**THE GREYEDGE GROUP**

**MEMORANDUM**

To: Cary Smith

 Matt Garlick

From: Rich White

Date: 8 Nov 2023

Subject: Summary of anticipated hydrogeologic conditions,

 Carbondale, CO drill site

**Geology and Drillability**

It is my understanding that one test hole will be drilled in Carbondale, CO at the following approximate location:

 Latitude: 39.396165 North

 Longitude: 107.210929 West

Based on descriptions provided by Kirkham and Widmann (2008), I anticipate the following subsurface conditions at this location:

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| Thickness (ft) | Formation |
|  40-50 | Younger Terrace Alluvium (late Pleistocene): Mostly poorly sorted, clast-supported, locally bouldery, pebble and cobble gravel in a sand and silt matrix. Depositedas glacial outwash. May include fine-grained overbank deposits. |
| >3500 | Eagle Valley Evaporite (Middle Pennsylvanian): Evaporitic sequence of massive to laminated gypsum, anhydrite, and halite interbedded with marine mudstone, fine-grained sandstone, thin carbonate beds, and black shale. Commonly intensely folded, faulted, and ductily deformed. |

A number of water wells have been drilled in the general vicinity. These are all shallow (less than 100 feet deep), typically completed in the alluvium, and yield relatively small quantities of water (generally less than 20 gallons per minute).

Evaporitic bedrock can flow under certain pressures and temperatures (hence, the above description that these materials can be “intensely folded, faulted, and ductily deformed”). In addition, this type of bedrock can dissolve in the presence of fresh water, thereby creating voids.

Given the coarse-grained surficial materials and the underlying evaporites, I anticipate that drilling could present some challenges. The site is located about 2000 feet east of the Cattle Creek Anticline (the bottom of a geologic trough) which may indicate that the evaporites beneath the site have fractured, thus increasing the potential for voids to have formed by dissolution. A well-maintained mud program will likely be sufficient to address these issues unless large voids are encountered in the Eagle Valley Evaporite (which I do not anticipate but which also cannot be discounted).

**Groundwater Availability**

The Town of Carbondale obtains its drinking water from two surface water sources and from wells completed in the alluvium of the nearby Roaring Fork River (located about 1.1 miles northeast of the project site) and the Crystal River (located about 0.4 mile southwest of the project site). As noted above, wells completed in the terrace alluvium yield small quantities of groundwater (less than 20 gpm).

I have found no reports of appreciable groundwater in the Eagle Valley Evaporite near Carbondale. However, large quantities of warm, saline groundwater flow through the Eagle Valley Evaporite at Glenwood Springs about 12 miles northwest of Carbondale.

**References**

Kirkham, R.M. and B.L. Widmann. 2008. Geologic Map of the Carbondale Quadrangle, Garfield County, Colorado. Map Series 36. Colorado Geological Survey. Denver, Colorado.