DATA

FIGURE
A27-1.1

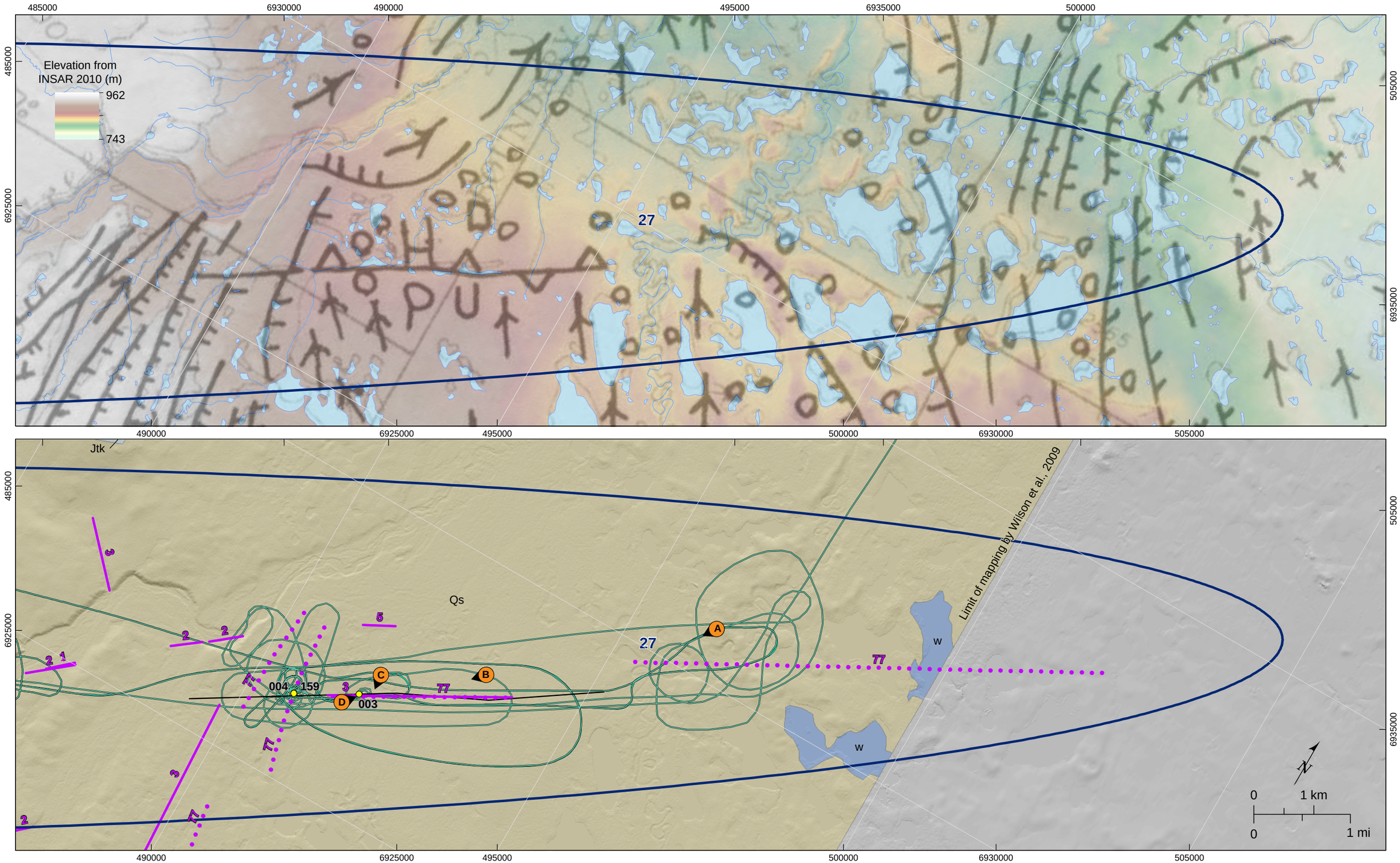
79_218900_Alaska_Railbelt/2189_Lineament Report October 2013, modified 10.18.13



Notes: 1. See Figures A0.2, A0.3, A0.4, and A0.5 for explanation.
2. Data frame has been rotated 30° east of north.
3. Geologic map by Williams and Galloway, 1986 (top) and by Wilson et al., 2009 (bottom).

FUGRO Date 10/18/13	STATE OF ALASKA ALASKA ENERGY AUTHORITY ALASKA ENERGY AUTHORITY	SUSITNA-WATANA HYDROELECTRIC PROJECT LINEAMENT GROUP 27 MAP DATA	FIGURE A27-2.1

79_218900_Alaska_Railbelt\2189_Lineament Report October 2013, modified 10.18.13



Notes: 1. See Figures A0.2, A0.3, A0.4, and A0.5 for explanation.
2. Data frame has been rotated 30° east of north.
3. Geologic map by Williams and Galloway, 1986 (top) and by Wilson et al., 2009 (bottom).

Date 10/18/13	STATE OF ALASKA ALASKA ENERGY AUTHORITY	SUSITNA-WATANA HYDROELECTRIC PROJECT LINEAMENT GROUP 27 MAP DATA	FIGURE A27-3.1

79_218900_Alaska_RailbelV2189_Lineament Report October 2013, modified 10.18.13

A)

View looking west-southwest toward linear alignment of lakes. Arrows point along lineament. Note kettle lake terrain in the foreground.

B)

Close up view looking west-southwest along linear alignment of lakes in Photograph A. Arrows point along lineament.

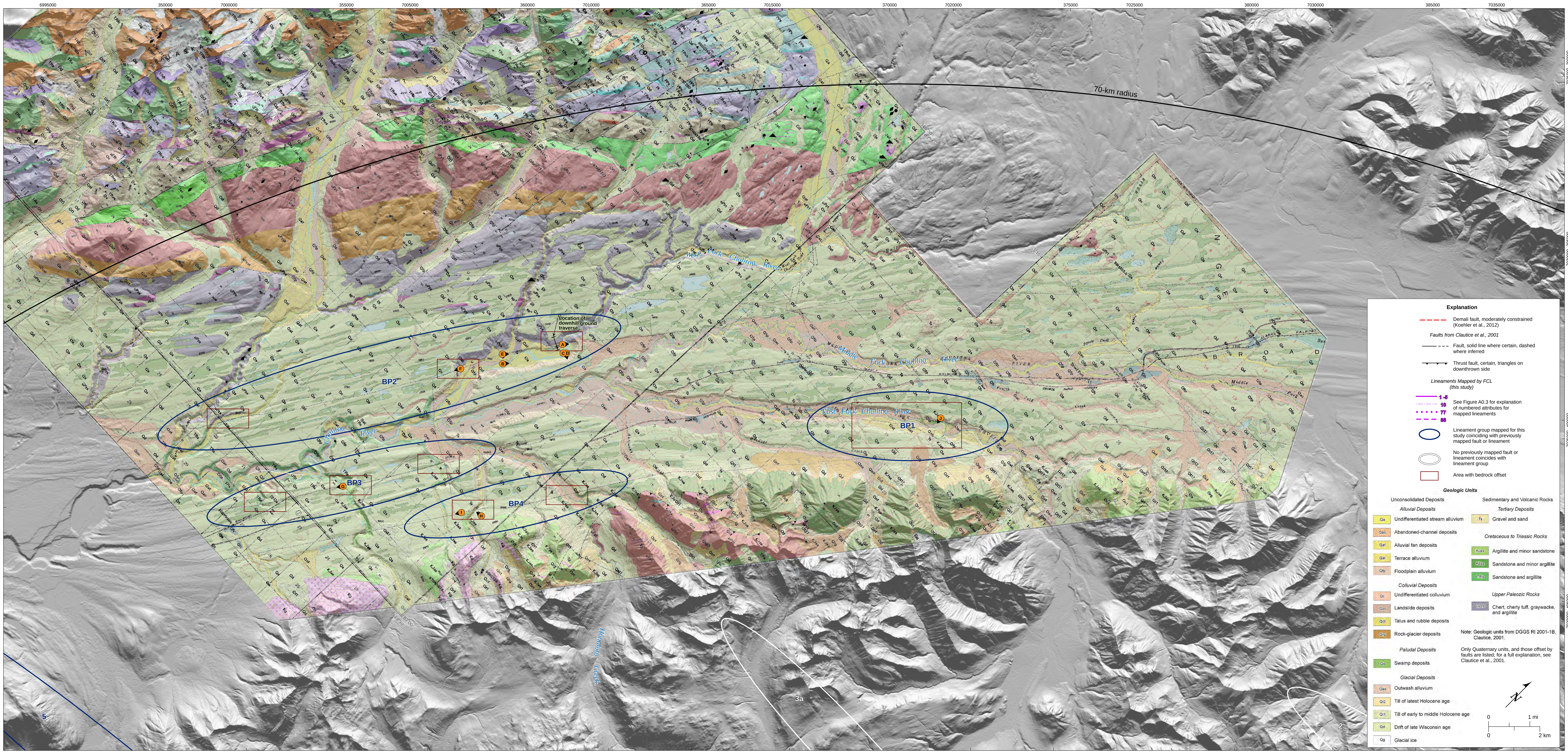
C)

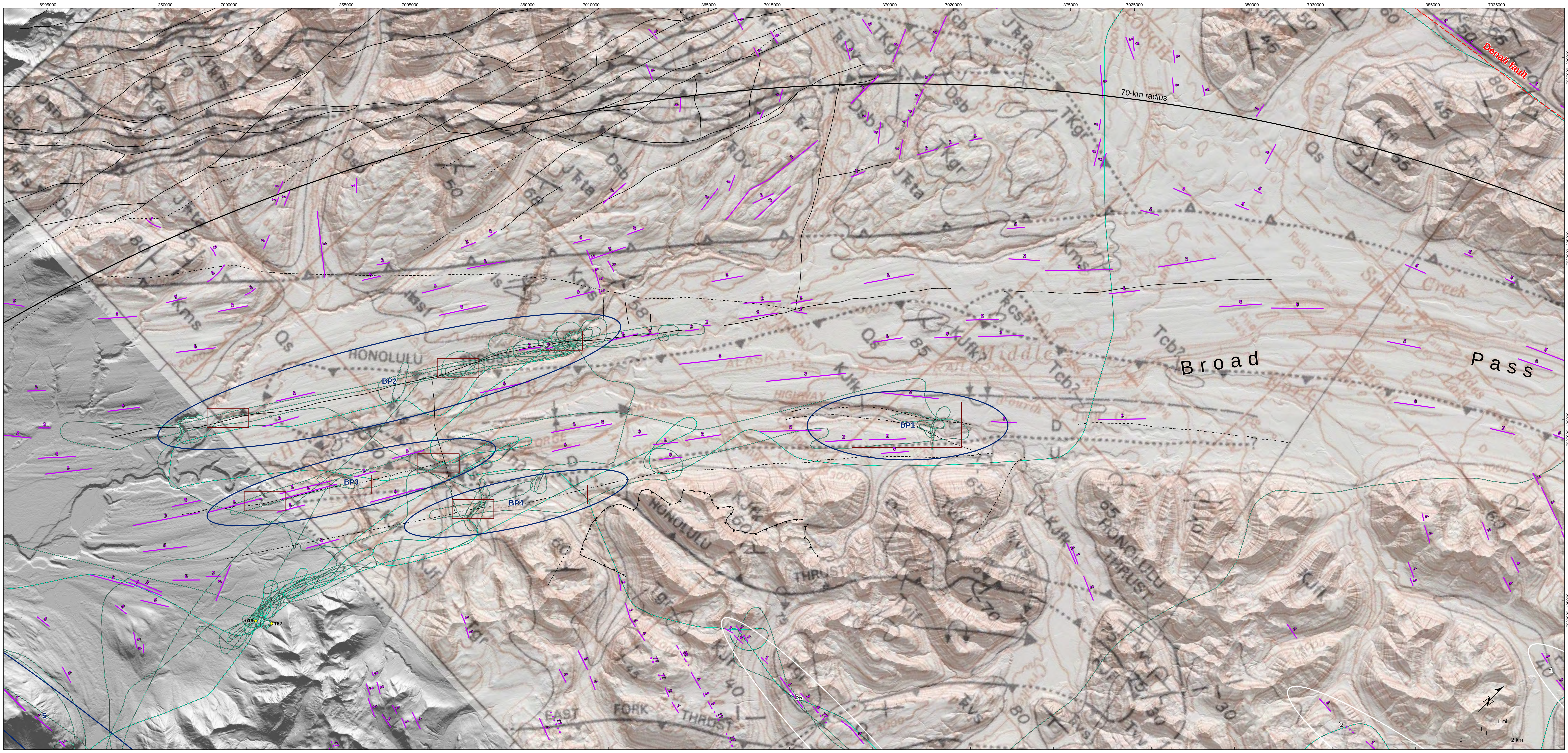
View looking south across strong vegetation lineament associated with a ~2-meter-high linear ridge. Note that topographic expression of ridge abruptly dies out and does not continue to the west.

D)

View looking northeast along south side of vegetation lineament and ~2-meter-high linear ridge shown in Photograph C. Positive feedback of vegetation growth and organic matter accumulation on the linear ridge may accentuate the apparent relief of the ridge.

FUGRO Date 10/18/13	STATE OF ALASKA ALASKA ENERGY AUTHORITY ALASKA ENERGY AUTHORITY	SUSITNA-WATANA HYDROELECTRIC PROJECT LINEAMENT GROUP 27 PHOTOGRAPHS	FIGURE A27-3.2


70-km radius
BP1
BP2
BP3
BP4
Location of downhill ground traverse
Explanation
Demali fault, moderately constrained (Koehler et al., 2012)
Faults from Clautice et al., 2001
Fault, solid line where certain, dashed where inferred
Thrust fault, certain, triangles on downthrown side
Lineaments Mapped by FCL (this study)
1 -5
10
77
88
See Figure A0.3 for explanation of numbered attributes for mapped lineaments
Lineament group mapped for this study coinciding with previously mapped fault or lineament
No previously mapped fault or lineament coincides with lineament group
Area with bedrock offset
Geologic Units
Unconsolidated Deposits
Alluvial Deposits
Qa Undifferentiated stream alluvium
Qac Abandoned-channel deposits
Qaf Alluvial fan deposits
Qat Terrace alluvium
Qfp Floodplain alluvium
Colluvial Deposits
Qc Undifferentiated colluvium
Qdl Landslide deposits
Qct Talus and rubble deposits
Qrg Rock-glacier deposits
Paludal Deposits
Qs Swamp deposits
Glacial Deposits
Qao Outwash alluvium
Qt2 Till of latest Holocene age
Qt1 Till of early to middle Holocene age
Qd Drift of late Wisconsin age
Qg Glacial ice
Sedimentary and Volcanic Rocks
Tertiary Deposits
Ts Gravel and sand
Cretaceous to Triassic Rocks
KJas Argillite and minor sandstone
KJsa Sandstone and minor argillite
TRs Sandstone and argillite
Upper Paleozic Rocks
uPzs Chert, cherty tuff, graywacke, and argillite
Note: Geologic units from DGGS RI 2001-1B, Clautice, 2001.
Only Quaternary units, and those offset by faults are listed; for a full explanation, see Clautice et al., 2001.
N
0 1 mi
0 2 km



Notes: 1. See Figures A0.2, A0.3, A0.4, and A0.5 for explanation.
2. Data frames have been rotated 45° west of north.
3. Geologic map by Clautice et al., 2001 (top), geologic map by Csejtey et al., 1961 (bottom).
4. Coordinates on NAD83 UTM Zone 6 North meters.
5. Elevation from INSAR data.

FUGRO

Date 01/06/14

STATE OF ALASKA
ALASKA ENERGY AUTHORITY
ALASKA ENERGY AUTHORITY

SUSITNA-WATANA HYDROELECTRIC PROJECT

Broad Pass Area

Plate A-BP

Notes: 1. See Figures A0.2, A0.3, A0.4, and A0.5 for explanation.
2. Data frames have been rotated 15° east of north.
3. Geology by Wilson et al., 2009
4. Coordinates on NAD83 UTM Zone 6 North meters.
5. Elevation from INSAR data and USGS SRTM data.

FUGRO

Date 01/06/14

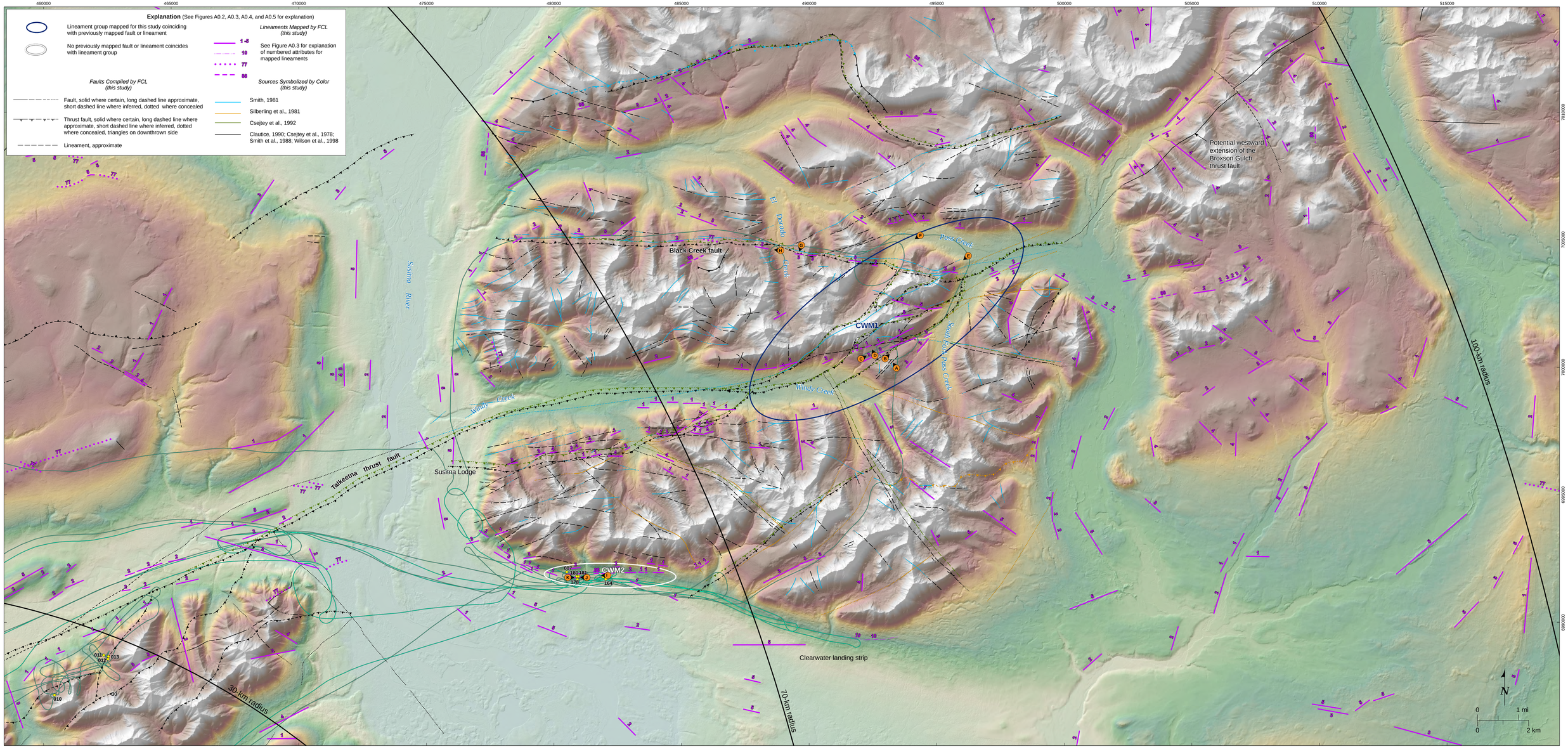
STATE OF ALASKA
ALASKA ENERGY AUTHORITY

SUSITNA-WATANA HYDROELECTRIC PROJECT

Castle Mountain Extension Area

Plate A-CME

79_218900_Alaska_Railbelt/2189_Lineament Report October 2013, modified 01.06.14



Notes: 1. See Figures A0.2, A0.3, A0.4, and A0.5 for explanation.
2. Coordinates in NAD83 UTM Zone 6 North meters.
3. Elevation from INSAR data

Date 01/06/14

STATE OF ALASKA
ALASKA ENERGY AUTHORITY

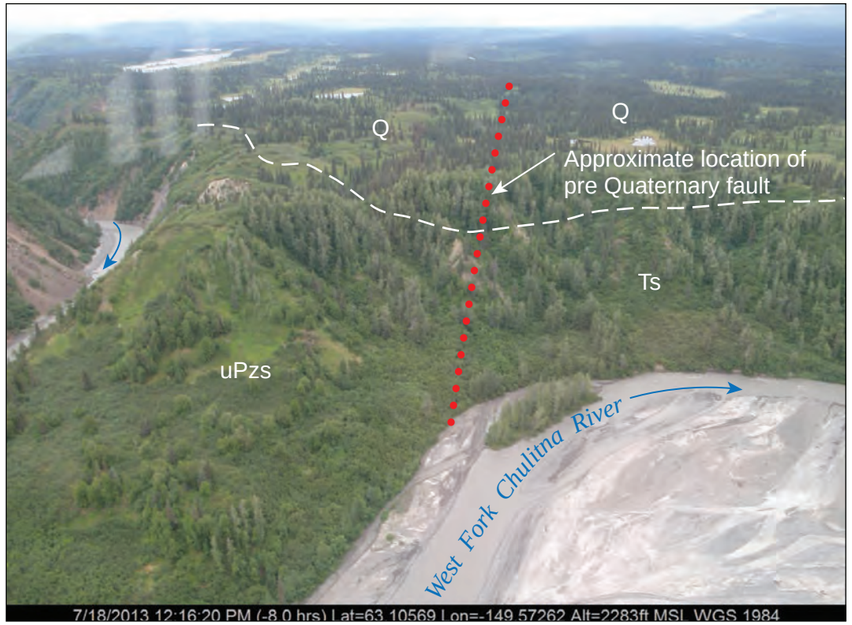
SUSITNA-WATANA HYDROELECTRIC PROJECT

Clearwater Mountains Area

Plate A-CWM

79_218000_Alaska_Plate#2189_Lineament Report October 2013_modified 01.06.14

A)

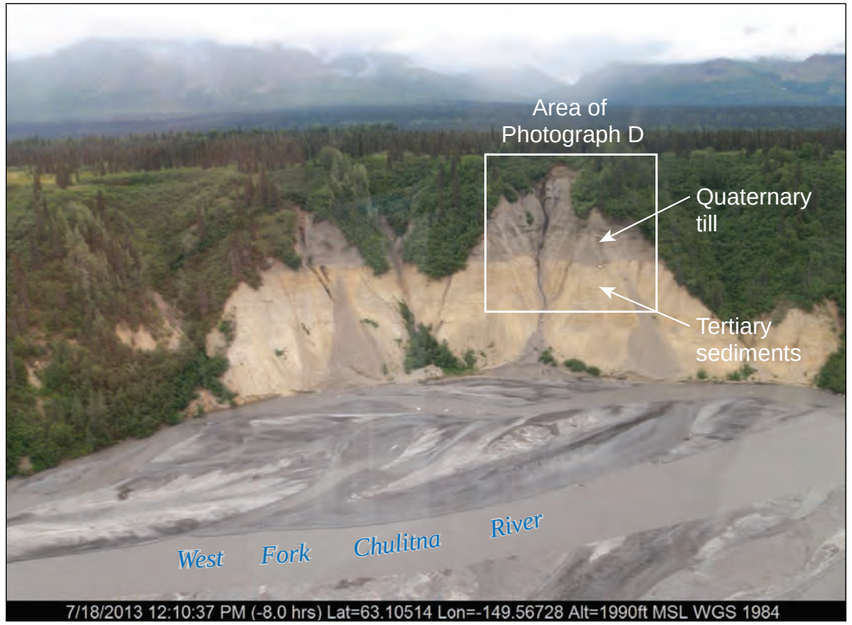


View looking north at location where mapped fault would traverse across Quaternary sediments.

B)

View looking north (upstream) along the West Fork Chulitna River valley at exposures described in text and photographs below.

C)



View looking west at exposure along east bank of the West Fork Chulitna River demonstrating Quaternary till overlying Tertiary fluvial sediments.

D)

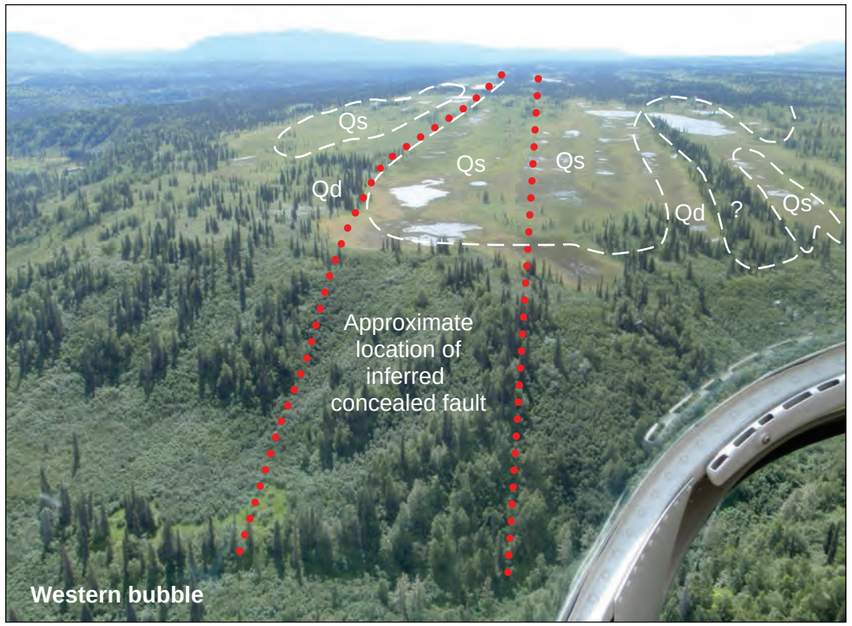
Close up view of exposure shown in Photograph C. Basal contact between overlying till and underlying fluvial deposits appears to be sub-horizontal.

FUGRO Date 10/18/13	STATE OF ALASKA ALASKA ENERGY AUTHORITY ALASKA ENERGY AUTHORITY	SUSITNA-WATANA HYDROELECTRIC PROJECT BROAD PASS AREA PHOTOGRAPHS	FIGURE A-BP.1

E)

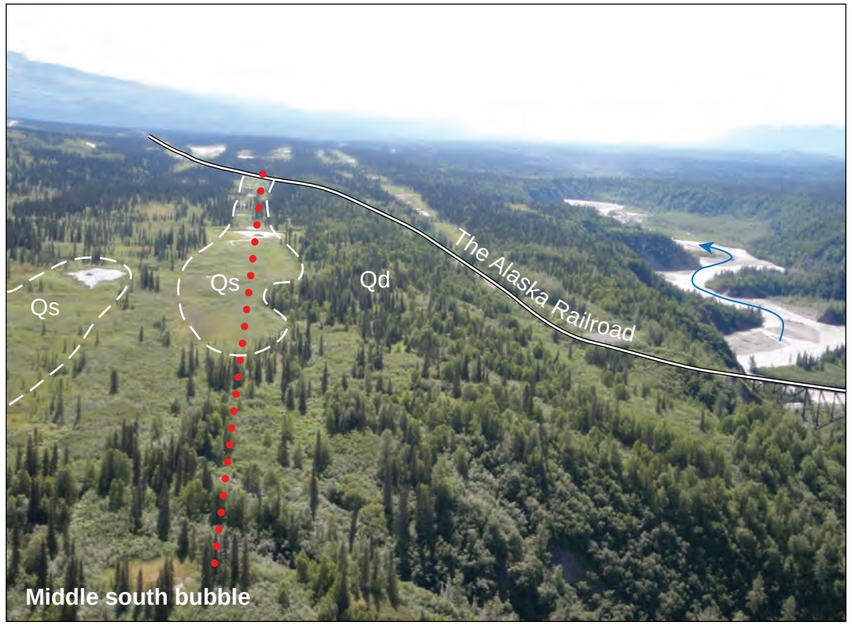
View looking northeast at subhorizontal contact between till and Tertiary sediments.

F)



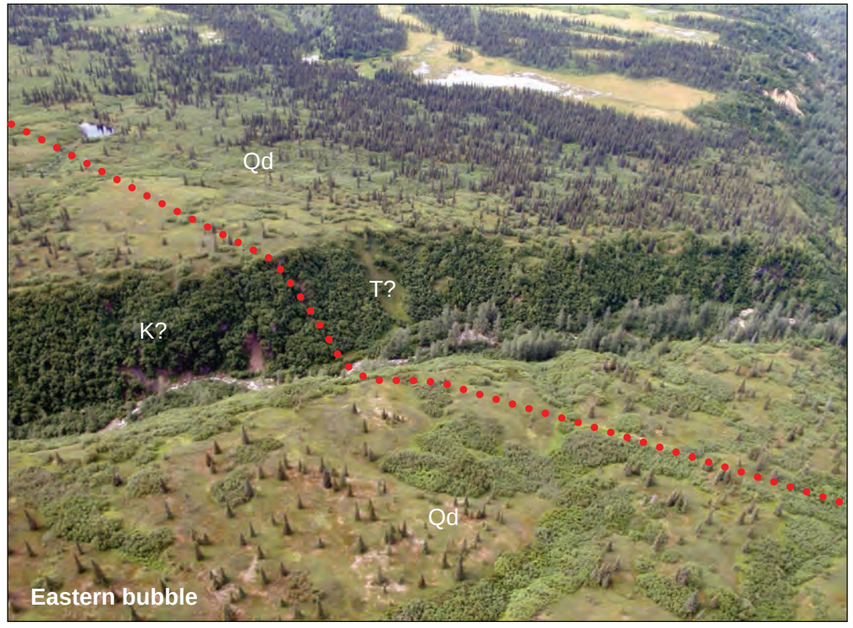
View looking south along Quaternary surface directly south of river valley. Marshy Quaternary sediments show no evidence of deformation or offset.

G)



View looking south at location where inferred fault would traverse east of railroad tracks. Fault is mapped as juxtaposing Triassic and Cretaceous rocks outcropping in creek behind photograph. No evidence of faulting in Quaternary deposits.

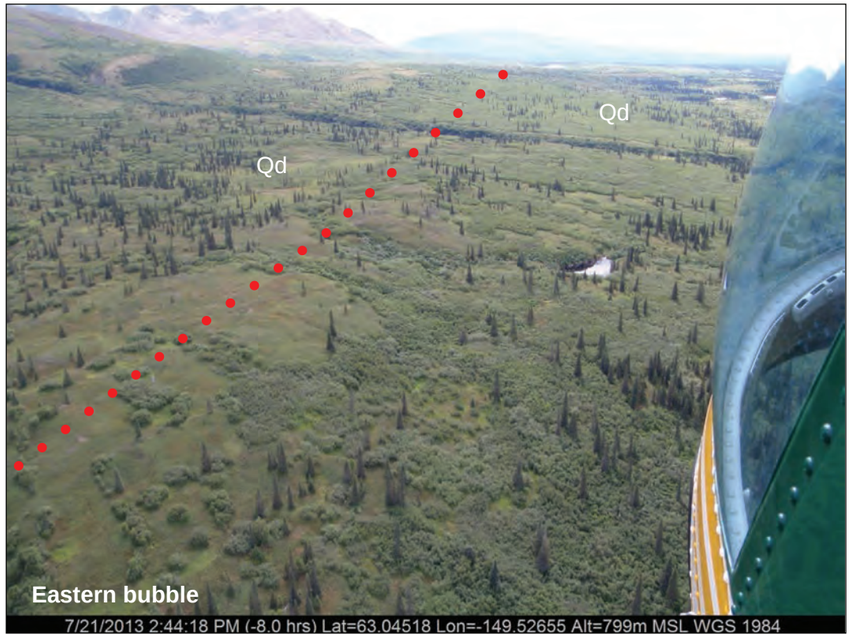
H)



View looking west at creek exposure along projection of mapped fault that depicts Cretaceous/Tertiary juxtapostion. Undisturbed surfaces support absence of Quaternary faulting.

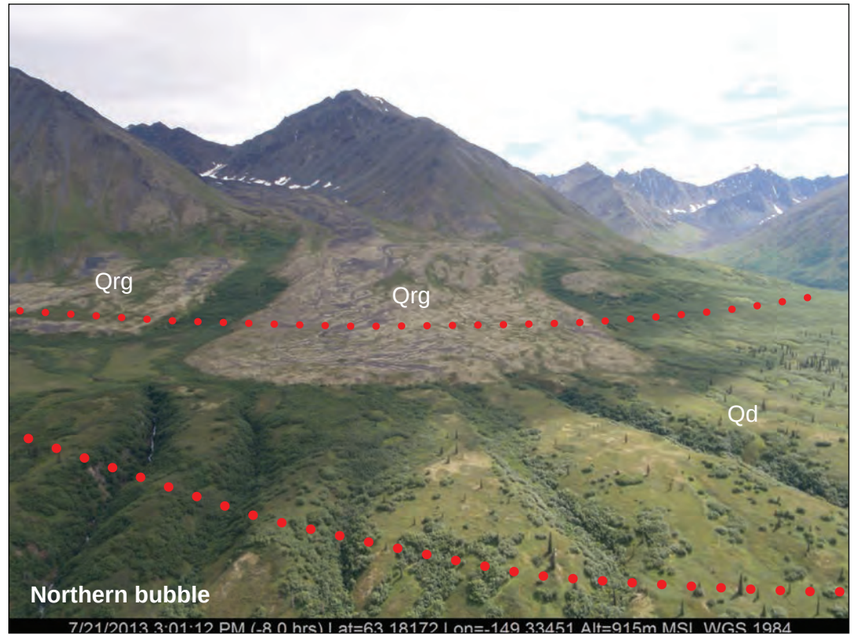
FUGRO Date 10/18/13	STATE OF ALASKA ALASKA ENERGY AUTHORITY ALASKA ENERGY AUTHORITY	SUSITNA-WATANA HYDROELECTRIC PROJECT BROAD PASS AREA PHOTOGRAPHS	FIGURE A-BP.2

I)



View looking west at creek exposure shown in Photograph H, Figure A-BP.2, showing morphology of Quaternary deposits along strike.

J)



View looking east at uninterrupted interfluves in dissected Quaternary glacial drift along with the mapped fault projects. Undisturbed surfaces support absence of Quaternary faulting.

79_218900_Alaska_Railbelt/2189_Lineament Report October 2013, modified 10.18.13

FUGRO
Date 10/18/13

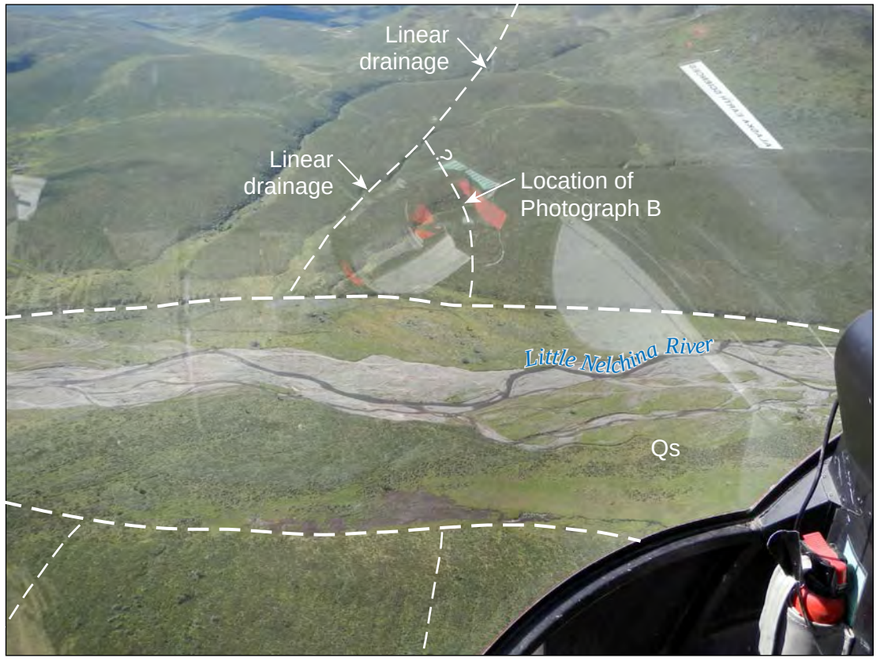
STATE OF ALASKA
ALASKA ENERGY AUTHORITY
ALASKA ENERGY AUTHORITY

SUSITNA-WATANA HYDROELECTRIC PROJECT

BROAD PASS AREA
PHOTOGRAPHS

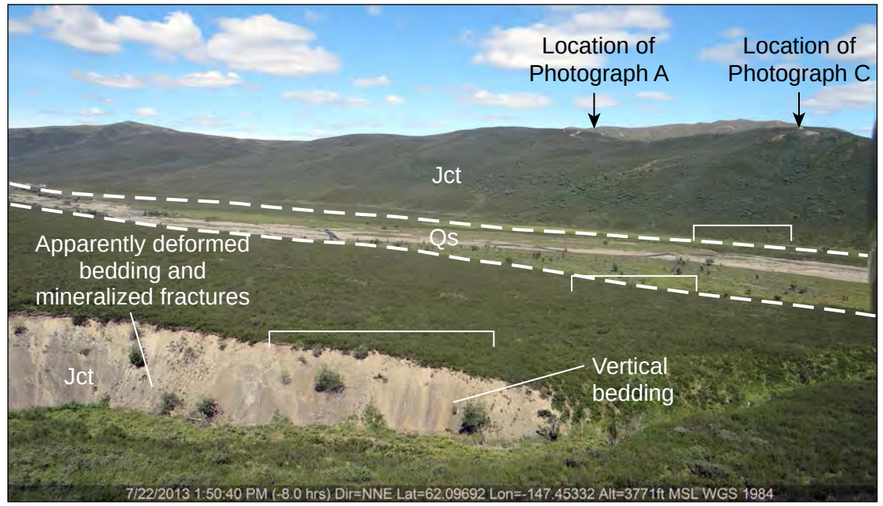
FIGURE
A-BP.3

A)



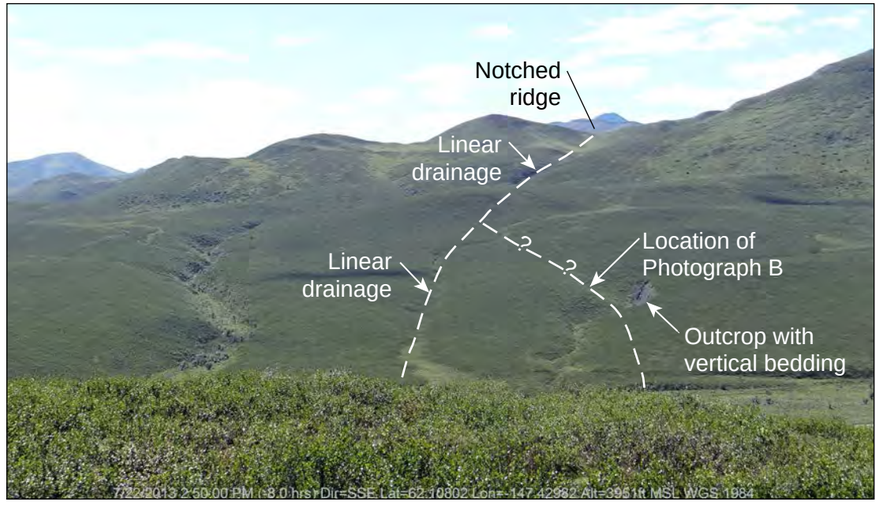
View looking southwest from location A, nearly along-strike with Csejtey et al. (1978) mapped faults. Note clear expression of linear features on bedrock landscape and absence of linear expression in Quaternary deposits.

B)



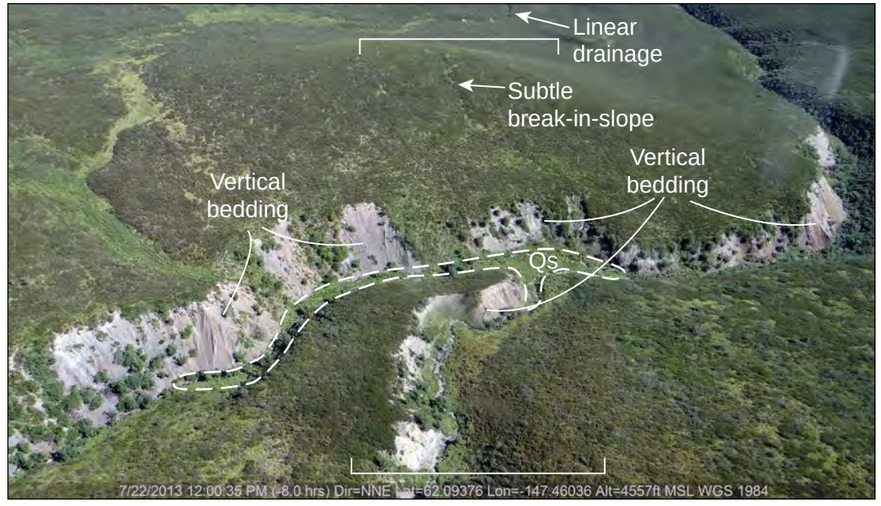
View looking northeast from location B nearly along-strike with Csejtey et al. (1978) mapped fault. The mapped fault segment projects through the vertical beds observed in the outcrop towards photograph location C. Note apparent undeformed hillslope and Quaternary deposits over projected trace of fault.

C)



View looking southwest from location C. Note alignment of features over mapped trace of fault.

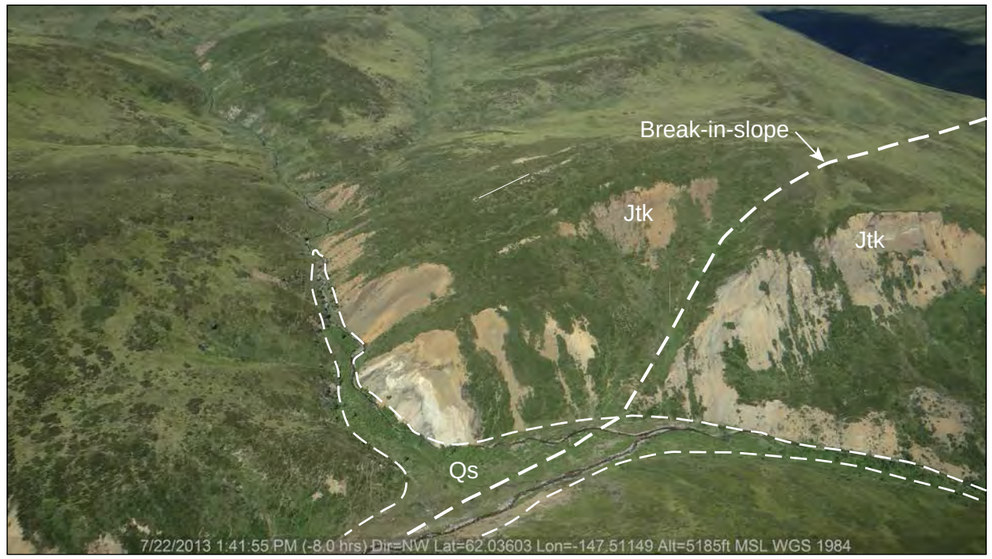
D)



View looking northeast from location D along-strike with a Csejtey et al. (1978) mapped fault. A wide zone of deformation is expressed as vertical bedding exposed in outcrops. Note alignment of the break-in-slope on ridge crest, linear drainage, and the deformation zone.

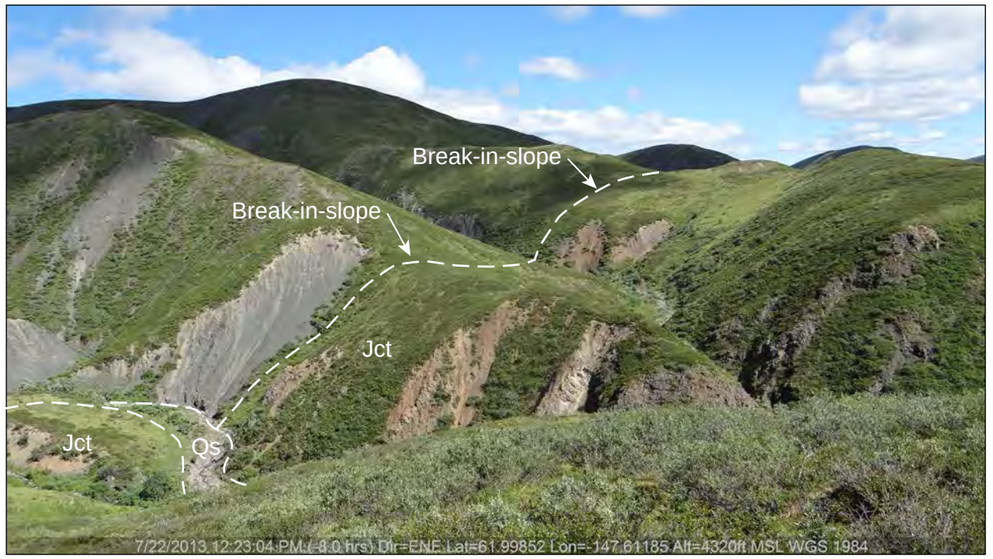
FUGRO Date 10/18/13	STATE OF ALASKA ALASKA ENERGY AUTHORITY ALASKA ENERGY AUTHORITY	SUSITNA-WATANA HYDROELECTRIC PROJECT CASTLE MOUNTAIN EXTENSION AREA PHOTOGRAPHS	FIGURE A-CME.1

E)



View looking northwest from location E at faulted Jurassic units. The fault occupies the linear valley then climbs the hill-slope where it correlates with a clear break-in-slope on the ridge crest.

F)



View looking north-northeast from location F. The fault juxtaposes Cretaceous against Jurassic bedrock and coincides with a break-in-slope on each ridge crest.

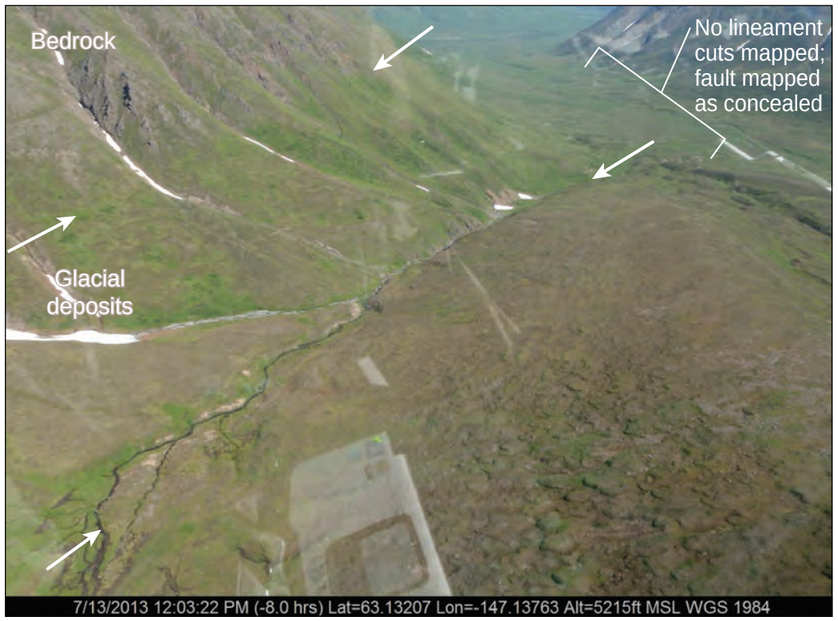
79_218900_Alaska_RailbelI\2189_Lineament Report October 2013, modified 10.18.13

FUGRO Date 10/18/13	STATE OF ALASKA ALASKA ENERGY AUTHORITY	SUSITNA-WATANA HYDROELECTRIC PROJECT CASTLE MOUNTAIN EXTENSION AREA PHOTOGRAPHS	FIGURE A-CME.2

A)

View looking northwest at mine site located along apparent rock type contrast and mapped fault. Arrows point along mapped fault.

B)



View looking northeast along linear drainage mapped as a lineament by FCL that coincides with a mapped fault. Another FCL-mapped lineament lies at the subtle break-in-slope and may correspond to the ice limit elevation.

C)

View looking northeast through the broad saddle at the head of the linear drainage shown in Photograph B. Note the absence of any tectonic geomorphic features.

D)

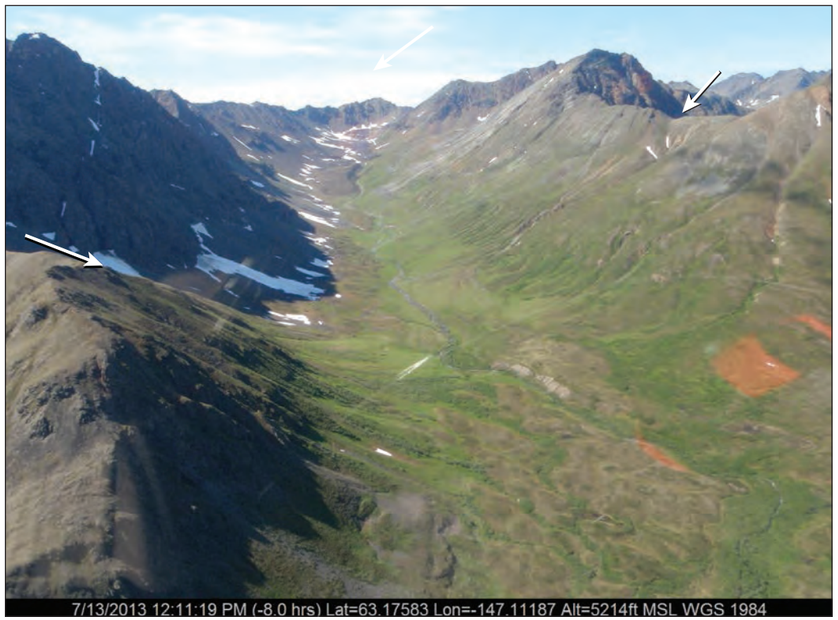
View looking northwest at location of FCL-mapped lineaments and mining roads partly shown in Photograph C. Note that FCL-mapped lineaments on the sidehill are not readily apparent and correspond to subtle break-in-slope like that shown in Photograph B.

FUGRO Date 10/18/13	STATE OF ALASKA ALASKA ENERGY AUTHORITY ALASKA ENERGY AUTHORITY	SUSITNA-WATANA HYDROELECTRIC PROJECT CLEARWATER MOUNTAINS AREA PHOTOGRAPHS	FIGURE A-CWM.1

E)

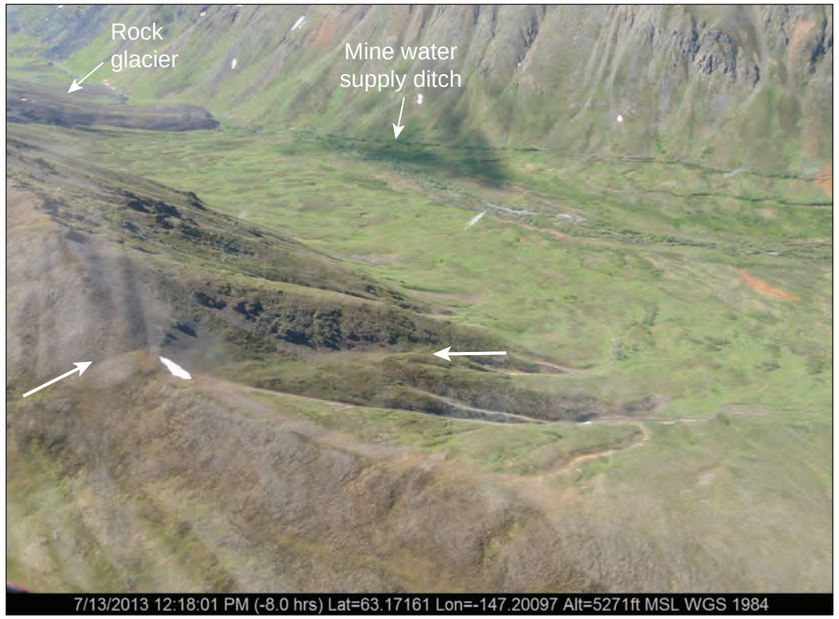
View looking southwest at several rock type contrasts (shown by arrows) that coincide with previously mapped faults.

F)



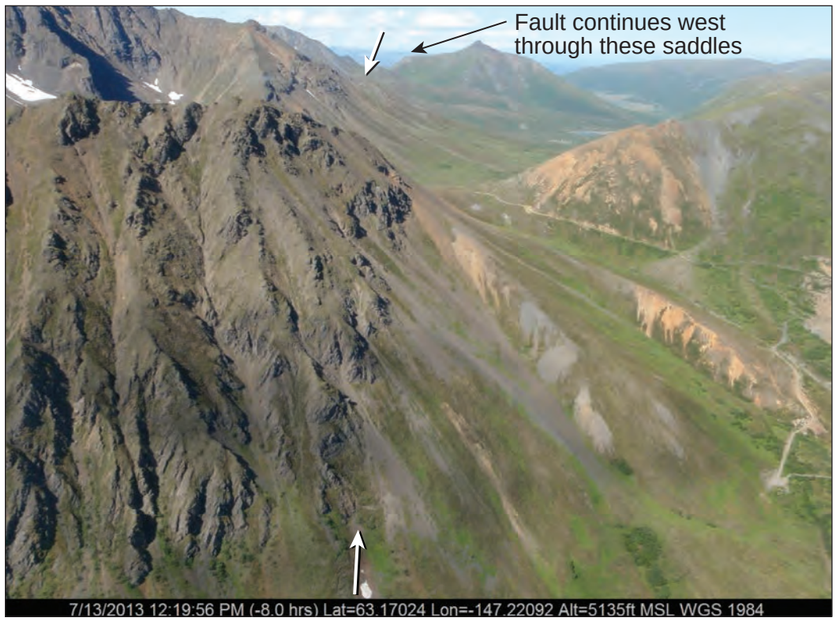
View looking south-southwest up glaciated valley that shows no expression of the mapped Black Creek fault that is present in adjacent bedrock ridges.

G)



View looking southwest across an FCL-mappped lineament that corresponds to the trace of mapped Black Creek fault marked by a rock contrast. Note that no expression of faulting exists along trend in the glacial sediments of the valley floor.

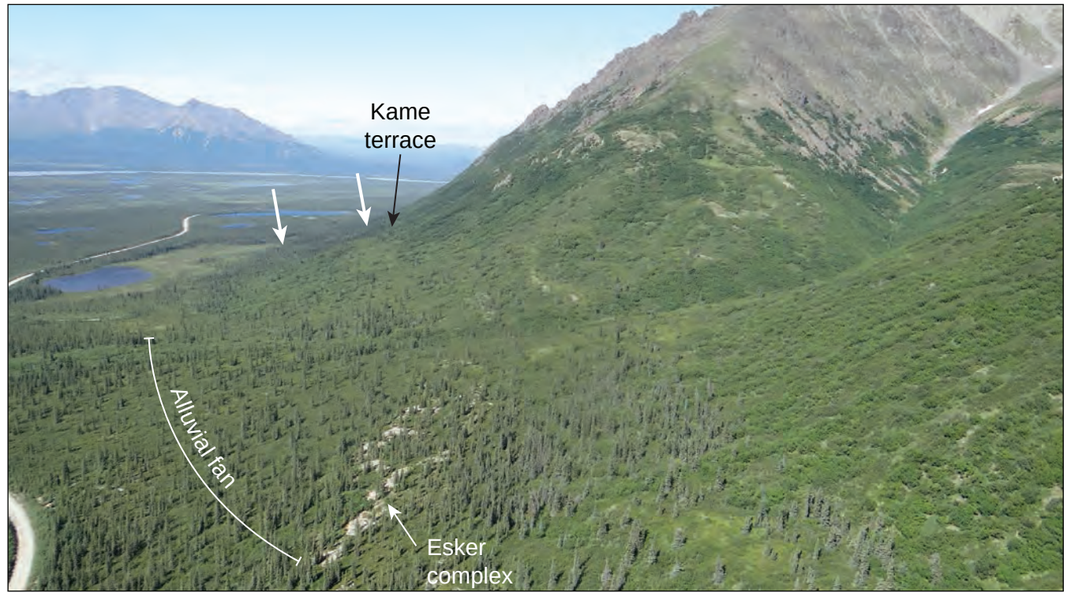
H)



View looking west along the Black Creek fault. Note the obvious rock type contrast across the fault. Aerial reconnaissance confirmed the presence of the fault in bedrock ridges to the west and the lack of expression in glacial sediments in adjacent valley bottoms.

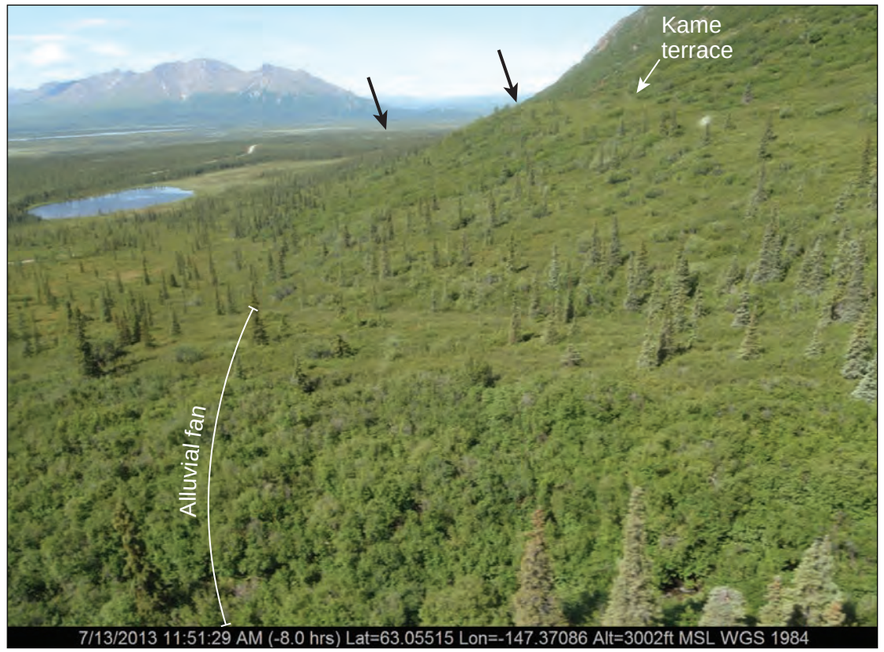
FUGRO Date 10/18/13	STATE OF ALASKA ALASKA ENERGY AUTHORITY ALASKA ENERGY AUTHORITY	SUSITNA-WATANA HYDROELECTRIC PROJECT CLEARWATER MOUNTAINS AREA PHOTOGRAPHS	FIGURE A-CWM.2

I)



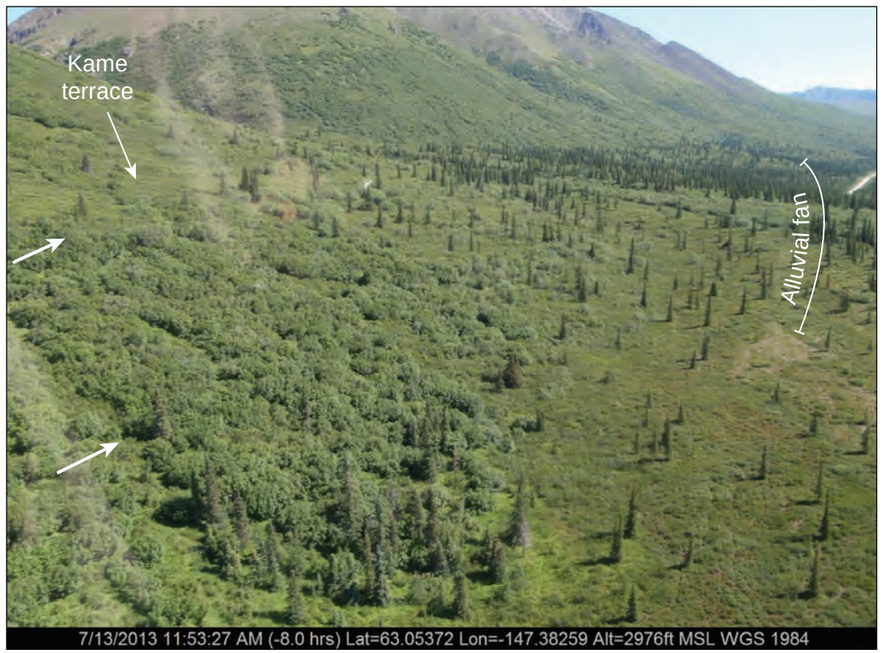
Overview looking west along mapped FCL-mapped lineaments that coincide with left-lateral moraines and kame terraces. The lineaments are interrupted by an alluvial fan and esker complex. Large arrows point along the mapped lineaments.

J)



Close-up view looking west along FCL-mapped lineaments.

K)



Close-up view looking east along FCL-mapped lineaments.

FUGRO Date 10/18/13	STATE OF ALASKA ALASKA ENERGY AUTHORITY ALASKA ENERGY AUTHORITY	SUSITNA-WATANA HYDROELECTRIC PROJECT CLEARWATER MOUNTAINS AREA PHOTOGRAPHS	FIGURE A-CWM.3