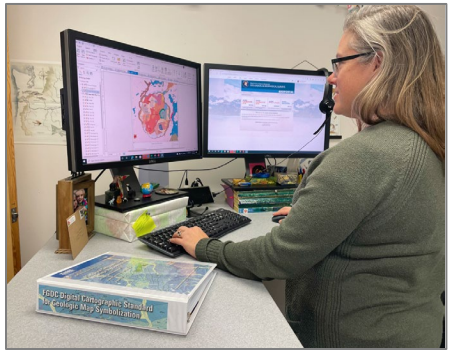
BUILDING A COMPREHENSIVE QA/QC PROCESS FOR AK DGGS GEOLOGIC MAPPING

How we incorporate QA/QC practices to ensure high quality geologic map data at Alaska DGGS

QA/ QC



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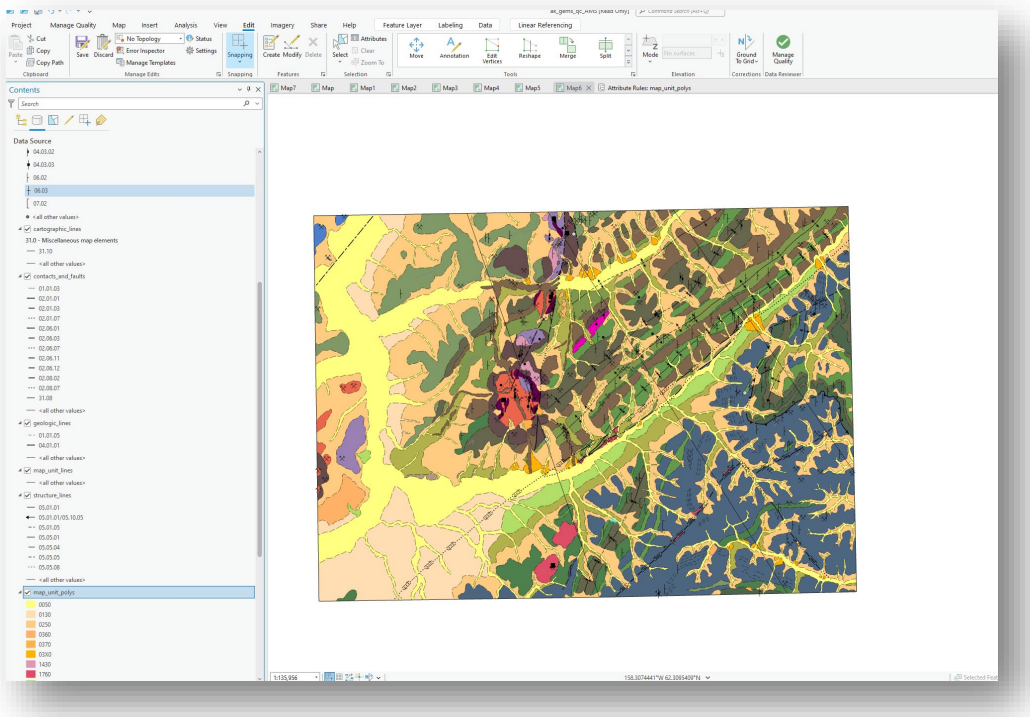
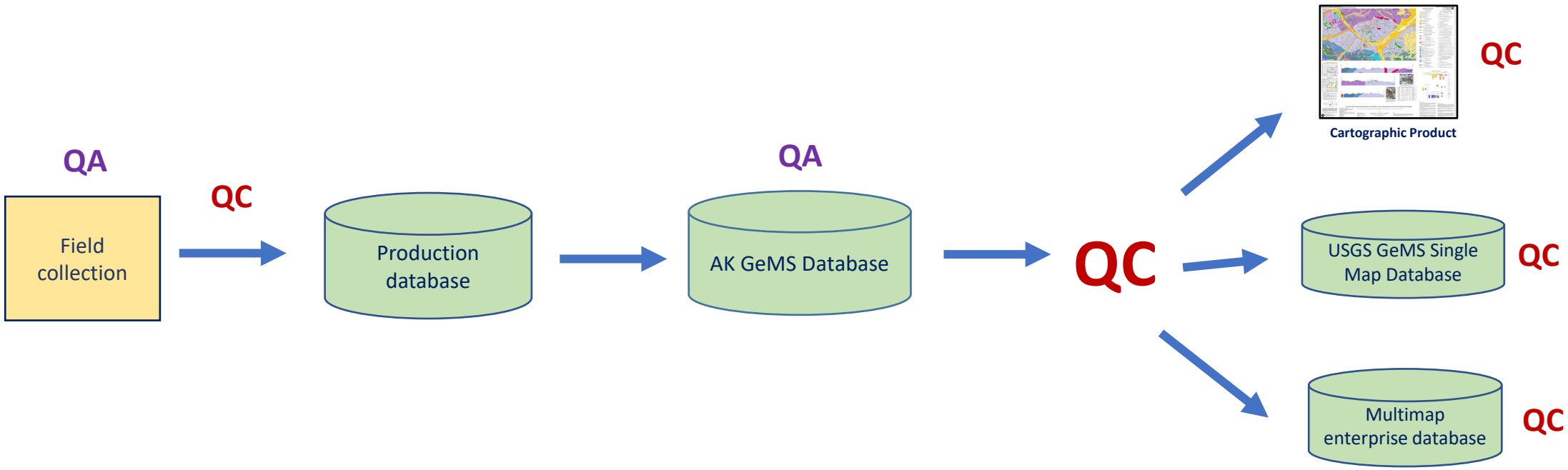
Agenda

- What does QA/QC mean?
- Current QA/QC process at DGGS
- Exciting future plans



Geospatial Data Quality Fundamentals

- **Quality Assurance**: Processes or methods to help prevent errors from being introduced in the data.
- **Quality Control**: Processes or tools to identify errors that are already in the data.



Some Causes of Data Quality Issues

Conceptualization errors

- Example: Raster Cell size issues
- Example: Vector representations of gradual change

Data Collection & Analysis Methods

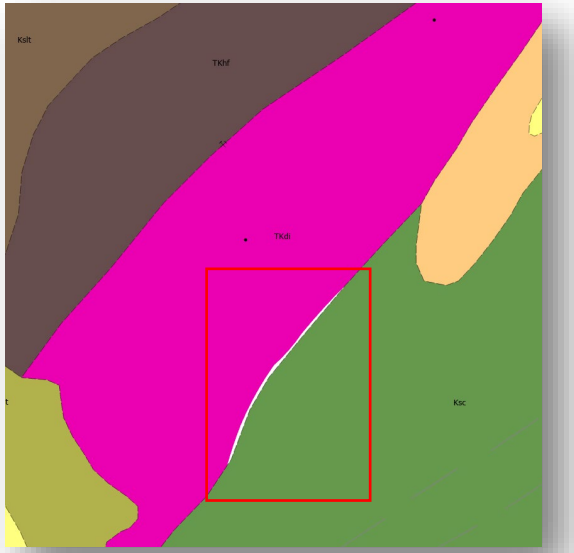
- Example: GPS errors
- Example: Digitizing errors
- Example: Process model errors
- Example: Age analysis

Human Error

- Example: Blunders – typed 01.01.10 instead of 01.01.01

Temporal

- Example: Old Data



Field: Add Calculate Selection: Select By Attributes Zoom To Switch Clear Delete Copy

	OBJECTID *	SHAPE *	contacts_and_faults_id	category	layer	type	symbol
1	1131	Polyline	{061E9470-02C3-4122-...	fault	0	fault, thrust	02.08.02
2	1212	Polyline	{C3902561-BAEB-4A39-...	fault	0	contact, other	02.08.02
3	1227	Polyline	{BAF52699-74E9-4B9B-...	fault	0	fault, thrust	02.08.07
4	1237	Polyline	{A5C47E79-3D71-4ADD...	fault	0	fault, thrust	02.08.07
5	1276	Polyline	{F9DDFA43-28D2-4030...	fault	0	fault, thrust	02.08.02
6	1278	Polyline	{23DF3518-329B-4857-...	fault	0	fault, thrust	02.08.07
7	1281	Polyline	{9CEB4251-D6D8-4452...	fault	0	fault, thrust	02.08.07

Fitness for Use vs. Data Quality

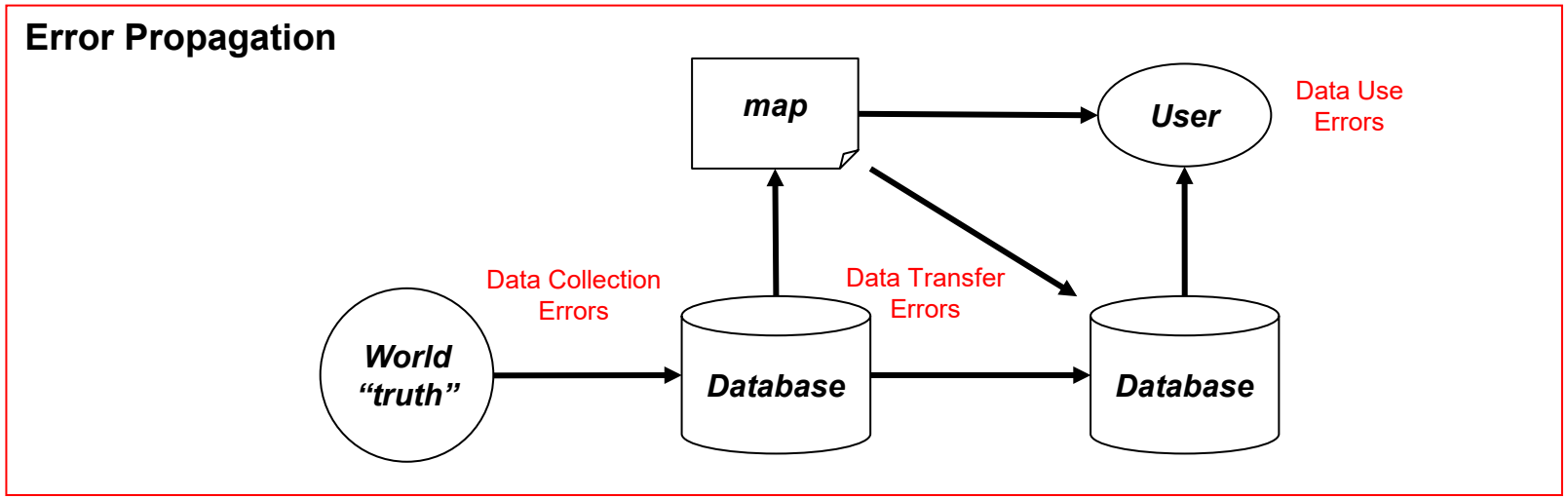
Fitness for Use: The ability of data to effectively be used for some intended purpose.

Data Quality: How faithfully the data represents the true (a) location, (b) shape, or (c) characteristics of the phenomena.

- *What level of data quality is required for a GeMS database to be fit for use? Not simple question*

Error Propagation

In GIS data processing, the persistence of an error into new datasets calculated or created using datasets & maps that originally contained errors. *The study of error propagation is concerned with the effects of combined and accumulated errors throughout a series of data processing operations.*



Quality Assurance/Quality Control (QA/QC) at AK DGGS

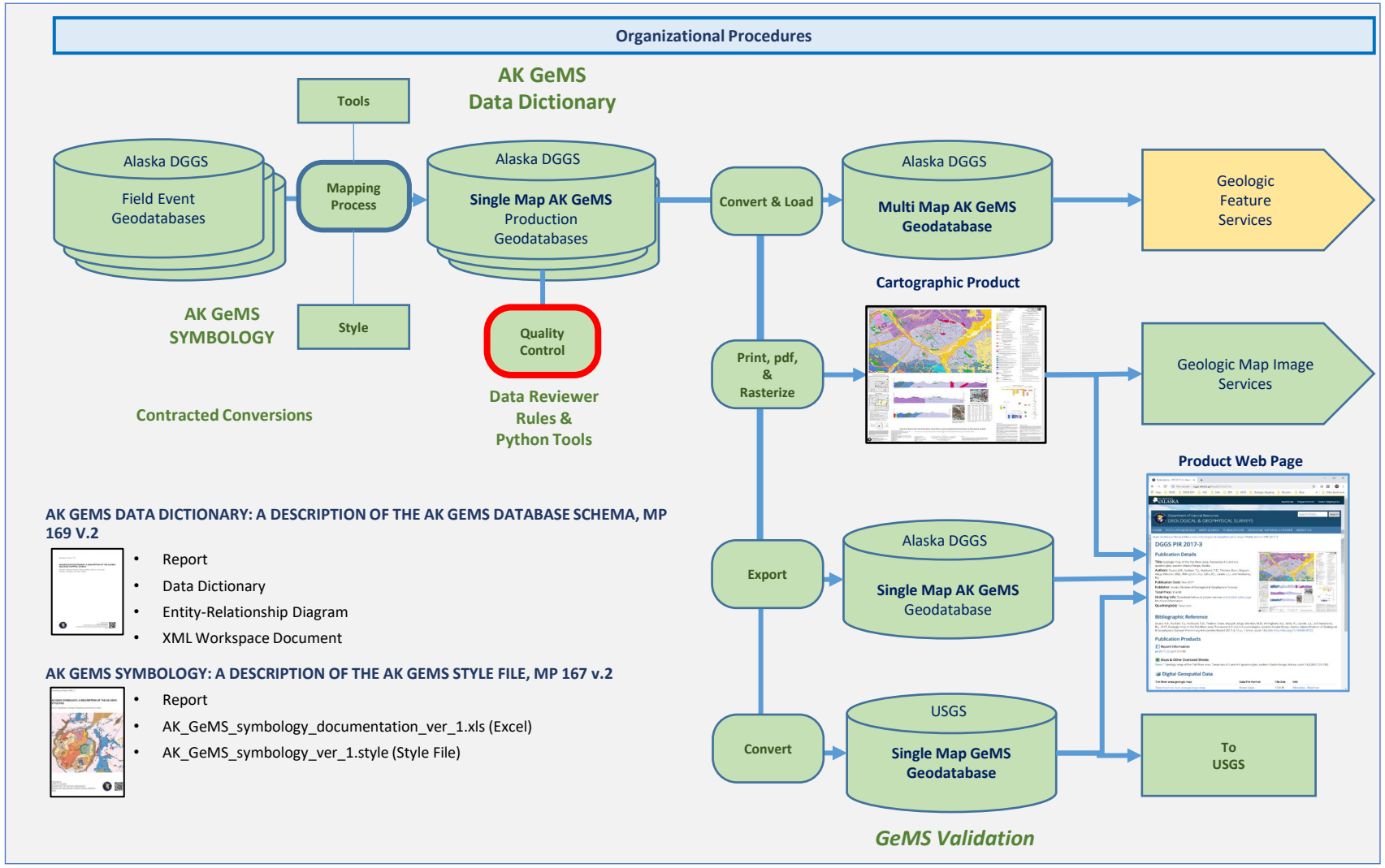
- The prevention and elimination of errors in data at every step of workflow (from collection of data to publication)
- Established and documented data quality standard at all phases of production
- Workflow is repeatable, automated, and adaptable

= consistent, accurate, and useable data

that meets the needs of intended audience

(accomplished through standardized schemas, domains, db rules, validation, custom tools, symbology, documentation, trainings)

Alaska DGGS Geologic Mapping System Components



AK GeMS QA/QC focused workflow phases

QA (*don't make mistakes*)

- Phase 2: Production
- Phases 5: Data Prep

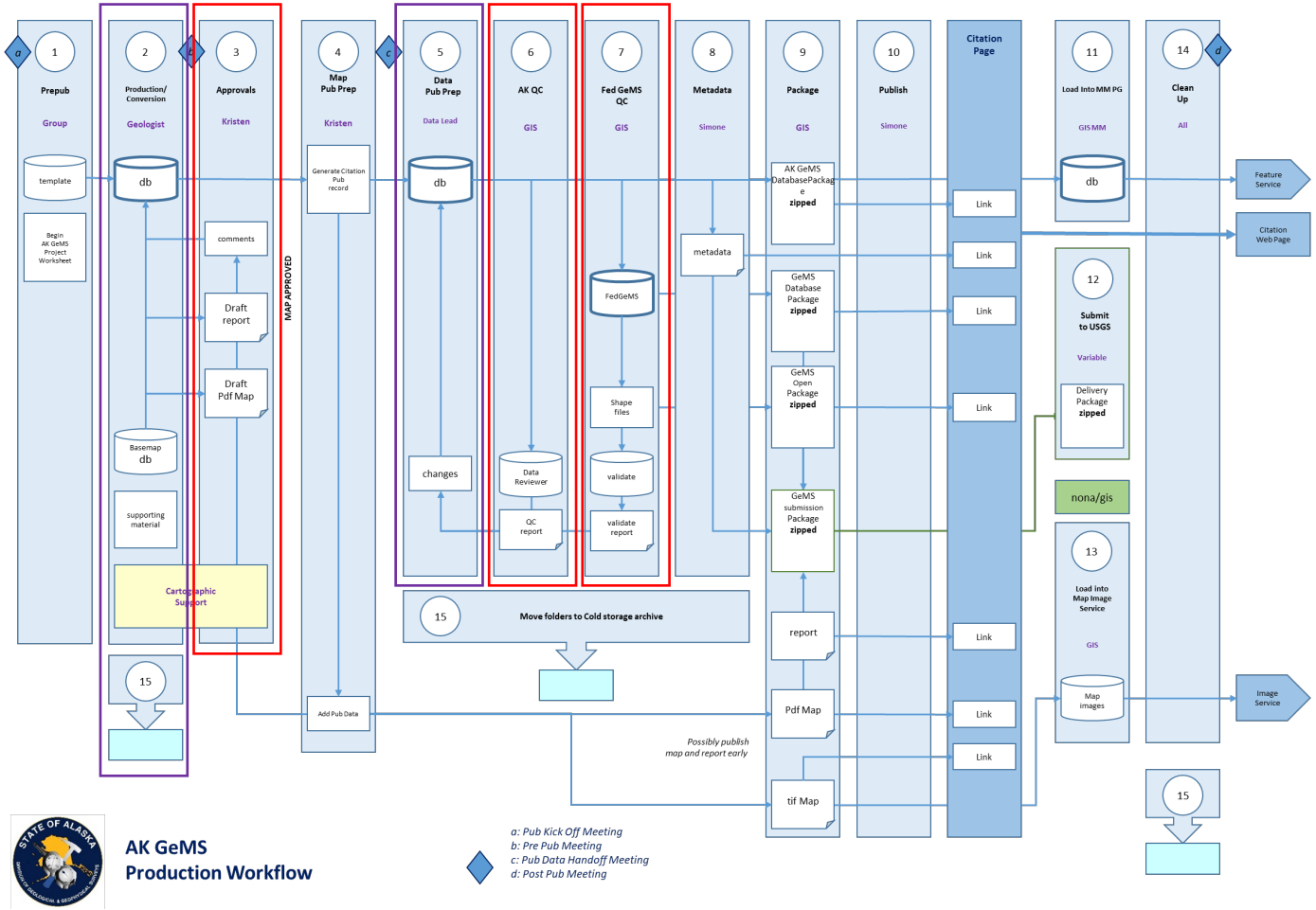
QC (*find mistakes*)

- Phase 3: Approvals
- Phases 6-7: GeMS QC

QA/QC Accomplished with:

- Data Reviewer
- Python Scripts
- Implementing Attribute Rules

AK GeMS Production Workflow

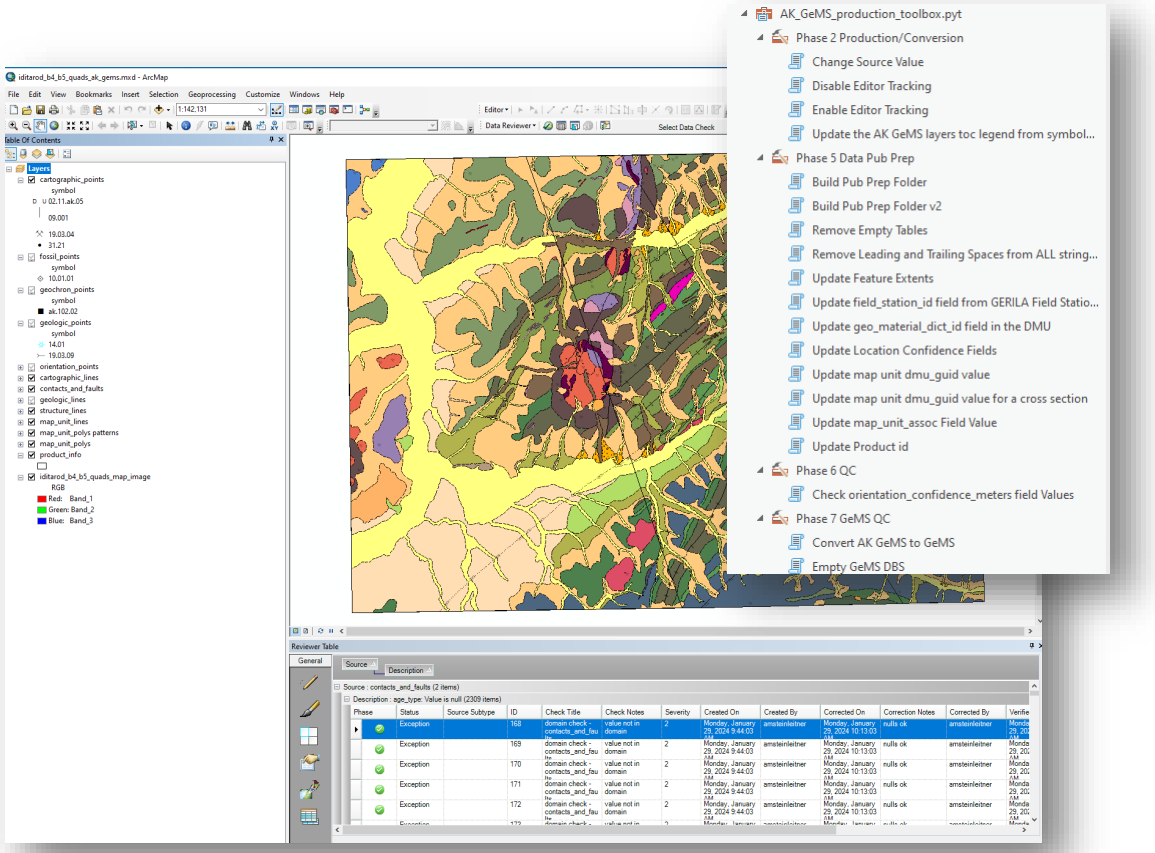


Currently leveraging Esri advantage Program credits to leverage Tasks and upgrade data reviewer processes to ArcPro 3.0

The Future of AK DGGS QA/QC

CURRENT:

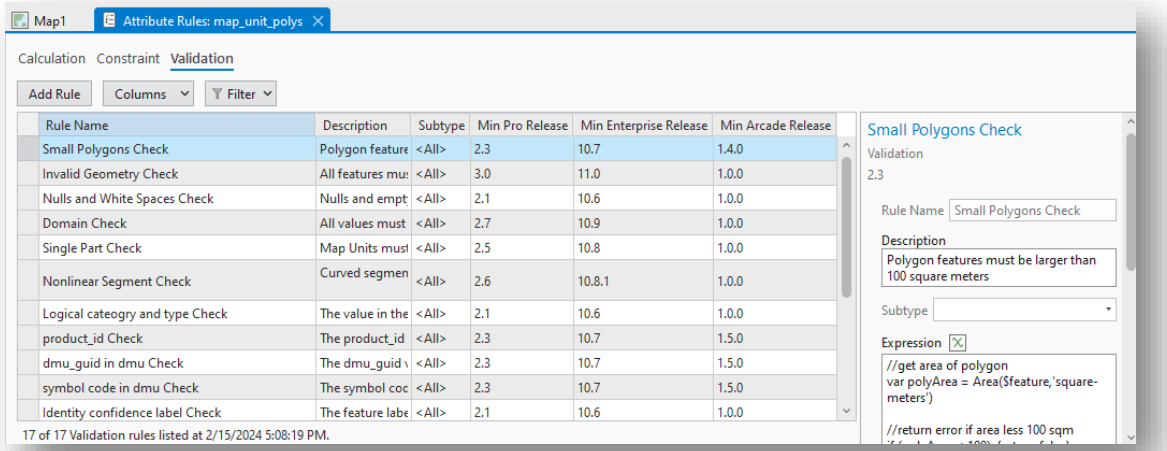
ArcGIS Data Reviewer Extension



FUTURE:

ArcPro Data Reviewer and Attribute Rules

- Constraint, Calculation, and Validation Rules
- Contingent Values
- Custom Python Tools



Current AK DGGS Rules List

Attribute Centric

- All values must meet database domain constraints
- The symbol code for a map unit must match that same map unit's symbol in the description_of_map_units table
- The feature label must match the correct value in the identity_confidence field and vice versa
- contacts_and_faults features must only be split when key attributes change
- map_units_polys features must only be split when key attributes change

Geometric Centric

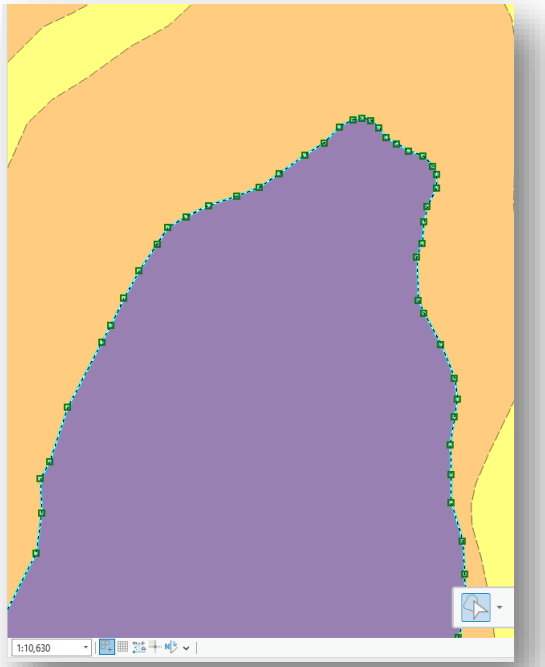
- All features must have valid geometries
- Line features must not self intersect
- contacts_and_faults and map_units must be single part features
- Curved segments for lines and polygons are not allowed
- Point feature classes that reference a station feature must be collated with that feature in the stations feature class
- contracts_and_faults must be on the boundary of map unit polygons
- Line features must be longer than 10 meters
- Polygon features must be larger than 100 square meters

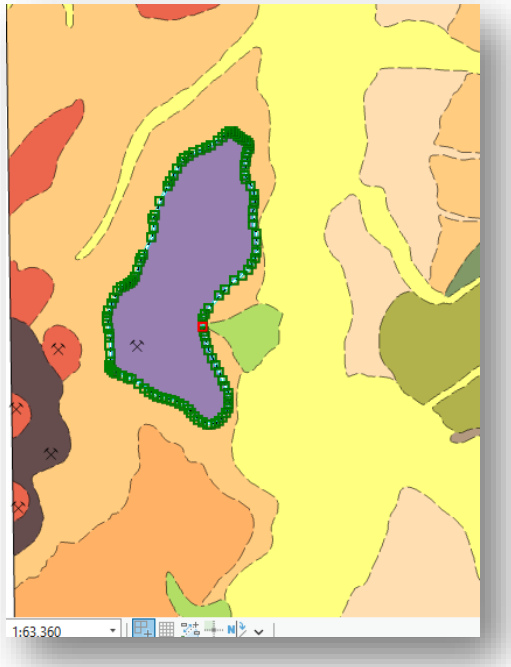
Additional Checks

- Check false Nulls, White space, carriage returns
- Report data_source_method field values used
- Check symbol is appropriate for attributes
- Report symbol field values not in style
- Check map unit abbreviations are correct
- Check map unit abbreviations is changed to proper code in label
- Check data_source value found in data_sources
- Check data_sources is found in GERILA (
- Check/report data_source records against the multimap data_sources_unique table
- Report layer values
- product_info equals contacts_and_faults where type equals boundary, map
- Check for valid RGB triplet and it matches the symbol color code for the map unit
- Check for valid geomaterial_dict_id value and is not Null
- Check symbol field is not null
- Check orientation point label and inclination values are logically consistent. If inclination is 0 or 90 label should be Null, otherwise label should equal inclination
- Check orientation point inclination value is consistent with symbol (ie 0 is horizontal, 90 is vertical)
- Check product_info polygon border is coincident with contact_and_faults type = “map, boundary”

Vertices Density

- Standardized range of vertices count
- Distance between vertices






```
total vertex count: 38001
average vertice spacing: 81.5 m

count of vertice spacings less than 25 m: 1156
percentage of total vertice spacings less than 25 m: 3.04%

errors:
features with vertices error: 475
percentage of total features: 20.57%
```

Python

Dependent on complexity and scale of map

Documentation

QA/QC User Guide

Questions?

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