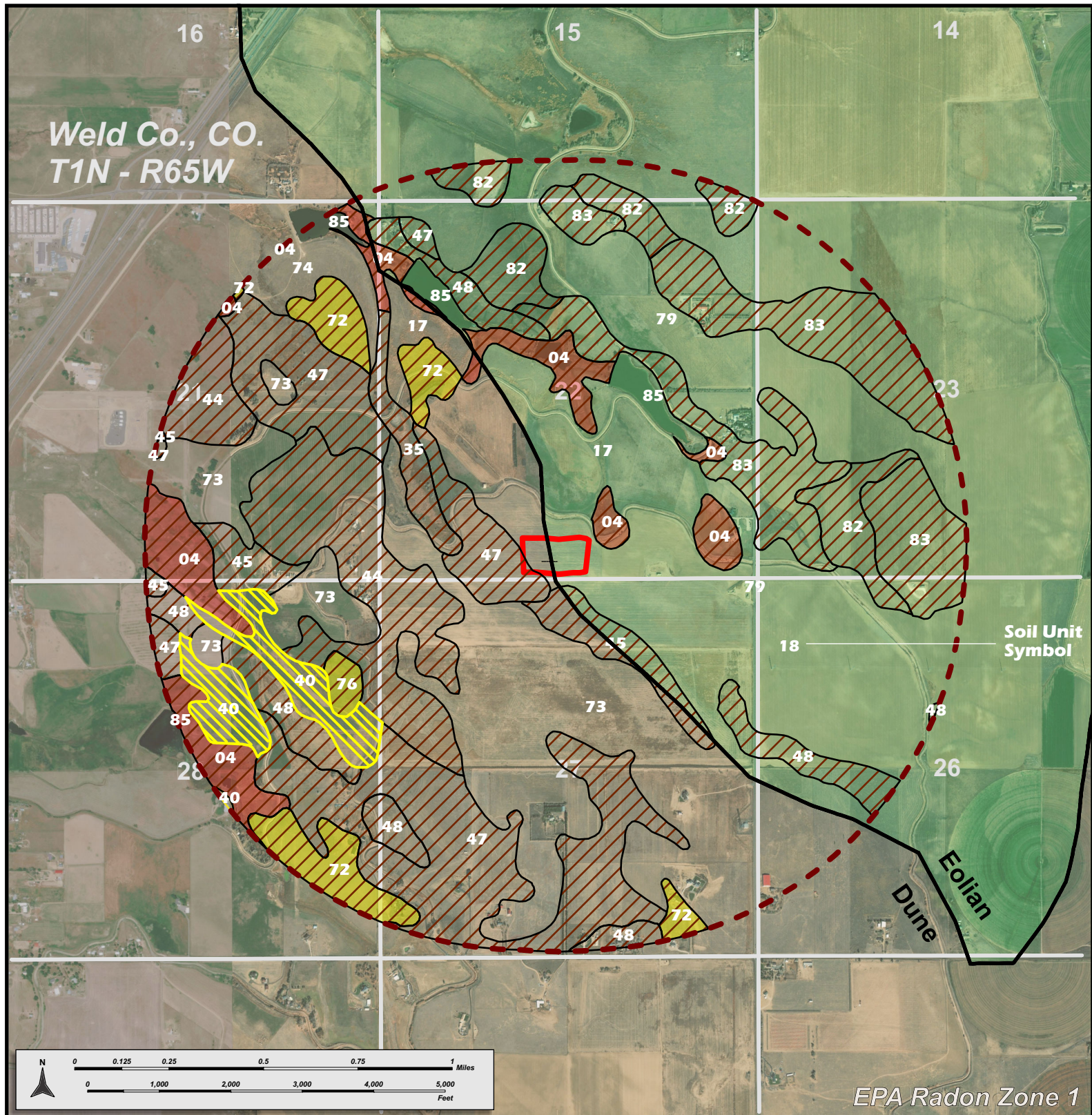


# FAWN 2734-2833 PAD GEOLOGIC HAZARD MAP



Drawn by:  
**VG**

Checked by:  
**WKR**

Drawing Date:  
**01-26-22**

**Data Source:**  
Esri, Maxar, GeoEye, AeroGRID,  
Earthstar Geographics,  
CIG Services Mines  
CNES/Airbus DS, USDA, USGS,  
IGN, GIS User Community

Site Name:  
**FAWN 2734-2833**

Surface Location:  
**SEC 22, T 1-N, R 65-W  
Weld County, Colorado**

Map area is within:  
**EPA Radon Zone 1**

**Legend:**

5280' Radius from WPS

Working Pad Surface

## Collapsible Soils:

- EG-14 Dune and sheet sand deposits
- EG-14 Eolian (wind-blown) deposit

EG-14 Cretaceous and Tertiary Formations  
Covers Entire Map Area

**Landslide:**  
Not Present

**Coal Mines:**  
Not Present

**Floodplain:**  
Not Present

## Corrosion of Concrete

Soil Unit Symbol #	Soil Rating
	<b>High</b>
04	Moderate
	<b>Moderate</b>
72, 76	Moderate

## Corrosion of Steel

Soil Unit Symbol #	Soil Rating
	<b>High</b>
04, 35, 44, 45 47, 48, 72 76, 82, 83	High
	<b>Moderate</b>
40	Moderate



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All other soil unit numbers low or not rated



**Geologic Hazards Summary for Fawn 2734 & Fawn 2833**

Location: S ½ S ½ Section 22, T1N-R65W 6th P.M.

Summary:

My name is Kurt Rucker, and I am currently employed as Senior Geologist for Verdad Resources LLC ("Verdad"). I certify that I am a Professional Geologist, satisfying the requirements of C.R.S. 23-41-208 (b). The matters described herein were devised under my direction and control. To the best of my knowledge and belief, all the matters set forth herein, my testimony and the supporting exhibits, are true, correct, and accurate.

Based on this review of available geologic data comprised of experience, measurements, and published reports, I determine that the following hazards are present at the proposed location: soil corrosion of concrete[1], soil corrosion of steel[1], collapsible soils[9], and Radon (NORM)[4]. Other hazards examined, but absent at the proposed location are landslides[1,2], expansive soils[1], flooding[3], NORM & TENORM[5], induced seismicity[6], natural rate seismicity[7], and coal mine subsidence[8]. A map summary of these findings is attached.

Corrosion to concrete is identified as a potential in the vicinity of the proposed location. The concrete on location will serve as a combustor base. Considering the soil composition, and Verdad's facility design and management, I determine the soil corrosion to concrete hazard is insignificant.

Corrosion to steel is identified as a potential hazard in vicinity of the proposed location. No steel at the proposed location will be exposed to the soil because 1) all steel equipment on location will have impervious liners, 2) steel flowlines will have protective lining, and 3) imported gravel or road base will separate the natural soil from steel. Considering the primary soil on the location, and facility design and management, I determine the steel corrosion hazard from soil at the proposed location is insignificant.

Collapsible soils are identified as a potential hazard. Prior to construction at the proposed location, topsoil is removed. During the cut and fill process, the ground is wetted and compacted. A cap of about 4-6" of road base pee gravel provides additional protection from differential compaction. The grade and ditches promote flow off of the proposed location to further mitigate the risk of water saturating soils. Considering the soil composition, and Verdad's facility design and management, I determine the collapsible soil hazard is insignificant.

Radon hazard is identified as a potential geo hazard on the map. However, there are no inhabited structures, or structures occupied throughout the working day, planned at the location. Considering the EPA radon zone, and the lack of inhabited structures, the radon hazard at the proposed location, I determine the radon hazard at the proposed location is insignificant.

Based on this review of available geologic data comprised of experience, measurements, and published reports, I determine that there are no known geologic hazards of significance at the proposed location.



Kurt Rucker

## References:

- [1] Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture. Web Soil Survey. Available online at the following link: <http://websoilsurvey.sc.egov.usda.gov/>. Accessed[01/25/2022].
- [2] Colorado Landslide Inventory. Colorado Geologic Survey, 25 January 2022.  
<https://www.arcgis.com/apps/webappviewer/index.html?id=9dd73db7fbc34139abe51599396e2648>
- [3] FEMA's National Flood Hazard Layer (NFHL) Viewer. Federal Emergency Management Agency Hazard and Risk Information Platform, January 25, 2022,  
<https://www.arcgis.com/apps/webappviewer/index.html?id=8b0adb51996444d4879338b5529aa9cd>
- [4] Environmental Protection Agency. (1993) EPA's Map of radon zones Colorado (Report No. EPA/402 R 93 026). U.S. Environmental Protection Agency. <https://nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=000005WN.txt>.
- [5] Colorado Oil and Gas Conservation Commission. (2014). Analysis of Naturally Occurring Radioactive Materials in Drill Cuttings, Greater Wattenberg Field, Weld County, Colorado (COGCC Special Project 2136).
- [6] Petersen, M.D., Mueller, C.S., Moschetti, M.P., Hoover, S.M., Rukstales, K.S., McNamara, D.E., Williams, R.A., Shumway, A.M., Powers, P.M., Earle, P.S., Llenos, A.L., Michael, A.J., Rubinstein, J.L., Norbeck, J.H., and Cochran, E.S., 2018, 2018 One Year Seismic Hazard Forecast for the Central and Eastern United States from Induced and Natural Earthquakes: Seismological Research Letters, Volume 89, Number 3.
- [7] "Unified Hazard Tool". USGS, 25 January 2022, <https://earthquake.usgs.gov/hazards/interactive/>.
- [8] Colorado Historical Coal Mines. Colorado Geologic Survey, 25 August 2022.  
<https://www.arcgis.com/apps/webappviewer/index.html?id=1891e3149eda44af9dc8af81c4dc58a8>.
- [9] White, Jonathan L., and Celia Greenman. "EG-14 Collapsible Soils in Colorado." Soil Engineering. Environmental Geology. Denver, CO: Colorado Geological Survey, Department of Natural Resources, 2008.  
<https://coloradogeologicalsurvey.org/publications/collapsible-soils-colorado/>.