TESORO SUBDIVISION, UNIT 4
Los Lunas, New Mexico
December 11, 2020

Prepared For:

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PROJECT NUMBER: 444320-7240000.00

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1.0 INTRODUCTION

This report presents the results of our geotechnical investigation for the Tesoro Subdivision, Unit 4 Project located in Los Lunas, New Mexico.

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

Shallow Foundation Design;
Foundation Bearing Pressures;
Slabs on Grade;
Site Grading;
Lateral Earth Pressures;
Drainage; and
Asphaltic Concrete Pavement.

The conclusions and recommendations presented are based on information provided to us regarding the proposed development, on subsurface conditions disclosed by the borings, 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, Inc. will perform an environmental audit of the site.

2.0 PROPOSED CONSTRUCTION

We understand that it is proposed to construct one hundred seven (107) single family residential dwellings in the form of both single story and two-story construction within the approximately 17 acre subdivision. The project includes the construction of paved streets, retaining walls with a maximum height of 5.0 feet. It is anticipated that the development of the site will require a moderate to appreciable amount of cut and fill.

3.0 SITE CONDITIONS

The proposed subdivision is bounded on the west by on-going development of the Inspiracion Subdivision, on the north by vacant, undeveloped land, on the east by an existing irrigation channel with existing residential properties beyond and on the south by vacant undeveloped land and an existing residential development beyond. Information provided at the time of the report indicates at least 49 feet of relief across the proposed development. The project site is characterized by low rolling hills with natural drainage directed towards all sides except to the west. Vegetation consists of numerous small shrubs, occasional prickly pear, numerous weeds and sparse native grasses. There are several dirt trails throughout the project site. An aerial view of the site is indicated on the Site Plan, Figure 1.

4.0 SITE SUBSURFACE CONDITIONS

To explore the site subsurface conditions, eight (8) borings were drilled at the approximate locations shown on the Site Plan, Figure 1. The soils encountered in the borings drilled at this site consist of poorly graded sand (SP-SM) with silt, silty sand (SM), sandy silt (ML) and sandy silty clay (CL-ML).

The various sand strata were generally described as dry to slightly moist and loose to very dense.

The sandy silt strata were generally described as slightly moist and very stiff to hard.

The sandy silty clay stratum was described as slightly moist and very stiff.

The soils encountered in the borings are also summarized in the following table for ease of reference. The table presents the depth intervals in feet in which each of the major soil types were encountered in each of the borings.

Boring No.	Poorly Graded Sand	Silty Sand	Sandy Silt	Silty Clay
B-1	0 – 10.0	10.0 – 51.5	-	-
B-2	7.5 – 26.5	0 – 7.5	-	-
B-3	10.0 – 25.0	0 – 10.0, 25.0 – 51.5	-	-
B-4	0 – 15.0	15.0 – 20.0, 25.0 – 26.5	20.0 – 25.0	-
B-5	0 – 35.0	35.0 – 51.5	-	-
B-6	-	0 – 26.5	-	-
B-7	0 – 7.5	20.0 – 51.5	15.0 – 20.0	7.5 – 15.0
B-8	10.0 – 26.5	0 – 10.0	-	-

Neither flowing groundwater nor bedrock was encountered in the borings to a depth of fifty-one and one half (51.5) 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 borings allow observation of a small portion of the soils below the site. Significant variations in subsurface conditions may occur across the site, which were not disclosed by the borings.

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 borings. The laboratory testing program

was structured to determine the physical properties of the soils encountered in the borings necessary for development of geotechnical recommendations.

The laboratory testing program included:

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

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 borings have dry density values ranging from 91 pounds per cubic foot to 122 pounds per cubic foot. Natural moisture content ranged from 0.9 percent to 8.8 percent. Test results are presented on the Logs of Borings, Figures 2 through 9, respectively, 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 and summarized 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 exhibited slight to moderate compressibility under anticipated loads. Slight to appreciable additional settlement (collapse) occurred upon inundation of the tested soils with water. Test results are presented on Figures 11 through 18.

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 either on conventional spread and strip footings or a monolithic slab on grade with turned down edges. Foundations and turned down edges should bear on building pads constructed with a minimum of five (5.0) feet of structural fill. 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 2,000 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. Spread and strip 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.

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 not less than 1.0% and not greater than 3.0% of optimum 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 structures should be placed and compacted as detailed in the attached Appendix. Prior to placing concrete for footings, excavations should be cleaned of any slough, loose soil, or debris. Additionally, any existing underground utilities below the proposed building addition should be removed and not abandoned in place. Footing excavations should be compacted as specified 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 on-site soils will collapse if allowed to increase in moisture content. With appropriate landscape irrigation, site grading and drainage as detailed in this report the moisture content of the soils within five to seven 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 ten feet occurs, movement slightly to moderately greater than quoted above will occur.

Based upon the results of this investigation, an International Building Code Site Classification of "D" may be utilized for design. Based on the SEAOC and OSHPD Seismic Design Map Tool and using the coordinates for boring B-4, the 0.2 second and 1.0 second spectral coordinates at this site are S_s = 0.406g and S_1 = 0.126g, respectively, for Site Class D. Results also indicate F_a = 1.475 and F_v = 2.348.

7.0 SLAB-ON-GRADE

Concrete slabs-on-grade may be utilized. Slabs should bear on building pads constructed with a minimum of five (5.0) feet of structural fill. Minimum floor slabs thickness, overall slab reinforcement, and sawed joints or control joints should be determined by a qualified structural engineer. 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.

Slabs should be adequately reinforced with steel. Reinforcement should be placed and supported as detailed in Section R506.2.4 of the 2009 International Building Code. Slab reinforcement should be turned down into turned down edges.

A vapor retarder is recommended beneath slab-on-grade construction. The vapor retarder may consist of a 15-mil polyethylene film or equivalent. As an alternative, the vapor retarder may consist of

Stego Wrap 15 mil installed in accordance with the manufacturer's recommendations. The vapor retarder should be placed over 4 inches of capillary water barrier.

Capillary water barrier shall consist of clean, crushed, nonporous rock, crushed gravel, or uncrushed gravel. Gradation of capillary water barrier shall meet grading requirements of ASTM C 33 coarse aggregate Size 67 and washed so that none to at most only trace quantities pass the No. 200 sieve. Capillary water barrier under concrete floor and area-way slabs on grade should be placed directly on the finished subgrade and should be compacted with a minimum of two passes of a hand-operated plate-type vibratory compactor.

For structural design of the floor slab, a modulus of subgrade reaction of 400 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:

$$K_s = 400\left[\frac{B+1}{2B}\right]^2$$

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

B = Effective width of loaded area (feet)

Slabs should bear on building pads constructed with a minimum of five (5.0) feet of structural fill. 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 not less than 1.0% and not greater than 3.0% of optimum 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 Appendix.

8.0 RETAINING WALLS

Retaining walls constructed in conjunction with this project are not anticipated to exceed five (5.0) feet in height. If higher walls or unusual loading conditions such as sloping backfill, slopes below retaining wall footings or surcharges are anticipated, this office should be contacted for supplemental recommendations.

Foundations for retaining walls may be designed for a maximum toe bearing pressure of 2,000 pounds per square foot. Retaining wall footings should be embedded a minimum of eighteen inches below lowest adjacent grade. Retaining wall footings should bear on a minimum of 18 inches of structural fill. The structural fill should be moistened to not less than 1.0% below and not greater than 3.0% above optimum moisture content, and compacted to a minimum of 95% of maximum density as determined by ASTM D-1557. Structural fill should extend a minimum of two feet beyond the edge of all footings. Prior to placing structural fill, the exposed soils should be scarified to a depth of eight inches; moistened to not less than 1.0% and not greater than 3.0% of optimum moisture content, and compacted to a minimum of 95% of maximum density as determined by ASTM D-1557.

We recommend that the following equivalent fluid pressures be utilized for design of retaining walls:

Loading Condition	Equivalent Fluid Pressure*
Active Earth Pressure	-
Wall Height up to 5'-0"	40 pcf
Passive Earth Pressure	-
Undisturbed Natural Soils	300 pcf
Structural Fill	400 pcf
Earth Pressure at Rest	60 pcf

* Does not include a factor of safety or hydrostatic pressure.

The above earth pressures do not include a factor of safety or hydrostatic pressure. If retaining walls are restrained against rotation (corners of basements, upper floors, etc.) the earth pressure at rest should be utilized for design.

Lateral retaining wall loads will be resisted by passive earth pressure at the toe and friction along the base of the wall. A coefficient of friction between soil and concrete of 0.4 may be used for design.

Backfill adjacent to retaining walls should be placed and compacted as detailed in the attached Appendix. Backfill adjacent to walls should be compacted with relatively light, hand-operated equipment to prevent overstressing the wall and excessive lateral deflections.

To prevent staining of concrete, the back of retaining walls should be waterproofed prior to backfilling. Weep holes should be constructed near the base of exterior walls. Perimeter drains may be necessary around interior walls.

9.0 EARTHWORK

9.1 GENERAL

The settlement estimates presented in this report are based upon the assumption that site earthwork will be performed as recommended in this report. Presented below is a summary of the site earthwork recommendations. Detailed earthwork procedures are presented in the Appendix. In the event of conflict between recommendations provided below and those presented in the Appendix, the below recommendations will apply.

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.

9.2 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 specified in the Appendix.

9.3 EXCAVATION

We anticipate that on-site soils can be excavated with conventional earthwork equipment. Cobbles and boulders, if encountered, 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.

9.4 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 moistened to not less than 1.0% and not greater than 3.0% of optimum 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.

9.5 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 to a minimum of 95% of maximum dry density as determined by ASTM D-1557. Structural fill below footings and slabs should be compacted to a minimum of 95% of maximum dry density as determined by ASTM D-1557. Some of the on-site soils within the upper five (5.0) feet may not be suitable for re-use as structural fill, at least those soils which lack sufficient fines. It is anticipated that the on-site soils may be blended with either import materials containing slightly more fines or surrounding soils within the project area which satisfy structural fill criteria. The resulting blended materials should be tested for conformance with the structural fill criteria.

9.6 OBSERVATION AND TESTING

Placement and compaction of 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.

9.7 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 six-inch vertical intervals, unless otherwise specified by the project documents. If fill areas are worked at different times, each individual area should be tested. Following finish grading, the final surface should be tested.

10.0 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.

To reduce the risk of structure settlement the site should be graded to effectively 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 this criterion 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.

11.0 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.

12.0 UTILITIES

Backfill in utility line trenches below driveways and pavement should be compacted to a minimum of 90% of maximum density as determined by ASTM D-1557, except within the upper 12 inches. The upper 12 inches of utility backfill shall be compacted to a minimum of 95% 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.

13.0 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.

14.0 ASPHALTIC CONCRETE PAVEMENT

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

Traffic within the subdivision is anticipated to consist primarily of automobiles and pick-up trucks. Very limited delivery and no semi-truck traffic, other than the occasional larger moving vans, are anticipated. For design purposes, we have assumed an EDLA (Equivalent Daily 18 kip Load Applications) of 0.2 for residential streets. As much of the near surface soils during site preparation of the roadways are likely to consist of A-2-4 soils, based on the AASHTO soil classification system, a conservative R-value of 50 was considered. 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 automobile, pick-up truck, and service trucks:

	Asphaltic Concrete	Aggregate Base Course
Residential Streets	2.0”	-

Pavement subgrade and all fill below paved areas shall be placed and compacted as detailed in the attached Appendix. Aggregate Base Course shall consist of Class I or Class II material as specified in “New Mexico State Department of Transportation." Base course shall be compacted to a minimum of 95% of maximum density as determined by ASTM D-1557.

Asphaltic concrete shall be Class SP-B as described in Section 116 of the "New Mexico Standard Specifications for Public Works Construction." Class SP-C Asphaltic Concrete may be utilized if a very smooth surface is desired. However, Class SP-C Asphaltic Concrete tends to be less durable than Class SP-B. Asphaltic Concrete shall be compacted to a range of 93-97% of the maximum Theoretical Unit Weight (ASTM D-2041).

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 various types of sands as encountered within the upper 3.0 feet of the borings drilled at this site. If the subgrade consists of imported soil, the import should be much more granular than the on-site soils. 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.

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.

15.0 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 borings. Soil and groundwater conditions may vary between borings and with time.

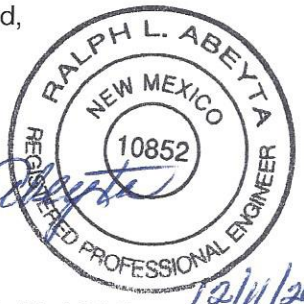
This report reflects our interpretation of the site subsurface conditions. We strongly recommend that prior to bidding all contractors perform their own subsurface investigation to form their own opinion of the site soil, rock, and groundwater conditions. Should contractors elect to use this report for 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 NV5, Inc. 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. NV5 would be pleased to provide these services.

Respectfully submitted,
NV5, Inc.



12/11/2020

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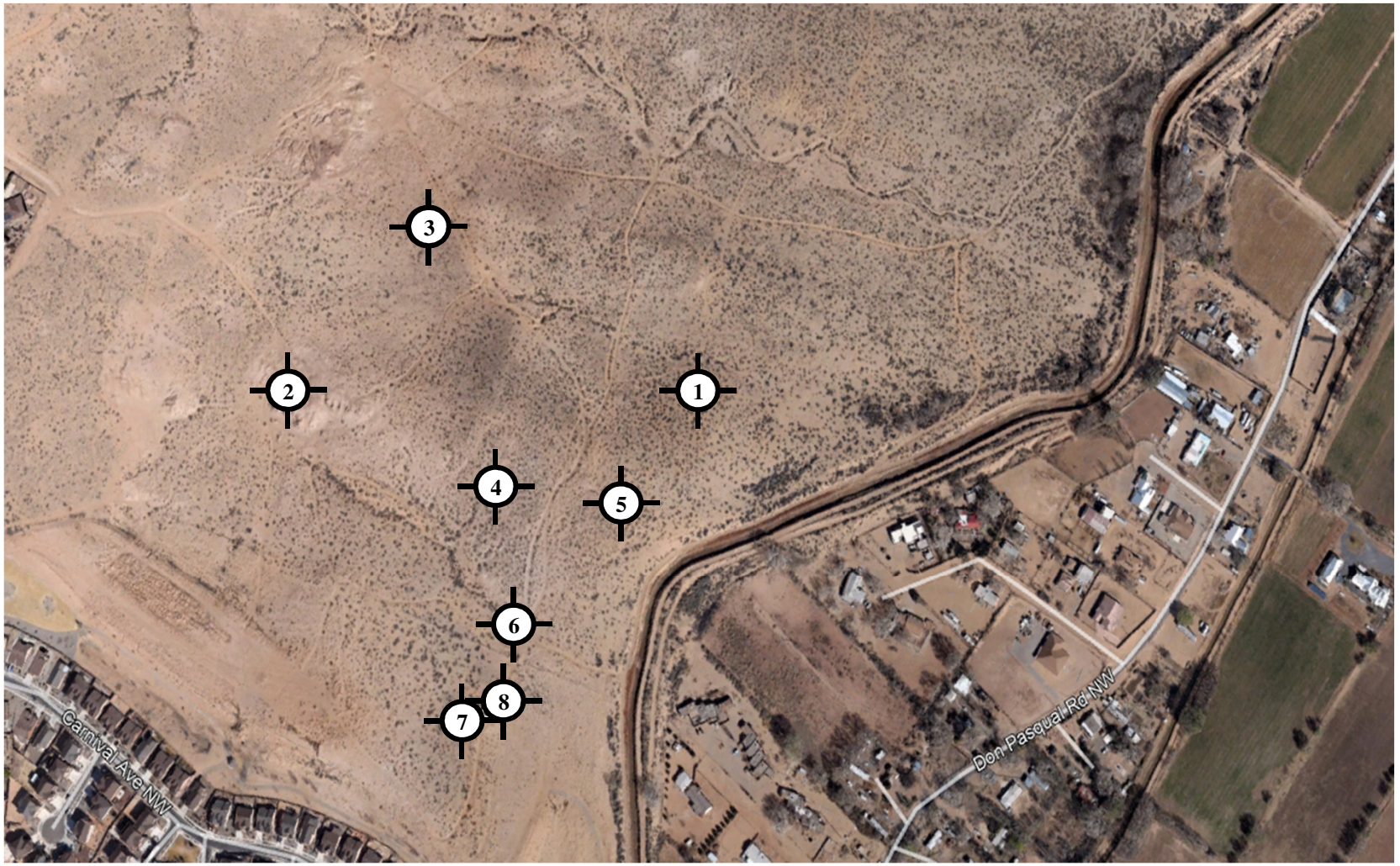
NV5 Project No.: 444320-7240000.00

SITE PLAN
***Scale Unknown**



Boring Location

FIGURE 1

BORING LOG NO. 1

Project: Tesoro at Fiesta Unit 4, Los Lunas, NM
Project No.: 444320-7240000.00
Elevation: N/A
Date Drilled: 11/2/2020
Depth to Groundwater: Not Encountered
Drilling Method: 7" H.S.A.

Depth, feet	Blows/Foot	Sample Type	Dry Density pcf	Water Content, %	Additional Testing	Unified Classification	Material Description
						SP-SM	SAND, poorly graded with silt, fine grained, loose, slightly moist, light brown
	25	MC	101	1.7	1,2		Medium dense, dry
5							
	17	MC	102	1.8	1,2,5		
	9	S		2.1			Loose
10							
	13	S		2.3		SM	SAND, silty, fine grained, medium dense, dry, light brown
15							
	13	S		2.2			
20							
	10	S		2.1			
25							
	13	S		2.6			
30							
	14	S		2.3			
35							

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

Figure: 2

BORING LOG NO. 1 cont'd

Project: Tesoro at Fiesta Unit 4, Los Lunas, NM
Project No.: 444320-7240000.00
Elevation: N/A
Date Drilled: 11/2/2020
Depth to Groundwater: Not Encountered
Drilling Method: 7" H.S.A.

Depth, feet	Blows/Foot	Sample Type	Dry Density pcf	Water Content, %	Additional Testing	Unified Classification	Material Description
	13	S		2.2		SM	SAND, silty, fine grained, medium dense, dry, light brown
40							
	9	S		2.9			Loose
45							
	20	S		2.7	1,2		Medium dense
50							
	32	S		2.6			Dense
							Bottom of boring 51½'
55							
60							
65							
70							

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

Figure: 2 cont'd

BORING LOG NO. 2

Project: Tesoro at Fiesta Unit 4, Los Lunas, NM
Project No.: 444320-7240000.00
Elevation: N/A
Date Drilled: 11/2/2020
Depth to Groundwater: Not Encountered
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 grained, loose, dry, light brown
	30	MC	109	2.2	1,2,5		Medium dense
5							
	10	S		1.4			Loose, grayish brown
	23	MC	122	0.9	1,2	SP-SM	SAND, poorly graded with silt, fine grained, medium dense, dry, gray
10							
	17	S		1.1			
15							
	15	S		1.7			
20							
	16	S		4.2			
25							
	19	S		1.9			
							Bottom of boring 26½'
30							
35							

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

Figure: 3

BORING LOG NO. 3

Project: Tesoro at Fiesta Unit 4, Los Lunas, NM
Project No.: 444320-7240000.00
Elevation: N/A
Date Drilled: 11/2/2020
Depth to Groundwater: Not Encountered
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 grained, loose, slightly moist, brown to light brown
	15	MC	102	2.2			
5							
	20	MC	91	1.4	1,2,5		Medium dense, light brown-gray
	15	S		1.1			
10							
	28	MC		1.2	1,2	SP-SM	SAND, poorly graded with silt, fine grained, medium dense, dry, light grayish brown
15							
	14	S		1.3			
20							
	16	S		1.8	1,2		
25							
	41	S		1.6		SM	SAND, silty, fine grained, dense, dry, light brown-gray
30							
	40	S		2.4			
35							

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

Figure: 4

BORING LOG NO. 3 cont'd

Project: Tesoro at Fiesta Unit 4, Los Lunas, NM
Project No.: 444320-7240000.00
Elevation: N/A
Date Drilled: 11/2/2020
Depth to Groundwater: Not Encountered
Drilling Method: 7" H.S.A.

Depth, feet	Blows/Foot	Sample Type	Dry Density pcf	Water Content, %	Additional Testing	Unified Classification	Material Description
	23	S		3.5		SM	SAND, silty, fine grained, medium dense, slightly moist, light brown-gray
40							
	25	S		4.7	1,2		Trace gravel, light brown
45							
	42	S		1.4			Dense, dry
50							
	40	S		2.1			
							Bottom of boring 51½'
55							
60							
65							
70							

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

Figure: 4 cont'd

BORING LOG NO. 4

Project: Tesoro at Fiesta Unit 4, Los Lunas, NM
Elevation: N/A
Depth to Groundwater: Not Encountered

Project No.: 444320-7240000.00
Date Drilled: 11/3/2020
Drilling Method: 7" H.S.A.

Depth, feet	Blows/Foot	Sample Type	Dry Density pcf	Water Content, %	Additional Testing	Unified Classification	Material Description
						SP-SM	SAND, poorly graded with silt, fine grained, loose, dry, light brown
	14	MC	102	2.0			
5							
	11	MC	100	1.7	1,2,5		
	7	S		2.1			
10							
	7	S		1.5	1,2		
15							
	21	S		2.2		SM	SAND, silty, fine grained, medium dense, dry, light brown
20							
	52	S		7.5	1,2	ML	SILT, sandy, hard, slightly moist, brown-light brown
25							
	69	S		1.8		SM	SAND, silty, fine grained, very dense, dry, light brown
							Bottom of boring 26½'
30							
35							

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

Figure: 5

BORING LOG NO. 5

Project: Tesoro at Fiesta Unit 4, Los Lunas, NM
Project No.: 444320-7240000.00
Elevation: N/A
Date Drilled: 11/2/2020
Depth to Groundwater: Not Encountered
Drilling Method: 7" H.S.A.

Depth, feet	Blows/Foot	Sample Type	Dry Density pcf	Water Content, %	Additional Testing	Unified Classification	Material Description
						SP-SM	SAND, poorly graded with silt, fine grained, very loose, slightly moist, brown
	7	S		5.1	1,2		Loose
5							
	5	S		5.2			
	8	MC	96	4.9	1,2,5		
10							
	15	MC	101	2.0			Medium dense, dry
15							
	12	MC	99	2.1	1,2,5		Lightly brown-gray
20							
	10	S		2.2			Loose
25							
	10	S		2.1	1,2		Brown
30							
	10	S		2.2			
35							

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

Figure: 6

BORING LOG NO. 5 cont'd

Project: Tesoro at Fiesta Unit 4, Los Lunas, NM
Project No.: 444320-7240000.00
Elevation: N/A
Date Drilled: 11/2/2020
Depth to Groundwater: Not Encountered
Drilling Method: 7" H.S.A.

Depth, feet	Blows/Foot	Sample Type	Dry Density pcf	Water Content, %	Additional Testing	Unified Classification	Material Description
	16	S		2.0		SM	SAND, silty, fine grained, medium dense, dry, brown
40	13	S		2.1			
45	12	S		2.3			
50	16	S		2.2			
							Bottom of boring 51½'
55							
60							
65							
70							

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

Figure: 6 cont'd

BORING LOG NO. 6

Project: Tesoro at Fiesta Unit 4, Los Lunas, NM
Project No.: 444320-7240000.00
Elevation: N/A
Date Drilled: 11/3/2020
Depth to Groundwater: Not Encountered
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 grained, loose, dry, light brown
	22	MC	106	1.6			Medium dense
5							
	29	MC	109	1.8	1,2		
	15	S		2.5	1,2		
10							
	9	S		2.1			Loose
15							
	16	S		1.2			Medium dense
20							
	21	S		1.2			
25							
	14	S		2.3			
30							Bottom of boring 26½'
35							

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

Figure: 7

BORING LOG NO. 7

Project: Tesoro at Fiesta Unit 4, Los Lunas, NM
Project No.: 444320-7240000.00
Elevation: N/A
Date Drilled: 11/2/2020
Depth to Groundwater: Not Encountered
Drilling Method: 7" H.S.A.

Depth, feet	Blows/Foot	Sample Type	Dry Density pcf	Water Content, %	Additional Testing	Unified Classification	Material Description
						SP-SM	SAND, poorly graded with silt, fine grained, loose, dry, light brown
	11	S		2.9	1,2		
5							
	20	S		5.2			Medium dense, slightly moist, brown
	30	MC	98	8.8	1,2,5	CL-ML	CLAY, sandy, silty, very stiff, slightly moist, brown
10							
	25	MC	100	4.7			
15							
	26	S		4.1	1,2	ML	SILT, sandy, very stiff, slightly moist, light brown
20							
	16	S		6.0		SM	SAND, silty, fine grained, medium dense, slightly moist, brown
25							
	36	S		6.2	1,2		Dense
30							
	40	S		1.0			Dry, light brown
35							

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

Figure: 8

BORING LOG NO. 7 cont'd

Project: Tesoro at Fiesta Unit 4, Los Lunas, NM
Project No.: 444320-7240000.00
Elevation: N/A
Date Drilled: 11/2/2020
Depth to Groundwater: Not Encountered
Drilling Method: 7" H.S.A.

Depth, feet	Blows/Foot	Sample Type	Dry Density pcf	Water Content, %	Additional Testing	Unified Classification	Material Description
	29	S		1.0		SM	SAND, silty, fine grained, medium dense, dry, light brown
40							
	28	S		1.0			Trace of gravel
45							
	60	S		1.6			Very dense
50							
	49	S		2.4			Dense
							Bottom of boring 51½'
55							
60							
65							
70							

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

Figure: 8 cont'd

BORING LOG NO. 8

Project: Tesoro at Fiesta Unit 4, Los Lunas, NM
Project No.: 444320-7240000.00
Elevation: N/A
Date Drilled: 11/3/2020
Depth to Groundwater: Not Encountered
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 grained, loose, dry, light brown
	15	MC	101	1.5			
5							
	28	MC	102	1.9	1,2,5		Medium dense
	11	S		1.5			
10							
	8	S		1.4	1,2	SP-SM	SAND, poorly graded with silt, fine grained, loose, dry, light brown
15							
	26	S		0.9			Medium dense
20							
	16	S		1.0			
25							
	20	S		2.1			
							Bottom of boring 26½'
30							
35							

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

Figure: 9

NOTES - LOGS OF BORE HOLES

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

"Drilling Method" refers to the equipment utilized to advance the bore 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.

"MC" 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.

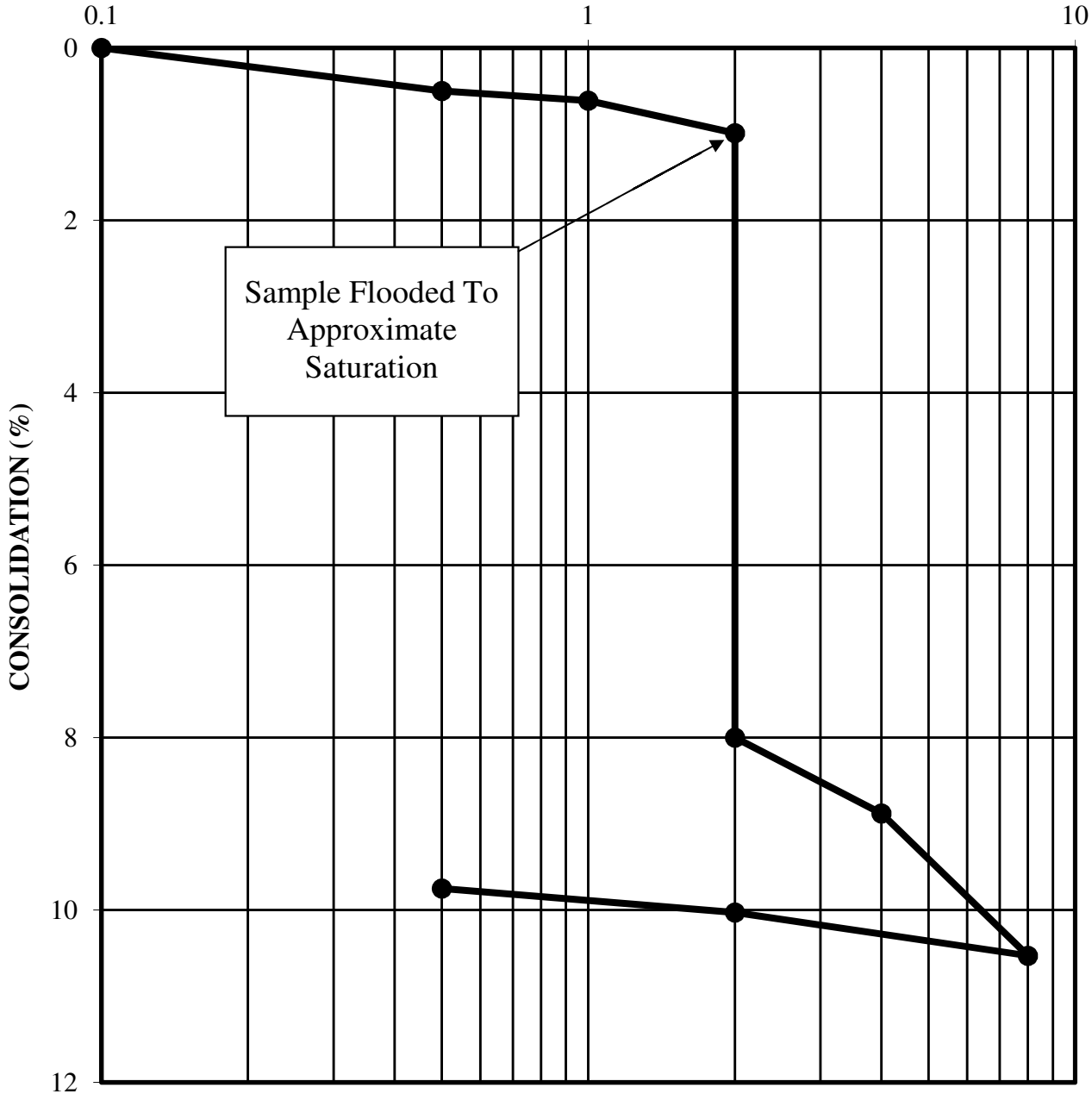
"Water Content %" indicates the laboratory determined soil moisture content in percent (ASTM D-2216).

"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 bore holes. Subsurface conditions may also vary between bore holes and with time.

Figure No.: 10

CONSOLIDATION TEST RESULTS

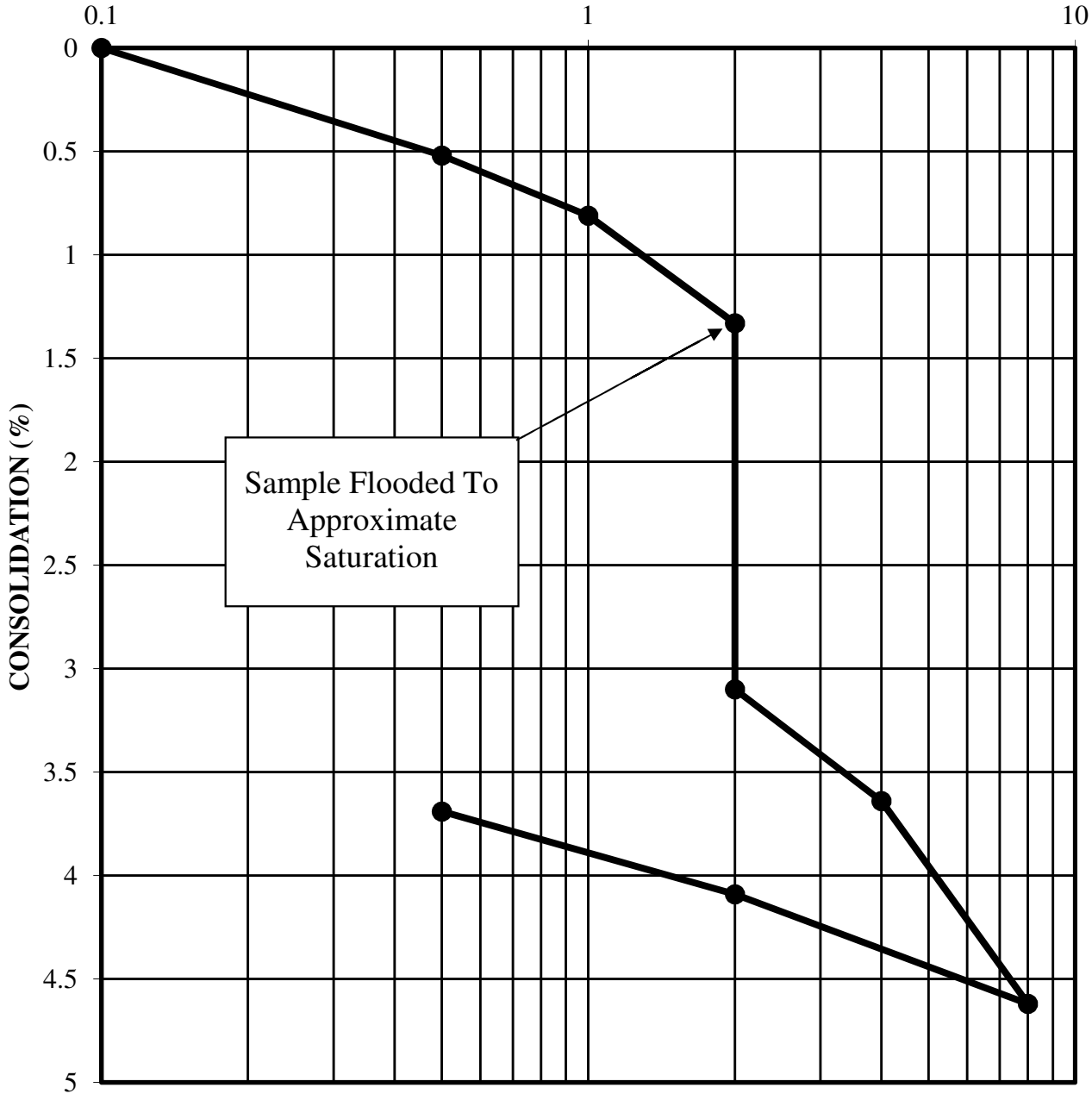


TEST HOLE NUMBER: B-1
SAMPLE DEPTH: 5.0 - 6.0 FEET
SOIL DESCRIPTION: Poorly graded SAND w/silt (SP-SM)
MOISTURE CONTENT: 1.8 %
BULK UNIT WEIGHT: 102 pcf

PROJECT: Tesoro Subdivision, Unit 4, Los Lunas, New Mexico
PROJECT NO.: 444320-7240000.00

FIGURE NO.: 11

CONSOLIDATION TEST RESULTS

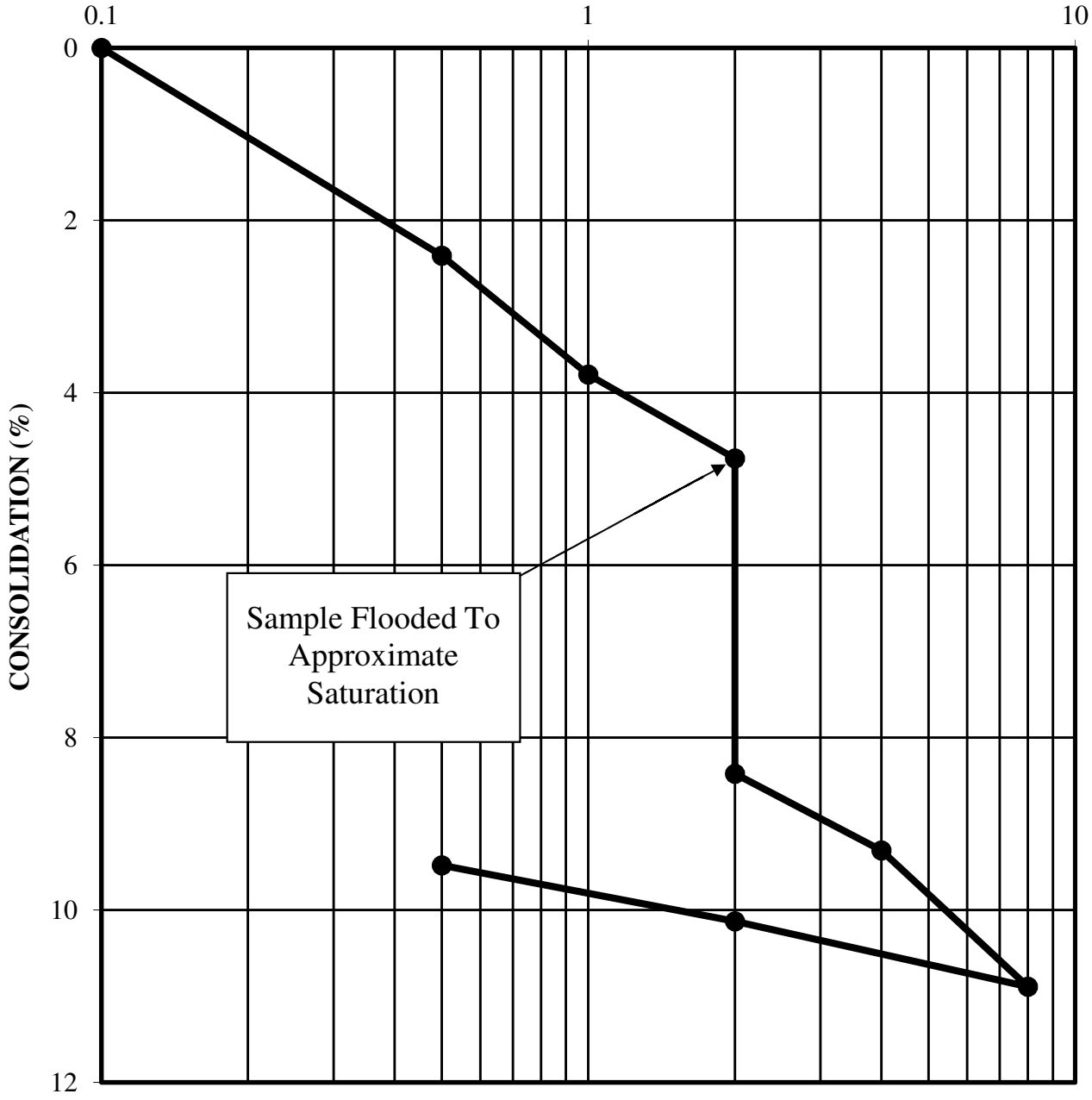


TEST HOLE NUMBER: B-2
SAMPLE DEPTH: 2.5 - 3.5 FEET
SOIL DESCRIPTION: Silty SAND (SM)
MOISTURE CONTENT: 2.2 %
BULK UNIT WEIGHT: 109 pcf

PROJECT: Tesoro Subdivision, Unit 4, Los Lunas, New Mexico
PROJECT NO.: 444320-7240000.00

FIGURE NO.: 12

CONSOLIDATION TEST RESULTS

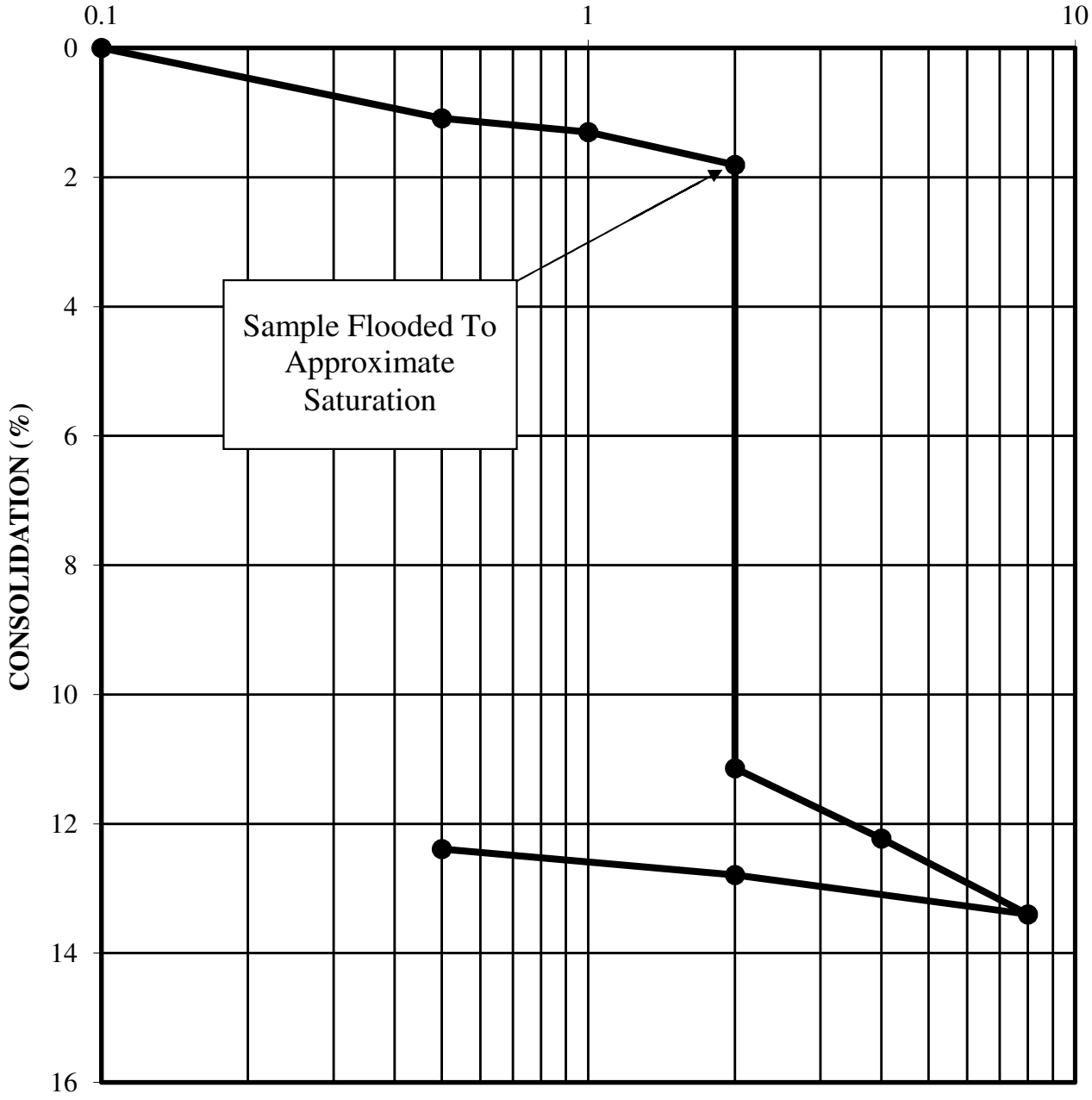


TEST HOLE NUMBER: B-3
SAMPLE DEPTH: 5.0 - 6.0 FEET
SOIL DESCRIPTION: Silty SAND (SM)
MOISTURE CONTENT: 1.4 %
BULK UNIT WEIGHT: 91 pcf

PROJECT: Tesoro Subdivision, Unit 4, Los Lunas, New Mexico
PROJECT NO.: 444320-7240000.00

FIGURE NO.: 13

CONSOLIDATION TEST RESULTS

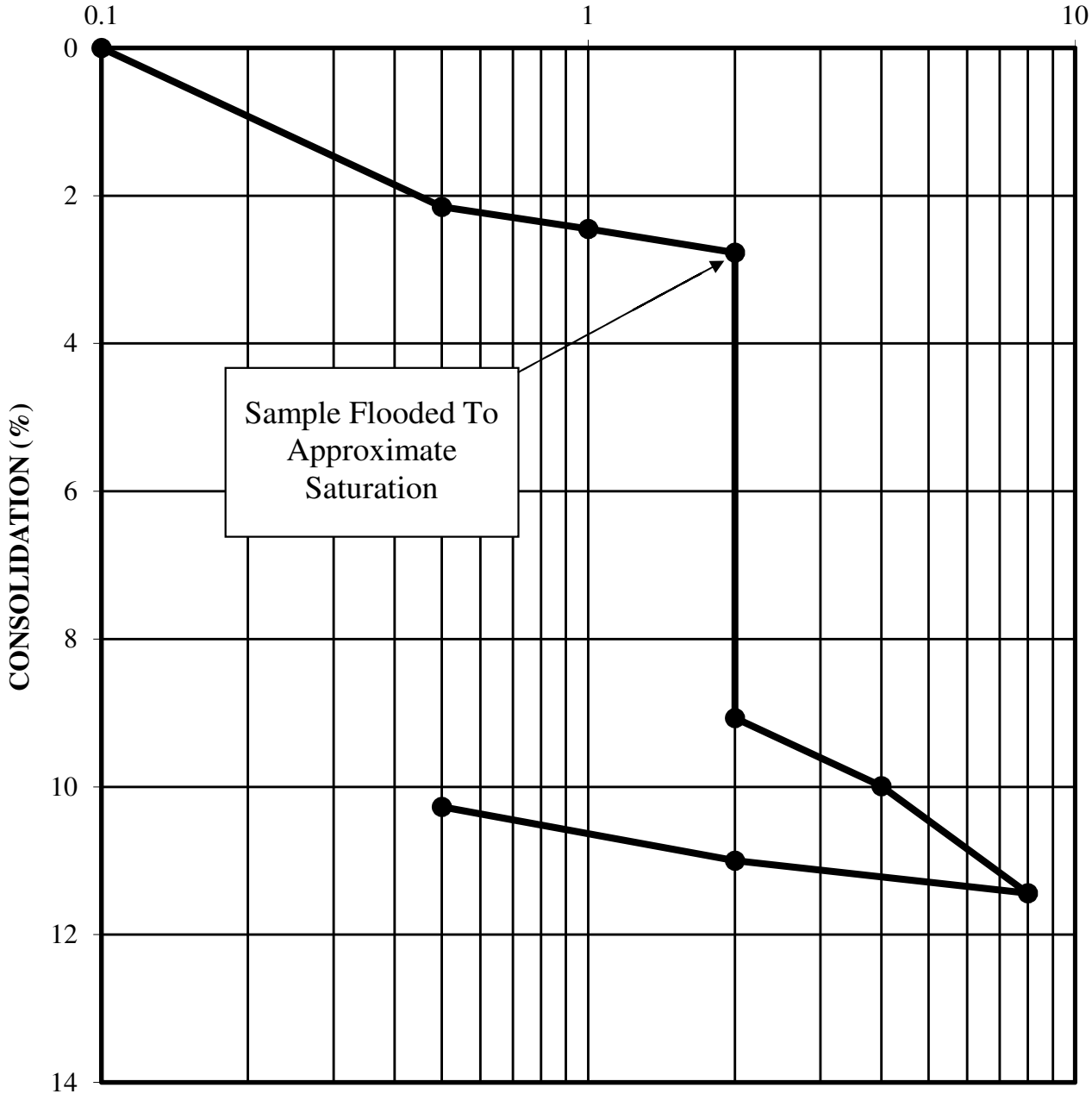


TEST HOLE NUMBER: B-4
SAMPLE DEPTH: 5.0 - 6.0 FEET
SOIL DESCRIPTION: Poorly graded SAND w/silt (SP-SM)
MOISTURE CONTENT: 1.7 %
BULK UNIT WEIGHT: 100 pcf

PROJECT: Tesoro Subdivision, Unit 4, Los Lunas, New Mexico
PROJECT NO.: 444320-7240000.00

FIGURE NO.: 14

CONSOLIDATION TEST RESULTS

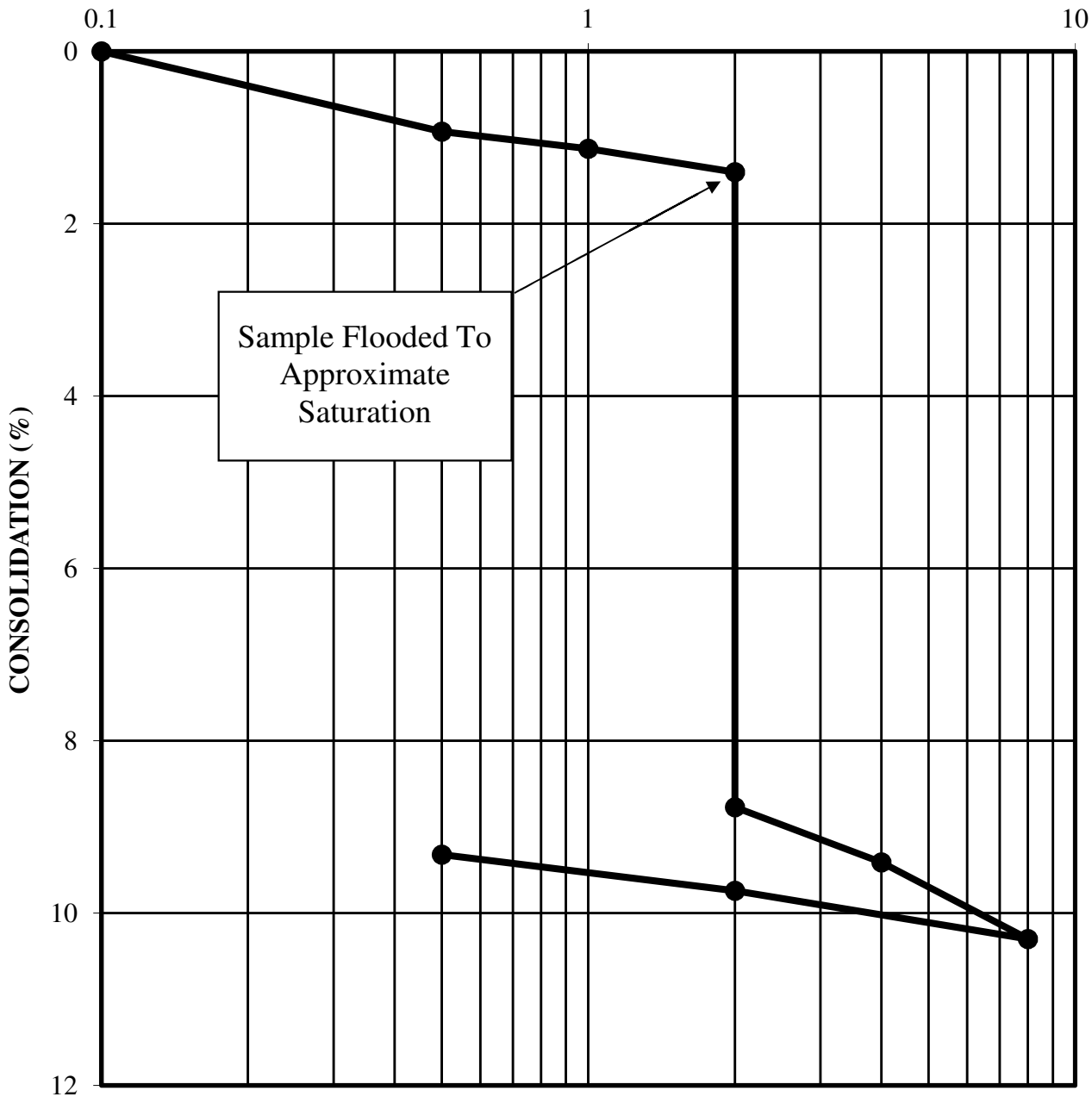


TEST HOLE NUMBER: B-5
SAMPLE DEPTH: 7.5 - 8.5 FEET
SOIL DESCRIPTION: Poorly graded SAND w/silt (SP-SM)
MOISTURE CONTENT: 4.9 %
BULK UNIT WEIGHT: 96 pcf

PROJECT: Tesoro Subdivision, Unit 4, Los Lunas, New Mexico
PROJECT NO.: 444320-7240000.00

FIGURE NO.: 15

CONSOLIDATION TEST RESULTS

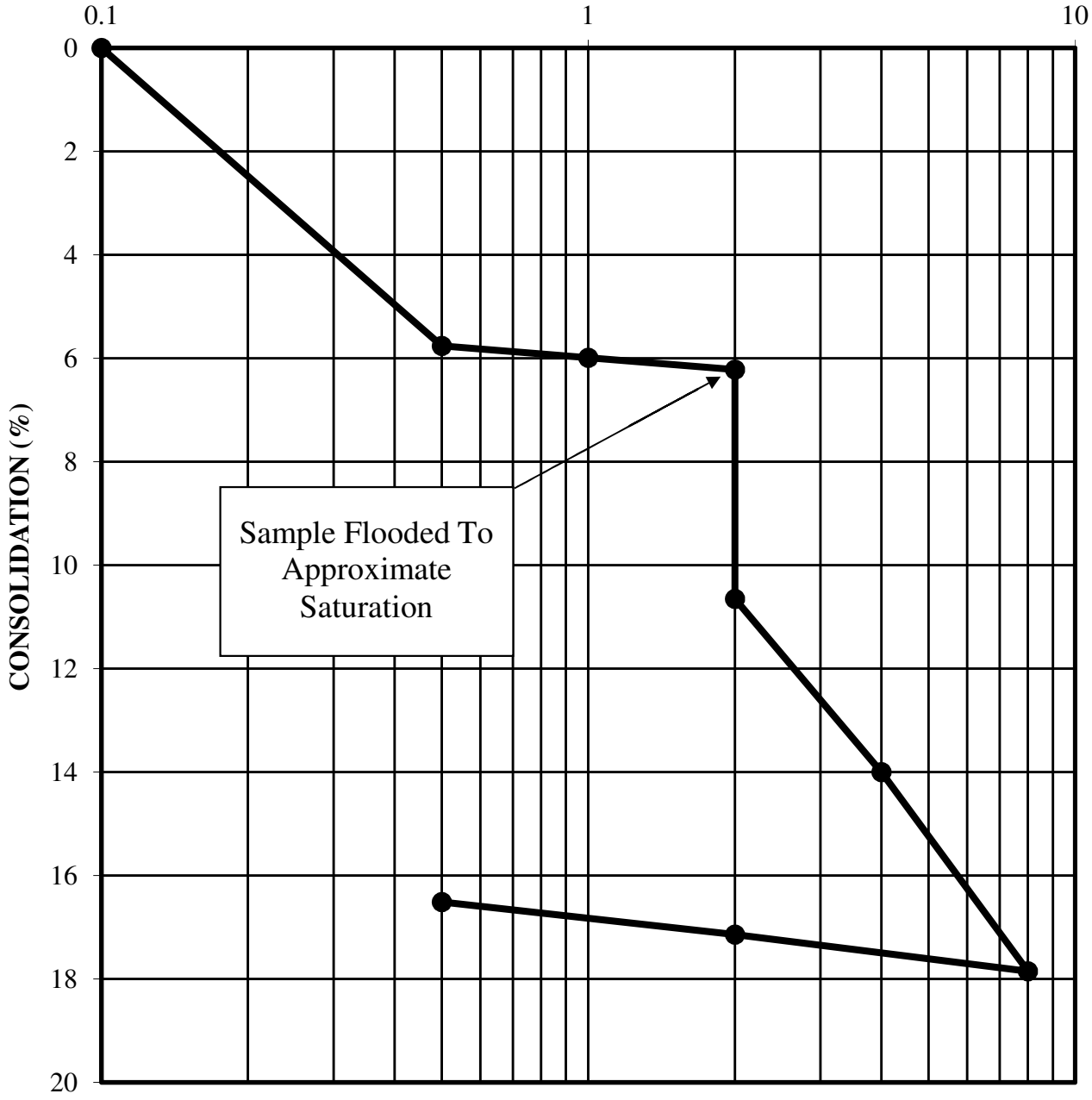


TEST HOLE NUMBER: B-5
SAMPLE DEPTH: 15.0 - 16.0 FEET
SOIL DESCRIPTION: Poorly graded SAND w/silt (SP-SM)
MOISTURE CONTENT: 2.1 %
BULK UNIT WEIGHT: 99 pcf

PROJECT: Tesoro Subdivision, Unit 4, Los Lunas, New Mexico
PROJECT NO.: 444320-7240000.00

FIGURE NO.: 16

CONSOLIDATION TEST RESULTS

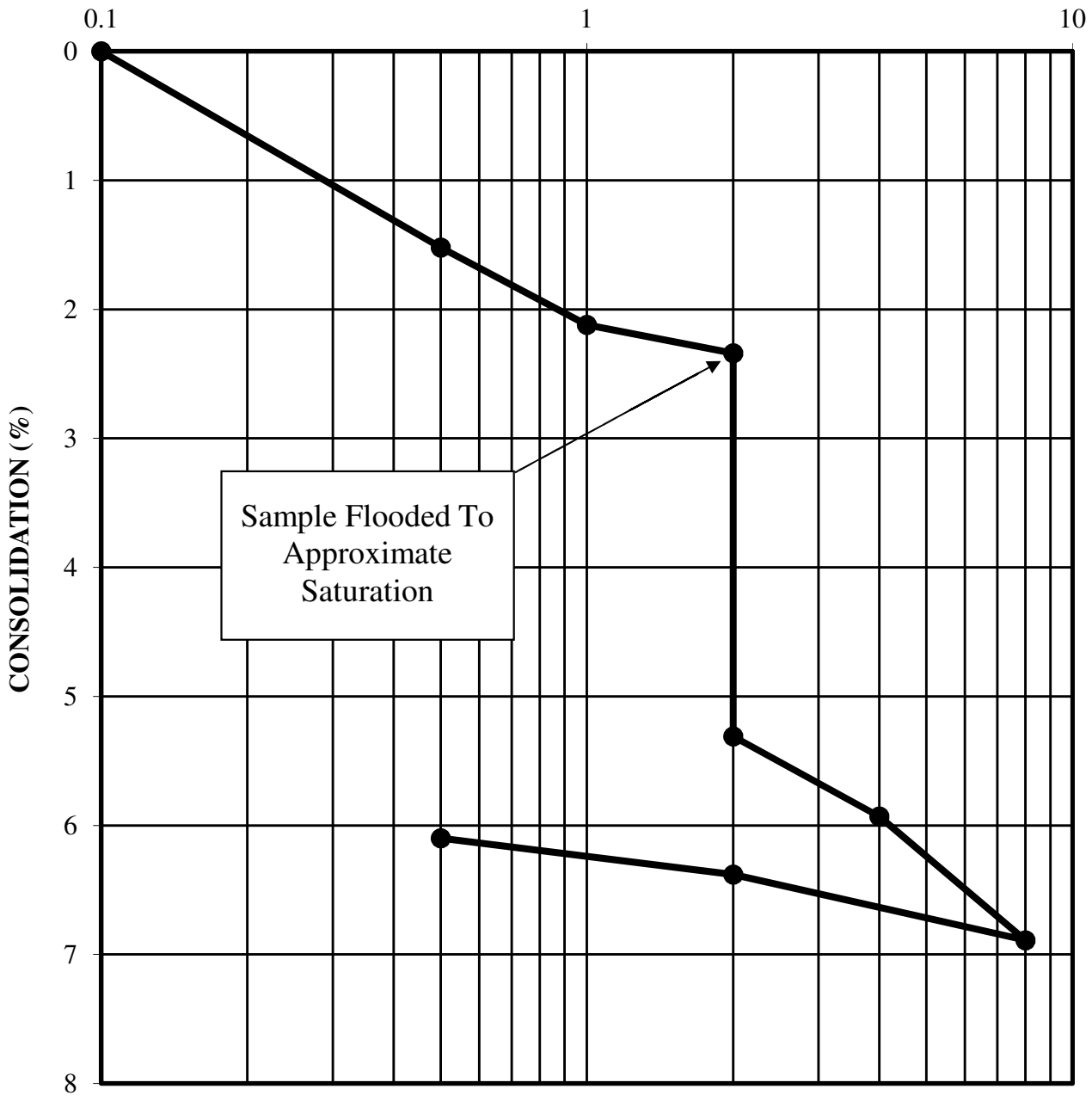


TEST HOLE NUMBER: B-7
SAMPLE DEPTH: 7.5 - 8.5 FEET
SOIL DESCRIPTION: Sandy, silty CLAY (CL-ML)
MOISTURE CONTENT: 8.8 %
BULK UNIT WEIGHT: 98 pcf

PROJECT: Tesoro Subdivision, Unit 4, Los Lunas, New Mexico
PROJECT NO.: 444320-7240000.00

FIGURE NO.: 17

CONSOLIDATION TEST RESULTS



TEST HOLE NUMBER: B-8
SAMPLE DEPTH: 5.0 - 6.0 FEET
SOIL DESCRIPTION: Silty SAND (SM)
MOISTURE CONTENT: 1.9 %
BULK UNIT WEIGHT: 102 pcf

PROJECT: Tesoro Subdivision, Unit 4, Los Lunas, New Mexico
PROJECT NO.: 444320-7240000.00

FIGURE NO.: 18

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	2.5	SP-SM	101	1.7	NV	NP						100	99	95	73	10.3	Poorly graded SAND with silt
1	5	SP-SM	102	1.8	NV	NP							100	97	77	10.8	Poorly graded SAND with silt
1	7.5			2.1													
1	10			2.3													
1	15			2.2													
1	20			2.1													
1	25			2.6													
1	30			2.3													
1	35			2.2													
1	40			2.9													
1	45	SM		2.7	NV	NP						100	97	81	54	13.6	Silty SAND
1	50			2.6													
2	2.5	SM	109	2.2	NV	NP						100	99	88	48	16.9	Silty SAND
2	5			1.4													
2	7.5	SP-SM	122	0.9	NV	NP						100	99	89	29	7.1	Poorly graded SAND with silt
2	10			1.1													
2	15			1.7													
2	20			4.2													
2	25			1.9													
3	2.5		102	2.2													

NV5 Project No.: 444320-7240000.00

Project: Tesoro at Fiesta Unit 4 - Los Lunas, NM **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	
3	5	SM	91	1.4	NV	NP						100	99	92	57	18.3	Silty SAND
3	7.5			1.1													
3	10	SP-SM		1.2	NV	NP						100	99	91	28	10.8	Poorly graded SAND with silt
3	15			1.3													
3	20	SP-SM		1.8	NV	NP						100	99	83	23	9.4	Poorly graded SAND with silt
3	25			1.6													
3	30			2.4													
3	35			3.5													
3	40	SM		4.7	NV	NP			100	98	97	96	90	64	31	21.2	Silty SAND
3	45			1.4													
3	50			2.1													
4	2.5		102	2.0													
4	5	SP-SM	100	1.7	NV	NP							100	84	15	6.0	Poorly graded SAND with silt
4	7.5			2.1													
4	10	SP-SM		1.5	NV	NP						100	99	76	25	9.0	Poorly graded SAND with silt
4	15			2.2													
4	20	ML		7.5	NV	NP					100	99	98	91	71	50.3	Sandy SILT
4	25			1.8													
5	2.5	SP-SM		5.1	NV	NP							100	96	61	11.1	Poorly graded SAND with silt
5	5			5.2													

NV5 Project No.: 444320-7240000.00

Project: Tesoro at Fiesta Unit 4 - Los Lunas, NM **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	
5	7.5	SP-SM	96	4.9	NV	NP							100	97	73	11.4	Poorly graded SAND with silt
5	10		101	2.0													
5	15	SP-SM	99	2.1	NV	NP							100	96	65	8.5	Poorly graded SAND with silt
5	20			2.2													
5	25	SP-SM		2.1	NV	NP							100	97	65	9.7	Poorly graded SAND with silt
5	30			2.2													
5	35			2.0													
5	40			2.1													
5	45			2.3													
5	50			2.2													
6	2.5		106	1.6													
6	5	SM	109	1.8	NV	NP							100	91	48	18.9	Silty SAND
6	7.5	SM		2.5	NV	NP				100	99	99	97	82	40	18.7	Silty SAND
6	10			2.1													
6	15			1.2													
6	20			1.2													
6	25			2.3													
7	2.5	SP-SM		2.9	NV	NP							100	89	37	10.9	Poorly graded SAND with silt
7	5			5.2													
7	7.5	CL-ML	98	8.8	29	7					100	98	93	90	87	70.1	Sandy silty CLAY

NV5 Project No.: 444320-7240000.00

Project: Tesoro at Fiesta Unit 4 - Los Lunas, NM **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	
7	10		100	4.7													
7	15	ML		4.1	NV	NP								100	95	60.9	Sandy SILT
7	20			6.0													
7	25	SM		6.2	NV	NP						100	98	84	54	39.2	Silty SAND
7	30			1.0													
7	35			1.0													
7	40			1.0													
7	45			1.6													
7	50			2.4													
8	2.5		101	1.5													
8	5	SM	102	1.9	NV	NP							100	94	39	13.5	Silty SAND
8	7.5			1.5													
8	10	SP-SM		1.4	NV	NP						100	98	80	26	7.5	Poorly graded SAND with silt
8	15			0.9													
8	20			1.0													
8	25			2.1													

NV5 Project No.: 444320-7240000.00

Project: Tesoro at Fiesta Unit 4 - Los Lunas, NM **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.

Fill Material

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

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

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

Fill Placement

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 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

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 minimum of 96% of maximum Marshall Density (75 Blows).

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 fill material. To minimize delays, the Earthwork Contractor is encouraged to submit soil samples prior to use for proctor testing.

N|V|5

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