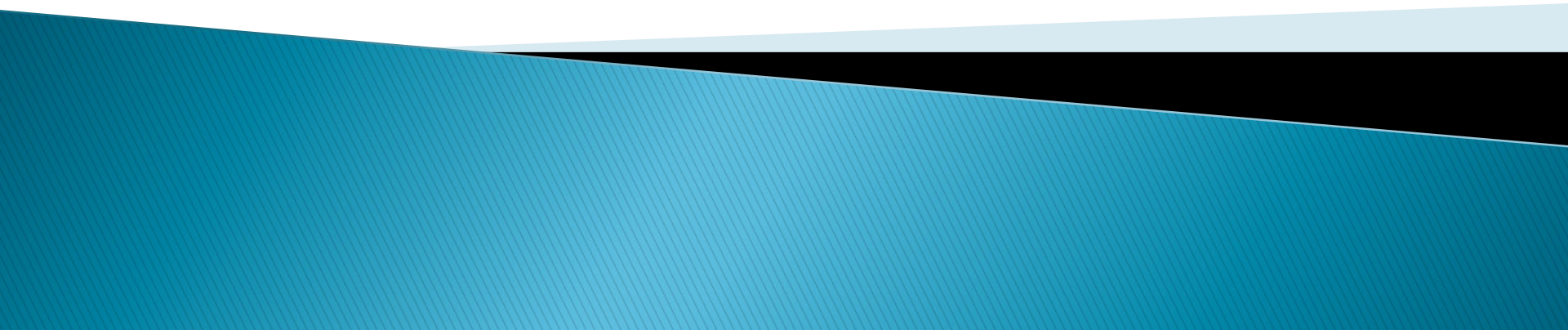
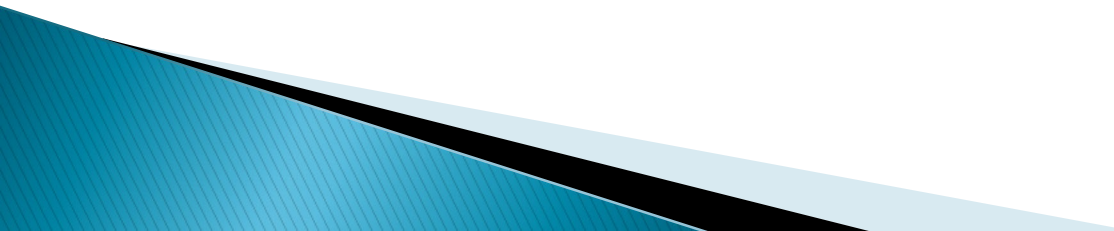


A Geotechnical and Geological Perspective on MATERIAL SITES

Craig Boeckman, C.P.G. – Regional Geologist



Presentation TOC

1. Material Site Database
 - Statewide Database compiled in 2009 using data from files of the 3 Regions
 2. Recent Material Site Data (Highway Projects)
 3. Remote Material Sites (Airport Projects)
- 

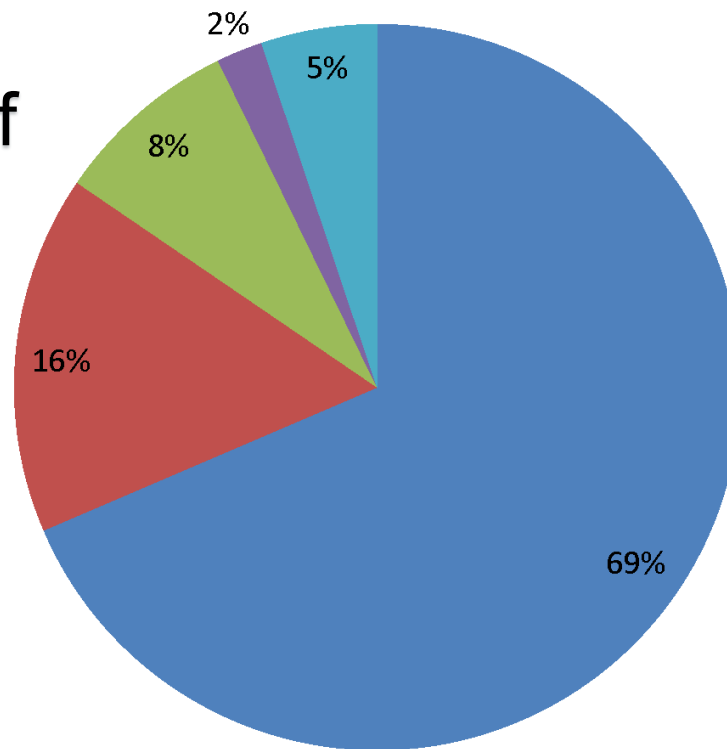
◦ Central Region Material Site Files:

- The STWD Material Site Database was largely compiled from data we had in our files in 2009.
- The data included both:
 - Areas proposed for a material site based on it's geological setting.
 - Sites that already had been developed and/or used.
- Limited amount of Geotechnical data in the original 2009 dataset.
- Some material sites that were entered into the database have been acquired by other entities (Borough, Native, Private).
- Some of the material sites have had residential areas built around them or were located in water sheds. These sites typically come with inherent problems with public resistance or permitting.
- Many of the sites in the database are labelled "Inactive" or "Closed" with no data associated with them.

Date of Soils Information for CREG Material Sites (Parks, Glenn, Mat/Su Area, Talkeetna Area)

■ 1960's Data ■ 1970's Data ■ 1980's Data ■ 1990's Data ■ 2000-2007 Data

Sites north of
Anchorage



If there was
data - it was
mostly pre
1980s data

◦ Material Site Data:

- For Highway Projects: since Design typically requires “contractor supplied” sites, we might not have knowledge of some of those sites before the project starts. After construction we should track:
 - What sites were used on construction projects.
 - Test results from those sites.
 - What material was processed at those sites.
 - What was the original soil type(s) encountered at the site.
 - Or was the site a staging area for material extracted from somewhere else and stored there for the project?
 - How “geologically” consistent was the site.
 - Size of material at the source (percentage of >3-in material, etc.).

○ DOT&PF Staff Knowledge of Material Sites

- Construction personnel have the most knowledge of the material sites that are used on a project.
 - If we can get a record of their knowledge of the material site used during construction, along with the QA/QC results from our lab (or other labs), we can keep track of these sites that contractors are using.
 - This would also give us a way to determine what areas have good quality rock (and the geology of the area).
- Drone overflight photos before, during, and after construction would also be very helpful.

Recent Material Site Test Data For Highway Projects



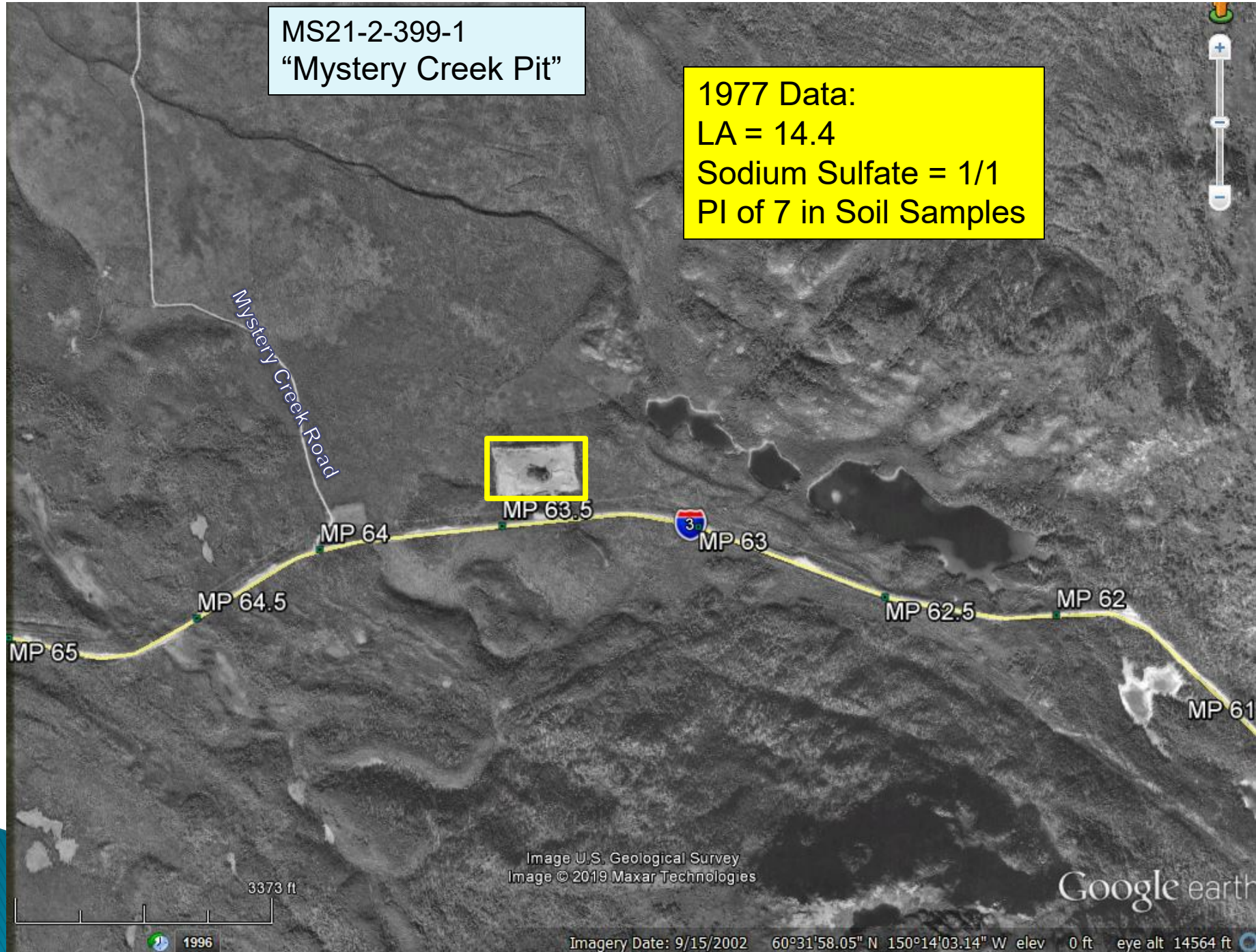
Sterling Highway MP 58-79 Project 2017 to 2019

This Project used 6 Material Sites

- Mystery Creek Pit (USF&W)
- “Seward Borough Pit” (KPB)
 - LA Abrasion = 16
 - SpG = (App 2.771)
- MP 76.9 Pit (USF&W?) (new site)
- Davis Block, Ciechanski Rd Pit.
 - Apparently will be closed soon.
- Granite RV Quarry, 355 Wyatt’s Windy Road

MS21-2-399-1
"Mystery Creek Pit"

1977 Data:
LA = 14.4
Sodium Sulfate = 1/1
PI of 7 in Soil Samples



Sterling Hwy

Drone use for Material
Site Definition

USF&W Mystery
Creek Pit

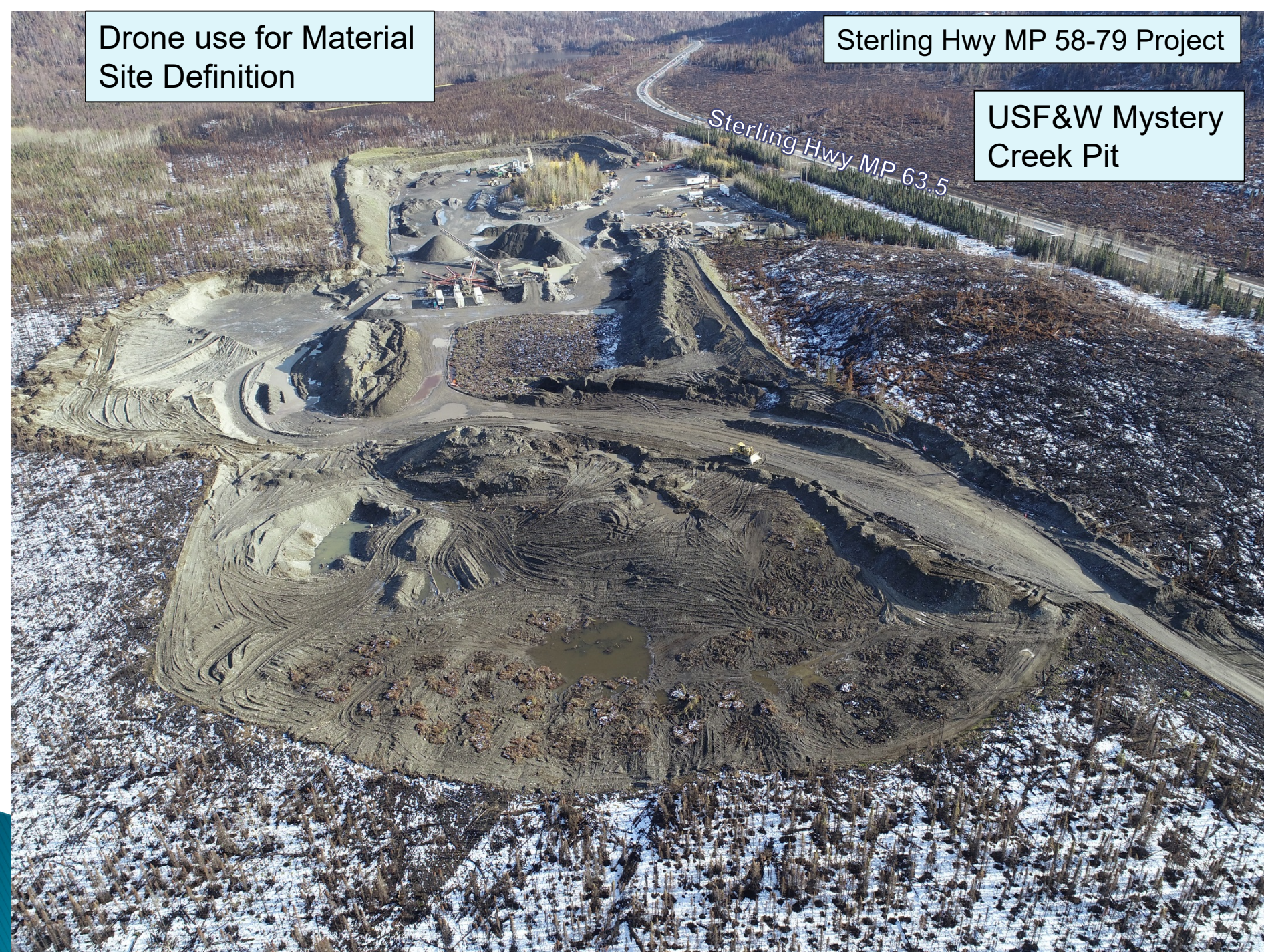


Drone use for Material
Site Definition

Sterling Hwy MP 58-79 Project

USF&W Mystery
Creek Pit

Sterling Hwy MP 63.5



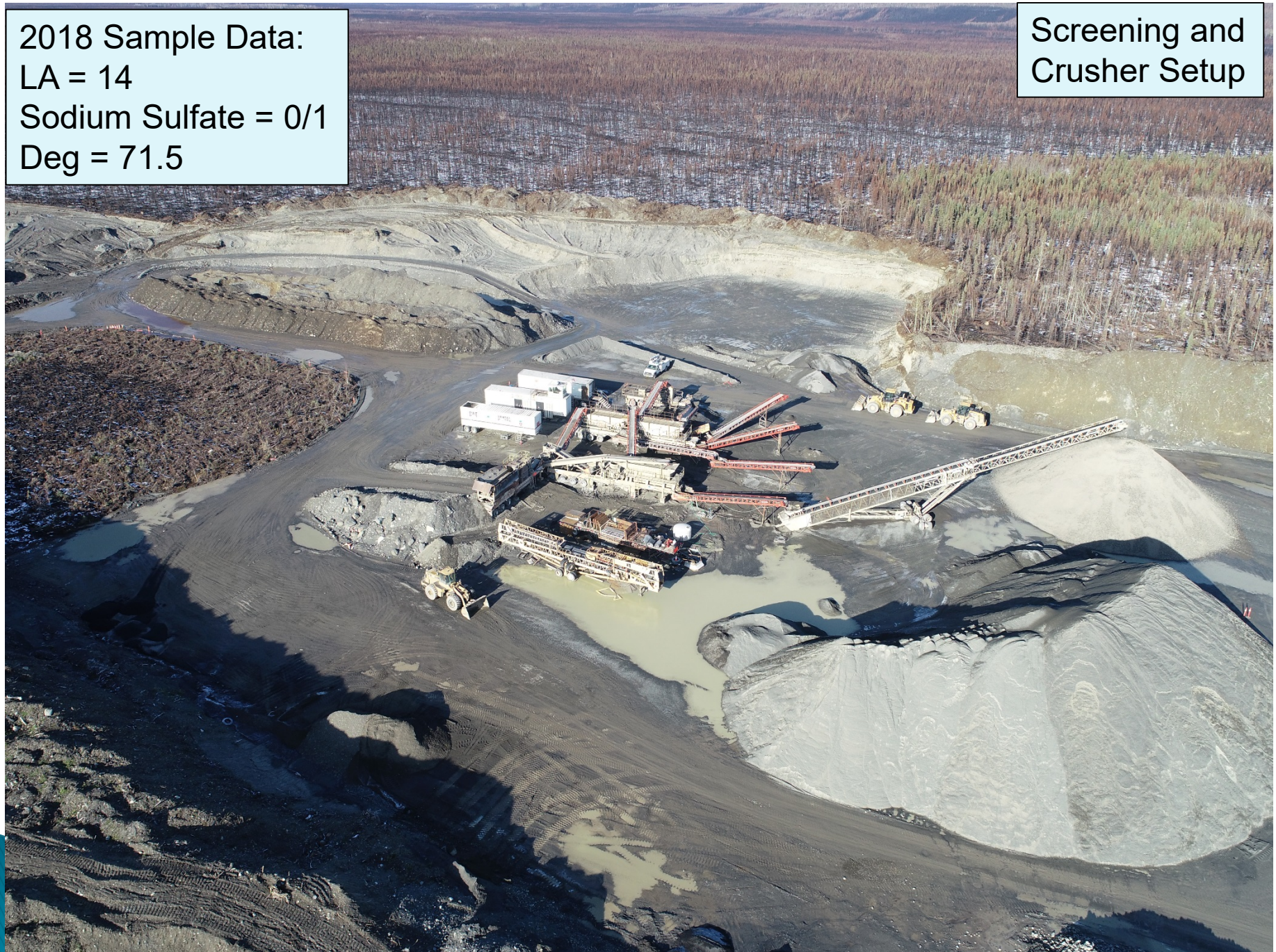
2018 Sample Data:

LA = 14

Sodium Sulfate = 0/1

Deg = 71.5

Screening and
Crusher Setup



Soil Sample Information

- Specify material site name and location (generally already being done).
- What was the material tested to be used for such as D-1, Rip Rap, etc (generally already being done).
- Collect sample(s) of the original material at the site from the pit extraction area.
 - This helps us know what kind of soil/rock material is at the source (geological knowledge).

Sterling Hwy MP 76.9 Pit
(No sample information).
Apparently used for "C" Material



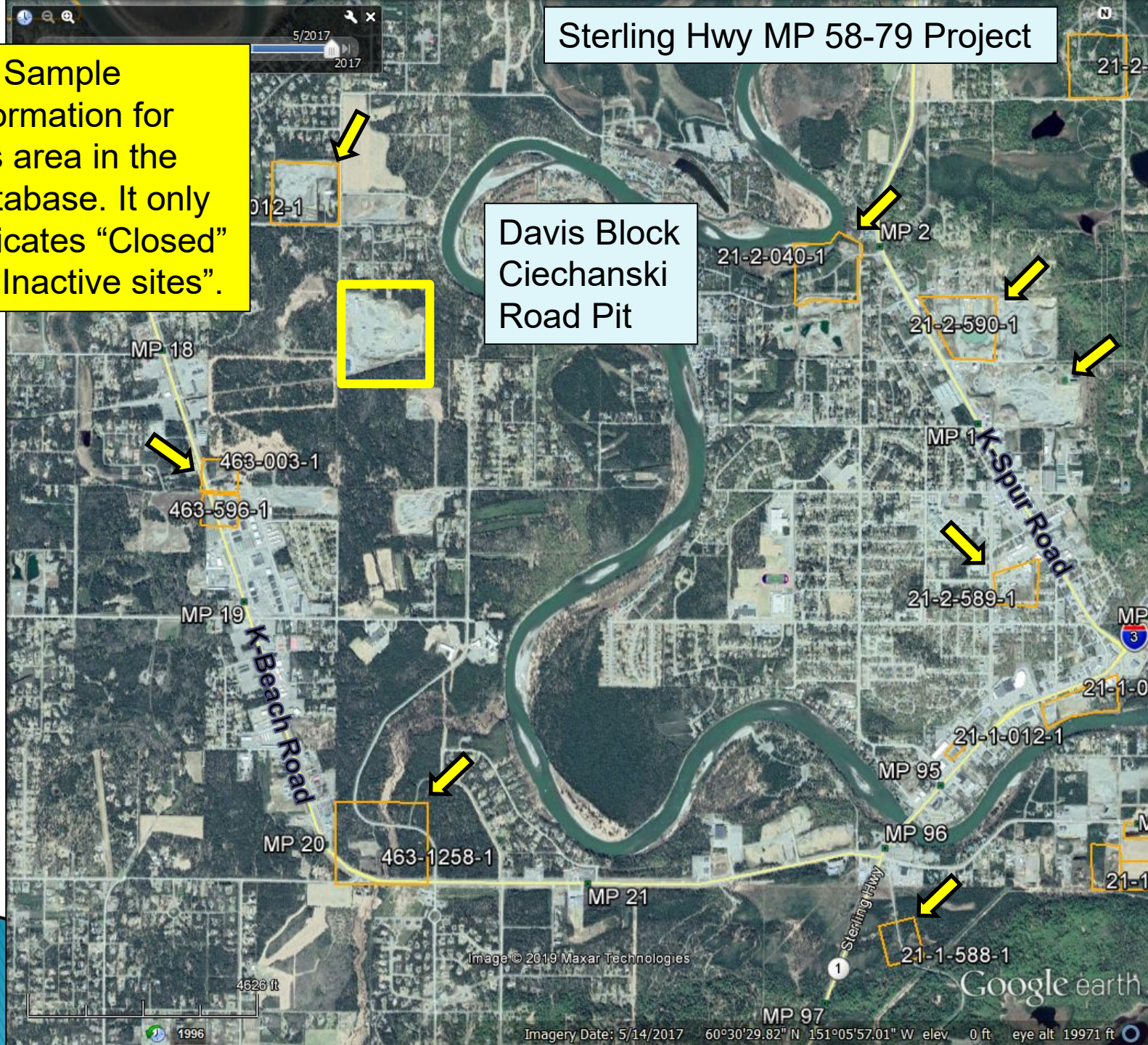
Material Site Information (this may not apply to all sites)

- Where was silt overburden placed during development?
- What material was generated from the pit?
 - Any rock quality results from the pit?
- During processing:
 - Where was rejected (processed) material placed?
 - What is the composition of any stockpiles left on site.
 - Where was the oversized material placed?
- Any septic systems installed? This was the case at Seward Hwy MP 49 Pit.
- Any waste material from other projects imported to the site (such as at Seward Hwy MP 42 and 49 Pits)?
- Was a water table encountered (important in KPB and Wasilla Areas for permits)?
- Percentage of material >3-inches in size.

Sterling Hwy MP 58-79 Project

No Sample Information for this area in the Database. It only indicates "Closed" or "Inactive sites".

Davis Block Ciechanski Road Pit

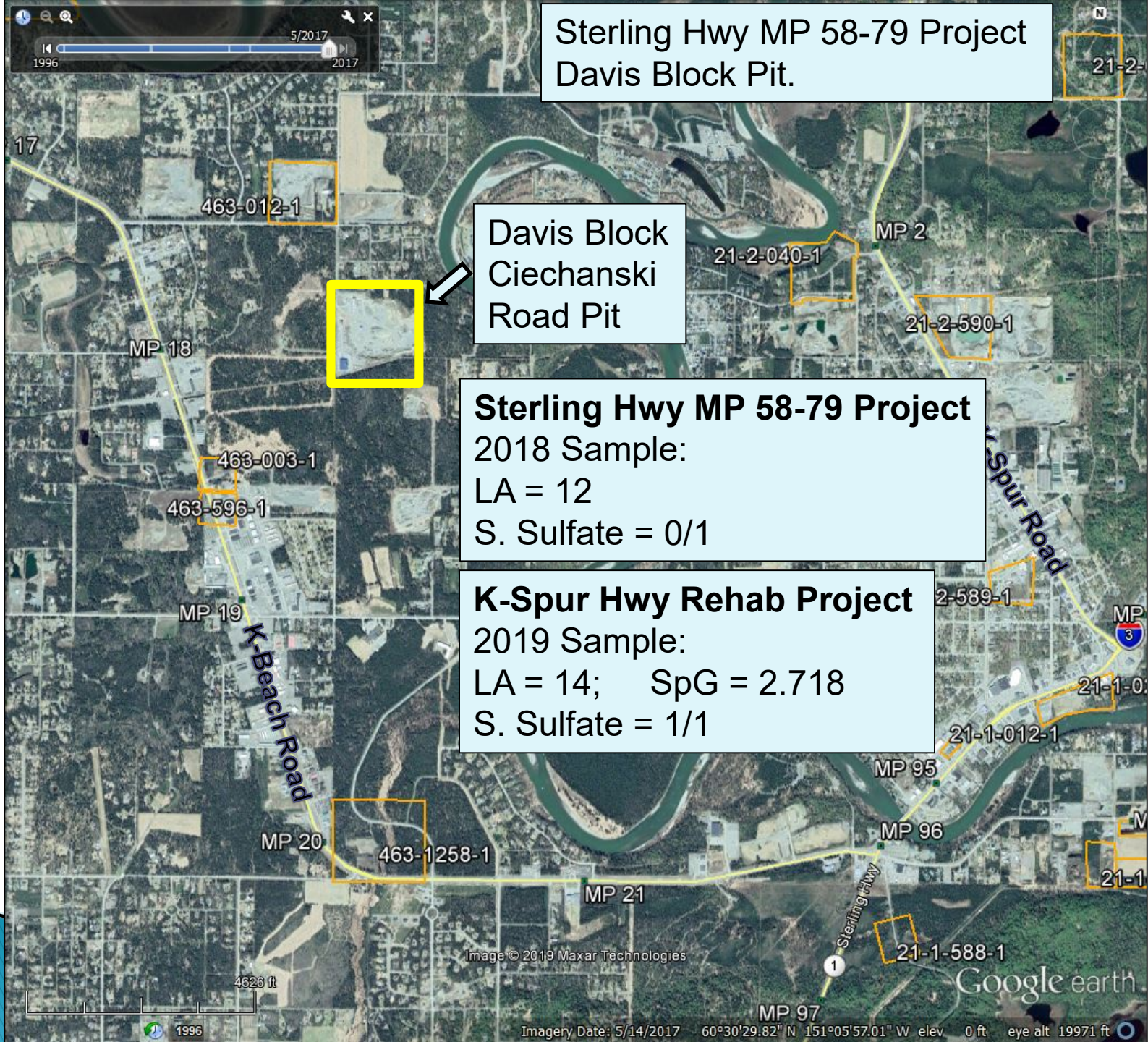


Sterling Hwy MP 58-79 Project Davis Block Pit.

Davis Block
Ciechanski
Road Pit

Sterling Hwy MP 58-79 Project
2018 Sample:
LA = 12
S. Sulfate = 0/1

K-Spur Hwy Rehab Project
2019 Sample:
LA = 14; SpG = 2.718
S. Sulfate = 1/1



Other Kenai Area Projects

K-Spur Road Rehab Project

“Ravenwood Pit” (Location?)

2019 Samples:

Deg = 76.6 and 77.9

LA = 12 and 12

S. Sulfate = 0/0 and 0/1

K-Beach Road MP 16-22.2 Project

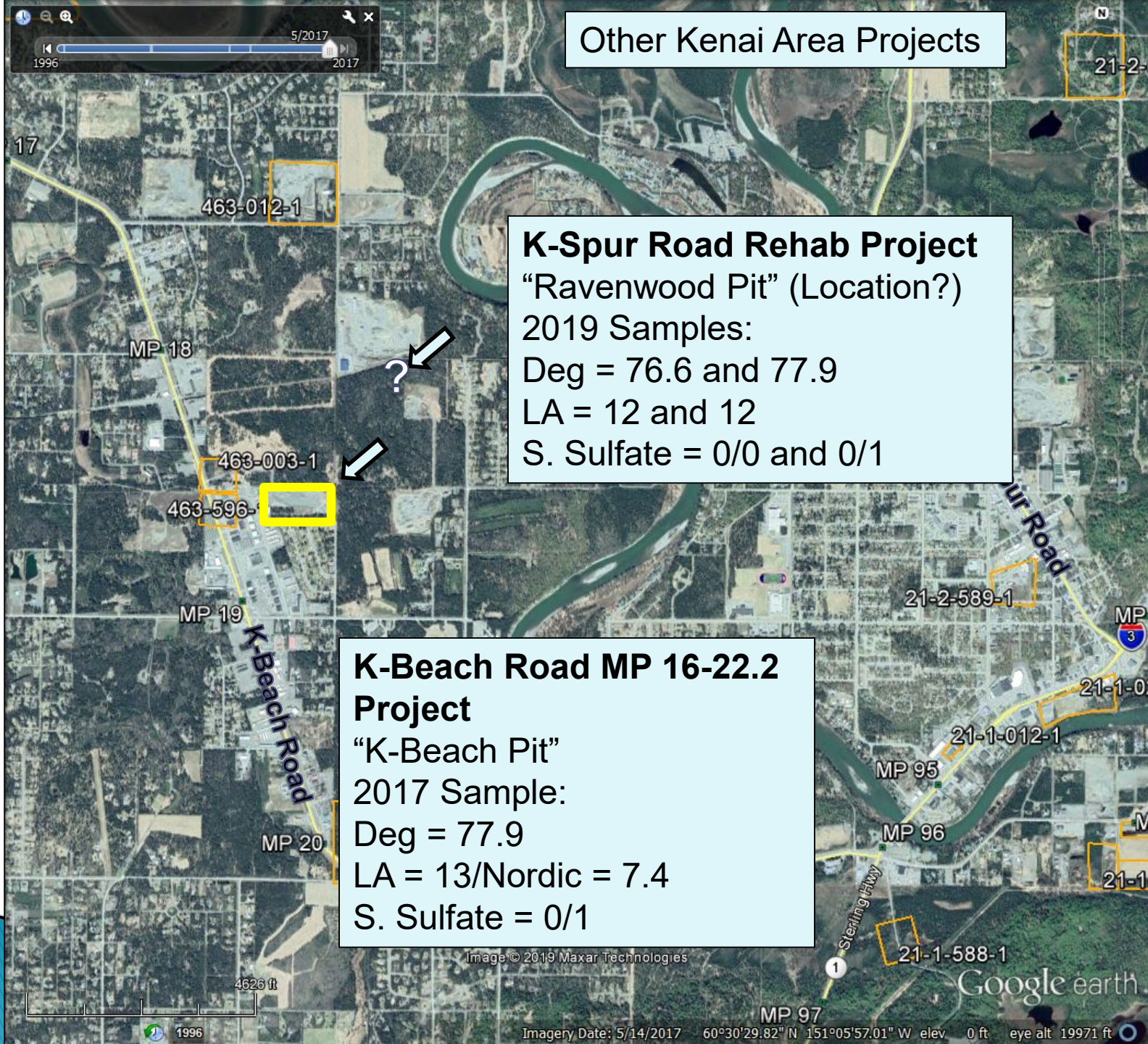
“K-Beach Pit”

2017 Sample:

Deg = 77.9

LA = 13/Nordic = 7.4

S. Sulfate = 0/1



Other Kenai Area Projects

1987 Sample Data
Deg from 54 to 78
LA = 16
S Sulfate = 3/5

New since >2011

**Sterling Hwy MP 97-118
Project**
MP 110.5 Cabin Ave Pit
Deg of 77.9
LA = 14 & 15
S. Sulfate = 1/

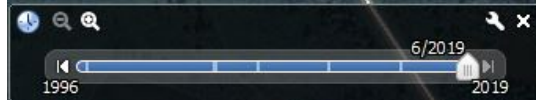
For yellow
arrows: No
data in the
Database

Image © 2019 Maxar Technologies

Google earth

Imagery Date: 5/14/2017 60°18'47.73" N 151°15'47.39" W elev 0 ft eye alt 13385 ft

Sterling Hwy MP 58-79 Project
355 Wyatt's Windy Road Pit.



Portage-Glacier Road

MP-2

355 Wyatt's Windy Rd

Wyatt's-Windy-Rd

Portage-Glacier-Hwy

MS496-003-1

New Test Data
2018:
LA = 20
SpG = 2.721 (app)

MS 496-003-1
No historical information



Image © 2019 CNES / Airbus

Google earth

1017 ft

REMOTE SITES

Nelson Island Sites

- Tununak
- Nightmute
- Mertarvik

Upper Kuskokwim Area

- McGrath

Anchorage

Nelson Island

Google earth

Image Landsat / Copernicus

Imagery Date: 12/30/2003 61°03'39.01" N 157°02'45.14" W elev 1174 ft eye alt 835.44 mi

216 mi





Chefornak Airport Relocation 2011 to 2012



Cheeching Mtn:

Chefornak Material Source for
crushed aggregate

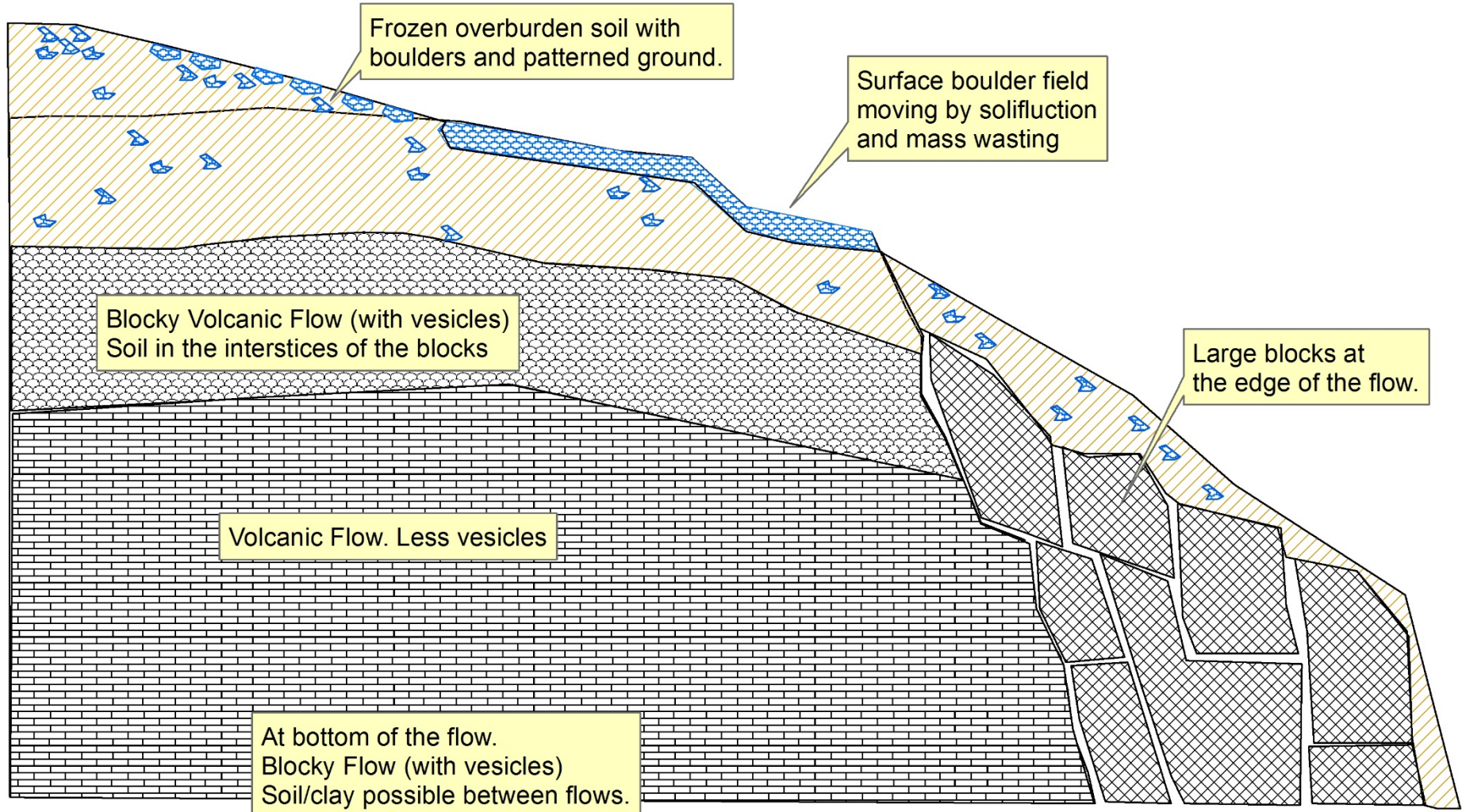


Cheeching Mtn Material Source

Test holes indicated 20 to 30 ft of overburden. But good quality rock.



Generalized Geological Cross Section



Ice road from Cheeching Mtn to Chefornak Runway:



Cheeching Mtn Quarry. A blocky material was generated from the shots. About 13 to 15% fines generated with the shot.



Tununak Airport Relocation 2013 to 2014



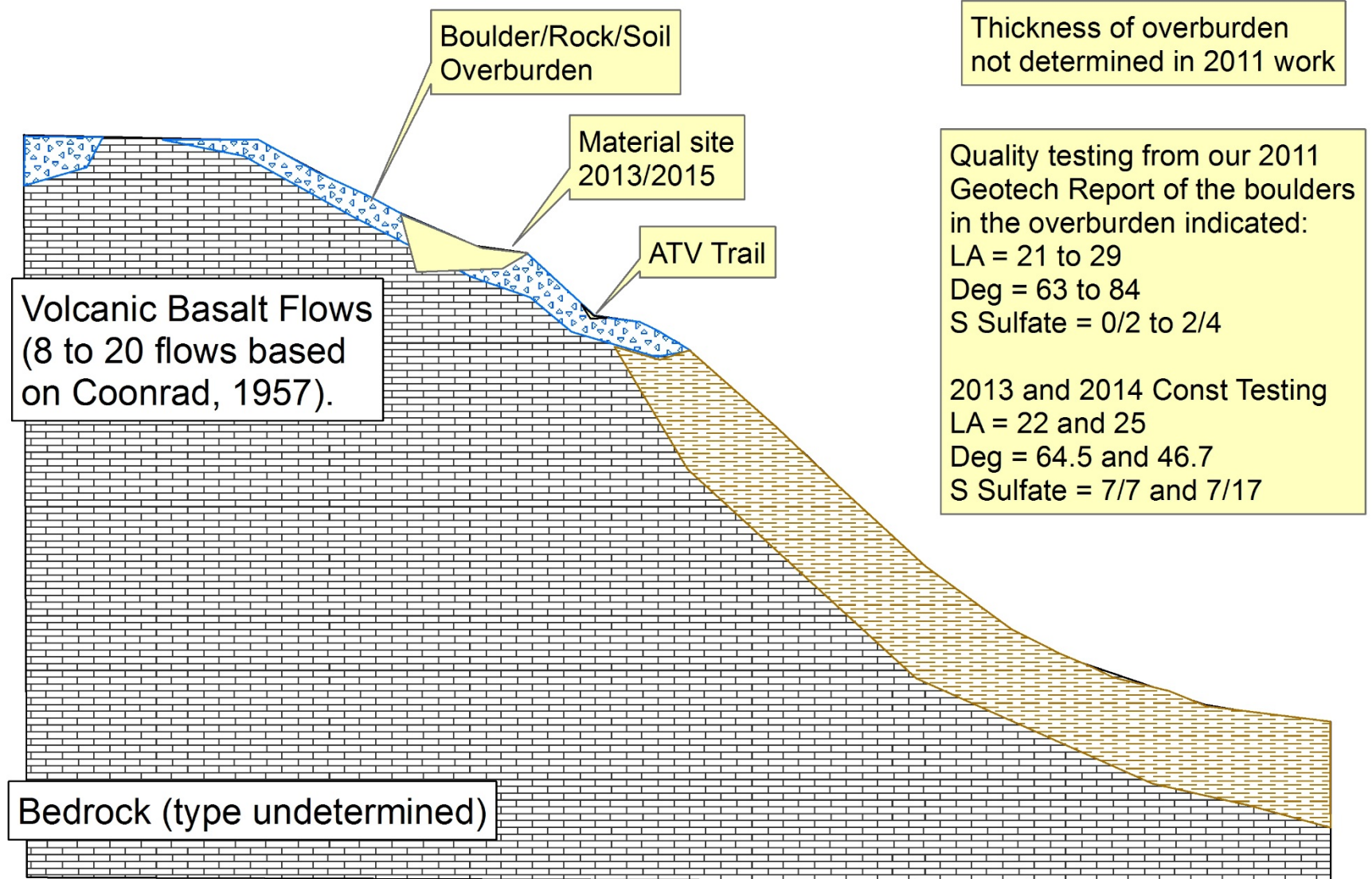
Mt Ugchirnak:

Tununak Airport Material Source
for crushed aggregate



2009 photo by B.Benko

Generalized Geologic Description of Mt Ugchirnak



Access Road to top Mt Ugchirnak:



2008 photo by Design

Access road to top of Mt Ugchirnak:



2009 photo by B.Benko

Top of Mt Ugchirnak:

Cell phone tower.

Rocks covering surface.

Some bedrock outcrops observed.



2009 photo by B.Benko

Top of Mt Ugchirnak:

This kind of patterned ground indicates permafrost activity. Rock rings. Indicate presence of an “active layer” (i.e., presence of soil overburden).



2013 Construction - Material Site adjacent to Access Road to top of Mt Ugchirnak:



2013 photo by Construction

Overburden was an issue for the Contactor. But we didn't attempt to determine it during design.

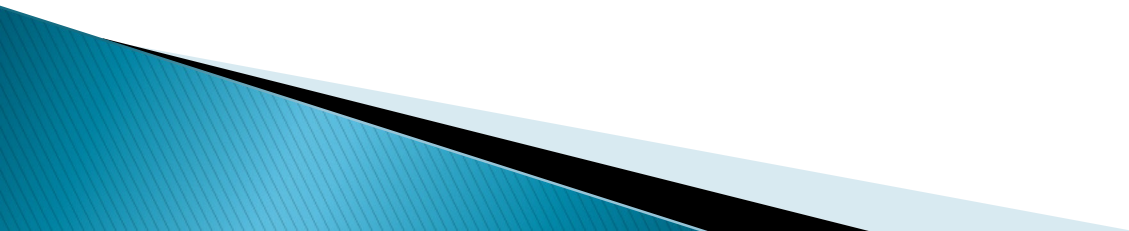


2013 or 2014 photo by Construction

Looking down at screening plant and Tununak in the background.



Nightmute Airport Runway Extension 2008 to 2009





Nightmute

Port Rd

Material Site

2866 ft

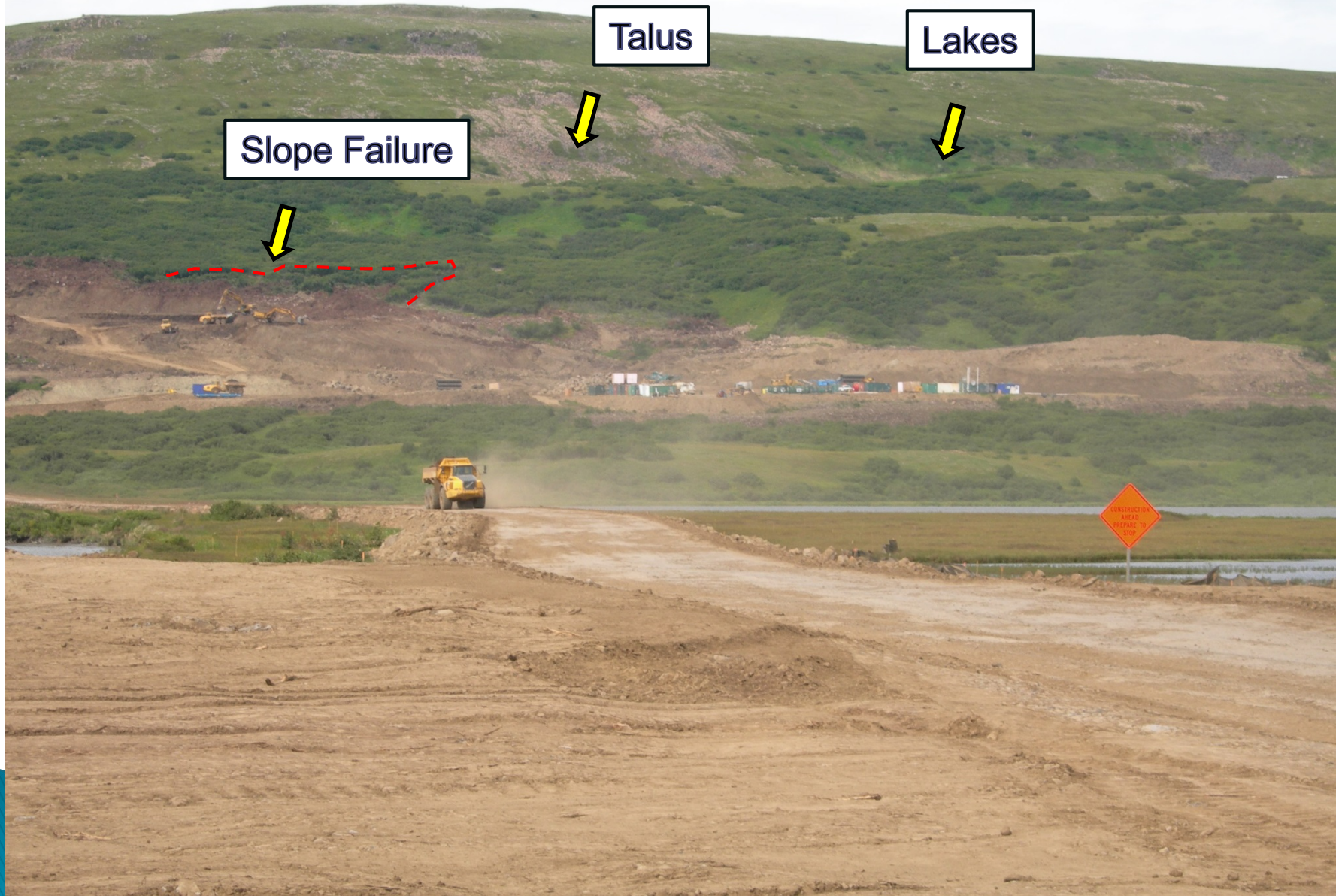
2001

Image © 2019 Maxar Technologies

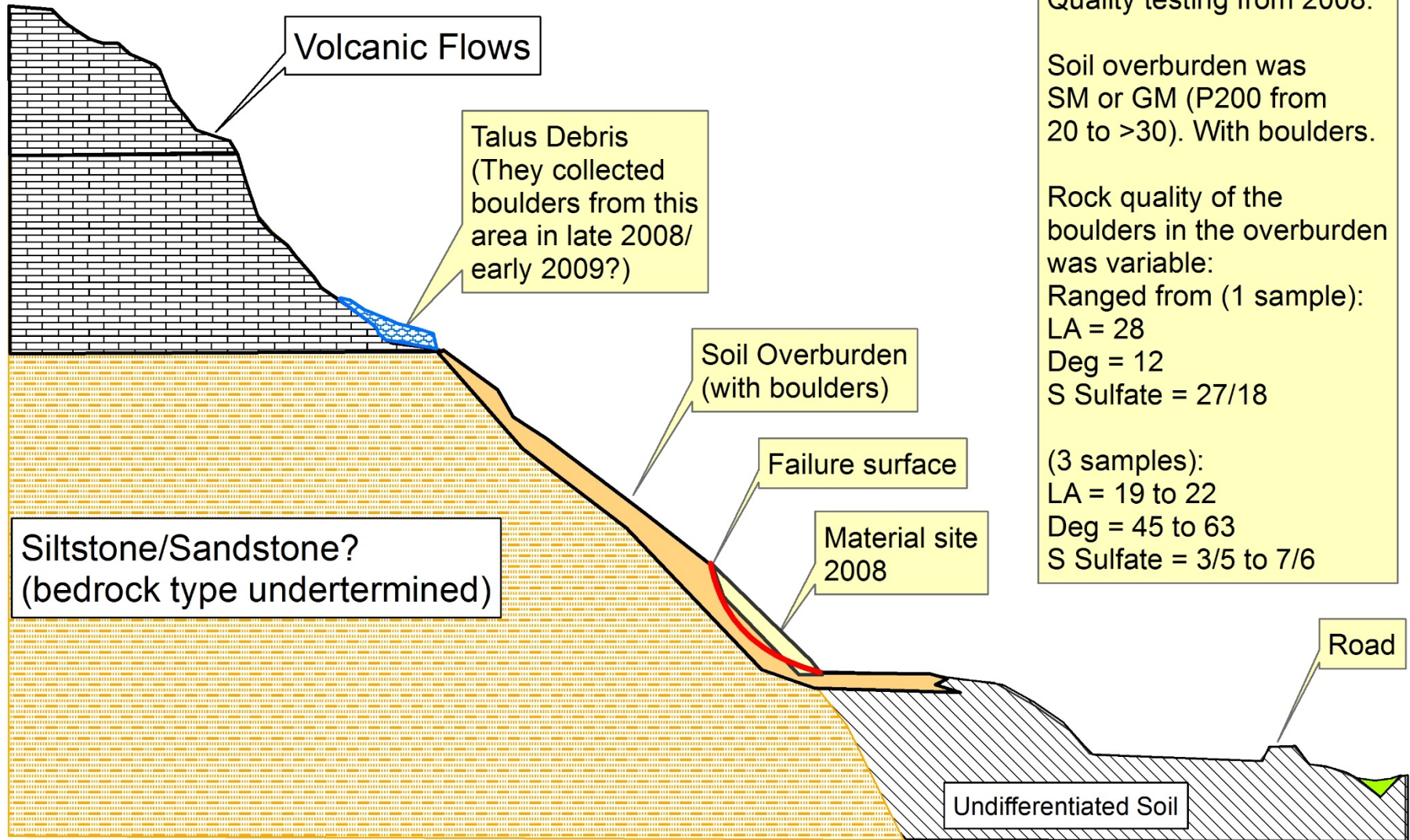
Google earth

Imagery Date: 7/5/2001 60°28'48.21" N 164°42'57.41" W elev 80 ft eye alt 13140 ft

Material Site (July 2008)



Generalized Geologic Description of Nightmute Material Site



Quality testing from 2008:

Soil overburden was SM or GM (P200 from 20 to >30). With boulders.

Rock quality of the boulders in the overburden was variable:

Ranged from (1 sample):

LA = 28

Deg = 12

S Sulfate = 27/18

(3 samples):

LA = 19 to 22

Deg = 45 to 63

S Sulfate = 3/5 to 7/6

Material Site: Toe
of slope in working
area



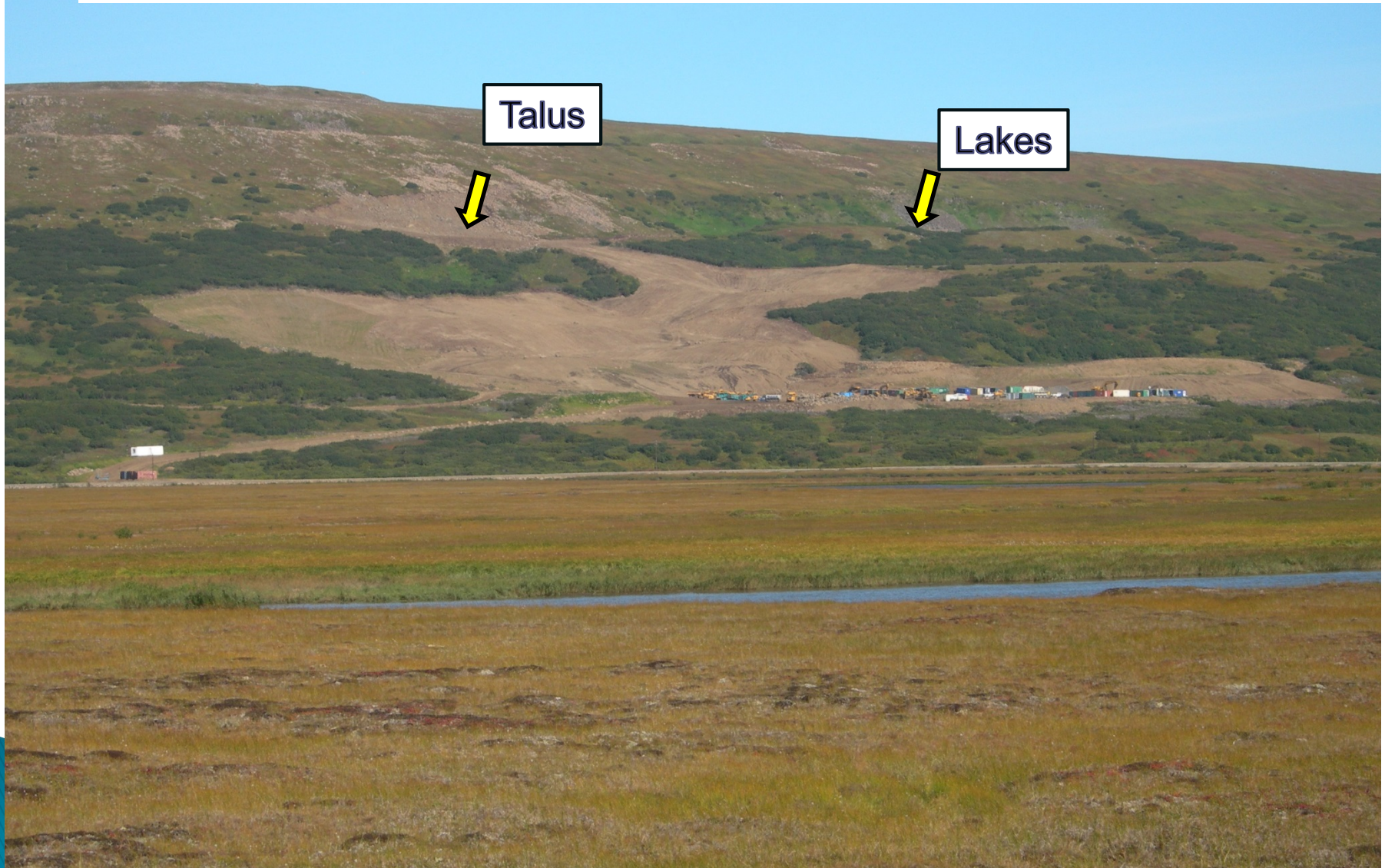
Material Site: Drainage from slope/working area



Material Site:
Tension crack at
top of failure



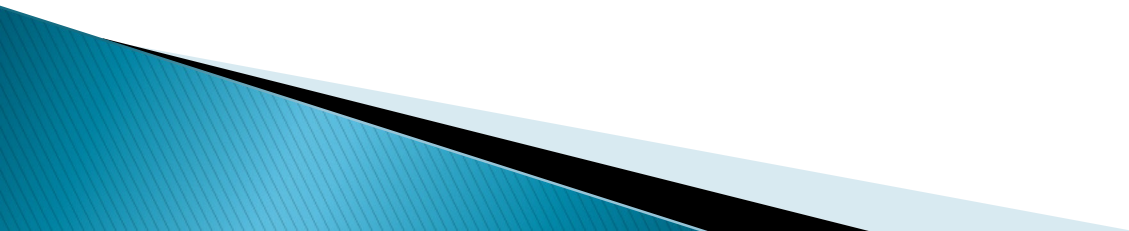
Material Site: The contractor went up to the Talus Area and excavated boulders for processing. Either because of the slope failure (they unloaded the slope), less drainage issues, or to get better quality rock.



Old slope failure
above Nightmute



Mertarvik Town-Site 2011 and 2018



Quarry



Mertarvik Town-site



2019 photos by J.Klebesadel

An aerial photograph of a quarry site. The quarry is a large, irregularly shaped excavation in the center of the image, with exposed earth and rock. To the left of the quarry, there is a cluster of white and blue storage containers and several yellow construction vehicles. A dirt road runs from the bottom left towards the quarry. The surrounding landscape is a vast, flat, green field. In the far distance, there are low hills under a grey, overcast sky. A white car is visible on the dirt road in the lower left.

Quarry

2019 photos by J.Klebesadel



2019 photos by J.Klebesadel

2011: Initial shot
material at “Hill 460”
Quarry. Drilled and shot
by the IRT Contractor



2011: Top of shot.
Blocky material below
the overburden



2011: Driller's indicated a soft red material at the bottom of the shot holes. Petrographic analysis indicated as an Oolitic Mudstone.



Mertarvik

2008 to 2011 rock samples (9) indicated:
LA from 15 to 33, SpG from 2.79 to 2.84,
Deg of 17, 37, 38, 44, 54, 67, and 77,
S Sulfate from 1 to 24 (course)

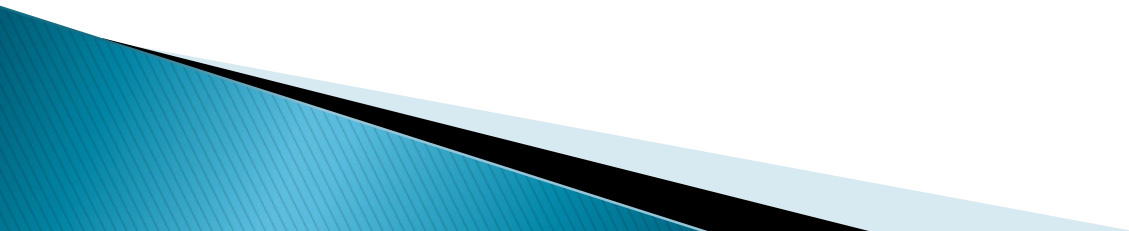
Quarry

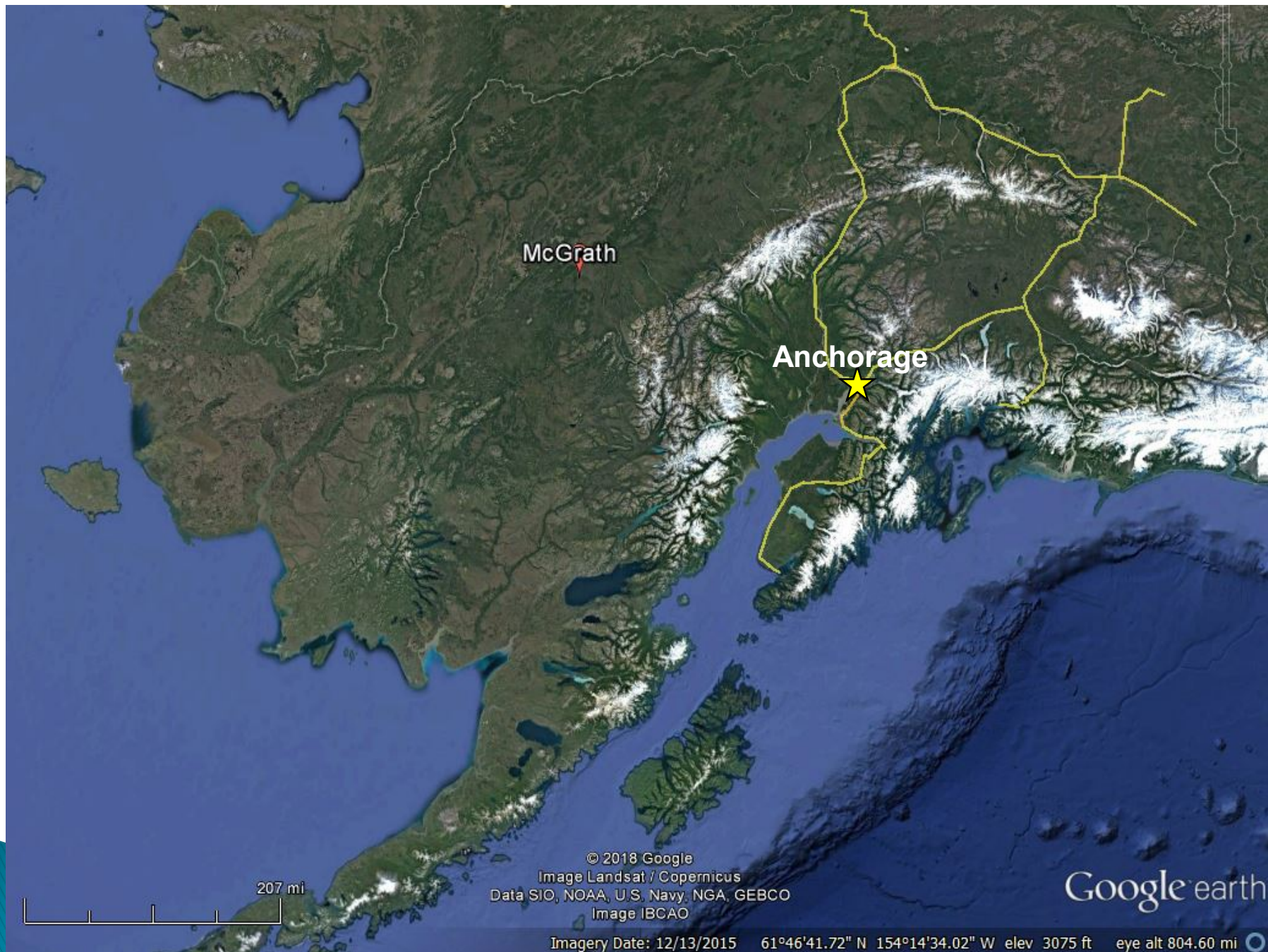
2019 photos by J.Klebesadel



McGrath Airport Imps Noir Hill Rock Quarry

2008 to 2019





McGrath

Anchorage

© 2018 Google

Image Landsat / Copernicus

Data SIO, NOAA, U.S. Navy, NGA, GEBCO

Image IBCAO

Google earth

207 mi

Imagery Date: 12/13/2015 61°46'41.72" N 154°14'34.02" W elev 3075 ft eye alt 804.60 mi

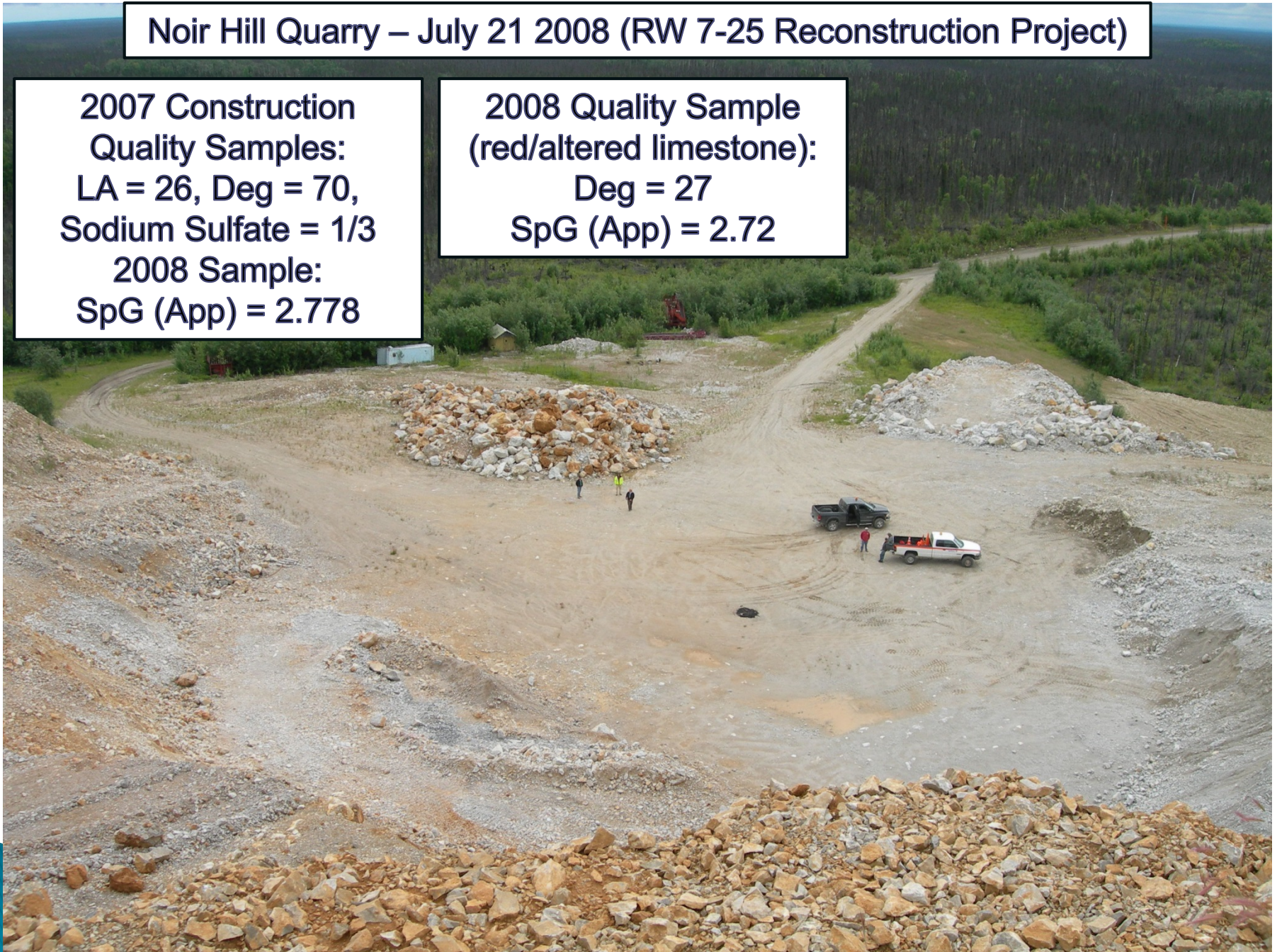
Noir Hill Quarry – July 21 2008 (RW 7-25 Reconstruction Project)



Noir Hill Quarry – July 21 2008 (RW 7-25 Reconstruction Project)

2007 Construction
Quality Samples:
LA = 26, Deg = 70,
Sodium Sulfate = 1/3
2008 Sample:
SpG (App) = 2.778

2008 Quality Sample
(red/altered limestone):
Deg = 27
SpG (App) = 2.72



Noir Hill Quarry – October 3, 2016 (after COE Project)



Noir Hill Limestone Quarry
October 1, 2019

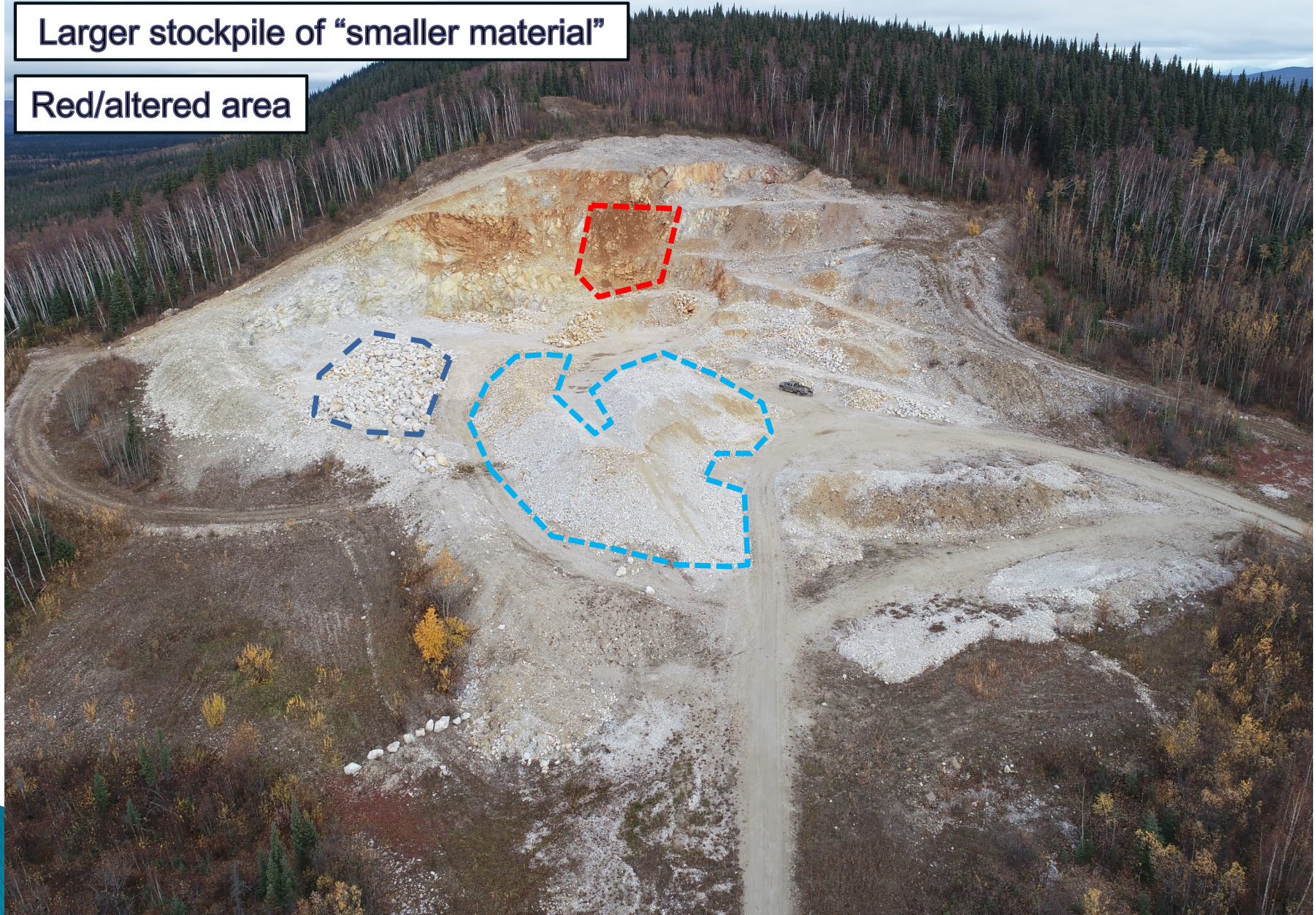


Smaller stockpile of “larger material”

October 1, 2019

Larger stockpile of “smaller material”

Red/altered area



Smaller stockpile
of “larger material”

Un-altered white limestone:
Close to widely-spaced joints.
Rock sample indicated:
LA = 25, SpG (App) = 2.789
S Sulfate = 2//



Larger stockpile
of “smaller material”



**Larger stockpile
of “smaller material”**

**Variable material. Altered and
not altered.**

**Rock sample indicated:
Deg = 34, LA = 25, SpG (App)
= 2.706, S Sulfate = 1//**



Re/Altered Limestone

Very closely-spaced joints.
Soil sample indicated PI of 11.
Rock sample indicated:
Deg = 10, SpG (App) = 2.710



QUESTIONS

Can a Geotechnical (Engineer) and Geological (Geologist) Perspective Coincide?

For example. Here is a question.
What is the value of Pi (3.14) carried out to the 10th digit?

Engineer

Wow. How easy.
3.14159 26535 89793..
Should I just use “5”?
Or should I just round up to “6”?

Geologist

What? That's a pretty good value for pie.
Only \$3 bucks plus change. But carried by ten digits? Does that mean it is finger food?
So I guess that means pie with no ice cream?