

**Interim Digital Geologic-GIS Map of Arches National Park and Vicinity, Utah (NPS, GRD, GRI, ARCH, ARCH digital map) adapted from Utah Geological Survey Maps by (collectively) Doelling, Ross, Kuehne, Yonkee, Hand, Morgan and Mulvey (1994, 1997, 2000, 2002, 2013 and 2014)**

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## What does this data set describe?

### *Title:*

Interim Digital Geologic-GIS Map of Arches National Park and Vicinity, Utah (NPS, GRD, GRI, ARCH, ARCH digital map) adapted from Utah Geological Survey Maps by (collectively) Doelling, Ross, Kuehne, Yonkee, Hand, Morgan and Mulvey (1994, 1997, 2000, 2002, 2013 and 2014)

### *Abstract:*

The Interim Digital Geologic-GIS Map of Arches National Park and Vicinity, Utah is composed of GIS data layers and GIS tables, and is available in the following GRI-supported GIS data format: 1.) a 10.1 file geodatabase (arch\_geology.gdb). The file geodatabase format is supported with a 1.) ArcGIS Pro map file (.mapx) file (arch\_geology.mapx) and individual Pro layer (.lyrx) files (for each GIS data layer), as well as with a 2.) 10.1 ArcMap (.mxd) map document (arch\_geology.mxd) and individual 10.1 layer (.lyr) files (for each GIS data layer). Upon request, the GIS data is also available in ESRI 10.1 shapefile format. Contact Stephanie O'Meara (see contact information below) to acquire the GIS data in these GIS data formats. In addition to the GIS data and supporting GIS files, two additional files comprise a GRI digital geologic-GIS dataset or map: 1.) A GIS readme file (arch\_geology\_gis\_readme.pdf), and 2.) a user-friendly FAQ PDF version of the metadata (arch\_geology\_metadata\_faq.pdf). Please read the arch\_geology\_gis\_readme.pdf for information pertaining to the proper extraction of the GIS data and other map files. The data were completed as a component of the Geologic Resources Inventory (GRI) program, a National Park Service (NPS) Inventory and Monitoring (I&M) Division funded program that is administered by the NPS Geologic Resources Division (GRD). For a complete listing of GRI products visit the GRI publications webpage: For a complete listing of GRI products visit the GRI publications webpage: <https://www.nps.gov/subjects/geology/geologic-resources-inventory-products.htm>. For more information about the Geologic Resources Inventory Program visit the GRI webpage: <https://www.nps.gov/subjects/geology/gri.htm>. At the bottom of that webpage is a "Contact Us" link if you need additional information. You may also directly contact the program coordinator, Jason Kenworthy (jason\_kenworthy@nps.gov). Source geologic maps and data used to complete this GRI digital dataset were provided by the following: Utah Geological Survey. Detailed information concerning the sources used and their contribution the GRI product are listed in the Source Citation section(s) of this metadata record (arch\_geology\_metadata.txt or arch\_geology\_metadata\_faq.pdf). Users of this data are cautioned about the locational accuracy of features within this dataset. Based on the source map scale of 1:24,000 and United States National Map Accuracy Standards features are within (horizontally) 12.2 meters or 40 feet of their actual location as presented by this dataset. Users of this data should thus not assume the location of features is exactly where they are portrayed in ArcGIS or other software used to display this dataset. All GIS and ancillary tables were produced as per the NPS GRI Geology-GIS Geodatabase Data Model v. 2.3. (available at: <https://www.nps.gov/articles/gri-geodatabase-model.htm>).

### *Supplemental Information:*

The data layers (feature classes) that comprise the Interim Digital Geologic-GIS Map of Arches National Park and Vicinity, Utah include: Deformation Area Boundaries

(ARCHDEFA), Deformation Areas (ARCHDEF), Linear Joints (ARCHJLN), Linear Geologic Units (ARCHGLN), Geologic Line Features (ARCHGLF), Map Symbology (ARCHSYM), Hazard Point Features (ARCHHZP), Geologic Attitude Observation Localities (ARCHATD), Geologic Cross Section Lines (ARCHSEC), Structure Contour Lines, Base of Wingate Sandstone (JTrw) (ARCHCN1), Faults (ARCHFLT), Folds (ARCHFLD), Geologic Contacts (ARCHGLGA) and Geologic Units (ARCHGLG). In addition to the data layers, there are three GIS tables, the Geologic Unit Information Table (archunit) Table, the short-version of the Geologic Unit Information Table (archunit\_short) Table, and the Source Map Information Table (archmap) Table. Refer to the NPS GRI Geology-GIS Geodatabase Data Model v. 2.3 (available at: <https://www.nps.gov/articles/gri-geodatabase-model.htm>) for detailed data layer (feature class) and table specifications including attribute field parameters, definitions and domains, and implemented topology rules and relationship classes. The GIS data projection is NAD83, UTM Zone 12N.

**1. How should this data set be cited?**

National Park Service (NPS) Geologic Resources Inventory (GRI) program, 20211018, Interim Digital Geologic-GIS Map of Arches National Park and Vicinity, Utah (NPS, GRD, GRI, ARCH, ARCH digital map) adapted from Utah Geological Survey Maps by (collectively) Doelling, Ross, Kuehne, Yonkee, Hand, Morgan and Mulvey (1994, 1997, 2000, 2002, 2013 and 2014).

**2. What geographic area does the data set cover?**

*West\_Bounding\_Coordinate:* -109.750678689  
*East\_Bounding\_Coordinate:* -109.375671862  
*North\_Bounding\_Coordinate:* 38.8749799309  
*South\_Bounding\_Coordinate:* 38.4999830432

**3. What does it look like?**

**4. Does the data set describe conditions during a particular time period?**

*Calendar\_Date:* 18-Oct-2021  
*Currentness\_Reference:* ground condition

**5. What is the general form of this data set?**

*Geospatial\_Data\_Presentation\_Form:* map

**6. How does the data set represent geographic features?**

- a. **How are geographic features stored in the data set?**
- b. **What coordinate system is used to represent geographic features?**

*Grid\_Coordinate\_System\_Name:* Universal Transverse Mercator

*Universal\_Transverse\_Mercator:*  
*UTM\_Zone\_Number:* 12  
*Transverse\_Mercator:*  
*Scale\_Factor\_at\_Central\_Meridian:* 0.999600  
*Longitude\_of\_Central\_Meridian:* -111.0  
*Latitude\_of\_Projection\_Origin:* 0.000000  
*False\_Easting:* 500000.000000  
*False\_Northing:* 0.000000

Planar coordinates are encoded using coordinate pair  
Abscissae (x-coordinates) are specified to the nearest 0.000007  
Ordinates (y-coordinates) are specified to the nearest 0.000007  
Planar coordinates are specified in meters

The horizontal datum used is North American Datum of 1983.  
The ellipsoid used is Geodetic Reference System 80.  
The semi-major axis of the ellipsoid used is 6378137.000000.  
The flattening of the ellipsoid used is 1/298.257222.

## 7. **How does the data set describe geographic features?**

*Entity\_and\_Attribute\_Overview:*

Refer to the NPS GRI Geology-GIS Geodatabase Data Model v. 2.3 (available at: <https://www.nps.gov/articles/gri-geodatabase-model.htm>) for detailed feature class and table attribute field parameters, definitions and domains, and implemented relationship classes, as well as for implemented feature class topology rules.

*Entity\_and\_Attribute\_Detail\_Citation:*

NPS GRI Geology-GIS Geodatabase Data Model v. 2.3. (available at: <https://www.nps.gov/articles/gri-geodatabase-model.htm>)

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## **Who produced the data set?**

1. **Who are the originators of the data set?** (may include formal authors, digital compilers, and editors)
  - o National Park Service (NPS) Geologic Resources Inventory (GRI) program
2. **Who also contributed to the data set?**

James Winter, Stephanie O'Meara and James R. Chappell (Colorado State University)

3. **To whom should users address questions about the data?**

Stephanie O'Meara  
Colorado State University  
Research Associate, Geologist/GIS Specialist/Data Manager

1201 Oak Ridge Drive, Suite 200  
Fort Collins, Colorado 80525  
USA

(970) 491-6655 (voice)  
stephanie\_o'meara@partner.nps.gov

*Hours\_of\_Service:* 9:00 a.m. to 5:00 p.m. (MST), Monday - Friday

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## Why was the data set created?

The data are intended to assist NPS personnel in the protection and management of Arches National Park.

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## How was the data set created?

### 1. From what previous works were the data drawn?

#### **UGS Map 181** (source 1 of 7)

Doelling, H.H., Ross, M.L., and Mulvey, W.E., 2002, Geologic Map of the Moab 7.5' Quadrangle, Grand County, Utah: Map 181, Utah Geological Survey (UGS), Salt Lake City, Utah.

*Type\_of\_Source\_Media:* digital data and image

*Source\_Scale\_Denominator:* 24000

*Source\_Contribution:*

Geologic features were derived from source digital data. In addition, geologic features not present with the digital data were digitized using a TIF image of the source map georeferenced in NAD83 UTM. The source map image was also used to attribute features, as well as to check (QC) line quality, both positionally and spatially, and feature attribution.

#### **UGS Map 178** (source 2 of 7)

Doelling, H.H., and Morgan, C.D., 2000, Geologic Map of the Merrimac Butte Quadrangle, Grand County, Utah: Map 178, Utah Geological Survey (UGS), Salt Lake City, Utah.

*Type\_of\_Source\_Media:* digital image

*Source\_Scale\_Denominator:* 24000

*Source\_Contribution:*

Geologic features present on the source map were digitized using a .TIF image of the map georeferenced in NAD83 UTM. The source map image was also used to attribute features, as well as to check (QC) line quality, both positionally and spatially, and feature attribution.

#### **UGS Map 258DM** (source 3 of 7)

Doelling, H.H., and Kuehne, P.A., 2013, Geologic Map of the Klondike Bluffs Quadrangle, Grand County, Utah: Map 258DM, Utah Geological Survey (UGS), Salt Lake City, Utah.

*Type\_of\_Source\_Media:* digital data and image

*Source\_Scale\_Denominator:* 24000

*Source\_Contribution:*

Geologic features were derived from source digital data. In addition, geologic features not present with the digital data were digitized using a TIF image of the source map georeferenced in NAD83 UTM. The source map image was also used to attribute features, as well as to check (QC) line quality, both positionally and spatially, and feature attribution.

**UGS Map 259DM** (source 4 of 7)

Doelling, H.H., and Kuehne, P.A., 2014, Geologic Map of the Mollie Hogans Quadrangle, Grand County, Utah: Map 259DM, Utah Geological Survey (UGS), Salt Lake City, Utah.

*Type\_of\_Source\_Media:* digital data and image

*Source\_Scale\_Denominator:* 24000

*Source\_Contribution:*

Geologic features were derived from source digital data. In addition, geologic features not present with the digital data were digitized using a TIF image of the source map georeferenced in NAD83 UTM. The source map image was also used to attribute features, as well as to check (QC) line quality, both positionally and spatially, and feature attribution.

**UGS Map 260DM** (source 5 of 7)

Doelling, H.H., and Kuehne, P.A., 2013, Geologic Map of The Windows Section Quadrangle, Grand County, Utah: Map 260DM, Utah Geological Survey (UGS), Salt Lake City, Utah.

*Type\_of\_Source\_Media:* digital data and image

*Source\_Scale\_Denominator:* 24000

*Source\_Contribution:*

Geologic features were derived from source digital data. In addition, geologic features not present with the digital data were digitized using a TIF image of the source map georeferenced in NAD83 UTM. The source map image was also used to attribute features, as well as to check (QC) line quality, both positionally and spatially, and feature attribution.

**UGS Map 155** (source 6 of 7)

Doelling, H.H., Yonkee, W.A., and Hand, J.S., 1994, Geologic Map of the Gold Bar Canyon Quadrangle, Grand County, Utah: Map 155, Utah Geological Survey (UGS), Salt Lake City, Utah.

*Type\_of\_Source\_Media:* digital image

*Source\_Scale\_Denominator:* 24000

*Source\_Contribution:*

Geologic features present on the source map were digitized using a .TIF image of the map georeferenced in NAD83 UTM. The source map image was also used to attribute

features, as well as to check (QC) line quality, both positionally and spatially, and feature attribution.

**UGS Map 171** (source 7 of 7)

Doelling, H.H., and Ross, M.L., 1997, Geologic Map of the Big Bend Quadrangle, Grand County, Utah: Map 171, Utah Geological Survey (UGS), Salt Lake City, Utah.

*Type\_of\_Source\_Media:* digital image

*Source\_Scale\_Denominator:* 24000

*Source\_Contribution:*

Geologic features present on the source map were digitized using a .TIF image of the map georeferenced in NAD83 UTM. The source map image was also used to attribute features, as well as to check (QC) line quality, both positionally and spatially, and feature attribution.

**2. How were the data generated, processed, and modified?**

Date: 18-Oct-2021 (process 1 of 1)

1.) GIS features were produced from source digital data or digitized from a source map. See the Source Information Contribution section(s) for specific source map details. GIS features converted from source digital data were imported into a GRI data model compliant geodatabase. For details on the GRI data model see the NPS GRI Geology-GIS Geodatabase Data Model v. 2.3 (available at: <https://www.nps.gov/articles/gri-geodatabase-model.htm>). GIS features captured from a source map were digitized from a TIF image of the map georeferenced in NAD83 UTM. 2.) Line quality of digitized features was checked against the source scan to ensure that GIS features were represented accurately, both positionally and spatially. Line quality of digital data was checked and if warranted edited to ensure good quality linework. 3.) Feature attribution was derived for all features using the source data attribution and the source printed/plotted map if available. 4.) Data Model topology rules were validated on all features and any topology errors corrected. 5.) Quality control (QC) consisted of checking features and their attribution against the source digital data, as well as against the source printed/plotted map if available. A GRI developed ArcObjects tool was run to check for GRI data model validation and feature-related consistency. 6.) The UNIT and MAP tables were populated and checked against the source(s). Relationship classes were also added and used to ensure attribution consistency between feature class and table attribution. 7.) Feature symbology was produced for all feature classes. An attempt was made to best match symbology to its source map, however, in some cases features symbology maybe slightly modified, primarily based on the limitations of the ArcGIS geology styles. In some cases, however, symbology may have been modified to reconcile differences from multiple sources. 8.) An ArcMap Document and ArcGIS Pro map file was produced, as well as layer (.lyr and .lyrx) files saved for all data layers.

Person who carried out this activity:

James Winter  
Colorado State University

Research Associate, Geologist/GIS Specialist  
1201 Oak Ridge Drive, Suite 200  
Fort Collins, Colorado 80525-5589  
USA

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james.winter@partner.nps.gov

*Hours\_of\_Service:* 9:00 a.m. to 5:00 p.m. (MST), Monday - Friday

Data sources used in this process:

- UGS Map 181, UGS Map 178, UGS Map 258DM, UGS Map 259DM, UGS Map 260DM, UGS Map 155 and UGS Map 171
3. **What similar or related data should the user be aware of?**

National Park Service Geologic Resources Inventory (GRI) program, 20211018, Metadata for the Interim Digital Geologic-GIS Map of Arches National Park and Vicinity, Utah (NPS, GRD, GRI, ARCH, ARCH digital map).

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## **How reliable are the data; what problems remain in the data set?**

1. **How well have the observations been checked?**

Feature and table attribution was derived and checked with the source map(s). Attribution was checked (QCd) for errors. Users of this data are advised to FULLY and CAREFULLY READ the "DISTRIBUTION LIABILITY" section of this metadata before using the data.

2. **How accurate are the geographic locations?**

Data was produced from digital source data and digitized from a georeferenced source map .TIF image(s) (300dpi). Users of this data are cautioned about the locational accuracy of features within this dataset. Based on the source map scale and United States National Map Accuracy Standards features are within (horizontally) 12.2 meters or 40 feet of their actual location as presented by this dataset. Users of this data should thus not assume the location of features is exactly where they portrayed are in ArcGIS or other software used to display this dataset. The PRECISION of any Shapefile (.shp) files is DOUBLE. The maximum root mean square (RMS) horizontal accuracy of the georeferenced image as measured in ArcMap is 2.3 meters. Coordinate tics on the georeferenced (registered and rectified) source map image(s) were checked against control points that had the exact specified coordinates of the tic. The direct distance between the image tic and its control point were measured. All measured distances were less than 50% of the required distance to meet National Map Accuracy Standards (1/50th



of an inch for maps at 1:20,000 scale and smaller). Features were checked (QCd) after digitizing for positional accuracy errors using the georeferenced source map image.

3. **How accurate are the heights or depths?**
4. **Where are the gaps in the data? What is missing?**

All data is considered complete to the extent of the source map(s).

5. **How consistent are the relationships among the observations, including topology?**

GIS data in 10.1 file geodatabase file format.

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## **How can someone get a copy of the data set?**

### **Are there legal restrictions on access or use of the data?**

*Access\_Constraints:* None

*Use\_Constraints:*

Not for use at scale greater than 1:24,000 (source map scale). Users of this data are cautioned about the locational accuracy of features within this dataset. Based on the source map scale and United States National Map Accuracy Standards features are within (horizontally) 12.2 meters or 40 feet of their actual location as presented by this dataset. Users of this data should thus not assume the location of features is exactly where they are portrayed in ArcGIS or other software used to display this dataset.

1. **Who distributes the data set?** (Distributor 1 of 1)

Stephanie O'Meara  
Colorado State University  
Research Associate, Geologist/GIS Specialist/Data Manager  
1201 Oak Ridge Drive, Suite 200  
Fort Collins, Colorado 80525  
USA

(970) 491-6655 (voice)  
stephanie\_o'meara@partner.nps.gov

*Hours\_of\_Service:* 8:00 a.m. to 4:00 p.m. (MST), Monday - Friday

*Contact\_Instructions:*

GRI data are available at: <http://irma.nps.gov/App/Reference/Search>

2. **What's the catalog number I need to order this data set?**

GIS map data available in several GRI-supported GIS data formats

### 3. What legal disclaimers am I supposed to read?

The National Park Service shall not be held liable for improper or incorrect use of the data described and/or contained herein. These data and related graphics are not legal documents and are not intended to be used as such.

The information contained in these data is dynamic and may change over time. The data are not better than the original sources from which they were derived. It is the responsibility of the data user to use the data appropriately and consistent within the limitations of geospatial data in general and these data in particular. The related graphics are intended to aid the data user in acquiring relevant data; it is not appropriate to use the related graphics as data.

The National Park Service gives no warranty, expressed or implied, as to the accuracy, reliability, or completeness of these data. It is strongly recommended that these data are directly acquired from an NPS server and not indirectly through other sources which may have changed the data in some way. Although these data have been processed successfully on a computer system at the National Park Service, no warranty, expressed or implied is made regarding the utility of the data on another system or for general scientific purposes, nor shall the act of distribution constitute any such warranty. This disclaimer applies to both to individual use of the data and aggregate use with other data.

### 4. How can I download or order the data?

- **Availability in digital form:**

**Data format:** GDB (version ArcGIS Pro 2.4) GIS (file geodatabase format) data package with a Pro map (.mapx) file (arch\_geology\_gdb\_pro.zip) Size: 7.2

**Network links:** NPS Data Store, <https://irma.nps.gov/DataStore/>

**Data format:** GDB (version ArcGIS 10.1) GIS (file geodatabase format) data package with an ArcMap map document (.mxd) file (arch\_geology\_gdb.zip) Size: 7.23

**Network links:** NPS Data Store, <https://irma.nps.gov/DataStore/>

**Data format:** PDF (version 9) GIS Readme Document Size: 0.1

**Network links:** NPS Data Store, <https://irma.nps.gov/DataStore/>

**Data format:** PDF (version 9) FAQ Metadata File Size: 0.1

**Network links:** NPS Data Store, <https://irma.nps.gov/DataStore/>

- **Cost to order the data:** None
- **Special instructions:**

Search for the GRI map, then download the GRI data at:  
<https://irma.nps.gov/DataStore/>

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## Who wrote the metadata?

Dates:

Last modified: 18-Oct-2021

Metadata author:

Stephanie O'Meara  
Colorado State University  
Research Associate, Geologist/GIS Specialist/Data Manager  
1201 Oak Ridge Drive, Suite 200  
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[stephanie.omeara@colostate.edu](mailto:stephanie.omeara@colostate.edu)

*Hours\_of\_Service:* 9:00 a.m. to 5:00 p.m. (MST), Monday - Friday

Metadata standard:

FGDC Content Standards for Digital Geospatial Metadata (FGDC-STD-001-1998)

Metadata extensions used:

- <http://www.fgdc.gov/standards/>

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