*NWSW of Section 23*
*Township 2 South, Range 99 West 6th P.M.*

N

0 575 1,150 2,300 Feet

1 in : 1,150 ft

5280'

2S 99W

FEDERAL 299-23-3

FEDERAL 299-23-2

FEDERAL 299-23-1

FEDERAL 299-22-1

FEDERAL 299-27-6

FEDERAL 299-27-2

FEDERAL 299-26-2

FEDERAL 299-27-5

FEDERAL 299-26-1

FEDERAL 299-27-1

CR 68

DILLON SHELTER (CR 70)

Windmill 6777

Spring 6748

Draw

Springs

Stake

Gulch

DITCH

**Legend**

- Existing O&G Location
- Proposed Working Pad Surface
- Existing Access Road
- County or Municipal Road
- One Mile Buffer

Notes:
1) Please see the attached Geologic Hazard Report for a detail description of the geologic hazards reviewed for this Oil and Gas Loca tion.

# Federal 299-23-3 Pad
# Geologic Hazards Map
# Exhibit GH-1

TEP ROCKY MOUNTAIN, LLC
Exhibit prepared by: AJT
Date prepared: July 14, 2021

TERRA ENERGY PARTNERS

Document Path: T:\Projects\Piceance\Ryan Gulch\Federal 299-23-3 Pad\2021 New Drill Injection Well Resubmittal\Federal 299-23-3 Injection Well Form 2A 304.b.(7).I Geologic Hazards Map.mxd

Colorado Oil & Gas Conservation Commission, Geologic Hazard Plan - Rules 304.b.(7).I and 304.c.(21)

TEP Rocky Mountain LLC

Federal 299-23-3 Injection Well Facility

Stephen Sunnenberg

I certify that I am a Professional Geologist, having met the educational requirements and professional work experience required by C.R.S. § 23-41-208(b). I have reviewed information pertaining to this Injection Well Facility and the surrounding area and have identified no Geologic Hazards within a 1 mile radius."

TEP Rocky Mountain LLC (TEP) has employed the services of Fox Engineering Solutions (FES) to provide a third-party evaluation of Geologic Hazards associated with our proposed Federal 299-23-3 Injection Well Facility. I have reviewed the attached documents and references prepared by FES and found them to be complete and accurate.

The COGCC references the Colorado Revised Statue (C.R.S.) § 24-65.1-103(8) definition of Geologic Hazard. C.R.S. 24-65.1-103(8) states: "Geologic Hazard" means a geologic phenomenon which is so adverse to past, current, or foreseeable construction or land use as to constitute a significant hazard to public health and safety or to property. The term includes but is not limited to:

a) Avalanches: The Pad site has a very low to no avalanche probability. (RBC)
b) Landslides: The facility site is not within a landslide area. (RBC & CGS)
c) Rockfalls: Rockfall is not a geologic hazard at this site. (RBC)
d) Mudflows: Mudflow and debris fans are not a geologic hazard at this site. (RBC)
e) Unstable or potentially unstable slopes: Unstable slopes are not a geologic hazard at this site. (NCRS)
f) Seismic effects: Seismic activity is not expected to impact the design or operations of this facility. (CGS)
g) Radioactivity: Radon is not expected to represent a geologic hazard at this facility.
h) Ground subsidence: Ground subsidence is not a geologic hazard at this site. (NCRS)

Rule 304.b.(7).I Geologic Hazard Map: A map identifying any Geologic Hazards within a 1 mile radius of the proposed Working Pad Surface. For any identified Geologic Hazard that extends beyond the 1 mile radius, a second map scaled to show the extent of that Hazard in relation to the proposed Oil and Gas Location.

- FES has prepared a map showing there are no Geologic hazards within a 1 mile radius. A second map is not necessary.

Rule 304.c.(21) Geologic Hazard Plan: If the Operator identifies any Geologic Hazards pursuant to Rule 304.b.(7).I, the Operator will submit a Geologic Hazard plan describing proposed mitigation measures.

- Neither FES nor TEP found any risk of "Geologic Hazard(s)"

Stephen Sunnenberg

Stephen Sunnenberg
Geologist

References:

RBC: Rio Blanco County Multi-Jurisdictional Hazard Mitigation Plan, 2019.
https://rbc.us/DocumentCenter/View/1947/1-Rio-Blanco-County-Upfront

NCRS: National Resources Conservation Service (2021). Web Soil Survey
https://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx

CGS: Colorado Geological Survey, (2021) Hazards. https://coloradogeologicalsurvey.org/hazards/

July 27, 2021

Stephen Sunnenberg
Chief Geologist
TEP Rocky Mountain LLC
3050 Post Oak Blvd., #1500
Houston, TX 77056

Re: Federal 299-23-3 Injection Well Facility
Geologic Hazards – COGCC 304.b.(7).I. and 304.c.(21)
NW ¼ SW ¼ Section 23, Township 2 South, Range 99 West, 6th P.M, Rio Blanco County, CO

Mr. Sunnenberg,

As requested, Fox Engineering Solutions ("FES") has prepared this report to address the requirements of Sections 304.b.(7).I. and 304.c.(21), of the Colorado Oil and Gas Conservation Commissions rules, effective January 15, 2021. It is FES's understanding that TEP Rocky Mountain is proposing to construct the Federal 299-23-3 Injection Well Facility along with the installation of associated injection well equipment.

COGCC Rule 304.b.(7).I. requires the Operator to submit a map identifying any geologic hazards within a 1 mile radius of the proposed working pad surface. For any identified geologic hazard that extends beyond the 1 mile radius, a second map scaled to show the extent of that hazard in relation to the proposed oil and gas location shall be submitted. If the Operator identifies any Geologic Hazards pursuant to Rule 304.b.(7).I, the Operator will submit a Geologic Hazard plan per Rule 304.c.(21) describing proposed mitigation measures.

This report summarizes FES's investigation into the geology and potential geologic hazards associated with the Federal 299-23-3 proposed injection well pad. The investigation included a review of available geologic maps and reports, Colorado Geologic Survey literature and mapping, Rio Blanco County's 2019 Multi-Jurisdictional Hazard Mitigation Plan, and data from the National Resource Conservation Service's ("NRCS") Customized Soil report. Additionally, FES performed a field reconnaissance of the Facility site on June 23, 2021.

Location and Topography

The Federal 299-23-3 proposed injection well facility ("Facility") will be located near the top of a wide ridge at an elevation of about 7080 ft. MSL in the NW ¼ SW ¼ of Section 23, T2S, R99W of the 6th P.M. in Rio Blanco County, Colorado. The site sits between the Ryan Gulch, 0.75 miles to the south, and the Stake Springs Draw, approximately 0.86 miles to the north. Ryan Gulch is tributary to Piceance Creek located approximately 10.3 miles to the east-northeast. Stake Springs Draws flows into Yellow Creek approximately 5.7 miles to the northeast.

The Facility is located in a pinyon - juniper upland area with a downhill slope gradient to the northwest of about 5%. Upland or above the site, the natural grade, averaging 5%, continues southeast for approximately 0.16 miles before dropping into an unnamed drainage, tributary to Stakes Springs Draw. No natural drainages are located within the facility boundary. Localized drainage is provided by sheet flow across native vegetation.

## Geology

The proposed facility will be located in the northern part of the Piceance Basin; formed by tectonic forces associated with the Laramie orogeny that down-warped the earth's crust as a result of the uplift of the Colorado Rocky Mountains. Areas on all sides of the Piceance Basin have been uplifted by these same tectonic forces.

The Piceance Basin is the major structural geologic feature in the region. It is bound to the east by the Grand Hogback monocline, the White River Uplift to the northeast, the Gunnison Uplift to the south, the Uncompahgre Uplift to the southwest, the Douglas Creek Arch to the west-northwest, and the axial basin uplift to the north (Grout and Verbeek, 1992). The Grand Hogback monocline is a feature comprised of Upper Cretaceous age bedrock of the Mesaverde Group, which includes the Williams Fork Formation and the underlying Mancos Shale. The Grand Hogback forms part of the boundary between the Colorado Plateau and the Rocky Mountains.

The Piceance Basin is the result of considerable ancient sediment deposition in Lake Uinta created in the Eocene epoch by crustal warping. Lake Uinta covered a large area of northwest Colorado and northeastern Utah. The USGS Geologic map of the Yankee Gulch Quadrangle (Duncan 1976), identifies the Facility location geologically as Eocene Uinta Formation bedrock consisting of dominantly brown and buff weathered sandstone, siltstone and minor marlstone. Formation thickness is estimated at 300 ft.

The weight of the overlying sediments consolidated the lake deposits forming sandstones, siltstone and marlstone of the Uinta Formations. Portions of the marlstone contained organic material which was converted to a solid hydrocarbon called kerogen. Marlstone rich in kerogen is commonly referred to as oil shale.

## Soils

The NRCS classifies three soil types within the Federal 299-23-3 Facility site. These include the Piceance fine sandy loam, Redcreek-Rentsac complex and the Rentsac channery loam.

The Piceance loam is described as a fine sandy loam derived from colluvium and/or eolian deposits. The typical soil profile is 0 to 4 inches of fine sandy loam; 4 – 22 inches of channery sandy loam, channery loam, channery sandy clay loam or unweathered bedrock; and 4 – 22 inches of weathered bedrock. The Piceance loam has a high available water capacity of about 11.6 inches and a low to moderately high infiltration rate range of 0.6 to 2.0 inches per hour. The Inchau is classified as hydrologic soil Group C - having slow infiltration rates when thoroughly wet.

The Redcreek portion of the Redcreek-Rentsac complex is derived from eolian deposits and/or residuum weathered from sandstone. The typical soil profile is 0 – 11 inches of sandy loam; 11 – 16 inches of channery sandy loam; and 16 – 20 inches of unweathered bedrock. The Redcreek has a very low available water capacity of about 1.7 inches and a moderately low to high infiltration rate range of 0.6 to 2.0 inches per hour. The Redcreek is classified as hydrologic soil Group D - having very slow infiltration rates when thoroughly wet.

The Rentsac portion of the Redcreek-Rentsac complex is derived from eolian deposits and/or residuum weathered from sandstone. The typical soil profile is 0 – 5 inches of channery loam; 5 – 16 inches of extremely channery gravelly sandy loam; and 5 – 16 inches of unweathered bedrock. The Rentsac has a very low available water capacity of about 2.0 inches and a very low infiltration rate. The Rentsac is classified as hydrologic soil Group D - having very slow infiltration rates when thoroughly wet.

The Rentsac channery loam is derived from residuum weathered from calcareous sandstone. The typical soil profile is 0 – 5 inches of channery loam; 5 – 16 inches of extremely channery sandy loam; and 5 – 16 inches of unweathered bedrock. The Rentsac has a very low available water capacity of about 2.0 inches and a very low infiltration rate. The Rentsac is classified as hydrologic soil Group D - having very slow infiltration rates when thoroughly wet.

Eight test holes excavated by FES in the area of the proposed Facility generally agree with the findings reported by NRCS. The customized soil report for the Federal 299-23-3 Facility is attached to this report.

## Geologic Hazards

Colorado Revised Statute (C.R.S.) 24-65.1-103(8) defines a Geologic Hazard as a "geologic phenomenon which is so adverse to past, current, or foreseeable construction or land use as to constitute a significant hazard to public health, safety, or to property." Additionally, the Colorado State legislature in 1974 passed House Bill 1041 defining geologic hazards that, if present, may pose a threat to life or property. For the purposes of this report, geologic hazards, as outlined in House Bill 1041, are discussed below.

1. Radioactivity: Radon is a naturally occurring, odorless and colorless radioactive gas that is produced by the radioactive decay of radioactive minerals present in the soils and bedrock. Although no radiological or radon testing was conducted, other than the initial construction activities, the Facility does not have buildings or areas that will be occupied throughout the work day. The potential presence of radon is not expected to represent a geologic hazard or a significant worker exposure issue that would affect the design or operations of the Facility.

2. Seismic Considerations: According to the Colorado Geological Survey, there have been 21 earthquakes in or near Rio Blanco County between the years of 1966 and 2017. There were no reported damages or injuries associated with these minor earthquake events. CGS's Earthquake and Fault mapping shows no faults in the vicinity of the Facility. The Rio Blanco County Multi-Jurisdictional Hazard Mitigation Plan and CGS's mapping indicates that there are two faults located in the far northeast corner of the County more than 40 miles to the northeast of the Facility. The most likely areas to experience an earthquake are those near fault lines. Seismic activity is not expected to impact the design or operations of the Facility.

3. Ground Subsidence: Ground subsidence is the sinking of land over human caused or natural underground voids and the settlement of native low density soils. As noted in the NRCS soils report and on Colorado Geological Survey maps, surface soil are derived from colluvium and/or eolian deposits with unweathered bedrock located 4 to 22 inches below the surface. FES test holes indicate shallow depth to bedrock. No mining patents are associated with the Facility site. Ground subsidence is not a geologic hazard at this site.

4. Landslides: Figure 25 of Rio Blanco County Multi-Jurisdictional Hazard Mitigation Plan, entitled "Landslide Occurrences" shows Colorado Geological Survey's mapped areas which have experienced landslides. The Facility site is not within a landslide area. Additionally, the site sits near the top of a rolling hill with no significantly higher terrain.

5. Avalanche: The Rio Blanco County Multi-Jurisdictional Hazard Mitigation Plan did not identify avalanches as a major hazard. The Colorado Geological Survey indicates that steeply sloped areas (30 to 45 degrees) are highly subject to avalanches primarily on south exposed slopes where unstable snow conditions are likely to occur. The Colorado Avalanche Information Center indicates the Facility site has a "No Rating" indicating a very low to no probability of an avalanche. Based on site and upland slope conditions, avalanches are not a geologic hazard at this site.

6. Rockfall: The Rio Blanco County Multi-Jurisdictional Hazard Mitigation Plan defines landslides as downward or lateral movements of rock, debris or soil mass. The Facility sits near the top of a rolling hill with no adjacent rock outcroppings. Rockfall is not a geologic hazard at this site.

7. Flood: The Facility is located in an upland area with no natural drainages within the site boundary. Localized drainage is provided by sheet flow across native vegetation. The NRCS reports that the Flood Frequency for the facility location is "None", meaning that the chance of flooding is nearly 0% in any year. The site may be subject to sheet flow from precipitation events, however, storm water control measures are in place to mitigate or prevent storm water from entering the facility and disrupting operations. Flooding is not a geologic hazard at this site.

8. Mudflow and Debris Fans: The Rio Blanco County Multi-Jurisdictional Hazard Mitigation Plan defines landslides as downward or lateral movements of rock, debris or soil mass (mudflow).
The Facility sits near the top of a rolling hill with no adjacent natural drainages. The NRCS reports that the Flood Frequency for the facility location is "None" for the site. Mudflow and debris fans are not a geologic hazard at this site.

9. Expansive Soil and Rock: The NRCS reports that the Piceance loam, as classified under the Uniform Soils Classification System, is CL – ML, inorganic clays and silt with low plasticity.
The Redcreek-Rentsac complex is reported as SC-SM, clayey and silty sands with the Rentsac loam as GM, as silty gravels. Unweathered bedrock is reported by NRCS to be 4 to 22 inches below the surface. FES test holes support reported depths to bedrock. The proposed uses, design and operations at the Facility are not impacted by expansive soils or rock.

10. Unstable Slopes: As noted in the NRCS soils report, unweathered bedrock is located 4 to 22 inches below the surface at the Facility. The facility is constructed on an upland site with natural slopes of 5%. There are no severe slopes within the Facility site. Unstable slopes are not a geologic hazard at this site.

<u>Additional Soil Considerations</u>

NRCS reports that the risk of concrete corrosion is low to moderate for the Facility site. Corrosion pertains to potential soil-induced electrochemical or chemical action that corrodes or weakens concrete. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Concrete structures or foundations are not planned within the Facility Site.

NRCS reports that the risk of steel corrosion is low to moderate for the Facility site. Corrosion" pertains to potential soil-induced electrochemical or chemical action that corrodes or weakens uncoated steel. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. Production equipment will be placed on gravel foundations with cathodic protection implemented on an as-needed basis.

NRCS reports that the Erosion factor K (whole soil) ranges between 0.20 and 0.28 for the Facility site. Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) and the Revised Universal Soil Loss Equation (RUSLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter and on soil structure and saturated hydraulic conductivity (Ksat). Values of K range from 0.02 to 0.69. Other factors being equal, the higher the value, the more susceptible the soil is to sheet and rill erosion by water. Stormwater BMPs will be implemented to control soil erosion.

NRCS mapping indicates that none of the soils within the footprint of the Federal 299-23-3 Facility are hydric. Hydric soils are defined by the National Technical Committee for Hydric Soils (NTCHS) as soils that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part (Federal Register, 1994). Under natural conditions, these soils are either saturated or inundated long enough during the growing season to support the growth and reproduction of hydrophytic vegetation. The proposed development is not impacted by hydric soils.

## Conclusion

Based on FES's preliminary review of published geologic date, information obtained from the Colorado Geological Survey and Rio Blanco County, along with NRCS soils data and an onsite inspection, it is FES's opinion that there are no known geologic hazards at the proposed site of the Federal 299-23-3 Injection Well Facility that would impact the design or operations of the Facility. A geologic hazards map is shown on Figure 1.

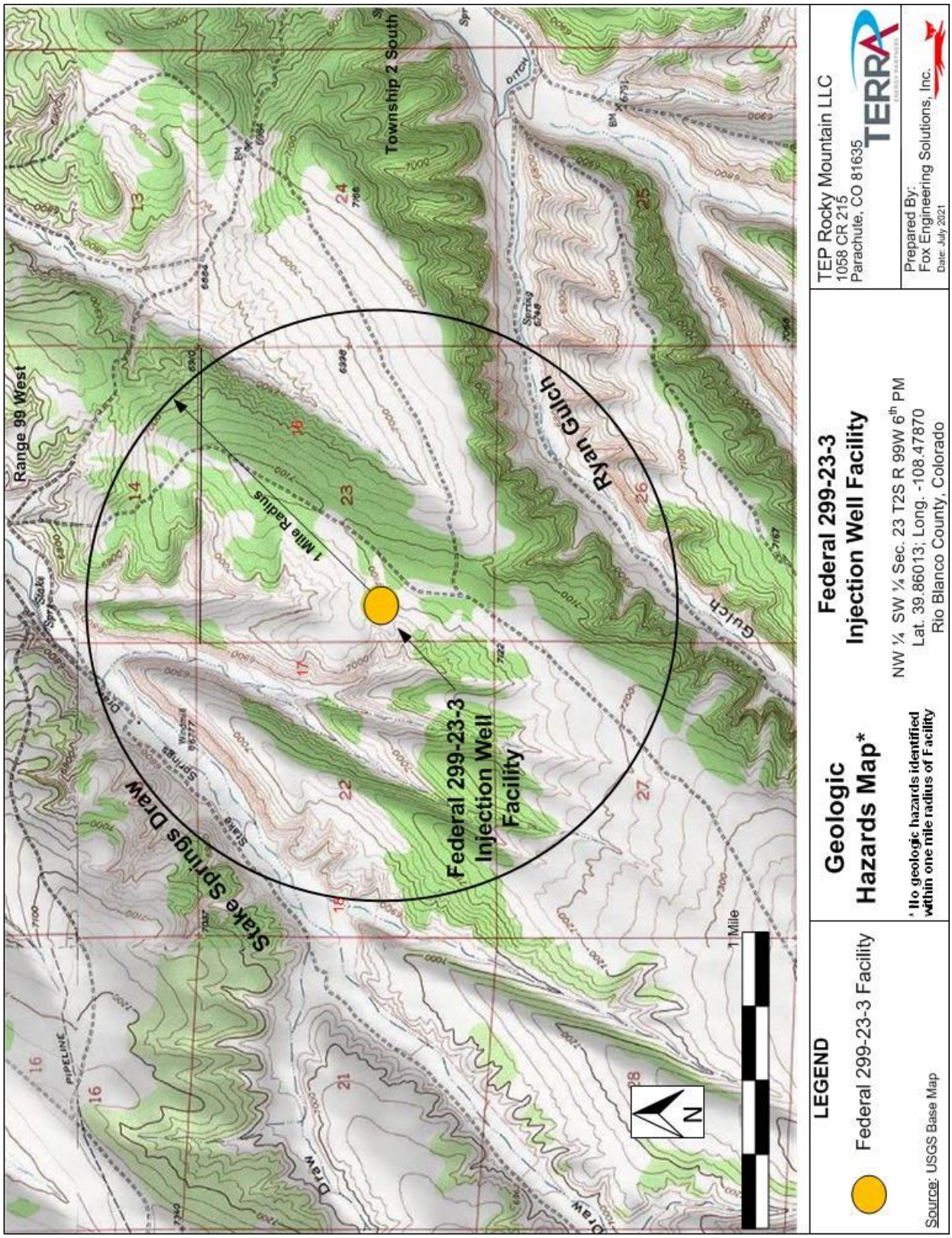
## Limitations

This report is intended for preliminary evaluation purposes only for geologic hazards, as contained in this report, in the project vicinity.

Respectfully submitted,


David Fox, P.E.
***Fox Engineering Solutions, Inc.***
P.O. Box 413
Fruita, CO 81521
Ph: (970) 250-5505
Email: david.fox.fes@gmail.com

Figure 1


Range 99 West
Township 2 South
Ryan Gulch
Stake Springs Draw
Federal 299-23-3 Injection Well Facility
1 Mile Radius
1 Mile
N
LEGEND
Federal 299-23-3 Facility
Source: USGS Base Map
Geologic Hazards Map*
* No geologic hazards identified within one mile radius of Facility
Federal 299-23-3 Injection Well Facility
NW ¼ SW ¼ Sec. 23 T2S R 99W 6th PM
Lat. 39.86013; Long. -108.47870
Rio Blanco County, Colorado
TEP Rocky Mountain LLC
1058 CR 215
Parachute, CO 81635
TERRA
Prepared By:
Fox Engineering Solutions, Inc.
Date: July 2021

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

# Custom Soil Resource Report for Rio Blanco County Area, Colorado

## Federal 299-23-3 Injection Well Pad


July 27, 2021

# Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require

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# Contents

# How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

# Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

# Custom Soil Resource Report
## Soil Map (Federal 299-23-3 Injection Well Pad)


Map Scale: 1:1,480 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 20 40 80 120

Feet
0 50 100 200 300

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 12N WGS84

## MAP LEGEND

**Area of Interest (AOI)**
- Area of Interest (AOI)

**Soils**
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

**Special Point Features**
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

**Water Features**
- Streams and Canals

**Transportation**
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

**Background**
- Aerial Photography

## MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Rio Blanco County Area, Colorado
Survey Area Data: Version 15, Jun 5, 2020

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Sep 13, 2010—Oct 26, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

# Map Unit Legend (Federal 299-23-3 Injection Well Pad)

| Map Unit Symbol | Map Unit Name | Acres in AOI | Percent of AOI |
|---|---|---|---|
| 64 | Piceance fine sandy loam, 5 to 15 percent slopes | 1.1 | 22.9% |
| 70 | Redcreek-Rentsac complex, 5 to 30 percent slopes | 2.3 | 49.9% |
| 73 | Rentsac channery loam, 5 to 50 percent slopes | 1.3 | 27.1% |
| **Totals for Area of Interest** | | **4.6** | **100.0%** |

# Map Unit Descriptions (Federal 299-23-3 Injection Well Pad)

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

# Rio Blanco County Area, Colorado

## 64—Piceance fine sandy loam, 5 to 15 percent slopes

### Map Unit Setting

*National map unit symbol:* jp5t
*Elevation:* 6,300 to 7,500 feet
*Mean annual precipitation:* 15 to 18 inches
*Mean annual air temperature:* 42 to 45 degrees F
*Frost-free period:* 80 to 105 days
*Farmland classification:* Not prime farmland

### Map Unit Composition

*Piceance and similar soils:* 85 percent
*Minor components:* 15 percent
*Estimates are based on observations, descriptions, and transects of the mapunit.*

### Description of Piceance

#### Setting

*Landform:* Ridges
*Landform position (three-dimensional):* Upper third of mountainflank
*Down-slope shape:* Linear
*Across-slope shape:* Linear
*Parent material:* Colluvium and/or eolian deposits derived from sandstone

#### Typical profile

*H1 - 0 to 4 inches:* fine sandy loam
*H2 - 4 to 22 inches:* loam, sandy clay loam, clay loam
*H2 - 4 to 22 inches:* channery sandy loam, channery loam, channery sandy clay loam
*H2 - 4 to 22 inches:* unweathered bedrock
*H3 - 22 to 30 inches:*
*H3 - 22 to 30 inches:*
*H3 - 22 to 30 inches:*
*H4 - 30 to 34 inches:*

#### Properties and qualities

*Slope:* 5 to 15 percent
*Depth to restrictive feature:* 20 to 40 inches to lithic bedrock
*Drainage class:* Well drained
*Runoff class:* Medium
*Capacity of the most limiting layer to transmit water (Ksat):* Moderately low to high (0.06 to 2.00 in/hr)
*Depth to water table:* More than 80 inches
*Frequency of flooding:* None
*Frequency of ponding:* None
*Calcium carbonate, maximum content:* 10 percent
*Available water capacity:* High (about 11.6 inches)

#### Interpretive groups

*Land capability classification (irrigated):* None specified
*Land capability classification (nonirrigated):* 4e
*Hydrologic Soil Group:* C
*Ecological site:* R048AY298CO - Rolling Loam

*Hydric soil rating:* No

**Minor Components**

**Other soils**

*Percent of map unit:* 15 percent
*Hydric soil rating:* No

## 70—Redcreek-Rentsac complex, 5 to 30 percent slopes

**Map Unit Setting**

*National map unit symbol:* jp61
*Elevation:* 6,000 to 7,400 feet
*Mean annual precipitation:* 14 to 18 inches
*Mean annual air temperature:* 42 to 45 degrees F
*Frost-free period:* 85 to 105 days
*Farmland classification:* Not prime farmland

**Map Unit Composition**

*Redcreek and similar soils:* 60 percent
*Rentsac and similar soils:* 30 percent
*Minor components:* 10 percent
*Estimates are based on observations, descriptions, and transects of the mapunit.*

**Description of Redcreek**

**Setting**

*Landform:* Ridges, mountainsides
*Landform position (three-dimensional):* Mountainflank
*Down-slope shape:* Linear
*Across-slope shape:* Linear
*Parent material:* Eolian deposits and/or residuum weathered from sandstone

**Typical profile**

*H1 - 0 to 11 inches:* sandy loam
*H2 - 11 to 16 inches:* channery sandy loam
*H3 - 16 to 20 inches:* unweathered bedrock

**Properties and qualities**

*Slope:* 5 to 30 percent
*Depth to restrictive feature:* 10 to 20 inches to lithic bedrock
*Drainage class:* Well drained
*Runoff class:* High
*Capacity of the most limiting layer to transmit water (Ksat):* Moderately low to moderately high (0.06 to 0.20 in/hr)
*Depth to water table:* More than 80 inches
*Frequency of flooding:* None
*Frequency of ponding:* None
*Calcium carbonate, maximum content:* 10 percent
*Maximum salinity:* Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
*Available water capacity:* Very low (about 1.7 inches)

**Interpretive groups**

*Land capability classification (irrigated):* None specified
*Land capability classification (nonirrigated):* 6e
*Hydrologic Soil Group:* D
*Ecological site:* F048AY909CO - Pinyon-Juniper
*Hydric soil rating:* No

## Description of Rentsac

**Setting**

*Landform:* Mountainsides
*Landform position (three-dimensional):* Mountainflank
*Down-slope shape:* Linear
*Across-slope shape:* Linear
*Parent material:* Eolian deposits and/or residuum weathered from sandstone

**Typical profile**

*H1 - 0 to 5 inches:* channery loam
*H2 - 5 to 16 inches:* extremely channery loam, extremely gravelly sandy loam, very flaggy loam
*H2 - 5 to 16 inches:* unweathered bedrock
*H2 - 5 to 16 inches:*
*H3 - 16 to 20 inches:*

**Properties and qualities**

*Slope:* 5 to 30 percent
*Depth to restrictive feature:* 10 to 20 inches to lithic bedrock
*Drainage class:* Well drained
*Runoff class:* Very high
*Capacity of the most limiting layer to transmit water (Ksat):* Very low (0.00 in/hr)
*Depth to water table:* More than 80 inches
*Frequency of flooding:* None
*Frequency of ponding:* None
*Calcium carbonate, maximum content:* 15 percent
*Maximum salinity:* Nonsaline to slightly saline (0.0 to 4.0 mmhos/cm)
*Available water capacity:* Very low (about 2.0 inches)

**Interpretive groups**

*Land capability classification (irrigated):* None specified
*Land capability classification (nonirrigated):* 7e
*Hydrologic Soil Group:* D
*Ecological site:* F048AY909CO - Pinyon-Juniper
*Hydric soil rating:* No

## Minor Components

**Other soils**

*Percent of map unit:* 10 percent
*Hydric soil rating:* No

## 73—Rentsac channery loam, 5 to 50 percent slopes

### Map Unit Setting

*National map unit symbol:* jp64
*Elevation:* 6,000 to 7,600 feet
*Mean annual precipitation:* 14 to 18 inches
*Mean annual air temperature:* 42 to 45 degrees F
*Frost-free period:* 80 to 105 days
*Farmland classification:* Not prime farmland

### Map Unit Composition

*Rentsac and similar soils:* 80 percent
*Minor components:* 20 percent
*Estimates are based on observations, descriptions, and transects of the mapunit.*

### Description of Rentsac

#### Setting

*Landform:* Ridges
*Landform position (three-dimensional):* Upper third of mountainflank
*Down-slope shape:* Convex, linear
*Across-slope shape:* Convex, linear
*Parent material:* Residuum weathered from calcareous sandstone

#### Typical profile

*H1 - 0 to 5 inches:* channery loam
*H2 - 5 to 16 inches:* extremely channery loam, extremely gravelly sandy loam, very flaggy loam
*H2 - 5 to 16 inches:* unweathered bedrock
*H2 - 5 to 16 inches:*
*H3 - 16 to 20 inches:*

#### Properties and qualities

*Slope:* 5 to 50 percent
*Depth to restrictive feature:* 10 to 20 inches to lithic bedrock
*Drainage class:* Well drained
*Runoff class:* Very high
*Capacity of the most limiting layer to transmit water (Ksat):* Very low (0.00 in/hr)
*Depth to water table:* More than 80 inches
*Frequency of flooding:* None
*Frequency of ponding:* None
*Calcium carbonate, maximum content:* 15 percent
*Maximum salinity:* Nonsaline to slightly saline (0.0 to 4.0 mmhos/cm)
*Available water capacity:* Very low (about 2.0 inches)

#### Interpretive groups

*Land capability classification (irrigated):* None specified
*Land capability classification (nonirrigated):* 7e
*Hydrologic Soil Group:* D

*Ecological site:* F048AY909CO - Pinyon-Juniper
*Hydric soil rating:* No

**Minor Components**

**Other soils**

*Percent of map unit:* 20 percent
*Hydric soil rating:* No

# Soil Information for All Uses

## Suitabilities and Limitations for Use

The Suitabilities and Limitations for Use section includes various soil interpretations displayed as thematic maps with a summary table for the soil map units in the selected area of interest. A single value or rating for each map unit is generated by aggregating the interpretive ratings of individual map unit components. This aggregation process is defined for each interpretation.

## Building Site Development

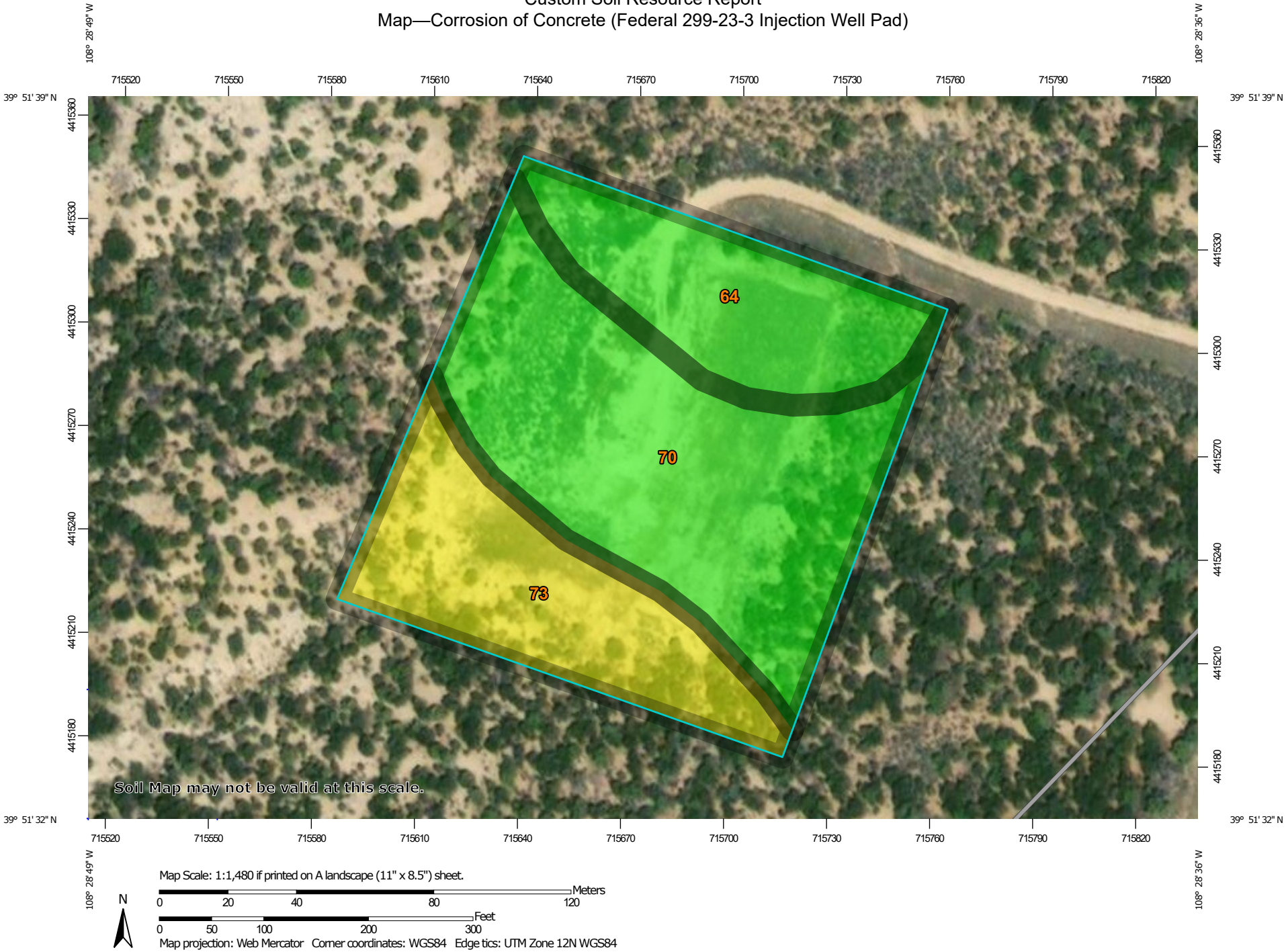
Building site development interpretations are designed to be used as tools for evaluating soil suitability and identifying soil limitations for various construction purposes. As part of the interpretation process, the rating applies to each soil in its described condition and does not consider present land use. Example interpretations can include corrosion of concrete and steel, shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping.

### Corrosion of Concrete (Federal 299-23-3 Injection Well Pad)

"Risk of corrosion" pertains to potential soil-induced electrochemical or chemical action that corrodes or weakens concrete. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors results in a severe hazard of corrosion. The concrete in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than the concrete in installations that are entirely within one kind of soil or within one soil layer.

The risk of corrosion is expressed as "low," "moderate," or "high."

Custom Soil Resource Report
Map—Corrosion of Concrete (Federal 299-23-3 Injection Well Pad)



## MAP LEGEND

**Area of Interest (AOI)**
- Area of Interest (AOI)

**Soils**

**Soil Rating Polygons**
- High
- Moderate
- Low
- Not rated or not available

**Soil Rating Lines**
- High
- Moderate
- Low
- Not rated or not available

**Soil Rating Points**
- High
- Moderate
- Low
- Not rated or not available

**Water Features**
- Streams and Canals

**Transportation**
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

**Background**
- Aerial Photography

## MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Rio Blanco County Area, Colorado
Survey Area Data: Version 15, Jun 5, 2020

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Sep 13, 2010—Oct 26, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

### Table—Corrosion of Concrete (Federal 299-23-3 Injection Well Pad)

| Map unit symbol | Map unit name | Rating | Acres in AOI | Percent of AOI |
|---|---|---|---|---|
| 64 | Piceance fine sandy loam, 5 to 15 percent slopes | Low | 1.1 | 22.9% |
| 70 | Redcreek-Rentsac complex, 5 to 30 percent slopes | Low | 2.3 | 49.9% |
| 73 | Rentsac channery loam, 5 to 50 percent slopes | Moderate | 1.3 | 27.1% |
| **Totals for Area of Interest** | | | **4.6** | **100.0%** |

### Rating Options—Corrosion of Concrete (Federal 299-23-3 Injection Well Pad)

*Aggregation Method:* Dominant Condition

*Component Percent Cutoff: None Specified*

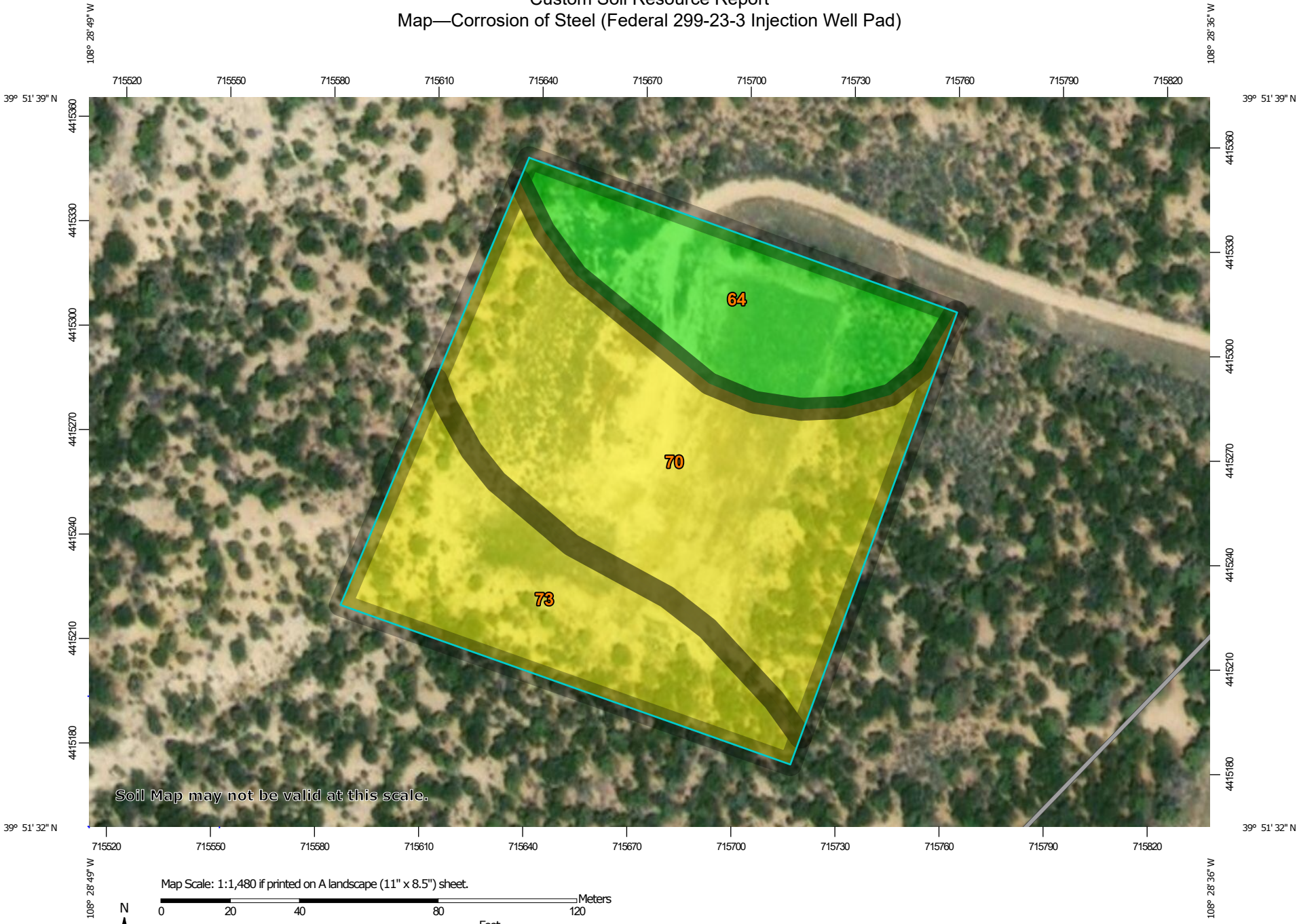
*Tie-break Rule:* Higher

## Corrosion of Steel (Federal 299-23-3 Injection Well Pad)

"Risk of corrosion" pertains to potential soil-induced electrochemical or chemical action that corrodes or weakens uncoated steel. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. Special site examination and design may be needed if the combination of factors results in a severe hazard of corrosion. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than the steel in installations that are entirely within one kind of soil or within one soil layer.

The risk of corrosion is expressed as "low," "moderate," or "high."

Custom Soil Resource Report
Map—Corrosion of Steel (Federal 299-23-3 Injection Well Pad)




Map Scale: 1:1,480 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 20 40 80 120

Feet
0 50 100 200 300

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 12N WGS84

## MAP LEGEND

**Area of Interest (AOI)**

Area of Interest (AOI)

**Soils**

**Soil Rating Polygons**

High

Moderate

Low

Not rated or not available

**Soil Rating Lines**

High

Moderate

Low

Not rated or not available

**Soil Rating Points**

High

Moderate

Low

Not rated or not available

**Water Features**

Streams and Canals

**Transportation**

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

**Background**

Aerial Photography

## MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Rio Blanco County Area, Colorado
Survey Area Data: Version 15, Jun 5, 2020

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Sep 13, 2010—Oct 26, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

### Table—Corrosion of Steel (Federal 299-23-3 Injection Well Pad)

| Map unit symbol | Map unit name | Rating | Acres in AOI | Percent of AOI |
|---|---|---|---|---|
| 64 | Piceance fine sandy loam, 5 to 15 percent slopes | Low | 1.1 | 22.9% |
| 70 | Redcreek-Rentsac complex, 5 to 30 percent slopes | Moderate | 2.3 | 49.9% |
| 73 | Rentsac channery loam, 5 to 50 percent slopes | Moderate | 1.3 | 27.1% |
| **Totals for Area of Interest** | | | **4.6** | **100.0%** |

### Rating Options—Corrosion of Steel (Federal 299-23-3 Injection Well Pad)

*Aggregation Method:* Dominant Condition

*Component Percent Cutoff: None Specified*

*Tie-break Rule:* Higher

# Land Classifications

Land Classifications are specified land use and management groupings that are assigned to soil areas because combinations of soil have similar behavior for specified practices. Most are based on soil properties and other factors that directly influence the specific use of the soil. Example classifications include ecological site classification, farmland classification, irrigated and nonirrigated land capability classification, and hydric rating.

## Hydric Rating by Map Unit (Federal 299-23-3 Injection Well Pad)

This rating indicates the percentage of map units that meets the criteria for hydric soils. Map units are composed of one or more map unit components or soil types, each of which is rated as hydric soil or not hydric. Map units that are made up dominantly of hydric soils may have small areas of minor nonhydric components in the higher positions on the landform, and map units that are made up dominantly of nonhydric soils may have small areas of minor hydric components in the lower positions on the landform. Each map unit is rated based on its respective components and the percentage of each component within the map unit.

The thematic map is color coded based on the composition of hydric components. The five color classes are separated as 100 percent hydric components, 66 to 99

percent hydric components, 33 to 65 percent hydric components, 1 to 32 percent hydric components, and less than one percent hydric components.

In Web Soil Survey, the Summary by Map Unit table that is displayed below the map pane contains a column named 'Rating'. In this column the percentage of each map unit that is classified as hydric is displayed.

Hydric soils are defined by the National Technical Committee for Hydric Soils (NTCHS) as soils that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part (Federal Register, 1994). Under natural conditions, these soils are either saturated or inundated long enough during the growing season to support the growth and reproduction of hydrophytic vegetation.

The NTCHS definition identifies general soil properties that are associated with wetness. In order to determine whether a specific soil is a hydric soil or nonhydric soil, however, more specific information, such as information about the depth and duration of the water table, is needed. Thus, criteria that identify those estimated soil properties unique to hydric soils have been established (Federal Register, 2002). These criteria are used to identify map unit components that normally are associated with wetlands. The criteria used are selected estimated soil properties that are described in "Soil Taxonomy" (Soil Survey Staff, 1999) and "Keys to Soil Taxonomy" (Soil Survey Staff, 2006) and in the "Soil Survey Manual" (Soil Survey Division Staff, 1993).

If soils are wet enough for a long enough period of time to be considered hydric, they should exhibit certain properties that can be easily observed in the field. These visible properties are indicators of hydric soils. The indicators used to make onsite determinations of hydric soils are specified in "Field Indicators of Hydric Soils in the United States" (Hurt and Vasilas, 2006).

References:

Federal Register. July 13, 1994. Changes in hydric soils of the United States.

Federal Register. September 18, 2002. Hydric soils of the United States.

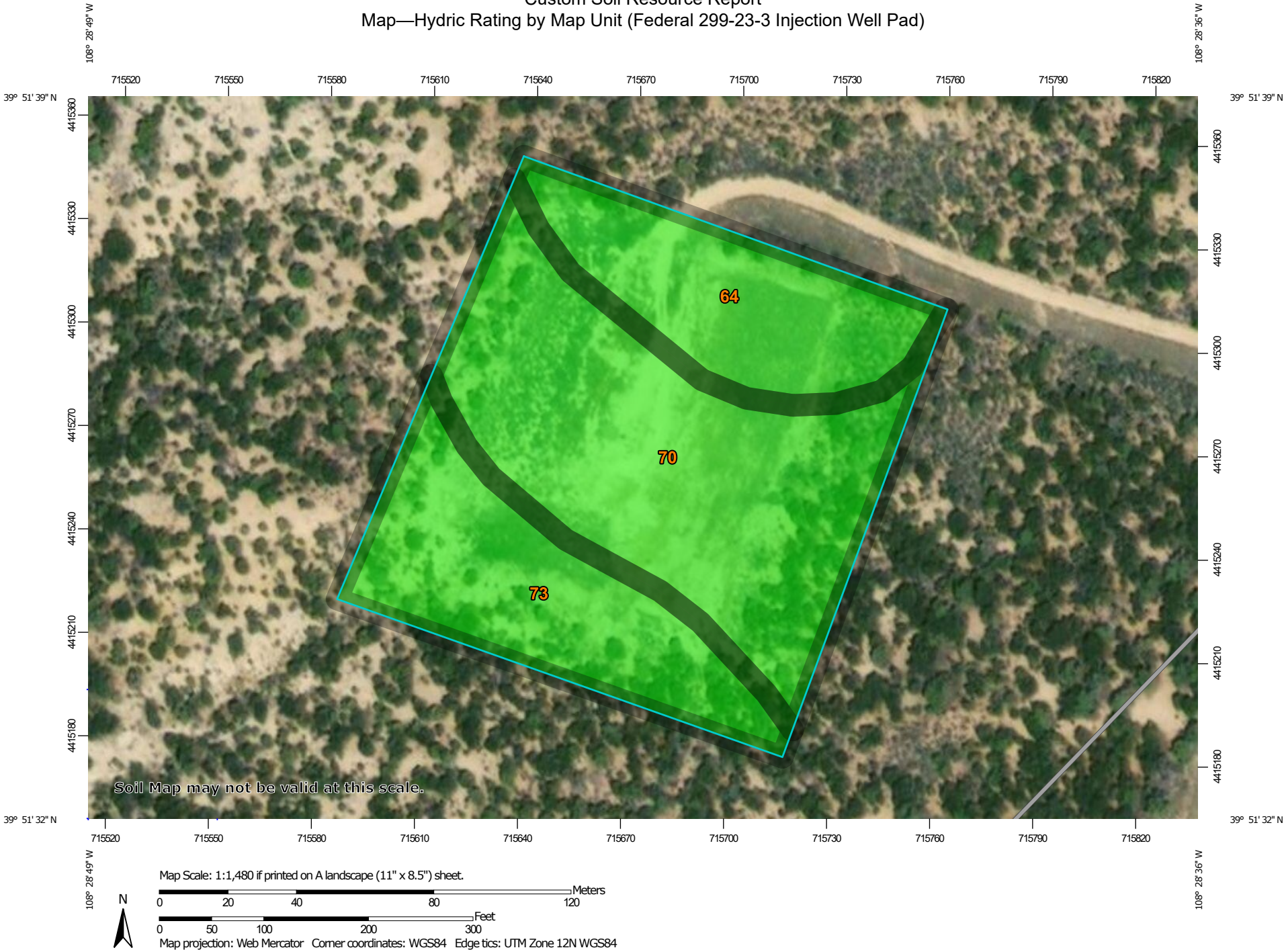
Hurt, G.W., and L.M. Vasilas, editors. Version 6.0, 2006. Field indicators of hydric soils in the United States.

Soil Survey Division Staff. 1993. Soil survey manual. Soil Conservation Service. U.S. Department of Agriculture Handbook 18.

Soil Survey Staff. 1999. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. 2nd edition. Natural Resources Conservation Service. U.S. Department of Agriculture Handbook 436.

Soil Survey Staff. 2006. Keys to soil taxonomy. 10th edition. U.S. Department of Agriculture, Natural Resources Conservation Service.

# Custom Soil Resource Report
## Map—Hydric Rating by Map Unit (Federal 299-23-3 Injection Well Pad)



## MAP LEGEND

**Area of Interest (AOI)**
- Area of Interest (AOI)

**Soils**

**Soil Rating Polygons**
- Hydric (100%)
- Hydric (66 to 99%)
- Hydric (33 to 65%)
- Hydric (1 to 32%)
- Not Hydric (0%)
- Not rated or not available

**Soil Rating Lines**
- Hydric (100%)
- Hydric (66 to 99%)
- Hydric (33 to 65%)
- Hydric (1 to 32%)
- Not Hydric (0%)
- Not rated or not available

**Soil Rating Points**
- Hydric (100%)
- Hydric (66 to 99%)
- Hydric (33 to 65%)
- Hydric (1 to 32%)
- Not Hydric (0%)
- Not rated or not available

**Water Features**
- Streams and Canals

**Transportation**
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

**Background**
- Aerial Photography

## MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Rio Blanco County Area, Colorado
Survey Area Data: Version 15, Jun 5, 2020

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Sep 13, 2010—Oct 26, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

## Table—Hydric Rating by Map Unit (Federal 299-23-3 Injection Well Pad)

| Map unit symbol | Map unit name | Rating | Acres in AOI | Percent of AOI |
|---|---|---|---|---|
| 64 | Piceance fine sandy loam, 5 to 15 percent slopes | 0 | 1.1 | 22.9% |
| 70 | Redcreek-Rentsac complex, 5 to 30 percent slopes | 0 | 2.3 | 49.9% |
| 73 | Rentsac channery loam, 5 to 50 percent slopes | 0 | 1.3 | 27.1% |
| **Totals for Area of Interest** | | | **4.6** | **100.0%** |

## Rating Options—Hydric Rating by Map Unit (Federal 299-23-3 Injection Well Pad)

*Aggregation Method:* Percent Present

*Component Percent Cutoff: None Specified*

*Tie-break Rule:* Lower

# Soil Properties and Qualities

The Soil Properties and Qualities section includes various soil properties and qualities displayed as thematic maps with a summary table for the soil map units in the selected area of interest. A single value or rating for each map unit is generated by aggregating the interpretive ratings of individual map unit components. This aggregation process is defined for each property or quality.

## Soil Erosion Factors

Soil Erosion Factors are soil properties and interpretations used in evaluating the soil for potential erosion. Example soil erosion factors can include K factor for the whole soil or on a rock free basis, T factor, wind erodibility group and wind erodibility index.

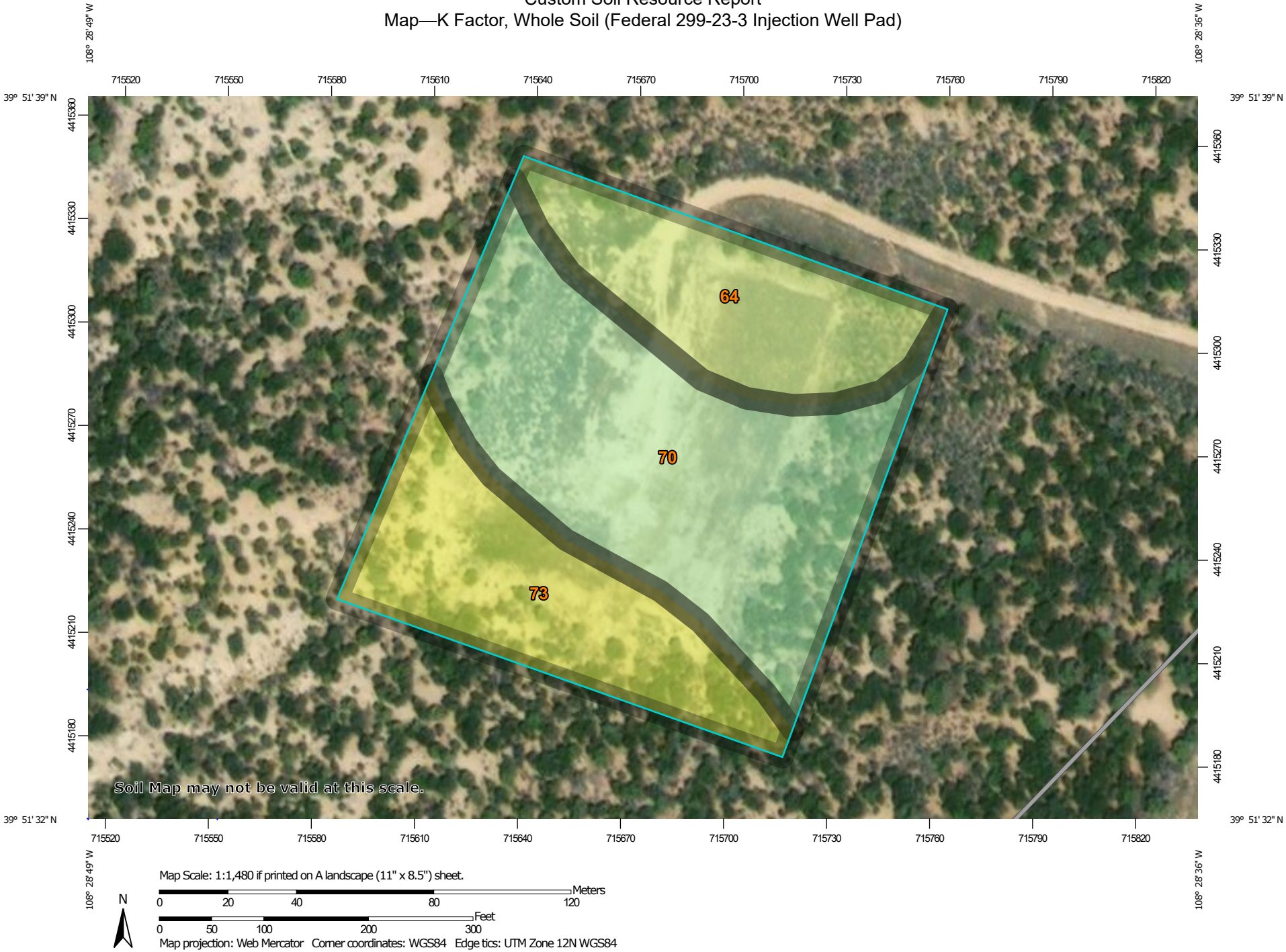
### K Factor, Whole Soil (Federal 299-23-3 Injection Well Pad)

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) and the Revised Universal Soil Loss Equation (RUSLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter and on soil structure and saturated hydraulic conductivity (Ksat). Values of K range from 0.02 to 0.69. Other factors being equal, the higher the value, the more susceptible the soil is to sheet and rill erosion by water.

"Erosion factor Kw (whole soil)" indicates the erodibility of the whole soil. The estimates are modified by the presence of rock fragments.

Factor K does not apply to organic horizons and is not reported for those layers.

Custom Soil Resource Report
Map—K Factor, Whole Soil (Federal 299-23-3 Injection Well Pad)



## MAP LEGEND

**Area of Interest (AOI)**

Area of Interest (AOI)

**Soils**

**Soil Rating Polygons**

.02
.05
.10
.15
.17
.20
.24
.28
.32
.37
.43
.49
.55
.64
Not rated or not available

**Soil Rating Lines**

.02
.05
.10
.15
.17
.20
.24
.28
.32
.37
.43
.49
.55
.64
Not rated or not available

**Soil Rating Points**

.02
.05
.10
.15
.17
.20
.24
.28
.32
.37
.43
.49
.55
.64
Not rated or not available

**Water Features**

Streams and Canals

**Transportation**

Rails
Interstate Highways
US Routes
Major Roads
Local Roads

**Background**

Aerial Photography

## MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Rio Blanco County Area, Colorado
Survey Area Data: Version 15, Jun 5, 2020

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Sep 13, 2010—Oct 26, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

### Table—K Factor, Whole Soil (Federal 299-23-3 Injection Well Pad)

| Map unit symbol | Map unit name | Rating | Acres in AOI | Percent of AOI |
|---|---|---|---|---|
| 64 | Piceance fine sandy loam, 5 to 15 percent slopes | .24 | 1.1 | 22.9% |
| 70 | Redcreek-Rentsac complex, 5 to 30 percent slopes | .28 | 2.3 | 49.9% |
| 73 | Rentsac channery loam, 5 to 50 percent slopes | .20 | 1.3 | 27.1% |
| **Totals for Area of Interest** | | | **4.6** | **100.0%** |

### Rating Options—K Factor, Whole Soil (Federal 299-23-3 Injection Well Pad)

*Aggregation Method:* Dominant Condition

*Component Percent Cutoff: None Specified*

*Tie-break Rule:* Higher

*Layer Options (Horizon Aggregation Method):* Surface Layer (Not applicable)

# Soil Qualities and Features

Soil qualities are behavior and performance attributes that are not directly measured, but are inferred from observations of dynamic conditions and from soil properties. Example soil qualities include natural drainage, and frost action. Soil features are attributes that are not directly part of the soil. Example soil features include slope and depth to restrictive layer. These features can greatly impact the use and management of the soil.

## Hydrologic Soil Group (Federal 299-23-3 Injection Well Pad)

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Custom Soil Resource Report
Map—Hydrologic Soil Group (Federal 299-23-3 Injection Well Pad)

## MAP LEGEND

**Area of Interest (AOI)**

Area of Interest (AOI)

**Soils**

**Soil Rating Polygons**

A

A/D

B

B/D

C

C/D

D

Not rated or not available

**Soil Rating Lines**

A

A/D

B

B/D

C

C/D

D

Not rated or not available

**Soil Rating Points**

A

A/D

B

B/D

C

C/D

D

Not rated or not available

**Water Features**

Streams and Canals

**Transportation**

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

**Background**

Aerial Photography

## MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

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Survey Area Data: Version 15, Jun 5, 2020

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Date(s) aerial images were photographed: Sep 13, 2010—Oct 26, 2017

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### Table—Hydrologic Soil Group (Federal 299-23-3 Injection Well Pad)

| Map unit symbol | Map unit name | Rating | Acres in AOI | Percent of AOI |
|---|---|---|---|---|
| 64 | Piceance fine sandy loam, 5 to 15 percent slopes | C | 1.1 | 22.9% |
| 70 | Redcreek-Rentsac complex, 5 to 30 percent slopes | D | 2.3 | 49.9% |
| 73 | Rentsac channery loam, 5 to 50 percent slopes | D | 1.3 | 27.1% |
| **Totals for Area of Interest** | | | **4.6** | **100.0%** |

### Rating Options—Hydrologic Soil Group (Federal 299-23-3 Injection Well Pad)

*Aggregation Method:* Dominant Condition

*Component Percent Cutoff: None Specified*

*Tie-break Rule:* Higher

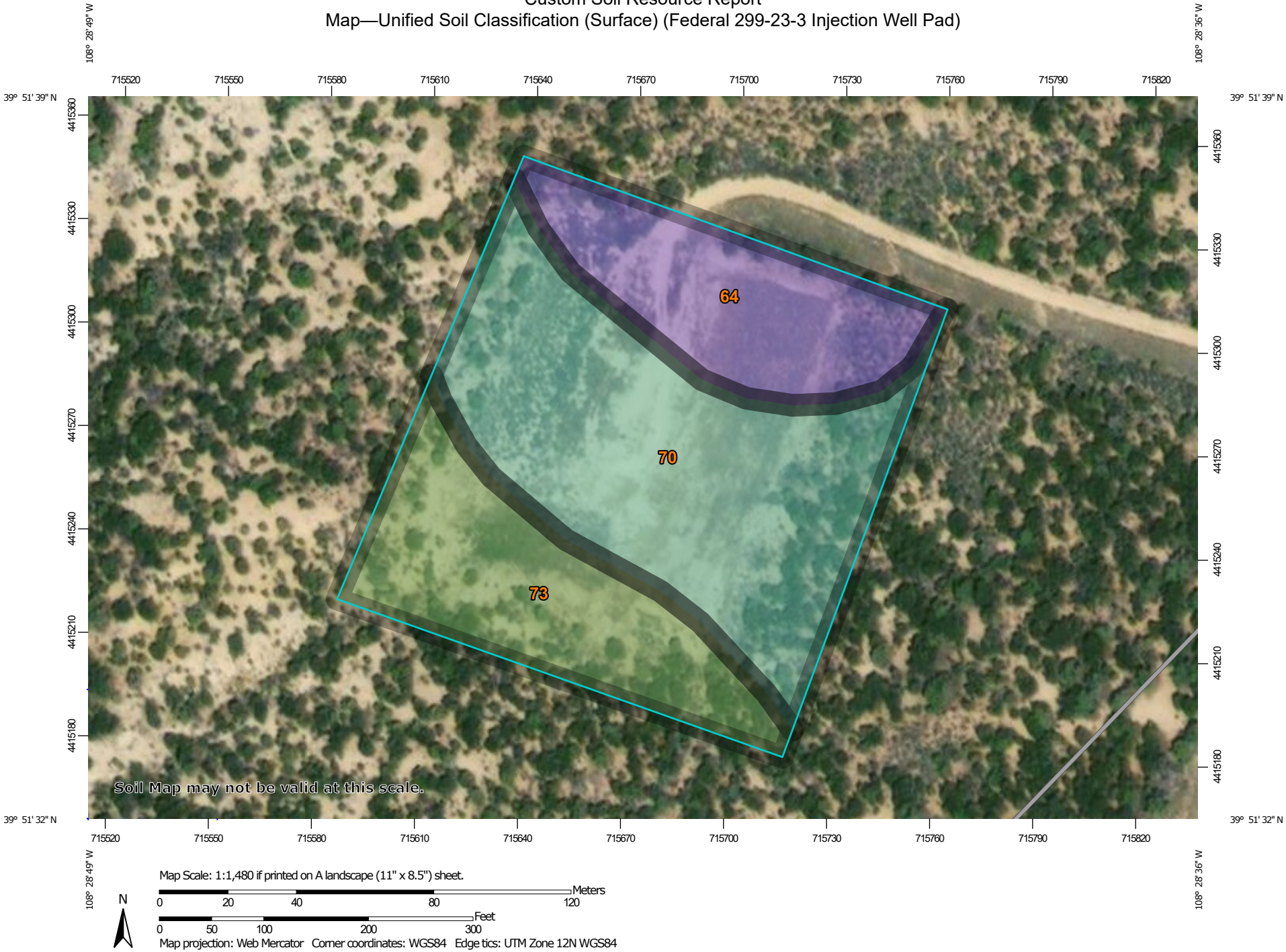
## Unified Soil Classification (Surface) (Federal 299-23-3 Injection Well Pad)

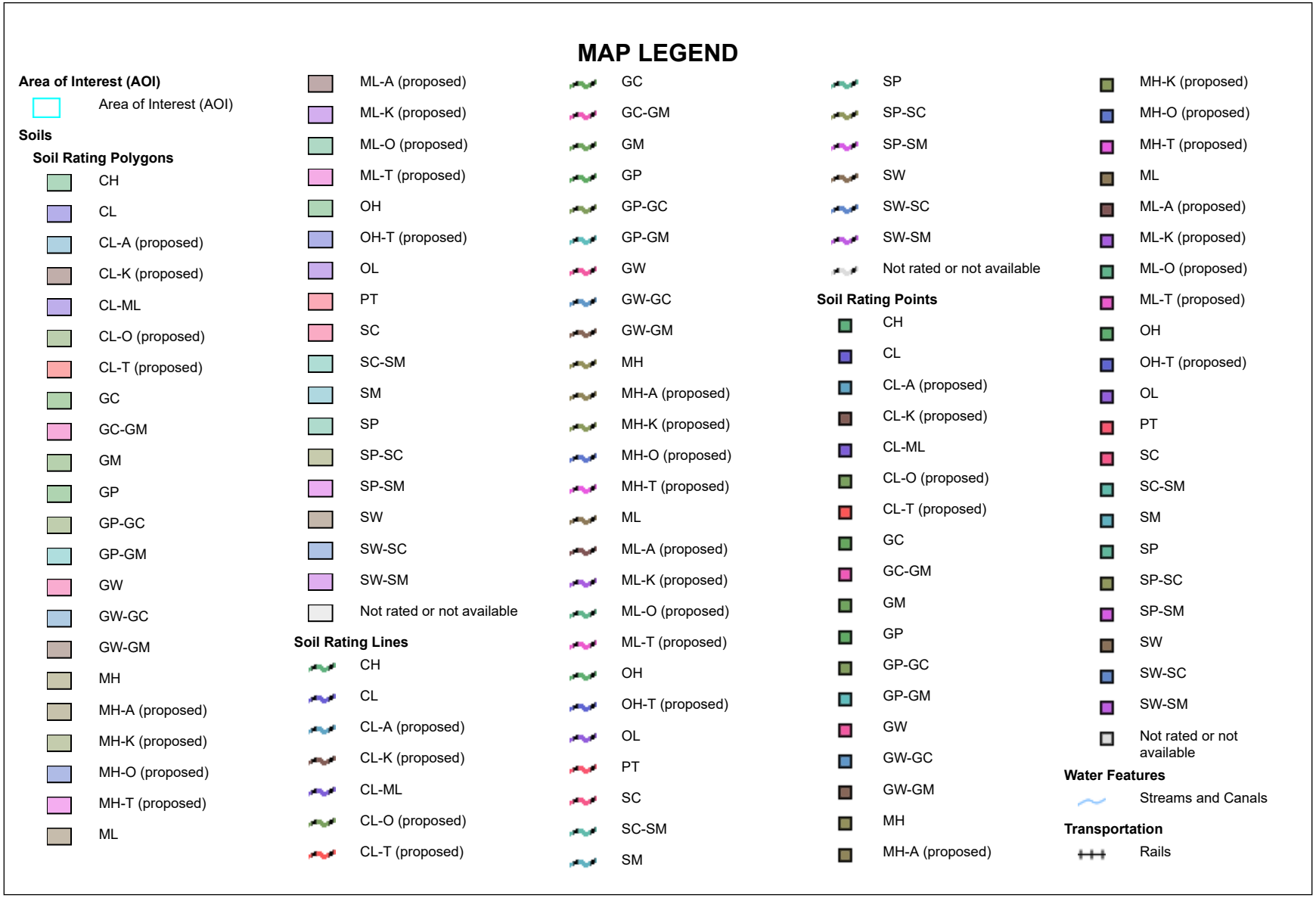
The Unified soil classification system classifies mineral and organic mineral soils for engineering purposes on the basis of particle-size characteristics, liquid limit, and plasticity index. It identifies three major soil divisions: (i) coarse-grained soils having less than 50 percent, by weight, particles smaller than 0.074 mm in diameter; (ii) fine-grained soils having 50 percent or more, by weight, particles smaller than 0.074 mm in diameter; and (iii) highly organic soils that demonstrate certain organic characteristics. These divisions are further subdivided into a total of 15 basic soil groups. The major soil divisions and basic soil groups are determined on the basis of estimated or measured values for grain-size distribution and Atterberg limits. ASTM D 2487 shows the criteria chart used for classifying soil in the Unified system and the 15 basic soil groups of the system and the plasticity chart for the Unified system.

The various groupings of this classification correlate in a general way with the engineering behavior of soils. This correlation provides a useful first step in any field or laboratory investigation for engineering purposes. It can serve to make some general interpretations relating to probable performance of the soil for engineering uses.

For each soil horizon in the database one or more Unified soil classifications may be listed. One is marked as the representative or most commonly occurring. The representative classification is shown here for the surface layer of the soil.

Custom Soil Resource Report
Map—Unified Soil Classification (Surface) (Federal 299-23-3 Injection Well Pad)




MAP LEGEND
Area of Interest (AOI)
Area of Interest (AOI)
Soils
Soil Rating Polygons
CH
CL
CL-A (proposed)
CL-K (proposed)
CL-ML
CL-O (proposed)
CL-T (proposed)
GC
GC-GM
GM
GP
GP-GC
GP-GM
GW
GW-GC
GW-GM
MH
MH-A (proposed)
MH-K (proposed)
MH-O (proposed)
MH-T (proposed)
ML
ML-A (proposed)
ML-K (proposed)
ML-O (proposed)
ML-T (proposed)
OH
OH-T (proposed)
OL
PT
SC
SC-SM
SM
SP
SP-SC
SP-SM
SW
SW-SC
SW-SM
Not rated or not available
Soil Rating Lines
CH
CL
CL-A (proposed)
CL-K (proposed)
CL-ML
CL-O (proposed)
CL-T (proposed)
GC
GC-GM
GM
GP
GP-GC
GP-GM
GW
GW-GC
GW-GM
MH
MH-A (proposed)
MH-K (proposed)
MH-O (proposed)
MH-T (proposed)
ML
ML-A (proposed)
ML-K (proposed)
ML-O (proposed)
ML-T (proposed)
OH
OH-T (proposed)
OL
PT
SC
SC-SM
SM
SP
SP-SC
SP-SM
SW
SW-SC
SW-SM
Not rated or not available
Soil Rating Points
CH
CL
CL-A (proposed)
CL-K (proposed)
CL-ML
CL-O (proposed)
CL-T (proposed)
GC
GC-GM
GM
GP
GP-GC
GP-GM
GW
GW-GC
GW-GM
MH
MH-A (proposed)
MH-K (proposed)
MH-O (proposed)
MH-T (proposed)
ML
ML-A (proposed)
ML-K (proposed)
ML-O (proposed)
ML-T (proposed)
OH
OH-T (proposed)
OL
PT
SC
SC-SM
SM
SP
SP-SC
SP-SM
SW
SW-SC
SW-SM
Not rated or not available
Water Features
Streams and Canals
Transportation
Rails

## MAP INFORMATION


Interstate Highways


US Routes


Major Roads


Local Roads

**Background**


Aerial Photography

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

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Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

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Survey Area Data: Version 15, Jun 5, 2020

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Date(s) aerial images were photographed: Sep 13, 2010—Oct 26, 2017

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### Table—Unified Soil Classification (Surface) (Federal 299-23-3 Injection Well Pad)

| Map unit symbol | Map unit name | Rating | Acres in AOI | Percent of AOI |
|---|---|---|---|---|
| 64 | Piceance fine sandy loam, 5 to 15 percent slopes | CL-ML | 1.1 | 22.9% |
| 70 | Redcreek-Rentsac complex, 5 to 30 percent slopes | SC-SM | 2.3 | 49.9% |
| 73 | Rentsac channery loam, 5 to 50 percent slopes | GM | 1.3 | 27.1% |
| **Totals for Area of Interest** | | | **4.6** | **100.0%** |

### Rating Options—Unified Soil Classification (Surface) (Federal 299-23-3 Injection Well Pad)

*Aggregation Method:* Dominant Condition

*Component Percent Cutoff: None Specified*

*Tie-break Rule:* Lower

*Layer Options (Horizon Aggregation Method):* Surface Layer (Not applicable)

## Depth to a Selected Soil Restrictive Layer: Lithic bedrock (Federal 299-23-3 Injection Well Pad)

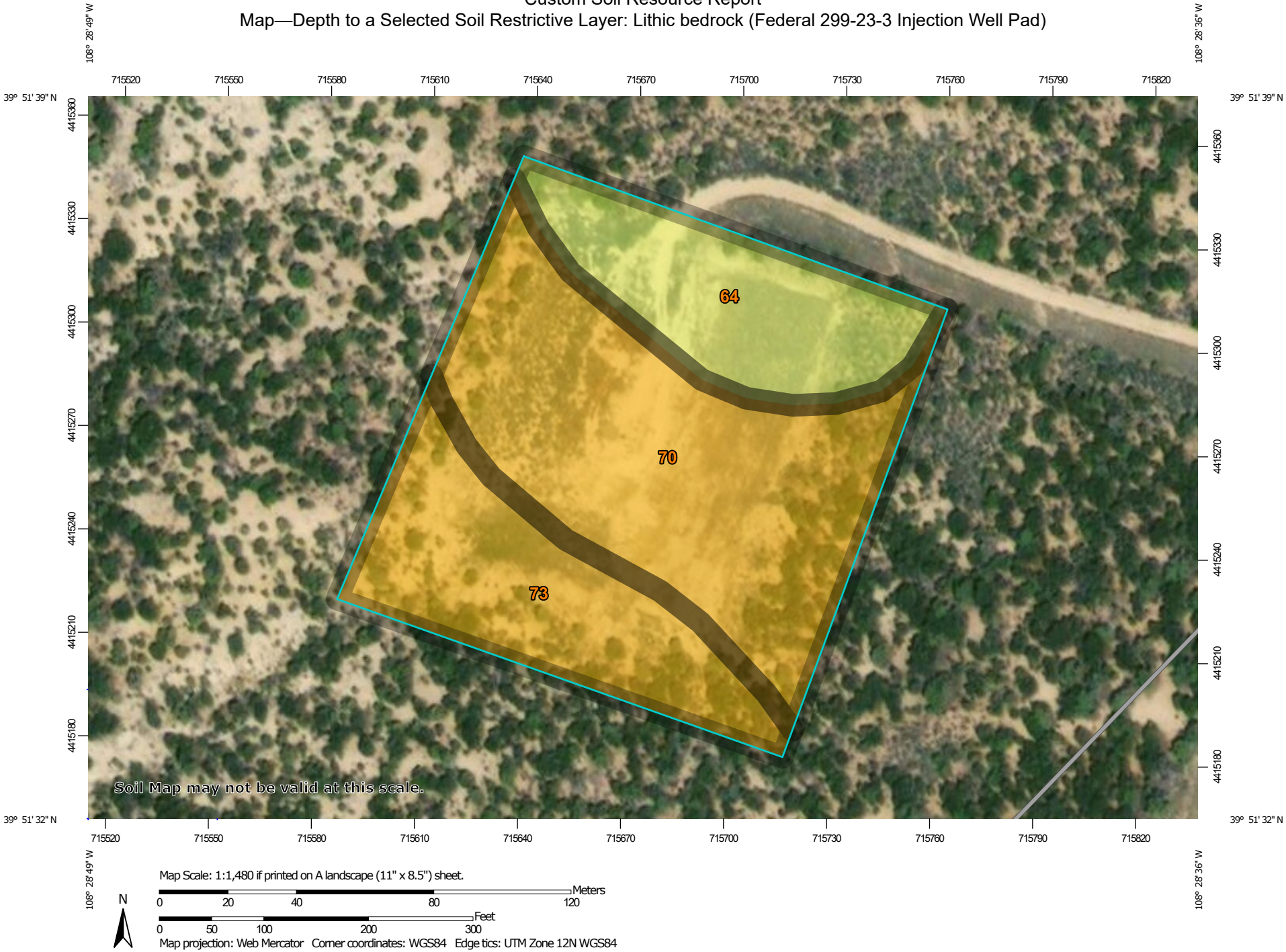
A "restrictive layer" is a nearly continuous layer that has one or more physical, chemical, or thermal properties that significantly impede the movement of water and air through the soil or that restrict roots or otherwise provide an unfavorable root environment. Examples are bedrock, cemented layers, dense layers, and frozen layers.

This theme presents the depth to the user selected type of restrictive layer as described in for each map unit. If no restrictive layer is described in a map unit, it is represented by the "greater than 200" depth class.

This attribute is actually recorded as three separate values in the database. A low value and a high value indicate the range of this attribute for the soil component. A "representative" value indicates the expected value of this attribute for the component. For this soil property, only the representative value is used.

Custom Soil Resource Report

Map—Depth to a Selected Soil Restrictive Layer: Lithic bedrock (Federal 299-23-3 Injection Well Pad)




Map Scale: 1:1,480 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 20 40 80 120

Feet: 0 50 100 200 300

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 12N WGS84

## MAP LEGEND

**Area of Interest (AOI)**

Area of Interest (AOI)

**Soils**

**Soil Rating Polygons**

0 - 25

25 - 50

50 - 100

100 - 150

150 - 200

> 200

Not rated or not available

**Soil Rating Lines**

0 - 25

25 - 50

50 - 100

100 - 150

150 - 200

> 200

Not rated or not available

**Soil Rating Points**

0 - 25

25 - 50

50 - 100

100 - 150

150 - 200

> 200

Not rated or not available

**Water Features**

Streams and Canals

**Transportation**

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

**Background**

Aerial Photography

## MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

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Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

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### Table—Depth to a Selected Soil Restrictive Layer: Lithic bedrock (Federal 299-23-3 Injection Well Pad)

| Map unit symbol | Map unit name | Rating (centimeters) | Acres in AOI | Percent of AOI |
|---|---|---|---|---|
| 64 | Piceance fine sandy loam, 5 to 15 percent slopes | 76 | 1.1 | 22.9% |
| 70 | Redcreek-Rentsac complex, 5 to 30 percent slopes | 41 | 2.3 | 49.9% |
| 73 | Rentsac channery loam, 5 to 50 percent slopes | 41 | 1.3 | 27.1% |
| **Totals for Area of Interest** | | | **4.6** | **100.0%** |

### Rating Options—Depth to a Selected Soil Restrictive Layer: Lithic bedrock (Federal 299-23-3 Injection Well Pad)

*Units of Measure:* centimeters

*Restriction Kind:* Lithic bedrock

*Aggregation Method:* Dominant Component

*Component Percent Cutoff: None Specified*

*Tie-break Rule:* Lower

*Interpret Nulls as Zero:* No

# Water Features

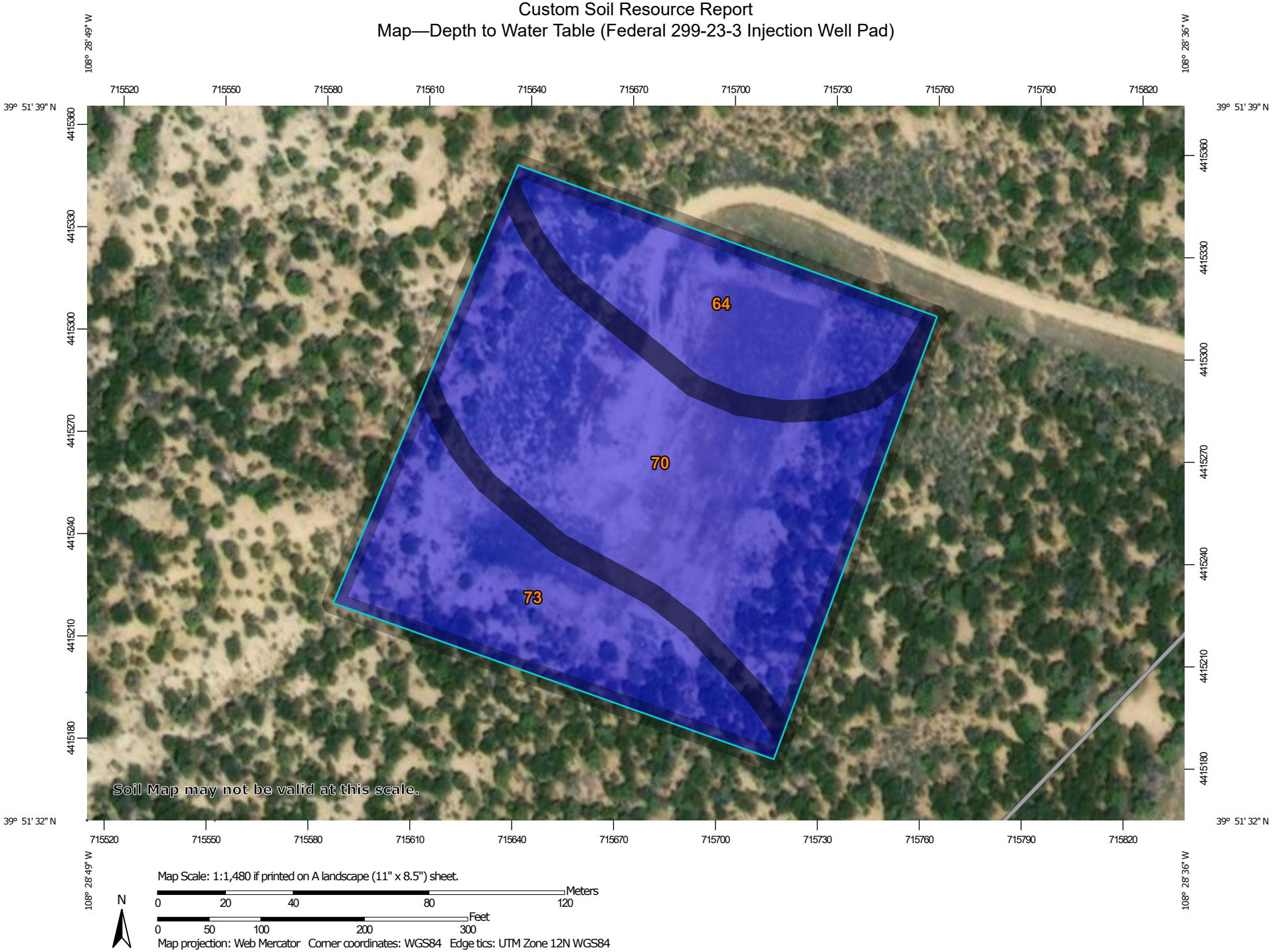
Water Features include ponding frequency, flooding frequency, and depth to water table.

## Depth to Water Table (Federal 299-23-3 Injection Well Pad)

"Water table" refers to a saturated zone in the soil. It occurs during specified months. Estimates of the upper limit are based mainly on observations of the water table at selected sites and on evidence of a saturated zone, namely grayish colors (redoximorphic features) in the soil. A saturated zone that lasts for less than a month is not considered a water table.

This attribute is actually recorded as three separate values in the database. A low value and a high value indicate the range of this attribute for the soil component. A "representative" value indicates the expected value of this attribute for the component. For this soil property, only the representative value is used.

# Custom Soil Resource Report
## Map—Depth to Water Table (Federal 299-23-3 Injection Well Pad)



## MAP LEGEND

**Area of Interest (AOI)**

Area of Interest (AOI)

**Soils**

**Soil Rating Polygons**

0 - 25

25 - 50

50 - 100

100 - 150

150 - 200

> 200

Not rated or not available

**Soil Rating Lines**

0 - 25

25 - 50

50 - 100

100 - 150

150 - 200

> 200

Not rated or not available

**Soil Rating Points**

0 - 25

25 - 50

50 - 100

100 - 150

150 - 200

> 200

Not rated or not available

**Water Features**

Streams and Canals

**Transportation**

Rails

Interstate Highways

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Major Roads

Local Roads

**Background**

Aerial Photography

## MAP INFORMATION

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## Table—Depth to Water Table (Federal 299-23-3 Injection Well Pad)

| Map unit symbol | Map unit name | Rating (centimeters) | Acres in AOI | Percent of AOI |
|---|---|---|---|---|
| 64 | Piceance fine sandy loam, 5 to 15 percent slopes | >200 | 1.1 | 22.9% |
| 70 | Redcreek-Rentsac complex, 5 to 30 percent slopes | >200 | 2.3 | 49.9% |
| 73 | Rentsac channery loam, 5 to 50 percent slopes | >200 | 1.3 | 27.1% |
| **Totals for Area of Interest** | | | **4.6** | **100.0%** |

### Rating Options—Depth to Water Table (Federal 299-23-3 Injection Well Pad)

*Units of Measure:* centimeters

*Aggregation Method:* Dominant Component

*Component Percent Cutoff: None Specified*

*Tie-break Rule:* Lower

*Interpret Nulls as Zero:* No

*Beginning Month:* January

*Ending Month:* December

## Flooding Frequency Class (Federal 299-23-3 Injection Well Pad)

Flooding is the temporary inundation of an area caused by overflowing streams, by runoff from adjacent slopes, or by tides. Water standing for short periods after rainfall or snowmelt is not considered flooding, and water standing in swamps and marshes is considered ponding rather than flooding.

Frequency is expressed as none, very rare, rare, occasional, frequent, and very frequent.

"None" means that flooding is not probable. The chance of flooding is nearly 0 percent in any year. Flooding occurs less than once in 500 years.

"Very rare" means that flooding is very unlikely but possible under extremely unusual weather conditions. The chance of flooding is less than 1 percent in any year.

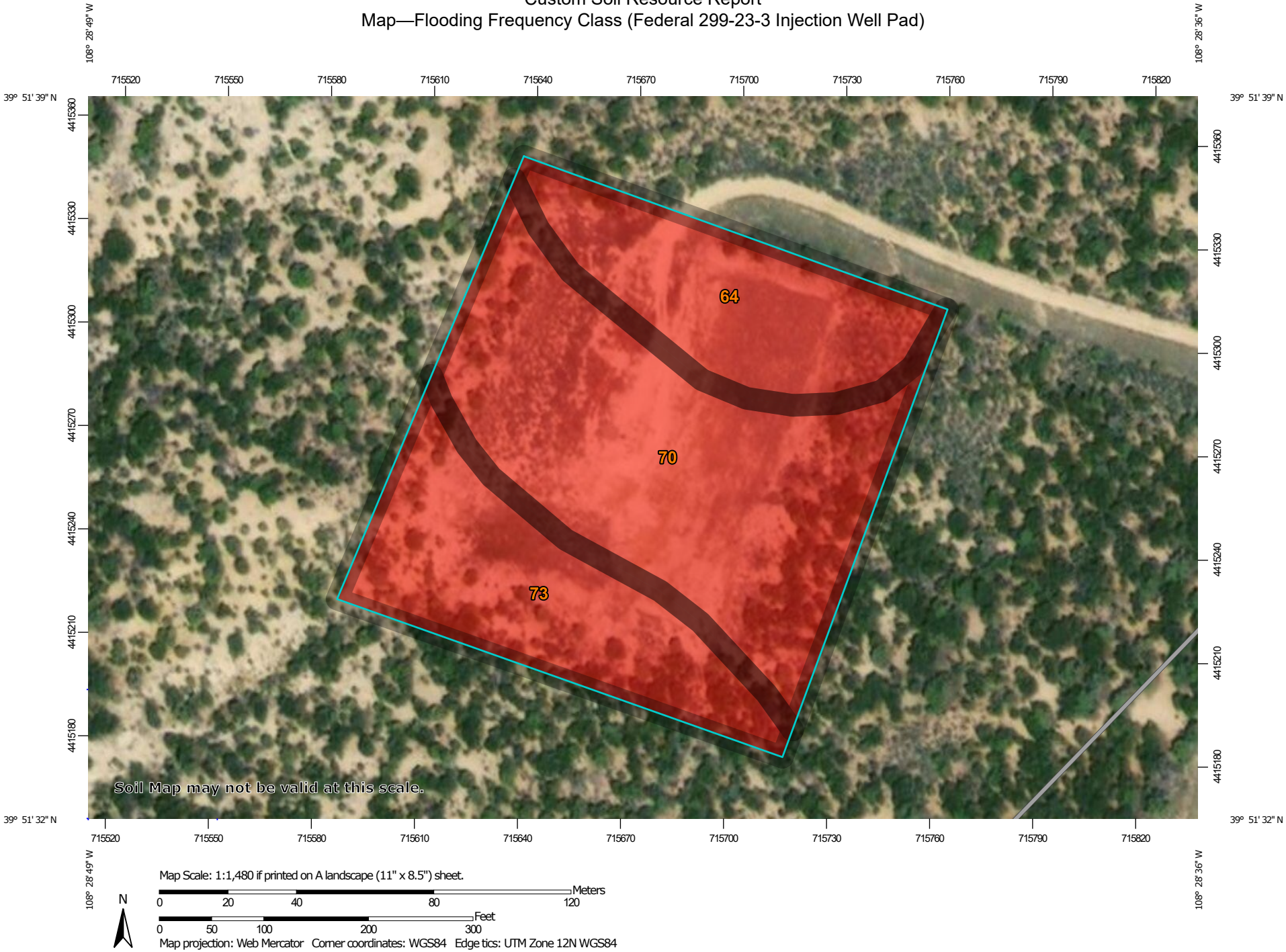
"Rare" means that flooding is unlikely but possible under unusual weather conditions. The chance of flooding is 1 to 5 percent in any year.

"Occasional" means that flooding occurs infrequently under normal weather conditions. The chance of flooding is 5 to 50 percent in any year.

"Frequent" means that flooding is likely to occur often under normal weather conditions. The chance of flooding is more than 50 percent in any year but is less than 50 percent in all months in any year.

"Very frequent" means that flooding is likely to occur very often under normal weather conditions. The chance of flooding is more than 50 percent in all months of any year.

Custom Soil Resource Report
Map—Flooding Frequency Class (Federal 299-23-3 Injection Well Pad)



## MAP LEGEND

**Area of Interest (AOI)**
- Area of Interest (AOI)

**Soils**

**Soil Rating Polygons**
- None
- Very Rare
- Rare
- Occasional
- Frequent
- Very Frequent
- Not rated or not available

**Soil Rating Lines**
- None
- Very Rare
- Rare
- Occasional
- Frequent
- Very Frequent
- Not rated or not available

**Soil Rating Points**
- None
- Very Rare
- Rare
- Occasional
- Frequent
- Very Frequent
- Not rated or not available

**Water Features**
- Streams and Canals

**Transportation**
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

**Background**
- Aerial Photography

## MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

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Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

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Date(s) aerial images were photographed: Sep 13, 2010—Oct 26, 2017

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## Table—Flooding Frequency Class (Federal 299-23-3 Injection Well Pad)

| Map unit symbol | Map unit name | Rating | Acres in AOI | Percent of AOI |
|---|---|---|---|---|
| 64 | Piceance fine sandy loam, 5 to 15 percent slopes | None | 1.1 | 22.9% |
| 70 | Redcreek-Rentsac complex, 5 to 30 percent slopes | None | 2.3 | 49.9% |
| 73 | Rentsac channery loam, 5 to 50 percent slopes | None | 1.3 | 27.1% |
| **Totals for Area of Interest** | | | **4.6** | **100.0%** |

## Rating Options—Flooding Frequency Class (Federal 299-23-3 Injection Well Pad)

*Aggregation Method:* Dominant Condition

*Component Percent Cutoff: None Specified*

*Tie-break Rule:* More Frequent

*Beginning Month:* January

*Ending Month:* December

# References

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