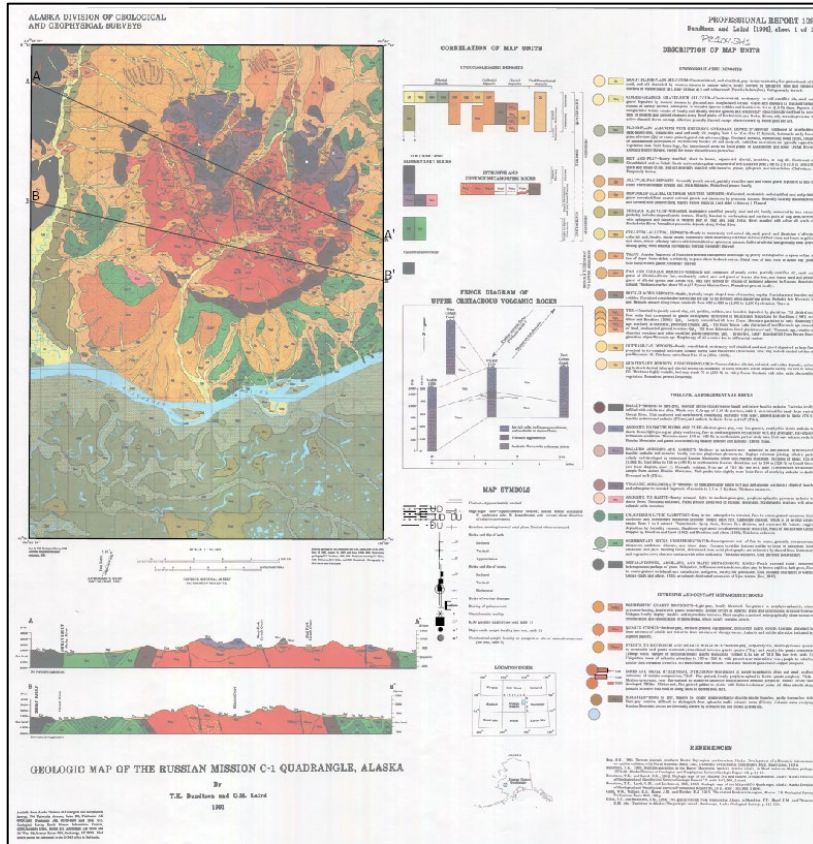# DIGITAL MAPPING TECHNIQUES 2025

The following was presented at DMT'25

May 18 - 21, 2025

The contents of this document are provisional

See Presentations and Proceedings
from the DMT Meetings (1997-2025)
http://ngmdb.usgs.gov/info/dmt/

Increasing Efficiency of Contracted Geologic Map Digitization
- Hail the Feature Template -

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Background

The Alaska DGGS has leveraged contractors in our geologic map/data conversion to GeMS projects for over 3 years

    STATEMAP FY21: 8 Maps
    STATEMAP FY22: 11 Maps
    STATEMAP FY23: 14 Maps

DMT Talk on the subject in 2022, https://doi.org/10.14509/30890

This talk will discuss the efficiencies we have introduced, particularly focusing on the use of feature templates into our workflow.

Changing views on the process

Original Ideas:
- Firm Fixed Contract. New contract ~ annually
- Extensive Contractor training required with GeMS and AK GeMS
- Emphasis on Geologic experience versus Geospatial
- In House Gems Savy Geologist fixes all issues after contractor work

Newer Ideas:
- Set up Master Agreement with Contractor – Kinney Engineering
- Contractor only requires general GeMS knowledge
- Emphasis on Geospatial versus Geologic
- In House Gems Savy Geologist prepares extensive templates and packages prior to contractor work
- Limited effort required after contractor

Every Map gets a Contractor Package

- Conversion Notes
- ArcPro Project File & AK GeMS DB
  - Feature Templates
  - Representative objects digitized from Legend
- Original georeferenced map image and Report
- Style File
- Toolbox
  - Planarize contacts and faults
  - Create Map Unit Polygons from Contacts and Faults with Map Unit Points

Conversion Notes

Digitizing notes: russian_mission_c1_quads_geo
Map publication: https://dggs.alaska.gov/pubs/id/2290
Coordinate system of geologic_map feature dataset: NAD 1927 UTM Zone 4N
The map border has been digitized in the feature classes product_info (symbol = ak.101.02) and contacts_and_faults (symbol = 31.08). Snap new contacts and faults to the contacts_and_faults map border.
The feature template examples for this map are drawn adjacent to the legend on the georeferenced map sheet.

Layer details and style file symbol codes:
pr109_sh001_r1.tif
Georeferenced .tif raster image of original map, including map collar with legend. Coordinate system is UTM NAD27 Zone 4.

map_unit_points
1. "Synthetic" map_unit_points features corresponding to each map unit in the description_of_map_units table, with feature template examples digitized ; used to identify map_unit_polys polygons to be generated automatically from digitized contacts_and_faults line features.
2. Create one synthetic map_unit_points feature within each polygon defined by contacts_and_faults features.
3. Digitize the Kuskokwim River as unit "Water", but small lakes can be included with surrounding map units.

contacts_and_faults
1. The original map used a solid line symbol for "approximately" located contacts and faults; the GeMS digital version will use a dashed line
   a. Identity and existence certain, location approximate – (01.01.03)
2. Boundaries
   a. Outer edge of map – (31.08)
   b. Map border had been digitized in contacts_and_faults; snap new contacts_and_faults to this feature.
3. There are a few dashed contacts on the original map that are not in the legend; digitize these as "approximate" as with most of the other contacts.

cartographic_points
1. There are four versions of the "Fault, apparent offset" symbol; choose the one that works best for each location and rotate the symbol as needed – (02.11.ak.02, 03, 04, 05)
2. Bearing of paleocurrent: two symbols in Kus at the Kuskokwim river near the eastern edge of the map; there may be more – (09.001)
3. Cross section endpoints – these have been digitized with label only, no symbol; default point symbol edited to no outline color and no fill color, to be invisible. Completed/drawn for this map, as an example.

orientation_points
1. Inclined features:
   a. Locate and digitize features, and rotate as needed; the "azimuth" field will populate automatically.
   b. Manually populate the "inclination" field with the dip value on the map; DGGS will copy the inclination value to the "label" field.
2. Horizontal features:
   a. Azimuth = 0
   b. Inclination = 0 (label will be <Null>)
3. Vertical features:
   a. Azimuth = (derived from symbol rotation)
   b. Inclination = 90 (label will be <Null>)

geochron_points
1. K-Ar age-date locality
   a. Locate and digitize features, and add 'label' to feature class table.
   b. Age data will be added to feature class table by DGGS.

geologic_points
1. Glacial erratic locality - (30.03.16)
2. Major oxide sample locality – (31.21)
3. Geochemical sample locality at prospect or site of mineral occurrence – (19.03.ak.01)

review_item_point
Web feature service layer, edited by DGGS and contractor, to identify features/areas requiring revision.
https://services1.arcgis.com/7HDiw78fcUiM2BWn/arcgis/rest/services/review_item_point/FeatureServer

cartographic_lines
1. Cross section lines – (31.10)
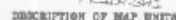2. Completed/drawn for this map, as an example.

geologic_lines
1. Bedding trends in map unit Kus – (01.02.03)
2. These are mapped in the northeast corner of the map, and possibly elsewhere.
3. Example polygon is drawn adjacent to Kus in raster Description of Map Units.

structure_lines
1. Syncline: accurately located (05.05.01) and concealed (05.05.07)

overlay_polys
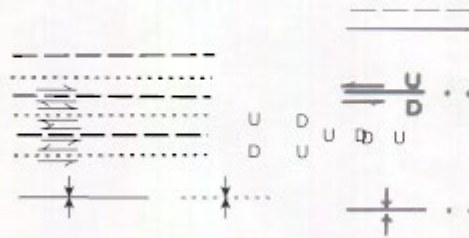1. Ankerite and sericite alteration in map unit TKsy; example polygon is drawn adjacent to TKsy in raster Description of Map Units.

CORRELATION OF MAP UNITS

DESCRIPTION OF MAP UNITS

FENCE DIAGRAM OF
UPPER CRETACEOUS VOLCANIC ROCKS

MAP SYMBOLS

LOCATION INDEX

REFERENCES

GEOLOGIC MAP OF THE RUSSIAN MISSION C-1 QUADRANGLE, ALASKA

By

T.K. Bundtzen and G.M. Laird
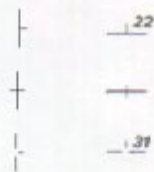
1991

MAP SYMBOLS

—————————— Contact—Approximately located

High-angle fault—Approximately located; dotted where concealed. U, upthrown side; D, downthrown side. Arrows show direction of relative movement

Syncline, showing trace of axial plane. Dotted where concealed

Strike and dip of beds

Inclined

Vertical

Approximate

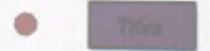Strike and dip of joints

Inclined

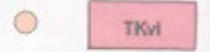Vertical

Horizontal

Strike of vertical cleavage

Bearing of paleocurrent
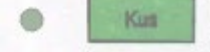
Glacial-erratic locality

Create Features

Templates Favorites

- ⌄ **contacts_and_faults**
  - — Contact, approximate
  - ▬ Fault, high-angle, approximate
  - ⋯ Fault, high-angle, concealed
  - ▬ Fault, strike-slip, left-lateral, approximate
  - ⋯ Fault, strike-slip, left-lateral, concealed
  - ▬ Fault, strike-slip, right-lateral, approximate
  - ⋯ Fault, strike-slip, right-lateral, concealed
- ⌄ **data_sources**
  - 📄 data_sources
- ⌄ **description_of_map_units**
  - 📄 description_of_map_units
- ⌄ **geochron_points**
  - ■ K-Ar age-date locality
- ⌄ **geologic_lines**
  - — Bedding trends in Kus
- ⌄ **geologic_points**
  - ● Geochemical sample locality at prospect or site of mineral occurrence
  - ✳ Glacial erratic locality
  - ● Major oxide sample locality
- ⌄ **map_unit_lines**
  - ▬ TKda
  - ▬ TKdf
- ⌄ **map_unit_points**
  - ● Ksl
  - ● Kus
  - ● MzPzvs
  - ○ Qa
  - ○ Qaf
  - ○ Qag
  - ○ Qas
  - ○ Qat

Create Features

← Active Template

— Contact, approximate

[⟋] [⋏] [✕] [⋏] [⊶] [ℓ] [◺]

[▦] [⟋]

Enter attributes for features you are about to create.

contacts_and_faults_id	<Null>
symbol	01.01.03
type	contact, generic
category	contact
label	<Null>
layer	-1
symbol_alt	<Null>
existence_confidence	certain
identity_confidence	certain
location_confidence_method	unprovided
location_confidence	approximate
location_confidence_meters	997
is_concealed	no
draw_policy	yes
data_sources	Bundtzen and Laird, 1991
data_sources_method	Feature unmodified from source material
notes	<Null>
age_label	<Null>
age_type	<Null>
age_oldest	<Null>
age_youngest	<Null>
group_id	<Null>
modifier	<Null>
distribution_policy	internal use only
product_id	<Null>

Create Features

Templates   Favorites

- ∨ **contacts_and_faults**
  - — Contact, approximate
  - — Fault, high-angle, approximate
  - ⋯ Fault, high-angle, concealed
  - — Fault, strike-slip, left-lateral, approximate
  - ⋯ Fault, strike-slip, left-lateral, concealed
  - — Fault, strike-slip, right-lateral, approximate
  - ⋯ Fault, strike-slip, right-lateral, concealed
- ∨ **data_sources**
  - 🗐 data_sources
- ∨ **description_of_map_units**
  - 🗐 description_of_map_units
- ∨ **geochron_points**
  - ■ K-Ar age-date locality
- ∨ **geologic_lines**
  - — Bedding trends in Kus
- ∨ **geologic_points**
  - ● Geochemical sample locality at prospect or site of mineral occurrence
  - ✳ Glacial erratic locality
  - ● Major oxide sample locality
- ∨ **map_unit_lines**
  - ▬ TKda
  - ▬ TKdf
- ∨ **map_unit_points**
  - ● Ksl
  - ● Kus
  - ● MzPzvs
  - ○ Qa
  - ○ Qaf
  - ○ Qag
  - ○ Qas
  - ○ Qat

Create Features

←   **Active Template**

● Ksl

Enter attributes for features you are about to create.

map_unit_points_id	<Null>
map_unit	Ksl
symbol	6350
type	synthetic, generic
category	synthetic
label	Ksl
layer	-1
identity_confidence	unprovided
location_confidence_method	unprovided
location_confidence	unprovided
location_confidence_meters	997
is_concealed	no
draw_policy	yes
data_sources	Bundtzen and Laird, 1991
data_sources_method	Feature unmodified from source material
field_id	<Null>
notes	<Null>
group_id	<Null>
modifier	<Null>
dmu_guid	{F37A98D8-4E0A-4B92-A3B0-DE1D78F85F36}
stations_id	<Null>
distribution_policy	internal use only
product_id	<Null>

Online AGOL service shared for QC
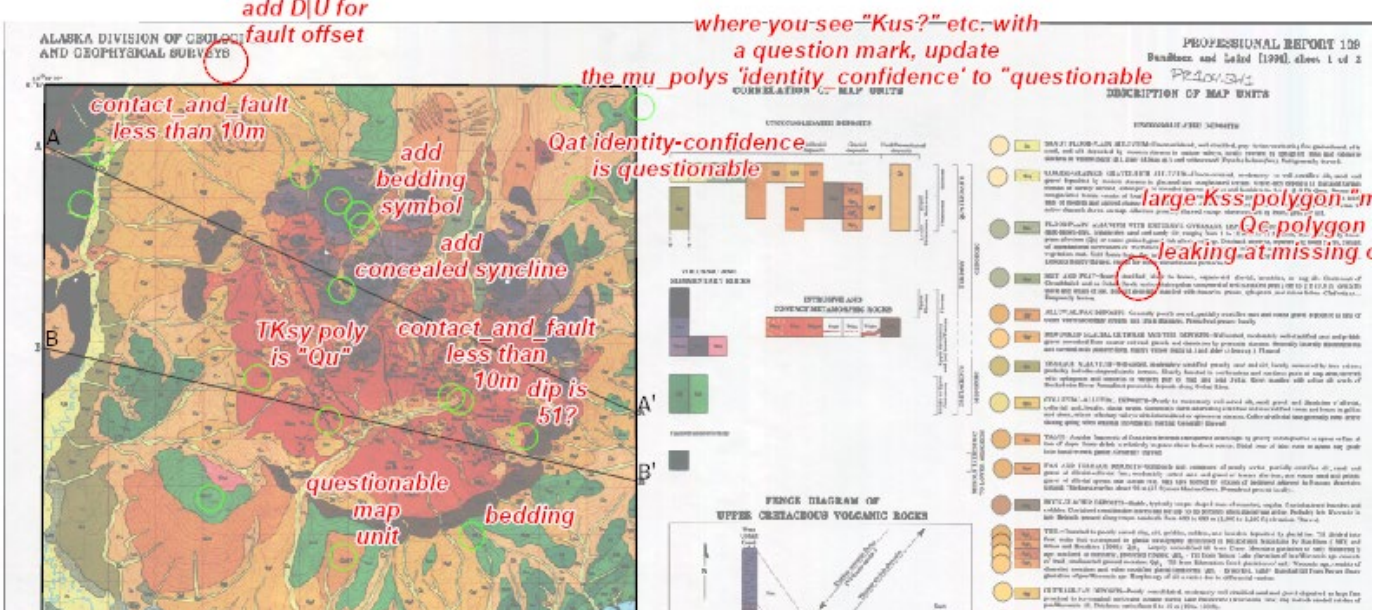
review_item_point - russian_mission_c1

Field	Value
OBJECTID	788
project	russian_mission_c1
issue	add 'label' to faults where you see them, i usually label all segments
Status	resolved
Review_Notes	<Null>
Producer_Notes	<Null>
General_Notes	<Null>
GlobalID	{9B8B9205-E707-42F7-8490-FD812BBA0678}
CreationDate	1/30/2025 3:42:46.425 PM
Creator	chris.wyatt@alaska.gov_SOA_DNR
EditDate	2/5/2025 6:48:47.896 PM
Editor	Lars.Arneson

Annotations on map:
- add D|U for fault offset
- where-you-see-"Kus?"-etc. with a question mark, update the mu_polys 'identity_confidence' to "questionable"
- contact_and_fault less than 10m
- add bedding symbol
- Qat identity-confidence is questionable
- large Kss polygon
- Qe polygon leaking at missing
- add concealed syncline
- TKsy poly is "Qu"
- contact_and_fault less than 10m dip is 51?
- questionable map unit
- bedding

Conclusion

- The Master Agreement has and will save us time

- The investment in time to prepare contractor packages that include rich attributed feature templates save time and money in the end.

- Having an expert Digitize the map's legend decreases confusion for the contractor and as a result saves money.