



ROCKY MOUNTAIN GROUP

This appears to be missing the Geology portion of 8.4.9 of Code and ECM report req including identifying the constraints, hazards & drainage ways, mitigation, and the figure Map associated with those ... These then should be reflected on the prelim plan may itself...

PRELIMINARY SUBSURFACE SOIL INVESTIGATION

**Windermere Subdivision
N. Carefree Circle and Marksheffel Road
El Paso County, Colorado**

PREPARED FOR:

Dam analysis?

**Windsor Ridge Homes
4164 Austin Bluffs Parkway, #361
Colorado Springs, CO 80918**

**JOB NO. 162062
April 17, 2018
Reissued: February 5, 2019**

Respectfully Submitted,

Reviewed by,

RMG – Rocky Mountain Group

RMG – Rocky Mountain Group

**Kelli Zigler
Project Geologist**



2/5/19

**Geoff Webster, P.E.
Sr. Geotechnical Project Manager**

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GENERAL SITE AND PROJECT DESCRIPTION

Project Description

The site is located in the eastern portion of Colorado Springs, Colorado, northeast of the intersection of North Carefree Circle and Marksheffel Road. The location of the site is shown on the Site Vicinity Map, Figure 1.

The site is approximately 49.5 acres and it is proposed to be developed with single-family residential construction. The structures are anticipated to be one to two-stories in height with multi-car garages. The homes may be constructed with or without basements. RMG - Rocky Mountain Group was retained to explore the subsurface conditions at the site and develop geotechnical engineering recommendations for earthwork balancing, design and construction.

Existing Site Conditions

The land is currently vacant and is undeveloped. The north and east portion of the site appears to be used as a drainage channel for adjacent development. The site slopes to the east and south, and is currently vegetated with native shrubs, grasses and weeds.

FIELD INVESTIGATION AND LABORATORY TESTING

Drilling

The subsurface conditions on the site were investigated by drilling thirty-three (33) exploratory test borings in a grid pattern across the site. The approximate locations of the test borings are presented in the Test Boring Location Plan, Figure 2.

The test borings were advanced with a power-driven, continuous-flight auger drill rig. Test Borings were advanced to varying depths of 10 to 47 feet below the existing ground surface. Samples were obtained in general accordance with ASTM D-1586 utilizing a 2-inch OD split-barrel sampler or in general accordance with ASTM D-3550 utilizing a 2½-inch OD modified California sampler. An Explanation of Test Boring Logs is presented in Figure 3. The Test Boring Logs are presented in Figures 4 through 20.

Laboratory Testing

The moisture content for the recovered samples was obtained in the laboratory. Grain-size analysis and Atterberg Limits tests were performed on selected samples for purposes of classification and to develop pertinent engineering properties. A Summary of Laboratory Test Results is presented in Figure 21. Soils Classification Data are presented in Figures 22 through 26.

SUBSURFACE CONDITIONS

Subsurface Materials

The subsurface materials encountered in the test borings were classified using the Unified Soils Classification System (USCS) and the materials were grouped into the general categories of native silty to clayey sand and sandstone, native sandy clay, sandy claystone, and hard blue sandstone. The site is characterized by overburden sands and sandstone with interbedded layers of sandy clay and claystone. All described soils are found at varying depths across the site. A primary objective of the investigation was to identify the limits of easily excavatable soil, categorized as the depths at which hard blue sandstone bedrock would be encountered.

Additional descriptions and the interpreted distribution (approximate depths) of the subsurface materials are presented on the Test Boring Logs. The descriptions shown on the logs are based upon the engineer's classification of the samples at the depths indicated. Stratification lines shown on the logs represent the approximate boundaries between material types and the actual transitions may be gradual and vary with location.

Groundwater

Groundwater was observed in two of the test borings, TB-107 and TB-130, at depths ranging between 14 to 16-feet below the existing ground surface. These two borings were performed adjacent to an apparent drainage channel crossing the site. Groundwater was not encountered in the other Test Borings. Fluctuations in groundwater and subsurface moisture conditions may occur due to variations in rainfall and other factors not readily apparent at this time. Development of the property and adjacent properties may also affect groundwater levels.

EARTHWORK AND SITE DEVELOPMENT

Proposed Grading, Cuts and Masses of Fill

RMG was provided a site map showing the layout of internal streets within the proposed development, and earthwork exhibits showing proposed cut and fill across the site. Of interest is the depth and nature of "easily" excavatable soil versus soil that would require extraordinary measures to remove. To that end RMG has prepared a site map showing test boring locations and an estimated depth to hard bedrock at each location. Soil Test Boring data from two previous subsurface soil investigations is also presented on the Figure along with charts listing the data. This information is presented in the Depths to Hard Sandstone, Figure 2.1.

The overburden soil across the site is primarily silty and clayey sand and sandstone with occasional seams of claystone. Upon excavation claystone may need to be segregated from the sand and processed for reuse. We feel with proper moisture conditioning and blending of claystone with sand the majority, if not all, of the in situ soil may be suitable as fill to balance earthwork across the site. A determination of the claystone suitability will have to be made at the time of excavation.

RMG recommends cut and fill grades be compared with depths to hard bedrock shown on Figure 2.1 to gain an understanding of the quantity of soil available for earthwork balancing. If upon excavation to final cut and fill grades, expansive soils are encountered near street grades or foundation or floor slab

bearing levels, additional overexcavation and replacement with non-expansive structural fill to depths of approximately 3 to 4 feet below foundation components should be anticipated. Note, the native claystone is not recommended for use as structural fill below foundation components or floor slabs without moisture conditioning and blending with sand soils. Even then, claystone blended soil should be installed in deeper fill sections so as to maintain a 3 to 4-foot separation from foundation elements.

Structural Fill

During earthwork balancing across the site, areas to receive structural fill should have topsoil, organic material, or debris removed. Loose, wet, soils, especially those from noted drainage areas, should be excavated to dry solid material, stockpiled and evaluated for suitability of re-use as structural fill. If soil is found to be unsuitable as structural fill, it may still be suitable as backfill in non-structural applications.

Structural fill composed of on-site soils should consist of granular, nil to low-expansive material. If claystone is elected to be re-used it should be thoroughly processed, moisture conditioned and blended with sand soil. Fill should be spread across the site and placed in even loose lifts not exceeding 10-inches, moisture conditioned to facilitate compaction (usually within 2 percent of the optimum moisture content), and compacted to a minimum of 95 percent of the maximum dry density as determined by the Standard Proctor test, ASTM D-698. The materials should be spread and compacted by mechanical means.

Structural fill placed on slopes should be benched into the slope. Maximum bench heights should not exceed 4 feet, and bench widths should be wide enough to accommodate compaction equipment. Materials used for structural fill should be approved by RMG prior to use. Structural fill should not be placed on frozen subgrade or allowed to freeze during moisture conditioning and placement.

- *Guideline Site Grading Specifications are included in the Appendix A.*

CONSTRUCTION CONSIDERATIONS

Anticipated Foundation Concepts

Based on the information presented previously, conventional shallow foundation systems consisting of standard spread footings/stemwalls or stiffened slabs are anticipated to be suitable for the proposed residential structures on the proposed lots. Alternative foundation systems are not anticipated. It is assumed that the deepest excavation cuts will be approximately 6 to 8 feet below the final ground surface, not including overexcavation or subexcavation which may be required.

The foundation system for each lot should be designed and constructed based upon recommendations developed in a detailed Subsurface Soil Investigation completed after earthwork balancing and site development activities are complete. The recommendations presented in the Subsurface Soils Investigation should be verified following the excavation on each lot and evaluation of the building loads.

Note, even after the recommended overexcavation and replacement is completed, it is possible that some of the replacement soils will exhibit low-density or expansive characteristics. In all cases, contractors shall retain the responsibility for excavating to the appropriate line and grade, for the quality of their

work, for adhering to plans and specifications, and for repairing defects regardless of when they are discovered.

The allowable bearing pressures to be used for design of foundation components should be determined by a detailed site specific Subsurface Soils Investigation. Allowable bearing pressures are anticipated to range from 2,000 to 3,000 psf for native sand soils when properly prepared and compacted as indicated herein.

Foundation and basement walls should be designed to resist lateral pressures. For granular, non-expansive soils used as exterior backfill around foundations, an equivalent fluid pressure (EFP) of 40 pcf may be used for design. On-site expansive soils as exterior backfill around foundations should typically be avoided. However, if the client elects to use expansive soils as backfill against foundation walls, higher lateral pressures should be anticipated. The lateral pressures presented herein apply to level, drained backfill conditions. Lateral pressures for sloping/undrained conditions or for expansive backfill soils should be determined on an individual basis.

Foundations Drains

A subsurface perimeter drain is recommended around portions of the structure which will have habitable or storage space located below the finished ground surface. This includes crawlspace areas but not the walkout trench, if applicable. Although groundwater was not encountered across the majority of the site, development activities may alter drainage patterns and groundwater flows. Depending on the conditions encountered during the lot specific Subsurface Soils Investigation and the conditions observed at the time of the Open Excavation Observation, additional subsurface drainage systems may be recommended.

One such system is an underslab drainage layer to help intercept groundwater before it enters the slab area should the groundwater levels rise. In general, if groundwater was encountered within 4 to 6 feet of the proposed basement slab elevation, an underslab drain should be anticipated. Another such system would consist of a subsurface drain and/or vertical drain board placed around the perimeter of the overexcavation to help intercept groundwater and allow for proper placement and compaction of the replacement structural fill. Careful attention should be paid to grade and discharge of the drain pipes of these systems.

It must be understood that the drain systems are designed to intercept some types of subsurface moisture and not others. Therefore, the drains could operate properly and not mitigate all moisture problems relating to foundation performance or moisture intrusion into the basement area.

Floor Slabs

Floor slabs should be supported on 12-inches of structural fill to control slab movement due to potential moisture changes in the supporting soil. Structural fill material for support of the floor slab should be placed in 8-inch loose lifts near optimum moisture content and compacted to 95 percent of Standard Proctor maximum dry density (ASTM D-698). To provide uniform support and to aid controlling moisture consideration may be given to installing 4-inches of free-draining gravel beneath concrete slabs. Depending upon interior floor finish, the use of a vapor retarding barrier over the gravel may be considered. Floor slabs should be separated from all bearing walls, columns, mechanical equipment and piping with an expansion joint that allows unrestrained vertical movement. Contraction joints should be

placed in the slab in accordance with American Concrete Institute (ACI) guidelines and applicable local Building Code requirements.

Concrete

Type I/II cement is recommended for concrete in contact with the subsurface materials. Calcium chloride should be used with caution for soils with high sulfate contents. The concrete should not be placed on frozen ground. If placed during periods of cold temperatures, the concrete should be kept from freezing. This may require covering the concrete with insulated blankets and heating. Concrete work should be completed in accordance with the latest applicable guidelines and standards published by ACI.

Surface Grading and Drainage

The ground surface should be sloped from the building with a minimum gradient of 10 percent for the first 10 feet. This is equivalent to 12 inches of fall across this 10-foot zone. If a 10-foot zone is not possible on the upslope side of the structure, then a well-defined swale should be created a minimum 5 feet from the foundation and sloped parallel with the wall with a minimum slope of 2 percent to intercept the surface water and transport it around and away from the structure. Roof drains should extend across backfill zones and landscaped areas to a region that is graded to direct flow away from the structure. Owners should maintain the surface grading and drainage recommended in this report to help prevent water from being directed toward and/or ponding near the foundations.

Landscaping should be selected to reduce irrigation requirements. Plants used close to foundation walls should be limited to those with low moisture requirements and irrigated grass should not be located within 5 feet of the foundation. To help control weed growth, geotextiles should be used below landscaped areas adjacent to foundations. Impervious plastic membranes are not recommended.

Irrigation devices should not be placed within 5 feet of the foundation. Irrigation should be limited to the amount sufficient to maintain vegetation. Application of more water will increase the likelihood of slab and foundation movements.

The recommendations listed in this report are intended to address normal surface drainage conditions, assuming the presence of groundcover (established vegetation, paved surfaces, and/or structures) throughout the regions upslope from this structure. However, groundcover may not be present due to a variety of factors (ongoing construction/development, wildfires, etc.). During periods when groundcover is not present in the "upslope" regions, higher than normal surface drainage conditions may occur, resulting in perched water tables, excess runoff, flash floods, etc. In these cases, the surface drainage recommendations presented herein (even if properly maintained) may not mitigate all groundwater problems or moisture intrusion into the structure. We recommend that the site plan be prepared with consideration of increased runoff during periods when groundcover is not present on the upslope areas.

BURIED UTILITIES

Based upon the conditions encountered in the exploratory test borings and the proposed earthwork balancing across the site, we anticipate that the soils encountered in utility trench excavations will consist of blended silty sand or native sand soil at medium relative densities.

We believe the sand and sandstone will classify as Type C materials and claystone, if encountered, will classify as Type B materials as defined by OSHA in 29 CFR Part 1926. OSHA requires that temporary excavations made in Type B and C materials be laid back at ratios no steeper than 1:1 (horizontal to vertical) and 1½:1 (horizontal to vertical), respectively, unless the excavation is shored and braced. Excavations deeper than 20 feet, or when water is present, should always be braced or the slope designed by a professional engineer.

Utility mains such as water and sanitary sewer lines are typically placed beneath paved roadways. The settlement of the utility trench backfill can have a detrimental effect on pavements and roadway surfaces. We recommend that utility trench backfill be placed in thin loose lifts, moisture conditioned as required and compacted to the recommendations outlined in the **Structural Fill** section of this report. The placement and compaction of utility trench backfill should be observed and tested by a representative of RMG Engineers during construction. Use of “flowable fill,” (i.e., a controlled low strength material (CLSM), or a similar material) should be considered in lieu of compacted soil backfill for areas with low tolerances for surface settlements in deep excavations and areas with difficult access.

It is a common local practice for underdrains to be placed at the bottom of sanitary sewer trenched within drive lanes. Underdrains placed in the sanitary sewer trenches in areas where groundwater is anticipated will likely be the "active" type, which uses a perforated drain pipe. In areas where groundwater is not anticipated, “passive” type underdrains may be used. The outfall for the sanitary sewer trench underdrain was not known at the time of this investigation because the development plan and grading plan were not available for our review. Typical underdrain details are presented in Figures 27 and 28.

Grading plans were provided.

PRELIMINARY PAVEMENT RECOMMENDATIONS

Roadway plans had not been provided at the time of the report issue date. However, roadways throughout the proposed development are anticipated to be classified mainly as Local in accordance with Section II of the Colorado Springs Engineering Criteria Manual (or El Paso County Engineering Criteria). The actual pavement section design for individual streets will be completed following overlot grading and installation of utilities. A site specific pavement design should be conducted to determine the design pavement sections for the proposed roadways.

ADDITIONAL STUDIES

The findings, conclusions and recommendations presented in this report were provided to evaluate the suitability of the site for future development. Unless indicated otherwise, the test borings, laboratory test results, conclusions and recommendations presented in this report are not intended for use for design and construction. **We recommend that a site specific Subsurface Soil Investigation be performed for all proposed structures including (but not limited to) residences, community or common buildings, retaining walls and pumphouses, commercial buildings, etc.**

To develop recommendations for construction of the proposed roadways, a pavement design investigation should be performed. This investigation should consist of additional test borings, soil laboratory testing and specific recommendations for the design and construction of roadway pavement sections.

CLOSING

This report has been prepared for the exclusive purpose of providing geotechnical engineering information and recommendations for development described in this report. RMG should be retained to review the final construction documents prior to construction to verify our findings, conclusions and recommendations have been appropriately implemented.

This report has been prepared for the exclusive use by **Windsor Ridge Homes** for application as an aid in the design and construction of the proposed development in accordance with generally accepted geotechnical engineering practices. The analyses and recommendations in this report are based in part upon data obtained from test borings, site observations and the information presented in referenced reports. The nature and extent of variations may not become evident until construction. If variations then become evident, RMG should be retained to review the recommendations presented in this report considering the varied condition, and either verify or modify them in writing.

Our professional services were performed using that degree of care and skill ordinarily exercised, under similar circumstances, by geotechnical engineers practicing in this or similar localities. RMG does not warrant the work of regulatory agencies or other third parties supplying information which may have been used during the preparation of this report. No warranty, express or implied is made by the preparation of this report. Third parties reviewing this report should draw their own conclusions regarding site conditions and specific construction techniques to be used on this project.

The scope of services for this project does not include, either specifically or by implication, environmental assessment of the site or identification of contaminated or hazardous materials or conditions. Development of recommendations for the mitigation of environmentally related conditions, including but not limited to biological or toxicological issues, are beyond the scope of this report. If the Client desires investigation into the potential for such contamination or conditions, other studies should be undertaken.

If we can be of further assistance in discussing the contents of this report or analysis of the proposed development, from a geotechnical engineering point-of-view, please feel free to contact us.

FIGURES



SITE



REFERENCE
NOT TO SCALE

SITE VICINITY MAP



ROCKY MOUNTAIN GROUP

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80918
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Central Office:
Englewood, CO 80112
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Northern Office:
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(970) 330-1071

WINDERMERE SUBDIVISION
COLORADO SPRINGS, CO
WINDSOR RIDGE HOMES

JOB No. 162062

FIG No. 1

DATE 4-17-2018



ROCKY MOUNTAIN GROUP

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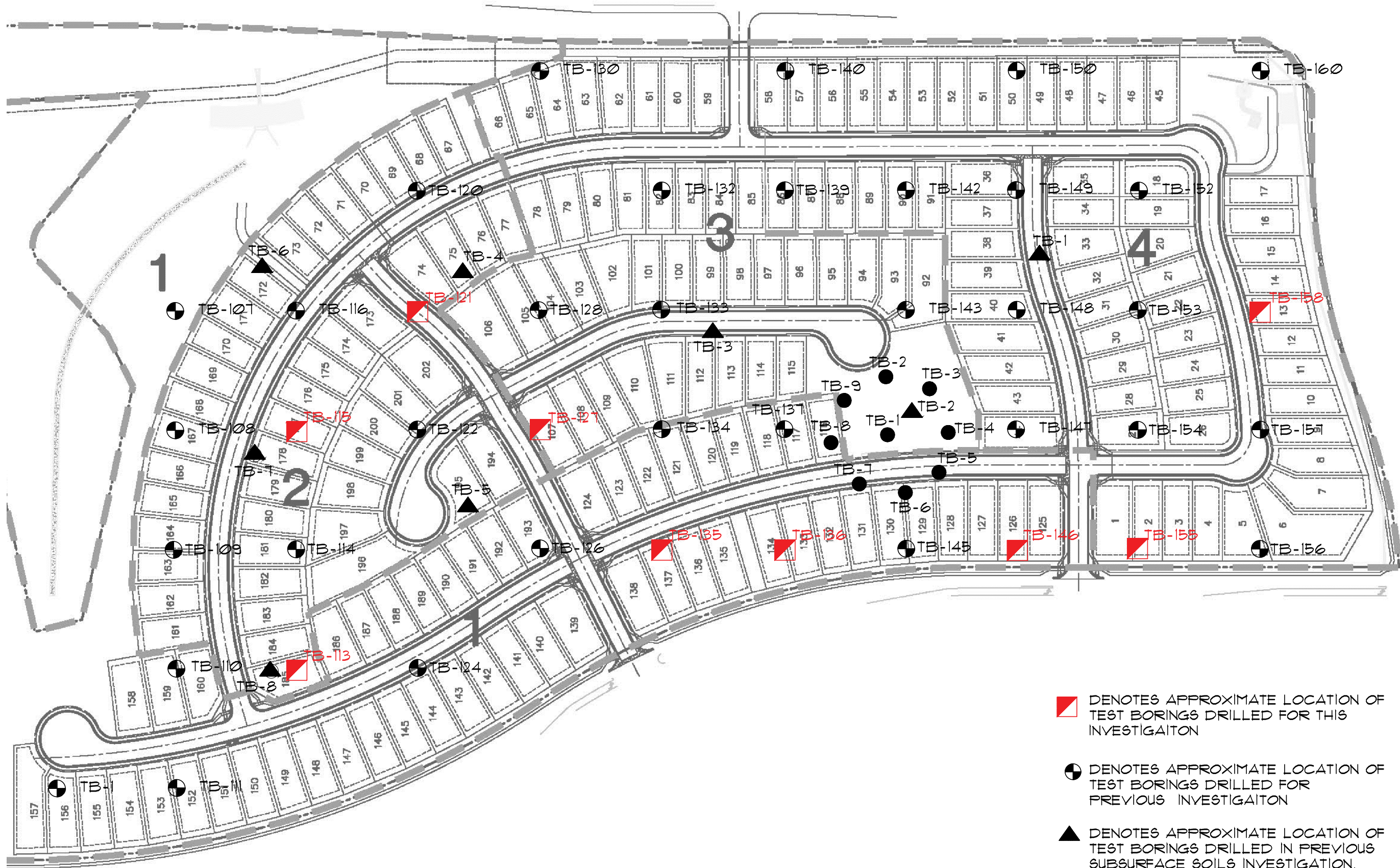
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Woodland Park Office:
(719) 687-6077

Monument Office:
(719) 488-2145

Pueblo / Canon City:
(719) 544-7750



◻ DENOTES APPROXIMATE LOCATION OF TEST BORINGS DRILLED FOR THIS INVESTIGATION

⊙ DENOTES APPROXIMATE LOCATION OF TEST BORINGS DRILLED FOR PREVIOUS INVESTIGATION

▲ DENOTES APPROXIMATE LOCATION OF TEST BORINGS DRILLED IN PREVIOUS SUBSURFACE SOILS INVESTIGATION, JOB NO. 142206, DATED MAY 28, 2015

● DENOTES APPROXIMATE LOCATION OF TEST BORINGS DRILLED IN PREVIOUS SUBSURFACE SOILS INVESTIGATION, JOB NO. 142206, DATED MARCH 5, 2014



NOT TO SCALE

WINDERMERE SUBDIVISION
COLORADO SPRINGS, CO
WINDSOR RIDGE HOMES

ENGINEER:	GW
DRAWN BY:	BG
CHECKED BY:	GW
ISSUED:	4-17-18
REVISION:	DATE: JOB #:

TEST BORING
LOCATION PLAN

SHEET No.
FIG-2



KEY
 X= DEPTH TO HARD SANDSTONE UP TO 50 BLOWS PER 3 INCHES
 Y= DEPTH TO HARD SANDSTONE GREATER THAN 50 BLOWS PER 3 INCHES

▲ DENOTES LOCATIONS DRILLED
 RMG SSI 142206 dated March 5, 2014

LOCATION	DEPTH(ft) TO HARD SANDSTONE UP TO < 50/3"	DEPTH(ft) TO HARD SANDSTONE > 50/3"	TOTAL DEPTH OF TEST BORING
TB-1	14	24	24
TB-2	19	49	49
TB-3	5	19	19
TB-4	4	19	19
TB-5	20	24	24
TB-6	> 20	> 20	20
TB-7	14	24	24
TB-8	16	> 20	20

● DENOTES LOCATIONS DRILLED
 RMG SSI 142206 dated May 28, 2015

LOCATION	DEPTH(ft) TO HARD SANDSTONE UP TO 50/3"	DEPTH(ft) TO HARD SANDSTONE > 50/3"	TOTAL DEPTH OF TEST BORING
TB-1	17	17	20
TB-2	6	6	20
TB-3	> 20	> 20	20
TB-4	> 20	> 20	20
TB-5	> 20	> 20	20
TB-6	13	13	20
TB-7	16	17	20
TB-8	9	27	20
TB-9	12	12	20

● DENOTES LOCATIONS DRILLED
 RMG PSSI 162062 dated April XX, 2018

LOCATION	DEPTH(ft) TO HARD SANDSTONE UP TO 50/3"	DEPTH(ft) TO HARD SANDSTONE > 50/3"	TOTAL DEPTH OF TEST BORING
100	6	25	30
107	>20	>20	20
108	>25	>25	25
109	19	>30	30
110	42	46	47
111	27	27	30
114	16	>20	20
116	6	9	20
120	>20	>20	20
122	>20	>20	20
124	>20	>20	20
126	22	22	25
128	11	19	25
130	>20	>20	20
132	9	9	25
133	9	9	30
134	SURFACE	SURFACE	30
137	SURFACE	20	30
139	>10	>10	10
140	16	>20	20
142	21	21	30
143	14	20	30
145	13	13	15
147	SURFACE	20	40
148	9	20	40
149	14	14	30
150	14	>20	20
152	9	15	20
153	6	6	20
154	18	18	30
156	11	15	30
157	6	9	20
160	>15	>15	15

▲ DENOTES LOCATIONS DRILLED
 RMG PSSI 162062 dated July 20, 2018

LOCATION	DEPTH(ft) TO HARD SANDSTONE UP TO 50/3"	DEPTH(ft) TO HARD SANDSTONE > 50/3"	TOTAL DEPTH OF TEST BORING
113	19	>25	25
115	15	>20	20
121	10	>15	15
127	10	15	15
135	5	>15	15
136	10	15	15
146	SURFACE	>25	25
155	SURFACE	>20	20
158	5	>25	25

SHEET NAME
 DEPTHS TO HARD SANDSTONE
 PRELIMINARY SET

ARCH/ENG:	GGW	
DRAWN:	CXM	
CHECKED:	GGW	
DATE	1-30-2019	
#	REVISION	DATE
JOB NO.	162062	
SHEET NO.	FG-2.1	
1 of 1		







WINDERMERE SUBDIVISION
 NORTH CAREFREE CIRCLE AND MARKSHEFFEL ROAD
 EL PASO COUNTY, COLORADO
 WINDSOR RIDGE HOMES

SOILS DESCRIPTION

-  CLAYSTONE
-  FILL: SAND, SILTY TO CLAYEY
-  FILL: CLAY, SANDY
-  SANDSTONE
-  SANDY CLAY
-  SILTY SAND
-  SILTY TO CLAYEY SAND

UNLESS NOTED OTHERWISE, ALL LABORATORY TESTS PRESENTED HEREIN WERE PERFORMED BY:
 RMG - ROCKY MOUNTAIN GROUP
 2910 AUSTIN BLUFFS PARKWAY
 COLORADO SPRINGS, COLORADO

SYMBOLS AND NOTES

-  XX STANDARD PENETRATION TEST - MADE BY DRIVING A SPLIT-BARREL SAMPLER INTO THE SOIL BY DROPPING A 140 LB. HAMMER 30", IN GENERAL ACCORDANCE WITH ASTM D-1586. NUMBER INDICATES NUMBER OF HAMMER BLOWS PER FOOT (UNLESS OTHERWISE INDICATED).
-  XX UNDISTURBED CALIFORNIA SAMPLE - MADE BY DRIVING A RING-LINED SAMPLER INTO THE SOIL BY DROPPING A 140 LB. HAMMER 30", IN GENERAL ACCORDANCE WITH ASTM D-3550. NUMBER INDICATES NUMBER OF HAMMER BLOWS PER FOOT (UNLESS OTHERWISE INDICATED).
-  FREE WATER TABLE
-  DEPTH AT WHICH BORING CAVED
-  BULK DISTURBED BULK SAMPLE
-  AUG AUGER "CUTTINGS"
- 4.5 WATER CONTENT (%)

ROCKY MOUNTAIN GROUP

Architectural
Structural
Forensics



Geotechnical
Materials Testing
Civil, Planning

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 Colorado Spings, CO 80918
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SOUTHERN COLORADO, DENVER METRO, NORTHERN COLORADO

EXPLANATION OF TEST BORING LOGS

JOB No. 162062

FIGURE No. 3

DATE 4/17/18

TEST BORING: 100 DATE DRILLED: 3/8/18 ELEVATION (FT): 6625.22 NO GROUNDWATER ON 3/8/18	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %	TEST BORING: 107 DATE DRILLED: 3/15/18 ELEVATION (FT): 6580.95 GROUNDWATER @ 14.0 ' 3/15/18	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
SANDSTONE, SILTY TO CLAYEY, tan and brown to light gray, very hard, moist	5		-	50/6"	15.5	SAND, SILTY, brown, medium dense, moist	5		-	13	9.5
CLAYSTONE, SANDY, tan to brown with rust staining, medium hard, moist	10		-	50/3"	11.9	SANDSTONE, SILTY TO CLAYEY, brown, medium hard, moist to wet	10		-	17	13.6
SANDSTONE, SILTY, blue, very hard, moist	15		-	50/7"	19.7	CLAYSTONE, SANDY, brown, hard, moist to wet	15		-	50/10"	20.8
	20		-	31	31.0		20		-	50/8"	25.6
	25		-						-		
	30		-	50/3"	18.1				-		

ROCKY MOUNTAIN GROUP

Architectural
Structural
Forensics



Geotechnical
Materials Testing
Civil, Planning

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SOUTHERN COLORADO, DENVER METRO, NORTHERN COLORADO

TEST BORING LOGS

JOB No. 162062

FIGURE No. 4

DATE 4/17/18

TEST BORING: 108 DATE DRILLED: 3/8/18 ELEVATION (FT): 6592.91 NO GROUNDWATER ON 3/8/18	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %	TEST BORING: 109 DATE DRILLED: 3/8/18 ELEVATION (FT): 6600.96 NO GROUNDWATER ON 3/8/18	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
SAND, SILTY TO CLAYEY, tan to brown, loose, moist	5			6	16.1	SAND, SILTY TO CLAYEY, with sandy clay seams, tan to brown, medium dense, moist	5			10	14.5
SANDSTONE, SILTY TO CLAYEY, tan to gray, hard to very hard, moist	10			9	7.6		10			13	10.7
	15			50/11"	12.4		15			25	24.4
	20			50/11"	12.4	SANDSTONE, SILTY TO CLAYEY, tan to brown, very hard, moist	20			50/3"	13.5
	25			50/7"	20.1	SANDSTONE, SILTY, blue, very hard, moist	25			50/3"	16.1
							30			50/3"	16.1

ROCKY MOUNTAIN GROUP

Architectural
Structural
Forensics



Geotechnical
Materials Testing
Civil, Planning

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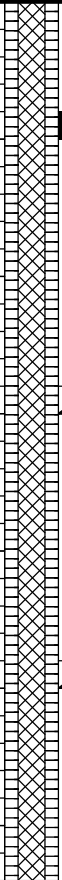
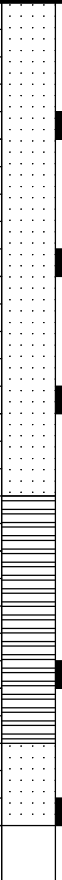

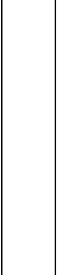
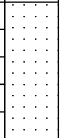
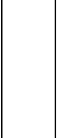
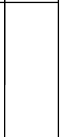
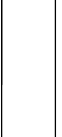
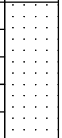
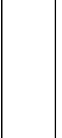
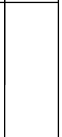
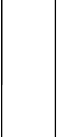
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TEST BORING LOGS

JOB No. 162062

FIGURE No. 5

DATE 4/17/18

TEST BORING: 110 DATE DRILLED: 3/8/18 ELEVATION (FT): 6625.54 NO GROUNDWATER ON 3/8/18	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %	TEST BORING: 111 DATE DRILLED: 3/8/18 ELEVATION (FT): 6628.33 NO GROUNDWATER ON 3/8/18	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
FILL: CLAY, SANDY, with interbedded clayey sand, tan and dark brown to dark gray, stiff, moist	5		■	15	19.5	SANDSTONE, SILTY TO CLAYEY, tan and brown to gray, hard to very hard, moist	5		■	50/9"	12.7
CLAYSTONE, SANDY, dark brown to dark gray, hard, moist	10		■	16	18.4	CLAYSTONE, SANDY, blue to gray, very hard, moist	10		■	50/6"	16.0
SANDSTONE, SILTY, blue, moist	15		■	11	19.6	SANDSTONE, SILTY, blue, very hard, moist	15		■	50/5"	16.0
AUGER REFUSAL AT 47' DUE TO HARD BEDROCK	20		■	50/8"	14.3		20		■	50/6"	23.6
CLAYSTONE, SANDY, dark brown to dark gray, hard, moist	25		■	11	19.6	SANDSTONE, SILTY, blue, very hard, moist	25		■	50/6"	23.6
SANDSTONE, SILTY, blue, moist	30		■	50/8"	14.3		30		■	50/6"	20.7

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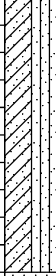



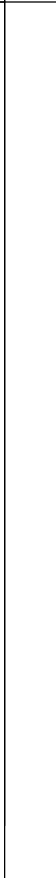
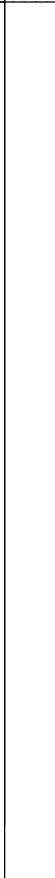
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TEST BORING LOGS

JOB No. 162062

FIGURE No. 6

DATE 4/17/18

TEST BORING: 114 DATE DRILLED: 3/15/18 ELEVATION (FT): 6603.50 NO GROUNDWATER ON 3/15/18	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %	TEST BORING: 116 DATE DRILLED: 3/8/18 ELEVATION (FT): 6584.34 NO GROUNDWATER ON 3/8/18	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
CLAY, SANDY, dark brown, stiff, moist	5		-	13	15.8	SANDSTONE, SILTY, tan to brown, very hard, moist	5		-	50/4"	12.1
SAND, SILTY TO CLAYEY, brown, loose to medium dense, moist	10		-	7	15.4		10		-	50/3"	13.1
SANDSTONE, SILTY, brown, very hard, moist	15		-	15	30.4		15		-	50/2"	15.6
	20		-	50/3"	14.5	SANDSTONE, SILTY, blue, very hard, moist	20		-	50/1"	10.9

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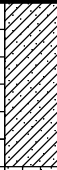


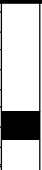






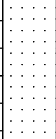





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TEST BORING LOGS

JOB No. 162062

FIGURE No. 7

DATE 4/17/18

TEST BORING: 120 DATE DRILLED: 3/15/18 ELEVATION (FT): 6580.85 NO GROUNDWATER ON 3/15/18	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %	TEST BORING: 122 DATE DRILLED: 3/15/18 ELEVATION (FT): 6593.85 NO GROUNDWATER ON 3/15/18	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
CLAY, SANDY, brown, stiff, moist	5			12	10.3	SAND, SILTY TO CLAYEY, brown, medium dense, moist	5			10	11.5
SAND, SILTY, brown, loose, moist	10			10	12.6	SAND, SILTY, brown, medium dense, moist	10			19	8.7
SANDSTONE, SILTY, brown, hard, moist	15			50/6"	12.3	SANDSTONE, SILTY, brown, very hard, moist	15			50/4"	11.2
CLAYSTONE, SANDY, brown with rust staining, hard, moist	20			50	23.5		20			50/4"	13.9

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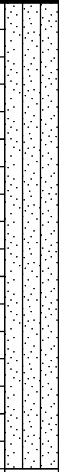

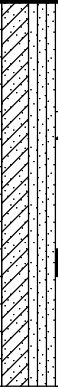



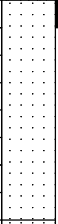







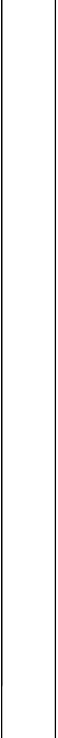

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TEST BORING LOGS

JOB No. 162062

FIGURE No. 8

DATE 4/17/18

TEST BORING: 124 DATE DRILLED: 3/15/18 ELEVATION (FT): 6615.03 NO GROUNDWATER ON 3/15/18	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %	TEST BORING: 126 DATE DRILLED: 3/15/18 ELEVATION (FT): 6600.14 NO GROUNDWATER ON 3/15/18	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
SAND, SILTY, light brown, loose to medium dense, moist	5			6	11.5	SAND, SILTY TO CLAYEY, brown to dark brown, loose to medium dense, moist	5			11	15.7
CLAYSTONE, SANDY, brown, hard, moist	10			8	9.7	SANDSTONE, SILTY TO CLAYEY, brown, very hard, moist	10			5	15.3
	15			11	6.7	SANDSTONE, SILTY, blue, very hard, moist	15			50/6"	17.4
	20			50/11"	21.3		20			50/3"	--

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TEST BORING LOGS

JOB No. 162062

FIGURE No. 9

DATE 4/17/18

TEST BORING: 128 DATE DRILLED: 3/15/18 ELEVATION (FT): 6596.82 NO GROUNDWATER ON 3/15/18	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %	TEST BORING: 130 DATE DRILLED: 3/15/18 ELEVATION (FT): 6577.11 GROUNDWATER @ 16.0' 3/15/18	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
SAND, SILTY, light brown, loose, moist	5			5	9.4	SAND, SILTY TO CLAYEY, brown, loose, moist	5			8	9.5
SANDSTONE, SILTY TO CLAYEY, brown, very hard, moist	10			50/4"	12.0	SANDSTONE, SILTY, brown, very hard, moist to wet	10			8	13.7
SANDSTONE, SILTY, blue, very hard, moist	15			50/3"	12.2	SANDSTONE, SILTY, brown, very hard, moist to wet	15			50/7"	12.9
	20			10/0"	13.5	CLAYSTONE, SANDY, brown, hard, moist to wet	20			50/10"	22.0

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TEST BORING LOGS

JOB No. 162062

FIGURE No. 10

DATE 4/17/18

TEST BORING: 132 DATE DRILLED: 2/8/18 ELEVATION (FT): 6594.64 NO GROUNDWATER ON 2/8/18	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %	TEST BORING: 133 DATE DRILLED: 2/8/18 ELEVATION (FT): 6605.14 NO GROUNDWATER ON 2/8/18	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
SAND, SILTY TO CLAYEY, tan to gray, medium dense, moist	5			13	7.7	SANDSTONE, SILTY TO CLAYEY, with sandy claystone seams, brown to gray, very hard, moist	5			50/6"	11.1
CLAYSTONE, SANDY, brown to olive and gray with rust staining, very hard, moist	10			50/3"	23.0		10			50/2"	14.8
SANDSTONE, SILTY TO CLAYEY, brown to gray, very hard, moist	15			50/2"	19.8		15			50/2"	17.7
AUGER REFUSAL AT 25' DUE TO HARD BEDROCK	20			50/1"	7.8		20			50/2"	14.2
	25			50/2"	2.4		25			50/1.5"	9.9
							30			50/1.5"	9.9

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TEST BORING LOGS

JOB No. 162062

FIGURE No. 11

DATE 4/17/18

TEST BORING: 134 DATE DRILLED: 2/8/18 ELEVATION (FT): 6607.17 NO GROUNDWATER ON 2/8/18	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %	TEST BORING: 137 DATE DRILLED: 2/8/18 ELEVATION (FT): 6617.72 NO GROUNDWATER ON 2/8/18	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
SANDSTONE, SILTY TO CLAYEY, with sandy claystone seams, brown to gray, very hard, moist	5	[Symbol]	[Symbol]	50/3"	13.7	CLAYSTONE, SANDY, tan to olive and gray, very hard, moist	5	[Symbol]	[Symbol]	50/3"	22.7
	10	[Symbol]	[Symbol]	50/3"	11.3		10	[Symbol]	[Symbol]	50/3"	18.7
	15	[Symbol]	[Symbol]	50/6"	10.4	SANDSTONE, SILTY, blue, very hard, moist	15	[Symbol]	[Symbol]	50/3"	12.6
	20	[Symbol]	[Symbol]	50/4"	10.0		20	[Symbol]	[Symbol]	50/3"	11.2
	25	[Symbol]	[Symbol]	50/3"	7.8	AUGER REFUSAL AT 25' DUE TO HARD BEDROCK	25	[Symbol]	[Symbol]	50/2"	18.1
AUGER REFUSAL AT 30' DUE TO HARD BEDROCK	30	[Symbol]	[Symbol]	50/3"	7.8						

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TEST BORING LOGS

JOB No. 162062

FIGURE No. 12

DATE 4/17/18

TEST BORING: 139 DATE DRILLED: 2/8/18 ELEVATION (FT): 6600.05 NO GROUNDWATER ON 2/8/18	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %	TEST BORING: 140 DATE DRILLED: 3/15/18 ELEVATION (FT): 6584.20 NO GROUNDWATER ON 3/15/18	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
SAND, SILTY TO CLAYEY, with sandy clay seams, tan to gray, medium dense, moist	5			21	10.8	CLAY, SANDY, brown, stiff, moist	5			9	13.9
BORING TERMINATED AT 10' DUE TO DRILL RIG MALFUNCTION	10			21	10.2	SAND, SILTY TO CLAYEY, brown, medium dense, moist	10			12	11.5
						SANDSTONE, SILTY, brown, very hard, moist	15			14	10.1
							20			50/3"	11.4

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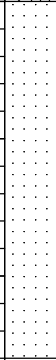

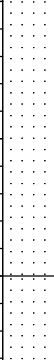
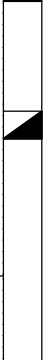
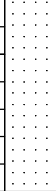


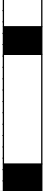
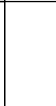



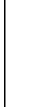



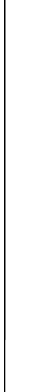



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TEST BORING LOGS

JOB No. 162062

FIGURE No. 13

DATE 4/17/18

TEST BORING: 142 DATE DRILLED: 2/7/18 ELEVATION (FT): 6601.70 NO GROUNDWATER ON 2/7/18	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %	TEST BORING: 143 DATE DRILLED: 2/7/18 ELEVATION (FT): 6618.87 NO GROUNDWATER ON 2/7/18	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
SAND, SILTY TO CLAYEY, tan to brown, medium dense, moist	5			25	11.3	SANDSTONE, SILTY TO CLAYEY, with sandy claystone seams, tan and brown to dark brown, very hard, moist	5			50/6"	21.1
SANDSTONE, SILTY TO CLAYEY, with sandy claystone seams, brown, very hard, moist	10			22	9.9		10			50/5"	28.3
SANDSTONE, SILTY, blue and dark gray, very hard, moist	15			50/6'	24.8		15			50/4"	27.0
	20			50/5"	18.7	SANDSTONE, SILTY TO CLAYEY, blue, very hard, moist	20			50/1"	--
	25			50/1"	16.9		25			50/3"	--
	30			50/1"	16.9	AUGER REFUSAL AT 30' DUE TO HARD BEDROCK	30			50/3"	--

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TEST BORING LOGS

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FIGURE No. 14

DATE 4/17/18

TEST BORING: 145 DATE DRILLED: 3/15/18 ELEVATION (FT): 6617.13 NO GROUNDWATER ON 3/15/18	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %	TEST BORING: 147 DATE DRILLED: 2/8/18 ELEVATION (FT): 6615.28 NO GROUNDWATER ON 2/8/18	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
CLAYSTONE, SANDY, brown, hard, moist	5		■	50/8"	17.2	SANDSTONE, SILTY TO CLAYEY, tan to gray, very hard, moist	5		■	50/3"	16.7
SANDSTONE, SILTY, blue, very hard, moist	10		■	50/8"	20.4	CLAYSTONE, SANDY, brown to gray, very hard, moist	10		■	50/3"	14.6
	15		▲	10/0"	15.3	SANDSTONE, SILTY TO CLAYEY, olive to gray, very hard, moist	15		▲	50/4"	18.0
						CLAYSTONE, SANDY, blue to gray, moist					
						SANDSTONE, SILTY TO CLAYEY, olive to gray, very hard, moist					
						CLAYSTONE, SANDY, blue to gray, moist					
						SANDSTONE, SILTY TO CLAYEY, olive to gray, very hard, moist					
						SANDSTONE, SILTY, blue, very hard, moist					

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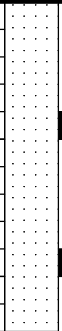





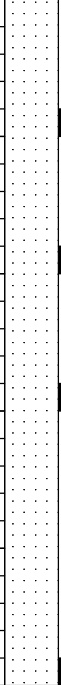

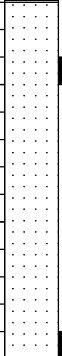

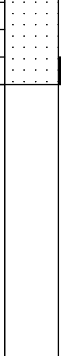

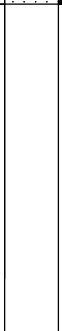

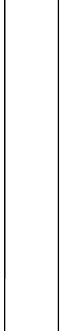

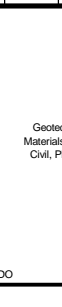





SOUTHERN COLORADO, DENVER METRO, NORTHERN COLORADO

TEST BORING LOGS

JOB No. 162062

FIGURE No. 15

DATE 4/17/18

TEST BORING: 148 DATE DRILLED: 2/8/18 ELEVATION (FT): 6607.75 NO GROUNDWATER ON 2/8/18	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %	TEST BORING: 149 DATE DRILLED: 2/7/18 ELEVATION (FT): 6594.95 NO GROUNDWATER ON 2/7/18	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
SANDSTONE, SILTY TO CLAYEY, tan to gray, hard to very hard, moist	5			50/8"	--	SAND, SILTY TO CLAYEY, tan to brown, medium dense, moist	5			18	15.2
CLAYSTONE, SANDY, olive to gray with rust staining, hard to very hard, moist	10			50/3"	--	SANDSTONE, SILTY TO CLAYEY, tan to brown, medium hard to very hard, moist	10			49	17.4
SANDSTONE, SILTY TO CLAYEY, blue, very hard, moist	15			50/8"	--		15			50/1"	33.0
	20			50/2"	--		20			50/1"	29.0
	25						25				
	30			50/3"	--		30			50/1"	13.8
	35										
	40			50/2"	--						

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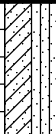





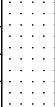

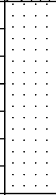

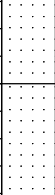





SOUTHERN COLORADO, DENVER METRO, NORTHERN COLORADO

TEST BORING LOGS

JOB No. 162062

FIGURE No. 16

DATE 4/17/18

TEST BORING: 150 DATE DRILLED: 3/15/18 ELEVATION (FT): 6584.33 NO GROUNDWATER ON 3/15/18	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %	TEST BORING: 152 DATE DRILLED: 2/7/18 ELEVATION (FT): 6582.74 NO GROUNDWATER ON 2/7/18	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
SAND, SILTY TO CLAYEY, brown, very loose to medium dense, moist	5			3	17.6	FILL: SAND, SILTY TO CLAYEY, brown to dark brown, medium dense, moist	5			11	12.7
SANDSTONE, SILTY, brown, very hard, moist	10			12	11.4	CLAYSTONE, SANDY, tan to olive, very hard, moist	10			50/3"	20.5
CLAYSTONE, SANDY, brown, hard, moist	15			50/3"	10.2	SANDSTONE, CLAYEY, with sandy claystone seams, brown and tan, very hard, moist	15			50/3"	26.9
	20			50/8"	19.0		20			50/1"	18.6

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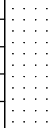




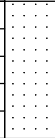

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TEST BORING LOGS

JOB No. 162062

FIGURE No. 17

DATE 4/17/18

TEST BORING: 153 DATE DRILLED: 2/7/18 ELEVATION (FT): 6592.81 NO GROUNDWATER ON 2/7/18	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %	TEST BORING: 154 DATE DRILLED: 2/7/18 ELEVATION (FT): 6604.54 NO GROUNDWATER ON 2/7/18	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
SAND, SILTY TO CLAYEY, tan to brown, medium dense, moist	5			24	11.8	SANDSTONE, SILTY TO CLAYEY, with sandy claystone seams, tan and brown to dark brown, hard to very hard, moist	5			50	9.0
SANDSTONE, SILTY TO CLAYEY, tan to brown, very hard, moist	10			50/1"	10.1	SANDSTONE, SILTY TO CLAYEY, with sandy claystone seams, tan and brown to dark brown, hard to very hard, moist	10			50/1"	11.1
	15			50/2"	11.8		15			50/7"	19.6
	20			47	23.7		SANDSTONE, SILTY, blue and dark gray, moist	20			50/1"
							25				
							30			40	--

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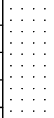
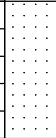

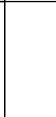

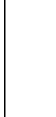
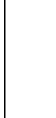
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TEST BORING LOGS

JOB No. 162062

FIGURE No. 18

DATE 4/17/18

TEST BORING: 156 DATE DRILLED: 2/7/18 ELEVATION (FT): 6602.4 NO GROUNDWATER ON 2/7/18	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %	TEST BORING: 157 DATE DRILLED: 2/7/18 ELEVATION (FT): 6595.20 NO GROUNDWATER ON 2/7/18	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
FILL: SAND, SILTY TO CLAYEY, tan to brown, loose, moist	5			9	8.7	SAND, SILTY TO CLAYEY, dark brown, moist	5			50/8"	6.9
SANDSTONE, SILTY TO CLAYEY, with sandy claystone seams, brown, hard to very hard, moist	10			50/9"	13.3	SANDSTONE, SILTY TO CLAYEY, tan to brown, very hard, moist	10			50/1"	9.2
SANDSTONE, SILTY, blue, moist	15			50/1"	12.0		15			50/2"	11.5
	20			50/1"	12.4		20			50/4"	11.5
	25										
	30										

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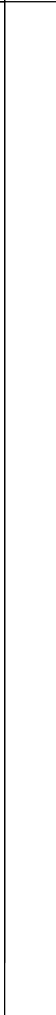

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TEST BORING LOGS

JOB No. 162062

FIGURE No. 19

DATE 4/17/18

TEST BORING: 160 DATE DRILLED: 3/15/18 ELEVATION (FT): NOT SURVEYED NO GROUNDWATER ON 3/15/18	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %	
SAND, SILTY, light brown, loose, moist	5			17	15.4	
CLAYSTONE, SANDY, brown, very hard moist	10			50/6"	14.6	
	15			50/5"	14.7	

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TEST BORING LOGS

JOB No. 162062

FIGURE No. 20

DATE 4/17/18

Test Boring No.	Depth	Water Content (%)	Dry Density (pcf)	Liquid Limit	Plasticity Index	% Retained No.4 Sieve	% Passing No. 200 Sieve	FHA Expansion Pressure (psf)	% Swell/Collapse	USCS Classification
100	4.0	15.5								
100	9.0	11.9								
100	14.0	19.7								
100	19.0	31.0								
100	29.0	18.1								
107	4.0	9.5								
107	9.0	13.6								
107	14.0	20.8								
107	19.0	25.6								
108	4.0	16.1								
108	9.0	7.6								
108	14.0	12.4								
108	24.0	20.1								
109	4.0	14.5								
109	9.0	10.7								
109	14.0	24.4								
109	19.0	13.5								
109	29.0	16.1								
110	4.0	19.5								
110	14.0	18.4								
110	24.0	19.6								
110	34.0	14.3								
111	4.0	12.7		NP	NP	0.0	29.1			SM
111	9.0	16.0		NP	NP	1.8	25.1			SM
111	14.0	16.0		NP	NP	0.0	25.9			SM
111	24.0	23.6								
111	29.0	20.7								
114	4.0	15.8								
114	9.0	15.4								
114	14.0	30.4								
114	19.0	14.5								
116	4.0	12.1		NP	NP	0.0	35.0			SM
116	9.0	13.1		NP	NP	1.0	37.6			SM
116	14.0	15.6								

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SUMMARY OF LABORATORY TEST RESULTS

JOB No. 162062
FIGURE No. 21
PAGE 1 OF 5
DATE 4/17/18

Test Boring No.	Depth	Water Content (%)	Dry Density (pcf)	Liquid Limit	Plasticity Index	% Retained No.4 Sieve	% Passing No. 200 Sieve	FHA Expansion Pressure (psf)	% Swell/Collapse	USCS Classification
116	19.0	10.9								
120	4.0	10.3								
120	9.0	12.6								
120	14.0	12.3								
120	19.0	23.5								
122	4.0	11.5								
122	9.0	8.7		NP	NP	5.6	23.9			SM
122	14.0	11.2		NP	NP	1.2	28.3			SM
122	19.0	13.9								
124	4.0	11.5								
124	9.0	9.7		NP	NP	0.4	21.6			SM
124	14.0	6.7		NP	NP	2.2	26.3			SM
124	19.0	21.3								
126	4.0	15.7								
126	9.0	15.3								
126	14.0	17.4								
126	19.0	14.4								
128	4.0	9.4								
128	9.0	12.0								
128	14.0	12.2								
128	19.0	13.5								
130	4.0	9.5								
130	9.0	13.7								
130	14.0	12.9								
130	19.0	22.0		48	27	0.0	44.4			SC
132	4.0	7.7								
132	9.0	23.0								
132	14.0	19.8								
132	19.0	7.8								
132	24.0	2.4								
133	4.0	11.1								
133	9.0	14.8								
133	14.0	17.7								
133	19.0	14.2								

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SOUTHERN COLORADO, DENVER METRO, NORTHERN COLORADO

SUMMARY OF LABORATORY TEST RESULTS

JOB No. 162062
FIGURE No. 21
PAGE 2 OF 5
DATE 4/17/18

Test Boring No.	Depth	Water Content (%)	Dry Density (pcf)	Liquid Limit	Plasticity Index	% Retained No.4 Sieve	% Passing No. 200 Sieve	FHA Expansion Pressure (psf)	% Swell/Collapse	USCS Classification
133	29.0	9.9								
134	4.0	13.7								
134	9.0	11.3								
134	14.0	10.4		32	14	1.8	41.6			SC
134	19.0	10.0								
134	29.0	7.8								
137	4.0	22.7								
137	9.0	18.7		66	41	0.0	81.6			CH
137	14.0	12.6								
137	19.0	11.2								
137	24.0	18.1								
139	4.0	10.8								
139	9.0	10.2								
140	4.0	13.9								
140	9.0	11.5								
140	14.0	10.1								
140	19.0	11.4								
142	4.0	11.3		36	16	2.6	30.5			SC
142	9.0	9.9				0.4	36.2			
142	14.0	24.8								
142	19.0	18.7				0.0	83.2			
142	29.0	16.9								
143	4.0	21.1								
143	9.0	28.3								
143	14.0	27.0								
143	34.0	27.5								
145	4.0	17.2								
145	9.0	20.4		45	22	0.5	45.1			SC
145	14.0	15.3								
147	4.0	16.7								
147	9.0	14.6				0.0	73.1			
147	14.0	18.0		37	19	0.0	56.8			CL
147	19.0	30.3								
147	29.0	64.8								

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SUMMARY OF LABORATORY TEST RESULTS

JOB No. 162062
FIGURE No. 21
PAGE 3 OF 5
DATE 4/17/18

Test Boring No.	Depth	Water Content (%)	Dry Density (pcf)	Liquid Limit	Plasticity Index	% Retained No.4 Sieve	% Passing No. 200 Sieve	FHA Expansion Pressure (psf)	% Swell/Collapse	USCS Classification
147	39.0	12.4								
149	4.0	15.2								
149	9.0	17.4								
149	14.0	33.0								
149	19.0	29.0								
149	29.0	13.8								
149	39.0	18.8								
150	4.0	17.6								
150	9.0	11.4								
150	14.0	10.2								
150	19.0	19.0								
152	4.0	12.7		33	12	0.9	49.1			SC
152	9.0	20.5		58	33	0.0	64.5			CH
152	14.0	26.9								
152	19.0	18.6								
153	4.0	11.8								
153	9.0	10.1								
153	14.0	11.8								
153	19.0	23.7								
154	4.0	9.0								
154	9.0	16.5								
154	14.0	19.6								
154	19.0	11.1								
154	24.0	15.2								
156	4.0	8.7								
156	9.0	13.3								
156	14.0	12.0								
156	19.0	12.4								
157	4.0	6.9								
157	9.0	9.2		NP	NP	0.1	39.7			SM
157	14.0	11.5								
157	19.0	11.5								
160	4.0	15.4								
160	9.0	14.6								

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SUMMARY OF LABORATORY TEST RESULTS

JOB No. 162062
FIGURE No. 21
PAGE 4 OF 5
DATE 4/17/18

Test Boring No.	Depth	Water Content (%)	Dry Density (pcf)	Liquid Limit	Plasticity Index	% Retained No.4 Sieve	% Passing No. 200 Sieve	FHA Expansion Pressure (psf)	% Swell/Collapse	USCS Classification
160	14.0	14.7								

ROCKY MOUNTAIN GROUP

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ENGINEERS

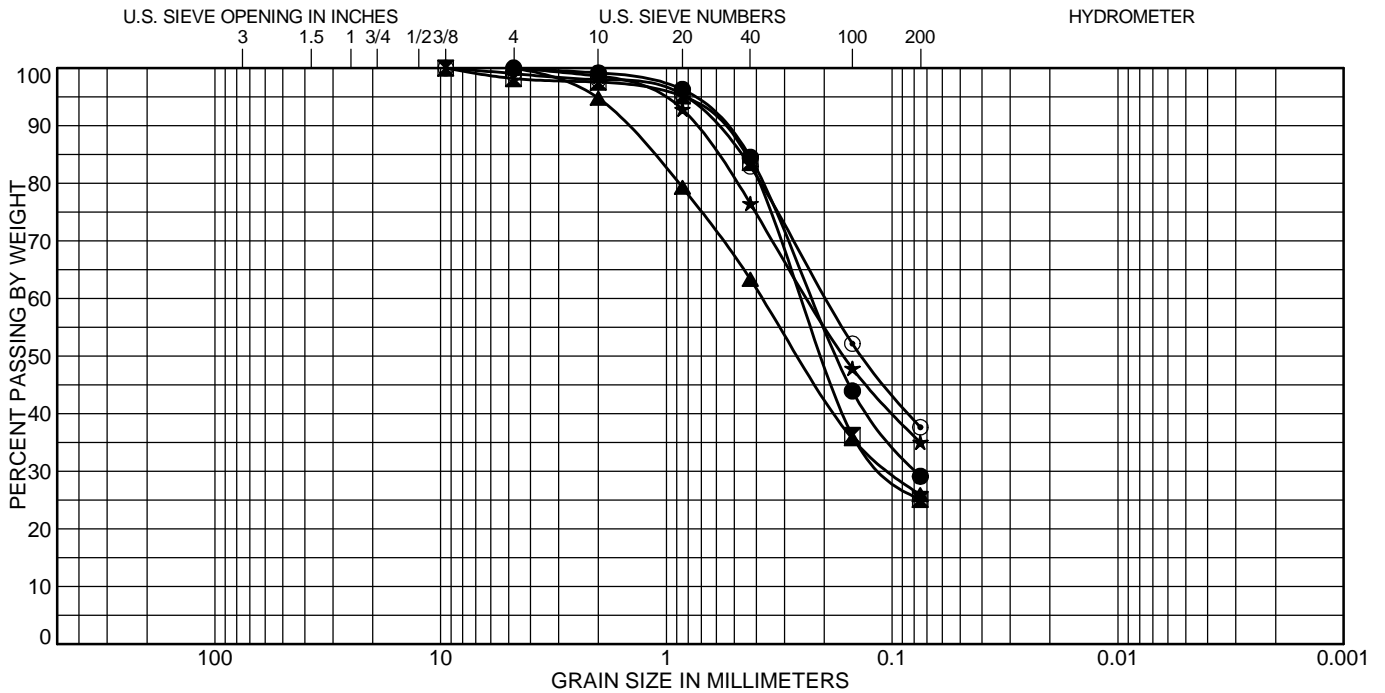
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SUMMARY OF LABORATORY TEST RESULTS

JOB No. 162062
 FIGURE No. 21
 PAGE 5 OF 5
 DATE 4/17/18



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Test Boring	Depth (ft)	Classification	LL	PL	PI
● 111	4.0	SILTY SAND(SM)	NP	NP	NP
☒ 111	9.0	SILTY SAND(SM)	NP	NP	NP
▲ 111	14.0	SILTY SAND(SM)	NP	NP	NP
★ 116	4.0	SILTY SAND(SM)	NP	NP	NP
◎ 116	9.0	SILTY SAND(SM)	NP	NP	NP

Test Boring	Depth (ft)	%Gravel	%Sand	%Silt	%Clay
● 111	4.0	0.0	70.9	29.1	
☒ 111	9.0	1.8	73.1	25.1	
▲ 111	14.0	0.0	74.1	25.9	
★ 116	4.0	0.0	65.0	35.0	
◎ 116	9.0	1.0	61.4	37.6	

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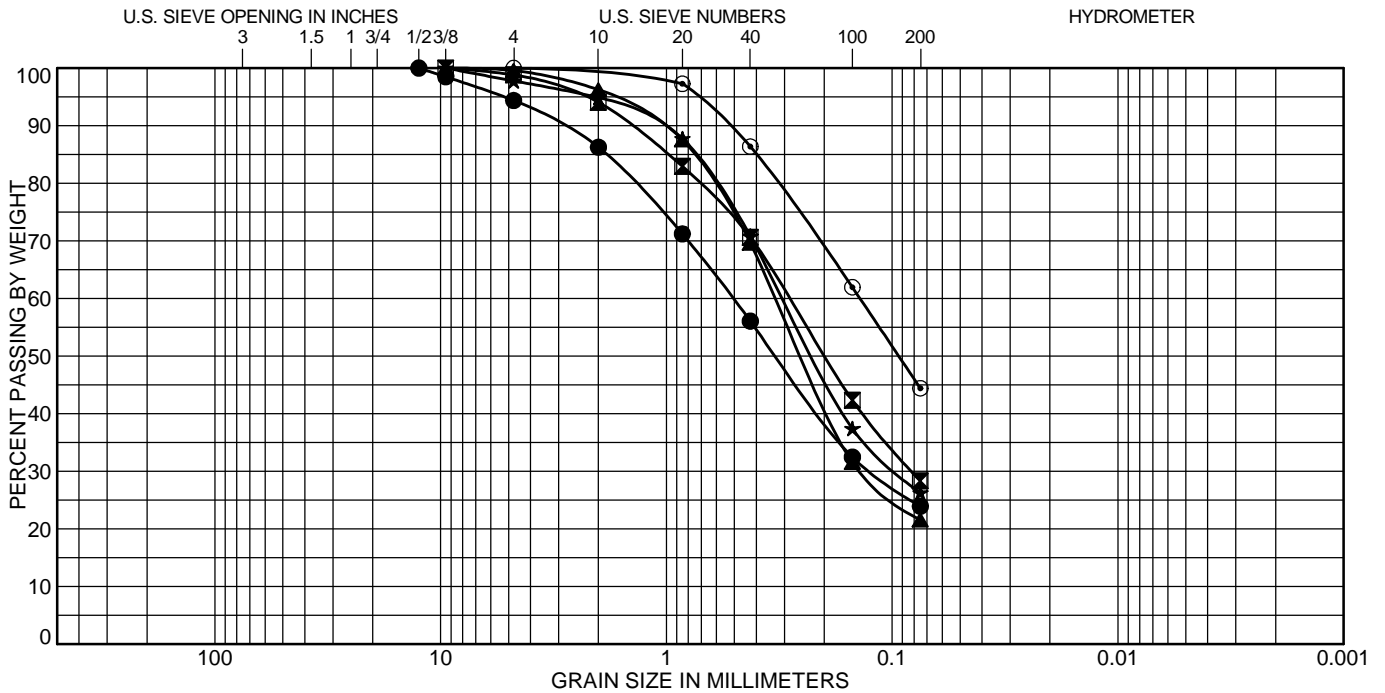
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SOIL CLASSIFICATION DATA

JOB No. 162062

FIGURE No. 22

DATE 4/17/18



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Test Boring	Depth (ft)	Classification	LL	PL	PI
● 122	9.0	SILTY SAND(SM)	NP	NP	NP
⊠ 122	14.0	SILTY SAND(SM)	NP	NP	NP
▲ 124	9.0	SILTY SAND(SM)	NP	NP	NP
★ 124	14.0	SILTY SAND(SM)	NP	NP	NP
⊙ 130	19.0	CLAYEY SAND(SC)	48	21	27

Test Boring	Depth (ft)	%Gravel	%Sand	%Silt	%Clay
● 122	9.0	5.6	70.5	23.9	
⊠ 122	14.0	1.2	70.5	28.3	
▲ 124	9.0	0.4	78.0	21.6	
★ 124	14.0	2.2	71.5	26.3	
⊙ 130	19.0	0.0	55.6	44.4	

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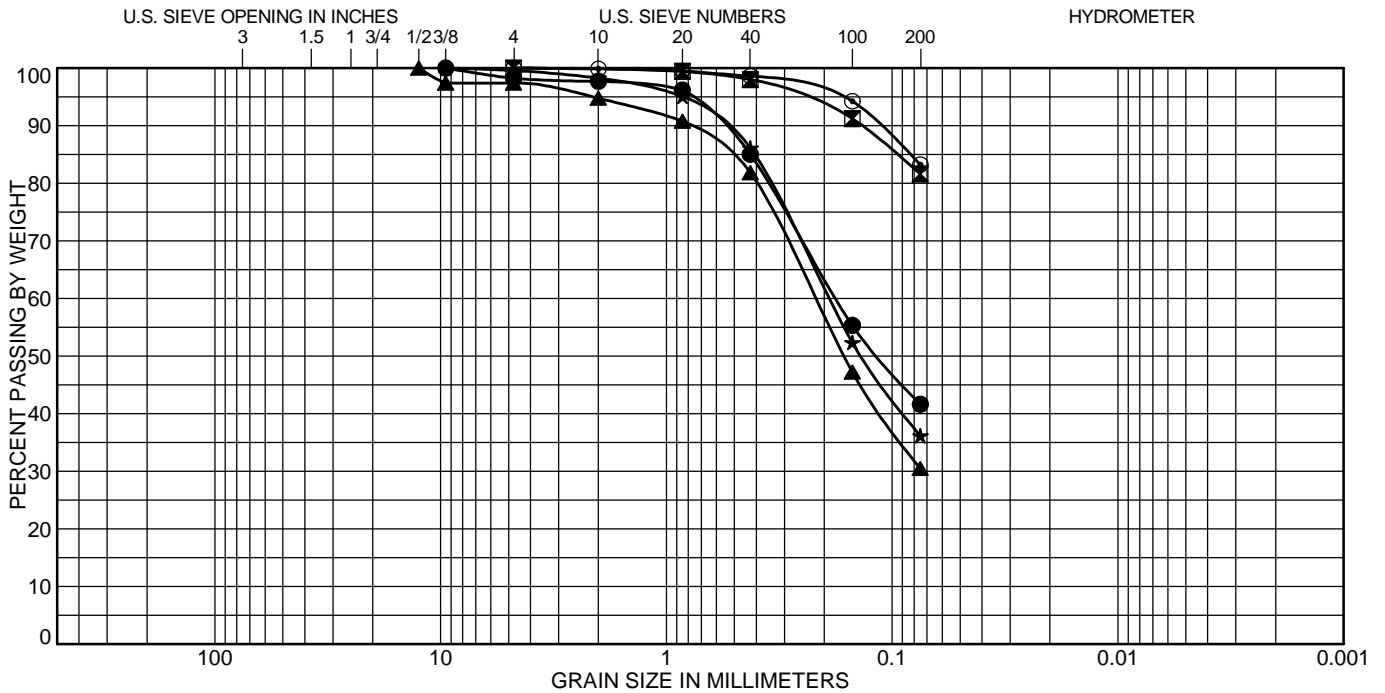
SOUTHERN COLORADO, DENVER METRO, NORTHERN COLORADO

SOIL CLASSIFICATION DATA

JOB No. 162062

FIGURE No. 23

DATE 4/17/18



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Test Boring	Depth (ft)	Classification	LL	PL	PI
● 134	14.0	CLAYEY SAND(SC)	32	18	14
☒ 137	9.0	FAT CLAY with SAND(CH)	66	25	41
▲ 142	4.0	CLAYEY SAND(SC)	36	20	16
★ 142	9.0				
⊙ 142	19.0				

Test Boring	Depth (ft)	%Gravel	%Sand	%Silt	%Clay
● 134	14.0	1.8	56.6	41.6	
☒ 137	9.0	0.0	18.4	81.6	
▲ 142	4.0	2.6	66.9	30.5	
★ 142	9.0	0.4	63.4	36.2	
⊙ 142	19.0	0.0	16.8	83.2	

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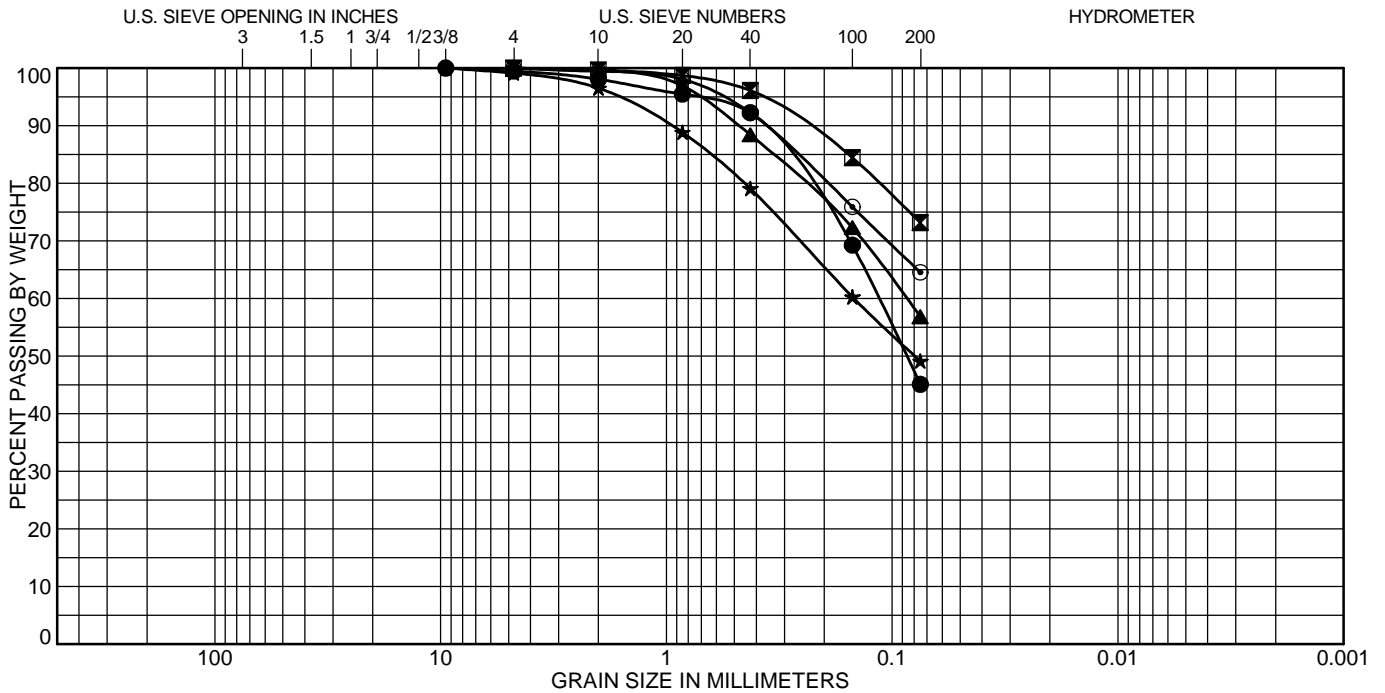
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SOIL CLASSIFICATION DATA

JOB No. 162062

FIGURE No. 24

DATE 4/17/18



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Test Boring	Depth (ft)	Classification	LL	PL	PI
● 145	9.0	CLAYEY SAND(SC)	45	23	22
☒ 147	9.0				
▲ 147	14.0	SANDY LEAN CLAY(CL)	37	18	19
★ 152	4.0	CLAYEY SAND(SC)	33	21	12
⊙ 152	9.0	SANDY FAT CLAY(CH)	58	25	33

Test Boring	Depth (ft)	%Gravel	%Sand	%Silt	%Clay
● 145	9.0	0.5	54.4	45.1	
☒ 147	9.0	0.0	26.9	73.1	
▲ 147	14.0	0.0	43.2	56.8	
★ 152	4.0	0.9	50.0	49.1	
⊙ 152	9.0	0.0	35.5	64.5	

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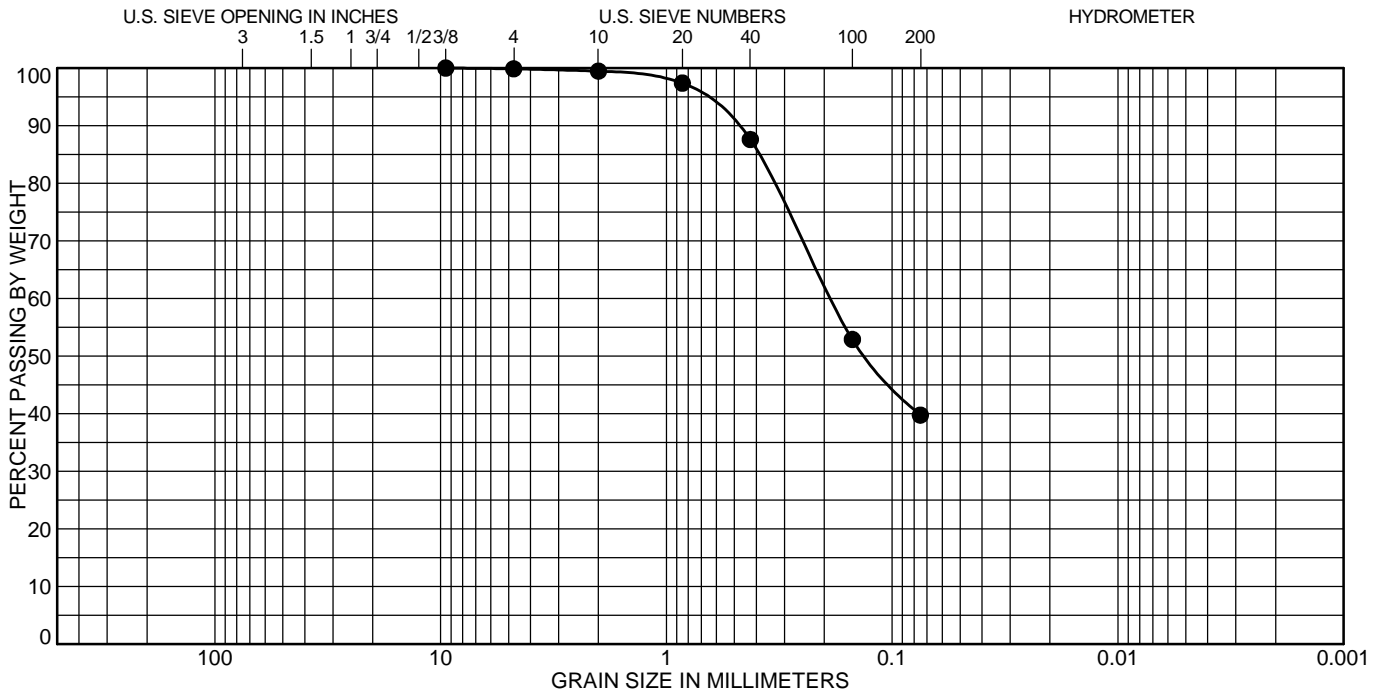
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SOIL CLASSIFICATION DATA

JOB No. 162062

FIGURE No. 25

DATE 4/17/18



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Test Boring	Depth (ft)	Classification	LL	PL	PI
● 157	9.0	SILTY SAND(SM)	NP	NP	NP

Test Boring	Depth (ft)	%Gravel	%Sand	%Silt	%Clay
● 157	9.0	0.1	60.1	39.7	

ROCKY MOUNTAIN GROUP

ARCHITECTS
RMG
ENGINEERS

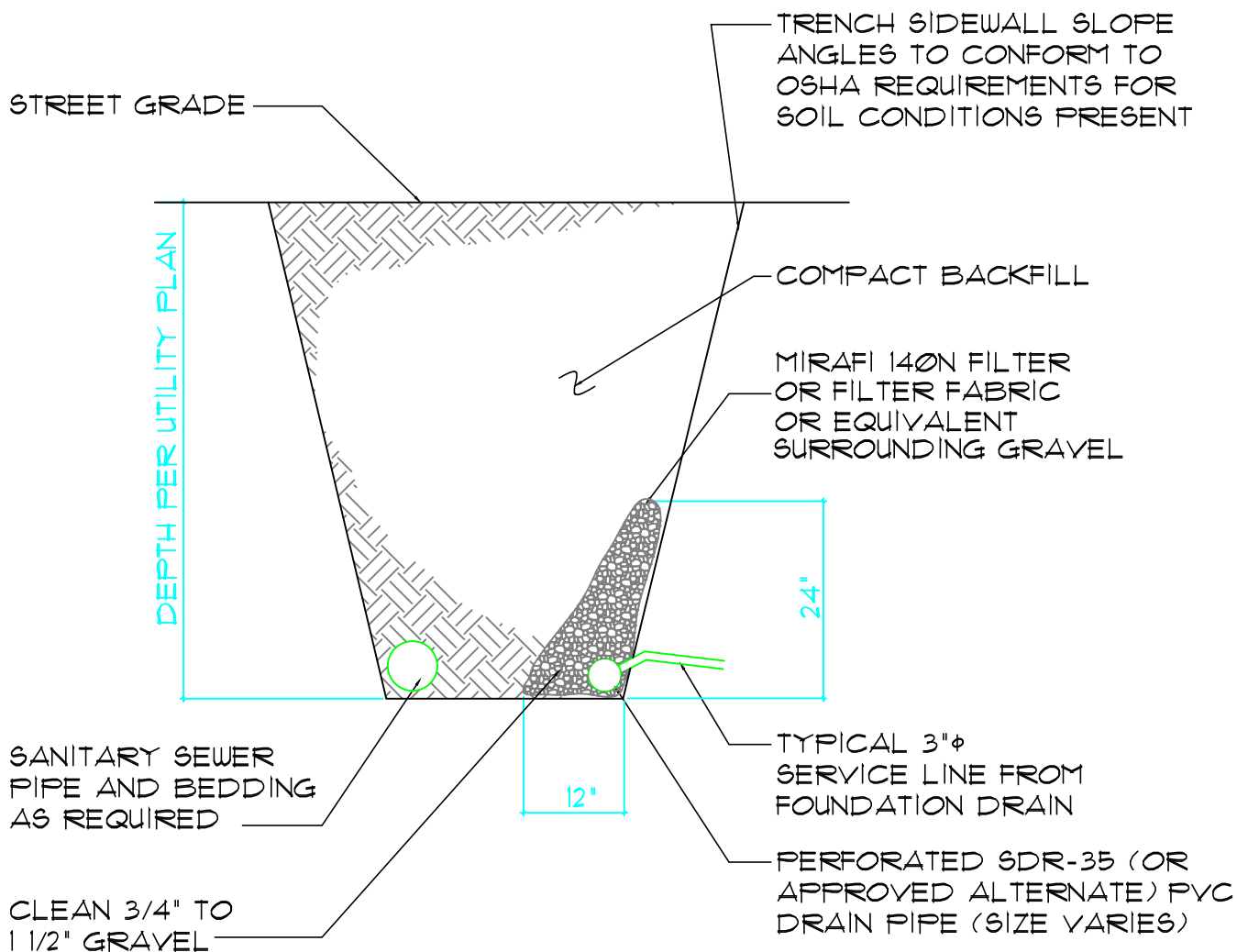
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SOIL CLASSIFICATION DATA

JOB No. 162062
 FIGURE No. 26
 DATE 4/17/18

NOTE: TO BE USED IN CASES WHERE
GROUNDWATER IS FOUND DURING
TRENCHING OR WHERE SHALLOW
GROUNDWATER IS KNOWN TO EXIST



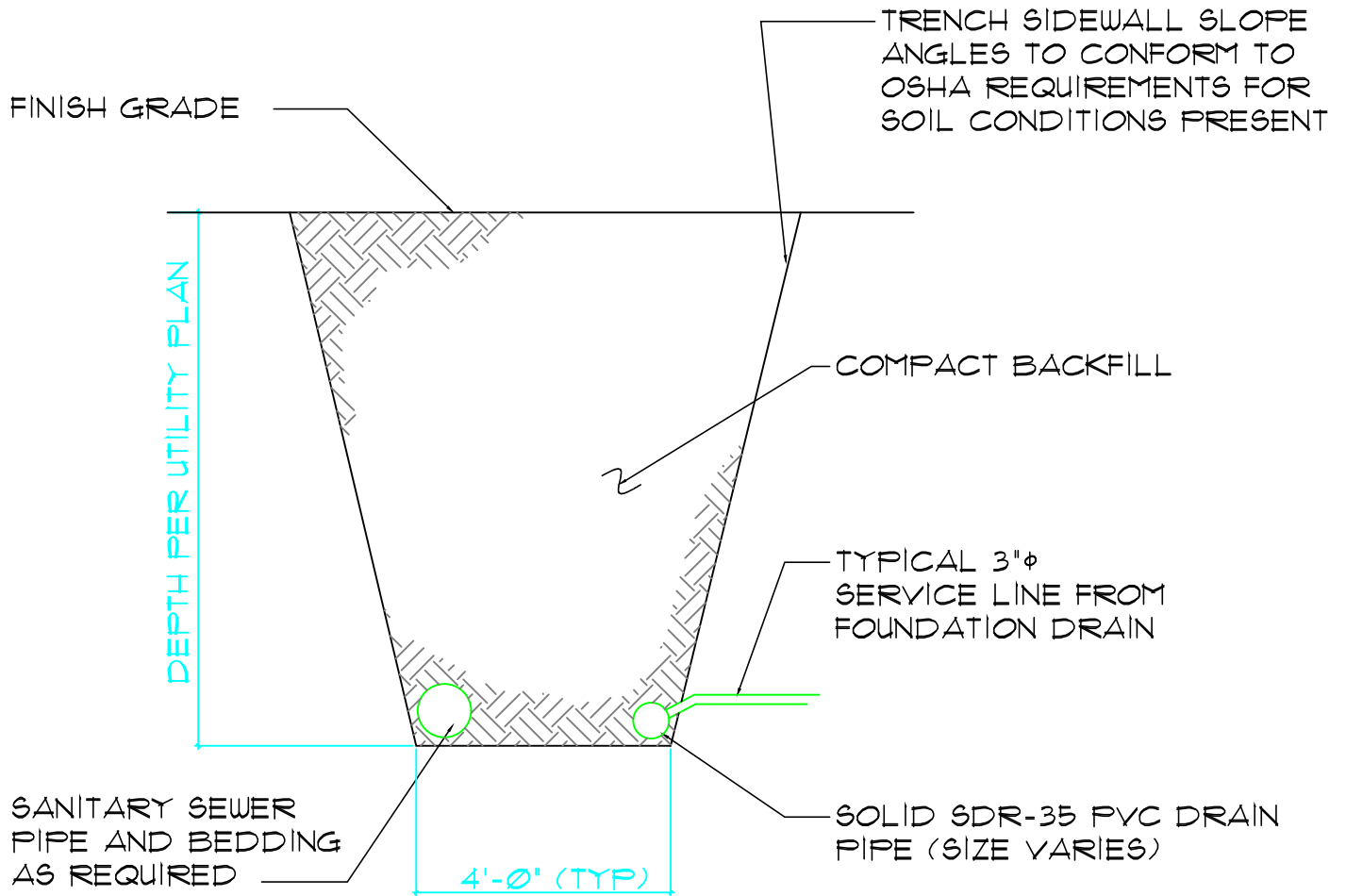
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ACTIVE DRAIN IN
SEWER UTILITY TRENCH

FIG No. 27

NOTE: TO BE USED WHERE NO SHALLOW GROUNDWATER IS KNOWN TO EXIST



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PASSIVE DRAIN IN SANITARY SEWER TRENCH

FIG No. 28

APPENDIX A

Guideline Site Grading Specifications

Description: Unless specified otherwise by local or state regulatory agencies, these guideline specifications are for the excavation, placement and compaction of material from locations indicated on the plans, or staked by the Engineer, as necessary to achieve the required elevations. These specifications shall also apply to compaction of materials that may be placed outside of the project.

General: The Geotechnical Engineer shall approve fill materials, method of placement, moisture contents and percent compactions, and shall give written approval of the compacted fill.

Clearing Site: The Contractor shall remove trees, brush, rubbish, vegetation, topsoil and existing structures before excavation or fill placement is commenced. The Contractor shall dispose of the cleared material to provide the Owner with a clean job site. Cleared material shall not be placed in areas to receive fill or where the material will support structures. Clearing shall also include removal of existing fills that do not meet the requirements of this specification and existing structures.

Preparation of Slopes or Drainage Areas to Receive Fill: Natural slopes or slopes of drainage gullies where grades are 20 percent (5:1, horizontal to vertical) or steeper shall be benched prior to fill placement. Benches shall be at least 10 feet wide. Benches may require additional width to accommodate excavation or compaction equipment. At least one bench shall be provided for each 4 feet or less of vertical elevation difference. The bench surface shall be essentially horizontal perpendicular to the slope or at a slight incline into the slope.

Scarifying: Topsoil and vegetation shall be removed from the ground surface in areas to receive fill. The surface shall be plowed or scarified a minimum of 12 inches until the surface is free from ruts, hummocks or other uneven features which would prevent uniform compaction by the equipment to be used.

Compacting Area to Receive Fill: After the area to receive fill has been cleared and scarified, it shall be disked or bladed until it is free from large clods, moisture conditioned to proper moisture content and compacted to the maximum density as specified for the overlying fill. Areas to receive fill shall be worked, stabilized, or removed and replaced, if necessary, in accordance with the Geotechnical Engineer's recommendations in preparation for fill.

Fill Materials: Fill material shall be free from organic material or other deleterious substances, and shall not contain rocks or lumps having a diameter greater than six inches. Fill materials shall be obtained from cut areas shown on the plans or staked in the field by the Engineer or imported to the site and shall be approved by the Geotechnical Engineer prior to placement. It is recommended that the fill materials have nil to low expansion potential, i.e., consist of silty to slightly clayey sand.

Moisture Content: Fill materials shall be moisture conditioned to within limits of optimum moisture content specified. Sufficient laboratory compaction tests shall be made to determine the optimum moisture content for the various soils encountered in borrow areas or imported to the site.

The contractor may be required to add moisture to the excavation materials in the borrow area if, in the opinion of the Geotechnical Engineer, it is not possible to obtain uniform moisture content by adding water to the fill material during placement. The Contractor may be required to rake or disk the fill soils to provide uniform moisture content through the soils.

The application of water to embankment materials shall be made with watering equipment, approved by the Geotechnical Engineer, which will give the desired results. Water jets from the spreader shall not be directed at the embankment with such force that fill materials are eroded.

Should too much water be added to the fill, such that the material is too wet to permit the desired compaction to be obtained, compacting and work on that section of the fill shall be delayed until the material has been allowed to dry to the required moisture content. The Contractor will be permitted to rework the wet material in an approved manner to hasten its drying.

Compaction of Fill Areas: Selected fill material shall be placed and mixed in evenly spread layers. After each fill layer has been placed, it shall be uniformly compacted to not less than the specified percentage of maximum density. Fill materials shall be placed such that the thickness of loose material does not exceed 10 inches and the compacted lift thickness does not exceed 6 inches.

Compaction, as specified above, shall be obtained by the use of sheepsfoot rollers, multiple-wheel pneumatic-tired rollers, or other equipment approved by the Geotechnical Engineer. Granular fill shall be compacted using vibratory equipment or other equipment approved by the Geotechnical Engineer. Compaction shall be accomplished while the fill material is at the specified moisture content. Compaction of each layer shall be continuous over the entire area.

Moisture Content and Density Criteria:

- A. For on-site, structural fills and fills supporting utilities, roadways and buildings, 95% maximum Standard Proctor dry density at 2% \pm of optimum moisture content.
- B. For imported, granular, structural fills and granular fills supporting utilities, roadways and buildings, 90% maximum Modified Proctor dry density at 2% \pm of optimum moisture content.
- C. For general grading fills, 92% maximum Standard Proctor dry density at 2% \pm of optimum moisture content.

Compaction of Slopes: Fill slopes shall be compacted by means of sheepsfoot rollers or other suitable equipment. Compaction operations shall be continued until slopes are stable, but not too dense for planting, and such that there is no appreciable amount of loose soil on the slopes. Compaction of slopes may be done progressively in increments of three to five feet in height or after the fill is brought to its total height. Permanent fill slopes shall not exceed 3:1 (horizontal to vertical).

Density Testing: Field density testing shall be performed by the Geotechnical Engineer at locations and depths of his choosing. Where sheepsfoot rollers are used, the soil may be disturbed to a depth of several inches. Density tests shall be taken in compacted material below the disturbed surface. When density tests indicate the density or moisture content of any layer of fill or portion thereof is below that required, the particular layer or portion shall be reworked until the required density or moisture content has been achieved.

Observation and Testing of Fill: Observation by the Geotechnical Engineer shall be sufficient during the placement of fill and compaction operations so that he can declare the fill was placed in general conformance with Specifications. All observations necessary to test the placement of fill and observe compaction operations will be at the expense of the Owner.

Seasonal Limits: No fill material shall be placed, spread or rolled while it is frozen, thawing, or during unfavorable weather conditions. When work is interrupted by heavy precipitation, fill operations shall not be resumed until the Geotechnical Engineer indicates the moisture content and density of previously placed materials are as specified.

Reporting of Field Density Tests: Density tests made by the Geotechnical Engineer shall be submitted progressively to the Owner. Dry density, moisture content, percent compaction, and approximate location shall be reported for each test taken.

APPENDIX B

Geotechnical Report Update Number 1

Dated July 20, 2018

Reissued February 5, 2019

Architecture
Structural
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Materials Testing
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Civil/Planning

**ROCKY MOUNTAIN GROUP
EMPLOYEE OWNED**

Job No. 162062

July 20, 2018

Reissued February 5, 2019

Todd Stephens
Windsor Ridge Homes
4164 Austin Bluffs Parkway, #361
Colorado Springs, CO 80918

Re: Addendum to Subsurface Soil Investigation
Windermere Subdivision
North Carefree Circle and Marksheffel Road
El Paso County, Colorado

Dear Mr. Stephens,

As requested, RMG – Rocky Mountain Group completed a subsurface soil investigation for the referenced project. The findings, conclusions and recommendations of our investigation were presented in our geotechnical report, entitled

*Preliminary Subsurface Soil Investigation
Windermere Subdivision
RMG Job No.: 162062
Dated: April 17, 2018*

Subsequent to submitting the referenced report of our previous investigation additional soil test borings were requested. RMG drilled an additional nine (9) locations across the site and performed laboratory testing on soil samples.

Similar subsurface conditions as reported previously were encountered. The site is characterized by overburden sands and sandstone with interbedded layers of sandy clay and claystone. All described soils are found at varying depths across the site. Groundwater was not encountered in any of the soil test borings.

As before, a primary objective of the investigation was to identify the limits of easily excavatable soil, categorized as the depths at which hard blue sandstone bedrock would be encountered. Figure 2.1 of the referenced report presented our estimated depths. Figure 2.1 has been updated and revised to reflect the depth of easily excavatable soil encountered in the current round of test borings. Revised Figure 2.1 is attached to this letter report.

All findings, conclusions and recommendations presented in the report referenced above and not specifically addressed in this letter remain valid for the site.

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Monument: 719.488.2145
Woodland Park: 719.687.6077

www.rmgengineers.com

Should you have questions, please do not hesitate to call.

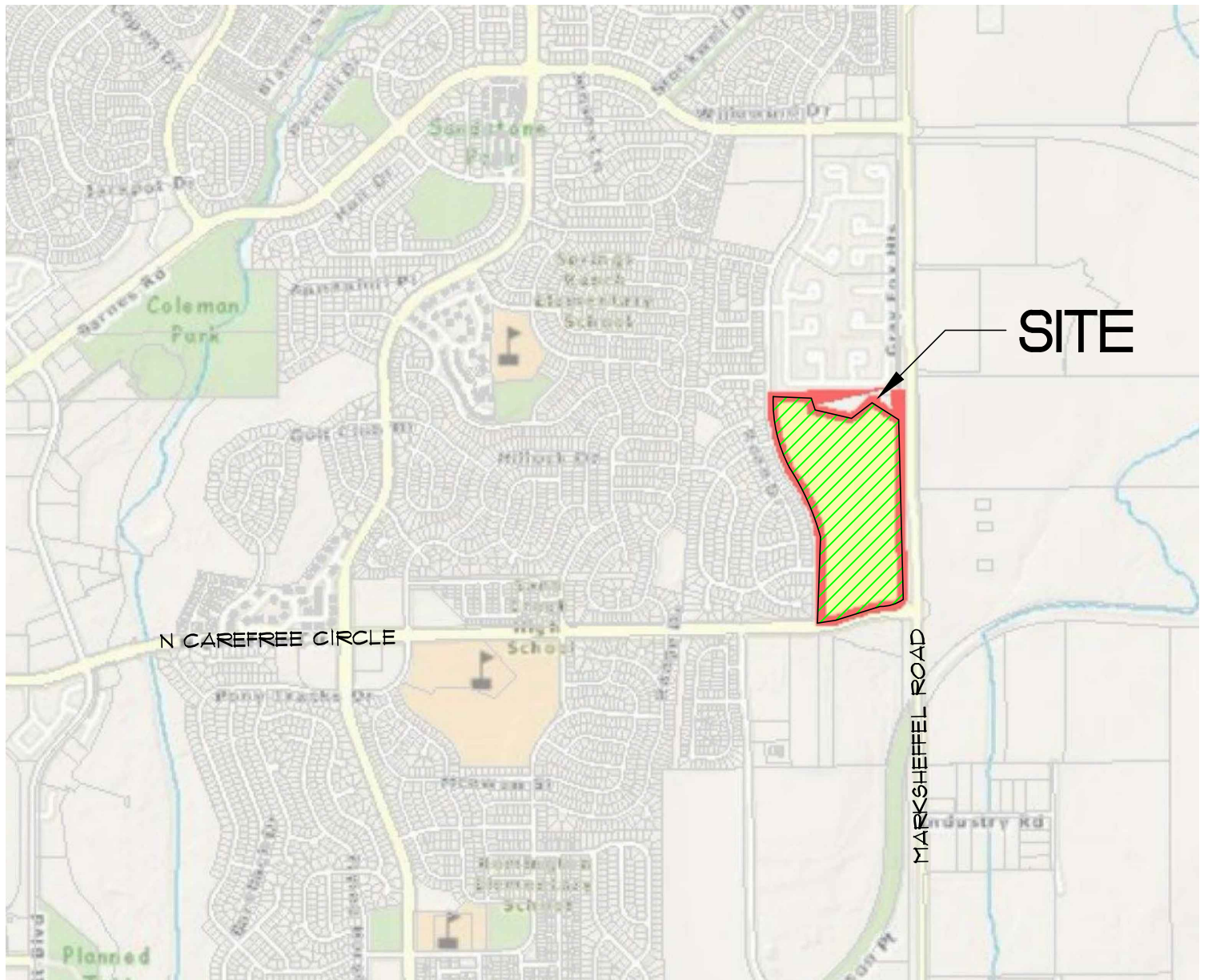
Cordially,

RMG – Rocky Mountain Group

Geoff Webster, P.E.
Sr. Geotechnical Project Manager



Attachments



SITE

N CAREFREE CIRCLE

MARKSHEFFEL ROAD



REFERENCE
NOT TO SCALE

SITE VICINITY MAP



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**WINDERMERE SUBDIVISION
COLORADO SPRINGS, CO
WINDSOR RIDGE HOMES**

JOB No. 162062

FIG No. 1

DATE 7-20-2018



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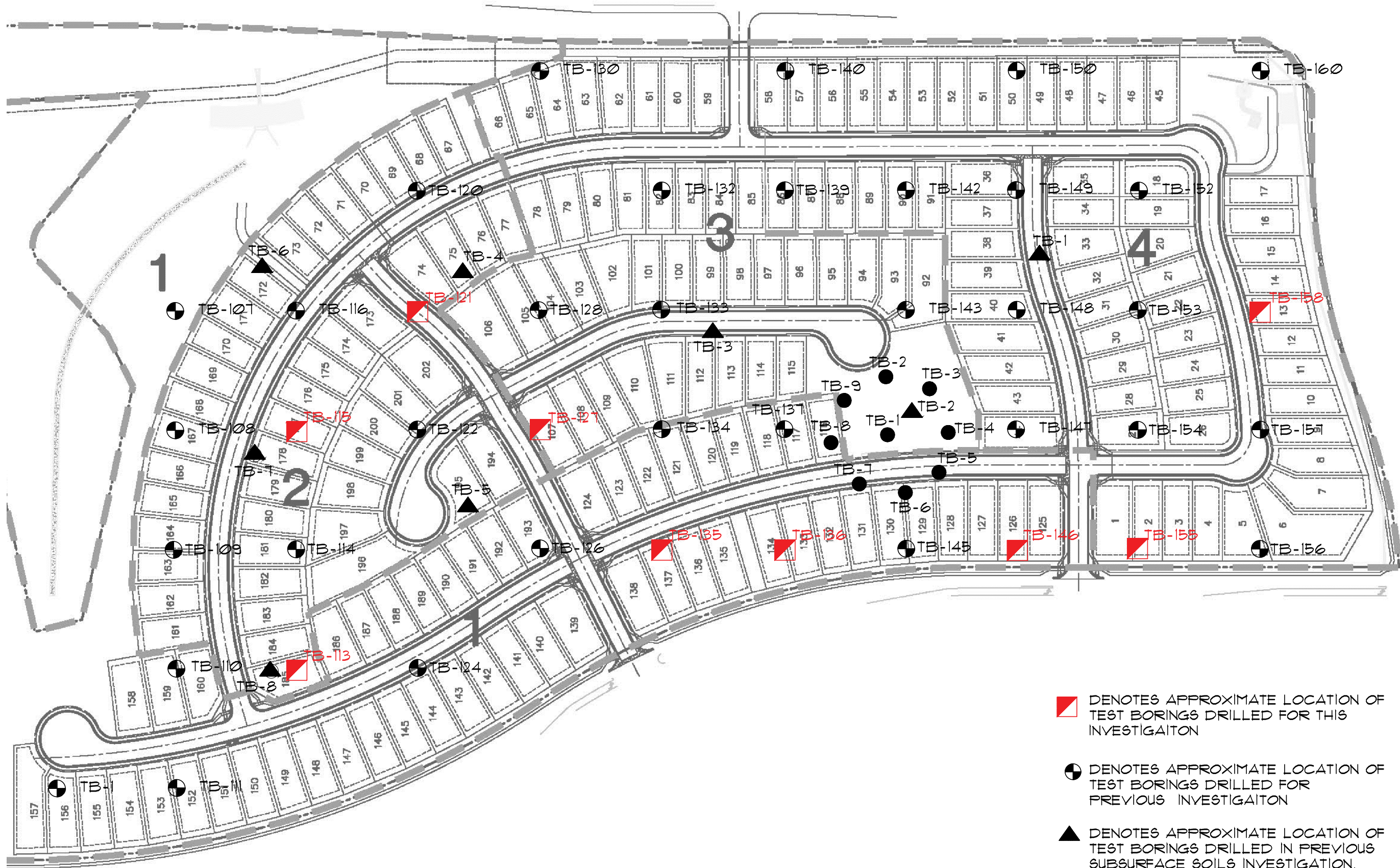
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Pueblo / Canon City:
(719) 544-7750



◻ DENOTES APPROXIMATE LOCATION OF TEST BORINGS DRILLED FOR THIS INVESTIGATION

⊙ DENOTES APPROXIMATE LOCATION OF TEST BORINGS DRILLED FOR PREVIOUS INVESTIGATION

▲ DENOTES APPROXIMATE LOCATION OF TEST BORINGS DRILLED IN PREVIOUS SUBSURFACE SOILS INVESTIGATION, JOB NO. 142206, DATED MAY 28, 2015

● DENOTES APPROXIMATE LOCATION OF TEST BORINGS DRILLED IN PREVIOUS SUBSURFACE SOILS INVESTIGATION, JOB NO. 142206, DATED MARCH 5, 2014



NOT TO SCALE

WINDERMERE SUBDIVISION
COLORADO SPRINGS, CO
WINDSOR RIDGE HOMES

ENGINEER:	GW
DRAWN BY:	BG
CHECKED BY:	GW
ISSUED:	4-17-18
REVISION:	DATE: JOB #

TEST BORING
LOCATION PLAN

SHEET No.
FIG-2



KEY
 X= DEPTH TO HARD SANDSTONE UP TO 50 BLOWS PER 3 INCHES
 Y= DEPTH TO HARD SANDSTONE GREATER THAN 50 BLOWS PER 3 INCHES

▲ DENOTES LOCATIONS DRILLED
 RMG SSI 142206 dated March 5, 2014

LOCATION	DEPTH(ft) TO HARD SANDSTONE UP TO < 50/3"	DEPTH(ft) TO HARD SANDSTONE > 50/3"	TOTAL DEPTH OF TEST BORING
TB-1	14	24	24
TB-2	19	49	49
TB-3	5	19	19
TB-4	4	19	19
TB-5	20	24	24
TB-6	> 20	> 20	20
TB-7	14	24	24
TB-8	16	> 20	20

● DENOTES LOCATIONS DRILLED
 RMG SSI 142206 dated May 28, 2015

LOCATION	DEPTH(ft) TO HARD SANDSTONE UP TO 50/3"	DEPTH(ft) TO HARD SANDSTONE > 50/3"	TOTAL DEPTH OF TEST BORING
TB-1	17	17	20
TB-2	6	6	20
TB-3	> 20	> 20	20
TB-4	> 20	> 20	20
TB-5	> 20	> 20	20
TB-6	13	13	20
TB-7	16	17	20
TB-8	9	27	20
TB-9	12	12	20

● DENOTES LOCATIONS DRILLED
 RMG PSSI 162062 dated April XX, 2018

LOCATION	DEPTH(ft) TO HARD SANDSTONE UP TO 50/3"	DEPTH(ft) TO HARD SANDSTONE > 50/3"	TOTAL DEPTH OF TEST BORING
100	6	25	30
107	>20	>20	20
108	>25	>25	25
109	19	>30	30
110	42	46	47
111	27	27	30
114	16	>20	20
116	6	9	20
120	>20	>20	20
122	>20	>20	20
124	>20	>20	20
126	22	22	25
128	11	19	25
130	>20	>20	20
132	9	9	25
133	9	9	30
134	SURFACE	SURFACE	30
137	SURFACE	20	30
139	>10	>10	10
140	16	>20	20
142	21	21	30
143	14	20	30
145	13	13	15
147	SURFACE	20	40
148	9	20	40
149	14	14	30
150	14	>20	20
152	9	15	20
153	6	6	20
154	18	18	30
156	11	15	30
157	6	9	20
160	>15	>15	15







▲ DENOTES LOCATIONS DRILLED
 RMG PSSI 162062 dated July 20, 2018

LOCATION	DEPTH(ft) TO HARD SANDSTONE UP TO 50/3"	DEPTH(ft) TO HARD SANDSTONE > 50/3"	TOTAL DEPTH OF TEST BORING
113	19	>25	25
115	15	>20	20
121	10	>15	15
127	10	15	15
135	5	>15	15
136	10	15	15
146	SURFACE	>25	25
155	SURFACE	>20	20
158	5	>25	25

DEPTHS TO HARD SANDSTONE
 PRELIMINARY SET







ARCH/ENG:	GGW	
DRAWN:	CXM	
CHECKED:	GGW	
DATE:	1-30-2019	
#	REVISION	DATE
JOB NO.:	162062	
SHEET NO.:	FG-2.1	
1 of 1		

SOILS DESCRIPTION

-  CLAYSTONE
-  FILL: SAND, SILTY TO CLAYEY
-  SANDSTONE
-  SANDY CLAY
-  SILTY SAND
-  SILTY TO CLAYEY SAND

UNLESS NOTED OTHERWISE, ALL LABORATORY TESTS PRESENTED HEREIN WERE PERFORMED BY:
 RMG - ROCKY MOUNTAIN GROUP
 2910 AUSTIN BLUFFS PARKWAY
 COLORADO SPRINGS, COLORADO

SYMBOLS AND NOTES

-  XX STANDARD PENETRATION TEST - MADE BY DRIVING A SPLIT-BARREL SAMPLER INTO THE SOIL BY DROPPING A 140 LB. HAMMER 30", IN GENERAL ACCORDANCE WITH ASTM D-1586. NUMBER INDICATES NUMBER OF HAMMER BLOWS PER FOOT (UNLESS OTHERWISE INDICATED).
-  XX UNDISTURBED CALIFORNIA SAMPLE - MADE BY DRIVING A RING-LINED SAMPLER INTO THE SOIL BY DROPPING A 140 LB. HAMMER 30", IN GENERAL ACCORDANCE WITH ASTM D-3550. NUMBER INDICATES NUMBER OF HAMMER BLOWS PER FOOT (UNLESS OTHERWISE INDICATED).
-  FREE WATER TABLE
-  DEPTH AT WHICH BORING CAVED
-  BULK DISTURBED BULK SAMPLE
-  AUG AUGER "CUTTINGS"
- 4.5 WATER CONTENT (%)

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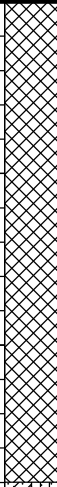

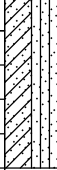
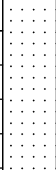










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EXPLANATION OF TEST BORING LOGS

JOB No. 162062

FIGURE No. 3

DATE 7/20/18

TEST BORING: 113 DATE DRILLED: 6/5/18 ELEVATION (FT): 6621.18 NO GROUNDWATER ON 6/5/18	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %	TEST BORING: 115 DATE DRILLED: 6/5/18 ELEVATION (FT): 6593.73 NO GROUNDWATER ON 6/5/18	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
FILL: SAND, SILTY TO CLAYEY, brown to gray with rust staining, medium dense, moist	5		-	15	17.0	SAND, SILTY TO CLAYEY, brown, loose to medium dense, moist	5		-	8	12.5
SAND, SILTY TO CLAYEY, tan to brown, loose, moist	10		-	12	12.0	SANDSTONE, SILTY TO CLAYEY, brown, very hard, moist	10		-	12	11.6
SAND, SILTY TO CLAYEY, tan to brown, loose, moist	15		-	9	8.7		15		-	50/6"	8.1
SANDSTONE, SILTY TO CLAYEY, tan to brown, very hard, moist	20		-	50/6"	11.9		20		-	-	10.5
	25		-	50/5"	15.2				-		
CLAYSTONE, SANDY, dark brown, moist	30		-	50/7"	23.3				-		
SANDSTONE, SILTY, blue, very hard, moist	35		-	50/5"	21.3				-		

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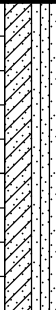





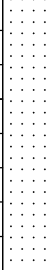

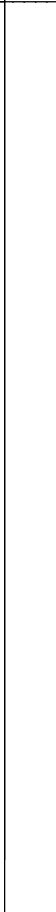



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TEST BORING LOG

JOB No. 162062

FIGURE No. 4

DATE 7/20/18

TEST BORING: 121 DATE DRILLED: 6/5/18 ELEVATION (FT): 6588.90 NO GROUNDWATER ON 6/5/18	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %	TEST BORING: 127 DATE DRILLED: 6/4/18 ELEVATION (FT): 6597.33 NO GROUNDWATER ON 6/4/18	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
SAND, SILTY TO CLAYEY, brown, loose, moist	5			6	9.2	CLAY, SANDY, light brown, medium stiff, moist	5			8	18.6
SANDSTONE, SILTY TO CLAYEY, brown, very hard, moist	10			50/3"	12.8	SANDSTONE, SILTY, light brown, dense, moist	10			50/4"	13.9
	15				12.6		15			50/2"	10.1

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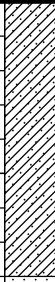





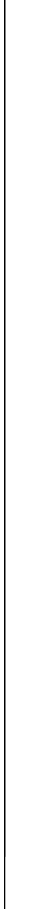

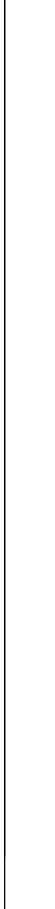

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TEST BORING LOG

JOB No. 162062

FIGURE No. 5

DATE 7/20/18

TEST BORING: 135 DATE DRILLED: 6/4/18 ELEVATION (FT): 6602.71 NO GROUNDWATER ON 6/4/18	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %	TEST BORING: 136 DATE DRILLED: 6/4/18 ELEVATION (FT): 6610.43 NO GROUNDWATER ON 6/4/18	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
SAND, SILTY, brown, medium dense, moist	5			10	22.3	CLAY, SANDY, brown, stiff, moist	5			11	16.7
SANDSTONE, SILTY, light brown, dense, moist	10			50/3"	14.6	SANDSTONE, SILTY, light brown, dense, moist	10			50/3"	11.6
	15			50/3"	15.0		15			50/2"	13.6

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TEST BORING LOG

JOB No. 162062

FIGURE No. 6

DATE 7/20/18

TEST BORING: 146 DATE DRILLED: 6/4/18 ELEVATION (FT): 6614.75 NO GROUNDWATER ON 6/4/18	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %	TEST BORING: 155 DATE DRILLED: 6/4/18 ELEVATION (FT): 6608.44 NO GROUNDWATER ON 6/4/18	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
SANDSTONE, SILTY, light brown, dense, moist	5			50/8"	12.2	SANDSTONE, SILTY, light brown, dense, moist	5			50/6"	12.4
CLAYSTONE, SANDY, brown, hard, moist	10			50/8"	19.1	CLAYSTONE, SANDY, brown, hard, moist	10			40	28.1
SANDSTONE, SILTY, light brown, dense, moist	15			50/9"	24.3	SANDSTONE, SILTY, light brown, dense, moist	15			50/8"	24.4
SANDSTONE, SILTY, light brown, dense, moist	20			50/6"	19.0	SANDSTONE, SILTY, light brown, dense, moist	20			50/4"	15.1
CLAYSTONE, SANDY, olive and brown, hard, moist	25			32	25.3						

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TEST BORING LOG

JOB No. 162062

FIGURE No. 7

DATE 7/20/18

TEST BORING: 158 DATE DRILLED: 6/4/18 ELEVATION (FT): 6584.40 NO GROUNDWATER ON 6/4/18	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
SAND, SILTY, brown, medimu dense, moist	5			15	9.9
SANDSTONE, SILTY, brown, dense, moist	10			50/3"	9.4
CLAYSTONE, SANDY, olive and brown, hard, moist	15				21.3
CLAYSTONE, SANDY, blue and gray, hard, moist	20			50/9"	23.9
	25			50/4"	20.0

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TEST BORING LOG

JOB No. 162062

FIGURE No. 8

DATE 7/20/18

Test Boring No.	Depth	Water Content (%)	Dry Density (pcf)	Liquid Limit	Plasticity Index	% Retained No.4 Sieve	% Passing No. 200 Sieve	% Swell/ Collapse	FHA Expansion Pressure (psf)	RMG Soil Type
113	4.0	17.0		42	16		30.4			
113	9.0	12.0								
113	14.0	8.7								
113	19.0	11.9								
113	24.0	15.2								
113	29.0	23.3								
113	34.0	21.3								
115	4.0	12.5								
115	9.0	11.6		34	11		36.5			
115	14.0	8.1								
115	19.0	10.5								
121	4.0	9.2								
121	9.0	12.8		40	14	0.8	38.6	- 0.2		
121	14.0	12.6								
127	4.0	18.6		NP	NP		57.7			
127	9.0	13.9								
127	14.0	10.1								
135	4.0	22.3								
135	9.0	14.6		NP	NP		19.9			
135	14.0	15.0								
136	4.0	16.7		NP	NP		59.6			
136	9.0	11.6								
136	14.0	13.6								
146	4.0	12.2								
146	9.0	19.1		47	18		52.7	1.2		
146	14.0	24.3								
146	19.0	19.0								
146	24.0	25.3								
155	4.0	12.4								
155	9.0	28.1								
155	14.0	24.4		64	26		56.7	0.7		
155	19.0	15.1								
158	4.0	9.9								
158	9.0	9.4								

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SUMMARY OF LABORATORY TEST RESULTS

JOB No. 162062
FIGURE No. 9
PAGE 1 OF 2
DATE 7/20/18



Test Boring No.	Depth	Water Content (%)	Dry Density (pcf)	Liquid Limit	Plasticity Index	% Retained No.4 Sieve	% Passing No. 200 Sieve	% Swell/ Collapse	FHA Expansion Pressure (psf)	RMG Soil Type
158	14.0	21.3								
158	19.0	23.9		58	21		60.3	0.7		
158	24.0	20.0								



ROCKY MOUNTAIN GROUP

ARCHITECTS
RMG
ENGINEERS

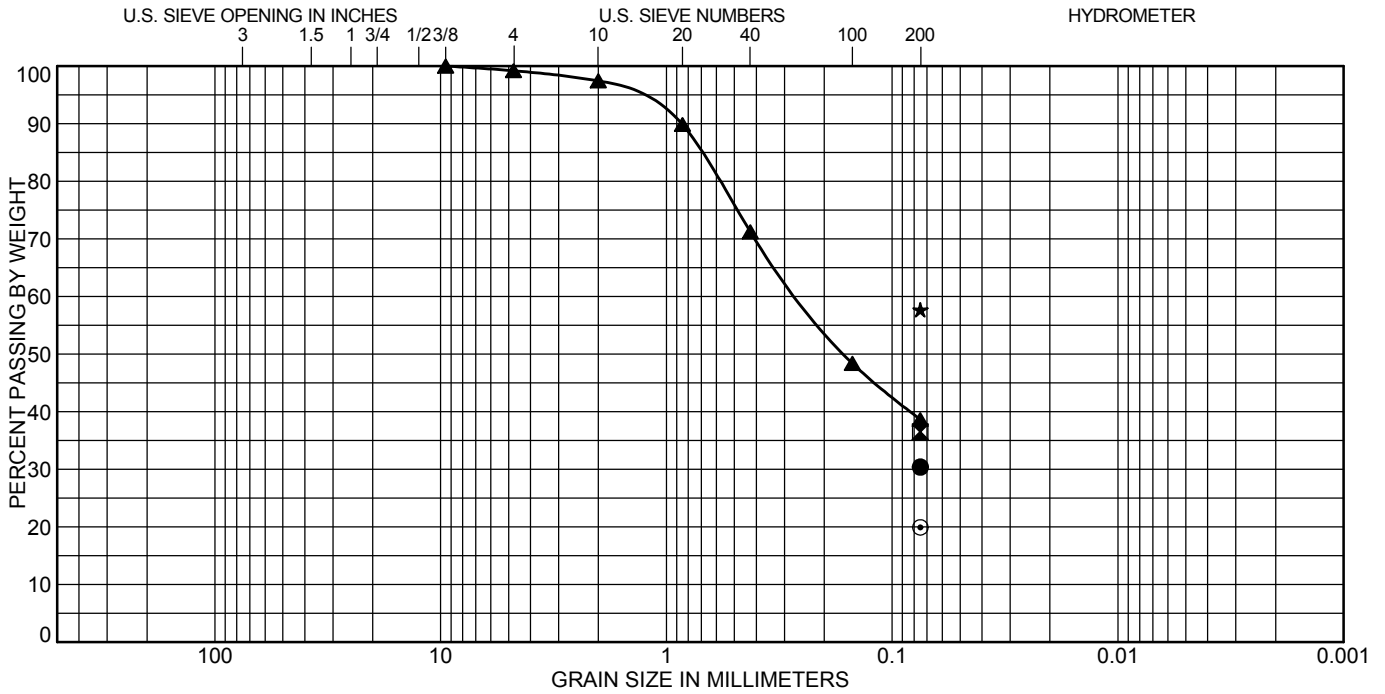
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**SUMMARY OF
LABORATORY TEST
RESULTS**

JOB No. 162062
FIGURE No. 9
PAGE 2 OF 2
DATE 7/20/18



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Test Boring	Depth (ft)	Classification	LL	PL	PI
● 113	4.0	SILTY SAND(SM)	42	26	16
☒ 115	9.0	CLAYEY SAND(SC)	34	23	11
▲ 121	9.0	SILTY SAND(SM)	40	26	14
★ 127	4.0	SANDY SILT(ML)	NP	NP	NP
⊙ 135	9.0	SILTY SAND(SM)	NP	NP	NP

Test Boring	Depth (ft)	%Gravel	%Sand	%Silt	%Clay
● 113	4.0			30.4	
☒ 115	9.0			36.5	
▲ 121	9.0	0.8	60.5	38.6	
★ 127	4.0			57.7	
⊙ 135	9.0			19.9	

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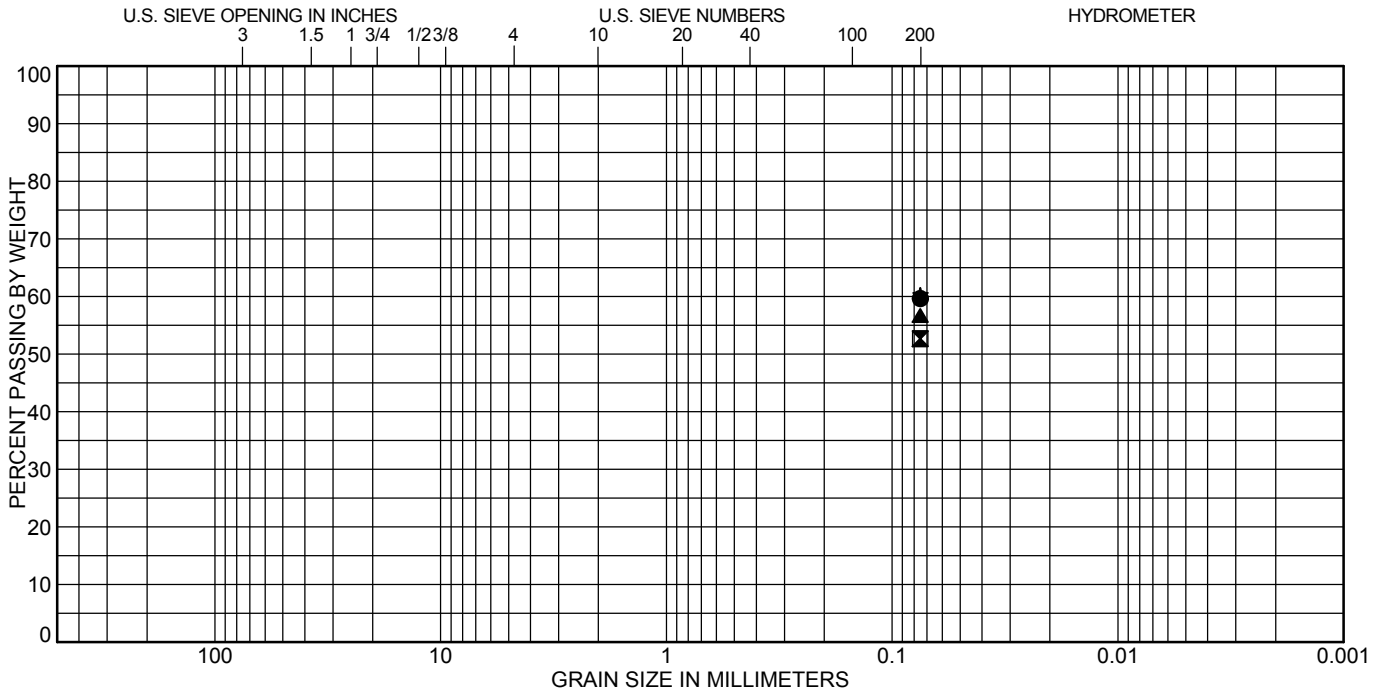
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SOIL CLASSIFICATION DATA

JOB No. 162062

FIGURE No. 10

DATE 7/20/18



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Test Boring	Depth (ft)	Classification	LL	PL	PI
● 136	4.0	SANDY SILT (ML)	NP	NP	NP
☒ 146	9.0	SANDY SILT (ML)	47	29	18
▲ 155	14.0	SANDY ELASTIC SILT (MH)	64	38	26
★ 158	19.0	SANDY ELASTIC SILT (MH)	58	37	21

Test Boring	Depth (ft)	%Gravel	%Sand	%Silt	%Clay
● 136	4.0			59.6	
☒ 146	9.0			52.7	
▲ 155	14.0			56.7	
★ 158	19.0			60.3	

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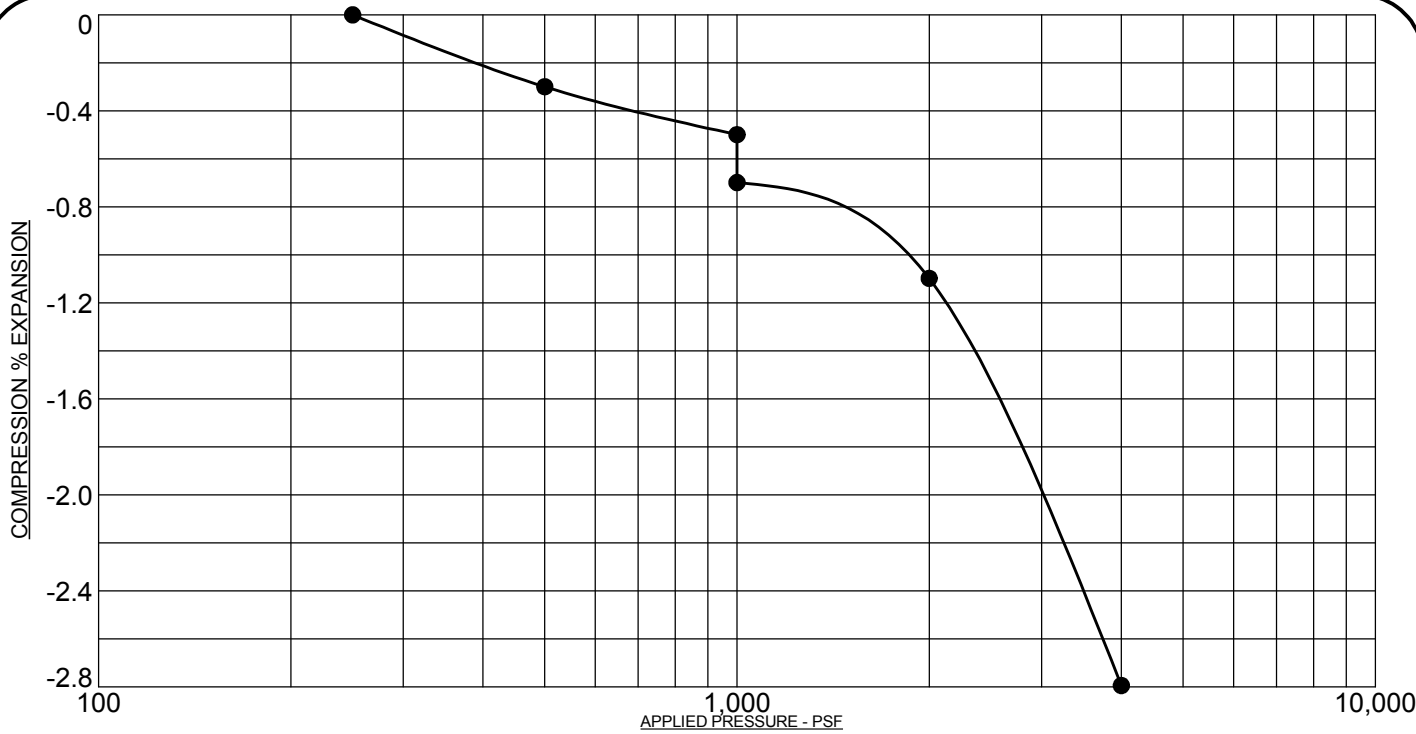
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SOIL CLASSIFICATION DATA

JOB No. 162062

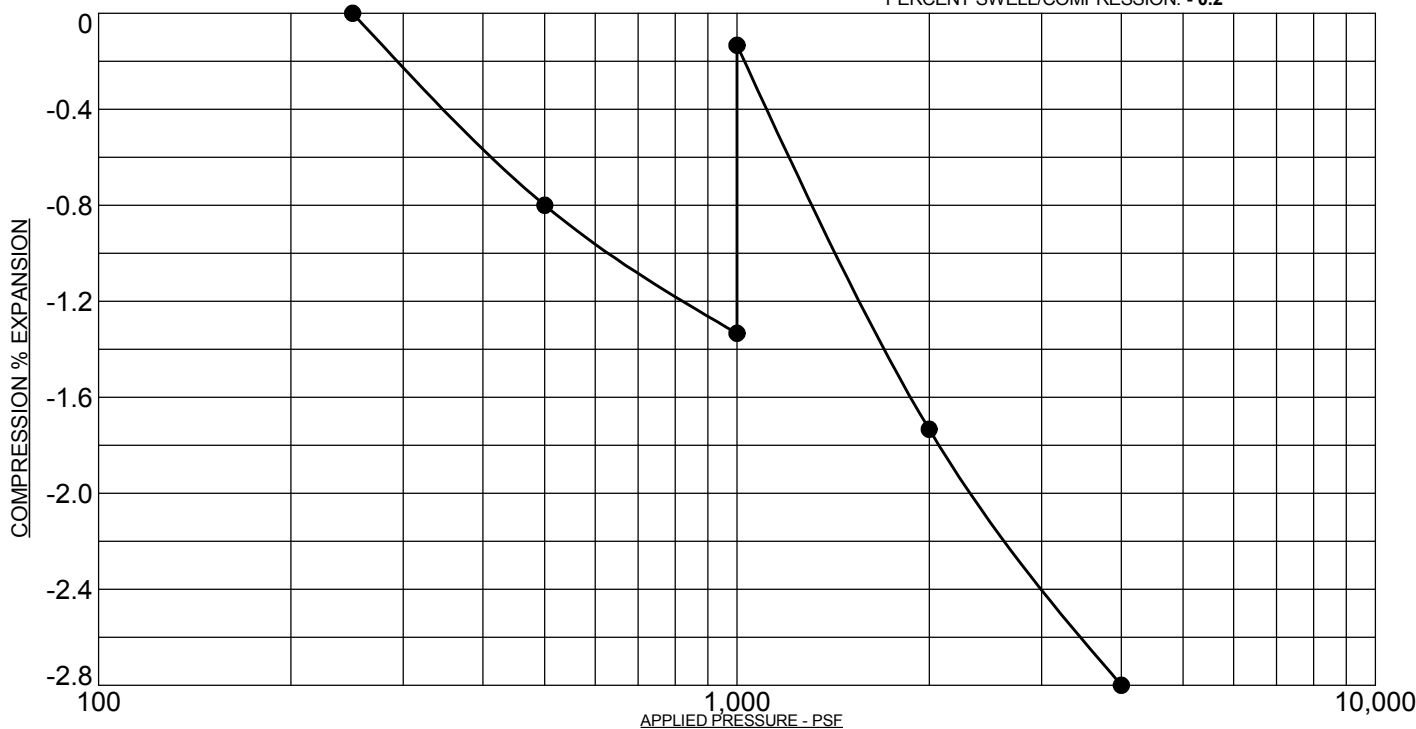
FIGURE No. 11

DATE 7/20/18



PROJECT: Windermere Subdivision Colorado Springs, Colorado
 SAMPLE DESCRIPTION: SANDSTONE, SILTY TO CLAYEY
 NOTE: SAMPLE WAS INUNDATED WITH WATER AT 1000 PSF

SAMPLE LOCATION: 121 @ 9 FT
 NATURAL DRY UNIT WEIGHT: PCF
 NATURAL MOISTURE CONTENT: 12.0%
 PERCENT SWELL/COMPRESSION: - 0.2



PROJECT: Windermere Subdivision Colorado Springs, Colorado
 SAMPLE DESCRIPTION: CLAYSTONE, SILTY
 NOTE: SAMPLE WAS INUNDATED WITH WATER AT 1000 PSF

SAMPLE LOCATION: 146 @ 9 FT
 NATURAL DRY UNIT WEIGHT: PCF
 NATURAL MOISTURE CONTENT: 19.0%
 PERCENT SWELL/COMPRESSION: 1.2

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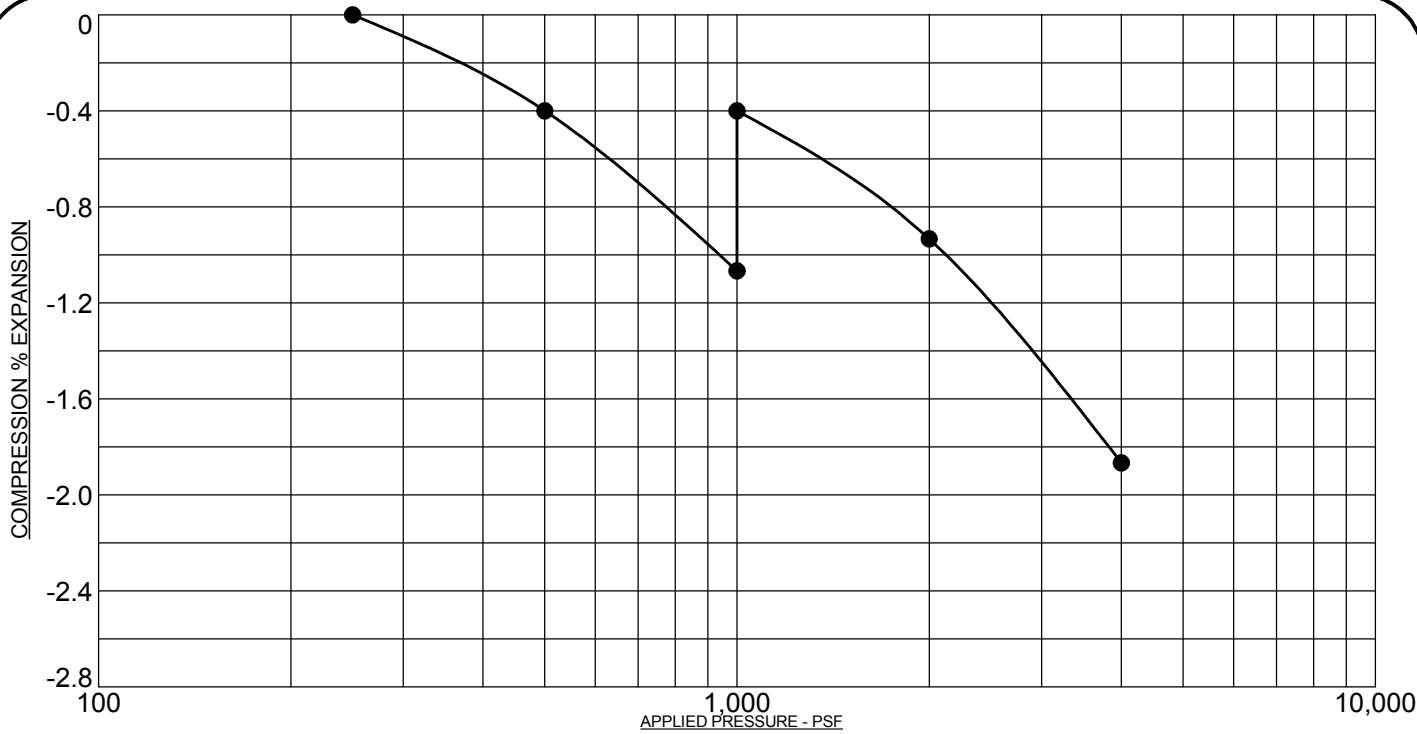
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SWELL/CONSOLIDATION TEST RESULTS

JOB No. 162062

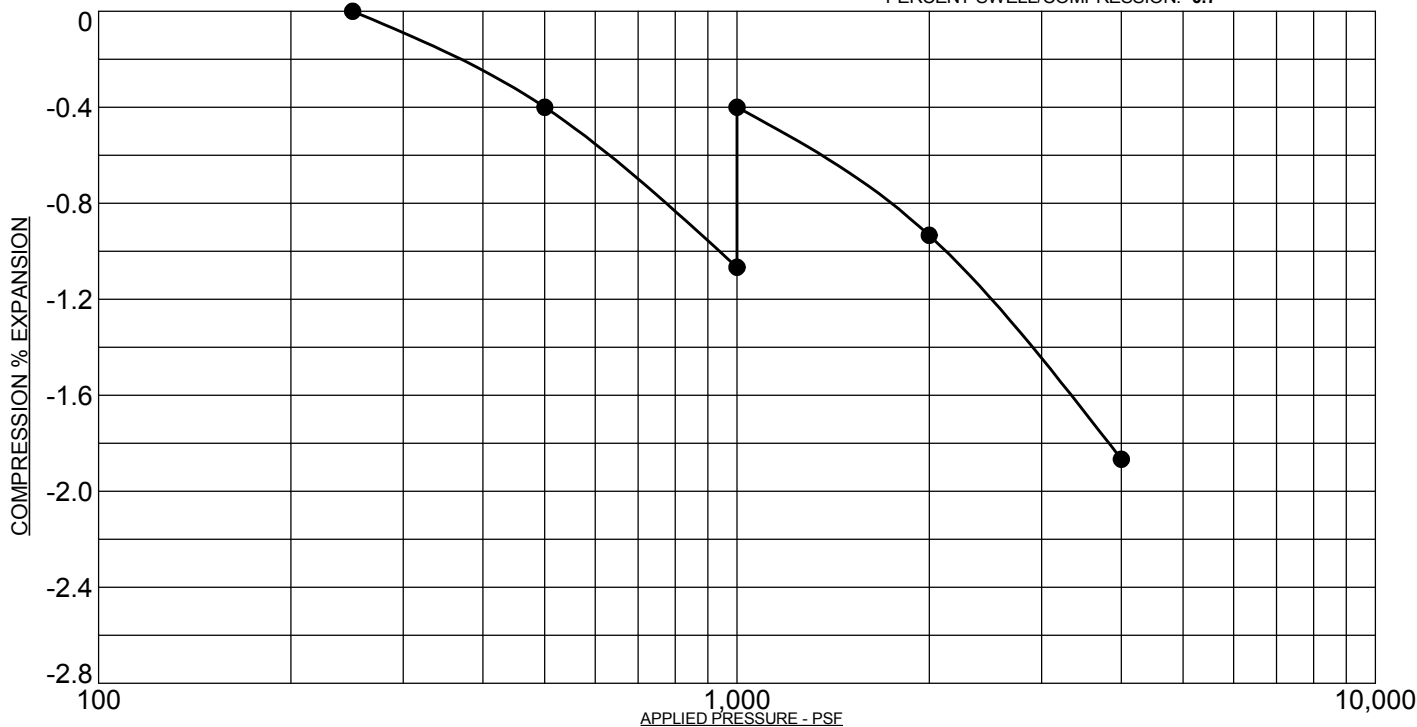
FIGURE No. 12

DATE 7/20/18



PROJECT: Windermere Subdivision Colorado Springs, Colorado
 SAMPLE DESCRIPTION: CLAYSTONE, SANDY
 NOTE: SAMPLE WAS INUNDATED WITH WATER AT 1000 PSF

SAMPLE LOCATION: 155 @ 14 FT
 NATURAL DRY UNIT WEIGHT: PCF
 NATURAL MOISTURE CONTENT: 14.0%
 PERCENT SWELL/COMPRESSION: 0.7



PROJECT: Windermere Subdivision Colorado Springs, Colorado
 SAMPLE DESCRIPTION: CLAYSTONE, SANDY
 NOTE: SAMPLE WAS INUNDATED WITH WATER AT 1000 PSF

SAMPLE LOCATION: 158 @ 19 FT
 NATURAL DRY UNIT WEIGHT: PCF
 NATURAL MOISTURE CONTENT: 23.0%
 PERCENT SWELL/COMPRESSION: 0.7

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SWELL/CONSOLIDATION TEST RESULTS

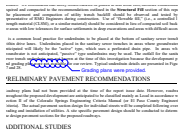
JOB No. 162062

FIGURE No. 13

DATE 7/20/18

Markup Summary

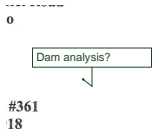
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3/18/2019 12:49:50 PM (1)



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Page Label: 1
Author: dsdparsons
Date: 3/18/2019 12:49:50 PM
Color: ■

Dam analysis?

3/18/2019 11:21:00 AM (1)



Subject: Callout
Page Label: 1
Author: dsdparsons
Date: 3/18/2019 11:21:00 AM
Color: ■

This appears to be missing the Geology portion of 8.4.9 of Code and ECM report req including identifying the constraints, hazards & drainage ways , mitigation, and the figure Map associated with those ... These then should be reflected on the prelim plan may itself...