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August 7, 2026

Land Development Consultants, Inc.
3898 Maizeland Road
Colorado Springs, Colorado 80909

Attn: Dan Kupferer

Re: Soils and Geology Study
Arroya Lane Minor Subdivision
Parcel No. 52220-00-018
9420 Arroya Lane
El Paso County, Colorado
Entech Job No. 261558

Dear Mr. Kupferer:

As requested, personnel of Entech Engineering, Inc. have investigated the above-referenced site to evaluate the conditions with respect to geology and geologic hazards affecting the proposed final plat of the minor subdivision. The site is located northwest of Raygor Road and Arroya Lane in El Paso County, Colorado.

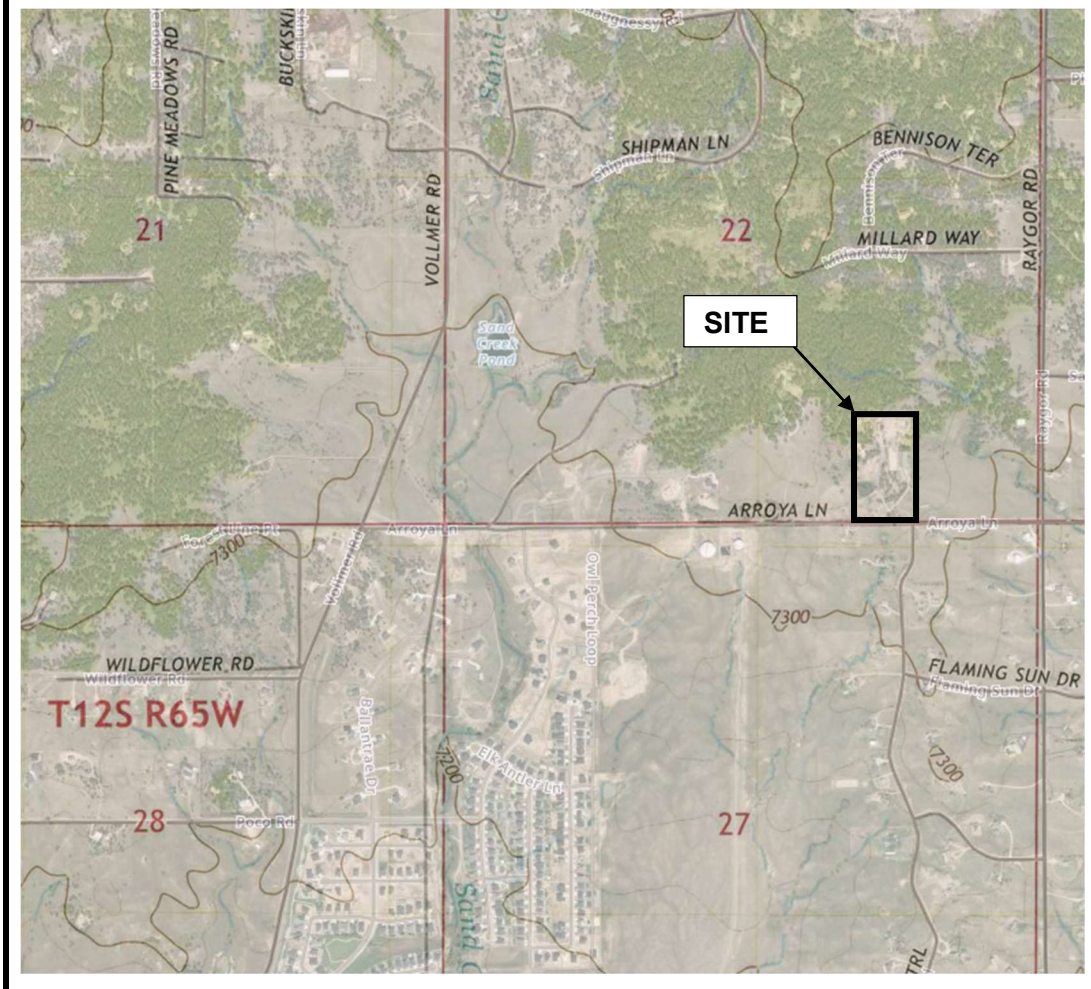
The scope of this report includes a geologic analysis of the site utilizing published geologic data, subsurface soils information and site-specific mapping of major geologic features, and identification of geologic hazards with respect to development with recommended mitigation techniques.

Site Conditions:

The site is located in a portion of the SE¼ of Section 22, Township 12 South, Range 65 West, of the 6th Principal Meridian in El Paso County, Colorado. The approximate location of the site is shown on the USGS Map, Exhibit 1. Terrain across the site is generally gradual to moderately sloping to the south. Minor drainage swales in the western portion, and a pond is located in the southern portion of the site. The drainages were dry at the time of our site observation, and the pond had some standing water. Vegetation observed on site consisted of field grasses, and weeds with areas of ponderosa pine trees, and landscaped areas around the residence.

The site is zoned as RR-5 (Rural Residential). The project is to consist of a final plat of the minor subdivision for an existing developed property. Two residences, horse arena, barn, and several outbuildings are located on the site. The residences are serviced by an existing water well and cistern, and an existing onsite wastewater treatment system. The Site Plan is presented in Figure 1.

Exhibit 1: USGS Topographic Map
Falcon NW Springs Quadrangle – 2022



Soil Conservation Survey

The Natural Resource Conservation Service (Reference 3), previously the Soil Conservation Service (Reference 7), has mapped two soil types on the site. In general, it is a sandy loam. The soils are described in Exhibit 2, and the Soil Survey Map is shown in Exhibit 3.

Complete descriptions of each soil type are presented in Appendix A. The soil has generally been described as having moderately high permeabilities. Limitations on development include limited ability to support a load, shrink-swell potential, slopes, and frost action potential. Possible hazards with soil erosion are present on the site. The erosion potential can be controlled with vegetation. The soil has been described to have moderate erosion hazards.

Exhibit 2: Soil Survey Description

Type	Description
41	Kettle gravelly loamy sand, 8 to 40% slopes
71	Pring coarse sandy loam, 3 to 8% slopes

Exhibit 3: USDA Soil Survey Map

Soil Map – El Paso County Area, Colorado



Geologic Conditions

The geology of the site was evaluated using the *Geologic Map of the Falcon NW Quadrangle* distributed by the Colorado Geological Survey in 2003 (Reference 4), the *Geologic Map of the Colorado Springs-Castle Rock Area*, distributed by the US Geological Survey in 1979 (Reference 5), and the *Geologic Map of the Pueblo 1° x 2° Quadrangle*, distributed by the US Geological Survey in 1978 (Reference 6).

The site lies in the western portion of the Great Plains Physiographic Province. Approximately 13 miles to the west is a major structural feature known as the Rampart Range Fault. This fault marks the boundary between the Great Plains Physiographic Province and the Southern Rocky Mountain Province. The site exists within the southeastern edge of a large structural feature known as the Denver Basin. Bedrock in the area tends to be very gently dipping in a northeasterly direction (Reference 1). The rocks in the area of the site are sedimentary in nature and typically Upper Cretaceous in age. The bedrock underlying the site consists of the Dawson Formation of Tertiary to Cretaceous Age. The Dawson Formation typically consists of arkosic sandstone with interbedded fine-grained sandstone, siltstone and claystone. Overlying this formation are variable layers of colluvial and residual soils, and man placed fill deposits. These soils typically consist of silty to clayey sands. The fill is primarily associated with the earthen dam in the southern portion of the site.

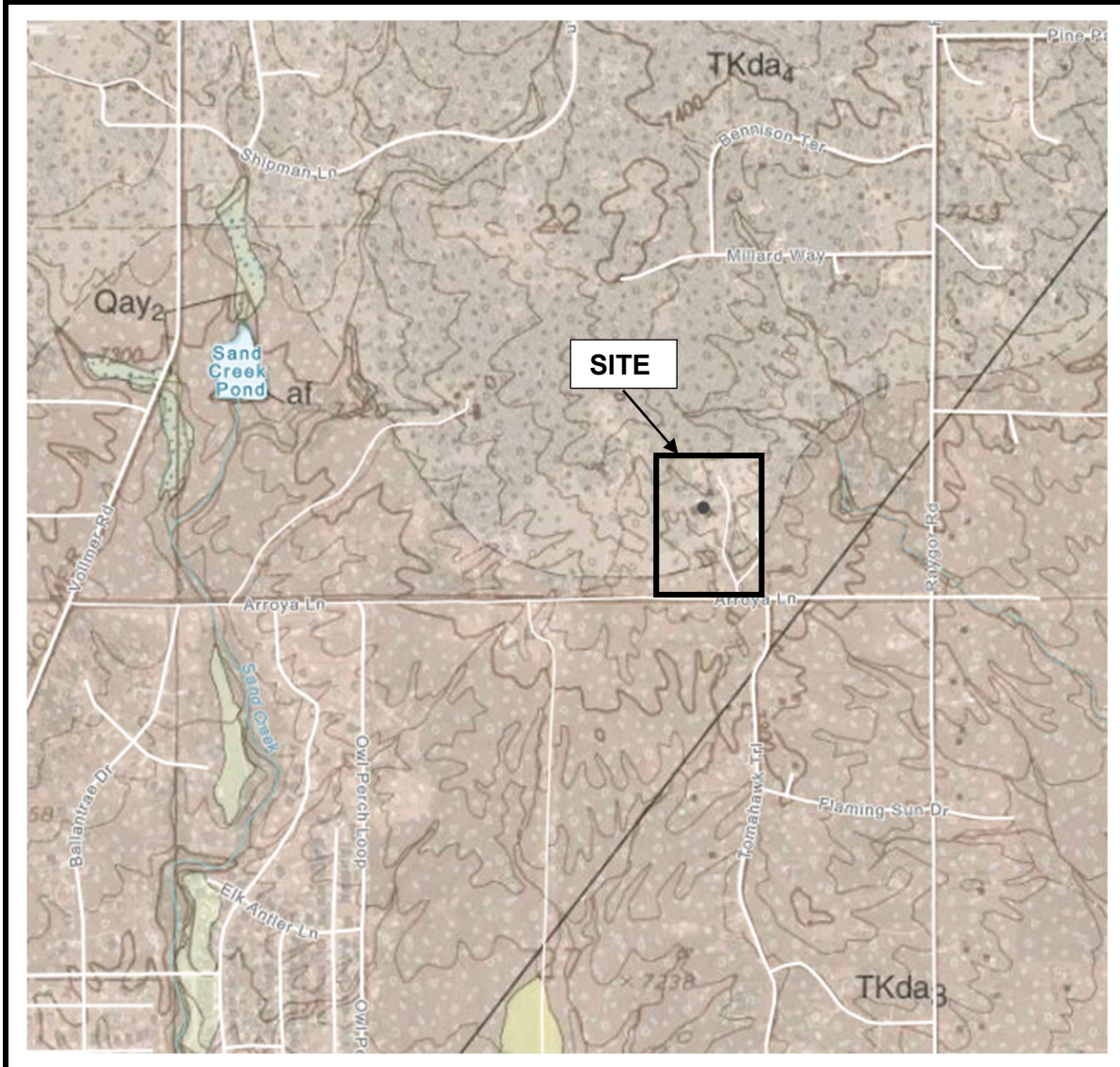
The Falcon NW Quadrangle Geology Map showing the site is presented in Exhibit 4 (Reference 4). The Geology Map prepared for the site is presented in Figure 2. Two mappable units were identified on this site which are described as follows:

Qaf Artificial Fill of Quaternary Age: These are man-made fill deposits associated with the earthen dam for the ponds located in the southern portion of the site. Other areas of fill may exist.

Qc/Tkd Colluvium of Quaternary Age overlying Dawson Arkose of Tertiary to Cretaceous Age: These materials consist of silty to clayey sands, cobbles and boulders deposited by the action of sheetwash and gravity. Some alluvial soils deposited by water and residual soil from in-situ weathering exist in this mapping. These soils are overlying the Dawson Formation. The Dawson Formation typically consists of coarse-grained, arkosic sandstone with interbedded lenses of fine-grained sandstone, siltstone and claystone.

Exhibit 4: Geologic Map of the Falcon NW Quadrangle

CGS Map No. OF 03-08



Engineering Geologic Constraints/Hazards

The geologic hazards identified on this site include artificial fill, potentially expansive soils, potential seasonal shallow groundwater, ponded water, and the potential for elevated radon levels. The geologic hazards have been addressed below.

Artificial Fill – Constraint

Fill associated with the earthen dam in the southern portion of the site exists. Additionally, areas of fill may be encountered adjacent to the existing structures onsite.

Mitigation: Uncontrolled fill if encountered in any future foundation area will require penetration or removal and recompaction.

Expansive Soils – Constraint

The site is mapped in an area of low swell potential according to the *Map of Potentially Swelling Soil and Rock in the Front Range Urban Corridor* by Hart, 1974 (Reference 7). The Pierre Shale underlying the site is typically highly expansive. Moderate to highly expansive claystone and siltstone are commonly interbedded in the Dawson Formation in the area. Expansive soils encountered at foundation grade can cause differential movement in the structure foundation, if not properly mitigated.

Mitigation: Expansive soils encountered at or near foundation grade will require mitigation. Overexcavation of 3 to 5 feet of expansive soils and replacement with non-expansive soils at a minimum of 95% of the Modified Proctor (D1557) maximum dry density at +/- 2% of optimum moisture content is a suitable mitigation.

Landslide Susceptibility and Slope Stability – Hazard

Terrain across the site is generally gradual to moderately sloping to the south. Minor drainage swales and a pond are located in the southern portion of the site. The majority of the slopes on-site are gradually sloping and do not exhibit and past or potential unstable slopes or landslides. It is recommended that any future grading or fill slopes should be 3:1 or flatter.

Drainage Areas, Floodplains, and Groundwater – Constraint

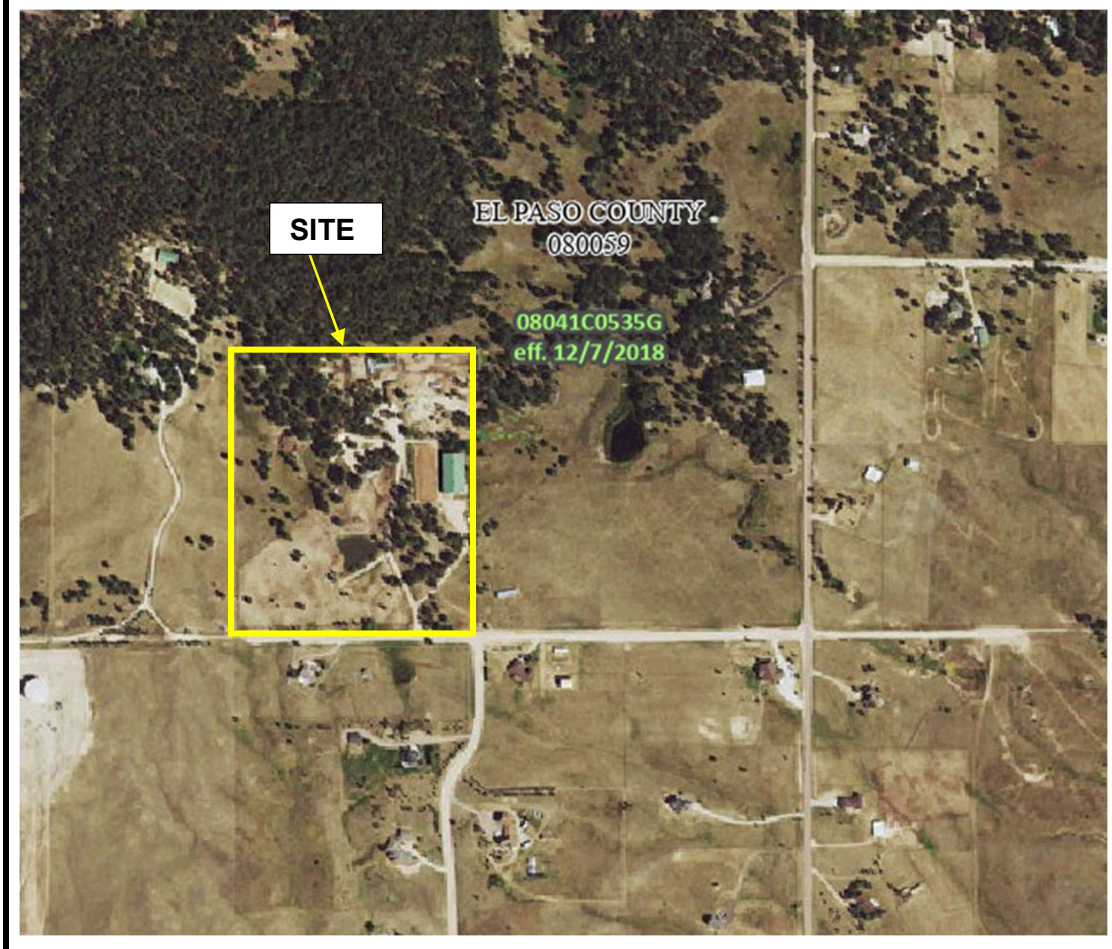
The site does not lie within any floodplains according to FEMA Map No. 08041C0535G (Reference 8, Exhibit 5). Minor drainage swales and a pond are located in the southern portion of the site with anticipated flows to the south. Water was not observed in the drainage swales, however, water was observed in the pond. Any site grading should be modified to direct surface flows around the structure and carried away as to not produce any areas of ponded water or accelerated erosion. Drainage studies are beyond the scope of this report.

Potentially Seasonal Shallow Groundwater: This constraint is associated with the minor drainage swales. In these areas, we would anticipate the potential for periodically high subsurface moisture conditions and possible frost heave potential, depending on the soil conditions.

Mitigation: In these locations, foundations in areas subject to severe frost heave potential should penetrate sufficient depth so as to discourage the formation of ice lenses beneath foundations. At this location and elevation, a foundation depth for frost protection of 2.5 feet is recommended. In areas where high subsurface moisture conditions are anticipated periodically, a subsurface perimeter drain will be necessary to help prevent the intrusion of water into areas located below grade.

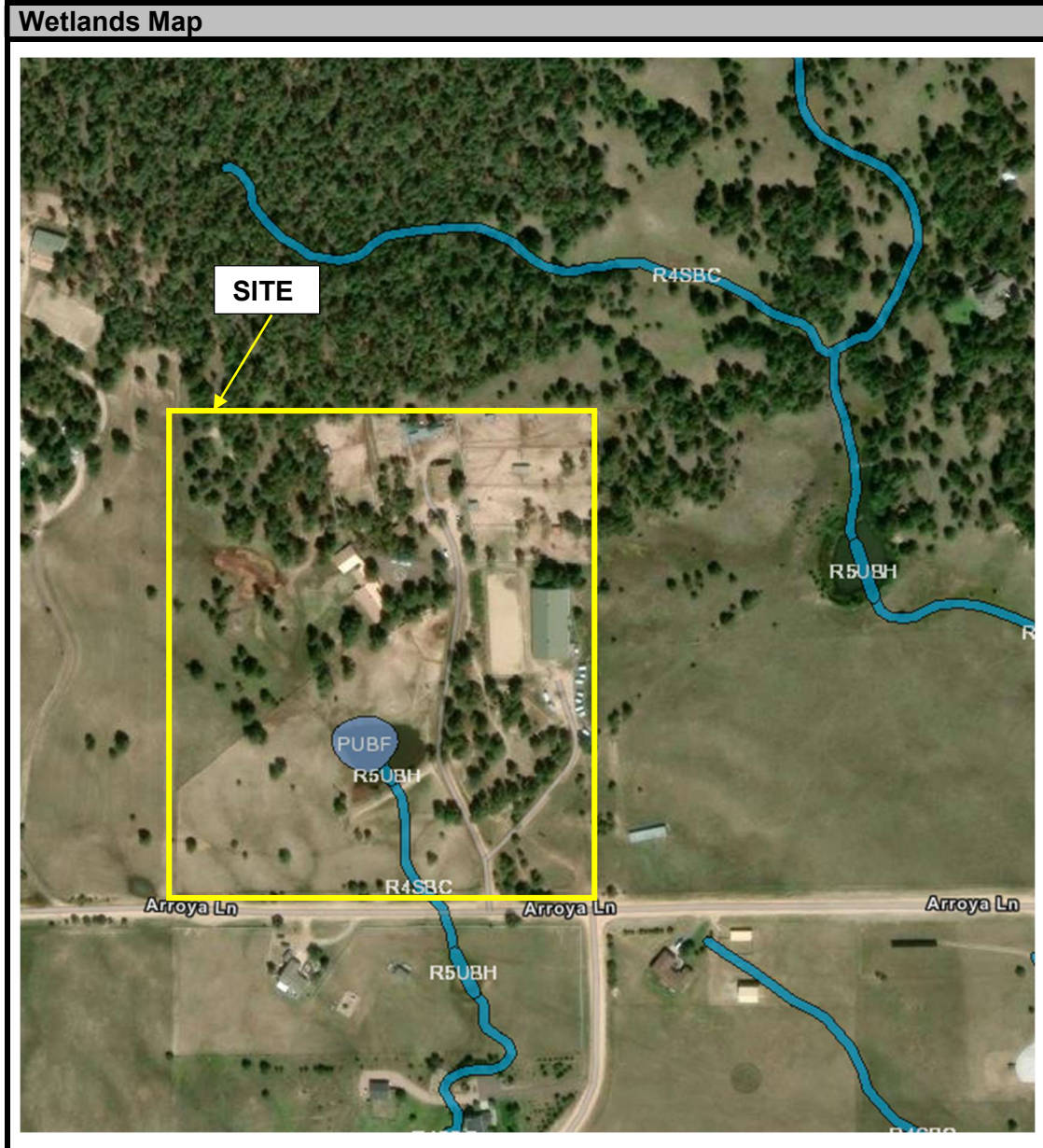
Exhibit 5: FEMA Floodplain Map

FEMA Map No. 08041C0535G



The minor drainage swale and pond observed in the southern portion of the site have been included in the National Wetlands Inventory as Freshwater Wetland habitats (Reference 9). Sand Creek is classified as **R5UBH** (R – Riverine, 5 – Unknown Perennial, UB – Unconsolidated Bottom, H – Permanently Flooded) **R4SBC** (R – Riverine, 4 – Intermittent, SB – Streambed, C – Seasonally Flooded), and the pond is classified as **PUBF** (P – Palustrine, UB – Unconsolidated Bottom, F – Semipermanently Flooded). These areas should be avoided by construction. The wetlands map is shown in Exhibit 6.

Exhibit 6: USFWS National Wetlands Inventory



Debris Fans - Hazard

The site is not mapped within an area susceptible to debris flows according to the *Debris Flow Susceptibility Map of El Paso County, Colorado*, by McCoy, Morgan, and Berry (Reference 10).

Radon

Radon is a colorless, tasteless radioactive gas with a United States Environmental Protection Agency (EPA) specified action level of 4.0 picocuries per liter (pCi/L) of air. Radon gas has a very short half-life of 3.8 days. Radon levels for the area have been reported by the Colorado Geologic Survey in the open file, Report No. 91-4 (Reference 11). Average Radon levels for the 80909-zip code of 3.40 pCi/l have been measured in the area. The average radon levels in this area are shown in Exhibit 7 below.

Exhibit 7: CGS Report No. 91-4

Average Radon Levels for the 80908 Zip Code	
0 < 4 pCi/L	50.00%
4 < 10 pCi/L	50.00%
10 < 20 pCi/L	0.00%
> 20 pCi/L	0.00%

Mitigation: The potential for high radon level is present for the site. Build-ups of radon gas can be mitigated by providing increased ventilation of basements and crawlspaces and sealing of joints.

Relevance of Geologic Conditions to Development

The project will consist of the final plat of the minor subdivision for an existing developed property. Two residences, horse arena, barn, and several outbuildings are located on the site and will remain. The residences are serviced by an existing water well and cistern, and an existing onsite wastewater treatment system. It is our opinion that the existing geologic and engineering geologic conditions will impose some minor constraints on the site. The most significant problems affecting development will be that associated with artificial fill, potentially expansive soils, potential seasonal shallow groundwater, ponded water, and the potential for elevated radon levels. These problems can be satisfactorily mitigated through proper engineering design and construction practices or avoidance.

In summary, development of the site can be achieved if the items mentioned above are mitigated. These items can be mitigated through proper design, construction practices or avoidance.

Closure

It is our opinion that the existing geologic engineering and geologic conditions will impose some constraints on future development and construction of the site. The majority of these conditions can be mitigated through proper engineering design and construction practices. The proposed development and use are consistent with anticipated geologic and engineering geologic conditions.

It should be pointed out that because of the nature of data obtained by random sampling of such variable and non-homogeneous materials as soil and rock, it is important that we be informed of any differences observed between surface and subsurface conditions encountered in construction and those assumed in the body of this report. Construction and design personnel should be made familiar with the contents of this report. Additional investigation is recommended for any new structures or additions.

This report has been prepared for Land Development Consultants for application to the proposed project in accordance with generally accepted geologic soil and engineering practices. No other warranty, expressed or implied, is made.

We trust that this report has provided you with all the information that you require. Should you require additional information, please do not hesitate to contact Entech Engineering, Inc.

Respectfully Submitted,

ENTECH ENGINEERING, INC.



Logan L. Langford, P.G.
Sr. Geologist

Reviewed by:



Joseph C. Goode, Jr., P.E.
President

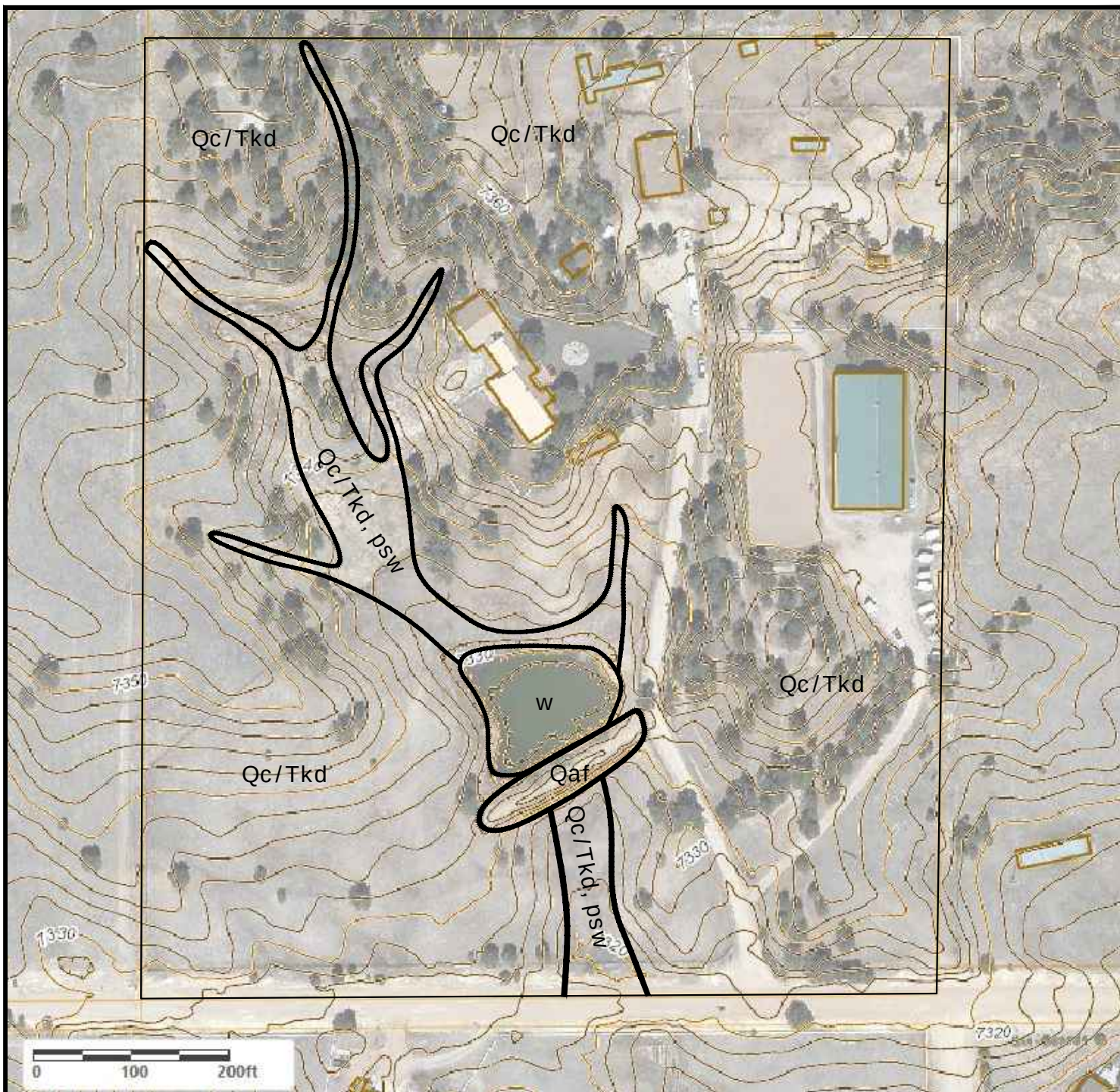
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FIGURES



Legend

- Qaf - Artificial Fill of Holocene Age:**
man-placed fill deposits associated with the earthen dam
- Qc/Tkd - Colluvium of Quaternary Age overlying the Dawson Formation of Tertiary to Cretaceous Age:**
sheetwash and residual soil deposits overlying arkosic sandstone with interbedded siltstone and claystone
- psw - potential seasonally shallow groundwater
w - ponded water



GEOLOGY ENGINEERING GEOLOGY MAP

9420 ARROYA LANE
LAND DEVELOPMENT CONSULTANTS, INC.

JOB NO.
261558

FIG. 2

APPENDIX A: USDA Soil Survey Descriptions

El Paso County Area, Colorado

41—Kettle gravelly loamy sand, 8 to 40 percent slopes

Map Unit Setting

National map unit symbol: 368h

Landscape: Uplands

Elevation: 7,000 to 7,700 feet

Farmland classification: Not prime farmland

Map Unit Composition

Kettle and similar soils: 85 percent

Minor components: 15 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Kettle

Setting

Landscape: Uplands

Landform: Hills

Landform position (three-dimensional): Side slope

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Sandy alluvium derived from arkose

Typical profile

E - 0 to 16 inches: gravelly loamy sand

Bt - 16 to 40 inches: gravelly sandy loam

C - 40 to 60 inches: extremely gravelly loamy sand

Properties and qualities

Slope: 8 to 40 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Somewhat excessively drained

Runoff class: Medium

Capacity of the most limiting layer to transmit water (Ksat): High
(2.00 to 6.00 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Available water supply, 0 to 60 inches: Low (about 3.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 7e

Hydrologic Soil Group: B

Ecological site: F048AY908CO - Mixed Conifer

Hydric soil rating: No

Minor Components

Other soils

Percent of map unit: 10 percent

Hydric soil rating: No

Pleasant

Percent of map unit: 5 percent

Landform: Depressions

Hydric soil rating: Yes

Data Source Information

Soil Survey Area: El Paso County Area, Colorado

Survey Area Data: Version 23, Aug 29, 2025

El Paso County Area, Colorado

71—Pring coarse sandy loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 369k

Landscape: Uplands

Elevation: 6,800 to 7,600 feet

Farmland classification: Not prime farmland

Map Unit Composition

Pring and similar soils: 85 percent

Minor components: 15 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Pring

Setting

Landscape: Uplands

Landform: Hills

Landform position (three-dimensional): Side slope

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Arkosic alluvium derived from sedimentary rock

Typical profile

A - 0 to 14 inches: coarse sandy loam

C - 14 to 60 inches: gravelly sandy loam

Properties and qualities

Slope: 3 to 8 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Well drained

Runoff class: Low

Capacity of the most limiting layer to transmit water (Ksat): High
(2.00 to 6.00 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Available water supply, 0 to 60 inches: Low (about 6.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 3e

Hydrologic Soil Group: B

Ecological site: R048AY222CO - Loamy Park

Hydric soil rating: No

Minor Components

Other soils

Percent of map unit: 10 percent

Hydric soil rating: No

Pleasant

Percent of map unit: 5 percent

Landform: Depressions

Hydric soil rating: Yes

Data Source Information

Soil Survey Area: El Paso County Area, Colorado

Survey Area Data: Version 23, Aug 29, 2025