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SOILS AND GEOLOGY STUDY
HODGEN ROAD 7-LOT SUBDIVISION
PARCEL NO. 61250-01-003
EL PASO COUNTY, COLORADO

Prepared for:
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March 20, 2025

Respectfully Submitted,

ENTECH ENGINEERING, INC.

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1 SUMMARY

Project Location

The project is located in the NE¼ of Section 25, Township 11 South, Range 66 West of the 6th Principal Meridian in El Paso County, Colorado. The site is located approximately 4 miles southwest of Monument, Colorado.

Project Description

A seven lot rural residential subdivision is proposed for the existing 19.5-acre parcel. The proposed site development will include single-family rural residential lots ranging in size from 2.5 to 4.5 acres with the existing residence located on Lot 5 to remain. The proposed new lots will utilize individual water wells and onsite wastewater treatment systems (OWTS).

Scope of Report

This report presents the results of our geologic evaluation and treatment of engineering geologic hazard study for the proposed subdivision.

Land Use and Engineering Geology

This site was found to be suitable for the proposed development; however, geologic conditions in certain areas will impose some constraints on development and land use. These include areas of artificial fill, potentially expansive soils, seasonally shallow groundwater areas, and areas of ponded water. Based on the proposed development plan, it appears that these areas will have some impact on the development. These conditions are discussed in greater detail in this report.

In general, it is our opinion that the development can be achieved if the observed geologic conditions on site are either properly mitigated or avoided. All recommendations are subject to the limitations discussed in the report.

2 GENERAL SITE CONDITIONS AND PROJECT DESCRIPTION

The project is located in the NE¼ of Section 25, Township 11 South, Range 66 West of the 6th Principal Meridian in El Paso County, Colorado. The site is located approximately 4 miles southwest of Monument, Colorado, southeast of Hodgen Road and Farrar Road. The location of the site is as shown on the Vicinity Map (Figure 1).

The topography of the site varies from gently to moderately sloping, generally to the east and southeast, along drainages in the northeastern and southern portions of the site. An earthen dam is located in the southern portion of the site and erosion control berms are in the eastern and southern portions of the site. The drainages on site generally flow in southeasterly, and easterly directions across the site. Water was not observed flowing in the drainages at the time of this investigation; however, an area of ponded water was observed on the eastern side earthen dam. Additionally, saturated conditions and minor amounts of water were observed in the minor drainage swales and along the uphill side of the erosion berms. The site boundaries are indicated on the USGS Map (Figure 2). Previous land uses have included rural residential, storage and material stockpiling, and grazing and pastureland. The site primarily contains field grasses, weeds, cacti, and with areas of ponderosa pines in the southern portion of the site. Site photographs taken February 17, 2025 are included in Appendix A.

The proposed site development will consist of seven single-family rural residential lots ranging in size from 2.5 to 4.5 acres with the existing residence located on Lot 5 to remain. The proposed new lots will utilize individual water wells and OWTS. The proposed lot configuration is shown on the Site and Exploration Plan (Figure 4).

3 SCOPE OF THE REPORT

The scope of the report includes a general geologic analysis utilizing published geologic data. Detailed site-specific mapping was conducted to obtain general information with respect to major geographic and geologic features, geologic descriptions, and their effects on the development of the property in accordance with the El Paso Land Development Code.

4 FIELD INVESTIGATION

Our field investigation consisted of the preparation of a geologic map of any bedrock features and significant surficial deposits. The site was also evaluated using the Web Soil Survey from the Natural Resource Conservation Service (NRCS), formerly known as the Soil Conservation Service (SCS). The position of mappable units within the subject property is shown on the Geologic Map. Our mapping procedures involved both field reconnaissance and measurements and air photo reconnaissance and interpretation. The same mapping procedures have also been utilized to produce the Engineering Geology Map, which identified pertinent geologic conditions

affecting development. The field mapping was completed on February 17, 2025. Site photographs are included in Appendix A.

Three (3) test borings were drilled and three (3) test pits were excavated across the project site to determine the classification and engineering characteristics of the soils. The borings were drilled to depths of 20 feet using a truck-mounted, continuous flight auger drilling rig supplied and operated by Entech, and the test pits were excavated to depths of 8 feet.

The locations of the test borings and test pits are indicated on the Site and Exploration Plan (Figure 4). The Test Boring and Test Pit Logs are included in Appendix B, and Laboratory Test Results are included in Appendix C. The results of the testing will be discussed later in this report.

Laboratory testing was performed to classify and determine the engineering characteristics of the soils. Laboratory tests included moisture content testing (ASTM D2216), grain-size analysis (ASTM D422), and Atterberg Limits testing (ASTM D4318). Swell testing included both FHA Swell Tests and Swell/Consolidation Tests. Results of the laboratory testing are included in Appendix C.

5 SOIL, GEOLOGY, AND ENGINEERING GEOLOGY

5.1 General Geology

The site lies in the western portion of the Great Plains Physiographic Province. A major structural feature known as the Rampart Range Fault lies approximately 11 miles to the west. 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 northerly direction (Reference 1). The rocks in the area of the site are sedimentary in nature and typically Tertiary to Cretaceous in age. The bedrock underlying the site consists of the Dawson Arkose Formation. Overlying this formation are unconsolidated deposits of residual and colluvial soils of the Quaternary Age. The residual soils are produced by the in-situ action of weathering of the bedrock on site and the colluvial soils deposited by gravity and sheetwash. Man-placed soils exist as earthen dams and erosion berms, and temporary stockpiles in the northwestern portion of the site. The site's stratigraphy will be discussed in more detail in Section 5.3.

5.2 Soil Conservation Survey

The Natural Resource Conservation Service (Reference 2), previously the Soil Conservation Service (Reference 3), has mapped two soil types on the site (Figure 4). In general, they vary from sandy loam to loam and sandy loam with subsoils of clay loam. The soils are described as follows:

Type	Description
67	Peyton sandy loam, 5 to 9% slopes
68	Peyton-Pring complex, 3 to 8% slopes

Complete descriptions of each soil type are presented in Appendix D. The soils have generally been described as having moderate to rapid 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. Most of the soils have been described to have moderate erosion hazards.

5.3 Site Stratigraphy

The Black Forest Quadrangle Geology Map showing the site is presented in Figure 5 (Reference 4). The Geology Map prepared for the site is presented in Figures 5 and 6 Three mappable units were identified on this site that are described as follows:

Qaf **Artificial Fill of Quaternary Age:** These are man-made fill deposits associated with erosion berms and earthen dams on the site, and areas of stockpiles located in the northwestern portion of the site (Lots 1 and 2) Other areas of fill may exist on the site other than those mapped.

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.

The soils listed above were mapped from site-specific mapping, the *Geologic Map of the Black Forest 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 Denver 1^0 x 2^0 Quadrangle*, distributed by the US Geological Survey in 1981 (Reference 6). The Test Borings and Test Pit Logs used in evaluating the site are included in Appendix B. The Geology/Engineering Geology Map prepared for the site is presented in Figure 6.

5.4 Soil Conditions

The soils encountered in the test borings drilled on the site can be grouped into three general soil and rock types. The soils were classified using the Unified Soil Classification System (USCS).

Soil Type 1 classified as a loose clayey to silty sand fill (SC, SM). The sand fill was encountered in TB-1 at the existing surface extending to 3 feet bgs and was encountered at loose states.

Soil Type 2 classified as silty sand (SM). The sand was encountered in the all of the test borings below Soil Type 1 in TB-1 and at the surface of TB-2 and TB-3 extending to depths ranging from 1 to 7 feet bgs. The sand was encountered at medium dense states and moist conditionsFHA Swell testing resulted in expansion pressures of 270. These results indicate low expansion potentials.

Soil Type 3 classified as a highly weathered to weathered sandstone or silty sand, and (SM) when classified as soils. The sandstone was encountered in all of the test borings at depths ranging from 1 foot to 7 feet bgs and extending to the termination of the borings (20 Feet).

5.5 Groundwater

Groundwater was not encountered in any of the test borings that were drilled to 20 feet, and no signs of redoximorphic features observed in the test pits which were excavated to depths of 8 feet. Areas of seasonally shallow groundwater, and ponded water have been mapped in the drainages and some low-lying areas on the site. Water and saturated conditions were observed along low-lying areas, portions of the minor drainage swales, and the uphill side of the erosion berms. The saturated surface conditions are attributed to recent snow melt collecting in the low-lying areas and uphill sides of the erosion berms. These areas are discussed in the following section. Fluctuation in groundwater conditions may occur due to variations in rainfall and other factors including development of the site and surrounding areas.

For the sandy materials on site, it should be noted that some groundwater conditions might be encountered due to the variability in the soil profile. Isolated sand and gravel layers within the soils, sometimes only a few feet in thickness and width, can carry water in the subsurface. Groundwater may also flow on top of the underlying bedrock or clays. Builders and planners should monitor potential occurrences of such subsurface water features during construction on-site and mitigate as necessary at the time of construction.

6 ENGINEERING GEOLOGY – IDENTIFICATION AND MITIGATION OF GEOLOGIC HAZARDS

Detailed mapping has been performed on this site to produce a Geology/Engineering Geology Map (Figure 6). This map shows the location of various geologic conditions the developers should monitor during the planning, design, and construction stages of the project. No significant geologic hazards were identified on the site; however, the following constraints have been identified on the site: artificial fill, potentially expansive soils, seasonally shallow groundwater areas, and areas of ponded water. These constraints and the recommended mitigation techniques include:

Artificial Fill – Constraint

These are areas of man-made fill associated with earthen dams, erosion berms, and temporary stockpiles observed on the site.

Mitigation: The earthen dams lie within defined drainages and should be avoided as building sites. Some dams are to be removed or reconstructed as a part of detention ponds. The erosion berms can either be avoided or penetrated by foundations. It is anticipated that the temporary stockpiles will be removed prior to construction. The fill on this site is considered uncontrolled for construction purposes. Any uncontrolled fill encountered beneath foundations will require removal and recompaction at a minimum of 95% of the Modified Procter (ASTM D1557) maximum dry density.

Potentially Expansive Soils – Constraint

The site is classified in an area of low to moderate swell potential according to the *Map of Potentially Swelling Soil and Rock in the Front Range Urban Corridor, Colorado* by Hart, 1974 (Reference 12). Expansive soils were not encountered in the test borings, however, expansive residual clays, claystone and siltstone are commonly interbedded in the Dawson Formation. These occurrences are typically sporadic; therefore, none have been indicated on the maps. These clays, claystone, and siltstone if encountered beneath foundations, can cause differential

The embankment/dam on the eastern edge of the detention pond has proposed modifications. Please analyze the embankment and provide recommendations for the proposed pipe through the dam and the proposed cut and fill. There is also a proposed driveway on top of the dam.

movement in the structure foundation. These occurrences should be identified and mitigated on an individual basis.

Mitigation: Should expansive soils be encountered beneath foundations, mitigation will be necessary. Mitigation of expansive soils will require special foundation design. Overexcavation and replacement with non-expansive soils at a minimum of 95% of the Modified Proctor (ASTM D1557) maximum dry density is a suitable mitigation, which is common in the area. Overexcavation depths of 3 to 5 feet may be necessary depending on soil conditions. Another alternative in areas of highly expansive soils is the use of drilled pier foundation systems. Typical minimum pier depths are on the order of 25 feet or more and require penetration into the bedrock material a minimum of 4 to 6 feet, depending upon building loads. Floor slabs on expansive soils should be expected to experience movement. Overexcavation and replacement have been successful in minimizing slab movements. The use of structural floors should be considered for basement construction on highly expansive clays. Final recommendations should be made after additional investigation of each building site.

Drainage and Floodplain Areas

The site is not located within any mapped floodplains according to the FEMA Map No. 08041CO305G, dated December 7, 2018 (Figure 7, Reference 8). The topography of the site varies from gently to moderately sloping, generally to the east and southeast, along drainages in the northeastern and southern portions of the site. An earthen dam is located in the southern portion of the site and erosion control berms are in the eastern and southern portions of the site. The drainages on site generally flow in southeasterly, and easterly directions across the site. Water was not observed flowing in the drainages at the time of this investigation; however, an area of ponded water was observed on the eastern side earthen dam. Additionally, saturated conditions and minor amounts of water were observed in the minor drainage swales and along the uphill side of the erosion berms. The drainages and minor drainages observed across the site have been indicated as seasonal shallow areas on the Geology/Engineering Geology Map (Figure 6). The major drainages are anticipated to be located in “open space” and drainage easements.

Portions of the drainages and pond in the southern portion of the site have been included in the National Wetland Inventory as Freshwater Emergent Wetland habitats classified as **PABFh** (Palustrine – P, Aquatic Bed – AB, Semi Permanently Flooded – F, Diked/Impounded – h), and **R4SBC** (Riverine – R, Intermittent – 4, Stream Bed – SB, Seasonally Flooded – C) (Figure 8, Reference 9). These areas will impact the proposed construction of access for Lots 3, 4, and 7 and are further discussed below.

Seasonal Shallow Groundwater Area – Constraint

In these areas, we would anticipate periodic high subsurface moisture conditions and frost heave potential on a seasonal basis. Several drainages originating off of the property flow on to the lots on the western and southern portions of the site. Due to the frozen ground and recent snow melt areas of saturated and ponded/flowing water were observed in the drainages, minor drainage swales, and on the uphill sides of the erosion berms located across the site. These areas lie within defined drainages and minor drainage swales in the northeastern and southern portions of the site. Additional, highly organic soils could be encountered in these areas. It is anticipated they can be avoided by development. Any structures in or adjacent to these areas should follow the mitigation discussed below.

Mitigation: Foundations must have a minimum 30-inch depth for frost protection. Buildings should be a minimum of 3 feet above groundwater levels. Subsurface perimeter drains are recommended for any usable below-grade areas including crawlspaces. Should groundwater be encountered within 3 feet of foundation grade, additional drains that could include but are not limited to interceptor drains, underslab drains (capillary break), and overexcavation drains may be needed. Typical drain details are presented in Figures 9 to 12. Any grading in these areas should be done to direct surface flow around construction to avoid areas of ponded water. Structures should not block drainages. All organic material should be completely removed prior to any fill placement. Septic fields should not be placed in areas where there is the potential for shallow groundwater.

Areas of Ponded Water – Constraint

These are areas of standing water behind the eastern side of the earthen dam on site. We would not expect development in these areas. Either the dams can be avoided by construction, or the areas may be completely regraded. Should complete regrading of the site be considered, all organic matter and soft, wet soils should be completely removed before filling. Any drainage into these areas should be rerouted in a non-erosive manner off the site to prevent areas of ponded water around proposed structures.

Slope Stability and Landslide Susceptibility – Hazard

The majority of the slopes on the site are gradually to moderately sloping and do not exhibit any past or potential unstable slopes or landslides. It is recommended that any future grading or fill slopes be 3:1 or flatter.

Shallow Bedrock – Constraint

Bedrock was encountered in the test borings at depths ranging from 1 to 7 feet. Shallow bedrock will be encountered in some areas of this site. Where claystone or sandstone are encountered,

excavation/grading may be difficult and may require track-mounted excavators. Bedrock will likely be encountered in cuts for utility excavations. The potential for seasonally perched groundwater may occur in areas of shallow bedrock and within more permeable layers of the Dawson Formation.

Radon – Hazard

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 10). The average radon level for the 80908 zip code is 3.40 pCi/l. The following is a table of radon levels in this area:

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 levels is present for the site. Build-up of radon gas can usually be mitigated by providing increased ventilation of basement and crawlspace and sealing joints. Specific requirements for mitigation should be based on site specific testing.

6.1 Relevance of Geologic Conditions to Land Use Planning

We understand that the development will be rural residential. It is our opinion that the existing geologic and engineering geologic conditions will impose some minor constraints on the proposed development and construction. The most significant problems affecting development will be those associated with the drainages on site which can be avoided. Other hazards on site may be satisfactorily mitigated through proper engineering design and construction practices.

The upper residual soils are typically at medium to very dense states. The granular soils encountered in the upper soil profiles of the test borings should provide good support for foundations. Expansive soils that will require mitigation were encountered on portions of the site. Foundations anticipated for the site are standard spread footings on granular soils or in conjunction with overexcavation in areas of expansive soils. Areas containing arkosic sandstone will have high allowable bearing conditions. Difficult excavation should be anticipated in areas of

shallow bedrock. Expansive layers may also be encountered in the soil and bedrock on this site. Areas of expansive soils encountered on site are sporadic; therefore, none have been indicated on the maps. Expansive soils, if encountered, will require special foundation design and/or overexcavation. These soils will not prohibit development. Bearing capacities of 2000 to 2400 psf for granular soils or structural fill, and 3000 to 3500 psf for undisturbed sandstone are anticipated. Site-specific subsurface investigations will need to be conducted and recommendations provided prior to construction.

Areas of fill associated with dam and erosion control berms, and temporary stockpiles were observed on site. It is anticipated that the dam could be avoided by development. The erosion berms can be regraded during site development and or avoided. It is anticipated the existing stockpiles will be removed and or utilized for any future site grading for the development. Any uncontrolled fill encountered beneath foundations should be removed and recompacted at a minimum of 95% of the Modified Proctor (ASTM D1557) maximum dry density.

The site is not located within any mapped floodplains according to the FEMA Map No. 08041CO305G, dated December 7, 2018 (Figure 7, Reference 8). The topography of the site varies from gently to moderately sloping, generally to the east and southeast, along drainages in the northeastern and southern portions of the site. An earthen dam is located in the southern portion of the site and erosion control berms are in the eastern and southern portions of the site. The drainages on site generally flow in southeasterly, and easterly directions across the site. Water was not observed flowing in the drainages at the time of this investigation; however, an area of ponded water was observed on the eastern side earthen dam. Additionally, saturated conditions and minor amounts of water were observed in the minor drainage swales and along the uphill side of the erosion berms.

Portions of the drainages and ponds on the site been included in the National Wetland Inventory as Freshwater Emergent Wetland habitats classified as **PABFh** (Palustrine – P, Aquatic Bed – AB, Semi Permanently Flooded – F, Diked/Impounded – h), and **R4SBC** (Riverine – R, Intermittent – 4, Stream Bed – SB, Seasonally Flooded – C) (Figure 8, Reference 9). These areas will be avoided with construction.

Areas of seasonal and potentially seasonal high groundwater and ponded water were encountered on site. Several drainages originating off of the property flow on to the lots on the western and southern portions of the site. Due to the frozen ground and recent snow melt areas of saturated and ponded/flowing water were observed in the drainages, minor drainage swales,

and on the uphill sides of the erosion berms located across the site. These areas lie within defined drainages and minor drainage swales in the northeastern and southern portions of the site. Subsurface perimeter drains are recommended for any below-grade usable areas including crawlspaces. Should groundwater be encountered within 3 feet of foundation grade, additional drains may include interceptor drains, under slab drains (capillary break), and overexcavation drains. Typical drain details are presented in Figures 9 to 12. Specific recommendations should be made once development plans have been determined and additional site investigation is completed.

UNRESOLVED: Discuss anticipated mitigation measures OR show wetland areas on the plat drawings.

In summary, development of the site can be achieved if the items mentioned above are mitigated. These items can be mitigated through proper design and construction or through avoidance. Investigation of the individual lots and building sites is recommended prior to construction.

7 ECONOMIC MINERAL RESOURCES

Some of the sandy materials on site could be considered a low-grade sand resource. According to the *El Paso County Aggregate Resource Evaluation Map* (Reference 11), portions of the area are mapped as stream terrace and floodplain deposits. According to the *Atlas of Sand, Gravel and Quarry Aggregate Resources, Colorado Front Range Counties* distributed by the Colorado Geological Survey (Reference 12), areas of the site are not mapped with any resources. According to the *Evaluation of Mineral and Mineral Fuel Potential* (Reference 13), the area of the site has been mapped as “Little or No Potential” for industrial minerals. It is possible that sand materials on site could be an aggregate resource. However, considering the silty to clayey nature of many of these materials, the abundance of similar materials throughout the region, and the proximity to developed land, they would be considered to have little significance as an economic resource.

According to the *Evaluation of Mineral and Mineral Fuel Potential of El Paso County State Mineral Lands* (Reference 13), the site is mapped within the Denver Basin Coal Region. However, the area of the site has been mapped as “Poor” for coal resources. No active or inactive mines have been mapped near the site. No metallic mineral resources have been mapped on the site (Reference 13).

The site has been mapped as “Fair” for oil and gas resources (Reference 13). No oil or gas fields have been discovered near the site. The sedimentary rocks in the area may lack the geologic structure for trapping oil or gas; therefore, they may not be considered a significant resource.

Hydraulic fracturing is a new method used to extract oil and gas from rocks. It utilizes pressurized fluid to extract oil and gas from rocks that would not normally be productive. The area of the site has not been explored to determine if the rocks underlying the site would be commercially viable utilizing hydraulic fracturing. The practice of hydraulic fracturing has come under review due to concerns about environmental impacts, health, and safety.

8 EROSION CONTROL

The soil types observed on the site are mildly to highly susceptible to wind erosion and moderately to highly susceptible to water erosion. A minor wind erosion and dust problem may be created for a short time during and immediately after construction. Should the problem be considered severe enough during this time, watering of the cut areas or the use of chemical palliative may be required to control dust. However, once construction has been completed and vegetation re-established, the potential for wind erosion should be considerably reduced.

Regarding water erosion, loosely compacted soils will be the most susceptible to water erosion; residually weathered soils and weathered bedrock materials become increasingly less susceptible to water erosion. For the typical soils observed on site, allowable velocities or unvegetated and unlined earth channels would be on the order of 3 to 4 feet/second, depending upon the sediment load carried by the water. Permissible velocities may be increased through the use of vegetation to something on the order of 4 to 7 feet/second, depending upon the type of vegetation established. Should the anticipated velocities exceed these values, some form of channel lining material may be required to reduce erosion potential. These might consist of synthetic channel lining materials on the market or conventional riprap. In cases where ditch-lining materials are still insufficient to control erosion, small check dams or sediment traps may be required. The check dams will serve to reduce flow velocities as well as provide small traps for containing sediment. The determination of the amount, location, and placement of ditch linings, check dams, and special erosion control features should be performed by or in conjunction with the drainage engineer who is more familiar with the flow quantities and velocities.

Cut and fill slope areas will be subjected primarily to sheetwash and rill erosion. Unchecked rill erosion can eventually lead to concentrated flows of water and gully erosion. The best means to combat this type of erosion is, where possible, the adequate re-vegetation of cut and fill slopes. Cut and fill slopes having gradients more than three (3) horizontal to one (1) vertical become increasingly more difficult to revegetate successfully. Therefore, recommendations pertaining to

the vegetation of the cut and fill slopes may require input from a qualified landscape architect and/or the Soil Conservation Service.

9 ROADWAY, EMBANKMENT, and STORMWATER CONSTRUCTION RECOMMENDATIONS

In general, the site soils are suitable for the proposed access roadways and embankments. Although groundwater was not encountered in the test borings it may be encountered in deeper cuts along drainages and low-lying areas. Additional investigation of these areas is recommended as plans are completed. If excavations encroach on the groundwater level, unstable soil conditions may be encountered. Excavation of saturated soils will be difficult with rubber-tired equipment. Stabilization using shot rock or geogrids may be necessary.

Any areas to receive fill should have all topsoil, organic material, or debris removed. Prior to fill placement, Entech should observe the subgrade. Fill must be properly benched and compacted to minimize potentially unstable conditions in slope areas. Fill slopes should be 3:1 or flatter. The subgrade should be scarified and moisture conditioned to within 2% of optimum moisture content and compacted to a minimum of 95% of the Modified Proctor (ASTM D1557) maximum dry density prior to placing new fill. Areas receiving fill may require stabilization with rock or fabric if shallow groundwater conditions are encountered.

New fill should be placed in thin lifts not to exceed 6 inches after compaction while maintaining at least 95% of the Modified Proctor (ASTM D1557) maximum dry density. These materials should be placed at a moisture content conducive to compaction, usually 0 to +/-2% of the Proctor optimum moisture content. The placement and compaction of fill should be observed and tested by Entech during construction. Entech should approve any imported materials prior to placing or hauling them to the site. Additional investigation will be required for pavement designs once roadway grading is completed and utilities are installed.

10 CLOSURE

It is our opinion that the existing geologic engineering and geologic conditions will impose some constraints on 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 as plans (grading and development) are generated prior to construction on individual building sites.

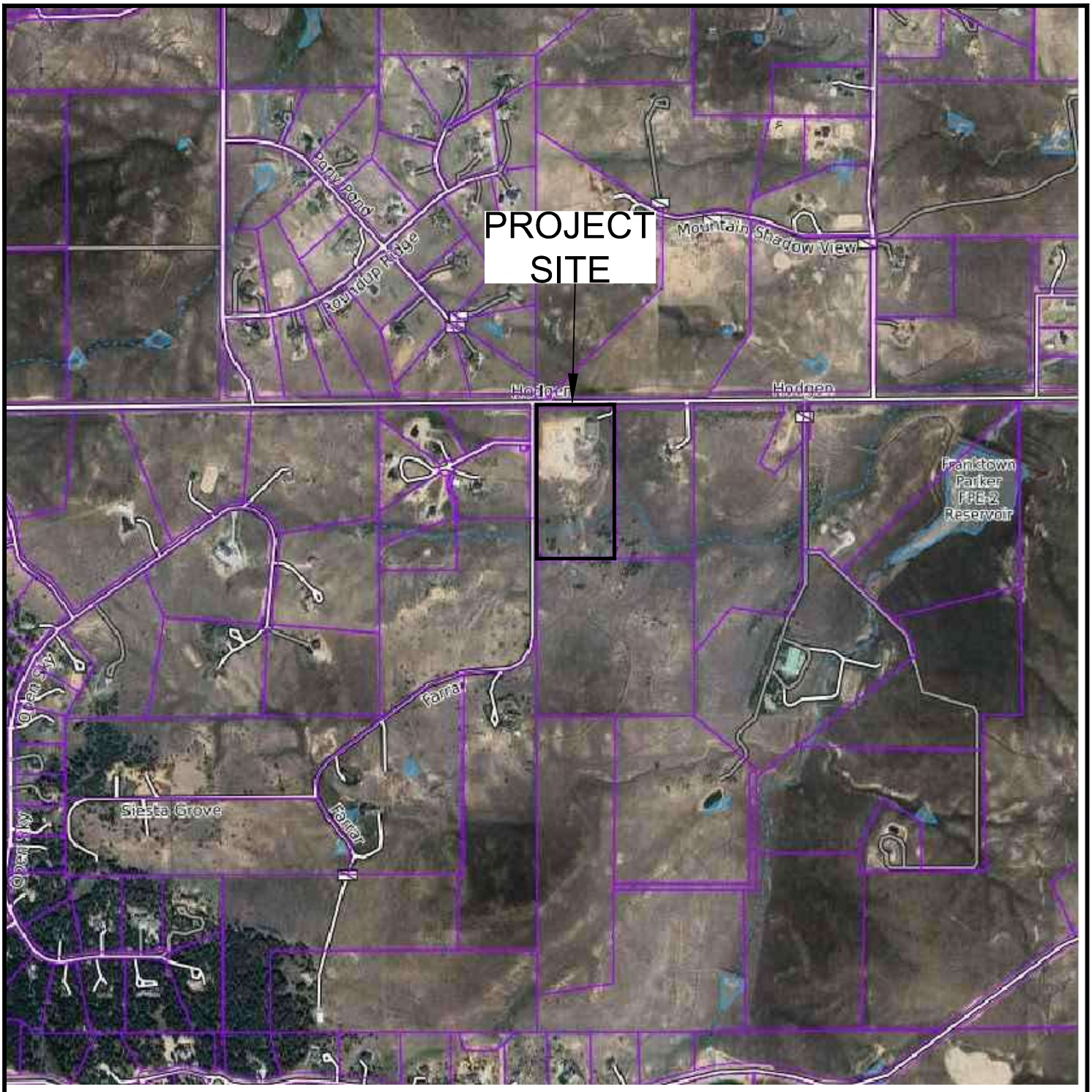
This report has been prepared for Matt & Gene Dunston for application to the proposed project in accordance with generally accepted geologic soil and engineering practices. No other warranty, expressed or implied, is made.

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.

11 REFERENCES

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FIGURES



N

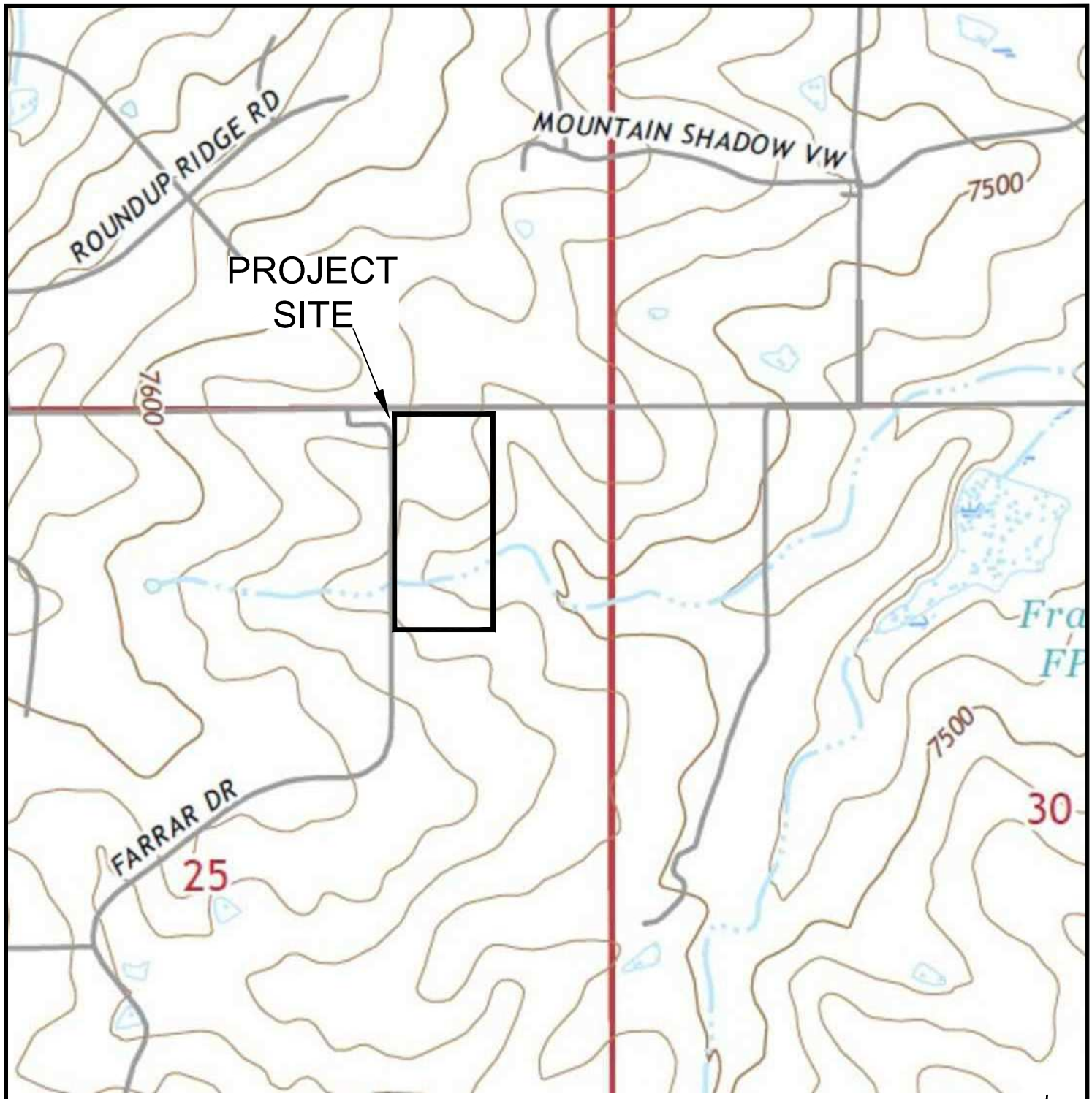
ENTECH ENGINEERING, INC.

VICINITY MAP

HODGEN ROAD, 7-LOT SUBDIVISION
Matt & Gene Dunston

JOB NO. 250183

FIG. 1



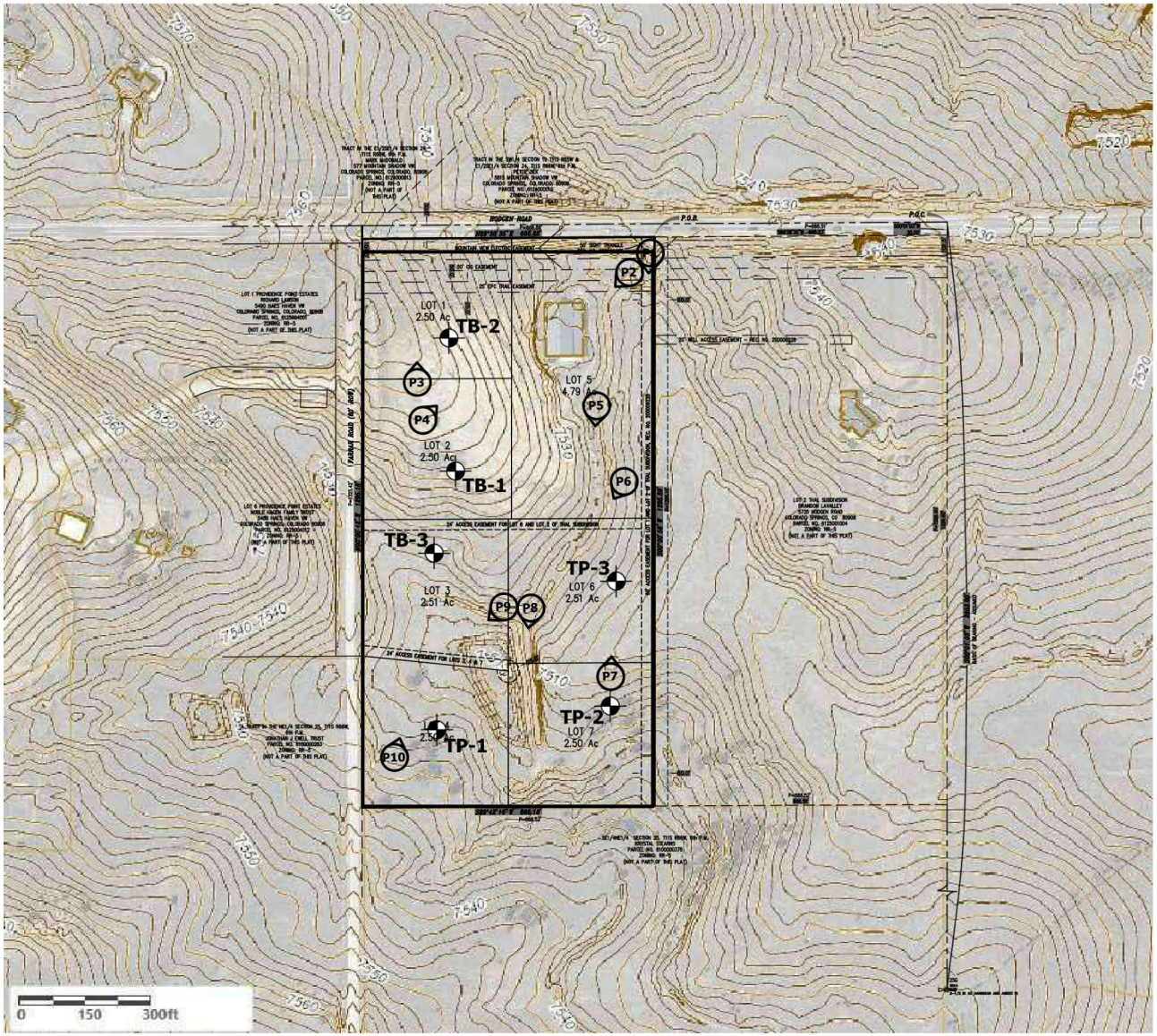
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USGS TOPOGRAPHY MAP

HODGEN ROAD, 7-LOT SUBDIVISION
Matt & Gene Dunston

JOB NO.
250183

FIG. 2



TB- APPROXIMATE TEST BORING LOCATION AND NUMBER

P2 - APPROXIMATE PHOTOGRAPH LOCATION AND DIRECTION

ENTECH ENGINEERING, INC.

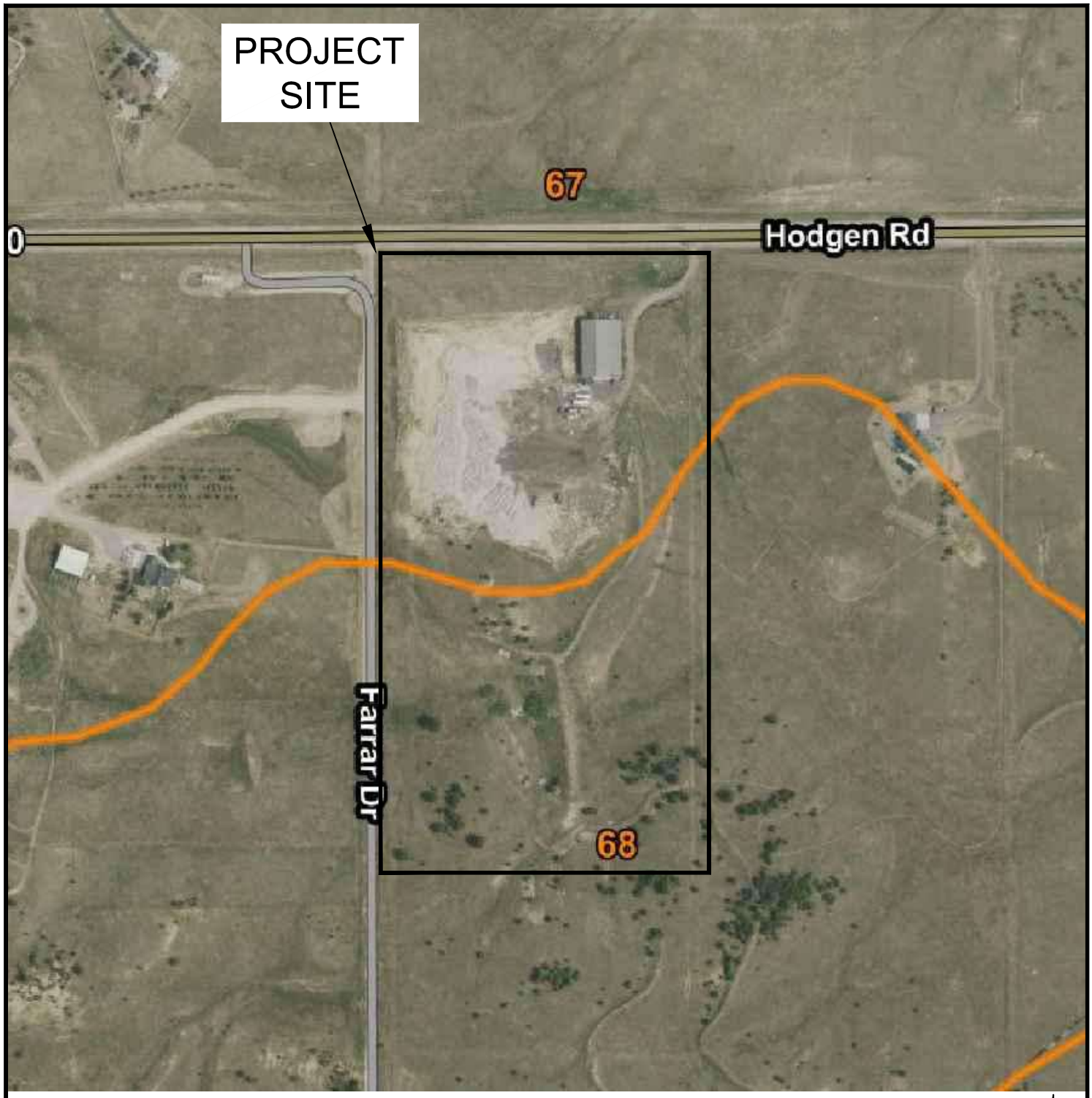
SITE AND EXPLORATION PLAN

HODGEN ROAD, 7-LOT SUBDIVISION

Matt & Gene Dunston

JOB NO. 250183

FIG. 3



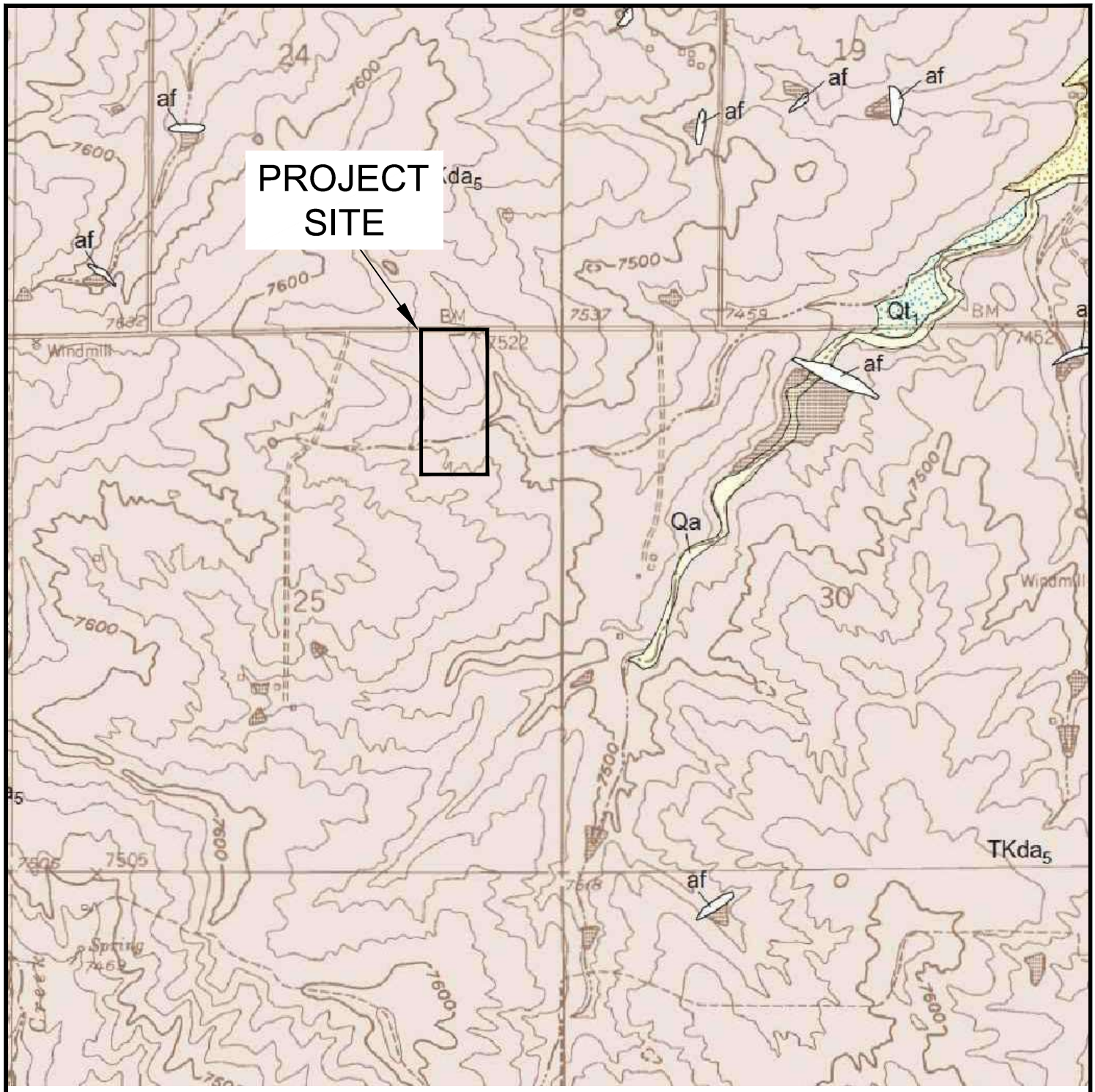
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SOIL SURVEY MAP

HODGEN ROAD, 7-LOT SUBDIVISION
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FIG. 4



N

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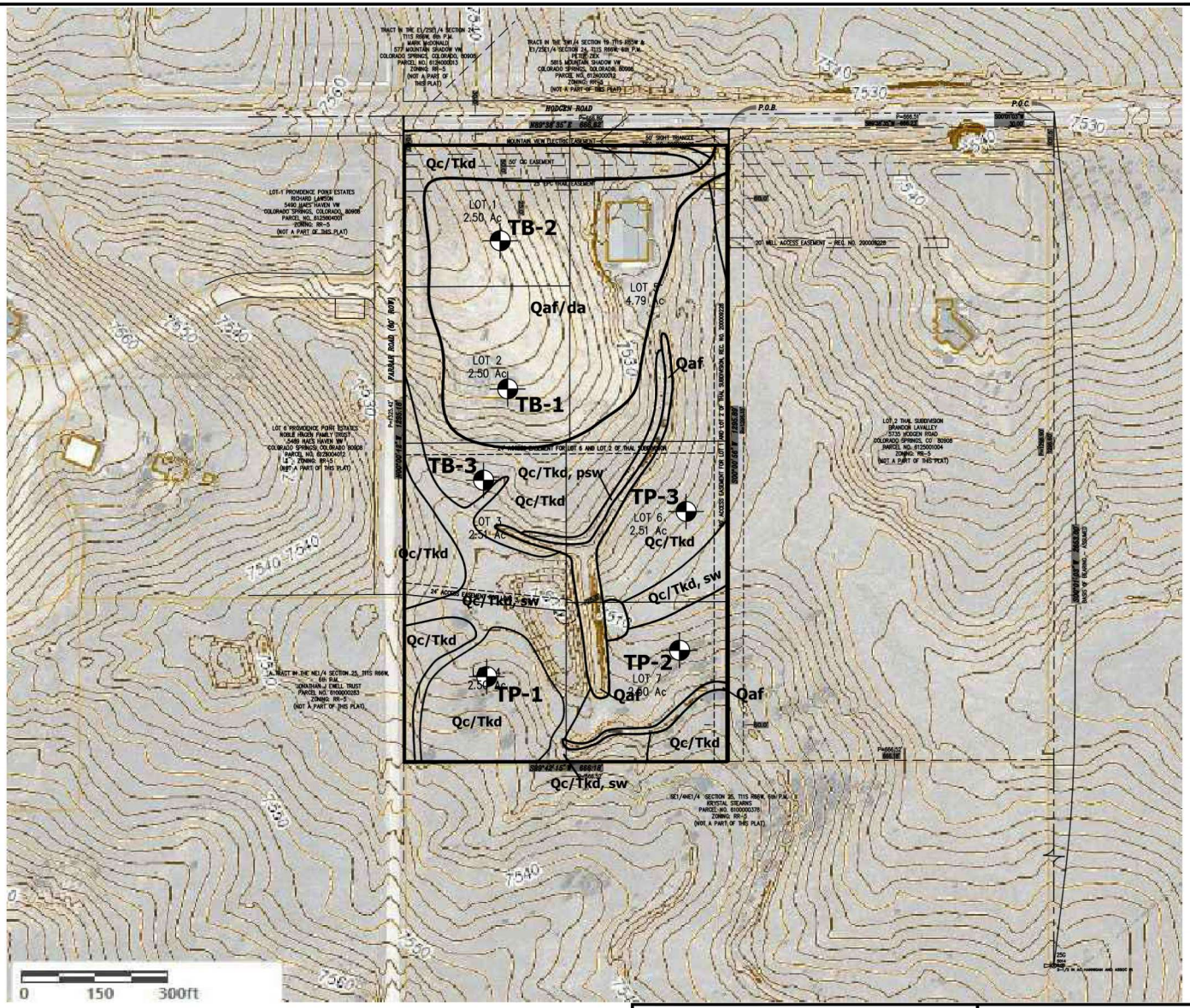
GEOLOGIC MAP OF THE BLACK FOREST QUADRANGLE

HODGEN ROAD, 7-LOT SUBDIVISION

Matt & Gene Dunston

JOB NO. 250183

FIG. 5



Legend:

Qaf - Artificial Fill of Holocene Age:
man placed fill deposits

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 claystone and siltstone

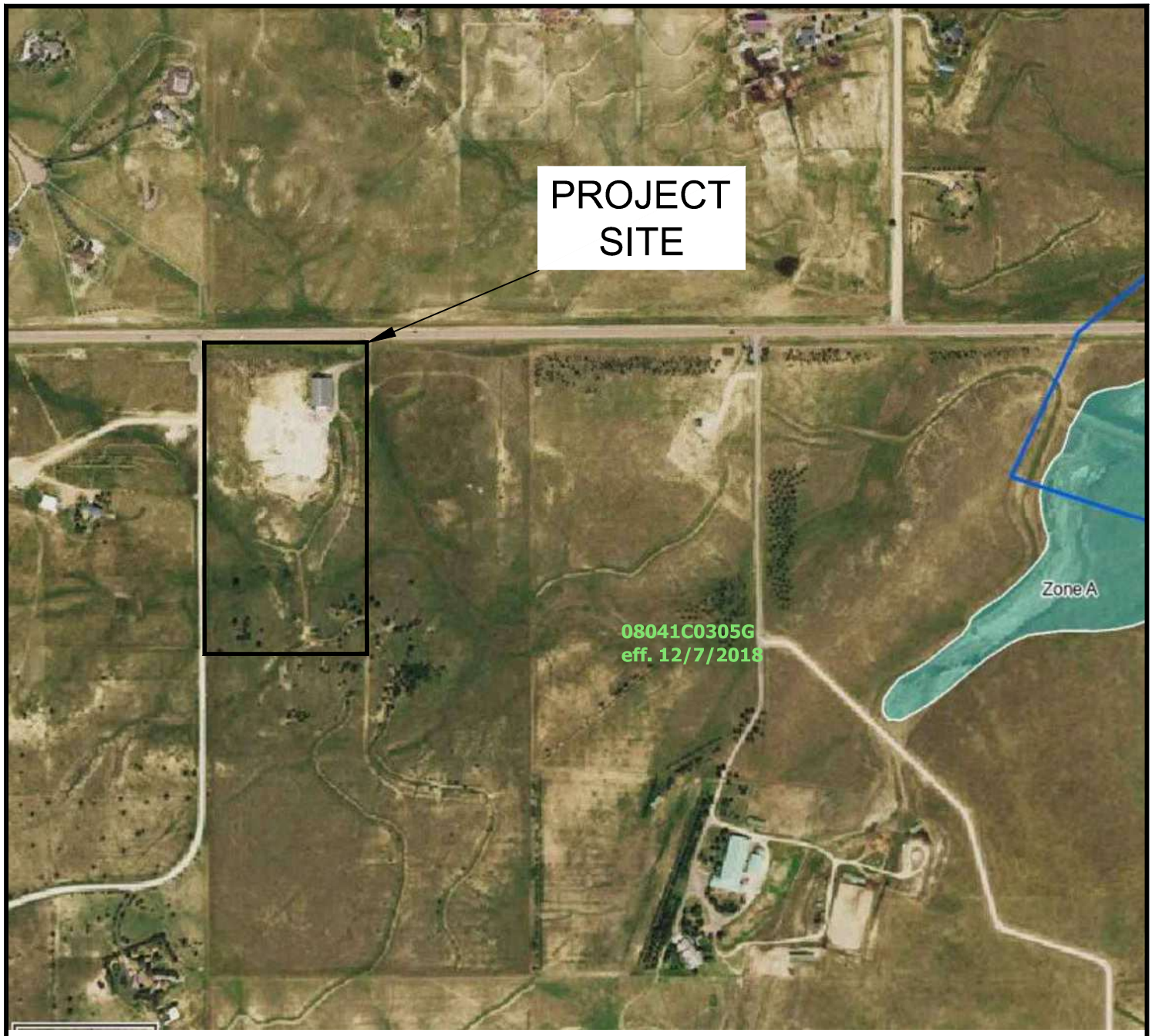
da - disturbed area
psw - potential seasonally shallow groundwater area
sw - seasonally shallow groundwater area

ENTECH ENGINEERING, INC.

GEOLOGY / ENGINEERING GEOLOGY MAP
HODGEN ROAD, 7-LOT SUBDIVISION
Matt & Gene Dunston

JOB NO. 250183

FIG. 6



N

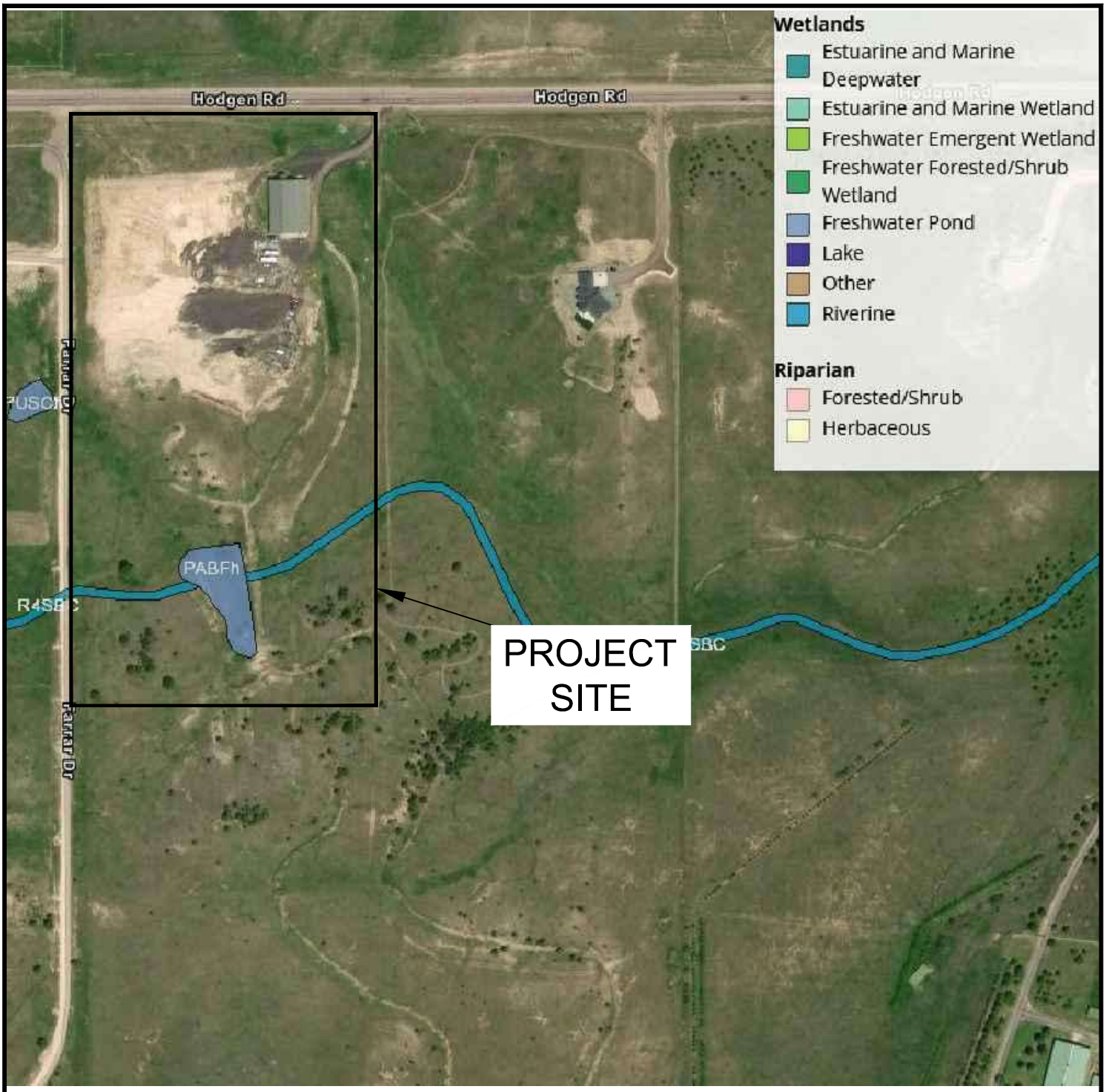
ENTECH ENGINEERING, INC.

FEMA FLOODPLAIN MAP

HODGEN ROAD, 7-LOT SUBDIVISON
Matt & Gene Dunston

JOB NO. 250183

FIG. 7



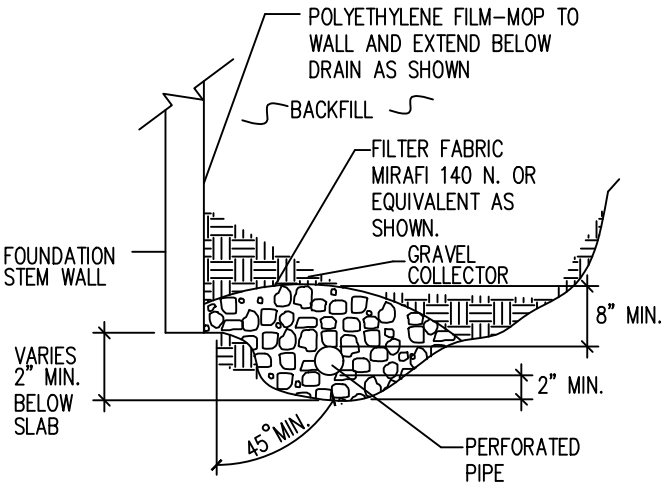
ENTECH ENGINEERING, INC.

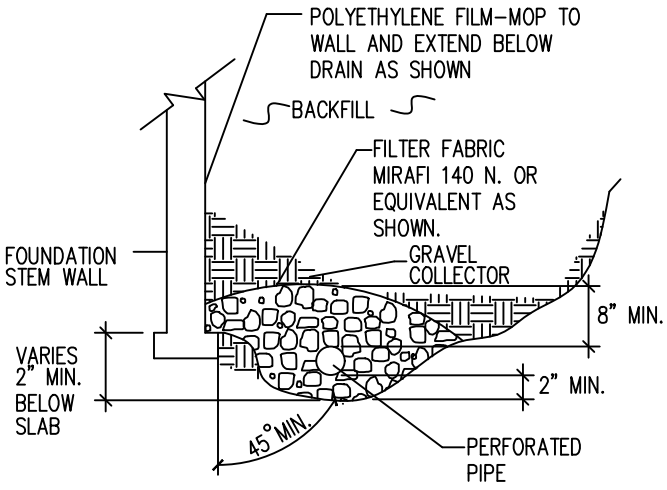
USFWS WETLANDS MAP

HODGEN ROAD, 7-LOT SUBDIVISON
Matt & Gene Dunston

JOB NO. 250183

FIG. 8





NOTES:

–GRAVEL SIZE IS RELATED TO DIAMETER OF PIPE PERFORATIONS–85% GRAVEL GREATER THAN 2x PERFORATION DIAMETER.

–PIPE DIAMETER DEPENDS UPON EXPECTED SEEPAGE. 4–INCH DIAMETER IS MOST OFTEN USED.

–ALL PIPE SHALL BE PERFORATED PLASTIC. THE DISCHARGE PORTION OF THE PIPE SHOULD BE NON–PERFORATED PIPE.

–FLEXIBLE PIPE MAY BE USED UP TO 8 FEET IN DEPTH, IF SUCH PIPE IS DESIGNED TO WITHSTAND THE PRESSURES. RIGID PLASTIC PIPE WOULD OTHERWISE BE REQUIRED.

–MINIMUM GRADE FOR DRAIN PIPE TO BE 1% OR 3 INCHES OF FALL IN 25 FEET.

–DRAIN TO BE PROVIDED WITH A FREE GRAVITY OUTFALL, IF POSSIBLE. A SUMP AND PUMP MAY BE USED IF GRAVITY OUT FALL IS NOT AVAILABLE.

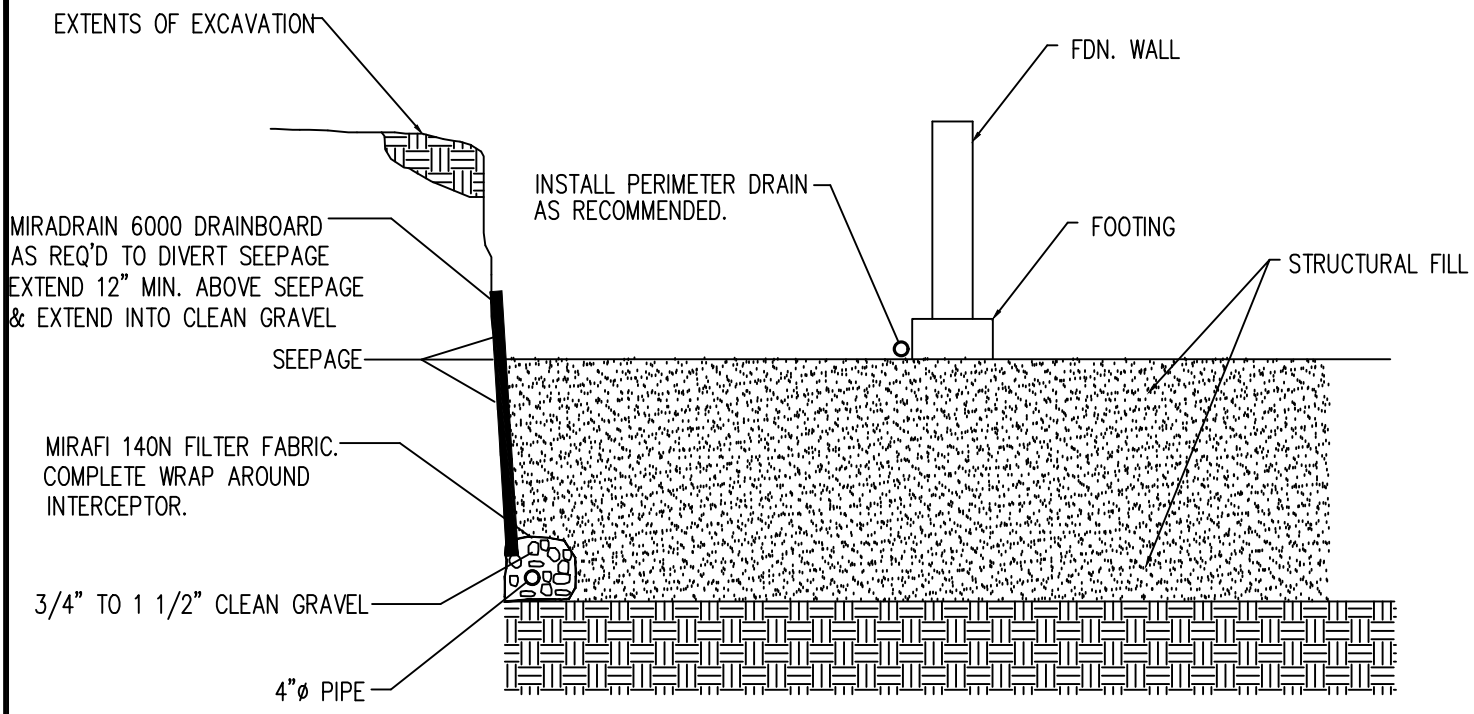
ENTECH ENGINEERING, INC.

PERIMETER DRAIN DETAIL

HODGEN ROAD, 7-LOT SUBDIVISION
Matt & Gene Dunston

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FIG. 9



NOTE:
EXTEND INTERCEPTOR DRAIN TO UNDERDRAIN OR TO SUMP.
BENCH DRAIN INTO NATIVE SOILS 12 INCHES MINIMUM.

INTERCEPTOR DRAIN DETAIL

N.T.S.

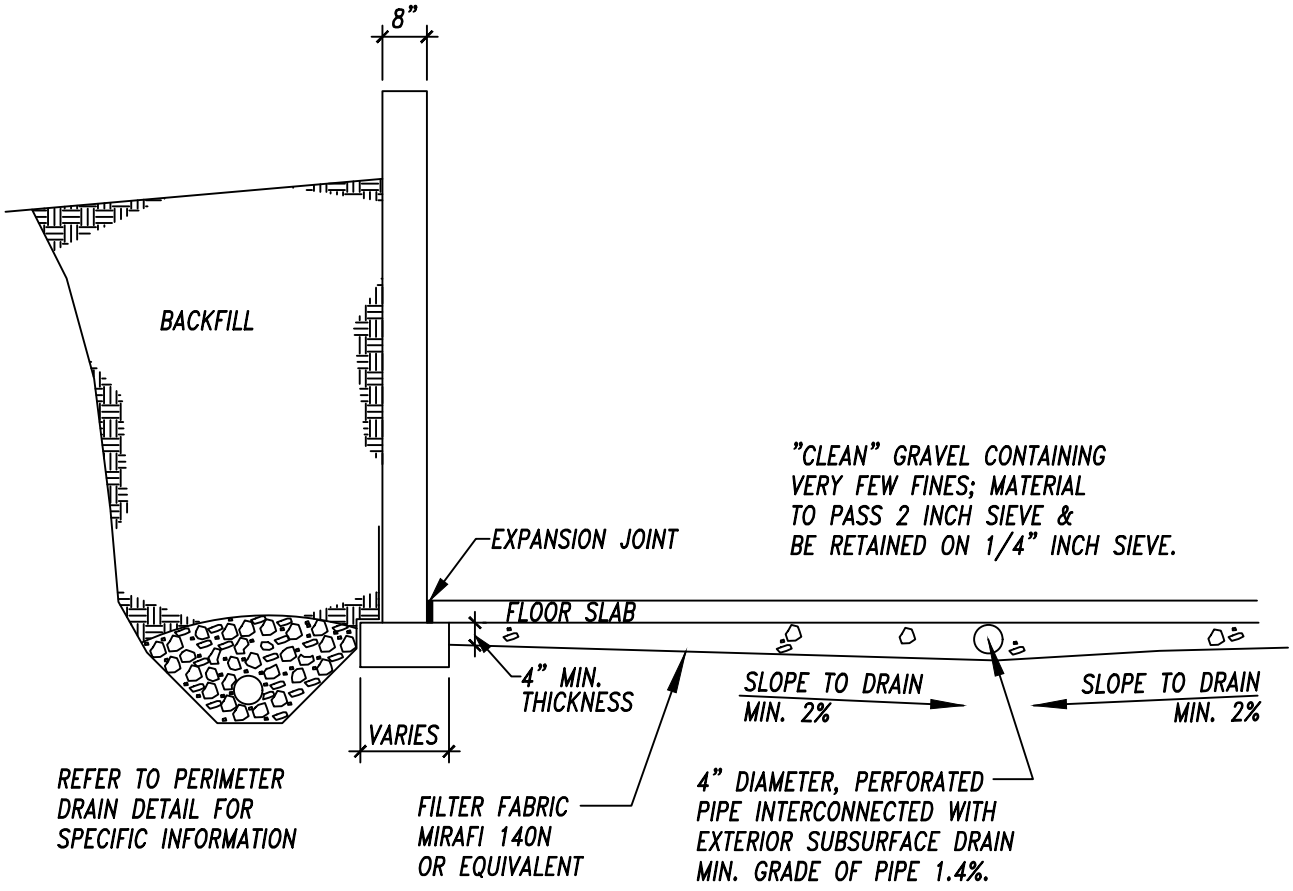
ENTECH ENGINEERING, INC.

INTERCEPTOR DRAIN DETAIL

HODGEN ROAD, 7-LOT SUBIDIVISION
Matt & Gene Dunston

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FIG. 10



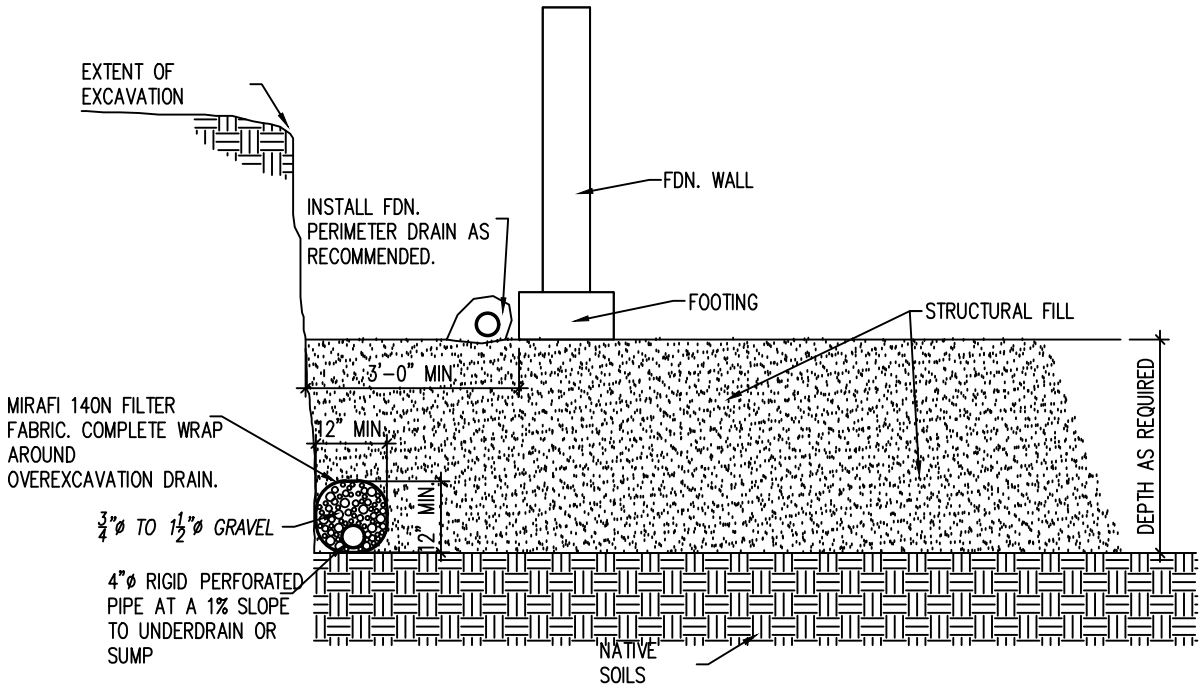
ENTECH ENGINEERING, INC.

TYP. UNDERSLAB DRAINAGE LAYER (CAPILLARY BREAK)

HODGEN ROAD, 7-LOT SUBDIVISION
Matt & Gene Dunston

JOB NO.
250183

FIG. 11



OVEREXCAVATION DRAIN DETAIL

N.T.S.

NOTE:

EXTEND DRAIN TO SUMP AS REQ'D.

ENTECH ENGINEERING, INC.

OVEREXCAVATION DRAIN

HODGEN ROAD, 7-LOT SUBDIVISION
Matt & Gene Dunston

JOB NO. 250183

FIG. 12

APPENDIX A: Site Photographs



1

Looking south from the northeastern side of the site.

February 17, 2025



2

Looking southwest from the northeastern side of the site.

February 17, 2025

Job No. 250183



3

Looking north from the western side of the site.

February 17, 2025



4

Looking northeast from the western side of the site.

February 17, 2025

Job No. 250183



5

Looking south from then eastern side of the site.

February 17, 2025



6

Looking southwest from the eastern side of the site.

February 17, 2025

Job No. 250183



7

Looking north from the southeastern side of the site.

February 17, 2025



8

Looking south from the northern side of the earthen dam.

February 17, 2025

Job No. 250183



9

Looking southwest from the northern side of the earthen dam.

February 17, 2025



10

Looking northeast from the southwestern side of the site.

February 17, 2025

Job No. 250183

APPENDIX B: Test Boring and Test Pit Logs

TEST BORING 1
DATE DRILLED 2/24/2025

REMARKS

DRY TO 20', 2/24/25

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
			6	12.9	1
5			20	13.4	2
10			50/8"	10.8	3
15			50/6"	10.3	3
20			50/6"	9.7	3

FILL 0-3', SAND, SILTY, BROWN, LOOSE, MOIST

SAND, SILTY, TAN, MEDIUM DENSE, MOIST

SANDSTONE, VERY WEAK, TAN, MODERATELY WEATHERED (SAND, SILTY, VERY DENSE, MOIST)

TEST BORING 2
DATE DRILLED 3/3/2025

REMARKS

DRY TO 20', 3/3/25

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
					2
			50/11"	11.6	3
5			50/2"	7.0	3
10			50/10"	8.7	3
15			27	11.5	3
20			50/11"	11.9	3

SAND, SILTY, TAN

SANDSTONE, VERY WEAK, TAN to LIGHT BROWN, HIGHLY WEATHERED (SAND, SILTY, VERY DENSE to MEDIUM DENSE, MOIST)

ENTECH ENGINEERING, INC.

TEST BORING LOGS

5525 HODGEN ROAD
MATT & BILL DUNSTON

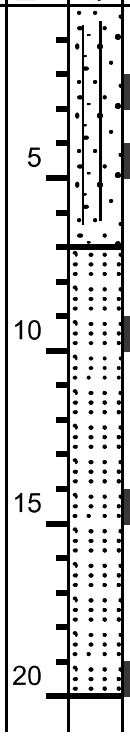
JOB NO. 250183

FIG. B-1

TEST BORING 3
DATE DRILLED 3/3/2025

REMARKS

DRY TO 20', 3/3/25



Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
			15	10.9	2
5			17	8.9	2
10			50/10"	11.4	3
15			50/10"	7.5	3
20			50/10"	12.2	3

12" TOPSOIL

SAND, SILTY, LIGHT BROWN, MEDIUM DENSE, MOIST

SANDSTONE, VERY WEAK, LIGHT BROWN, HIGHLY WEATHERED (SAND, SILTY, VERY DENSE, MOIST)

ENTECH ENGINEERING, INC.

TEST BORING LOGS

5525 HODGEN ROAD
MATT & BILL DUNSTON

JOB NO. 250183

FIG. B-2

TEST PIT 1
DATE EXCAVATED 2/27/2025

REMARKS	Depth (ft)	Symbol	Samples	Soil Structure Shape	Soil Structure Grade	Soil Type
topsoil, sandy clay, dark brown, moist	1					
	2					
sandy clay, fine grained, light brown, moist	3			ma	sl	4A
	4					
gravelly sandy clay, fine to coarse, moist	5			gr	w	4A R-1
	6					
	7					
	8					
	9					
	10					

TEST PIT 2
DATE EXCAVATED 2/27/2025

REMARKS	Depth (ft)	Symbol	Samples	Soil Structure Shape	Soil Structure Grade	Soil Type
topsoil, sandy clay, dark brown, moist	1					
	2					
sandy clay, fine grained, brown, moist	3			ma	sl	4A
	4					
	5					
	6					
sandy clay, fine to very coarse, light brown, moist	7			gr	w	4A
	8					
	9					
	10					

Soil Structure Shape
granular - gr
platy - pl
blocky - bl
prismatic - pr
single grain - sg
massive - ma

Soil Structure Grade
weak - w
moderate - m
strong - s
loose - l
structureless - sl

ENTECH ENGINEERING, INC.

TEST PIT LOGS

5525 HODGEN ROAD
MATT & BILL DUNSTON

JOB NO. 250183

FIG. B-3

TEST PIT 3
DATE EXCAVATED 2/27/2025
REMARKS

	Depth (ft)	Symbol	Samples	Soil Structure Shape	Soil Structure Grade	Soil Type
topsoil, sandy clay, dark brown, moist	1					
	2					
sandy clay, fine to medium graind, dark brown to brown, moist	3			ma	sl	4A
	4					
	5					
	6			ma	sl	4A
	7					
	8					
	9					
	10					

Depth (ft) Symbol Samples Soil Structure Shape Soil Structure Grade Soil Type

Soil Structure Shape
granular - gr
platy - pl
blocky - bl
prismatic - pr
single grain - sg
massive - ma

Soil Structure Grade
weak - w
moderate - m
strong - s
loose - l

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TEST PIT LOGS

5525 HODGEN ROAD
MATT & BILL DUNSTON

JOB NO. 250183

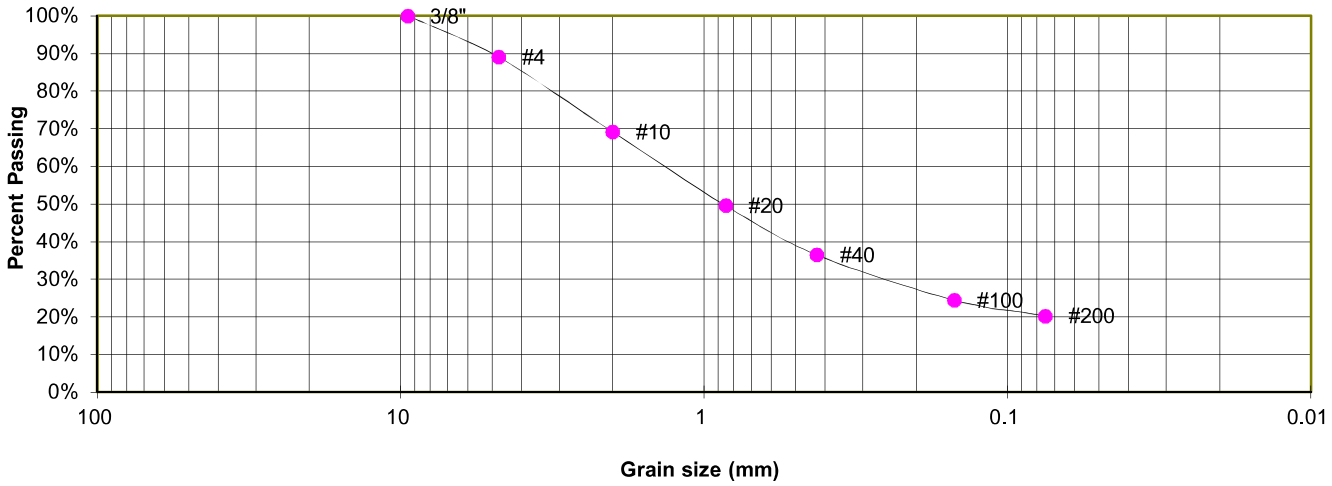
FIG. B-4

APPENDIX C: Laboratory Test Results

TABLE C-1
SUMMARY OF LABORATORY TEST RESULTS

SOIL TYPE	TEST BORING NO.	DEPTH (FT)	PASSING NO. 200 SIEVE (%)	FHA SWELL (PSF)	USCS	SOIL DESCRIPTION
1	1	2-3	20.3		SM	FILL, SAND, SILTY
2	1	5	42.4		SM	SAND, SILTY
2	3	5	17.5	270	SM	SAND, SILTY
3	1	15	20.5		SM	SANDSTONE (SAND, SILTY)
3	2	10	17.5		SM	SANDSTONE (SAND, SILTY)

TEST BORING	1	SOIL DESCRIPTION	FILL, SAND, SILTY
DEPTH (FT)	2-3	SOIL TYPE	1



GRAIN SIZE ANALYSIS

U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	89.0%
10	69.1%
20	49.6%
40	36.5%
100	24.5%
200	20.3%

SOIL CLASSIFICATION

USCS CLASSIFICATION: SM

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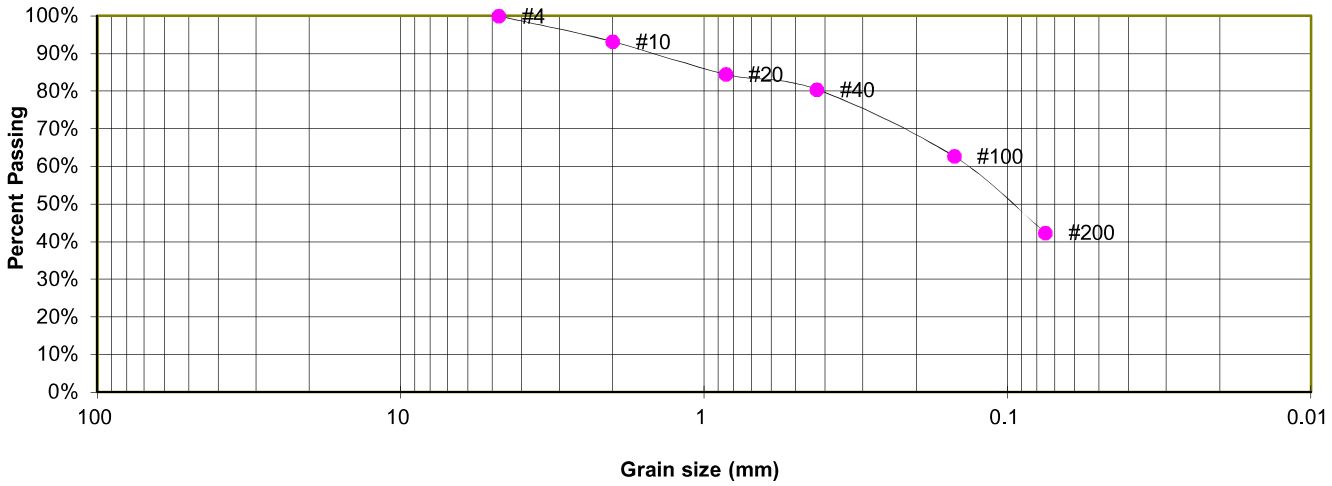
LABORATORY TEST RESULTS

5525 HODGEN ROAD
MATT & BILL DUNSTON

JOB NO. 250183

FIG. C-1

TEST BORING	1	SOIL DESCRIPTION	SAND, SILTY
DEPTH (FT)	5	SOIL TYPE	2



GRAIN SIZE ANALYSIS

U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	93.2%
20	84.5%
40	80.5%
100	62.7%
200	42.4%

SOIL CLASSIFICATION

USCS CLASSIFICATION: SM

ENTECH ENGINEERING, INC.

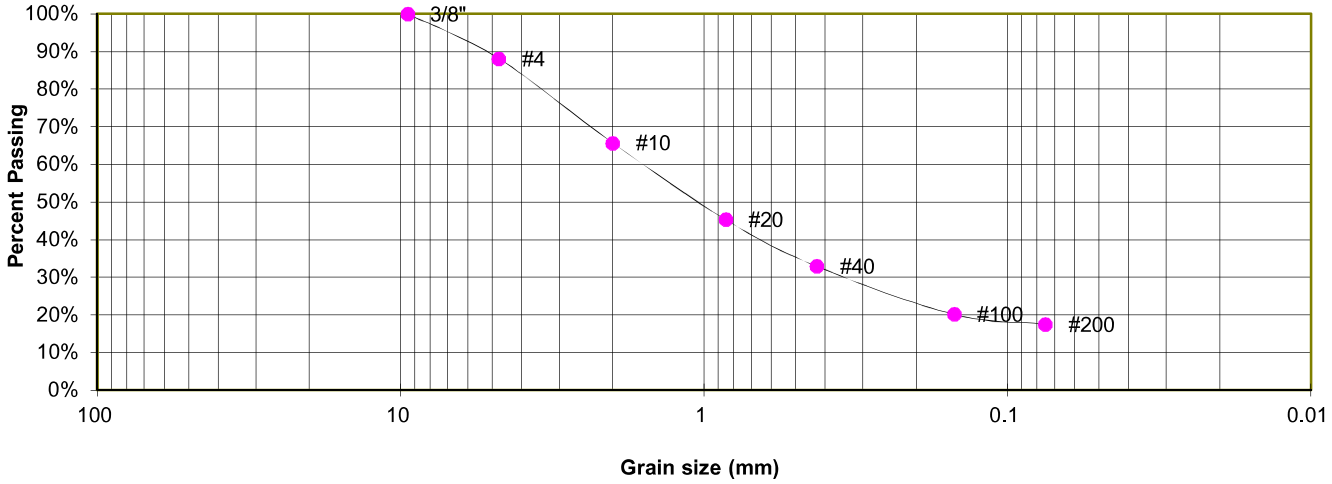
LABORATORY TEST RESULTS

5525 HODGEN ROAD
MATT & BILL DUNSTON

JOB NO. 250183

FIG. C-2

TEST BORING	3	SOIL DESCRIPTION	SAND, SILTY
DEPTH (FT)	5	SOIL TYPE	2



GRAIN SIZE ANALYSIS

U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	88.1%
10	65.7%
20	45.4%
40	32.9%
100	20.1%
200	17.5%

FHA SWELL

Moisture at start	13.8%
Moisture at finish	19.7%
Moisture increase	5.9%
Initial dry density (pcf)	104
Swell (psf)	270

SOIL CLASSIFICATION

USCS CLASSIFICATION: SM

ENTECH ENGINEERING, INC.

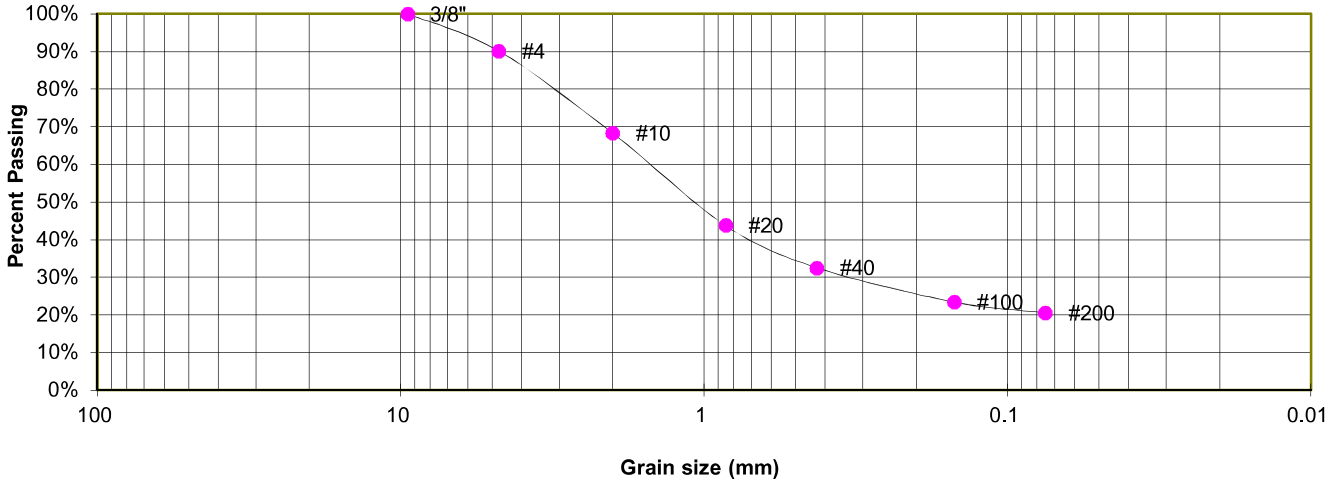
LABORATORY TEST RESULTS

5525 HODGEN ROAD
MATT & BILL DUNSTON

JOB NO. 250183

FIG. C-3

TEST BORING	1	SOIL DESCRIPTION	SANDSTONE (SAND, SILTY)
DEPTH (FT)	15	SOIL TYPE	3



GRAIN SIZE ANALYSIS

U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	90.2%
10	68.3%
20	43.8%
40	32.5%
100	23.4%
200	20.5%

SOIL CLASSIFICATION

USCS CLASSIFICATION: SM

ENTECH ENGINEERING, INC.

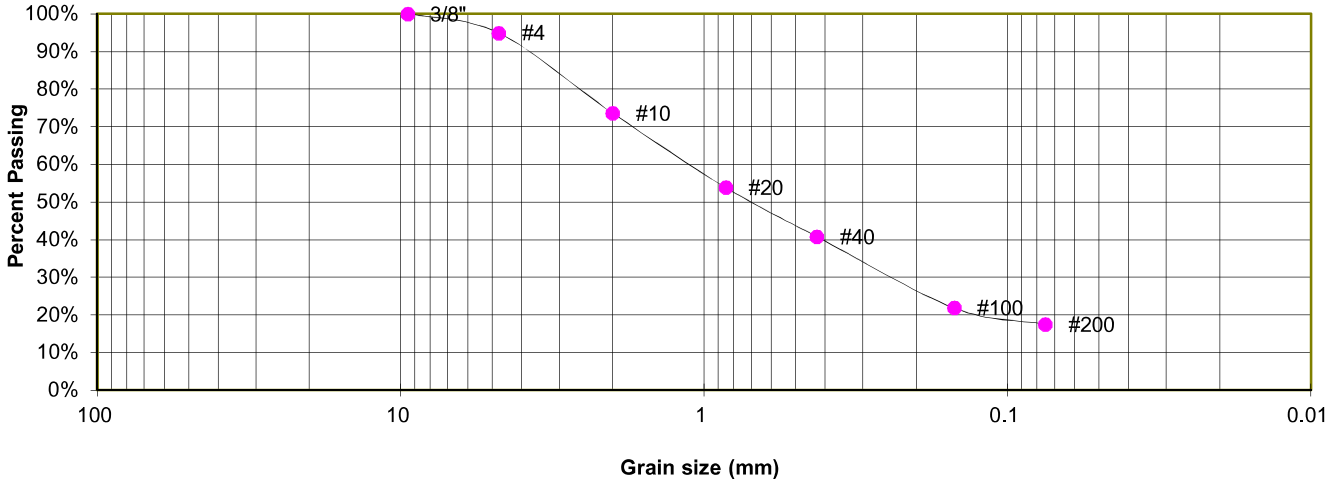
LABORATORY TEST RESULTS

5525 HODGEN ROAD
MATT & BILL DUNSTON

JOB NO. 250183

FIG. C-4

TEST BORING	2	SOIL DESCRIPTION	SANDSTONE (SAND, SILTY)
DEPTH (FT)	10	SOIL TYPE	3



GRAIN SIZE ANALYSIS

U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	95.0%
10	73.6%
20	53.9%
40	40.8%
100	21.9%
200	17.5%

SOIL CLASSIFICATION

USCS CLASSIFICATION: SM

ENTECH ENGINEERING, INC.

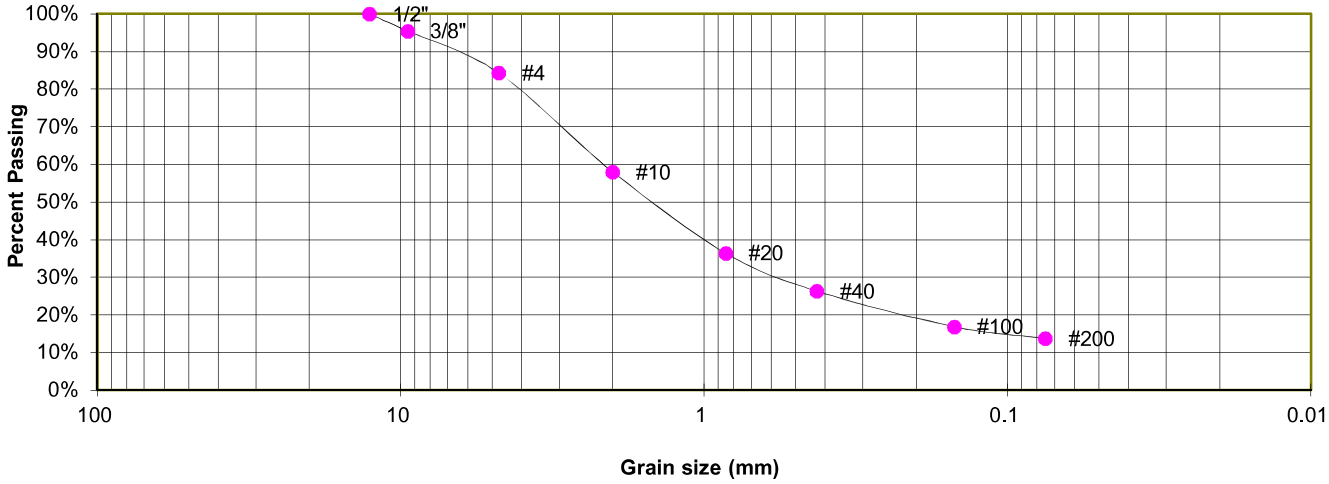
LABORATORY TEST RESULTS

5525 HODGEN ROAD
MATT & BILL DUNSTON

JOB NO. 250183

FIG. C-5

TEST BORING	TP-1	SOIL DESCRIPTION	SAND, SILTY
DEPTH (FT)	6.5	USDA SOIL TYPE #	R-1



GRAIN SIZE ANALYSIS

U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	100.0%
3/8"	95.5%
4	84.3%
10	58.0%
20	36.4%
40	26.3%
100	16.9%
200	13.8%

SOIL CLASSIFICATION

USCS CLASSIFICATION: SM

ENTECH ENGINEERING, INC.

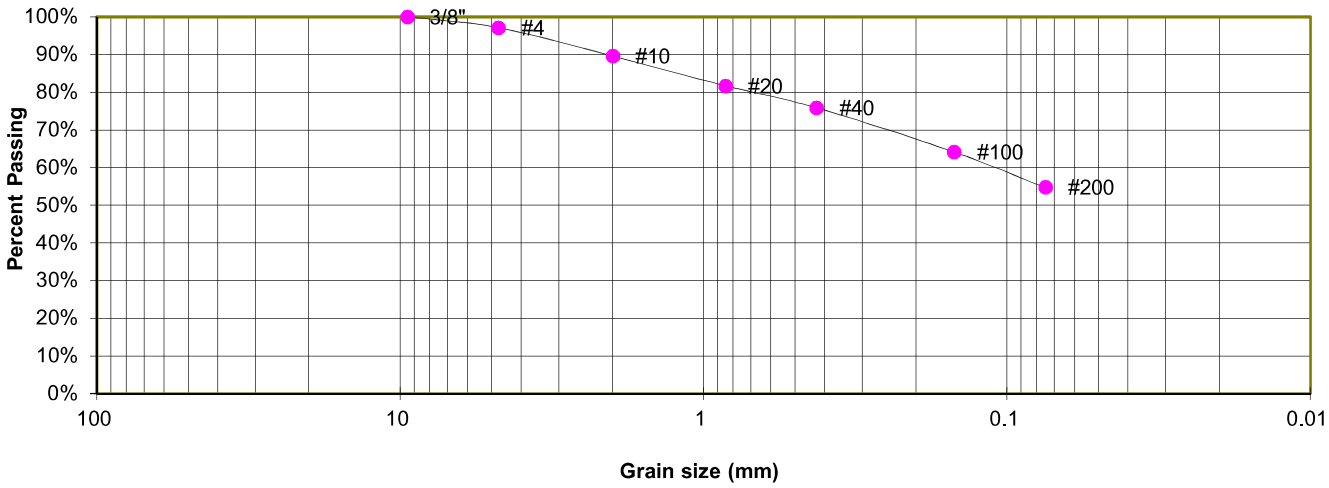
LABORATORY TEST RESULTS

5525 HODGEN ROAD
MATT & BILL DUNSTON

JOB NO. 250183

FIG. C-6

TEST PIT	TP-2	SOIL DESCRIPTION	CLAY, SANDY
DEPTH (FT)	2.5	USDA SOIL TYPE #	4



GRAIN SIZE ANALYSIS

U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	97.2%
10	89.7%
20	81.7%
40	75.9%
100	64.2%
200	54.7%

SOIL CLASSIFICATION

USCS CLASSIFICATION: CL

ENTECH ENGINEERING, INC.

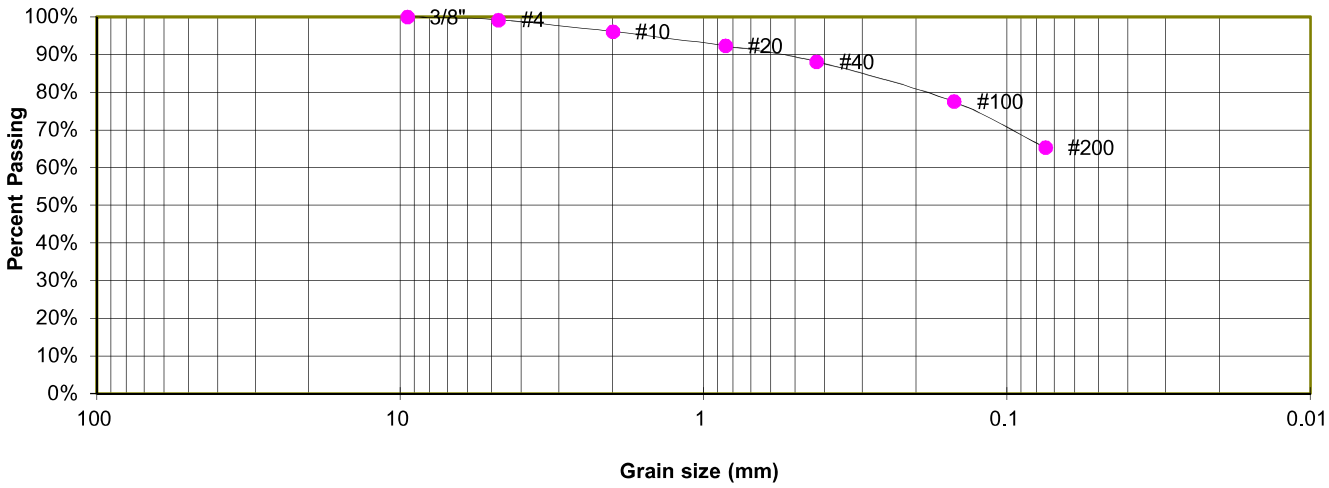
LABORATORY TEST RESULTS

5525 HODGEN ROAD
MATT & BILL DUNSTON

JOB NO. 250183

FIG. C-7

TEST PIT	TP-3	SOIL DESCRIPTION	CLAY, SANDY
DEPTH (FT)	6.5	USDA SOIL TYPE #	4



GRAIN SIZE ANALYSIS

U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	99.2%
10	96.1%
20	92.3%
40	88.2%
100	77.5%
200	65.3%

SOIL CLASSIFICATION

USCS CLASSIFICATION: CL

ENTECH ENGINEERING, INC.

LABORATORY TEST RESULTS

5525 HODGEN ROAD
MATT & BILL DUNSTON

JOB NO. 250183

FIG. C-8

APPENDIX D: USDA Soil Survey Descriptions

El Paso County Area, Colorado

67—Peyton sandy loam, 5 to 9 percent slopes

Map Unit Setting

National map unit symbol: 369d
Elevation: 6,800 to 7,600 feet
Mean annual air temperature: 43 to 45 degrees F
Frost-free period: 115 to 125 days
Farmland classification: Not prime farmland

Map Unit Composition

Peyton and similar soils: 85 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Peyton

Setting

Landform: Hills
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Arkosic alluvium derived from sedimentary rock and/or arkosic residuum weathered from sedimentary rock

Typical profile

A - 0 to 12 inches: sandy loam
Bt - 12 to 25 inches: sandy clay loam
BC - 25 to 35 inches: sandy loam
C - 35 to 60 inches: sandy loam

Properties and qualities

Slope: 5 to 9 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 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: Moderate (about 7.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: B
Ecological site: R049XY216CO - Sandy Divide
Hydric soil rating: No

Minor Components

Pleasant

Percent of map unit: 5 percent
Landform: Depressions
Hydric soil rating: Yes

Other soils

Percent of map unit:
Hydric soil rating: No

Data Source Information

Soil Survey Area: El Paso County Area, Colorado
Survey Area Data: Version 22, Sep 3, 2024

El Paso County Area, Colorado

68—Peyton-Pring complex, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 369f
Elevation: 6,800 to 7,600 feet
Farmland classification: Not prime farmland

Map Unit Composition

Peyton and similar soils: 40 percent
Pring and similar soils: 30 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Peyton

Setting

Landform: Hills
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Arkosic alluvium derived from sedimentary rock and/or arkosic residuum weathered from sedimentary rock

Typical profile

A - 0 to 12 inches: sandy loam
Bt - 12 to 25 inches: sandy clay loam
BC - 25 to 35 inches: sandy loam
C - 35 to 60 inches: sandy loam

Properties and qualities

Slope: 3 to 5 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): Moderately high (0.20 to 0.60 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: Moderate (about 7.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4c
Hydrologic Soil Group: B
Ecological site: R049XY216CO - Sandy Divide
Hydric soil rating: No

Description of Pring

Setting

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

Pleasant

Percent of map unit: 5 percent
Landform: Depressions
Hydric soil rating: Yes

Other soils

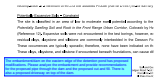
Percent of map unit:
Hydric soil rating: No

Data Source Information

Soil Survey Area: El Paso County Area, Colorado
Survey Area Data: Version 22, Sep 3, 2024

V2_Soils and Geology Report.pdf Markup Summary

Joseph Sandstrom (1)



Subject: Text Box
Page Label: 8
Author: Joseph Sandstrom
Date: 11/9/2026 1:18:47 PM
Status:
Color:
Layer:
Space:

The embankment/dam on the eastern edge of the detention pond has proposed modifications. Please analyze the embankment and provide recommendations for the proposed pipe through the dam and the proposed cut and fill. There is also a proposed driveway on top of the dam.

Lacey Dean (1)



Subject: Planner
Page Label: 13
Author: Lacey Dean
Date: 11/5/2026 5:14:26 PM
Status:
Color:
Layer:
Space:

UNRESOLVED: Discuss anticipated mitigation measures OR show wetland areas on the plat drawings.