Geotechnical Investigation

Holly Estate Subdivision
Albuquerque, New Mexico

Prepared for:
Mr. Shakeel Rizvi

Project No.: 16-1-051

June 24, 2016

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1.0 INTRODUCTION

This report presents the results of our geotechnical investigation for Holly Estate Subdivision located in Albuquerque, New Mexico.

The investigation was performed to determine site subsurface conditions and, based upon the conditions observed in the test holes, to develop geotechnical recommendations for:

Shallow Foundation Design;
Foundation Bearing Pressures;
Site Grading;
Drainage; and
Asphalt Pavement.

The conclusions and recommendations presented are based on information provided to us regarding the proposed development, on subsurface conditions disclosed by the test holes, on laboratory testing, and upon the local standards of our profession at the time this report was prepared.

This investigation was not performed to determine the presence of potentially hazardous waste or radon gas. Determination of the presence of potentially hazardous materials was beyond the scope of this investigation and requires the use of exploration techniques and analytic testing which were not appropriate for this investigation. If desired, NV5 will perform an environmental audit of the site.

2.0 PROPOSED CONSTRUCTION

We anticipate construction will consist of eight (8) single story residential dwellings per cul-de-sac, namely, at Ronan Court and Jensen Court. It is also proposed to re-construct that portion of Holly Avenue NE, an existing asphalt pavement, which fronts the north side of either cul-de-sac development.

3.0 SITE CONDITIONS

The project site is bounded to the north by Holly Avenue NE with an existing baseball park beyond, to the east by St. Peter's Holy Catholic Church Anglican Rite, to the south by a walking/biking trail with Paseo Del Norte Boulevard NE, either vacant land or an at-grade water storage tank beyond, and to the west by a CMU retaining wall with a vacant lot and residential development beyond. The site generally consisted of gentle rolling terrain with two arroyo crossings from northeast to southwest. The topsoil was observed to be loose suggesting that the site had not been previously developed. Vegetation consisted primarily of native grasses, small shrubs, two small trees and weeds, including green Russian Thistle (tumble weeds). There is an underground gas line located near and parallel to Holly Avenue. Configuration of the site is indicated on the Site Plan, Figure 1.

4.0 SITE SUBSURFACE CONDITIONS

To explore the site subsurface conditions, six (6) test holes were drilled at the approximate locations shown on the Site Plan, Figure 1. The soils in the test holes consisted of well-graded sand (SW-SM) with silt, silty, clayey sand (SC-SM), silty sand (SM) and clayey sand (SC). The sands were generally described as dry to moist and loose to dense.

Neither flowing groundwater nor bedrock was encountered in the test holes to a depth of twenty-one and one half (21.5) feet, the maximum depth of exploration. However, groundwater conditions may change with time due to precipitation, variations in groundwater level, seepage from ponding areas, or leaking utilities.

The test holes allow observation of a very small portion of the soils below the site. Significant variations in subsurface conditions may occur across the site, which were not disclosed by the test holes.

5.0 LABORATORY TESTING

A laboratory testing program was performed on samples obtained during the field investigation which appeared representative of the soils encountered in the test holes. The laboratory testing program was structured to determine the physical properties of the soils encountered in the test holes necessary for development of geotechnical recommendations.

The laboratory testing program included:

- Moisture Content;
- Dry Density;
- Sieve Analysis;
- Atterberg Limits; and
- Consolidation/Collapse.

Moisture Content and Dry Density tests were performed to evaluate the in-place soil density and moisture content. Test results help to evaluate settlement potential. Test results indicate the soils encountered in the test holes have an average dry density of approximately 111 pcf. Natural moisture content averaged approximately 5.4 percent. Test results are presented on the Logs of Test Holes, Figures 2 through 6, and are summarized on Table 1.

Sieve Analysis and Atterberg Limits tests were performed to confirm field soil classifications and to provide information on general physical soil properties. Test results are presented on Table 1.

Consolidation/Collapse tests were performed to evaluate structure settlement and to determine the effect of water on site soils. The results indicate that the tested soils generally exhibited slight to moderate compressibility under anticipated loads. Moderate to appreciable

additional settlement (collapse) occurred when the tested soils increased in moisture content. Test results are presented on Figures 8 through 11.

6.0 FOUNDATIONS

If the recommendations presented in this report are implemented particularly those regarding site grading and drainage, the proposed structures may be supported on either conventional strip (continuous) footings with spot spread footings at column locations, if any, or a monolithic slab on grade with turned down edges. Foundations and turned down edges should bear on a minimum of four (4) feet of structural fill at all the lots due to loose and collapsible soils as indicated by Test Hole numbers 1 through 6. Structural fill should extend a minimum of three feet laterally beyond the edge of all footings. Foundations may be designed for an allowable bearing pressure of 1500 pounds per square foot. This value may be increased by one-third for short-term loads due to wind and earthquakes. If it is not feasible to implement the site grading, drainage, and landscaping recommendations presented herein, an alternate foundation system may be required. This office should be contacted for additional recommendations.

The base of exterior footings should be embedded a minimum of eighteen inches below lowest adjacent grade. The base of interior footings should be embedded a minimum of twelve inches below finish pad grade. Spot spread and strip (continuous) footings should be a minimum of twenty-four and eighteen inches wide, respectively. Turned down edges should be a minimum of twelve inches wide. However, local building codes may require greater dimensions. Refer to Section R403.1 of the 2012 International Building Code.

Lateral foundation loads will be resisted by a combination of passive soil pressure against the sides of footings and friction along the base. A passive soil resistance of 300 pounds per cubic foot may be utilized for design. Frictional resistance may be determined by multiplying foundation dead load by a coefficient of friction of 0.40.

Prior to fill placement and following footing excavation, the natural soils should be scarified to a depth of eight inches and moistened to near optimum moisture content (±3%). Where conditions allow, the exposed soils should then be compacted to a minimum of 95% of maximum density as determined by ASTM D-1557. All fill below structures should be placed and compacted as detailed in the attached Appendix. Prior to pouring concrete footing excavations should be cleaned of any slough, loose soil, or debris. Footing excavations should be compacted as detailed in the attached Appendix.

Foundations designed and constructed as described herein are not anticipated to settle more than one inch. Differential settlement between adjacent column footings should not exceed one-half of the above value. Foundations should be designed and constructed to tolerate the above settlement. Foundations should be designed by a qualified structural engineer.

The site soils will consolidate if allowed to increase in moisture content. With appropriate landscape irrigation and site grading and drainage as detailed in this report the moisture content of the soils within five to six feet of the ground surface may increase. The recommendations presented

in this report for site preparation are the minimum we consider prudent to address this degree of moisture penetration. In the event moisture penetration to depths greater than six feet occurs, movement substantially greater than quoted above will occur.

To reduce the effect of settlement on the structure, we suggest that all stucco be fiberglass reinforced. Periodic control joints should be utilized in the stucco particularly at window and door corners. Periodic control joints should also be utilized in masonry walls.

Based upon the results of this investigation, an International Building Code Site Classification of "D" may be utilized for design.

7.0 CONCRETE SLABS-ON-GRADE

Concrete slabs-on-grade may be utilized. Slabs should bear on a minimum of five (5) feet of structural fill at all the lots. Conventional slabs should be isolated from all foundations, stem walls, and utility lines. Monolithic slabs should be isolated from all utilities. Frequent joints should be scored or cut in slabs to control the location of cracks.

Thickened slabs may be utilized to support interior partitions. Thickened slabs should be a minimum of twelve inches in width and should be designed to exert a maximum earth pressure of 500 pounds per square foot. Wall loads on thickened slabs should not exceed 800 pounds per linear foot. Refer to Section R403.1.1 of the 2012 International Building Code. The thickness and reinforcement should be determined by a qualified structural engineer.

Slabs should be adequately reinforced with steel. Reinforcement should be placed and supported as detailed in Section R506.2.4 of the 2012 International Building Code. Slab reinforcement should be turned down into turned down edges.

For structural design of the floor slab, a modulus of subgrade reaction of 300 kips per cubic foot may be utilized. This value is for a 1' x 1' square or a 1' wide strip. The above value may be modified for various effective widths based upon the following equation:

$$K_s = 300\left[\frac{B+1}{2B}\right]^2$$

K_s = Modulus of subgrade reaction (kips per cubic foot)

B = Effective width of loaded area (feet)

If moisture-sensitive floor covering is utilized, the flooring manufacturer should be contacted to determine the necessity of a vapor barrier. The moisture barrier may consist of a 6-mil polyethylene film or equivalent. The barrier may be overlain with one or two inches of clean sand to provide a working surface and reduce shrinkage cracking.

Slabs should bear on a minimum of five (5) feet of structural fill at all the lots. Prior to placing slabs or structural fill, the natural soils should be stripped of vegetation, scarified to a depth of eight inches, and moistened to a near optimum (±3%) moisture content. The exposed soils should then be compacted to a minimum of 95% of maximum density as determined by ASTM D-1557. All fill below slabs should be placed and compacted as detailed in the attached Appendix.

8.0 EARTHWORK

8.1 General

The settlement estimates presented in this report are based upon the assumption that site earthwork will be performed as recommended in this report and the attached Appendix. Presented below is a summary of the site earthwork recommendations. Detailed earthwork procedures are presented in the attached Appendix.

Prior to commencing earthwork the Contractor should obtain appropriate Proctor tests. Field density testing and evaluation of the suitability of the proposed materials performed prior to completion of the Proctor is “Preliminary” and may change based upon the results of the Proctor testing.

8.2 Clearing and Grubbing

Prior to placing structural fill, all borrow and fill areas should be stripped of vegetation and deleterious materials. All strippings should be hauled off-site or utilized in landscaped areas.

All existing utilities, septic tanks, leach fields, and disturbed soil should be removed from below the proposed amenities. The resulting excavations should be backfilled with compacted fill as detailed in the attached Appendix.

8.3 Excavation

We anticipate that on-site soils can be excavated with conventional earthwork equipment. Cobbles or boulders may be encountered during excavation. Cobbles and boulders should be disposed of off-site or utilized for landscaping. Cobbles and boulders should not be placed within structural fills. Cobbles and boulders as defined in ASTM D-2487.

8.4 Natural Ground Preparation

Prior to placing structural fill and subsequent to final grading in cut areas, the exposed soils should be scarified to a depth of eight inches and moisture conditioned to a near optimum (±3%) moisture content. The exposed soils should then be compacted to a minimum of 95% of maximum density as determined by ASTM D-1557. If vibratory compaction poses a threat to nearby structures, static compaction should be utilized.

8.5 Fill Placement and Compaction

Structural fill should be placed in horizontal lifts a maximum of eight inches in loose thickness, moisture conditioned to near optimum moisture content, and mechanically compacted. Fill below footings and slabs should be compacted to a minimum of 95% of maximum dry density as determined by ASTM D-1557. On-site soils are anticipated to be suitable as structural fill with the possible exception within the area of Test Hole No. 6. Imported soils may be blended with the existing soils, provided that the resulting blended material satisfies structural fill criteria.

8.6 Observation and Testing

Placement and compaction of structural fill should be observed and tested by a qualified geotechnical engineer or his representative. The purpose of the observation and testing is to confirm that the recommendations presented herein are followed and to provide supplemental recommendations, if subsurface conditions differ from those anticipated.

Foundation excavations should be observed by a qualified geotechnical engineer, or his representative, prior to placement of reinforcement or concrete. The purpose of the observation is to determine if the exposed soils are similar to those anticipated.

8.7 Frequency of Testing

Earthwork should be tested periodically to confirm the fill is compacted to the criteria presented in this report. Prior to placing fill, the natural ground should be moisture conditioned, compacted, and tested to confirm it is properly compacted. Fill should be placed in maximum eight-inch thick loose lifts, but in no case thicker than can be compacted with the equipment being utilized. Fill should be moisture conditioned and compacted as detailed in this report. Fill areas should be tested at maximum one-foot vertical intervals. If fill areas are worked at different times, each individual area should be tested. Following finish grading, the final surface should be tested. Following foundation excavation, the footing excavations should be tested. Utility trench backfill should be tested as necessary.

9.0 SITE GRADING AND DRAINAGE

The settlement estimates presented in this report assume the site will be graded to drain properly. If the site does not drain properly, structure settlement substantially greater than quoted in this report will occur. Site grading and drainage should conform to Section R401.3 of the 2012 International Building Code.

To reduce the risk of structure settlement the site should be graded to rapidly drain away from amenities. Splash blocks should be utilized below down spouts and canales.

If ponding areas are required, they should be located as far away from amenities as possible, a minimum of ten feet. If these criteria cannot be met, this office should be contacted for supplemental recommendations.

Roof gutters and downspouts should be utilized. Roof gutters should discharge to a hard surface. Water should run off rapidly.

10.0 LANDSCAPING

Landscaping adjacent to amenities should be designed and constructed to minimize the potential for wetting of soils supporting the proposed facilities. If soils supporting the proposed facilities are allowed to increase in moisture content to a depth greater than seven feet settlement greater than quoted in this report will occur.

Trees and shrubs within five feet of amenities should be hand watered or watered using controlled drip irrigation. If drip irrigation is used, emitters should discharge no more than one gallon per hour. If grass must be planted within five feet of structures, watering should be carefully controlled to prevent overwatering. Grassed areas adjacent to structures should be sloped so that excess irrigation water will run off promptly. Sprinkler lines and drip irrigation mains should be located a minimum of five feet away from foundations.

Mowing strips, planters and sidewalks should not "dam" water adjacent to structures. If necessary, mowing strips should be perforated to allow water to flow away from structures.

All amenities' planters should be closed bottom and watertight.

11.0 UTILITIES

The site soils are collapsible if allowed to increase in moisture content. If post-construction water or sewer line leaks occur, localized settlement will occur. Following installation, all water and sewer lines should be pressure checked for leaks. Any leaks found should be repaired.

Backfill in utility line trenches below slabs, driveways, and pavement should be compacted to a minimum of 90% of maximum density as determined by ASTM D-1557. Utility trenches should be as narrow as can be properly compacted. To reduce the possibility of breaking utility lines with compaction equipment, heavy compactors should not be utilized.

Utility trenches may not be compacted to the same degree as the remainder of the building pad. Therefore, wall footings, interior walls and thickened slabs should not be placed longitudinally over utility trenches. Column footings should not be placed over utility trenches.

12.0 TRENCHES AND EXCAVATIONS

All trenches greater than four feet in depth must be sloped, shored or braced or otherwise supported according to OSHA Construction and Safety Standards. Material excavated from the trench or spoil must be placed a minimum of two feet from the edge of the excavation. The spoil should be retained in an effective manner such that no loose material can fall into the excavation.

Temporary construction excavations less than eight feet deep should be sloped no steeper than 1½:1 (horizontal:vertical). If deeper excavations are required, this office should be contacted for supplemental recommendations. Limited raveling of slopes will occur particularly as the exposed soils dry out. Heavy equipment and material stockpiles should be located a minimum of five feet from the top of slope.

13.0 ASPHALTIC CONCRETE PAVEMENT

The pavement recommendations presented herein are based upon New Mexico State Highway and Transportation Department design procedures.

Traffic within either cul-de-sac is anticipated to consist of very light traffic with automobiles, pick-up trucks and service trucks, including refuse trucks and the occasional moving van. For design purposes, we have assumed an EDLA (Equivalent Daily 18 kip Load Applications) of 2 for automobile, pick-up truck and service trucks. We have also assumed a conservative R-value of 45 as it is anticipated that the subgrade soils may include non-plastic, silty sands having more than 36 percent or more passing the No. 200 sieve. If traffic conditions will vary from the assumed values, this office should be contacted.

Additional design coefficients utilized in our analysis are:

Design Period*	20 years
Regional Factor	1.4
Serviceability Index	1.5

*Periodic pavement maintenance will be required during this period.

To evaluate the required pavement section, the following structural coefficients were utilized in our analysis.

Material	Coefficient
Asphaltic Concrete	0.40
Aggregate Base Course	0.10

Based upon the above criteria, we recommend the following asphaltic concrete pavement sections for the new automobile and pick-up truck parking area and driveway areas:

	Asphaltic Concrete	Aggregate Base Course
Option A	3”	--
Option B	2”	4”

Traffic on Holly Avenue NE along the north side of either cul-de-sac is a residential street. We have assumed a conservative EDLA (Equivalent Daily 18 kip Load Applications) of 10. We have also assumed a conservative R-value of 45 as that for the cul-de-sac street. We have also assumed a serviceability index of 2.0 in lieu of 1.5 though the present design precludes through traffic to the west. If traffic conditions will vary from the assumed values, this office should be contacted.

Additional design coefficients utilized in our analysis are:

Design Period*	20 years
Regional Factor	1.4
Serviceability Index	2.0

*Periodic pavement maintenance will be required during this period.

To evaluate the required pavement section, the following structural coefficients were utilized in our analysis.

Material	Coefficient
Asphaltic Concrete	0.40
Aggregate Base Course	0.10

Based upon the above criteria, we recommend the following asphaltic concrete pavement sections for the new automobile and pick-up trucks parking area and driveway areas:

	Asphaltic Concrete	Aggregate Base Course
Option A	3”	5”
Option B	4.5”	--

Pavement subgrade and all fill below paved areas should be placed and compacted as detailed in the attached Appendix. Aggregate Base Course should consist of Class I or Class II material as specified in Section 302 of the “City of Albuquerque Standard Specifications for Public Works Construction.” Base course should be compacted to a minimum of 95% of maximum density as determined by ASTM D-1557.

Asphaltic Concrete should be Class B as described in Section 116 of the “City of Albuquerque Standard Specifications for Public Works Construction.” Class C Asphaltic Concrete may be utilized if a very smooth surface is desired. However, Class C Asphaltic Concrete tends to be less durable than Class B. Asphaltic Concrete shall be compacted to a range of 93-97% of maximum Theoretical Unit Weight (ASTMD-2041).

Should asphaltic concrete Class B, or Class C, not be readily available, it is recommended that asphaltic concrete shall be Class SP-III as described in Section 116 of the "City of Albuquerque Standard Specifications for Public Works Construction." Asphaltic Concrete shall be compacted to a range of 93-97% of maximum Theoretical Unit Weight (ASTM D-2041). Where pavement thickness if 4 inches or greater, a minimum of two lifts of asphaltic concrete shall be placed.

Prior to placing Aggregate Base Course or Asphaltic Concrete, a soil sterilant may be applied. The sterilant should be applied as per the manufacturer's recommendations.

The above pavement recommendations assume the pavement subgrade will consist of on-site soils comparable to the silty sands encountered within the upper 2 to 5 feet. If the subgrade consists of imported soil, the import should be more granular than the on-site soils. Should the subgrade consist of imported soil that is much more granular than the on-site soils, modification, including reduction, of the above pavement sections may be possible. If the subgrade consists of uncontrolled fill, the uncontrolled fill should be more granular than the on-site soils and not less than 12 inches of subgrade shall be moisture conditioned and compacted to a minimum of 95% of maximum density as determined in accordance with ASTM D-1557. If this is not possible, modification of the above pavement sections may be necessary.

Fill in utility line trenches below the pavement must be properly compacted to prevent localized pavement settlement. To minimize settlement and maintenance of the pavement, all trenches should be backfilled with compacted fill as detailed in the attached Appendix.

The site should be graded to prevent saturation of pavement subgrade soils. If soils supporting the proposed pavement increase in moisture content, their ability to support the proposed pavement is significantly reduced.

The area in front of refuse dumpsters should be paved with Portland Cement Concrete.

Periodic pavement maintenance consisting of crack cleaning and sealing should be performed to extend pavement life. Seal coating may also be desired after the pavement has been in service for several years to improve appearances and increase pavement life.

14.0 CLOSURE

This report was prepared for the exclusive use of our Client. The recommendations presented in this report are based upon the subsurface conditions disclosed by the test holes. Soil and groundwater conditions may vary between test holes and with time.

This report reflects our interpretation of the site subsurface conditions. We strongly recommend that prior to bidding all contractors perform their own subsurface investigation to form their own opinion of the site soil, rock, and groundwater conditions. Should contractors elect to use this report for construction, bidding or estimating purposes, they do so at their own risk.

In a southwest climate it is particularly important to protect the soils supporting the proposed structure from an increase in moisture content. If soils supporting the structure increase in moisture

content due to any cause such as poor site drainage, ponding areas, or leaking utility lines, significant structural settlement and distress may occur.

If conditions are encountered during construction which differ from those presented herein, this office should be contacted for supplemental recommendations. The staff of X8e Vinyard is available for supplemental consultation as necessary.

This office would be pleased to review site grading and drainage plans to evaluate conformance with the recommendations presented herein. All site earthwork should be observed by a qualified geotechnical engineer or his representative. X8e Vinyard would be pleased to provide these services.

NV5,

Ralph L. Abeyta, P.E., M. ASCE

NV5 Project No.: 16-1-051

SITE PLAN
***Scale Unknown**

Test Hole Location

FIGURE 1

LOG OF TEST HOLE NO. 1

Project: Holly Estate Subdivision
Elevation: N/A
Depth to Groundwater: Not Encountered

Project No.: 16-1-051
Date Drilled: 6/9/16
Drilling Method: 7" H.S.A.

Depth, feet	Blows/Foot	Sample Type	Dry Density pcf	Water Content, %	Additional Testing	Unified Classification	Material Description Asphalt concrete 8", base course 5"
1	11	S		14.6	1,2	SM	SAND, silty, medium to coarse grained, trace gravel, medium dense, moist, brown
2							
3							
4	8	S		3.1			Loose
5							
6							Bottom of hole at 5½'

LOG OF TEST HOLE NO. 2

Elevation: N/A
Depth to Groundwater: Not Encountered

Date Drilled: 6/9/16
Drilling Method: 7" H.S.A.

Depth, feet	Blows/Foot	Sample Type	Dry Density pcf	Water Content, %	Additional Testing	Unified Classification	Material Description Asphalt concrete 8" - base course 4"
1	5	S		9.5		SC-SM	SAND, silty, clayey, fine grained with some coarse grained angular sand, loose, moist, brown
2							
3							
4							
5	4	S		8.4	1,2	SM	SAND, silty, fine to coarse grained, very loose, medium moist, brown
6							Bottom of hole at 5½'

ADDITIONAL TESTS: 1= Sieve Analysis 2= Atterberg Limits 3=Direct Shear 4=R-Value 5=Other

Figure: 2

LOG OF TEST HOLE NO. 3

Project: Holly Estate Subdivision
Elevation: N/A
Depth to Groundwater: Not Encountered

Project No.: 16-1-051
Date Drilled: 6/9/16
Drilling Method: 7" H.S.A.

Depth, feet	Blows/Foot	Sample Type	Dry Density pcf	Water Content, %	Additional Testing	Unified Classification	Material Description
						SM	SAND, silty, fine to coarse grained, loose, angular sand, slightly moist, light brown
	12	R	108	3.4	1,2,5		Medium dense
5							
	5	R	107	2.4	1,2		Loose
10							
	15	S		2.2	1,2		Medium dense
15							
	15	S		4.3		SC	SAND, clayey, fine grained, trace gravel, medium dense, moist, brown
20							
	30	S		5.5	1,2		
							Bottom of hole 21½'
25							
30							
35							

ADDITIONAL TESTS: 1= Sieve Analysis 2= Atterberg Limits 3=Direct Shear 4=R-Value 5=Other

Figure: 3

LOG OF TEST HOLE NO. 4

Project: Holly Estate Subdivision
Elevation: N/A
Depth to Groundwater: Not Encountered

Project No.: 16-1-051
Date Drilled: 6/9/16
Drilling Method: 7" H.S.A.

Depth, feet	Blows/Foot	Sample Type	Dry Density pcf	Water Content, %	Additional Testing	Unified Classification	Material Description
	14	R		4.0	1,2	SM	Silty SAND, silty, fine grained, loose, medium moist, brown
5	8	R	112	11.7	1,2,5	SC	SAND, clayey, fine grained, trace gravel, loose, moist, light reddish brown/white
10	21	S		10.4	1,2	SM	SAND, silty, fine to coarse grained, medium dense, moist, light reddish brown/white
15	20	S		2.6		SW-SM	SAND, well-graded with silt, medium dense, slightly moist, brown
20	13	S		8.8		SC-SM	SAND, silty, clayey, fine to coarse grained, medium dense, moist, brown
25							Bottom of hole 21½'
30							
35							

ADDITIONAL TESTS: 1= Sieve Analysis 2= Atterberg Limits 3=Direct Shear 4=R-Value 5=Other

Figure: 4

LOG OF TEST HOLE NO. 5

Project: Holly Estate Subdivision
Elevation: N/A
Depth to Groundwater: Not Encountered

Project No.: 16-1-051
Date Drilled: 6/9/16
Drilling Method: 7" H.S.A.

Depth, feet	Blows/Foot	Sample Type	Dry Density pcf	Water Content, %	Additional Testing	Unified Classification	Material Description
	7	R	111	2.6	1,2,5	SM	SAND, silty, fine to coarse grained, trace gravel, loose, slightly moist, brown
5	11	R		2.2			No recovery, medium dense
10	23	S		1.1	1,2	SW-SM	SAND, well-graded with silt, fine to medium grained, medium dense, dry, brown
15	12	S		7.7		SC-SM	SAND, silty, clayey, fine to coarse grained, angular sand, medium dense, moist, brown
20	11	S		6.8			
25							Bottom of hole 21½'
30							
35							

ADDITIONAL TESTS: 1= Sieve Analysis 2= Atterberg Limits 3=Direct Shear 4=R-Value 5=Other

Figure: 5

LOG OF TEST HOLE NO. 6

Project: Holly Estate Subdivision
Elevation: N/A
Depth to Groundwater: Not Encountered

Project No.: 16-1-051
Date Drilled: 6/9/16
Drilling Method: 7" H.S.A.

Depth, feet	Blows/Foot	Sample Type	Dry Density pcf	Water Content, %	Additional Testing	Unified Classification	Material Description
						SC	SAND, clayey, fine grained, trace gravel, loose, moist, light brown
5	12	R	107	5.9	1,2,5	SM	SAND, silty with gravel, fine to coarse grained, medium dense, medium moist, brown
10	34	R	118	4.4	1,2	SC	SAND, clayey, fine to medium grained, dense, medium moist, brown
	14	S		1.3	1,2	SW-SM	SAND, well-graded with silt, fine to coarse grained, trace gravel, medium dense, moist, brown
15	14	S		4.3	1,2	SM	SAND, silty, fine to coarse grained, medium dense, medium moist, brown
20	20	S		3.5			
25							Bottom of hole 21½'
30							
35							

ADDITIONAL TESTS: 1= Sieve Analysis 2= Atterberg Limits 3=Direct Shear 4=R-Value 5=Other

Figure: 6

NOTES - LOGS OF TEST HOLES

Test hole locations were determined by compass bearing and pacing distances from known topographic points.

"Drilling Method" refers to the equipment utilized to advance the test hole. A seven-inch outside diameter, continuous flight, hollowstem auger was utilized.

"S" under "Sample Type" indicates a Standard Penetration test (ASTM D-1586). The Standard Penetration sampler is 2 inches in outside diameter and 1 3/8 inches inside diameter.

"R" under "Sample Type" indicates a 3-inch outside diameter by 2.5-inch inside diameter sampler. The sampler is lined with 1-inch high brass rings.

"B" under "Sample Type" indicates a bulk sample.

"Blows Per Foot" indicates the number of blows of a 140-pound hammer falling 30 inches required to drive the indicated sampler 12 inches.

"NR" under "Blows/Foot" indicates that no sample was recovered.

"Dry Density PCF" indicates the laboratory determined soil dry density in pounds per cubic foot.

"Water Content %" indicates the laboratory determined soil moisture content in percent (ASTM D-2216).

"Unified Classification" indicates the field soil classification as per ASTM D-2488. When appropriate, the field classification is modified based upon subsequent laboratory tests.

Variations in soil profile, consistency, and moisture content may occur between test holes. Subsurface conditions may also vary between test holes and with time.

Figure No.: 7

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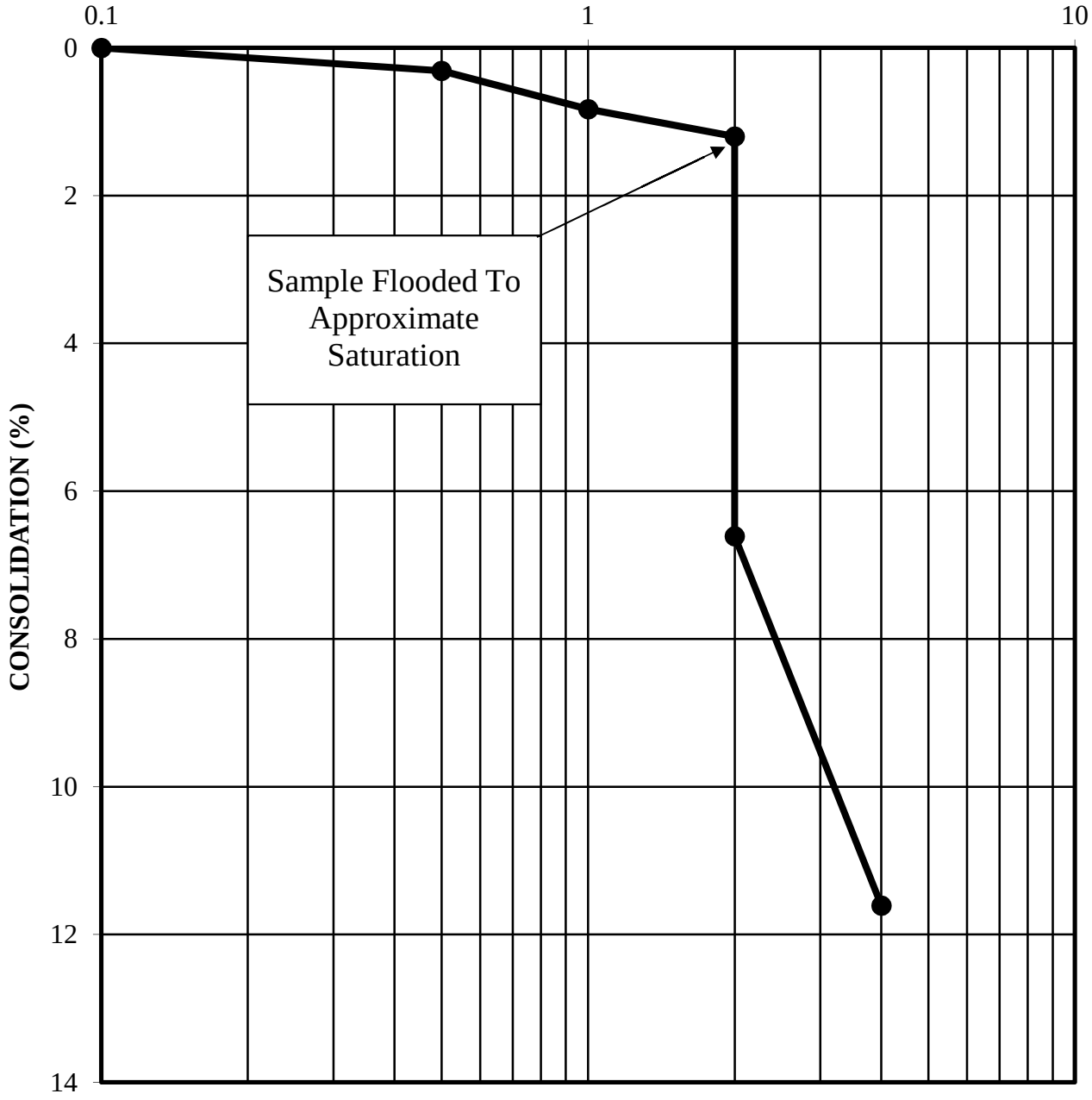
CONSOLIDATION TEST RESULTS

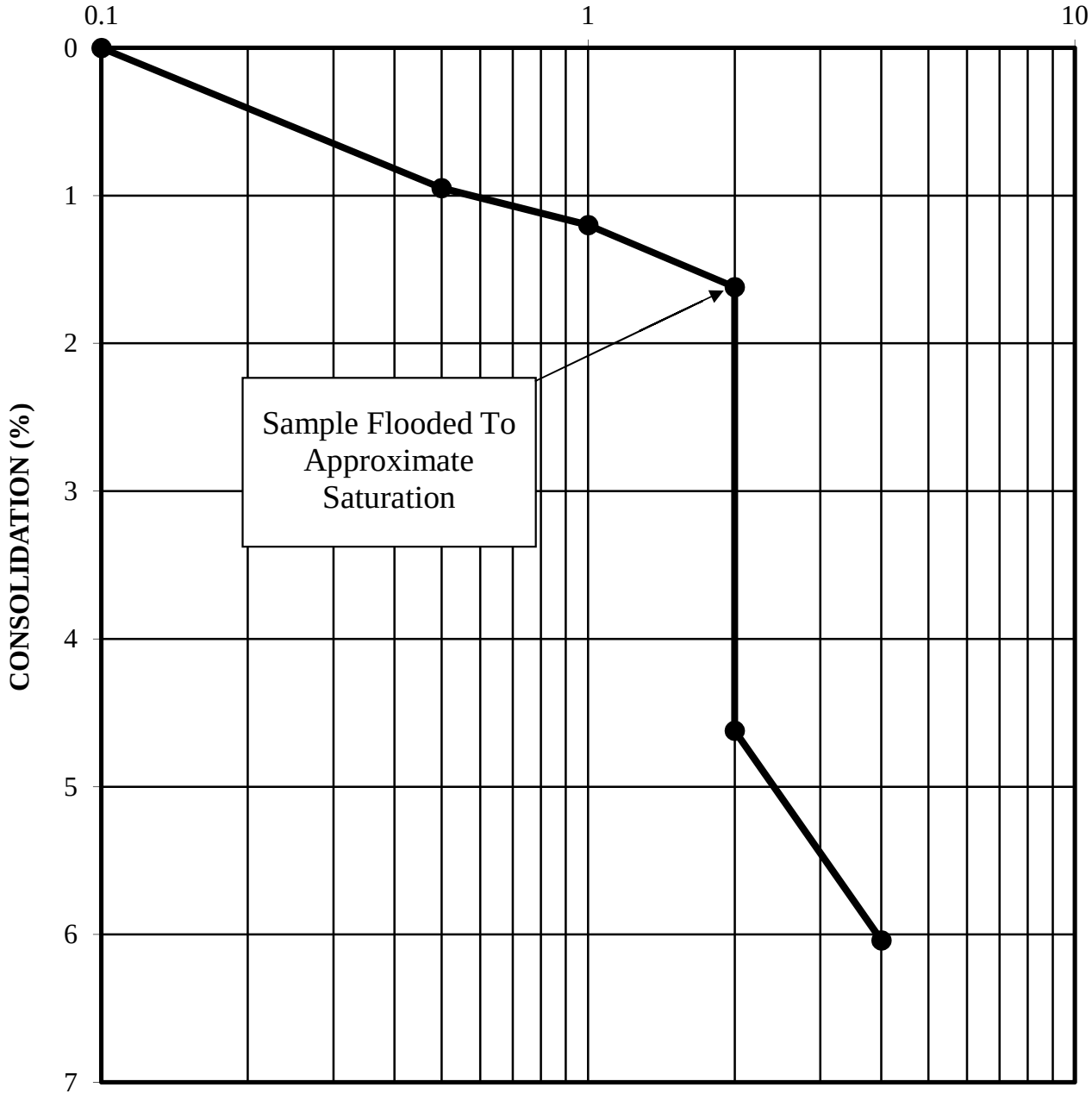


TEST HOLE NUMBER: 3
SAMPLE DEPTH: 2 FEET
SOIL DESCRIPTION: Silty SAND (SM)
MOISTURE CONTENT: 3.4 %
BULK UNIT WEIGHT: 108 pcf

PROJECT: Holly Estate Subdivision in Albuquerque, New Mexico
PROJECT NO.: 16-1-051

FIGURE NO.: 8

CONSOLIDATION TEST RESULTS



TEST HOLE NUMBER: 4
SAMPLE DEPTH: 5 FEET
SOIL DESCRIPTION: Clayey SAND (SC)
MOISTURE CONTENT: 11.7 %
BULK UNIT WEIGHT: 112 pcf

PROJECT: Holly Estate Subdivision in Albuquerque, New Mexico
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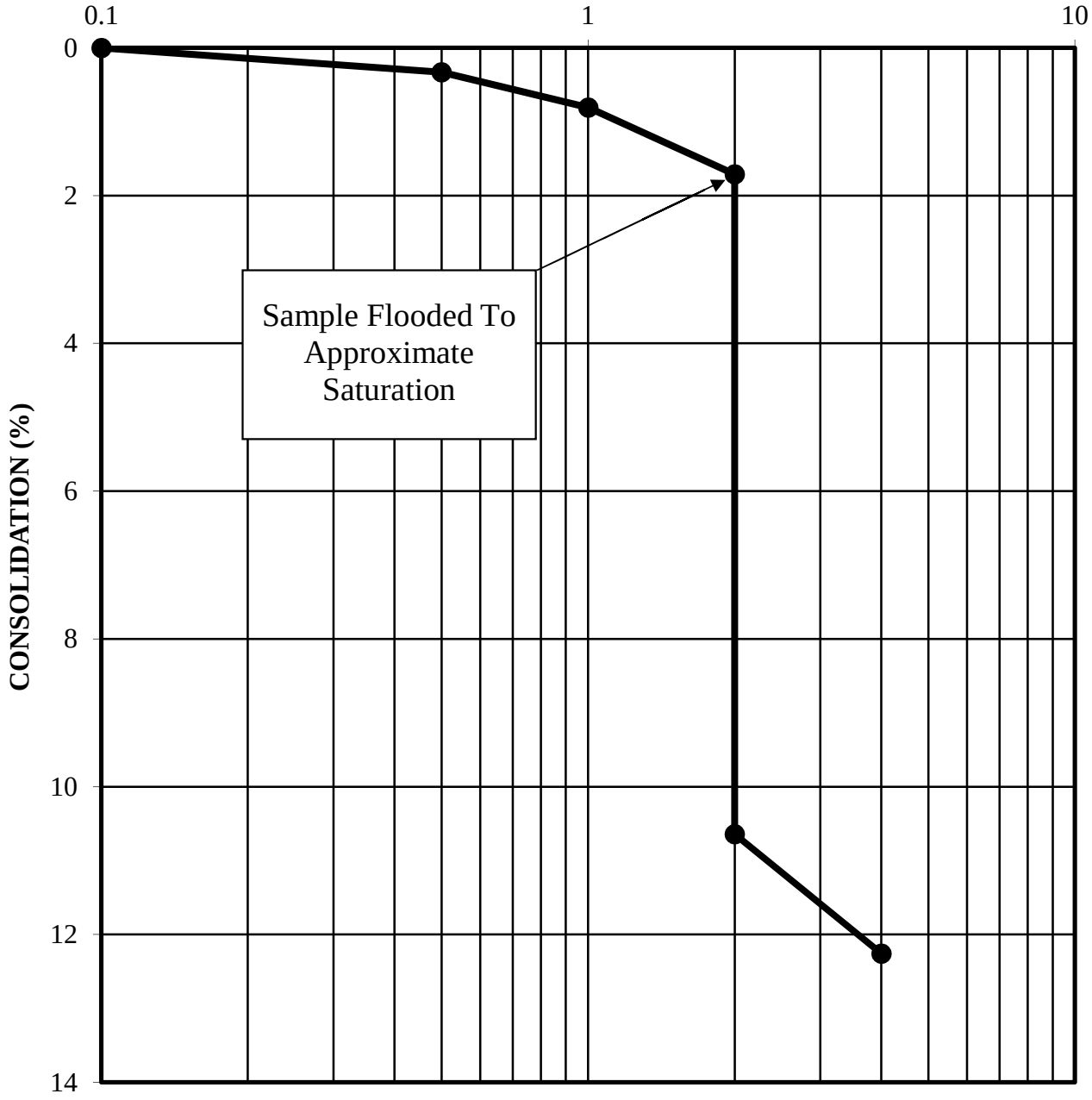
FIGURE NO.: 9

CONSOLIDATION TEST RESULTS



TEST HOLE NUMBER: 5
SAMPLE DEPTH: 2 FEET
SOIL DESCRIPTION: Silty SAND (SM)
MOISTURE CONTENT: 2.6 %
BULK UNIT WEIGHT: 111 pcf

PROJECT: Holly Estate Subdivision in Albuquerque, New Mexico
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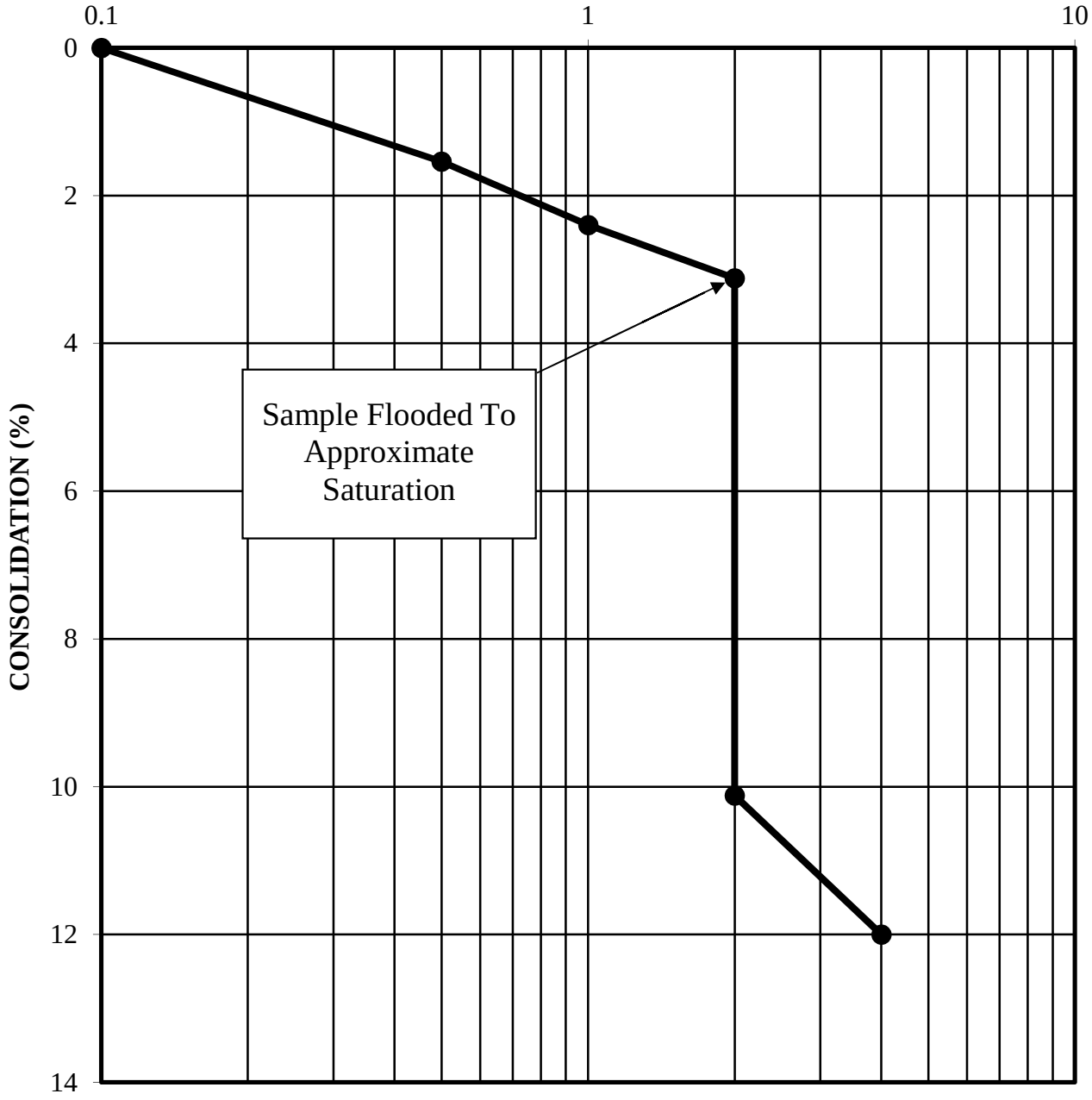
FIGURE NO.: 10

CONSOLIDATION TEST RESULTS



TEST HOLE NUMBER: 6
SAMPLE DEPTH: 2 FEET
SOIL DESCRIPTION: Silty SAND (SM)
MOISTURE CONTENT: 5.9 %
BULK UNIT WEIGHT: 107 pcf

PROJECT: Holly Estate Subdivision in Albuquerque, New Mexico
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FIGURE NO.: 11

SUMMARY OF LABORATORY TEST DATA

Test Hole	Depth (feet)	Unified Classification	Natural Dry Density (pcf)	Natural Moisture Content (%)	Atterberg Limits		SIEVE ANALYSIS-% PASSING BY WEIGHT										Description
					LL	PI	1 1/2"	3/4"	3/8"	No. 4	No. 8	No. 16	No. 30	No. 50	No. 100	No. 200	
1	1	SM		14.6	NV	NP		100	99	94	79	59	47	40	33	22.8	Silty SAND
1	4			3.1													
2	2			9.5													
2	4	SM		8.4	25	NP			100	95	85	71	61	55	49	36.1	Silty SAND
3	2	SM	108	3.4	23	NP			100	98	91	80	72	64	55	37.9	Silty SAND
3	5	SM	107	2.4	23	NP			100	97	85	64	50	41	35	26.1	Silty SAND
3	10	SM		2.2	NV	NP			100	96	83	64	53	45	39	29.1	Silty SAND
3	15			4.3													
3	20	SC		5.5	28	16			100	95	84	73	66	61	56	45.4	Clayey SAND
4	2	SM		4.0	NV	NP		100	97	92	79	56	42	34	28	20.8	Silty SAND
4	5	SC	112	11.7	24	8			100	98	92	81	75	70	65	48.1	Clayey SAND
4	10	SM		10.4	21	NP		100	99	93	82	72	66	60	54	39.7	Silty SAND
4	15			2.6													
4	20			8.8													
5	2	SM	111	2.6	NV	NP		100	99	94	82	59	43	32	25	17.9	Silty SAND
5	5			2.2													
5	10	SW-SM		1.1	NV	NP			100	94	71	50	36	24	16	9.5	Well-graded SAND with silt
5	15			7.7													
5	20			6.8													
6	2	SM	107	5.9	26	NP	100	91	88	85	78	68	59	52	45	32.7	Silty SAND with gravel

NV5 Project No.: 16-1-051

Project: Holly Estate Subdivision **Table No.: 1**

SUMMARY OF LABORATORY TEST DATA

Test Hole	Depth (feet)	Unified Classification	Natural Dry Density (pcf)	Natural Moisture Content (%)	Atterberg Limits		SIEVE ANALYSIS-% PASSING BY WEIGHT										Description
					LL	PI	1 1/2"	3/4"	3/8"	No. 4	No. 8	No. 16	No. 30	No. 50	No. 100	No. 200	
6	5	SC	118	4.4	30	15			100	97	83	65	53	44	37	27.3	Clayey SAND
6	10	SW-SM		1.3	NV	NP		100	97	90	75	50	35	24	16	11.0	Well-graded SAND with silt
6	15	SM		4.3	23	NP		100	99	92	78	66	58	52	46	31.6	Silty SAND
6	20			3.5													

NV5 Project No.: 16-1-051

Project: Holly Estate Subdivision **Table No.: 1**

APPENDIX
EARTHWORK PROCEDURES

General

The Geotechnical Engineer shall be the Owner's representative to observe and evaluate the earthwork operations. The Contractor shall cooperate with the Geotechnical Engineer in the performance of the Engineer's duties.

Clearing and Grubbing

Prior to placing structural fill all borrow areas and areas to receive structural fill shall be stripped of vegetation and deleterious materials. Strippings shall be hauled off-site or stockpiled for subsequent use in landscaped areas or nonstructural fill areas as designated by the Owner or his representative and approved by the Geotechnical Engineer.

Site Preparation - Fill Areas

Prior to placing structural fill the areas to be filled shall be scarified to a depth of eight inches and moisture conditioned as described below. The area to be filled shall then be compacted to a minimum of 95 percent of maximum density as determined by ASTM D-1557. If vibratory compaction techniques pose a threat to the structural integrity of nearby facilities a static compactor shall be used. Any soft or "spongy" areas shall be removed as directed by the Geotechnical Engineer and replaced with structural fill as described herein.

Site Preparation - Cut Areas

Following excavation to rough grade, all building and pavement areas shall be scarified to a depth of eight inches and moisture conditioned as described below. All building and paved areas shall be compacted to a minimum of 95 percent of maximum density as determined by ASTM D-1557. If vibratory compaction techniques pose a threat to the structural integrity of nearby facilities, a static compactor shall be used. Any soft or "spongy" areas shall be removed as directed by the Geotechnical Engineer and replaced with structural fill as described herein.

Foundation, Slab and Pavement Subgrade Preparation

Prior to placing reinforcement, footings, slabs, or pavement, the supporting soils shall be prepared, moisture conditioned, and compacted as described herein.

Structural Fill Material

Structural fill material shall be nonexpansive soil which may be gravel, sand, silt or clay, or a combination there of.

Sieve Size	Percent Passing By Weight
4”	100
1”	90-100
No. 4	70-100
No. 200	10-40

Structural fill material shall exhibit a plasticity index of ten or less. No organic, frozen or

decomposable material shall be utilized. All structural fill material shall be approved by the Geotechnical Engineer.

Structural Fill Placement

Structural fill material shall be blended as necessary to produce a homogeneous material. Fill material shall be spread in horizontal lifts no greater than eight inches in uncompacted thickness, but in no case thicker than can be properly compacted with the equipment to be utilized. If structural fill is to be placed on slopes steeper than 5:1 (horizontal:vertical) the natural ground shall be benched with minimum three foot wide benches at maximum two foot vertical intervals.

Moisture Conditioning

Structural fill material shall be dried or moistened as necessary, prior to compacting, to within ± three percent of optimum moisture content as determined by ASTM D-1557. Moisture shall be distributed uniformly throughout each lift.

Compaction

Structural fill shall be mechanically compacted to the following:

	Minimum Compaction ASTM D-1557
Foundation Support	95%
Slab Support	95%
Below Slab Utility Trenches	90%
General Site Grading	90%
Pavement Support	-
Upper 8" of Subgrade	95%
All other fill below pavement	90%

Aggregate Base Course shall be compacted to a minimum of 95% of maximum density as determined by ASTM D-1557.

Asphaltic concrete shall be compacted to a range of 93% to 97% of the maximum Theoretical Unit Weight in accordance with ASTM D2041.

Compaction by flooding and jetting is specifically prohibited unless authorized in advance by the Owner or his representative and the Geotechnical Engineer.

Observation and Testing

The Geotechnical Engineer or his representative shall perform field density tests with a frequency and at the locations he feels appropriate. The Geotechnical Engineer or his representative will perform Proctor tests on representative samples of all structural fill material for compliance to structural fill requirements on page A-1. To minimize delays, the Earthwork Contractor is encouraged to submit soil samples prior to use for proctor testing.