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SOIL, GEOLOGY, & WASTEWATER STUDY
THE RETREAT AT TIMBERRIDGE, FILING 2
VOLLMER ROAD AND ARROYA LANE
EL PASO COUNTY, COLORADO

Prepared for

TimberRidge Development Group, LLC
2138 Flying Horse Club Drive
Colorado Springs, Colorado 80921

Attn: Loren Moreland

April 26, 2021

Respectfully Submitted,

ENTECH ENGINEERING, INC.

Logan L. Langford, P.G.
Geologist

LLL/am

Encl.

Entech Job No. 211066
AAprojects/2021/211066 countysoil/geo

Reviewed by:

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

COLORADO LICENSED
JOSEPH COLLIN GOODE
No. 23725
4/27/21
PROFESSIONAL ENGINEER

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1.0 SUMMARY

Project Location

The project lies in portions of the SE¼ of Section 21, SW¼ of Section 22, W½ of Section 27, and NE¼ of Section 28, Township 12 South, Range 65 West of the 6th Principal Meridian in El Paso County, Colorado. The site is located approximately three miles northeast of Colorado Springs, Colorado.

Project Description

Total acreage involved in the project is approximately two hundred and thirty-seven acres. Filing 2 consists of 75.8 acres. Filing 2 consists of ninety single-family residential lots. Seventy-eight conventional residential lots and twelve 2.5+ acres rural residential lots are proposed. The development will utilize municipal sewer and water on seventy-eight conventional residential lots, and individual water wells and on-site wastewater treatment systems on twelve 2.5+ acre lots.

Scope of Report

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

Land Use and Engineering Geology

This site was found to be suitable for the proposed development. Areas were encountered where the geologic conditions will impose some constraints on development and land use. These include areas of shallow bedrock, expansive soils, artificial fill, downslope creep, erosion, floodplain, ponded water, shallow groundwater, seasonal shallow groundwater and potentially seasonally shallow groundwater areas. Based on the proposed development plan, it appears that these areas will have some impact on the development. These conditions will be discussed in greater detail in the report.

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

2.0 GENERAL SITE CONDITIONS AND PROJECT DESCRIPTION

The site is located in portions of the SE¼ of Section 21, SW¼ of Section 22, W½ of Section 27, and NE¼ of Section 28, Township 15 South, Range 65 West of the 6th Principal Meridian in El Paso County, Colorado. The site is located approximately three miles northeast of Colorado Springs, Colorado, at Vollmer Road and Arroya Lane. The location of the site is as shown on the Vicinity Map, Figure 1.

The topography of the site is generally gradually to moderately sloping to the south, with moderate to steep slopes along Sand Creek. The drainages on site flow in a southerly direction through the central portion of the site. Ponds are located on the site, over all TimberRidge, one north of Arroya Lane outside of the proposed residential development, and one located along the eastern side of Parcel C. Water was observed in Sand Creek and the ponds, other drainages on the site were dry at the time of this investigation. The site boundaries are indicated on the USGS Map, Figure 2. Previous land uses have included grazing and pasture land. The site contains primarily field grasses, weeds, cacti, and yuccas, with areas of scattered trees along Sand Creek, and ponderosa pine trees located across the northwest portion of the site. Site photographs, taken February 10, and March 9, 2017, are included in Appendix A.

Total acreage involved in Filing 2 is approximately 75.8 acres. Ninety single-family residential lots are proposed. The development will consist of twelve larger two and half acre sized lots in the northern and northwestern portions of the development and seventy-eight smaller lots in the eastern and southern portions of the development to the east of Sand Creek. The one acre or smaller lots will be serviced by municipal sewer and water. The two and half acre lots will have individual water wells and on-site wastewater treatment systems. Open space is proposed along Sand Creek. Overlot grading is anticipated across a majority of the site to develop the roads and lots. The Preliminary Concept Plan and the Development Plan is presented in Figures 3 and 4.

3.0 SCOPE OF THE REPORT

The scope of the report will include the following:

- A general geologic analysis utilizing published geologic data. Detailed site-specific mapping will be conducted to obtain general information in respect to major geographic and geologic features, geologic descriptions and their effects on the development of the property.

4.0 FIELD INVESTIGATION

Our field investigation consisted of the preparation of a geologic map of any bedrock features and significant surficial deposits. The Natural Resource Conservation Service (NRCS), previously the Soil Conservation Service (SCS) survey was also reviewed to evaluate the site. The position of mappable units within the subject property are 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 performed by personnel of Entech Engineering, Inc. on February 10 and March 9, 2017.

Thirteen Test Borings were drilled on the site to determine general soil and bedrock characteristics. Six Test Pits were excavated to evaluate the use of individual on-site wastewater treatment systems. The locations of the test borings and test pits are indicated on the Development Plan/Test Boring Location Map, Figure 4. The Test Boring Logs are presented in Appendix B. Results of this testing will be discussed later in this report.

Laboratory testing was also performed on some of the soils to classify and determine the soils engineering characteristics. Laboratory tests included grain-size analysis ASTM D-422, Atterberg Limits ASTM D-4318, volume change testing using FHA Swell and Swell/Consolidation test. Sulfate testing was performed on select samples to evaluate potential for below grade concrete degradation due to sulfate attack. Results of the laboratory testing are included in Appendix C. A Summary of Laboratory Test Results is presented in Table 1. Results of the tactile test pits are presented in Table 2.

5.0 SOIL, GEOLOGY AND ENGINEERING GEOLOGY

5.1 General Geology

Physiographically, the site lies in the western portion of the Great Plains Physiographic Province. Approximately twelve 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. Overlying this formation are unconsolidated deposits of man-made, and alluvial soils of Quaternary Age. The alluvial soils were deposited by water on site and as stream terraces along Sand Creek and the drainages located on the site. Man-made soils exist as fill piles located in the southern 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 three soil types on the site (Figure 4). In general, the soils classify as coarse sandy loam. The soils are described as follows:

Type	Description
71	Pring Coarse Sandy Loam, 3 to 8% slopes

Complete descriptions of each soil type are presented in Appendix D. The soils have generally been described to have moderate to moderately rapid permeabilities. Possible hazards with soil erosion are present on the site. The erosion potential can be controlled with vegetation. The majority of the soils have been described to have slight to moderate erosion hazards.

5.3 Site Stratigraphy

The Falcon NW Quadrangle Geology Map showing the site is presented in Figure 6 (Reference 4). The Geology Map prepared for the site is presented in Figure 7. Five mappable units were identified on this site which are described as follows:

Qaf **Artificial Fill of Holocene Age:** These are recent deposits of man-made fill. They are associated with the three man-made dams located across the site.

Qal **Recent alluvium of Holocene Age:** These are recent deposits that have been deposited along Sand Creek and the other drainages on-site.

Qay2 **Young alluvium two of Holocene Age:** These materials consist of water deposited alluvium, typically classified as a silty to well-graded sand, brown to dark brown in color and of moderate densisty.

Qam **Middle alluvium of Holocene to Pleistocene Age:** These materials consist of lower stream terrace deposits. The alluvium typically consists of silty to clayey gravelly sands.

Tkd **Dawson Formation of Tertiary to Cretaceous Age:** The Dawson Formation typically consisted of arkosic sandstone with interbedded fine-grained sandstone, siltstone and claystone. Overlying this formation is a variable layer of residual soil. The residual soils were derived from the in-situ weathering of the bedrock materials on-site. These soils consisted of silty to clayey sands and sandy clays.

The soils listed above were mapped from site-specific mapping, 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 Denver 1^0 x 2^0 Quadrangle*, distributed by the US Geological Survey in 1981 (Reference 6). The Test Borings and Profile Holes were also used in evaluating the site and are included in Appendix B. The Geology Map prepared for the site is presented in Figure 7.

5.4 Soil Conditions

The soils encountered in the Test Borings can be grouped into four general soil types. The soils were classified using the Unified Soil Classification System (USCS).

Soil Type 1 silty to slightly silty sand and very clayey sand (SM-SW, SM, SC), encountered in all of Test Borings at the existing ground surface and extending to depths ranging from1 foot to 17 feet bgs. These soils were encountered at loose to dense states and at moist conditions. The majority of the soils were encountered and medium dense states. Samples tested had 9 to 41 percent passing the No. 200 Sieve. Atterberg Limits Testing resulted in the sand being non-plastic. Sulfate testing resulted in less than 0.01 to 0.01 percent sulfate by weight indicating the sand exhibits negligible potential for below grade concrete degradation.

Soil Type 2 sandy clay (CL), encountered in Test Boring Nos. 1, 2 and 7 at depths ranging from 2 to 14 feet bgs, and extending to depths ranging from 4 to 19 feet. These soils were encountered at very soft to stiff consistencies. Samples tested had 78 to 90 percent passing the No. 200 Sieve. Atterberg Limits Testing resulted in a liquid limit of 47 and aplastic index of 21. FHA Swell testing on samples of the sandy clay resulted in expansion pressures of 1520 to 1550 psf, indicating a moderate to high expansion potential. Sulfate testing resulted in less than 0.01 to 0.01 percent sulfate by weight indicating the clay exhibits negligible potential for below grade concrete degradation.

Soil Type 3 silty to slightly silty sandstone and clayey-silty sandstone (SM, SM-SW, SC-SM), encountered in all of Test Borings at depths ranging from 1 foot to 19 feet bgs and extending to the termination of the test borings (20 feet). The sandstone was encountered at dense to very dense states and at moist conditions. Samples tested had 9 to 24 percent passing the No. 200 Sieve. Atterberg Limits Testing resulted in the sandstone being non-plastic. Sulfate testing resulted in less than 0.01 percent sulfate by weight indicating the sandstone exhibits negligible potential for below grade concrete degradation.

Soil Type 4 sandy to very sandy claystone (CL), encountered in Test Boring Nos. 4 and 5 at depths ranging from 7 to 9 feet bgs and extending to depths ranging from 16 to 19 feet bgs. The claystone was encountered at hard consistencies and at moist conditions. Samples tested had 56 to 64 percent passing the No. 200 Sieve. Swell/Consolidation Testing resulted in expansions of 1 to 3.3 percent, which indicates the claystone exhibits a low to high expansion potential. Atterberg Limits Testing resulted in a liquid limit of 44 and a plastic index of 20.

The Test Boring Logs are presented in Appendix B. Laboratory Test Results are presented in Appendix C. A Summary of Laboratory Test Results is presented in Table 1.

5.5 Groundwater

Groundwater was encountered in four of the test borings at depths ranging from 5 to 17.5 feet, water was not encountered in the remaining borings which were drilled to 20 feet. Areas of water, seasonal shallow groundwater water, and potential seasonal shallow groundwater have been mapped along the drainages on-site. These areas are discussed in the following section.

Fluctuation in groundwater conditions may occur due to variations in rainfall and other factors not readily apparent at this time.

It should be noted that in the sandy materials on-site, 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. Builders and planners should be cognizant of the potential for the occurrence of such subsurface water features during construction on-site and deal with each individual problem as necessary at the time of construction.

6.0 ENGINEERING GEOLOGY – IDENTIFICATION AND MITIGATION OF GEOLOGIC HAZARDS

As mentioned previously, detailed mapping has been performed on this site to produce an Engineering Geology Map Figure 7. This map shows the location of various geologic conditions of which the developers should be cognizant during the planning, design and construction stages of the project. These hazards and the recommended mitigation techniques are as follows:

Artificial Fill - constraint

These are recent man-made fill deposits associated with the two dams located across the site. One of the dams is located north of Arroya Lane and is not within the proposed developed area. One dam is located on the eastern side of Parcel C. It is anticipated that this dam will be removed and filled during the site grading process. At the time of the investigation the condition of the dams was observed, and appeared to be in good condition.

Mitigation: The earthen dams lie within defined drainages and should be avoided as building sites. 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 its maximum Modified Procter Dry Density, ASTM D-1557.

Collapsible Soils - constraint

The majority of the soils encountered on-site do not exhibit collapsible characteristics, however, areas of loose soils were encountered in the test borings drilled on site. Should loose or collapsible soils be encountered beneath foundations, recompaction and moisture conditioning of the upper 2 feet of soil at 95% of its maximum Modified Proctor Dry Density ASTM D-1557 will be required. Exterior flatwork and parking areas may also experience movement. Proofrolling and recompaction of soft areas should be performed during site work.

Expansive Soils - constraint

Expansive soils were encountered in the test borings drilled on site. These occurrences are typically sporadic; therefore, none have been indicated on the maps. The clays and claystone, if encountered at foundation grade, can cause differential movement in structures. These occurrences should be identified and dealt with 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 its maximum Modified Proctor Dry Density, ASTM D-1557 is a suitable mitigation, which is common in the area. Floor slabs on expansive soils should be expected to experience movement. Overexcavation and replacement has 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 determined after additional investigation of each building site.

Areas of Erosion - constraint

These are areas that are undergoing erosion by water and sheetwash producing gullies and rill erosion.

Mitigation: Due to the nature of the soils on this site, virtually all the soils are subject to erosion by wind and water. Other minor areas of erosion were observed on site other than those mapped, particularly where some rill erosion has occurred. Areas of erosion can occur across the entire site, particularly if the soils are disturbed during construction. Vegetation reduces the potential for erosion. The areas identified where erosion is actually taking place may require check dams, regrading and revegetation using channel lining mats to anchor vegetation. Further recommendations for erosion control are discussed under Section 8.0 "Erosion Control" of this report. Recommendations pertaining to revegetation may require input from a qualified

landscape architect and/or the Natural Resource Conservation Service (previously Soil Conservation Service).

Groundwater and Floodplain Areas - constraint

Areas within the drainages on-site have been identified as areas of seasonally wet and/or seasonally high groundwater areas. Water was observed in the three ponds on-site, and flowing in Sand Creek. The majority of the drainages across the site were dry. The site is mapped within floodplain zones according to the FEMA Map No. 08041CO535G, Figure 8 (Reference 7). The floodplain area is to consist of open space/ park for the development. These areas are discussed as follows:

Seasonal Shallow Groundwater Area - constraint

In these areas, we would anticipate periodic high subsurface moisture conditions and frost heave potential on a seasonal basis. Additional, highly organic soils could be encountered in these areas. These areas lie within defined drainages and it is anticipated they will 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. In areas where high subsurface moisture conditions are anticipated periodically, subsurface perimeter drains are recommended to help prevent the intrusion of water into areas below grade. 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. Finished floor levels must be located a minimum of one foot above floodplain levels.

Potentially Seasonal Shallow Groundwater Area - constraint

In these areas, we would anticipate the potential for periodically high subsurface moisture conditions, frost heave potential and highly organic soils. The majority of these areas lie within defined drainages which can likely be avoided by the proposed development. The same mitigation recommendations for the seasonal shallow groundwater areas apply to the potentially seasonal shallow groundwater areas.

Areas of Ponded Water - constraint

These are areas of standing water behind earthen dams 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 of the site where it does not create areas of ponded water around proposed structures.

Downslope Creep Areas - hazard

These areas are acceptable as building sites, however, in areas identified with this hazard classification, we would anticipate accelerated lateral and vertical movement of the near surface soils in the downslope direction. It is anticipated that many of these areas will be mitigated by the overlot grading.

Mitigation: The design of foundations in these areas should account for the additional pressure on the uphill side of the structure due to the creep potential. Tie-beams, buttresses and counterforts may be necessary in some areas. Where possible, in areas of downslope creep, structures should be designed to be as compact and rigid as possible. This will help them better tolerate the vertical and lateral movements to which the foundation system may be subjected with minimal damage. Long, rambling, irregular structures should be avoided, as they are associated with much greater potential for damaging differential movement. Additionally, structures should be designed to step up the slope. Deep cuts in these areas should be avoided. Any retaining walls proposed in these areas should also be properly designed for by a qualified professional engineer for the global slope stability. Proper control of drainage at both the surface and subsurface is important. Saturation of materials should be avoided that may create unstable conditions.

Potentially Unstable Slope Areas - hazard

These slopes are considered stable in their present condition; however, considerable care must be exercised in these areas not to create a condition which would tend to activate instability. These areas are primarily located along the banks of Sand Creek, which are proposed as open space.

Mitigation: Building should be avoided in these areas. Proper control of drainage at both the surface and the subsurface is extremely important. Areas of ponded water at the surface

should be avoided. Utility trenches, basement excavations and other subsurface features should not be permitted to become water traps which may promote saturation of the subsurface materials. Drainage should not be permitted over the potentially unstable slope but directed in a non-erosive manner away from the slope. Irrigation above these slopes should be kept to a minimum to prevent saturation of the subsurface soils. The use of xeriscape landscaping utilizing native plantings is recommended to reduce the need for irrigation.

6.1 Relevance of Geologic Conditions to Land Use Planning

As mentioned earlier in this report, we understand that the development will be single family residential. It is our opinion that the existing geologic and engineering geologic conditions will impose some constraints on the proposed development and construction. The most significant problems affecting development will be those associated with the major drainages on site that are mitigated by avoidance. The minor drainages are being mitigated by site grading. Other hazards on site may be satisfactorily mitigated through proper engineering design and construction practices. These items are discussed in more detail in the Soil, Geology, & Geologic Hazard Study by Entech Engineering, Inc., dated April 26, 2021, Entech job no. 211066.

7.0 ON-SITE WASTEWATER TREATMENT

The site was evaluated for on-site wastewater treatment systems for the proposed lots in accordance with El Paso Land Development Code. Six (6) tactile test pits were performed across the larger lots. Test pits were located in anticipated locations of proposed on-site wastewater treatment system (OWTS) for the development. The approximate locations of the test pits are indicated on Figure 4 and 7, and on the Septic Suitability Map, Figure 9. The locations were chosen to determine a general understanding of the soil and bedrock conditions across the site. The results of the test pits are presented in Table 2.

The Natural Resource Conservation Service (Reference 2), previously the Soil Conservation Service (Reference 3) has been mapped with three soil descriptions. The Soil Survey Map (Reference 2) is presented in Figure 5, and the Soil Survey Descriptions are presented in Appendix D. The soils are described as having moderate to moderately rapid percolation rates.

Soils encountered in the tactile test pits consisted of loamy sand to gravelly loamy sand, sandy loam to gravelly sandy loam, sandy clay and silty clay with underlying clayey to silty sandstone. The limiting layers encountered in the test pits are the sandy loam, silty clay and silty to clayey sandstone, which corresponds to an LTAR values of 0.10 to 0.50 gallons per day per square foot. The bedrock was encountered at 5 to 7.5 feet in four of the test pits. The conditions encountered in the majority of the test pits will require a designed system. Signs of seasonal shallow groundwater were observed at depths 7 feet in Test Pit Nos. 3 and 5.

Absorption fields must be maintained a minimum of 4 feet above groundwater or bedrock. signs of seasonally occurring groundwater were observed in Test Pit Nos. 3 and 5 at depths of 7 feet.

In summary, it is our opinion the site is suitable for individual on-site wastewater treatment systems (OWTS) and that contamination of surface and subsurface water resources should not occur provided the OWTS sites are evaluated and installed according to El Paso County Guidelines and properly maintained. Based on the testing performed as part of this investigation and the type of project designed systems will likely be required for the majority of the lots. A Septic Suitability Map is presented in Figure 9. Absorption fields must be located a minimum of 100 feet from any well, including those on adjacent properties. Absorption fields must also be located a minimum of 50 feet from any ponded areas and 25 feet from dry gulches. It should be noted that additional testing will be required for the individual lots prior to construction.

8.0 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. Individual investigations for building sites will be required prior to construction. Construction and design personnel should be made

familiar with the contents of this report. Reporting such discrepancies to Entech Engineering, Inc. soon after they are discovered would be greatly appreciated and could possibly help avoid construction and development problems.

This report has been prepared for TimberRidge Development Group, LLC. 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 required. Should you require additional information, please do not hesitate to contact Entech Engineering, Inc.

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TABLES

TABLE 1

SUMMARY OF LABORATORY TEST RESULTS

CLIENT TIMBERRIDGE DEVELOPMENT GROUP, LLC
PROJECT THE RETREAT AT TIMBERRIDGE, FILING 2
JOB NO. 211066

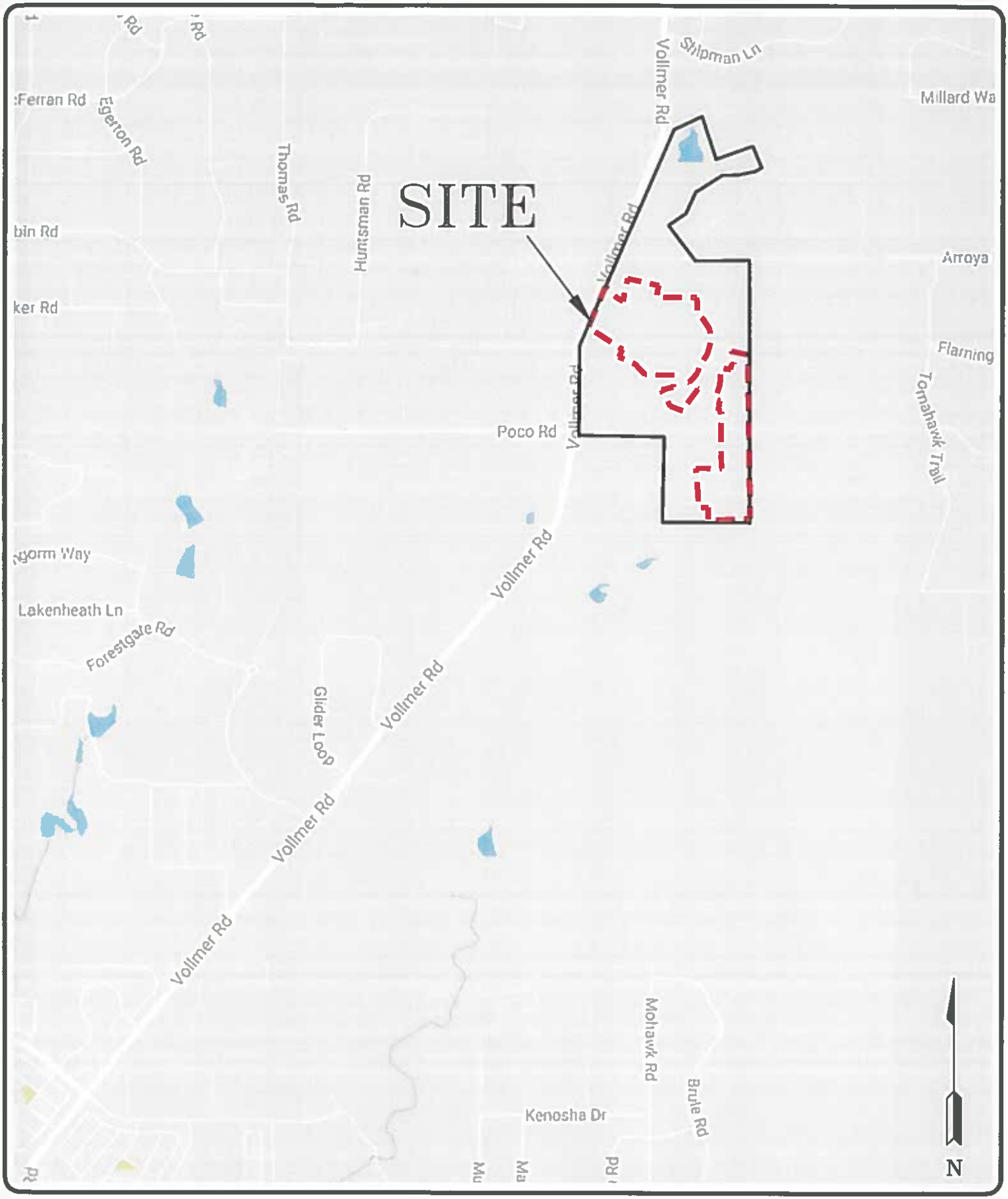
SOIL TYPE	TEST BORING NO.	DEPTH (FT)	WATER (%)	DRY DENSITY (PCF)	PASSING NO. 200 SIEVE (%)	LIQUID LIMIT (%)	PLASTIC INDEX (%)	SULFATE (WT %)	FHA SWELL (PSF)	SWELL/ CONSOL (%)	UNIFIED CLASSIFICATION	SOIL DESCRIPTION
1	5	2-3			10.5						SM-SW	SAND, SLIGHTLY SILTY
1	6	5			41.3			0.01			SC	SAND, VERY CLAYEY
1	11	5			16.5						SM	SAND, SILTY
1	13	2-3			17.8						SM	SAND, SILTY
1	9	2-3			14.6	NV	NP				SM	SAND, SILTY
1	10	5			17.4			<0.01			SM	SAND, SILTY
1	2	10			9.2	NV	NP	<0.01			SM-SW	SAND, SLIGHTLY SILTY
2	1	2-3			77.5				1550		CL	CLAY, SANDY
2	2	4			86.1			0.01	1520		CL	CLAY, SANDY
3	1	10			9.3	NV	NP	<0.01			SM-SW	SANDSTONE, SLIGHTLY SILTY
3	3	5			24.0						SM	SANDSTONE, SILTY
3	7	20			16.6						SM	SANDSTONE, SILTY
3	8	5			14.9						SM	SANDSTONE, SILTY
3	12	10			24.4						SC	SANDSTONE, CLAYEY
3	9	15			9.9	NV	NP				SM-SW	SANDSTONE, SILTY
4	4	15	19.9	109.5	63.9	44	20	<0.01		3.3	CL	CLAYSTONE, SANDY
4	5	10	17.8	111.3	55.7					1.0	CL	CLAYSTONE, VERY SANDY
4	7	15			89.5	47	21	<0.01			CL	CLAYSTONE, SANDY

Table 2: Summary of Percolation Test and Tactile Test Pit Results

Test Pit No.	USDA Soil Type Limiting Layer	LTAR Value	Depth to Bedrock (ft.)	Depth to Seasonal Groundwater (ft.)
1	2A	0.50	N/A	N/A
2	4A*	0.15	5	N/A
3	5*	0.10	7.5	7
4	2A	0.50	N/A	N/A
5	5*	0.10	7	7
6	4A*	0.15	7	N/A

*- Conditions that will require an engineered OWTS

FIGURES



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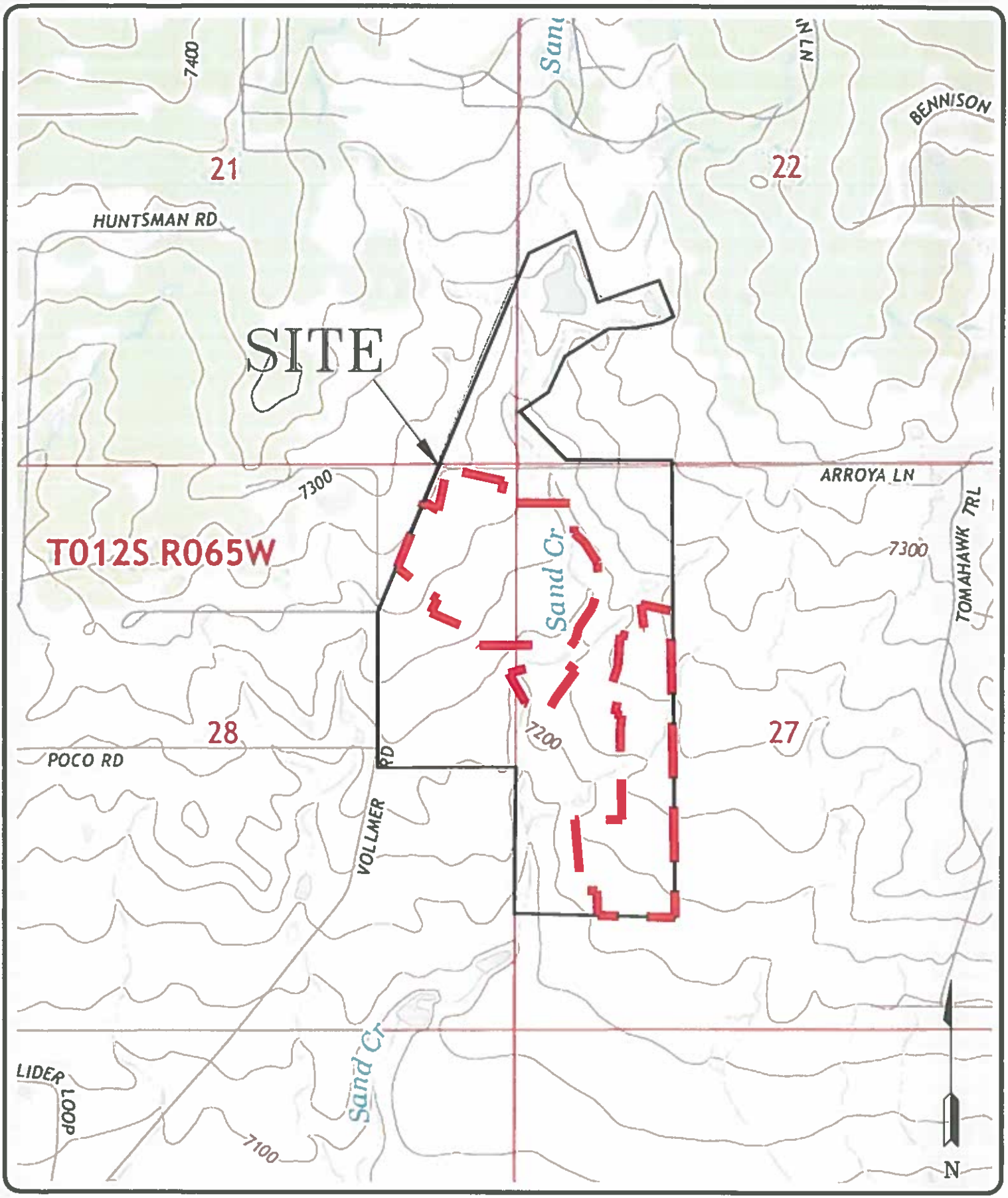
VICINITY MAP
TIMBERRIDGE, FILING #2
VOLLMER ROAD AND ARROYA LANE
EL PASO COUNTY, CO.
FOR: TIMBERRIDGE DEVELOPMENT GROUP, LLC

DRAWN:	DATE:	CHECKED:	DATE:
JAC	4/27/21	KAH	

JOB NO.: 211066

FIG NO.: 1



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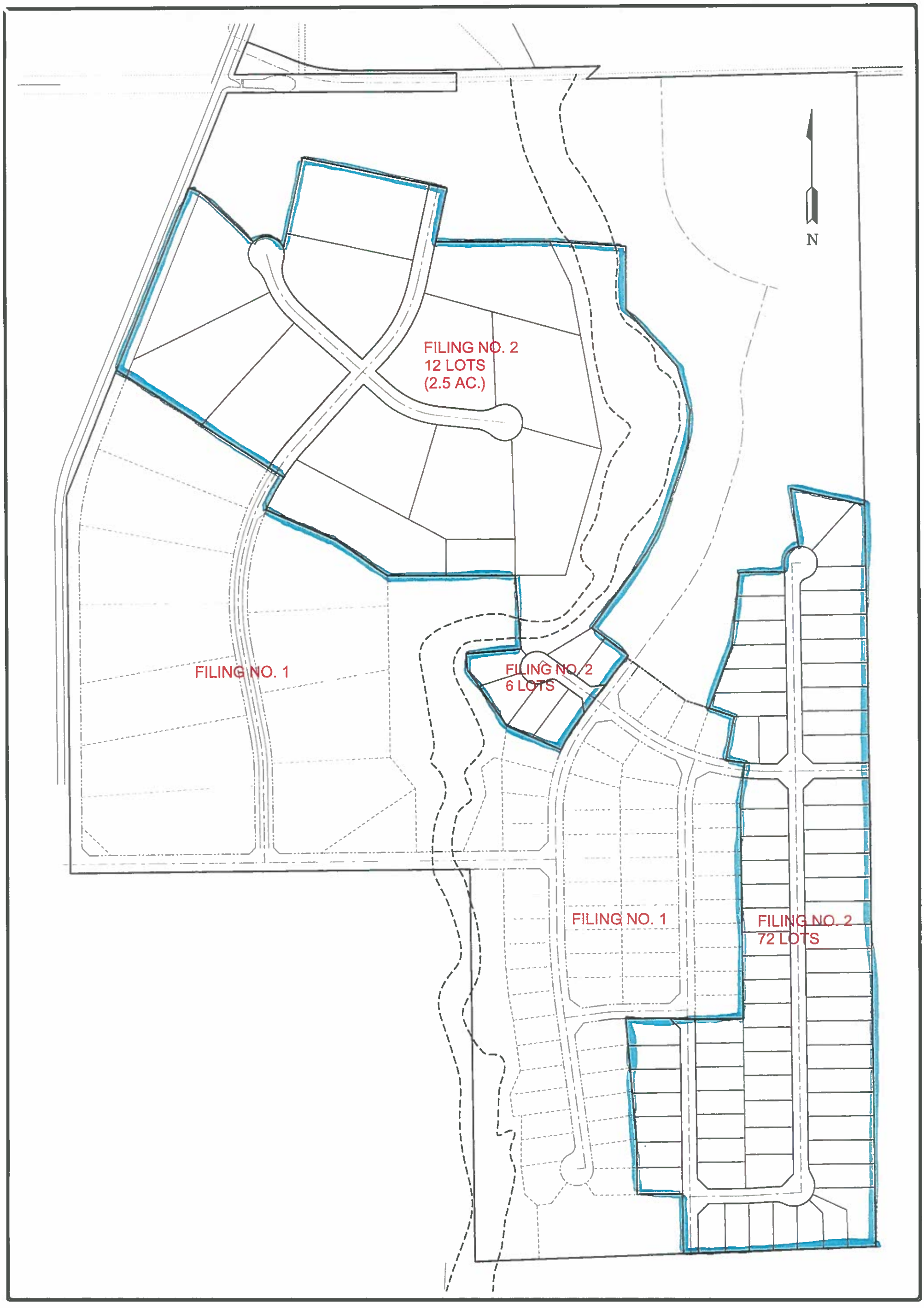
505 ELKTON DRIVE
COLORADO SPRINGS, CO. 80907 (719) 531-5599

USGS MAP
TIMBERRIDGE, FILING #2
VOLLMER ROAD AND ARROYA LANE
EL PASO COUNTY, CO.
FOR: TIMBERRIDGE DEVELOPMENT GROUP, LLC

DRAWN:	DATE:	CHECKED:	DATE:
JAC	4/27/21	KAC	

JOB NO.: 211066

FIG NO.: 2



DRAWN JAC
CHECKED KAB
DATE 4/27/21
SCALE AS SHOWN
JOB NO. 211066
FIGURE NO. 3

SITE PLAN
TIMBERRIDGE, FILING #2
VOLLMER ROAD AND ARROYA LANE
EL PASO COUNTY, CO.
FOR: TIMBERRIDGE DEVELOPMENT GROUP, LLC

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505 ELKTON DRIVE
COLORADO SPRINGS, CO. 80907 (719) 531-5599

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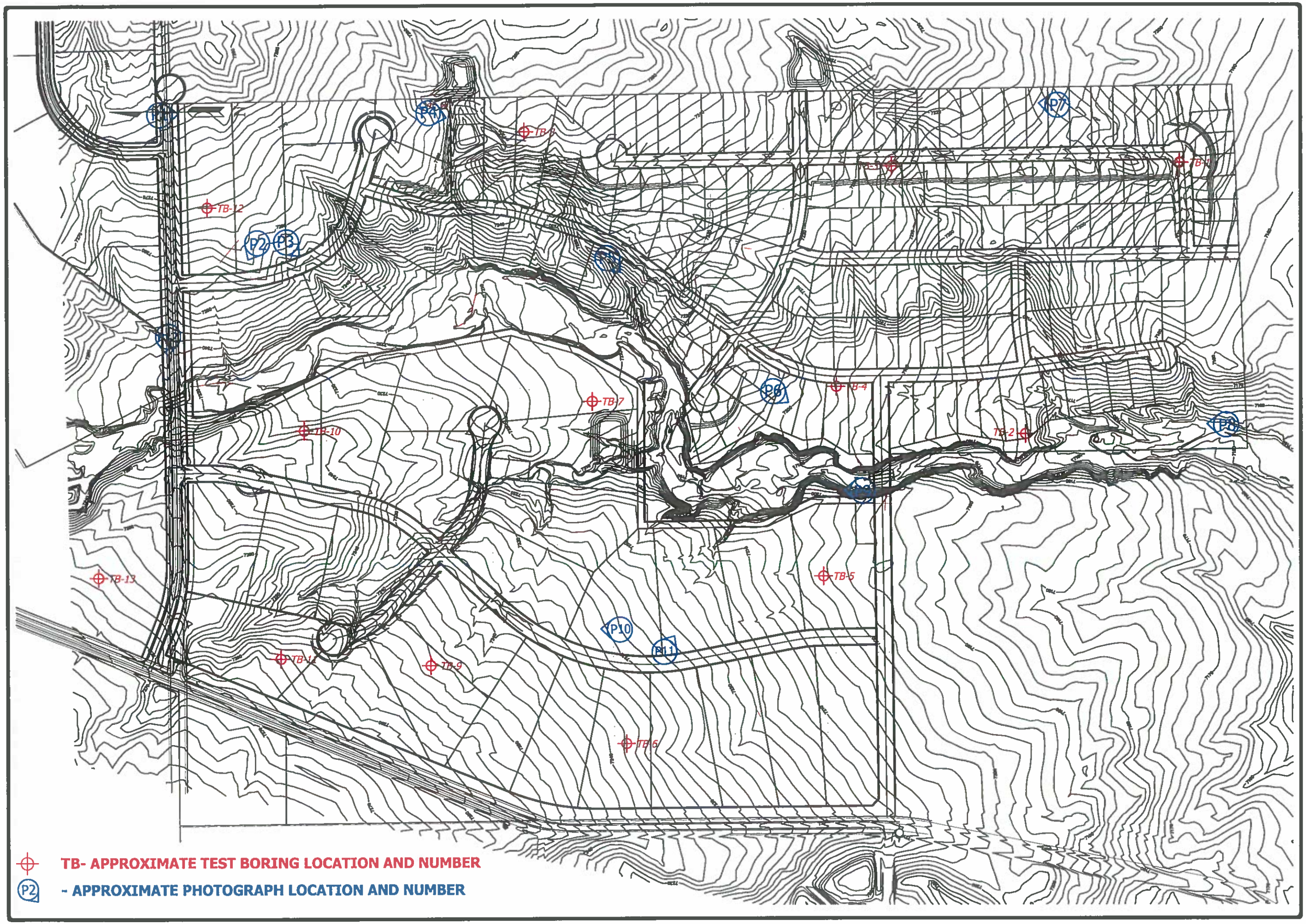

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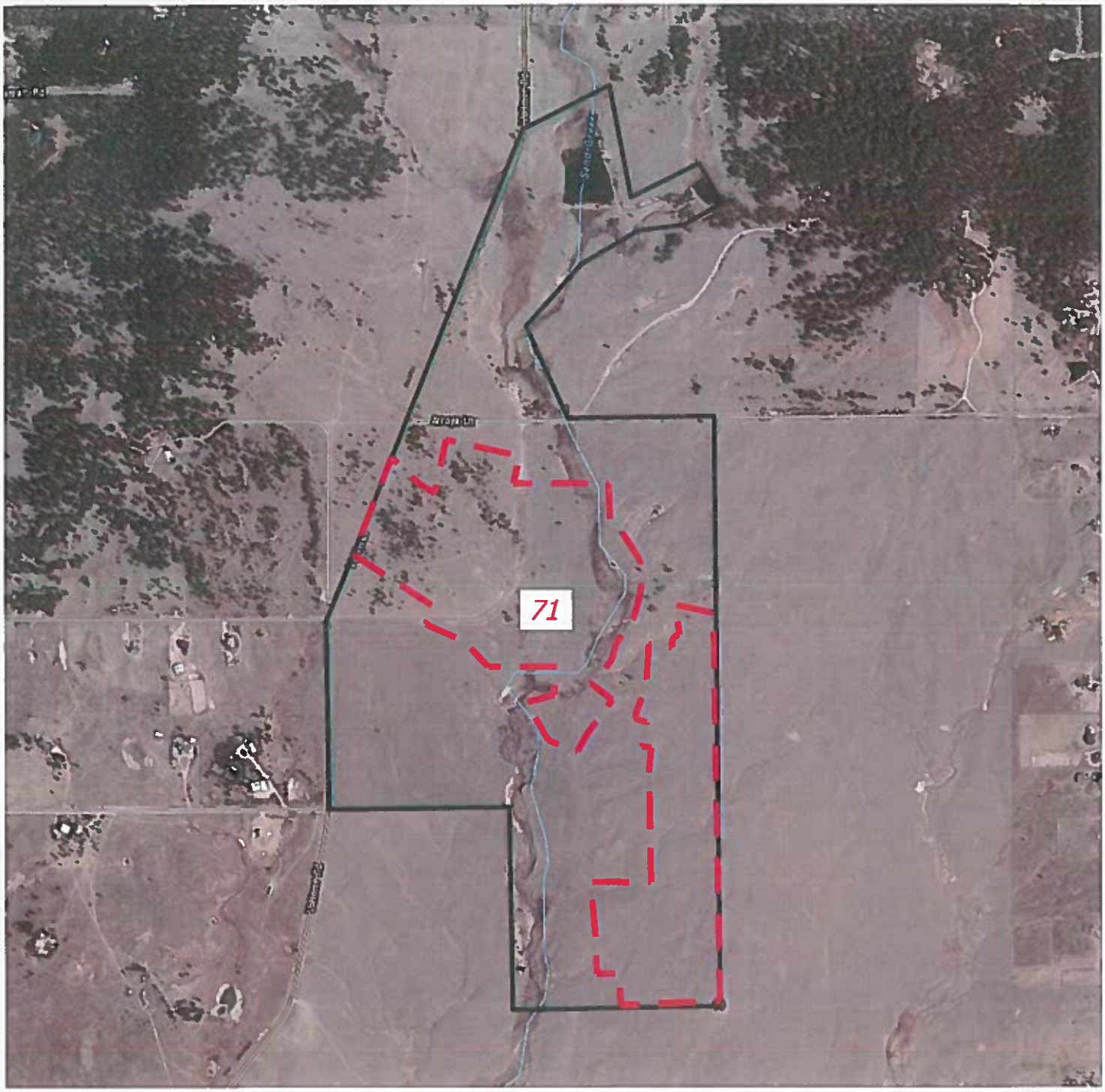
DEVELOPMENT PLAN/TEST BORING LOCATION MAP
TIMBERRIDGE, FILING #2
VOLLMER ROAD AND ARROYA LANE
EL PASO COUNTY, CO.
FOR: TIMBERRIDGE DEVELOPMENT GROUP, LLC

DRAWN	JAC
CHECKED	KAH
DATE	4/27/21
SCALE	AS SHOWN
JOB NO.	211066
FIGURE No.	4



N

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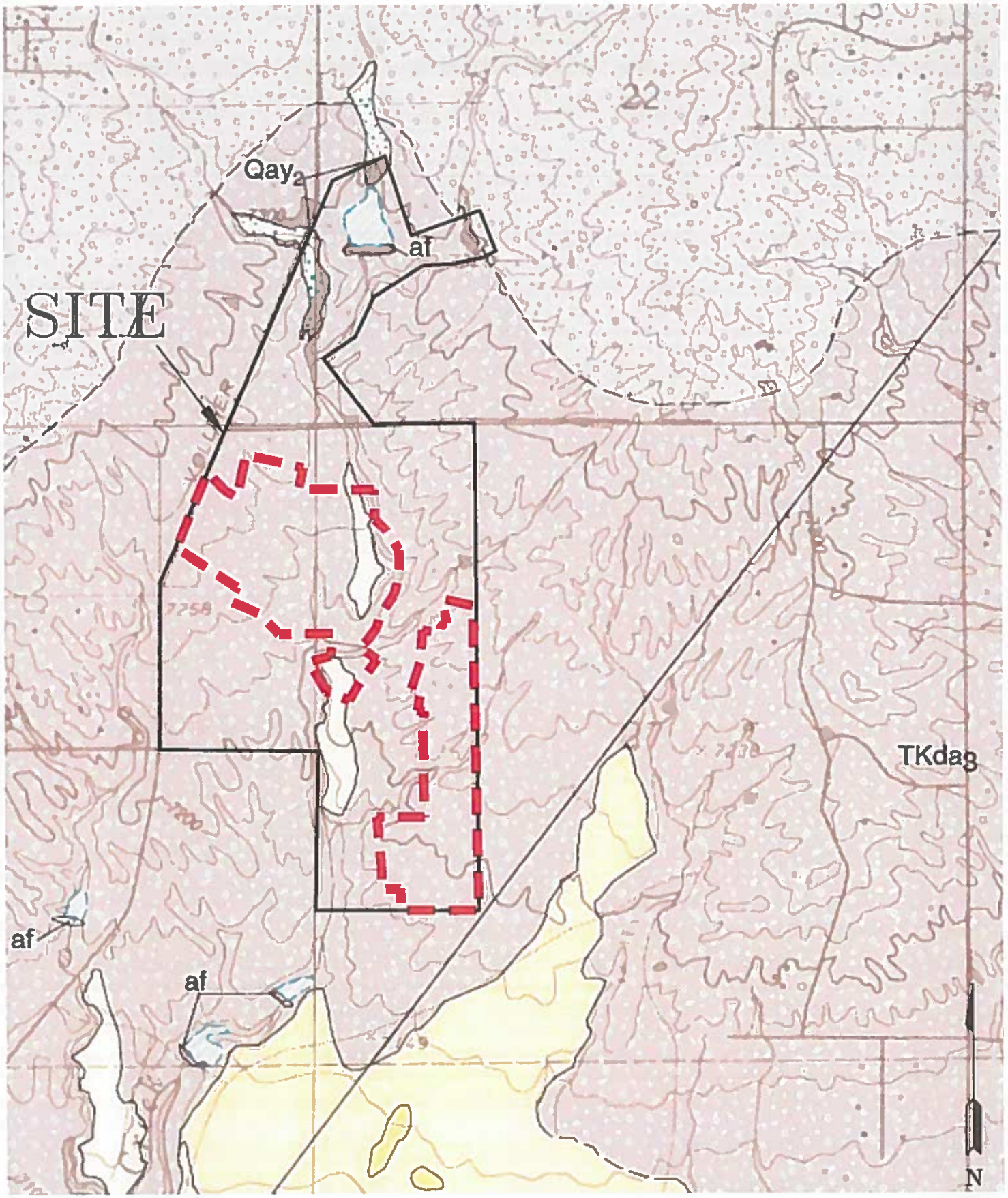
SOIL SURVEY MAP
TIMBERRIDGE, FILING #2
VOLLMER ROAD AND ARROYA LANE
EL PASO COUNTY, CO.
FOR: TIMBERRIDGE DEVELOPMENT GROUP, LLC

DRAWN:	DATE:	CHECKED:	DATE:
JAC	4/27/21	KAH	

JOB NO.: 211066

FIG NO.: 5



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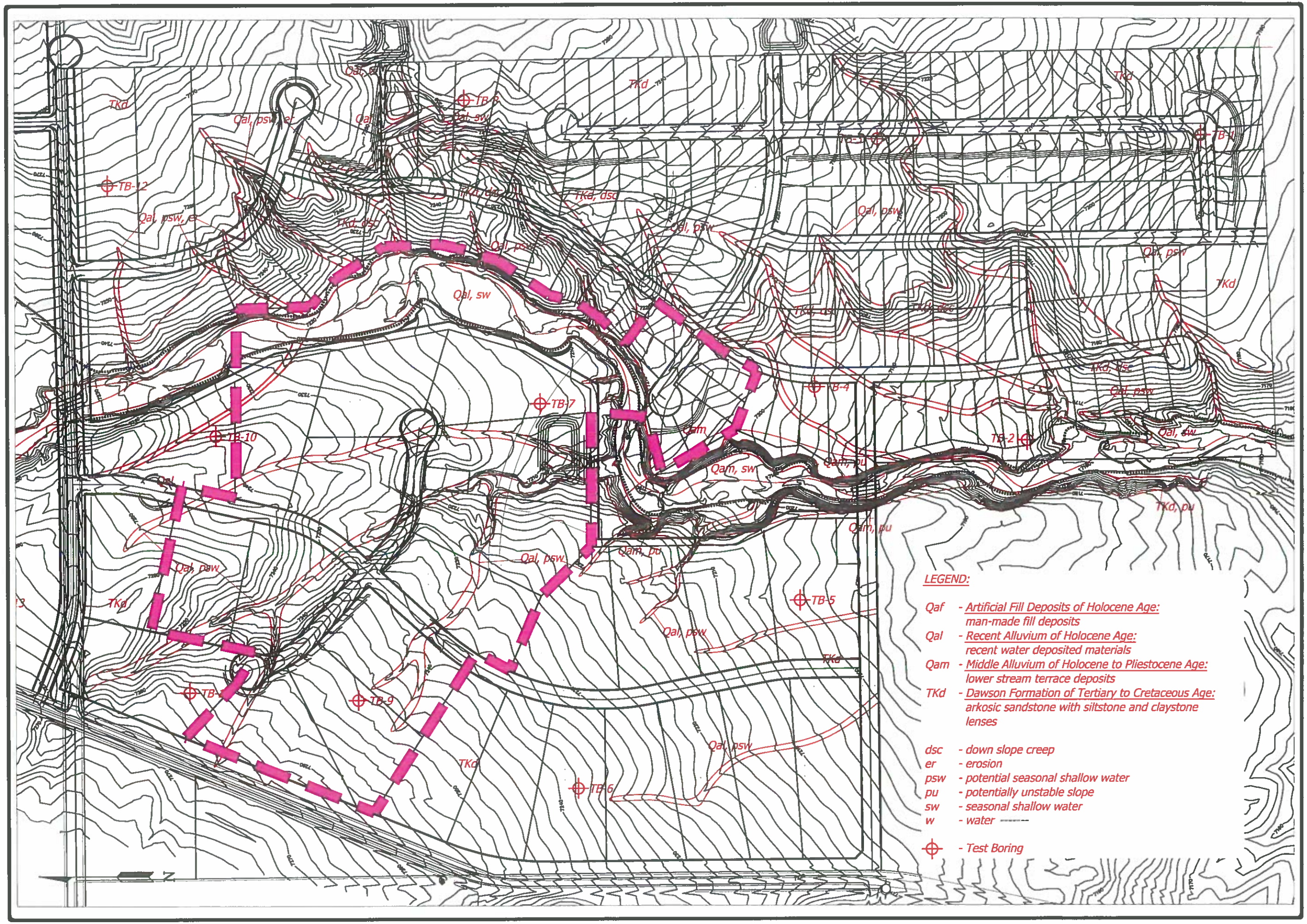
FALCON NW QUADRANGLE GEOLOGY MAP
TIMBERRIDGE, FILING #2
VOLLMER ROAD AND ARROYA LANE
EL PASO COUNTY, CO.
FOR: TIMBERRIDGE DEVELOPMENT GROUP, LLC

DRAWN:	DATE:	CHECKED:	DATE:
JAC	4/27/21	KAH	

JOB NO.: 211066

FIG NO.: 6



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GEOLOGY MAP/ENGINEERING GEOLOGY
TIMBERRIDGE, FILING #2
VOLLMER ROAD AND ARROYA LANE
EL PASO COUNTY, CO.
FOR: TIMBERRIDGE DEVELOPMENT GROUP, LLC

DRAWN	JAC
CHECKED	KAH
DATE	4/27/21
SCALE	AS SHOWN
JOB NO.	211036
FIGURE No.	7

LEGEND

SPECIAL FLOOD HAZARD AREAS INUNDATED BY 100-YEAR FLOOD

ZONE A No base flood elevations determined.

ZONE AE Base flood elevations determined.

ZONE AH Flood depths of 1 to 3 feet (usually areas of ponding); base flood elevations determined.

ZONE AO Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.

ZONE A99 To be protected from 100-year flood by Federal flood protection system under construction; no base elevations determined.

ZONE V Coastal flood with velocity hazard (wave action); no base flood elevations determined.

ZONE VE Coastal flood with velocity hazard (wave action); base flood elevations determined.

FLOODWAY AREAS IN ZONE AE

OTHER FLOOD AREAS

ZONE X Areas of 500-year flood; areas of 100-year flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 100-year flood.

OTHER AREAS

ZONE X Areas determined to be outside 500-year floodplain.

ZONE D Areas in which flood hazards are undetermined.

UNDEVELOPED COASTAL BARRIERS

Identified 1983 | Identified 1990 | Otherwise Protected Areas

Coastal barrier areas are normally located within or adjacent to Special Flood Hazard Areas.

Flood Boundary

Floodway Boundary

Zone D Boundary

Boundary Dividing Special Flood Hazard Zones, and Boundary Dividing Areas of Different Coastal Base Flood Elevations Within Special Flood Hazard Zones.

513 — Base Flood Elevation Line; Elevation in Feet. See Map Index for Elevation Datum.

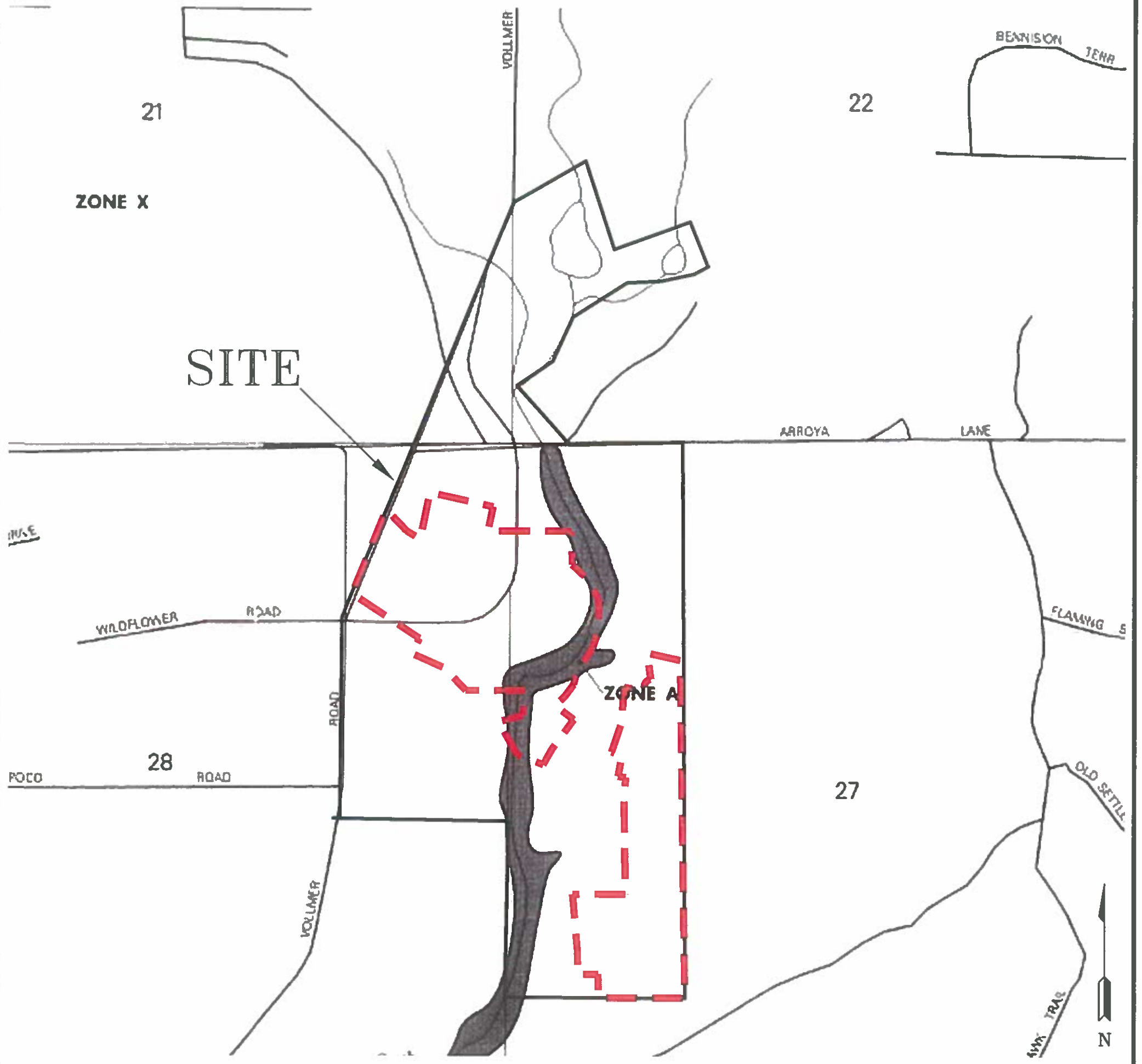
D — D — Cross Section Line

(EL 987) — Base Flood Elevation in Feet Where Uniform Within Zone. See Map Index for Elevation Datum.

RM7 × — Elevation Reference Mark

● M2 — River Mile

97°07'30", 32°22'30" — Horizontal Coordinates Based on North American Datum of 1927 (NAD 27) Projection.



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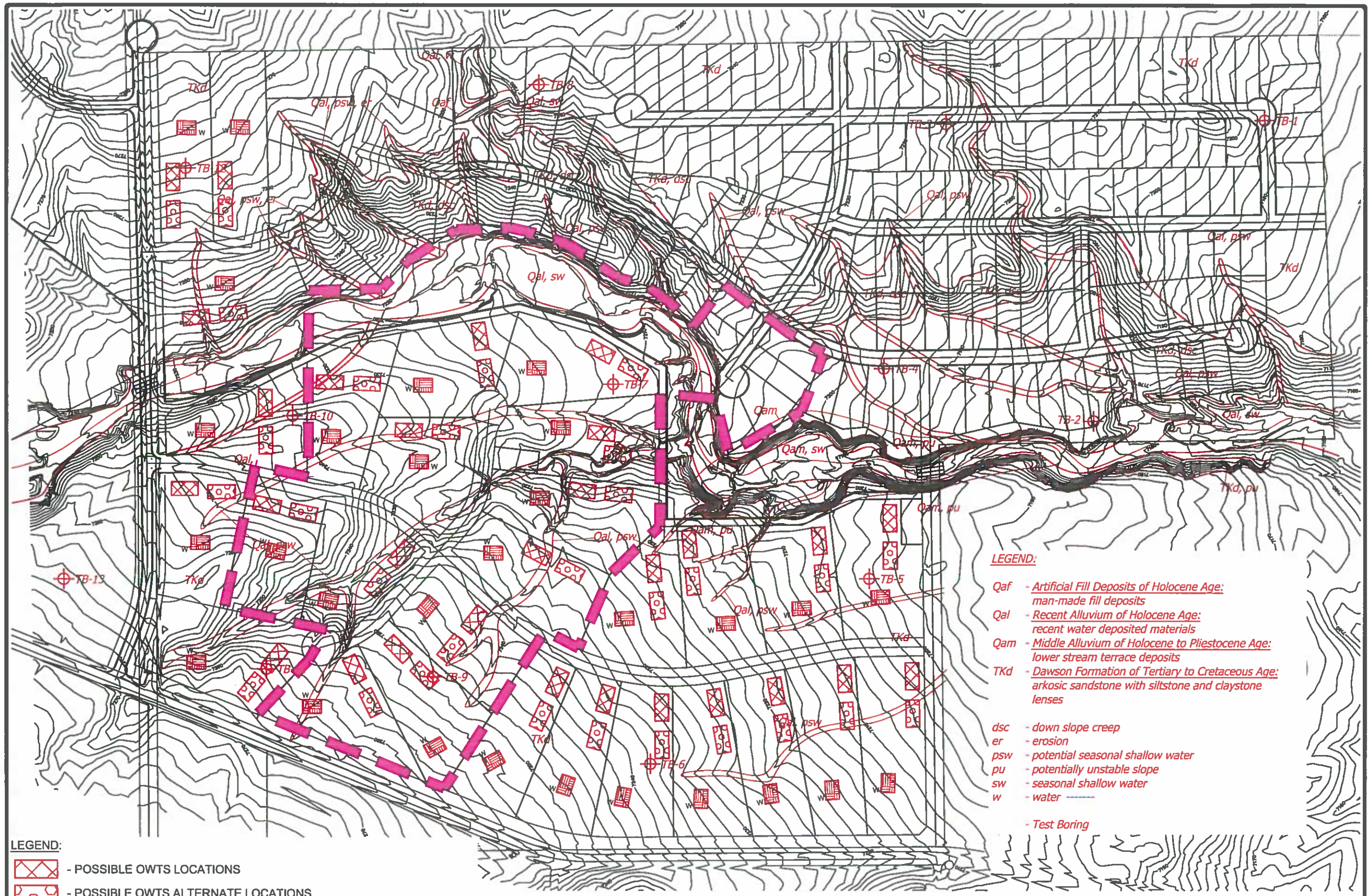
FLOODPLAIN MAP
TIMBERRIDGE, FILING #2
VOLLMER ROAD AND ARROYA LANE
EL PASO COUNTY, CO.
FOR: TIMBERRIDGE DEVELOPMENT GROUP, LLC

DRAWN	JAC
CHECKED	KAH
DATE	4/27/21
SCALE	AS SHOWN
JOB NO.	211066
FIGURE No.	8



LEGEND:

- POSSIBLE OWTS LOCATIONS
- POSSIBLE OWTS ALTERNATE LOCATIONS
- POSSIBLE HOUSE LOCATIONS

W *- WATER WELLS MUST BE A MINIMUM OF 100 FT FROM OWTS ABSORPTION FIELDS

LEGEND:

Qaf - Artificial Fill Deposits of Holocene Age: man-made fill deposits

Qal - Recent Alluvium of Holocene Age: recent water deposited materials

Qam - Middle Alluvium of Holocene to Pliestocene Age: lower stream terrace deposits

TKd - Dawson Formation of Tertiary to Cretaceous Age: arkosic sandstone with siltstone and claystone lenses

dsc - down slope creep
er - erosion
psw - potential seasonal shallow water
pu - potentially unstable slope
sw - seasonal shallow water
w - water

- Test Boring

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SITE PLAN/TEST BORING LOCATION MAP
TIMBERRIDGE, FILING #2
VOLLMER ROAD AND ARROYA LANE
EL PASO COUNTY, CO.
FOR: TIMBERRIDGE DEVELOPMENT GROUP, LLC

DRAWN	TLC
CHECKED	LLL
DATE	12/1/17
SCALE	AS SHOWN
JOB NO.	170020
FIGURE No.	9

APPENDIX A: Site Photographs

1

Looking south from the northeastern portion of the site.

February 10, 2017

2

Looking northwest from the northeastern portion of the site.

February 10, 2017

Job No. 211066

3

Looking west from the northeastern portion of the site.

February 10, 2017

4

Looking southwest from the eastern portion of the site at the existing pond.

February 10, 2017

Job No. 211066

5

Looking west from the central portion of the site.

February 10, 2017

6

Looking south along Sand Creek from the central portion of the site.

February 10, 2017

Job No. 211066

7

Looking north from the southeast portion of the site.

February 10, 2017

8

Looking north from the southern portion of the site along Sand Creek.

February 10, 2017

Job No. 211066

9

Looking north from central portion of the site.

February 10, 2017

10

Looking north from the western portion of the site.

February 10, 2017

Job No. 211066

11

Looking southeast from the western portion of the site

February 10, 2017

12

Looking along Arroya Lane in the northern portion of the site.

February 10, 2017

Job No. 211066

13

Looking west along the crest of the dam in the northern portion of the site.

March 9, 2017

14

Looking south from the dam in the northern portion of site.

March 9, 2017

Job No. 211066

APPENDIX B: Test Boring and Test Pit Logs

TEST BORING NO. 1
DATE DRILLED 1/12/2017
Job # 211066

REMARKS

STAKE 3500

DRY TO 18', 1/23/17

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type	
					1	SAND, SILTY, BROWN
		■	15	19.3	2	CLAY, SANDY, BROWN, STIFF, MOIST
5		■	50 / 10"	11.5	3	SANDSTONE, SLIGHTLY SILTY, FINE TO COARSE GRAINED, TAN, VERY DENSE, MOIST
10		■	50 / 6"	7.1	3	
15		■	50 / 6"	8.2	3	
20		■	50 / 4"	17.2	3	SANDSTONE, CLAYEY, FINE TO MEDIUM GRAINED, TAN, VERY DENSE, MOIST

TEST BORING NO. 2
DATE DRILLED 1/12/2017
CLIENT TIMBERRIDGE DEV. GROUP, LLC
LOCATION RETREAT AT TIMBERRIDGE, FIL. 2

REMARKS

STAKE 3501

WATER @ 5', 1/12/17
WATER @ 11', 1/23/17

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type	
		■	10	3.2	1	SAND, SILTY, FINE TO COARSE GRAINED, BROWN, MEDIUM DENSE, MOIST
		■	*	19.4	2	CLAY, SANDY, BROWN
5		■	14	6.9	1	SAND, SILTY, FINE TO COARSE GRAINED, BROWN, MEDIUM DENSE TO LOOSE, MOIST TO WET
10		■	15	13.9	1	
15		■	3	19.4	1	
20		■	50 / 8"	11.9	3	SANDSTONE, SILTY, FINE TO COARSE GRAINED, GREEN BROWN, VERY DENSE, MOIST

* - BULK SAMPLE TAKEN

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TEST BORING LOG

DRAWN:	DATE:	CHECKED:	DATE:
			3/28/17

JOB NO.: 211066
FIG NO.: B-1

TEST BORING NO. 3
DATE DRILLED 1/12/2017
Job # 211066

REMARKS

STAKE 3502

DRY TO 19',
1/23/17

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
					1
			50 / 11"	6.1	3
5			50 / 7"	9.4	3
10			50 / 6"	7.4	3
15			50 / 4"	8.3	3
20			50 / 4"	11.2	3

SAND, SILTY, TAN
SANDSTONE, SILTY, FINE TO COARSE GRAINED, GREEN BROWN, VERY DENSE, MOIST

TEST BORING NO. 4
DATE DRILLED 1/12/2017
CLIENT TIMBERRIDGE DEV. GROUP, LLC
LOCATION RETREAT AT TIMBERRIDGE, FIL. 2

REMARKS

STAKE 3503

DRY TO 19',
1/23/17

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
					1
			43	7.9	3
5			50	8.5	3
10			50 / 8"	9.6	3
15			50 / 6"	12.9	4
20			50 / 4"	10.4	3

SAND, SILTY, TAN
SANDSTONE, SILTY, FINE TO COARSE GRAINED, GREEN BROWN, VERY DENSE, MOIST

CLAYSTONE, SANDY, BROWN, HARD, MOIST

SANDSTONE, CLAYEY, FINE TO COARSE GRAINED, GREEN BROWN, VERY DENSE, MOIST

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TEST BORING LOG

DRAWN:	DATE:	CHECKED: LLL	DATE: 3/28/17

JOB NO.: 211066
FIG NO.: B-2

TEST BORING NO. 5
DATE DRILLED 1/12/2017
Job # 211066

REMARKS

STAKE 3504

DRY TO 19.5',
1/23/17

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
SAND, SLIGHTLY SILTY, FINE TO COARSE GRAINED, TAN, MEDIUM DENSE, MOIST			17	3.9	1
5			15	7.8	1
CLAYSTONE, SANDY, GREEN BROWN, HARD, MOIST					
10			50 / 11"	15.7	4
15			50 / 8"	12.0	4
20			50 / 6"	10.0	3
SANDSTONE, CLAYEY, FINE TO COARSE GRAINED, GREEN BROWN, VERY DENSE, MOIST					

TEST BORING NO. 6
DATE DRILLED 1/12/2017
CLIENT TIMBERRIDGE DEV. GROUP, LLC
LOCATION RETREAT AT TIMBERRIDGE, FIL. 2

REMARKS

STAKE 3505

WATER @ 17.5',
1/23/17

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
SAND, SILTY, FINE TO COARSE GRAINED, TAN, MEDIUM DENSE, MOIST			16	5.8	1
5			15	18.5	1
SAND, VERY CLAYEY, FINE TO COARSE GRAINED, TAN, MEDIUM DENSE, MOIST					
SANDSTONE, CLAYEY TO SILTY, FINE TO COARSE GRAINED, BUFF, VERY DENSE, MOIST					
10			50 / 6"	7.7	3
15			50 / 6"	11.6	3
20			50 / 6"	9.3	3

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COLORADO SPRINGS, COLORADO 80907

TEST BORING LOG

DRAWN:	DATE:	CHECKED:	DATE:
		CLC	3/28/17

JOB NO.: 211066
FIG NO.: B-3

TEST BORING NO. 7
DATE DRILLED 1/12/2017
Job # 211066

REMARKS

STAKE 3506

WATER @ 14.5', 1/23/17

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
			5	4.5	1
5			5	6.0	1
10			9	5.9	1
15			2	22.9	2
20			50 / 9"	11.8	3

SAND, SILTY, FINE TO COARSE GRAINED, TAN, LOOSE, MOIST

CLAY, SANDY, DARK BROWN, VERY SOFT, VERY MOIST

SANDSTONE, SILTY, FINE GRAINED, DARK BROWN, VERY DENSE, MOIST

TEST BORING NO. 8
DATE DRILLED 1/12/2017
CLIENT TIMBERRIDGE DEV. GROUP, LLC
LOCATION RETREAT AT TIMBERRIDGE, FIL. 2

REMARKS

STAKE 3507

DRY TO 18', 1/23/17

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
					1
			50 / 10"	6.2	3
5			50 / 9"	6.1	3
10			50 / 6"	6.5	3
15			50 / 7"	11.8	3
20			50 / 7"	6.0	3

SAND, SILTY, TAN

SANDSTONE, SILTY, FINE TO COARSE GRAINED, GREEN BROWN, VERY DENSE, MOIST

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TEST BORING LOG

DRAWN:	DATE:	CHECKED: LLC	DATE: 3/28/17

JOB NO.: 170020
FIG NO.: B-4

TEST BORING NO. 9
DATE DRILLED 1/12/2017
Job # 211066

REMARKS

STAKE 3508

DRY TO 20',
1/23/17

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
			32	8.8	1
5			50 / 11"	4.9	3
10			50	9.6	3
15			50 / 8"	7.6	3
20			50 / 6"	10.5	3

SAND, SILTY, FINE TO COARSE GRAINED, TAN, DENSE, MOIST

SANDSTONE, SILTY, FINE TO COARSE GRAINED, TAN, VERY DENSE, MOIST

TEST BORING NO. 10
DATE DRILLED 1/12/2017
CLIENT TIMBERRIDGE DEV. GROUP, LLC
LOCATION RETREAT AT TIMBERRIDGE, FIL. 2

REMARKS

STAKE 3509

WATER @ 14.5',
1/23/17

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
			44	8.4	1
5			50 / 10"	9.4	3
10			50	10.5	3
15			50 / 11"	11.8	3
20			50 / 9"	12.0	3

SAND, SILTY, FINE TO COARSE GRAINED, TAN, DENSE, MOIST

SANDSTONE, SILTY, FINE TO COARSE GRAINED, TAN, VERY DENSE, MOIST

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TEST BORING LOG

DRAWN:	DATE:	CHECKED:	DATE:
		LLL	3/28/17

JOB NO.: 211066
FIG NO.: B-5

TEST BORING NO. 11
DATE DRILLED 1/12/2017
Job # 211066

REMARKS

STAKE 3510

DRY TO 19.5',
1/23/17

Depth (ft)	Samples	Blows per foot	Watercontent %	Soil Type
		11	3.4	1
5		24	11.8	1
10		50 / 8"	11.4	3
15		50 / 6"	8.2	3
20		50 / 6"	8.6	3

SAND, SILTY, FINE TO COARSE GRAINED, TAN, MEDIUM DENSE, DRY TO MOIST

SANDSTONE, SILTY, FINE TO COARSE GRAINED, TAN, VERY DENSE, MOIST

TEST BORING NO. 12
DATE DRILLED 1/12/2017
CLIENT TIMBERRIDGE DEV. GROUP, LLC
LOCATION RETREAT AT TIMBERRIDGE, FIL. 2

REMARKS

STAKE 3511

DRY TO 19',
1/23/17

Depth (ft)	Samples	Blows per foot	Watercontent %	Soil Type
		21	3.0	1
5		19	7.8	1
10		50 / 10"	14.4	3
15		50 / 6"	8.9	3
20		50 / 6"	9.1	3

SAND, SILTY, FINE TO COARSE GRAINED, TAN, MEDIUM DENSE, DRY TO MOIST

SANDSTONE, CLAYEY FINE TO COARSE GRAINED, TAN, VERY DENSE, MOIST

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TEST BORING LOG

DRAWN:	DATE:	CHECKED: LLC	DATE: 3/28/17

JOB NO.: 211066
FIG NO.: B-6

TEST BORING NO. 13
DATE DRILLED 1/12/2017
Job # 211066

TEST BORING NO.
DATE DRILLED
CLIENT TIMBERRIDGE DEV. GROUP, LLC
LOCATION RETREAT AT TIMBERRIDGE, FIL. 2

REMARKS

STAKE 3512

DRY TO 18.5',
1/23/17

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
SAND, SILTY WITH SLIGHTLY CLAYEY LENSES, FINE TO COARSE GRAINED, TAN, MEDIUM DENSE, MOIST			18	11.9	1
5 SANDSTONE, SILTY, FINE TO COARSE GRAINED, TAN, VERY DENSE, MOIST			50 / 11"	7.8	3
10			50 / 6"	10.8	3
15			50 / 5"	8.4	3
20			50 / 6"	9.4	3

REMARKS

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
5					
10					
15					
20					

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TEST BORING LOG

DRAWN:	DATE:	CHECKED: LLL	DATE: 3/28/17

JOB NO.: 211066
FIG NO.: B-7

TEST PIT NO. 1
DATE EXCAVATED 11/13/2017
Job # 211066

REMARKS	Depth (ft)	Symbol	Samples	Soil Structure Shape	Soil Structure Grade	USDA Soil Type
topsoil, sandy loam, brown	1			gr	w	2A
sandy loam, fine to coarse grained, light brown to tan	2			gr	w	2A
loamy sand, fine to coarse grained, tan	3			sg		1
	4					
	5					
	6					
	7					
	8					
	9					
	10					

TEST PIT NO. 2
DATE EXCAVATED 11/13/2017
CLIENT TIMBERRIDGE DEV. GROUP, LLC
LOCATION RETREAT AT TIMBERRIDGE, FILING 2

REMARKS	Depth (ft)	Symbol	Samples	Soil Structure Shape	Soil Structure Grade	USDA Soil Type
topsoil, sandy loam, brown	1			gr	l	2A
interbedded sandy clay and loamy sand, tan to olive	2			gr	w	4A
	3					
	4					
	5					
formational silty sandstone, tan	6			ma		4A
	7					
	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

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TEST PIT LOG

DRAWN:	DATE:	CHECKED:	DATE:
		LL	11/30/17

JOB NO.: 211066
FIG NO.: B-8

TEST PIT NO. 3
DATE EXCAVATED 11/13/2017
Job # 211066

REMARKS	Depth (ft)	Symbol	Samples	Soil Structure Shape	Soil Structure Grade	USDA Soil Type
topsoil, loamy sand, brown	1			sg		1
loamy sand, fine to coarse grained, tan	2			sg		1
	3					
	4					
	5					
	6					
	7					
silty clay, olive				pl	w	5
silty to clayey sandstone, fine to coarse grained, tan	8			ma		4A
*-signs of seasonally occurring groundwater at 7ft	9					
	10					

TEST PIT NO. 4
DATE EXCAVATED 11/13/2017
CLIENT TIMBERRIDGE DEV. GROUP, LLC
LOCATION RETREAT AT TIMBERRIDGE, FILING 2

REMARKS	Depth (ft)	Symbol	Samples	Soil Structure Shape	Soil Structure Grade	USDA Soil Type
topsoil, sandy loam, brown	1			gr	w	2A
sandy loam to gravelly sandy loam, fine to coarse grained, tan	2			gr	w	2A
	3					
	4					
	5					
	6					
	7					
	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

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505 ELKTON DRIVE
COLORADO SPRINGS, COLORADO 80907

TEST PIT LOG

DRAWN:	DATE:	CHECKED:	DATE:
		LL	11/30/17

JOB NO.: 211066
FIG NO.: B-9

TEST PIT NO. 5
DATE EXCAVATED 11/13/2017
Job # 211066

REMARKS	Depth (ft)	Symbol	Samples	Soil Structure Shape	Soil Structure Grade	USDA Soil Type
topsoil, loamy sand, brown	1			sg		1
gravelly loamy sand, fine to coarse grained, tan	2			sg		1
	3					
silty clay, olive	4			pl	w	5
	5					
	6					
	7					
silty sandstone, fine to coarse grained, tan to buff	8			ma		4A
*-signs of seasonally occurring groundwater at 7ft	9					
	10					

TEST PIT NO. 6
DATE EXCAVATED 11/13/2017
CLIENT TIMBERRIDGE DEV. GROUP, LLC
LOCATION RETREAT AT TIMBERRIDGE, FILING 2

REMARKS	Depth (ft)	Symbol	Samples	Soil Structure Shape	Soil Structure Grade	USDA Soil Type
topsoil, sandy loam, brown	1			gr	w	2A
interbedded loamy sand and sandy clay, olive to tan	2			gr	w	4A
	3					
	4					
	5					
	6					
	7					
silt sandstone, fine to coarse grained, tan to buff	8			ma		4A
	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

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COLORADO SPRINGS, COLORADO 80907

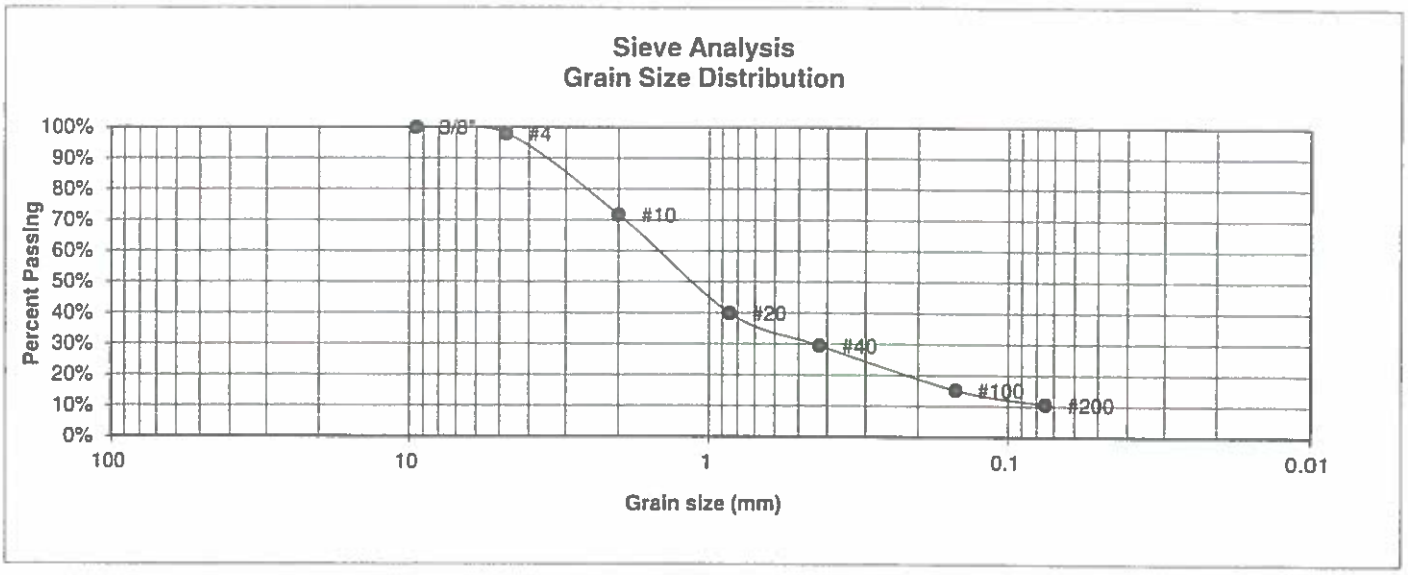
TEST PIT LOG

DRAWN:	DATE:	CHECKED:	DATE:
		HL	11/30/17

JOB NO.: 211066
FIG NO.: B-10

APPENDIX C: Laboratory Test Results

UNIFIED CLASSIFICATION	SM-SW	CLIENT	ARROYA INVESTMENTS
SOIL TYPE #	1	PROJECT	THE RETREAT AT TIMBER RIDGE
TEST BORING #	5	JOB NO.	170020
DEPTH (FT)	2-3	TEST BY	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	97.9%
10	71.7%
20	40.0%
40	29.4%
100	15.2%
200	10.5%

Atterberg Limits

Plastic Limit

Liquid Limit

Plastic Index

Swell

Moisture at start

Moisture at finish

Moisture increase

Initial dry density (pcf)

Swell (psf)

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LABORATORY TEST RESULTS

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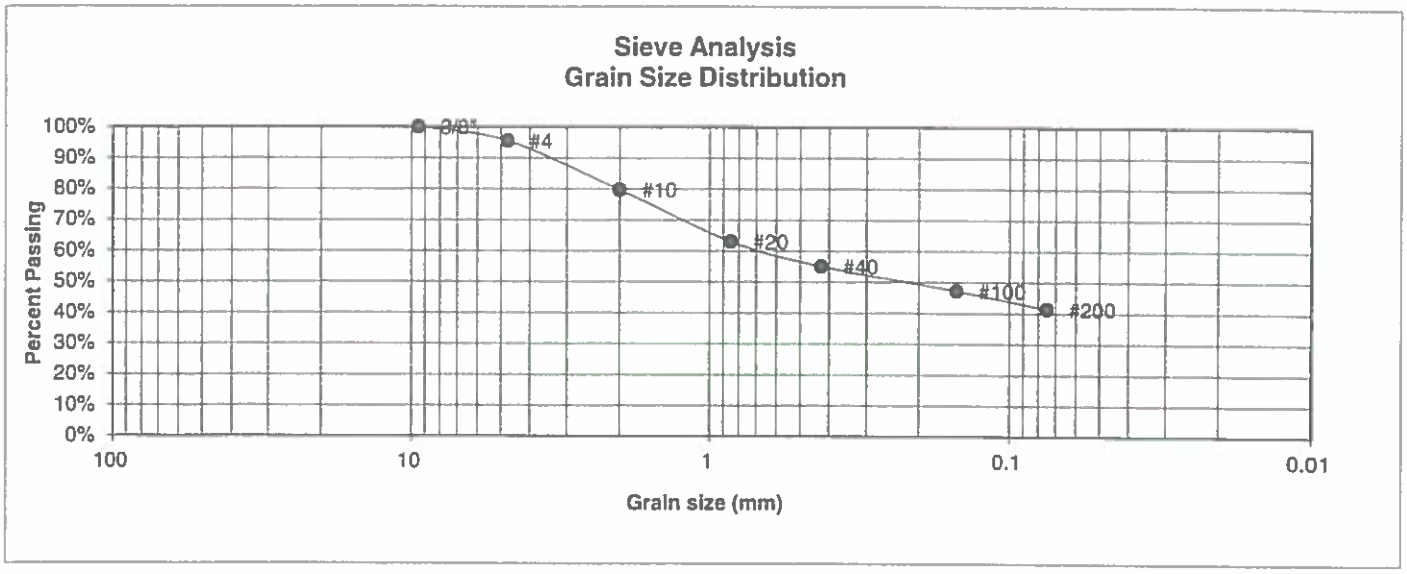
JOB NO.: 170020

FIG NO.: C-1

UNIFIED CLASSIFICATION	SC	CLIENT	ARROYA INVESTMENTS
SOIL TYPE #	1	PROJECT	THE RETREAT AT TIMBER RIDGE
TEST BORING #	6	JOB NO.	170020
DEPTH (FT)	5	TEST BY	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	95.6%
10	79.8%
20	63.1%
40	55.1%
100	47.2%
200	41.3%

Atterberg Limits
Plastic Limit
Liquid Limit
Plastic Index

Swell
Moisture at start
Moisture at finish
Moisture increase
Initial dry density (pcf)
Swell (psf)

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LABORATORY TEST RESULTS

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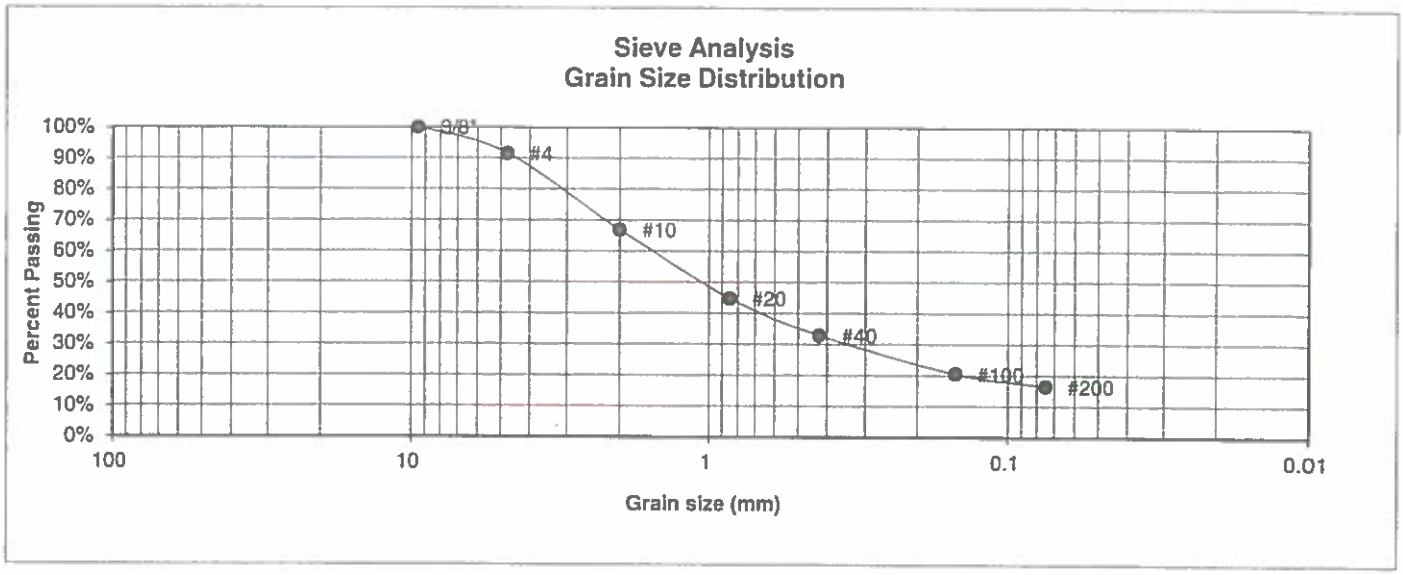
FIG NO.: C-2

UNIFIED CLASSIFICATION	SM	CLIENT	ARROYA INVESTMENTS
SOIL TYPE #	1	PROJECT	THE RETREAT AT TIMBER RIDGE
TEST BORING #	11	JOB NO.	170020
DEPTH (FT)	5	TEST BY	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	91.5%
10	66.9%
20	44.8%
40	32.9%
100	20.5%
200	16.5%

Atterberg Limits
Plastic Limit
Liquid Limit
Plastic Index

Swell
Moisture at start
Moisture at finish
Moisture increase
Initial dry density (pcf)
Swell (psf)

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LABORATORY TEST RESULTS

DRAWN	DATE	CHECKED	DATE
		LLL	3/28/17

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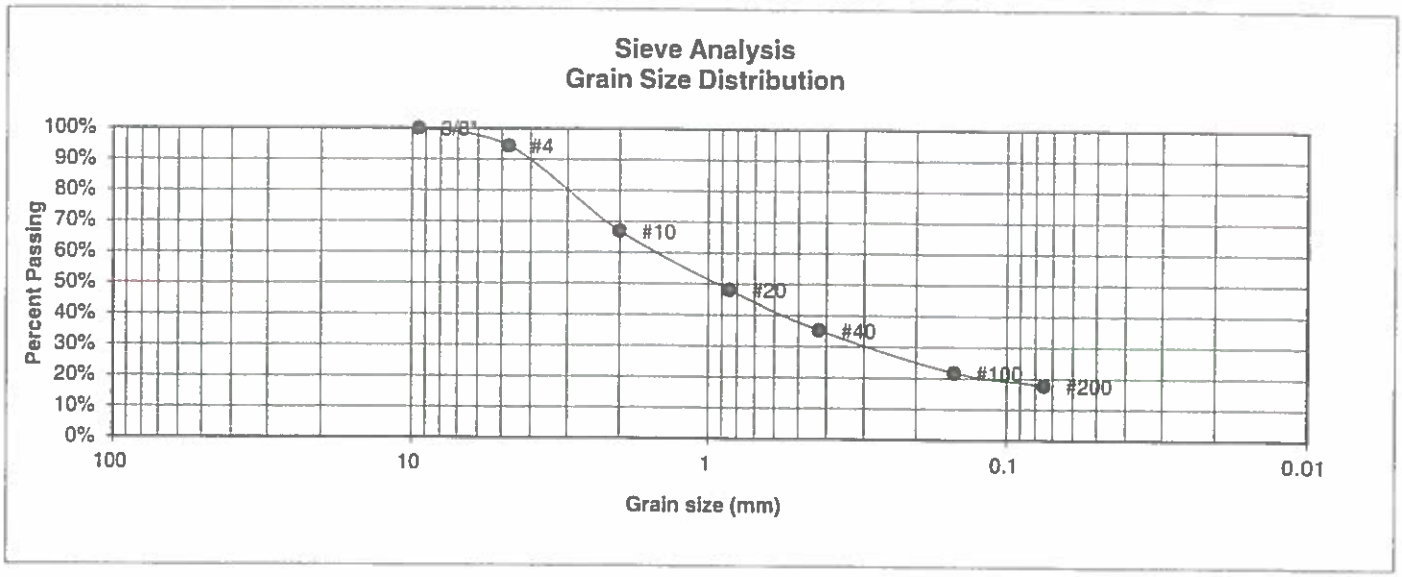
FIG NO.: C-3

UNIFIED CLASSIFICATION	SM	CLIENT	ARROYA INVESTMENTS
SOIL TYPE #	1	PROJECT	THE RETREAT AT TIMBER RIDGE
TEST BORING #	13	JOB NO.	170020
DEPTH (FT)	2-3	TEST BY	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	94.4%
10	67.0%
20	48.2%
40	35.2%
100	21.8%
200	17.8%

Atterberg Limits
Plastic Limit
Liquid Limit
Plastic Index

Swell
Moisture at start
Moisture at finish
Moisture increase
Initial dry density (pcf)
Swell (psf)

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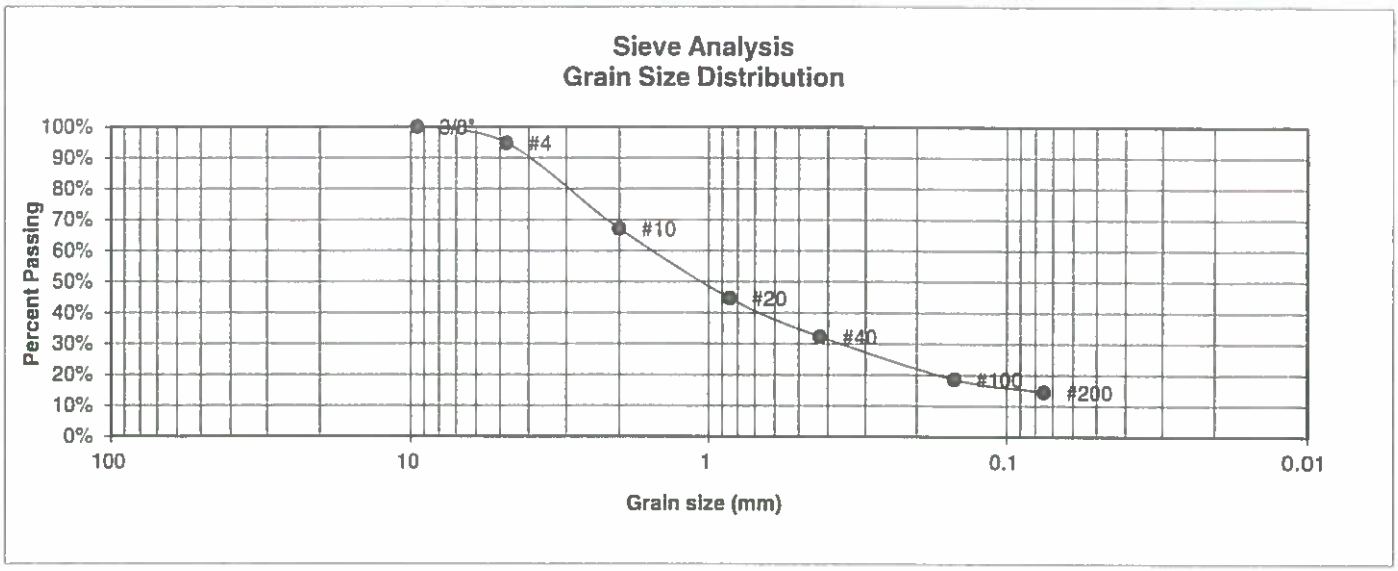
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED: LLL	DATE: 3/28/17

JOB NO.: 170020

FIG NO.: C-4

UNIFIED CLASSIFICATION	SM	CLIENT	ARROYA INVESTMENTS
SOIL TYPE #	1	PROJECT	THE RETREAT AT TIMBER RIDGE
TEST BORING #	9	JOB NO.	170020
DEPTH (FT)	2-3	TEST BY	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	94.8%
10	67.2%
20	44.7%
40	32.3%
100	18.6%
200	14.6%

Atterberg Limits	
Plastic Limit	NP
Liquid Limit	NV
Plastic Index	NP

Swell	
Moisture at start	
Moisture at finish	
Moisture increase	
Initial dry density (pcf)	
Swell (psf)	

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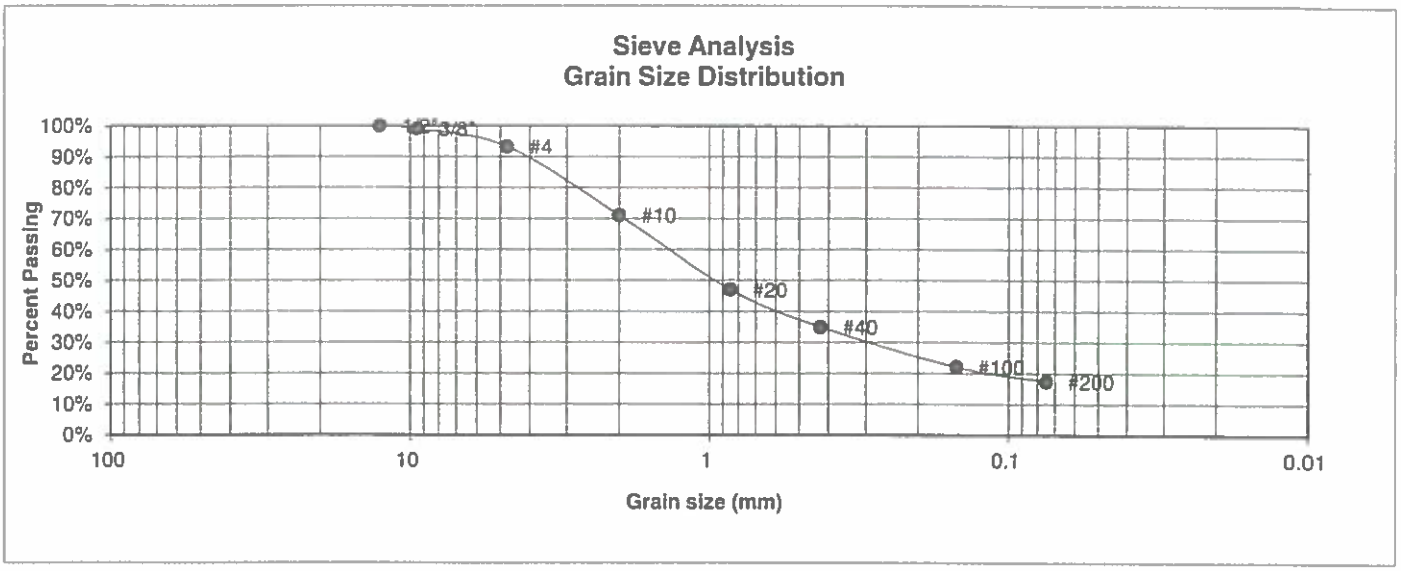
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED: LLL	DATE: 3/28/17

JOB NO.: 170020

FIG NO.: C-5

UNIFIED CLASSIFICATION	SM	CLIENT	ARROYA INVESTMENTS
SOIL TYPE #	1	PROJECT	THE RETREAT AT TIMBER RIDGE
TEST BORING #	10	JOB NO.	170020
DEPTH (FT)	5	TEST BY	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	100.0%
3/8"	99.1%
4	93.3%
10	71.0%
20	47.0%
40	35.0%
100	22.0%
200	17.4%

Atterberg Limits

Plastic Limit

Liquid Limit

Plastic Index

Swell

Moisture at start

Moisture at finish

Moisture increase

Initial dry density (pcf)

Swell (psf)

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LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED: LLL	DATE: 3/28/17

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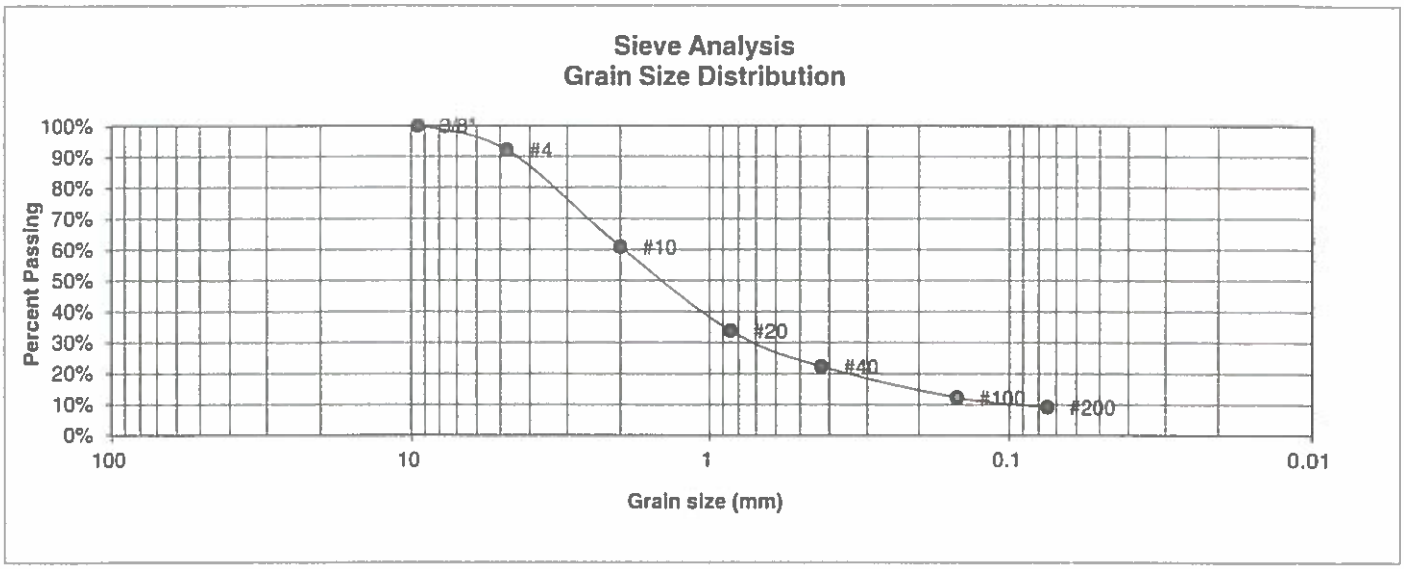
FIG NO.: C-6

UNIFIED CLASSIFICATION	SM-SW	CLIENT	ARROYA INVESTMENTS
SOIL TYPE #	1	PROJECT	THE RETREAT AT TIMBER RIDGE
TEST BORING #	2	JOB NO.	170020
DEPTH (FT)	10	TEST BY	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	92.1%
10	60.9%
20	33.9%
40	22.3%
100	12.3%
200	9.2%

Atterberg Limits	
Plastic Limit	NP
Liquid Limit	NV
Plastic Index	NP

Swell	
Moisture at start	
Moisture at finish	
Moisture increase	
Initial dry density (pcf)	
Swell (psf)	

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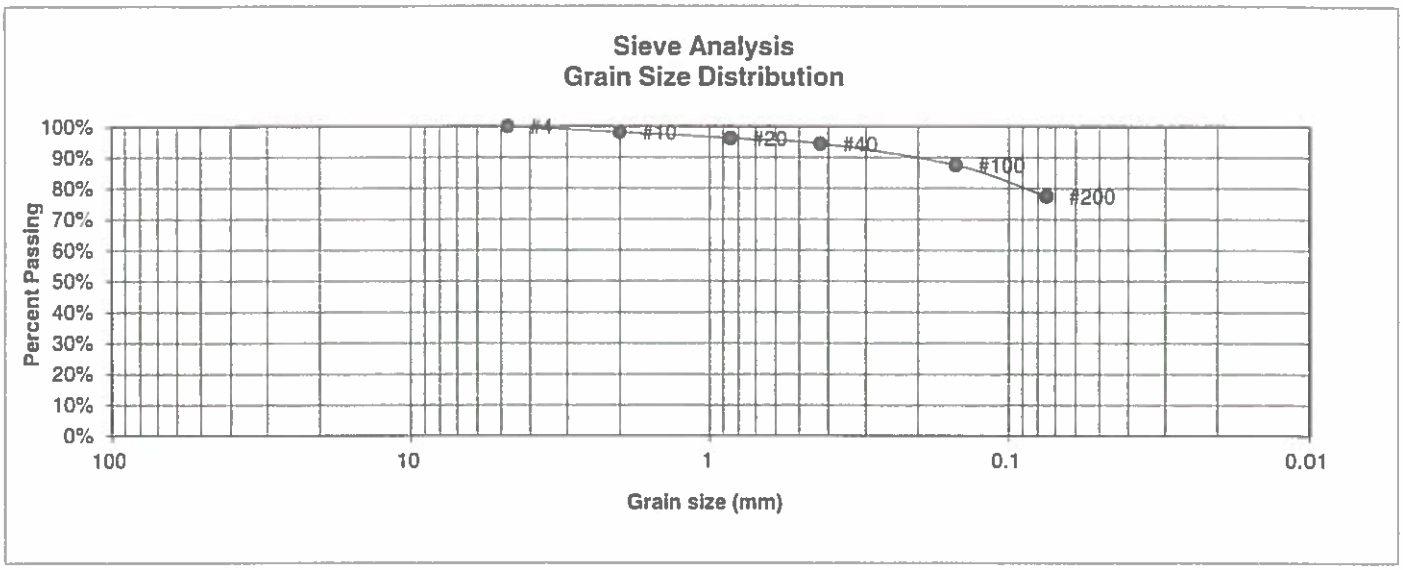
JOB NO.: 170020

FIG NO.: C-7

UNIFIED CLASSIFICATION	CL	CLIENT	ARROYA INVESTMENTS
SOIL TYPE #	2	PROJECT	THE RETREAT AT TIMBER RIDGE
TEST BORING #	1	JOB NO.	170020
DEPTH (FT)	2-3	TEST BY	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	98.2%
20	96.2%
40	94.4%
100	87.5%
200	77.5%

Atterberg Limits	
Plastic Limit	
Liquid Limit	
Plastic Index	
Swell	
Moisture at start	10.9%
Moisture at finish	20.4%
Moisture increase	9.5%
Initial dry density (pcf)	131
Swell (psf)	1550

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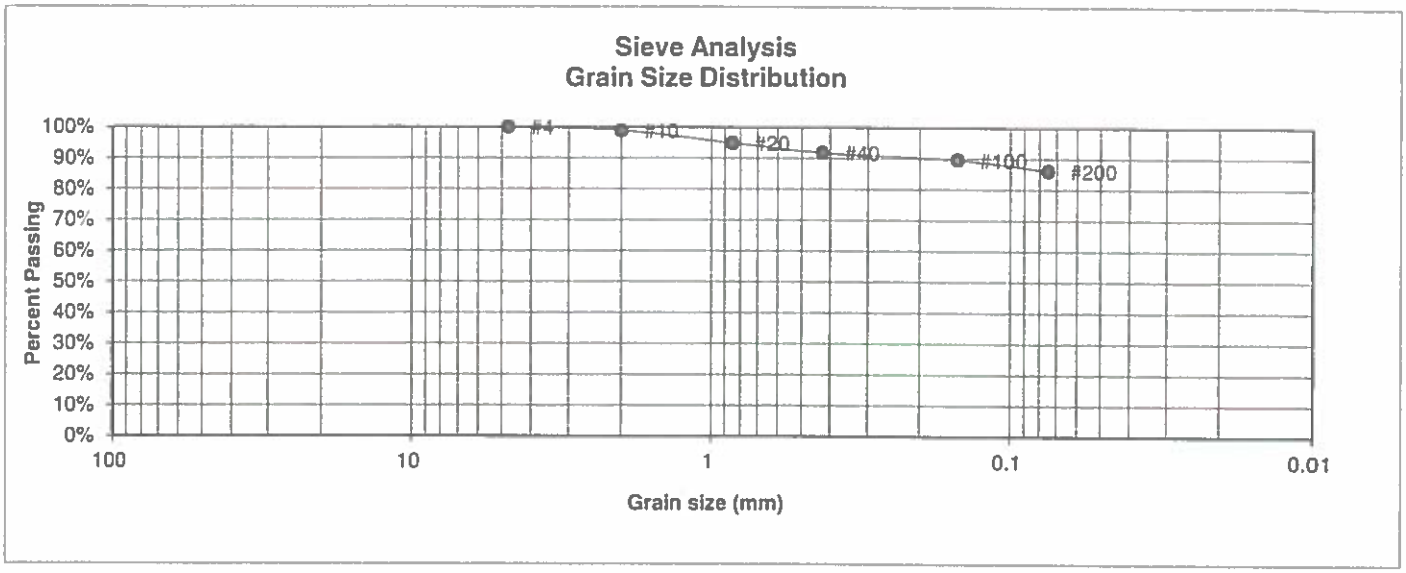
DRAWN:	DATE:	CHECKED: LLL	DATE: 3/28/17

JOB NO: 170020

FIG NO: L-8

UNIFIED CLASSIFICATION	CL	CLIENT	ARROYA INVESTMENTS
SOIL TYPE #	2	PROJECT	THE RETREAT AT TIMBER RIDGE
TEST BORING #	2	JOB NO.	170020
DEPTH (FT)	4	TEST BY	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	98.9%
20	94.9%
40	91.8%
100	89.6%
200	86.1%

Atterberg Limits	
Plastic Limit	
Liquid Limit	
Plastic Index	
Swell	
Moisture at start	15.9%
Moisture at finish	24.9%
Moisture increase	9.0%
Initial dry density (pcf)	99
Swell (psf)	1520

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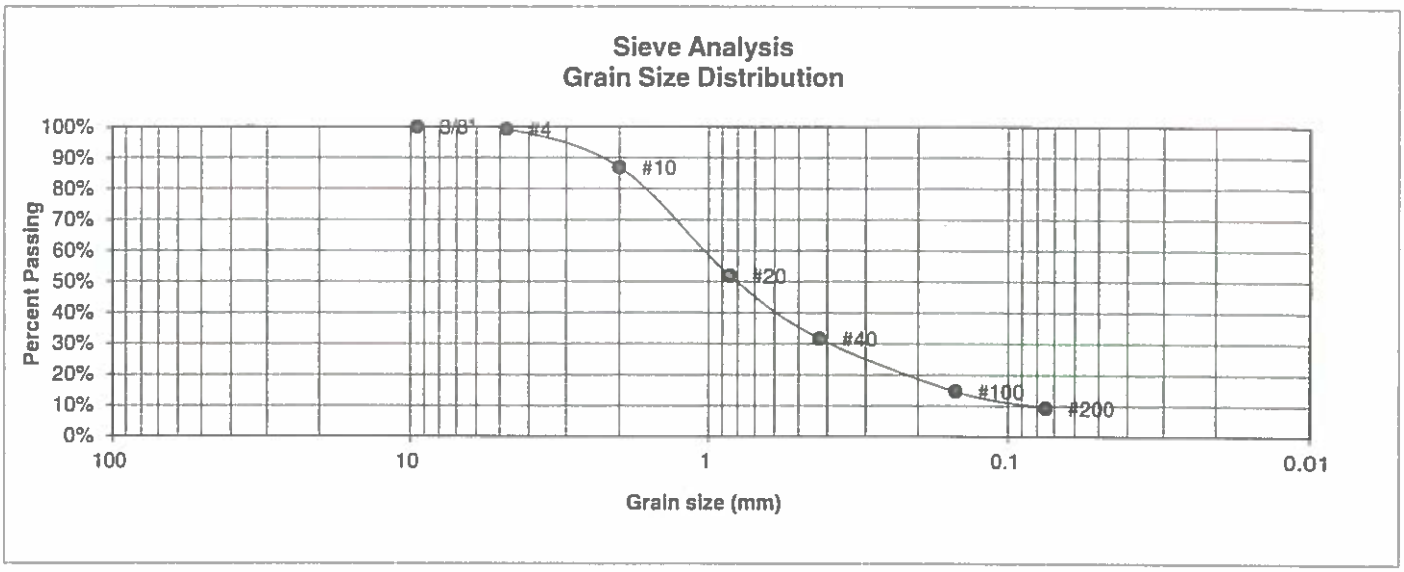
JOB NO. 170020

FIG NO. L-9

UNIFIED CLASSIFICATION	SM-SW	CLIENT	ARROYA INVESTMENTS
SOIL TYPE #	3	PROJECT	THE RETREAT AT TIMBER RIDGE
TEST BORING #	1	JOB NO.	170020
DEPTH (FT)	10	TEST BY	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	99.3%
10	87.0%
20	52.0%
40	31.6%
100	14.7%
200	9.3%

Atterberg Limits	
Plastic Limit	NP
Liquid Limit	NV
Plastic Index	NP

Swell	
Moisture at start	
Moisture at finish	
Moisture increase	
Initial dry density (pcf)	
Swell (psf)	

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LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED: LLL	DATE: 3/28/17

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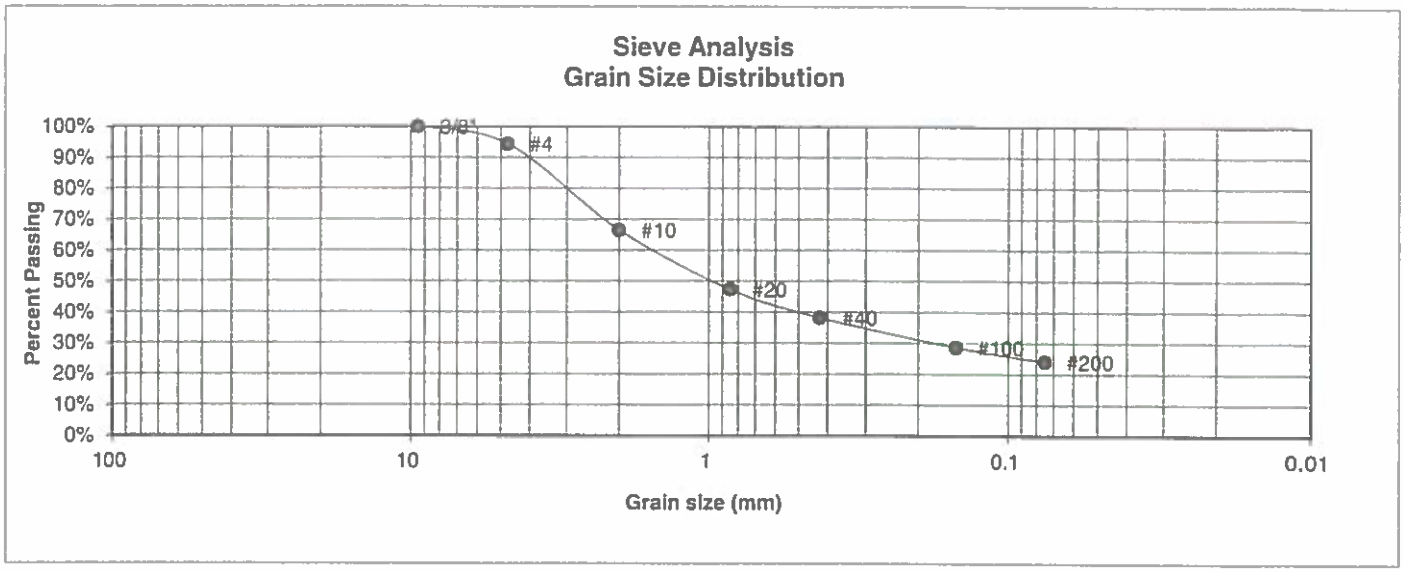
FIG NO: C-10

UNIFIED CLASSIFICATION	SM	CLIENT	ARROYA INVESTMENTS
SOIL TYPE #	3	PROJECT	THE RETREAT AT TIMBER RIDGE
TEST BORING #	3	JOB NO.	170020
DEPTH (FT)	5	TEST BY	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	94.4%
10	66.5%
20	47.4%
40	38.2%
100	28.7%
200	24.0%

Atterberg Limits

Plastic Limit

Liquid Limit

Plastic Index

Swell

Moisture at start

Moisture at finish

Moisture increase

Initial dry density (pcf)

Swell (psf)

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DRAWN:	DATE:	CHECKED: LLL	DATE: 3/28/17

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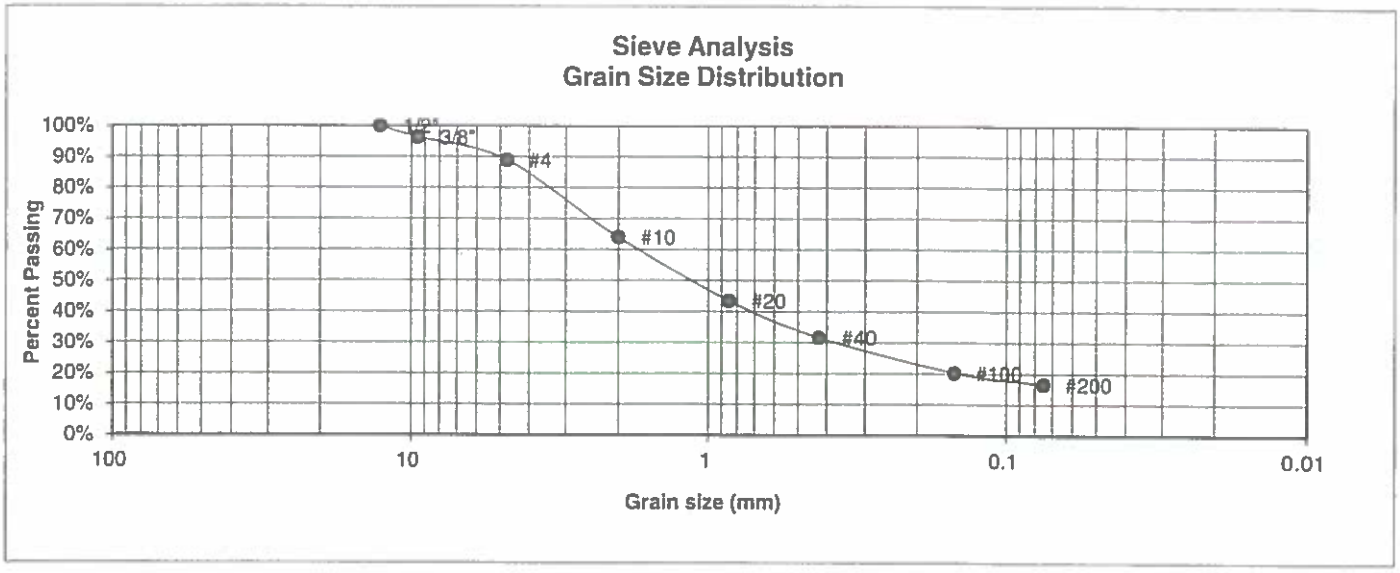
FIG NO.: C-11

UNIFIED CLASSIFICATION	SM	CLIENT	ARROYA INVESTMENTS
SOIL TYPE #	3	PROJECT	THE RETREAT AT TIMBER RIDGE
TEST BORING #	7	JOB NO.	170020
DEPTH (FT)	20	TEST BY	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	100.0%
3/8"	96.3%
4	88.9%
10	64.0%
20	43.5%
40	31.6%
100	20.3%
200	16.6%

Atterberg Limits
Plastic Limit
Liquid Limit
Plastic Index

Swell
Moisture at start
Moisture at finish
Moisture increase
Initial dry density (pcf)
Swell (psf)

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DRAWN:	DATE:	CHECKED: LLL	DATE: 3/28/17

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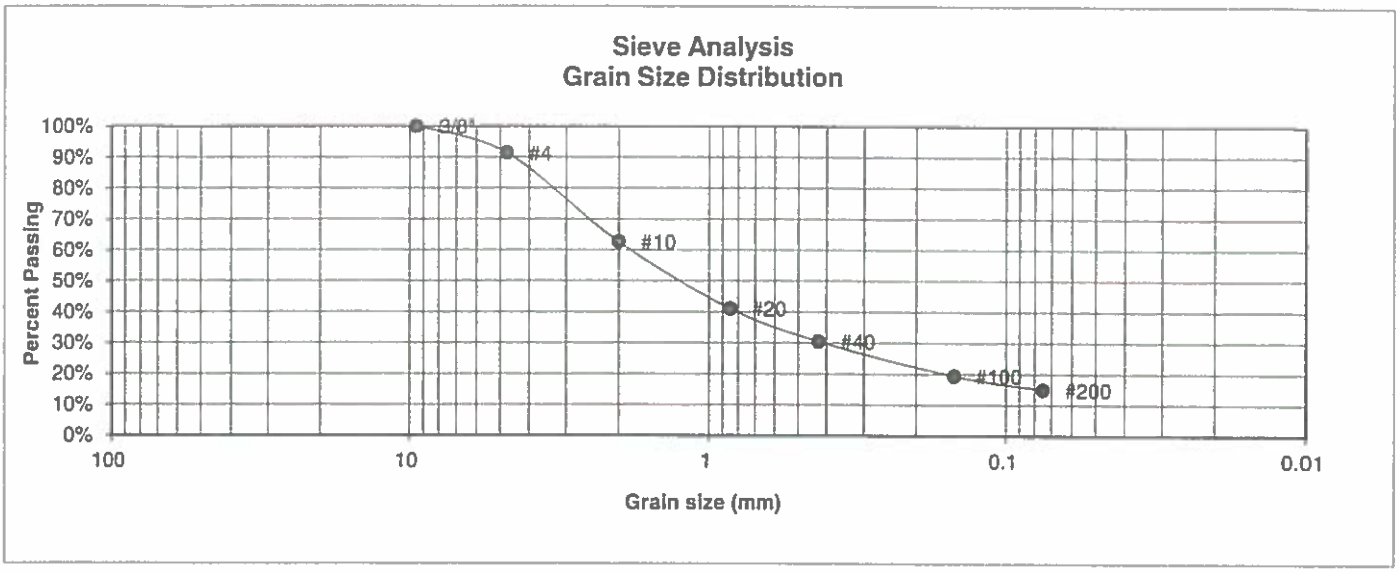
FIG NO.: L-12

UNIFIED CLASSIFICATION	SM	CLIENT	ARROYA INVESTMENTS
SOIL TYPE #	3	PROJECT	THE RETREAT AT TIMBER RIDGE
TEST BORING #	8	JOB NO.	170020
DEPTH (FT)	5	TEST BY	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	91.3%
10	62.6%
20	41.1%
40	30.5%
100	19.4%
200	14.9%

Atterberg Limits

Plastic Limit

Liquid Limit

Plastic Index

Swell

Moisture at start

Moisture at finish

Moisture increase

Initial dry density (pcf)

Swell (psf)

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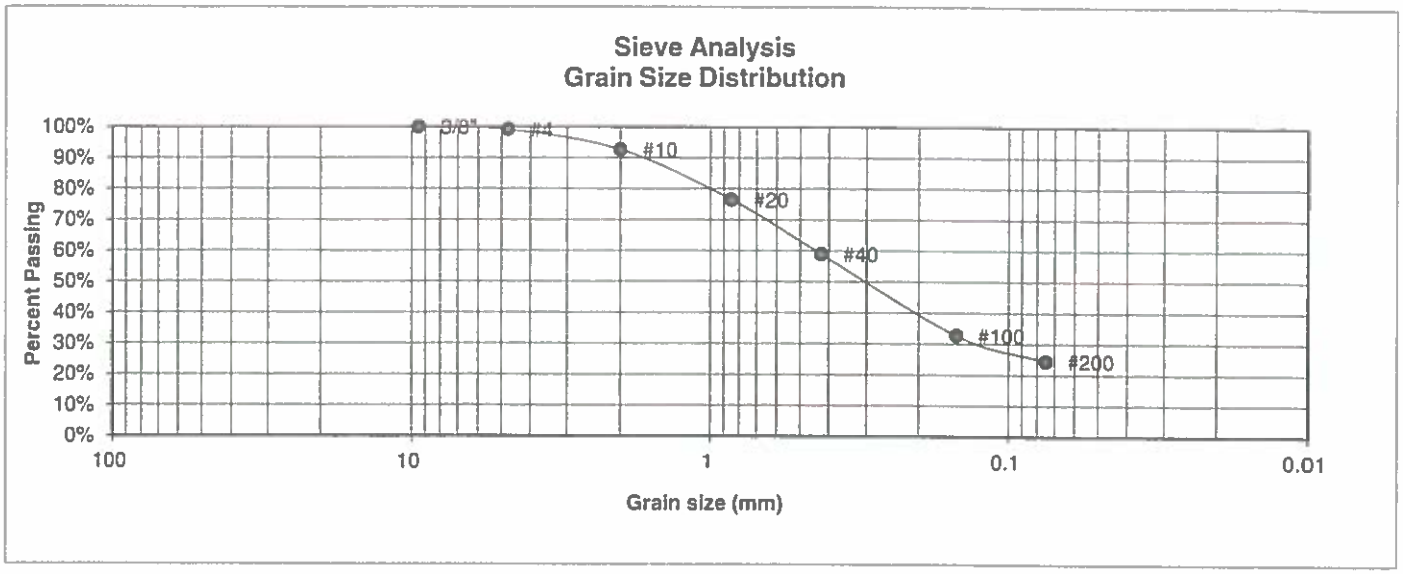
JOB NO.: 170020

FIG NO.: C-13

UNIFIED CLASSIFICATION	SC	CLIENT	ARROYA INVESTMENTS
SOIL TYPE #	3	PROJECT	THE RETREAT AT TIMBER RIDGE
TEST BORING #	12	JOB NO.	170020
DEPTH (FT)	10	TEST BY	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	99.1%
10	92.7%
20	76.5%
40	58.9%
100	32.7%
200	24.4%

Atterberg Limits
Plastic Limit
Liquid Limit
Plastic Index

Swell
Moisture at start
Moisture at finish
Moisture increase
Initial dry density (pcf)
Swell (psf)

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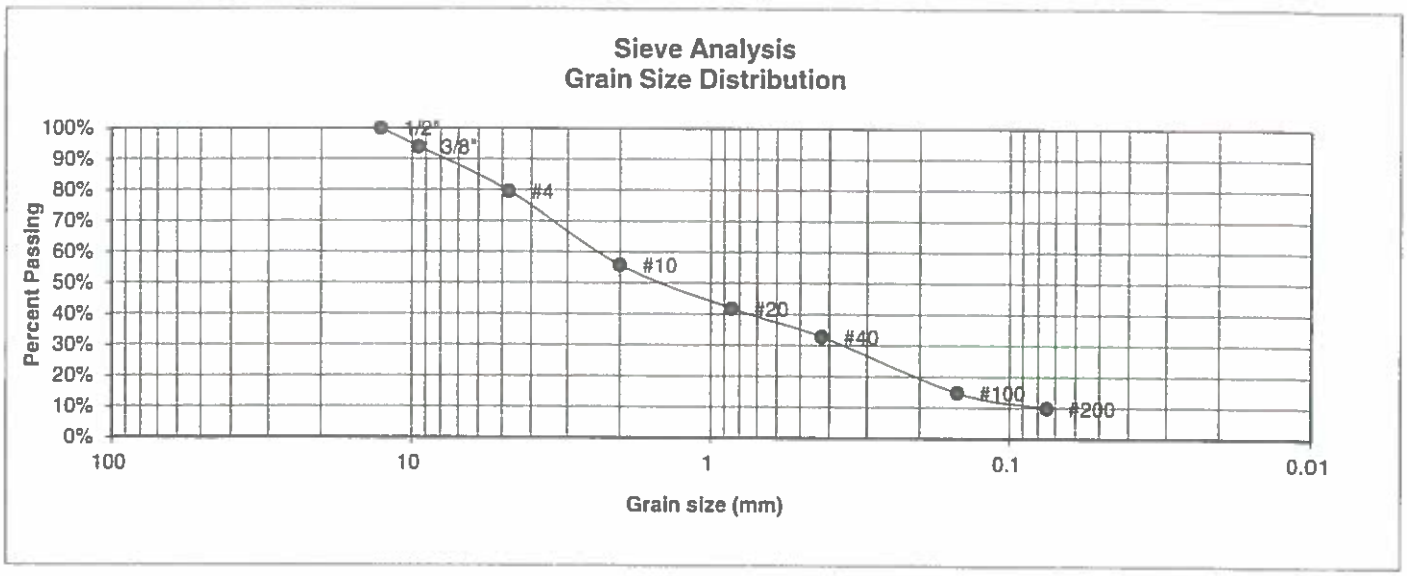
DRAWN:	DATE:	CHECKED: LLL	DATE: 3/29/17

JOB NO.: 170020

FIG NO.: L-14

UNIFIED CLASSIFICATION	SM-SW	CLIENT	ARROYA INVESTMENTS
SOIL TYPE #	3	PROJECT	THE RETREAT AT TIMBER RIDGE
TEST BORING #	9	JOB NO.	170020
DEPTH (FT)	15	TEST BY	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	100.0%
3/8"	93.9%
4	79.6%
10	55.8%
20	41.8%
40	32.8%
100	14.8%
200	9.9%

Atterberg Limits	
Plastic Limit	NP
Liquid Limit	NV
Plastic Index	NP

Swell	
Moisture at start	
Moisture at finish	
Moisture increase	
Initial dry density (pcf)	
Swell (psf)	

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LABORATORY TEST RESULTS

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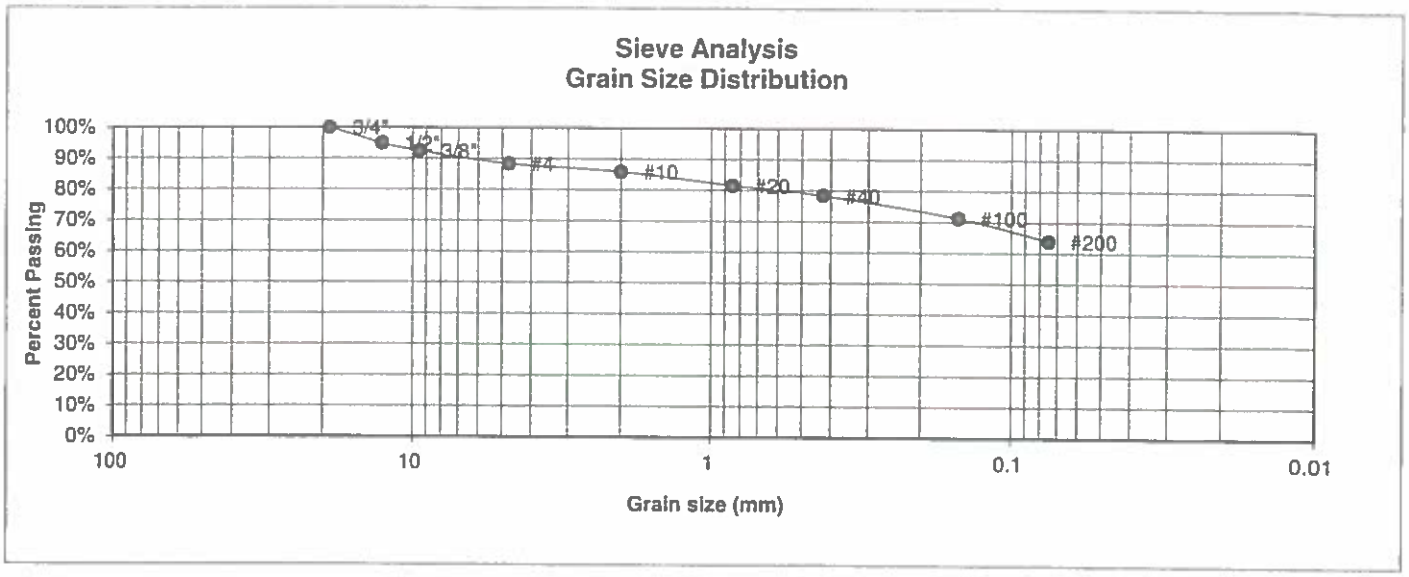
JOB NO. 170020

FIG NO. G-15

UNIFIED CLASSIFICATION	CL	CLIENT	ARROYA INVESTMENTS
SOIL TYPE #	4	PROJECT	THE RETREAT AT TIMBER RIDGE
TEST BORING #	4	JOB NO.	170020
DEPTH (FT)	15	TEST BY	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	100.0%
1/2"	94.9%
3/8"	92.5%
4	88.4%
10	85.9%
20	81.5%
40	78.4%
100	71.3%
200	63.9%

Atterberg Limits	
Plastic Limit	24
Liquid Limit	44
Plastic Index	20

Swell	
Moisture at start	
Moisture at finish	
Moisture increase	
Initial dry density (pcf)	
Swell (psf)	

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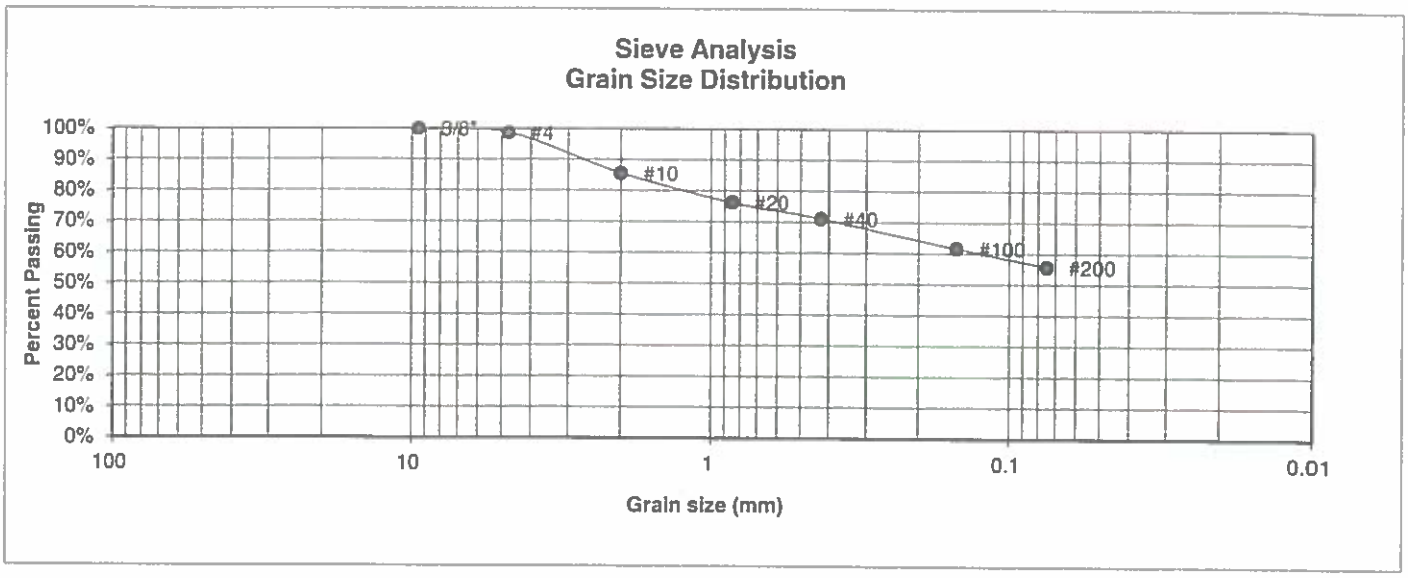
LABORATORY TEST RESULTS

DRAWN:	DATE	CHECKED:	DATE:
		LLL	3/28/17

JOB NO.: 170020

FIG NO.: C-16

UNIFIED CLASSIFICATION	CL	CLIENT	ARROYA INVESTMENTS
SOIL TYPE #	4	PROJECT	THE RETREAT AT TIMBER RIDGE
TEST BORING #	5	JOB NO.	170020
DEPTH (FT)	10	TEST BY	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	98.6%
10	85.6%
20	76.2%
40	71.0%
100	61.6%
200	55.7%

Atterberg Limits
Plastic Limit
Liquid Limit
Plastic Index

Swell
Moisture at start
Moisture at finish
Moisture increase
Initial dry density (pcf)
Swell (psf)

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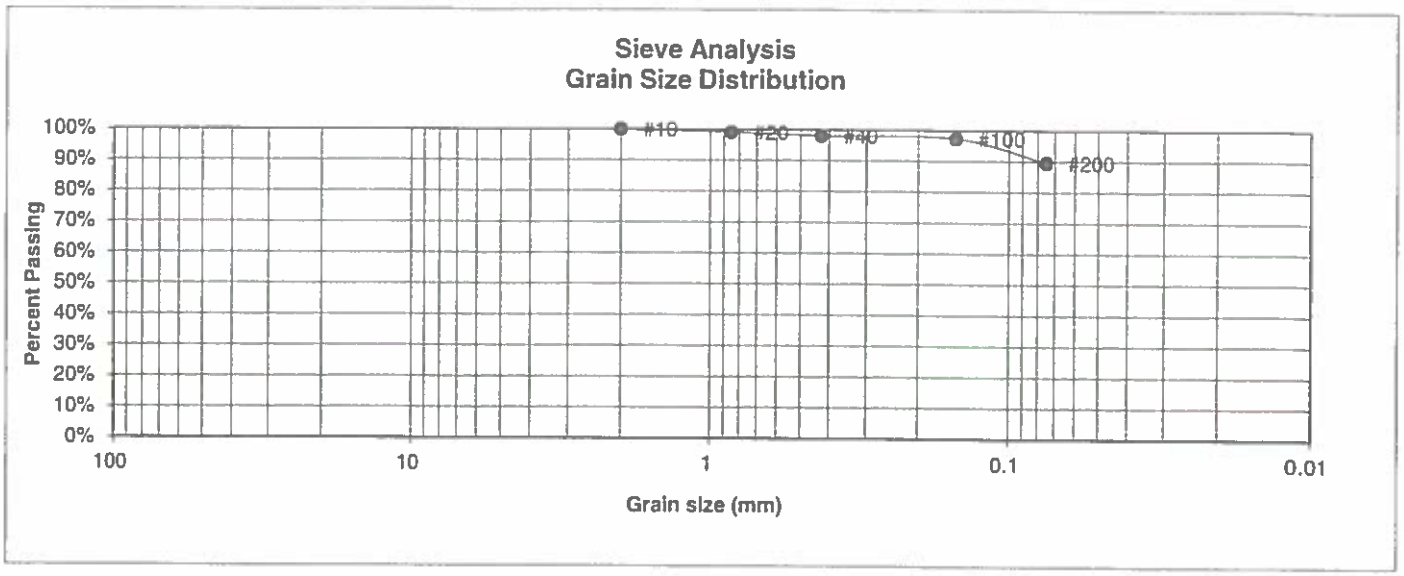
LABORATORY TEST RESULTS

DRAWN	DATE	CHECKED	DATE
		LLL	3/28/17

JOB NO. 170020

FIG NO. C-17

UNIFIED CLASSIFICATION	CL	CLIENT	ARROYA INVESTMENTS
SOIL TYPE #	4	PROJECT	THE RETREAT AT TIMBER RIDGE
TEST BORING #	7	JOB NO.	170020
DEPTH (FT)	15	TEST BY	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	
10	100.0%
20	99.1%
40	98.1%
100	97.3%
200	89.5%

Atterberg Limits	
Plastic Limit	26
Liquid Limit	47
Plastic Index	21

Swell	
Moisture at start	
Moisture at finish	
Moisture increase	
Initial dry density (pcf)	
Swell (psf)	

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LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED: LLL	DATE: 3/28/17

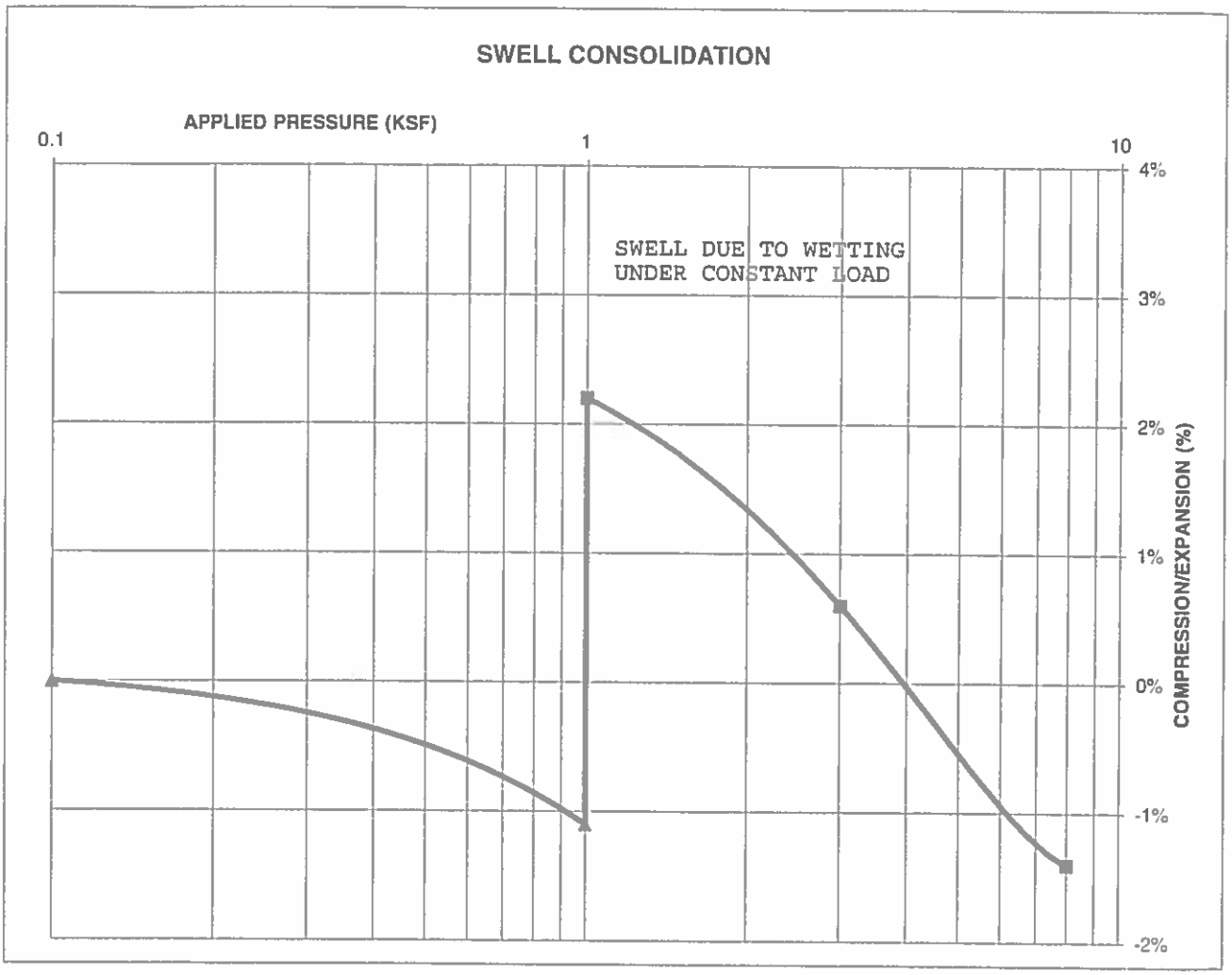
JOB NO. 170020

FIG NO. C-18

CONSOLIDATION TEST RESULTS

TEST BORING #	4	DEPTH(ft)	15
DESCRIPTION	CL	SOIL TYPE	4
NATURAL UNIT DRY WEIGHT (PCF)			109
NATURAL MOISTURE CONTENT			19.9%
SWELL/CONSOLIDATION (%)			3.3%

JOB NO. 170020
CLIENT ARROYA INVESTMENTS
PROJECT THE RETREAT AT TIMBER RIDGE



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SWELL CONSOLIDATION
TEST RESULTS

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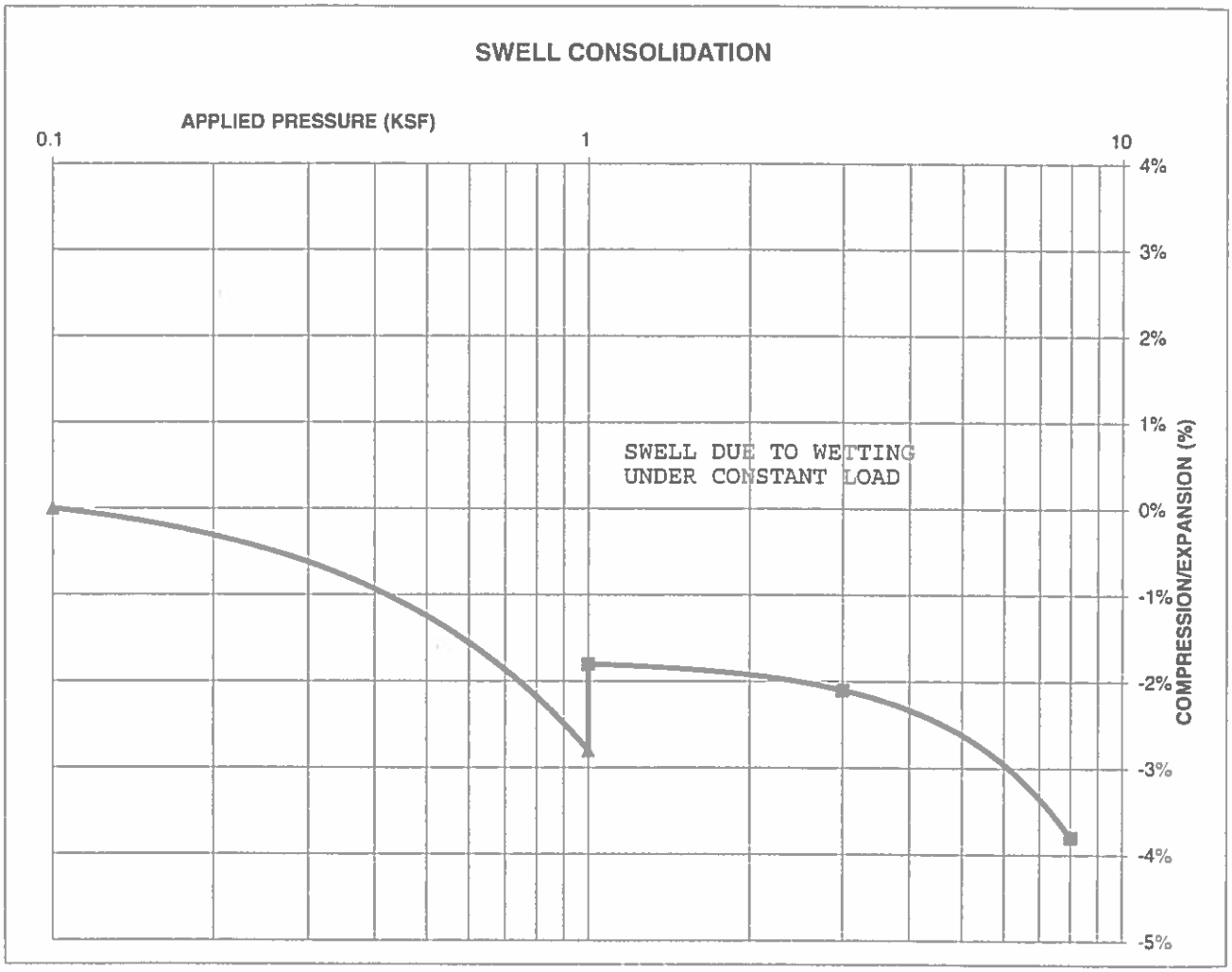
		LLL	3/28/17

JOB NO.: 170020
FIG NO.: C-19

CONSOLIDATION TEST RESULTS

TEST BORING #	5	DEPTH(ft)	10
DESCRIPTION	CL	SOIL TYPE	4
NATURAL UNIT DRY WEIGHT (PCF)			111
NATURAL MOISTURE CONTENT			17.8%
SWELL/CONSOLIDATION (%)			1.0%

JOB NO. 170020
CLIENT ARROYA INVESTMENTS
PROJECT THE RETREAT AT TIMBER RIDGE



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SWELL CONSOLIDATION
TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
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JOB NO.: 170020
FIG NO.: C-20

CLIENT	ARROYA INVESTMENTS	JOB NO.	170020
PROJECT	THE RETREAT AT TIMBER RIDGE	DATE	1/20/2017
LOCATION	THE RETREAT AT TIMBER RIDGE	TEST BY	BL

BORING NUMBER	DEPTH, (ft)	SOIL TYPE NUMBER	UNIFIED CLASSIFICATION	WATER SOLUBLE SULFATE, (wt%)
TB-1	10	3	SM-SW	<0.01
TB-2	4	2	CL	0.01
TB-2	10	3	SM-SW	<0.01
TB-4	15	4	CL	<0.01
TB-6	5	1	SC	0.01
TB-7	15	4	CL	<0.01
TB-10	5	1	SM	<0.01

QC BLANK PASS

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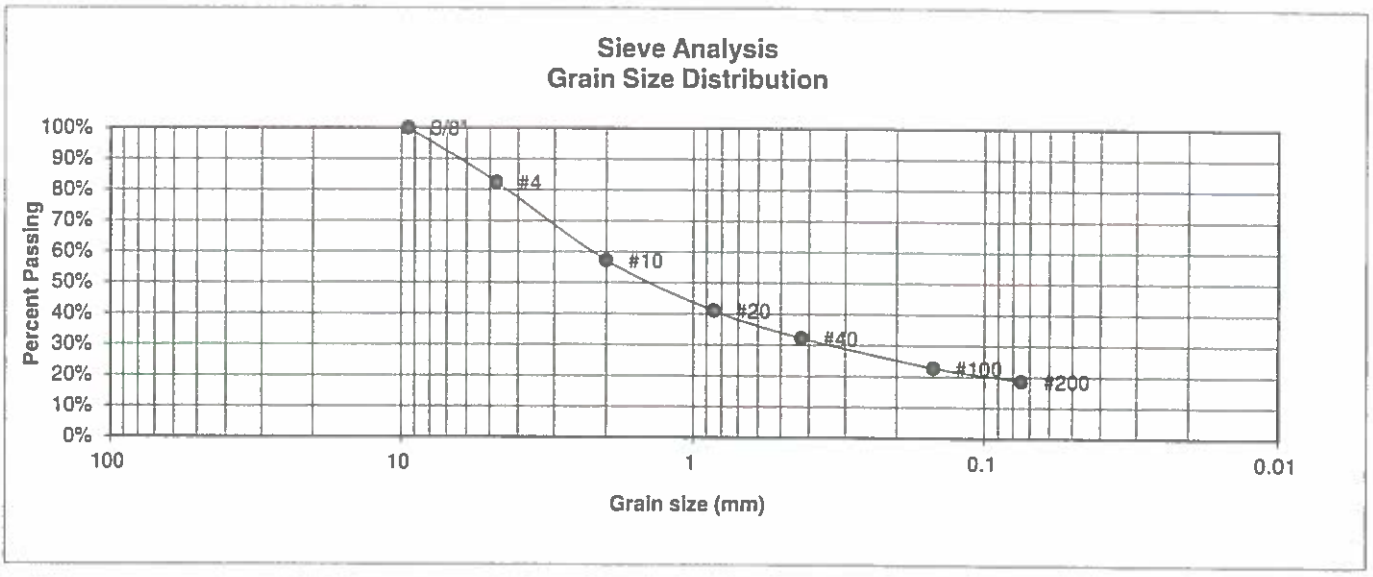
LABORATORY TEST
SULFATE RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		LLL	3/28/17

JOB NO. 170020

FIG NO. C-21

BORING NO.	TP-2	UNIFIED CLASSIFICATION	SM	TEST BY	BL
DEPTH(ft)	3	AASHTO CLASSIFICATION		JOB NO.	170020
CLIENT	ARROYA INVESTMENTS				
PROJECT	THE RETREAT AT TIMBER RIDGE				



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	82.5%
10	57.3%
20	41.0%
40	32.3%
100	22.9%
200	18.7%

Atterberg Limits
Plastic Limit
Liquid Limit
Plastic Index

Swell
Moisture at start
Moisture at finish
Moisture increase
Initial dry density (pcf)
Swell (psf)

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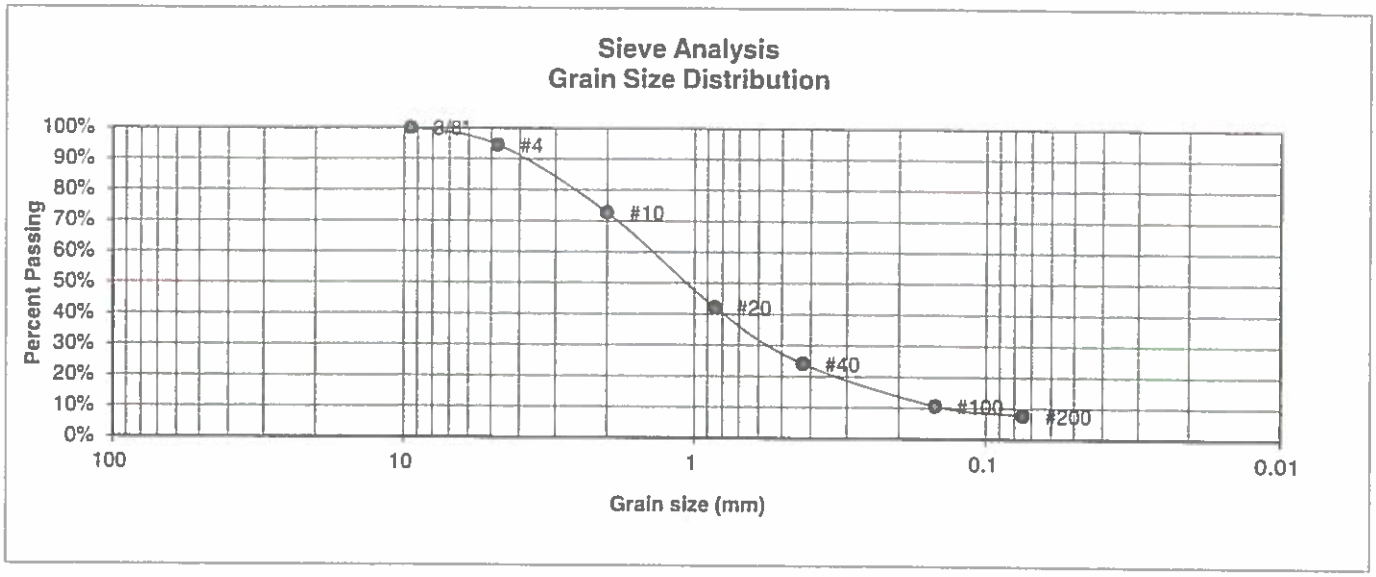
LABORATORY TEST RESULTS

DRAWN:	DATE	CHECKED: LLL	DATE: 12/1/17

JOB NO.: 170020

FIG NO.: C-22

BORING NO.	TP-4	UNIFIED CLASSIFICATION	SM-SW	TEST BY	BL
DEPTH(ft)	4	AASHTO CLASSIFICATION		JOB NO.	170020
CLIENT	ARROYA INVESTMENTS				
PROJECT	THE RETREAT AT TIMBER RIDGE				



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	94.6%
10	72.7%
20	42.2%
40	24.1%
100	10.6%
200	7.7%

Atterberg Limits

Plastic Limit

Liquid Limit

Plastic Index

Swell

Moisture at start

Moisture at finish

Moisture increase

Initial dry density (pcf)

Swell (psf)

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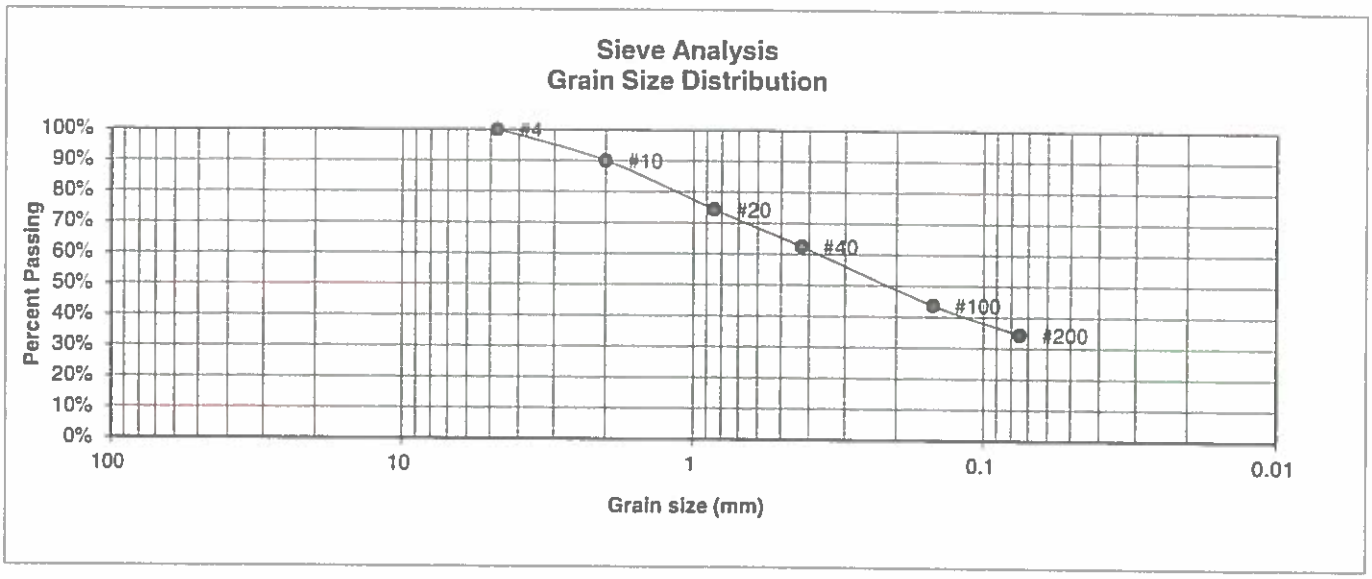
LABORATORY TEST RESULTS

DRAWN	DATE	CHECKED	DATE
		LLL	12/1/17

JOB NO. 170020

FIG NO. C-23

BORING NO.	TP-5	UNIFIED CLASSIFICATION	SC	TEST BY	BL
DEPTH(ft)	7-8	AASHTO CLASSIFICATION		JOB NO.	170020
CLIENT	ARROYA INVESTMENTS				
PROJECT	THE RETREAT AT TIMBER RIDGE				



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	90.1%
20	74.4%
40	62.5%
100	43.8%
200	34.4%

Atterberg Limits
Plastic Limit
Liquid Limit
Plastic Index

Swell
Moisture at start
Moisture at finish
Moisture increase
Initial dry density (pcf)
Swell (psf)

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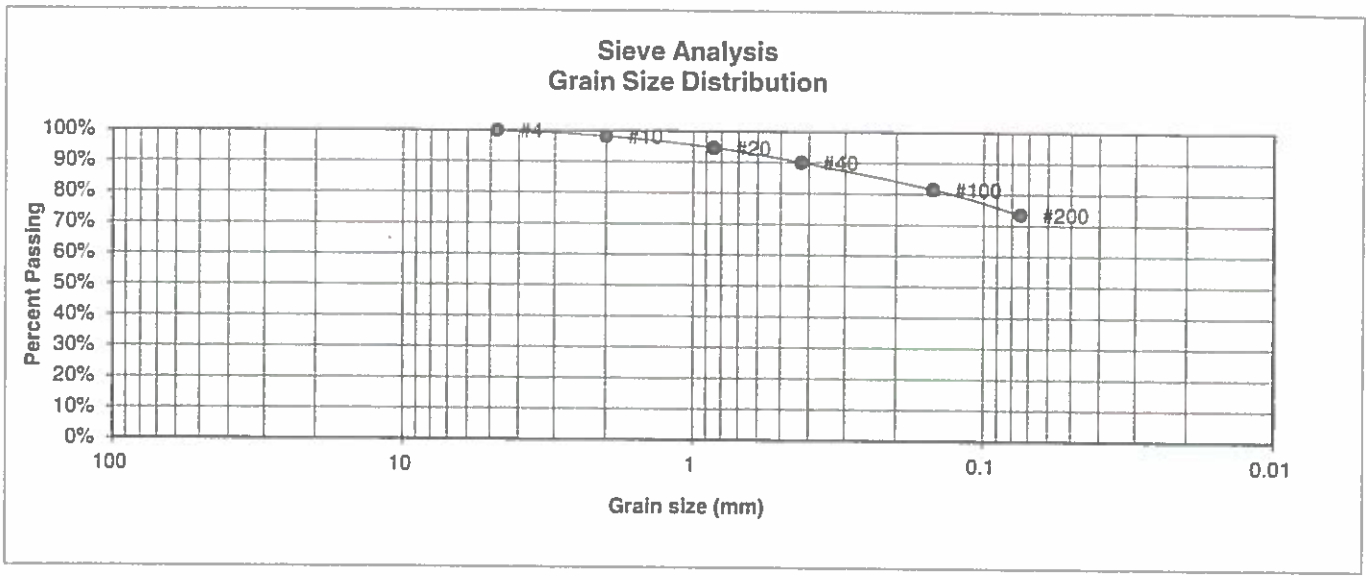
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		LLL	12/1/17

JOB NO.: 170020

FIG NO.: C-24

BORING NO.	TP-6	UNIFIED CLASSIFICATION	CL	TEST BY	BL
DEPTH(ft)	2	AASHTO CLASSIFICATION		JOB NO.	170020
CLIENT	ARROYA INVESTMENTS				
PROJECT	THE RETREAT AT TIMBER RIDGE				



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	98.3%
20	94.7%
40	90.0%
100	81.6%
200	73.6%

Atterberg Limits
Plastic Limit
Liquid Limit
Plastic Index

Swell
Moisture at start
Moisture at finish
Moisture increase
Initial dry density (pcf)
Swell (psf)

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LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED: LLL	DATE: 12/1/17

JOB NO. 170020

FIG NO. C-75

APPENDIX D: Soil Survey Descriptions

El Paso County Area, Colorado

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

Map Unit Setting

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

Map Unit Composition

Pring and similar soils: 85 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

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
Natural 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 storage in profile: Low (about 6.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: B
Ecological site: Loamy Park (R048AY222CO)
Hydric soil rating: No

Minor Components

Pleasant

Percent of map unit:
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 14, Sep 23, 2016