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**GEOTECHNICAL AND PAVEMENT DESIGN REPORT  
TANNER RANCH PHASE 1  
COLORADO SPRINGS, COLORADO**

Prepared for:  
**Pusan Holdings, LLC**  
**5801 North Union Boulevard**  
**Colorado Springs, Colorado 80918**

Attn: Ben Wilbur

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Respectfully Submitted,

ENTECH ENGINEERING, INC.

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LJM:JCG/ed

Entech Job No. 251259

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## 1 INTRODUCTION

Entech Engineering, Inc. (Entech) completed this revised pavement design report for the interior roadways associated with the Tanner Ranch, Phase 1 development. This report describes the subsurface exploration program and laboratory testing program conducted for the proposed roadway improvements and provides pavement section alternatives and construction recommendations. In addition, investigations for proposed ponds within Phase 2 and Phase 3 are presented within this report. Entech participated in this project as a consultant to Pusan Holdings, LLC, in accordance with our subconsultant agreement dated June 6, 2025. The contents of this report, including the pavement design recommendations, are subject to the limitations and assumptions presented in Section 8.

## 2 PROJECT AND SITE DESCRIPTION

The site is located southwest of the intersection of Highway 94 and South Calhan Highway within the Tanner Ranch development in El Paso County, Colorado (Figure 1). The project consists of asphalt paving for the interior roadways in Phase 1 as well as an investigation for two proposed ponds located on the south side of the development. The proposed roadway improvements include the paving of a section of North Dinner Bell Drive and the entirety of Lonesome Dove Lane, Blue Duck Way, and Cross Bow Court within the development. The extent of our investigation is shown in Figure 2.

At the time of our investigation, compacted asphalt millings were present on Lonesome Dove Lane and the northern portion of North Dinner Bell Drive. North Dinner Bell Drive south of Lonesome Dove Lane was a gravel road, and Blue Duck Way and Cross Bow Court were rough graded with two-tracks and weeds growing within the roadway. Based on the development plans, the roadways are designated as rural local roadways. Conditions at the pond locations consisted of grassland vegetation with a detention berm located along the south side of the ponds. Existing residential homes are located along North Dinner Bell Drive and Lonesome Dove Lane. Surrounding properties comprise residential properties and vacant land.

### **3 SUBSURFACE EXPLORATIONS AND LABORATORY TESTING**

#### **3.1 Subsurface Exploration Program**

Subsurface conditions at the project site were explored by 23 test borings, designated TB-1 through TB-23, drilled on July 10 and 11, 2025. The locations of the test borings are shown on the Site and Exploration Plan (Figure 2). The borings along the proposed roadways were drilled to depths of 5 to 10 feet below the existing ground surface (bgs). Borings TB-1 and TB-2 were drilled at the locations for the proposed ponds to a depth of 20 feet bgs. The drilling was performed using a truck-mounted, continuous flight auger drill rig supplied and operated by Entech. Descriptive boring logs providing the lithologies of the subsurface conditions encountered during drilling are presented in Appendix A. Groundwater levels were measured in each of the open boreholes at the conclusion of drilling.

Soil samples were obtained from the borings utilizing the Standard Penetration Test (ASTM D1586) using a 2-inch outside diameter split spoon or a 2½-inch modified California sampler. Results of the Standard Penetration Test (SPT) are included on the boring logs in terms of N-values expressed in blows per foot (bpf). Soil samples recovered from the borings were visually classified and recorded on the boring logs. The soil classifications were later verified utilizing laboratory testing and grouped by soil type. The soil type numbers are included on the boring logs. It should be understood that the soil descriptions shown on the boring logs may vary between boring locations and sample depths. It should also be noted that the lines of stratigraphic separation shown on the boring logs represent approximate boundaries between soil types and the actual stratigraphic transitions may be more gradual or variable with location.

#### **3.2 Geotechnical Index and Engineering Property Testing**

Water content testing (ASTM D2216) was performed on the samples recovered from the borings, and the results are shown on the boring logs. Grain-Size Analysis (ASTM D422) and Atterberg Limits testing (ASTM D4318) were performed on selected samples to assist in classifying the materials encountered in the borings.

For pavement design, a Modified Proctor (ASTM D1557) and a California Bearing Ratio (CBR) test (ASTM D1883) were completed. Soluble sulfate testing was performed on select soil samples to evaluate the potential for below-grade degradation of concrete due to sulfate attack. The laboratory testing results are presented in Appendix B and summarized in Table B-1.

## 4 SUBSURFACE CONDITIONS

Three primary soil types were encountered in the test borings drilled for the subsurface investigation. Each soil type was classified in accordance with the Unified Soil Classification System (USCS) and the American Association of State Highway and Transportation Officials (AASHTO) soil classification system using the laboratory testing results and the observations made during drilling.

### 4.1 Subsurface Conditions

Subsurface conditions at the proposed project site consisted of medium dense clayey sand fill (Soil Type 1, AASHTO A-4), native loose to medium dense clayey sand (Soil Type 2, AASHTO A-2-4, A-2-6, A-4, A-6), and native stiff to hard sandy clay (Soil Type 3, AASHTO A-4, A-6, A-7-6). Two to three inches of compacted asphalt millings were encountered at the surface of Lonesome Dove Lane and the north side of North Dinner Bell Drive. Laboratory test results are presented in Appendix B and summarized in Table B-1.

### 4.2 Groundwater

Groundwater was not encountered in the test borings. Boings TB-1 and TB-2 in the pond areas were drilled to a depth of 20 feet. Groundwater fluctuations are likely and will depend on seasonal variations, local precipitation, runoff, and other factors. We do not anticipate that groundwater will affect the proposed roadway construction or ponds.

## 5 PAVEMENT DESIGN RECOMMENDATIONS

Pavement design recommendations were made in accordance with the *El Paso County Engineering Criteria Manual (ECM)*.

### 5.1 Subgrade Conditions

California Bearing Ratio (CBR) testing was performed on representative samples of the pavement subgrade, including native clayey sand (Soil Type 2) and native sandy clay (Soil Type 3) from boring TB-13 and TB-15, respectively, to determine the support characteristics of the subgrade soils for the roadway section. The results of the CBR testing are presented in Appendix B and summarized in Exhibit 1.

**Exhibit 1: Subsurface Laboratory Testing Summary**

Design Parameter	Value	
Soil Type	2 – Clayey Sand	3 – Sandy Clay
CBR at 95%	3.9	3.2
Design CBR	3.2	3.2
Liquid Limit	30	35
Plasticity Index	16	14
Percent Passing 200	15.5	51.9
AASHTO Classification	A-2-6	A-6
Group Index	0	4
Unified Soils Classification	SC	CL

Notes:

Soil Type 3 was used for pavement design.

**5.2 Swell Mitigation**

El Paso County requires swell mitigation for soils with swell testing results greater than 2% under a 150-pound-per-square-foot (psf) surcharge. Based on the subgrade soils classification and swell testing, mitigation for expansive soils will not be required for the section of North Dinner Bell Drive north of Lonesome Dove Lane. For the remainder of the site, swelling soils were encountered in borings TB-7, TB-12, TB-13, TB-15, and TB-16. To mitigate for swell, we recommend moisture conditioning expansive soils identified during subgrade preparation to within 0% to 3% of the optimum moisture content to a depth of 2 feet. Swell mitigation should be field-determined as isolated areas of cohesive soils may be present between boring locations.

**5.3 Traffic Loading**

Traffic data is not available for the future interior roads in the Tanner Ranch, Phase 1 subdivision; however, the roads are classified as rural local roadways based on current development plans. The *El Paso County Engineering Criteria Manual* provides a default 18-kip equivalent single axle load (ESAL) based on the street classification. For design, a default ESAL value of 36,500 was used for the local rural road designation.

**5.4 Pavement Design**

The pavement sections were determined utilizing the *El Paso County Engineering Criteria Manual*, the CBR testing, and default ESALs. Design parameters used in the pavement analysis are presented in Exhibit 2.

**Exhibit 2: Pavement Design Parameters**

Design Parameter	Values
Reliability	75%
Standard Deviation	0.45
Serviceability Loss ( $\Delta$ psi)	2.5
Design CBR	3.2
Resilient Modulus - Soil Type 1	4,800 psi
Structural Coefficients	
Hot Mix Asphalt	0.44
Aggregate Base Course	0.11
Recycled Concrete Base	0.11

Pavement section alternatives recommended for the roadways included in this phase are summarized in Exhibit 3. The pavement design calculations are presented in Appendix C.

**Exhibit 3: Recommended Pavement Sections**

Pavement Area	Design ESAL	Alternative
North Dinner Bell Drive, Lonesome Dove Lane, Blue Duck Way, Cross Bow Court	36,500	1. 4.0 inches HMA over 4.0 inches ABC/RCB

*ABC = Aggregate Base Course; ESAL = equivalent single axle loads; HMA = Hot Mix Asphalt; RCB = Recycled Concrete Base*

**6 DETENTION POND CONSIDERATIONS**

The borings in the detention ponds at the southwest and southeast portions of the site encountered clay with sand and sandy clay overlying silty and clayey sand. Groundwater was not encountered to a depth of 20 feet in either pond (borings TB-1 and TB-2).

If any improvements are proposed the following recommendations should be followed. Any areas to receive fill should have all topsoil, organic material, or debris removed. Prior to fill placement, Entech should observe the subgrade. Fill must be properly benched and compacted to minimize potentially unstable conditions in slope areas. Fill slopes should be 3:1 or flatter. The subgrade should be scarified and moisture conditioned to within 2% of optimum moisture content and compacted to a minimum of 95% of the Modified Proctor (ASTM D1557) maximum dry density prior to placing new fill. New fill should be placed in thin lifts not to exceed 6 inches after compaction while maintaining at least 95% of the Modified Proctor (ASTM D1557) maximum dry density. These materials should be placed at a moisture content conducive to compaction, usually +/-2% of the Proctor optimum moisture content. The placement and compaction of fill should be

observed and tested by Entech during construction. Entech should approve any imported materials prior to placing or hauling them to the site.

## **7 CONSTRUCTION RECOMMENDATIONS**

Pavement design recommendations provided herein are contingent on good construction practices, and poor construction techniques may result in poor performance. Our analyses assumed that this project would be constructed according to the *El Paso County Engineering Criteria Manual* and the *Pikes Peak Region Asphalt Paving Specifications*.

### **7.1 Earthwork Recommendations for Pavement Subgrade**

Proper subgrade preparation is required for adequate pavement performance. Paving areas should be cleared of all deleterious materials, including but not limited to existing pavements, utility poles, and fence poles. Surface vegetation should be removed by stripping, with the depth to be field-determined. Where expansive soils are encountered, soils should be moisture conditioned to a depth of 2 feet within 0% to 3% of the optimum water content, and recompacted to 95% of the Standard Proctor (ASTM 698) maximum dry density. Particular attention should be given to soils around the intersection of Lonesome Dove Lane and North Dinner Bell Drive. Additionally, loose soils such as those encountered in TB-10 should be overexcavated to underlying dense and unyielding subgrade. Granular soils can be replaced in accordance with Section 7.1.2. In-situ asphalt millings were encountered on Lonesome Dove Lane and North Dinner Bell Drive and should be removed or pulverized and mixed with the on-site soils.

We do not anticipate issues with the subgrade in regard to shallow water, frost-susceptible soils, groundwater or drainage conditions, or cold weather construction.

#### **7.1.1 Subgrade Preparation – Unbound Base Alternatives**

If pavement section alternatives are selected utilizing aggregate base course (ABC) or Recycled Concrete Base (RCB), the final subgrade surface should be scarified to a depth of 8 inches, moisture conditioned within -1% to 3% of the optimum water content, and recompacted to 95% of the Modified Proctor (ASTM 1557) maximum dry density.

The compacted surface below pavements should be proof rolled with a fully loaded, tandem-axle, 10-yard dump truck or equivalent. Any areas that are delineated to be soft, loose, or yielding during proof rolling should be removed and reconditioned, or replaced.

### **7.1.2 Fill Placement and Compaction**

Granular fill placed as part of the pavement subgrade shall consist of nonexpansive, granular soil, free of organic matter, unsuitable materials, debris, and cobbles greater than 3 inches in diameter. Additionally, any granular fill placed as part of the roadway subgrade should have a minimum CBR of 5. All granular fill placed within the pavement subgrade should be compacted to a minimum of 95% of the Modified Proctor (ASTM D1557) maximum dry density at +/-2% of optimum moisture content. Fill material should be placed in horizontal lifts such that each finished lift has a compacted thickness of 6 inches or less. Entech should approve any imported fill to be used within the pavement subgrade area prior to delivery to the site.

### **7.1.3 Aggregate Base Course and Recycled Concrete Base**

ABC or RCB materials shall conform to the *El Paso County Standard Specifications Manual*, Section 300 Aggregate Base Course. ABC or RCB materials should be compacted to a minimum of 95% of the Modified Proctor (ASTM D1557) maximum dry density within +/-2% of optimum moisture content.

## **7.2 Concrete Degradation Due to Sulfate Attack**

Sulfate solubility testing was conducted on several samples recovered from the test borings to evaluate the potential for sulfate attack on concrete. The test results indicated less than 0.01% soluble sulfate (by weight). The test results indicate the sulfate component of the in-place soils presents a negligible exposure threat to concrete placed below the site grade.

Type 1L cement is recommended for concrete on the site. To further avoid concrete degradation during construction, it is recommended that concrete not be placed on frozen or wet ground. Care should be taken to prevent the accumulation or ponding of water in the concrete placement areas. If concrete is placed during periods of cold temperatures, the concrete must be kept from freezing. This may require covering the concrete with insulated blankets and adding heat to prohibit freezing.

## **7.3 Construction Observation**

Subgrade preparation for pavement structures should be observed by Entech in order to verify that (1) no anomalies are present, (2) materials similar to those described in this report have been encountered or placed, and (3) no soft spots, expansive or organic soil, or debris are present in the pavement subgrade prior to paving.

## 8 CLOSURE

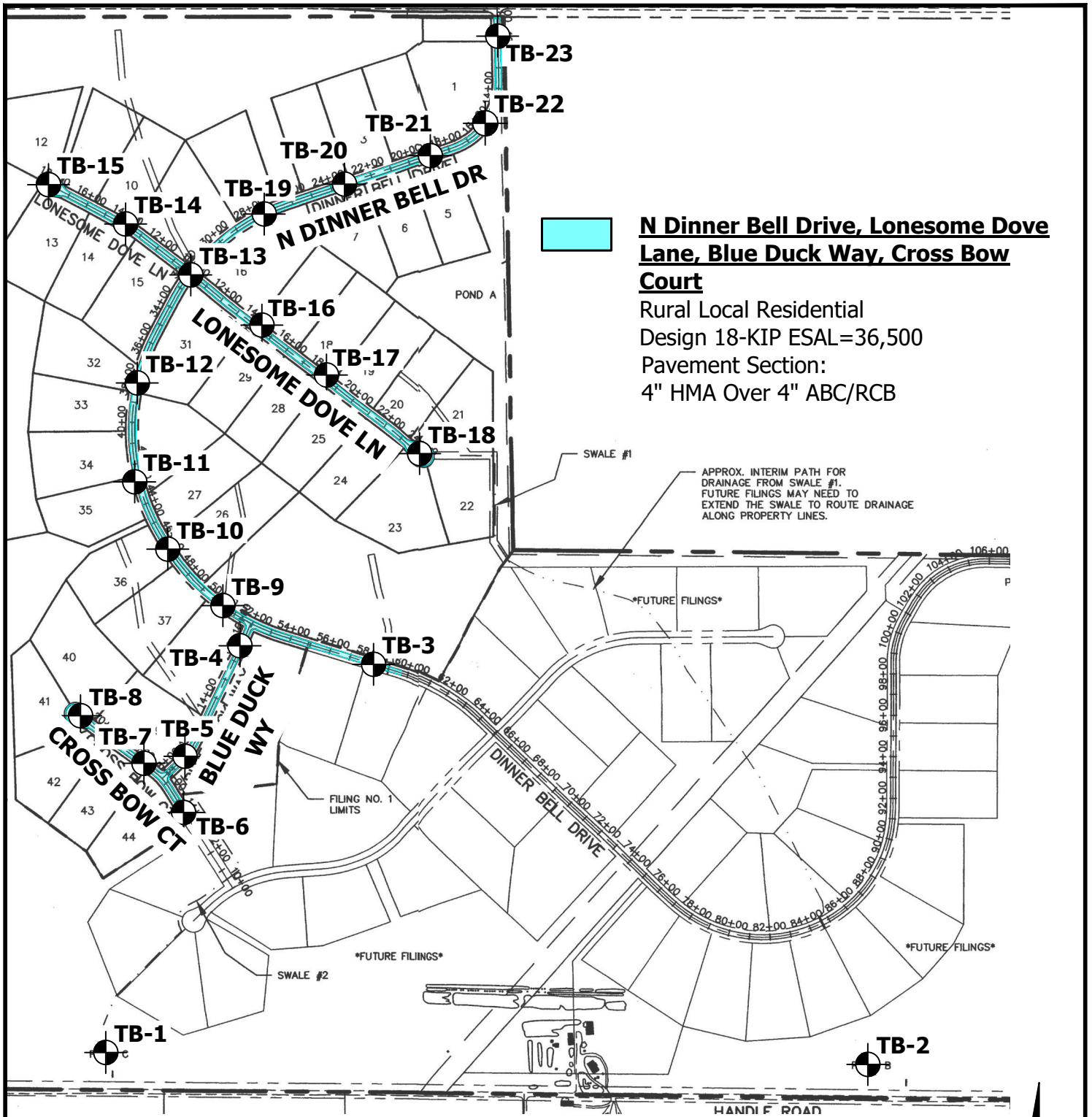
The subsurface investigation, geotechnical evaluation, and recommendations presented in this report are intended for use by Pusan Holdings, LLC, with application to the ponds and paving of the Tanner Ranch, Phase 1 project in El Paso County, Colorado. In conducting the subsurface investigation, laboratory testing, engineering evaluation, and reporting, Entech Engineering, Inc. endeavored to work in accordance with generally accepted professional geotechnical and geologic practices and principles consistent with the level of care and skill ordinarily exercised by members of the geotechnical profession currently practicing in the same locality and under similar conditions. No other warranty, expressed or implied, is made. During final design and/or construction, if conditions are encountered that appear different from those described in this report, Entech Engineering, Inc. requests to be notified so that the evaluation and recommendations presented herein can be reviewed and modified as appropriate.

If there are any questions regarding the information provided herein or if Entech Engineering, Inc. can be of further assistance, please do not hesitate to contact us.



**VICINITY MAP**  
TANNER RANCH, PHASE 1  
PUSAN HOLDINGS, LLC

JOB NO.  
251259  
**FIG. 1**



- ROADWAYS INCLUDED WITH THIS INVESTIGATION



TB- APPROXIMATE TEST BORING LOCATION AND NUMBER

SCALE: 0 250 500



**SITE AND EXPLORATION PLAN**

TANNER RANCH, PHASE 1  
 PUSAN HOLDINGS, LLC

JOB NO.  
 251259

**FIG. 2**



## **APPENDIX A: Test Boring Logs**

TEST BORING 1  
DATE DRILLED 7/10/2025

TEST BORING 2  
DATE DRILLED 7/10/2025

REMARKS

REMARKS

DRY TO 19', 7/22/25

DRY TO 19', 7/22/25

CLAY, WITH SAND, BROWN, STIFF, MOIST

CLAY, SANDY, BROWN to TAN, HARD to VERY STIFF, MOIST

SAND, SILTY, BROWN to TAN, MEDIUM DENSE, MOIST

SAND, CLAYEY, TAN, MEDIUM DENSE, MOIST

CLAY, SANDY, BROWN, STIFF, MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
0					
5			11	15.0	3
5			15	15.0	3
10			12	4.7	2
15			17	4.2	2
20			15	14.5	3

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
0					
5			32	7.7	3
5			18	10.0	3
10			15	9.3	2
15			17	6.6	2
20			14	10.8	2



**TEST BORING LOGS**

TANNER RANCH, PHASE 1  
PUSAN HOLDINGS, LLC

JOB NO.  
251259

**FIG. A-1**

TEST BORING 3  
 DATE DRILLED 7/10/2025

TEST BORING 4  
 DATE DRILLED 7/10/2025

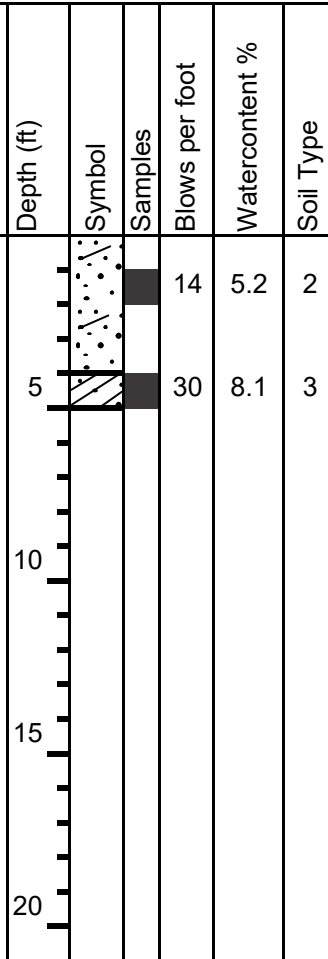
REMARKS

REMARKS

DRY TO 5', 7/10/25

SAND, CLAYEY, LIGHT BROWN,  
 MEDIUM DENSE, MOIST

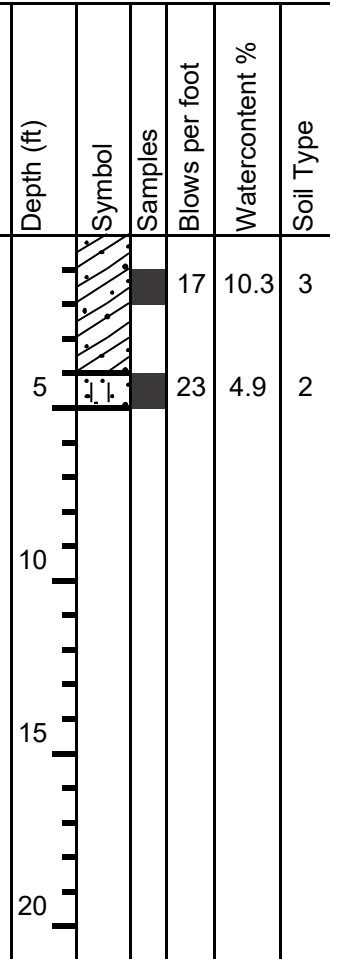
CLAY, SANDY, HARD, MOIST



DRY TO 5', 7/10/25

CLAY, WITH SAND, BROWN, VERY  
 STIFF, MOIST

SAND, SILTY, TAN, MEDIUM  
 DENSE, MOIST



**TEST BORING LOGS**

TANNER RANCH, PHASE 1  
 PUSAN HOLDINGS, LLC

JOB NO.  
 251259

**FIG. A-2**

TEST BORING 5  
 DATE DRILLED 7/10/2025

TEST BORING 6  
 DATE DRILLED 7/10/2025

REMARKS

REMARKS

DRY TO 5', 7/10/25

CLAY, SANDY, BROWN, STIFF to  
 VERY STIFF, MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
0-5					
5-6	Diagonal lines		12	10.3	3
6-8	Diagonal lines		18	7.0	3
8-10					
10-15					
15-20					

DRY TO 5', 7/10/25

FILL 0-4', SAND, CLAYEY, BROWN,  
 MEDIUM DENSE, MOIST

CLAY, SANDY, BROWN, VERY  
 STIFF, MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
0-4	Stippled				
4-5	Stippled		18	7.5	1
5-6	Diagonal lines		23	15.1	3
6-10	Diagonal lines				
10-11	Diagonal lines		22	19.1	3
11-15					
15-20					



**TEST BORING LOGS**

TANNER RANCH, PHASE 1  
 PUSAN HOLDINGS, LLC



JOB NO.  
 251259

**FIG. A-3**


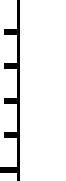
TEST BORING 7  
 DATE DRILLED 7/10/2025

TEST BORING 8  
 DATE DRILLED 7/10/2025

REMARKS  
  
 DRY TO 5', 7/10/25

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
5		■	15	11.0	3
5		■	13	7.9	3
10					
15					
20					

REMARKS  
  
 DRY TO 5', 7/10/25

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
5		■	16	6.0	3
5		■	12	7.6	3
10					
15					
20					

CLAY, WITH SAND, BROWN, STIFF, MOIST

CLAY, SANDY, TAN, VERY STIFF to STIFF, MOIST



**TEST BORING LOGS**

TANNER RANCH, PHASE 1  
 PUSAN HOLDINGS, LLC

JOB NO.  
 251259

**FIG. A-4**

TEST BORING 9  
 DATE DRILLED 7/10/2025

TEST BORING 10  
 DATE DRILLED 7/10/2025

REMARKS

REMARKS

DRY TO 5', 7/10/25

CLAY, SANDY, BROWN, VERY STIFF, MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
0 - 5	(Diagonal hatching symbol)		15	12.4	3
5 - 10	(Diagonal hatching symbol)		18	9.4	3
10 - 15	(Diagonal hatching symbol)				
15 - 20	(Diagonal hatching symbol)				

DRY TO 10', 7/10/25

SAND, CLAYEY, BROWN, LOOSE to MEDIUM DENSE, MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
0 - 5	(Dotted symbol)		3	8.5	2
5 - 10	(Dotted symbol)		8	6.9	2
10 - 15	(Dotted symbol)		15	3.0	2
15 - 20	(Dotted symbol)				



**TEST BORING LOGS**

TANNER RANCH, PHASE 1  
 PUSAN HOLDINGS, LLC

JOB NO.  
 251259

**FIG. A-5**

TEST BORING 11  
 DATE DRILLED 7/10/2025





TEST BORING 12  
 DATE DRILLED 7/10/2025

REMARKS

REMARKS

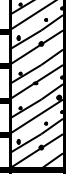



DRY TO 5', 7/10/25

CLAY, SANDY, BROWN, VERY STIFF to STIFF, MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
5			16	9.7	3
5			11	9.9	3
10					
15					
20					

DRY TO 5', 7/10/25

CLAY, SANDY, BROWN, STIFF, MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
5			9	10.5	3
5			11	5.7	3
10					
15					
20					



**TEST BORING LOGS**

TANNER RANCH, PHASE 1  
 PUSAN HOLDINGS, LLC

JOB NO.  
 251259

**FIG. A-6**

TEST BORING 13  
 DATE DRILLED 7/10/2025

TEST BORING 14  
 DATE DRILLED 7/11/2025

REMARKS

REMARKS

DRY TO 5', 7/10/25

3" ASPHALT  
 SAND, CLAYEY, BROWN, MEDIUM  
 DENSE, MOIST

\* - BULK SAMPLE TAKEN

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
0 - 5	Diagonal lines	1	*	4.7	2
5 - 11	Diagonal lines	1	16	13.8	2
11 - 12	Diagonal lines	1	11	4.6	2

DRY TO 5', 7/11/25

2" ASPHALT  
 CLAY, SANDY, BROWN, VERY  
 STIFF, MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
0 - 5	Diagonal lines	1	20	7.5	3
5 - 12	Diagonal lines	1	20	6.3	3



**TEST BORING LOGS**

TANNER RANCH, PHASE 1  
 PUSAN HOLDINGS, LLC

JOB NO.  
 251259

**FIG. A-7**

TEST BORING 15  
 DATE DRILLED 7/11/2025

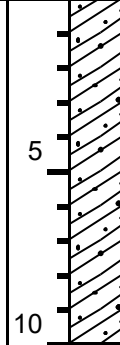
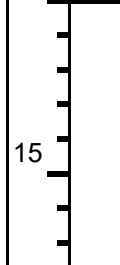
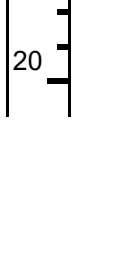
TEST BORING 16  
 DATE DRILLED 7/11/2025

REMARKS

REMARKS

DRY TO 10', 7/11/25

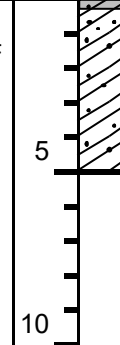
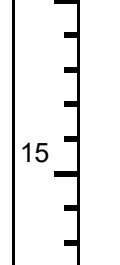
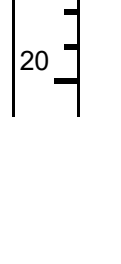
CLAY, WITH SAND, BROWN to  
 TAN, VERY STIFF to HARD, MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
5			16	16.6	3
5			17	8.6	3
10			30	3.5	3
15					
20					

DRY TO 5', 7/11/25

2" ASPHALT  
 CLAY, WITH SAND, BROWN, STIFF  
 to VERY STIFF, MOIST

\* - BULK SAMPLE TAKEN

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
5			* 14	16.8	3
5			14	14.3	3
5			17	6.8	3
10					
15					
20					



**TEST BORING LOGS**

TANNER RANCH, PHASE 1  
 PUSAN HOLDINGS, LLC

JOB NO.  
 251259

**FIG. A-8**

TEST BORING 17  
 DATE DRILLED 7/11/2025

TEST BORING 18  
 DATE DRILLED 7/11/2025

REMARKS

REMARKS

DRY TO 5', 7/11/25  
 SAND, CLAYEY, BROWN to TAN,  
 LOOSE, MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
5	[Symbol]		7	11.1	2
5	[Symbol]		9	11.6	2
10					
15					
20					

DRY TO 5', 7/11/25  
 3" ASPHALT  
 SAND, CLAYEY, BROWN to TAN,  
 MEDIUM DENSE to LOOSE, DRY  
 \* - BULK SAMPLE TAKEN

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
5	[Symbol]		*	2.0	2
5	[Symbol]		10	13.2	2
5	[Symbol]		9	5.2	2
10					
15					
20					



**TEST BORING LOGS**

TANNER RANCH, PHASE 1  
 PUSAN HOLDINGS, LLC

JOB NO.  
 251259

**FIG. A-9**

TEST BORING 19  
 DATE DRILLED 7/11/2025

TEST BORING 20  
 DATE DRILLED 7/11/2025

REMARKS

REMARKS

DRY TO 10', 7/11/25

3" ASPHALT  
 SAND, CLAYEY, TAN, MEDIUM  
 DENSE, MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
0					
5			13	4.5	2
5			10	3.2	2
10			28	3.8	2
15					
20					

DRY TO 5', 7/11/25

3" ASPHALT  
 SAND, CLAYEY, TAN, MEDIUM  
 DENSE, DRY to MOIST

\* - BULK SAMPLE TAKEN

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
0					
5			14	0.7	2
5			12	7.7	2
5			12	6.4	2
10					
15					
20					



**TEST BORING LOGS**

TANNER RANCH, PHASE 1  
 PUSAN HOLDINGS, LLC

JOB NO.  
 251259

**FIG. A-10**

TEST BORING 21  
 DATE DRILLED 7/11/2025

TEST BORING 22  
 DATE DRILLED 7/11/2025

REMARKS

REMARKS

DRY TO 5', 7/11/25

3" ASPHALT  
 CLAY, SANDY, BROWN, STIFF,  
 MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
0 - 5	Diagonal lines		11	14.1	3
5 - 10	Diagonal lines		10	4.6	3
10 - 15					
15 - 20					

DRY TO 5', 7/11/25

3" ASPHALT  
 SAND, CLAYEY, BROWN to TAN,  
 MEDIUM DENSE, MOIST

\* - BULK SAMPLE TAKEN

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
0 - 5	Diagonal lines		*	1.8	2
5 - 10	Diagonal lines		13	11.8	2
10 - 15	Diagonal lines				
15 - 20	Diagonal lines		19	6.7	2



**TEST BORING LOGS**

TANNER RANCH, PHASE 1  
 PUSAN HOLDINGS, LLC

JOB NO.  
 251259

**FIG. A-11**

TEST BORING 23  
 DATE DRILLED 7/11/2025

REMARKS

DRY TO 10', 7/11/25

3" ASPHALT

SAND, CLAYEY, BROWN to TAN,  
 MEDIUM DENSE, MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
0					
0 - 3					
3					
3 - 5			16	12.8	2
5 - 10			10	9.3	2
10 - 20			22	8.3	2
20					



**TEST BORING LOGS**

TANNER RANCH, PHASE 1  
 PUSAN HOLDINGS, LLC

JOB NO.  
 251259

**FIG. A-12**



## **APPENDIX B: Laboratory Test Results**

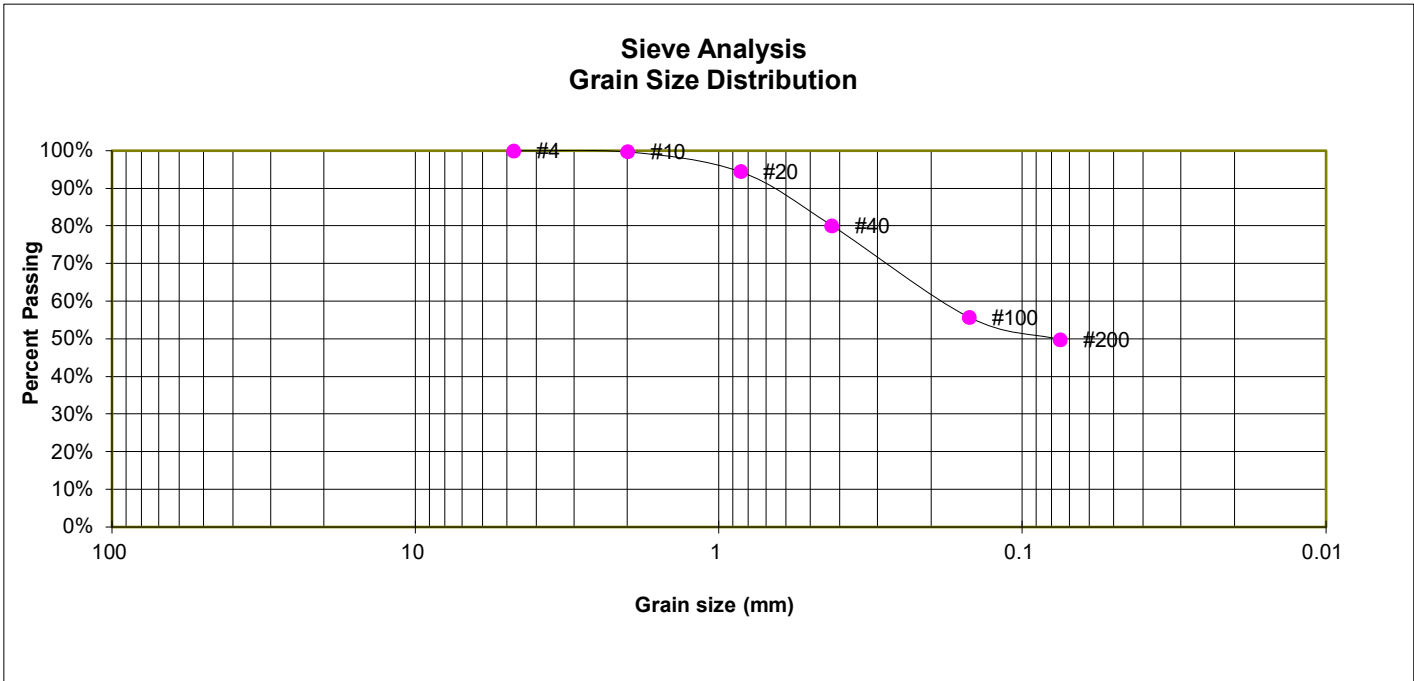
**TABLE B-1  
SUMMARY OF LABORATORY TEST RESULTS**



SOIL TYPE	TEST BORING NO.	DEPTH (FT)	WATER (%)	DRY DENSITY (PCF)	PASSING NO. 200 SIEVE (%)	LIQUID LIMIT	PLASTIC LIMIT	PLASTIC INDEX	SULFATE (WT %)	SWELL/ COLLAPSE (%)	AASHTO CLASS. (GROUP INDEX)	USCS	SOIL DESCRIPTION
1	6	1-2	7.7		49.8	21	14	7			A-4 (1)	SC	FILL, SAND, CLAYEY
2, CBR #1	13	0-3	3.3		15.5	30	14	16			A-2-6 (0)	SC	SAND, CLAYEY
2	3	1-2	4.7		34.1	22	15	7	0.00		A-4 (0)	SC	SAND, CLAYEY
2	18	1-2	12.4		42.1	31	22	9			A-4 (1)	SC	SAND, CLAYEY
2	19	1-2	6.1		28.0	25	18	7			A-2-4 (0)	SC	SAND, CLAYEY
2	20	1-2	9.0	102.7	40.0	30	20	10		0.8	A-4 (1)	SC	SAND, CLAYEY
2	13	5	3.9		17.7	25	15	10	0.00		A-2-4 (0)	SC	SAND, CLAYEY
2	4	0-3	6.7		49.8	25	16	9			A-4 (1)	SC	SAND, CLAYEY
2	10	1-2	7.9	95.8	38.3	27	17	10		-0.1	A-4 (0)	SC	SAND, CLAYEY
2	13	1-2	13.0	98.5	49.0	35	19	16		2.5	A-6 (4)	SC	SAND, CLAYEY
2	17	1-2	11.6	104.7	45.3	27	19	8		-0.4	A-4 (1)	SC	SAND, CLAYEY
2	22	1-2	10.6	123.7	38.9	35	20	15		1.3	A-6 (2)	SC	SAND, CLAYEY
2	23	1-2	11.3		41.8	31	22	9			A-4 (1)	SC	SAND, CLAYEY
3, CBR #2	15	0-3	10.7		51.9	35	21	14			A-6 (4)	CL	CLAY, SANDY
3	4	1-2	8.2		70.2	33	23	10			A-6 (5)	CL	CLAY, WITH SAND
3	5	1-2	11.0	82.5	58.5	25	17	8		0.7	A-4 (2)	CL	CLAY, SANDY
3	7	1-2	11.5	94.8	78.1	41	22	19		3.4	A-7-6 (15)	CL	CLAY, WITH SAND
3	8	1-2	7.1		52.4	25	17	8			A-4 (2)	CL	CLAY, SANDY
3	9	1-2	11.6		69.8	26	18	8			A-4 (4)	CL	CLAY, SANDY
3	11	1-2	10.4		62.0	40	27	13	<0.01		A-6 (7)	CL	CLAY, SANDY
3	12	1-2	11.5	99.7	57.9	29	9	20		2.3	A-6 (8)	CL	CLAY, SANDY
3	14	1-2	7.8		51.2	24	17	7			A-6 (1)	CL	CLAY, SANDY
3	15	1-2	15.6	107.3	74.2	42	25	17		3.4	A-7-6 (12)	CL	CLAY, WITH SAND
3	16	1-2	13.5	108.4	71.5	35	23	12		4.7	A-6 (8)	CL	CLAY, WITH SAND
3	21	1-2	14.4	115.8	56.2	36	22	14		1.1	A-6 (6)	CL	CLAY, SANDY
3	1	5	11.6	121.0	80.6	35	21	14		-0.2	A-6 (10)	CL	CLAY, WITH SAND
3	2	5	13.7	92.4	66.5	26	17	9		0.1	A-4 (3)	CL	CLAY, SANDY
3	3	5	8.1		61.2							CL	CLAY, SANDY

TEST BORING 6  
 DEPTH (FT) 1-2

SOIL DESCRIPTION FILL, SAND, CLAYEY  
 SOIL TYPE 1



**GRAIN SIZE ANALYSIS**

U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	99.7%
20	94.5%
40	80.1%
100	55.8%
200	49.8%

**ATTERBERG LIMITS**

Plastic Limit	14
Liquid Limit	21
Plastic Index	7

**SOIL CLASSIFICATION**

USCS CLASSIFICATION: SC  
 AASHTO CLASSIFICATION: A-4  
 AASHTO GROUP INDEX: 1



**LABORATORY TEST RESULTS**

TANNER RANCH, PHASE 1  
 PUSAN HOLDINGS, LLC

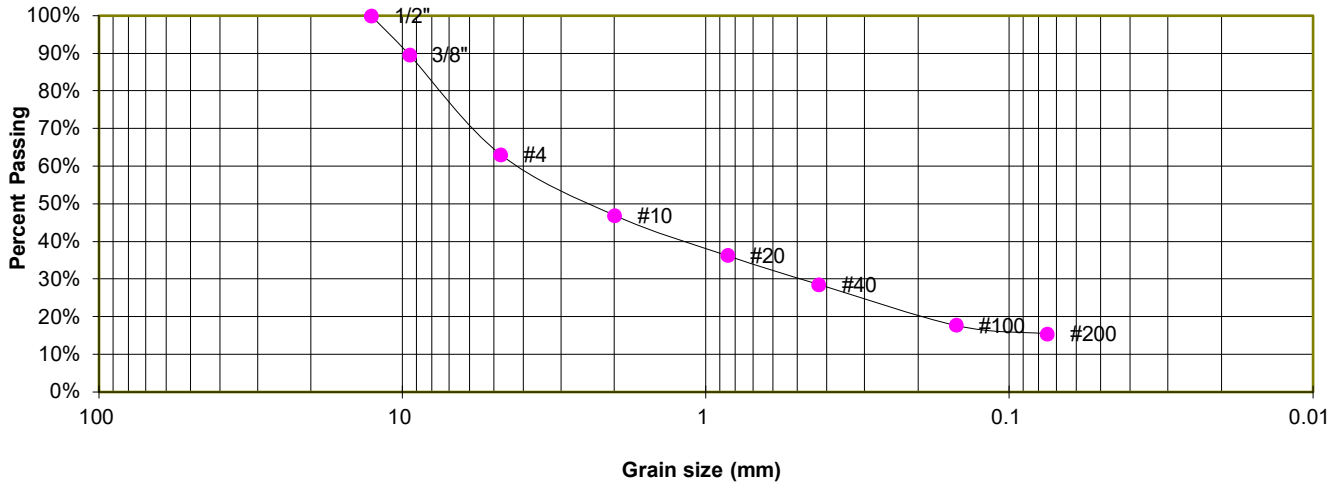
JOB NO.  
 251259

**FIG. B-1**

TEST BORING 13  
 DEPTH (FT) 0-3

SOIL DESCRIPTION SAND, CLAYEY  
 SOIL TYPE 2, CBR #1

**Sieve Analysis  
 Grain Size Distribution**



**GRAIN SIZE ANALYSIS**

U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	100.0%
3/8"	89.6%
4	63.1%
10	46.9%
20	36.3%
40	28.6%
100	17.8%
200	15.5%

**ATTERBERG LIMITS**

Plastic Limit	14
Liquid Limit	30
Plastic Index	16

**SOIL CLASSIFICATION**

USCS CLASSIFICATION: SC  
 AASHTO CLASSIFICATION: A-2-6  
 AASHTO GROUP INDEX: 0



**LABORATORY TEST RESULTS**

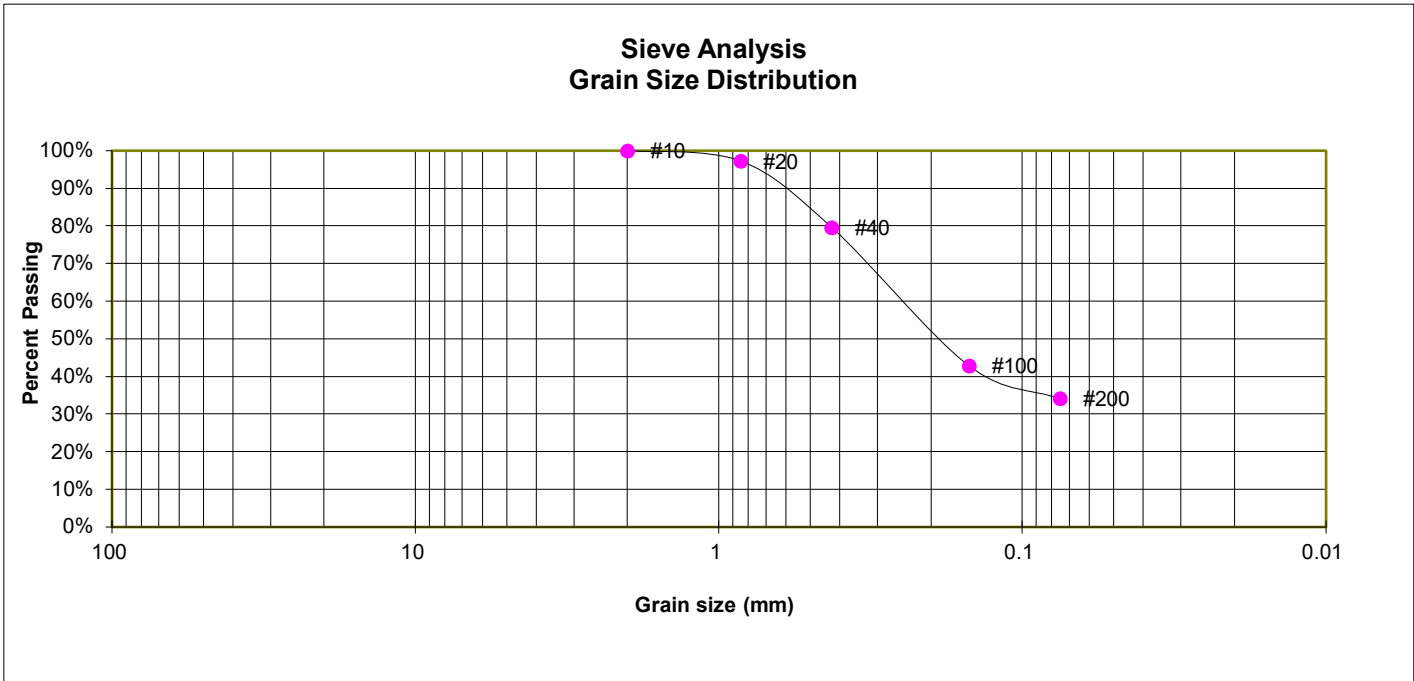
TANNER RANCH, PHASE 1  
 PUSAN HOLDINGS, LLC

JOB NO.  
 251259

**FIG. B-2**

TEST BORING 3  
 DEPTH (FT) 1-2

SOIL DESCRIPTION SAND, CLAYEY  
 SOIL TYPE 2



**GRAIN SIZE ANALYSIS**

U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	
10	100.0%
20	97.3%
40	79.6%
100	42.9%
200	34.1%

**ATTERBERG LIMITS**

Plastic Limit	15
Liquid Limit	22
Plastic Index	7

**SOIL CLASSIFICATION**

USCS CLASSIFICATION:	SC
AASHTO CLASSIFICATION:	A-4
AASHTO GROUP INDEX:	0



**LABORATORY TEST RESULTS**

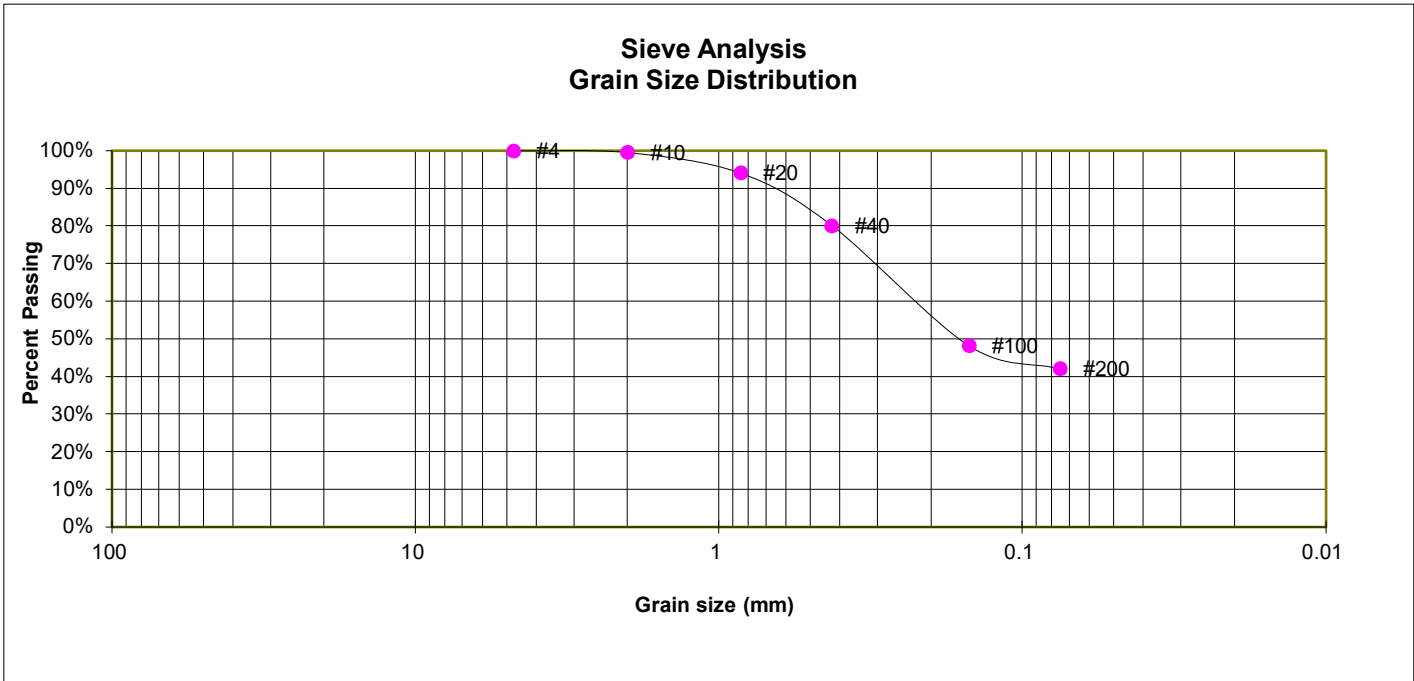
TANNER RANCH, PHASE 1  
 PUSAN HOLDINGS, LLC

JOB NO.  
 251259

**FIG. B-3**

TEST BORING 18  
 DEPTH (FT) 1-2

SOIL DESCRIPTION SAND, CLAYEY  
 SOIL TYPE 2



**GRAIN SIZE ANALYSIS**

U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	99.6%
20	94.2%
40	80.1%
100	48.2%
200	42.1%

**ATTERBERG LIMITS**

Plastic Limit	22
Liquid Limit	31
Plastic Index	9

**SOIL CLASSIFICATION**

USCS CLASSIFICATION:	SC
AASHTO CLASSIFICATION:	A-4
AASHTO GROUP INDEX:	1



**LABORATORY TEST RESULTS**

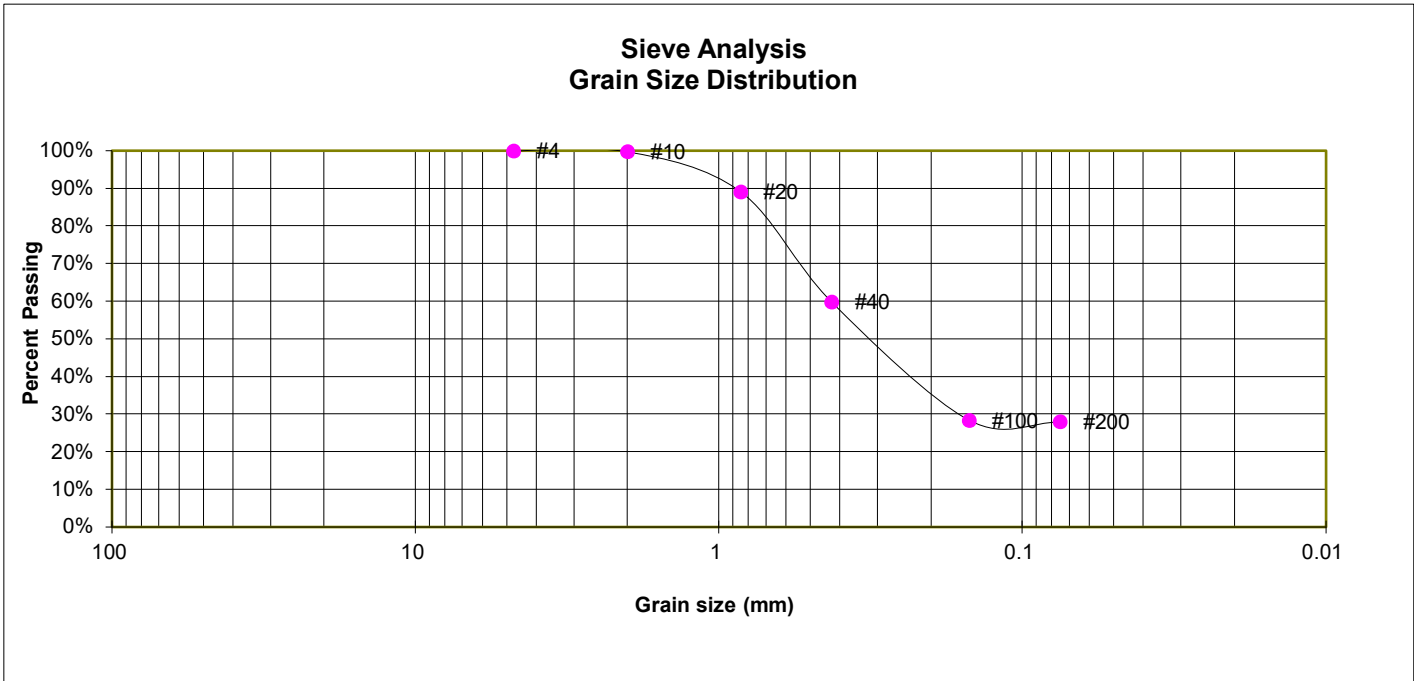
TANNER RANCH, PHASE 1  
 PUSAN HOLDINGS, LLC

JOB NO.  
 251259

**FIG. B-4**

TEST BORING 19  
 DEPTH (FT) 1-2

SOIL DESCRIPTION SAND, CLAYEY  
 SOIL TYPE 2



**GRAIN SIZE ANALYSIS**

U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	99.8%
20	89.2%
40	59.8%
100	28.4%
200	28.0%

**ATTERBERG LIMITS**

Plastic Limit	18
Liquid Limit	25
Plastic Index	7

**SOIL CLASSIFICATION**

USCS CLASSIFICATION: SC  
 AASHTO CLASSIFICATION: A-2-4  
 AASHTO GROUP INDEX: 0



**LABORATORY TEST RESULTS**

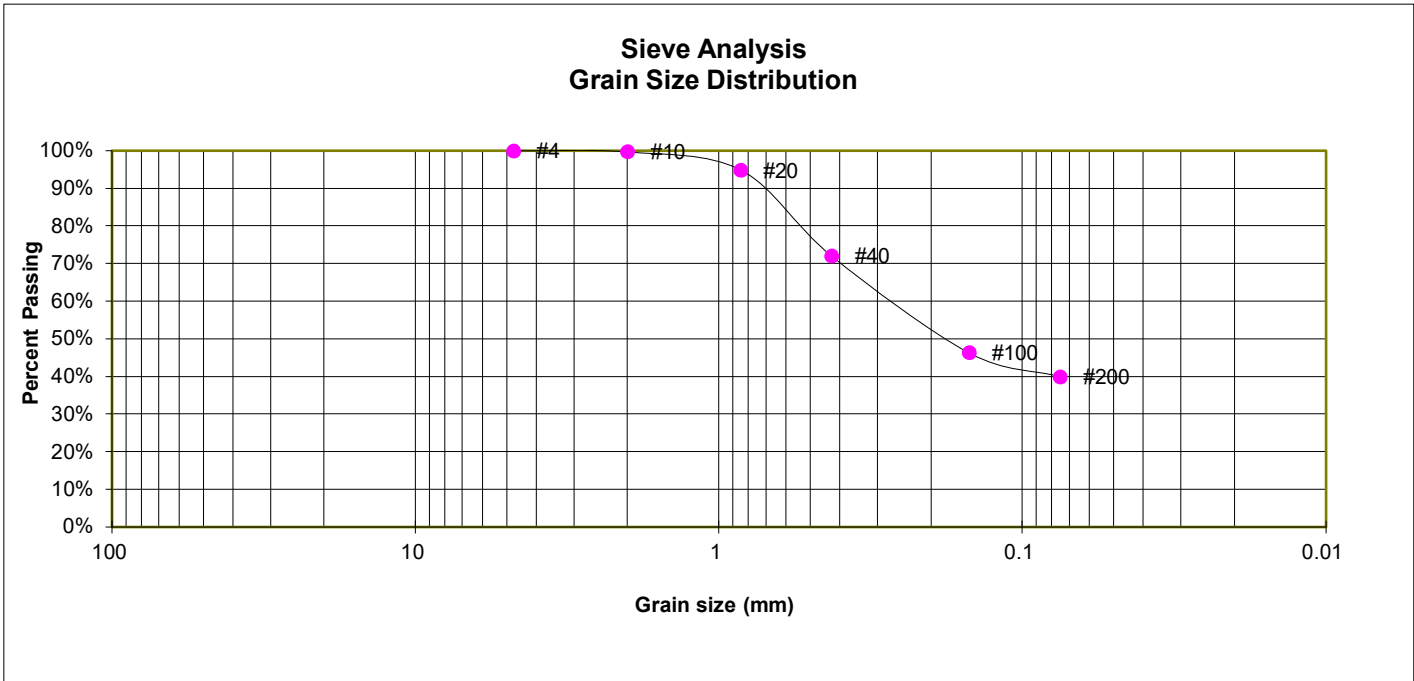
TANNER RANCH, PHASE 1  
 PUSAN HOLDINGS, LLC

JOB NO.  
 251259

**FIG. B-5**

TEST BORING 20  
 DEPTH (FT) 1-2

SOIL DESCRIPTION SAND, CLAYEY  
 SOIL TYPE 2



**GRAIN SIZE ANALYSIS**

U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	99.8%
20	94.9%
40	72.0%
100	46.4%
200	40.0%

**ATTERBERG LIMITS**

Plastic Limit	20
Liquid Limit	30
Plastic Index	10

**SOIL CLASSIFICATION**

USCS CLASSIFICATION:	SC
AASHTO CLASSIFICATION:	A-4
AASHTO GROUP INDEX:	1



**LABORATORY TEST RESULTS**

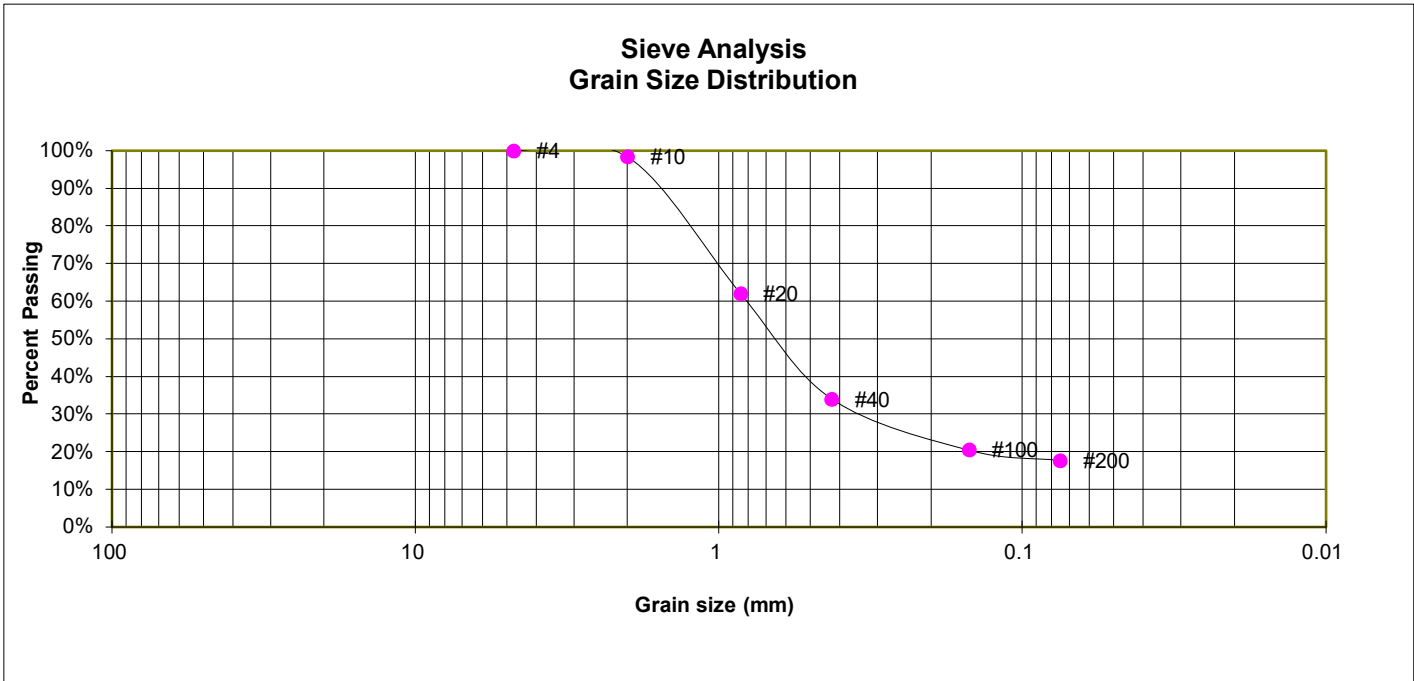
TANNER RANCH, PHASE 1  
 PUSAN HOLDINGS, LLC

JOB NO.  
 251259

**FIG. B-6**

TEST BORING 13  
 DEPTH (FT) 5

SOIL DESCRIPTION SAND, CLAYEY  
 SOIL TYPE 2



**GRAIN SIZE ANALYSIS**

U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	98.4%
20	62.1%
40	34.0%
100	20.5%
200	17.7%

**ATTERBERG LIMITS**

Plastic Limit	15
Liquid Limit	25
Plastic Index	10

**SOIL CLASSIFICATION**

USCS CLASSIFICATION: SC  
 AASHTO CLASSIFICATION: A-2-4  
 AASHTO GROUP INDEX: 0



**LABORATORY TEST RESULTS**

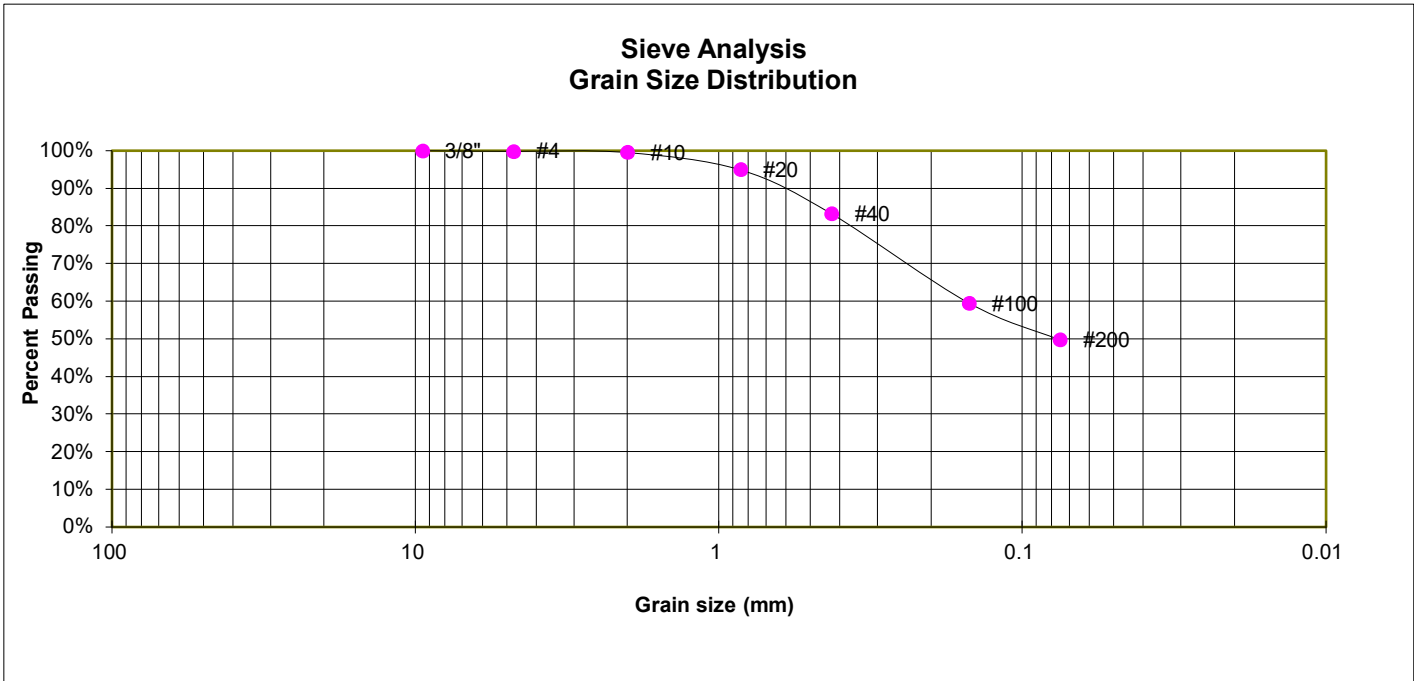
TANNER RANCH, PHASE 1  
 PUSAN HOLDINGS, LLC

JOB NO.  
 251259

**FIG. B-7**

TEST BORING 4  
 DEPTH (FT) 0-3

SOIL DESCRIPTION SAND, CLAYEY  
 SOIL TYPE 2



**GRAIN SIZE ANALYSIS**

U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	99.9%
10	99.6%
20	95.0%
40	83.3%
100	59.5%
200	49.8%

**ATTERBERG LIMITS**

Plastic Limit	16
Liquid Limit	25
Plastic Index	9

**SOIL CLASSIFICATION**

USCS CLASSIFICATION: SC  
 AASHTO CLASSIFICATION: A-4  
 AASHTO GROUP INDEX: 1



**LABORATORY TEST RESULTS**

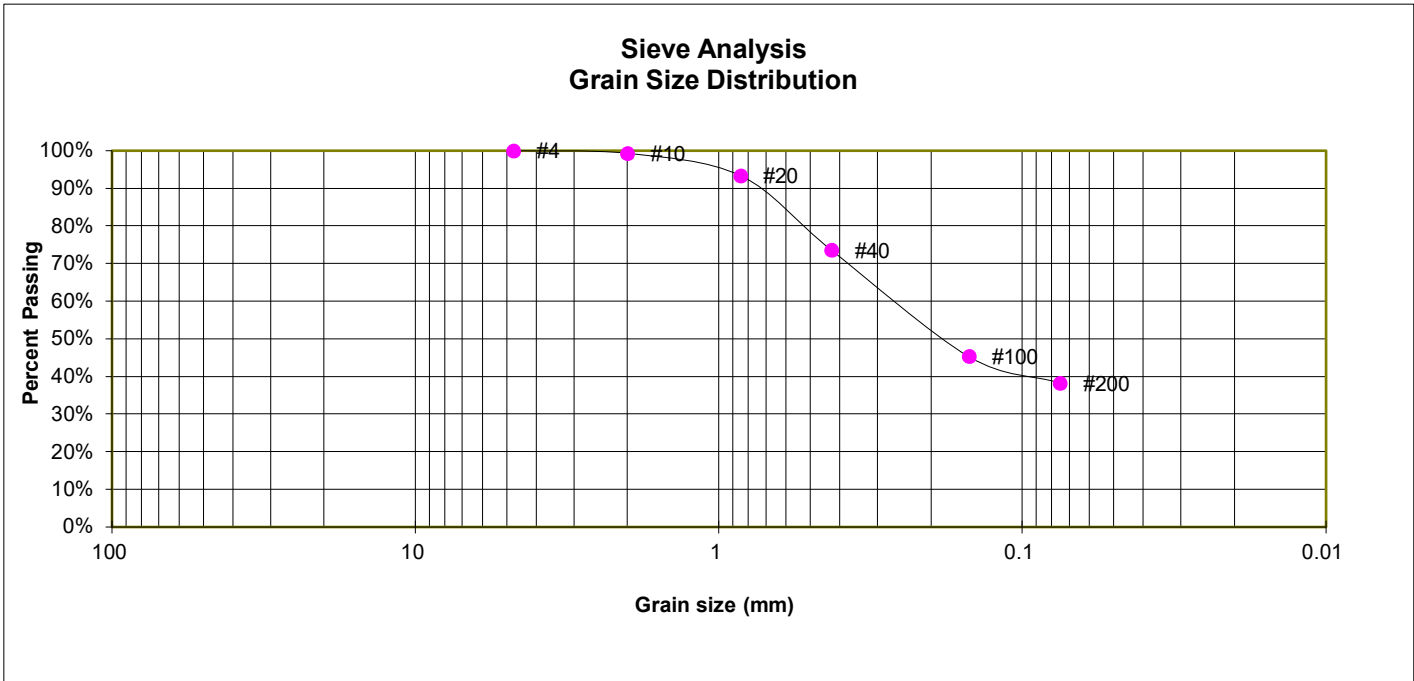
TANNER RANCH, PHASE 1  
 PUSAN HOLDINGS, LLC

JOB NO.  
 251259

**FIG. B-8**

TEST BORING 10  
 DEPTH (FT) 1-2

SOIL DESCRIPTION SAND, CLAYEY  
 SOIL TYPE 2



**GRAIN SIZE ANALYSIS**

U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	99.3%
20	93.4%
40	73.6%
100	45.4%
200	38.3%

**ATTERBERG LIMITS**

Plastic Limit	17
Liquid Limit	27
Plastic Index	10

**SOIL CLASSIFICATION**

USCS CLASSIFICATION: SC  
 AASHTO CLASSIFICATION: A-4  
 AASHTO GROUP INDEX: 0



**LABORATORY TEST RESULTS**

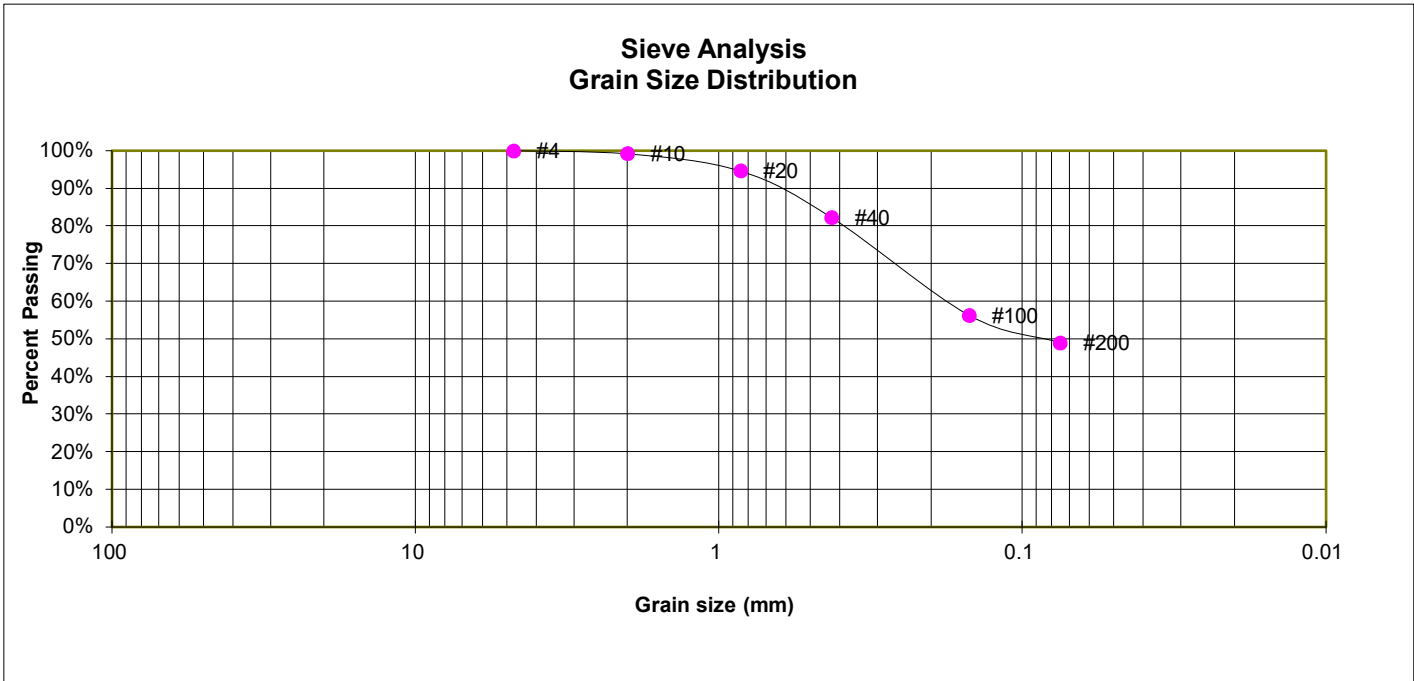
TANNER RANCH, PHASE 1  
 PUSAN HOLDINGS, LLC

JOB NO.  
 251259

**FIG. B-9**

TEST BORING 13  
 DEPTH (FT) 1-2

SOIL DESCRIPTION SAND, CLAYEY  
 SOIL TYPE 2



**GRAIN SIZE ANALYSIS**

U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	99.3%
20	94.7%
40	82.3%
100	56.3%
200	49.0%

**ATTERBERG LIMITS**

Plastic Limit	19
Liquid Limit	35
Plastic Index	16

**SOIL CLASSIFICATION**

USCS CLASSIFICATION:	SC
AASHTO CLASSIFICATION:	A-6
AASHTO GROUP INDEX:	4



**LABORATORY TEST RESULTS**

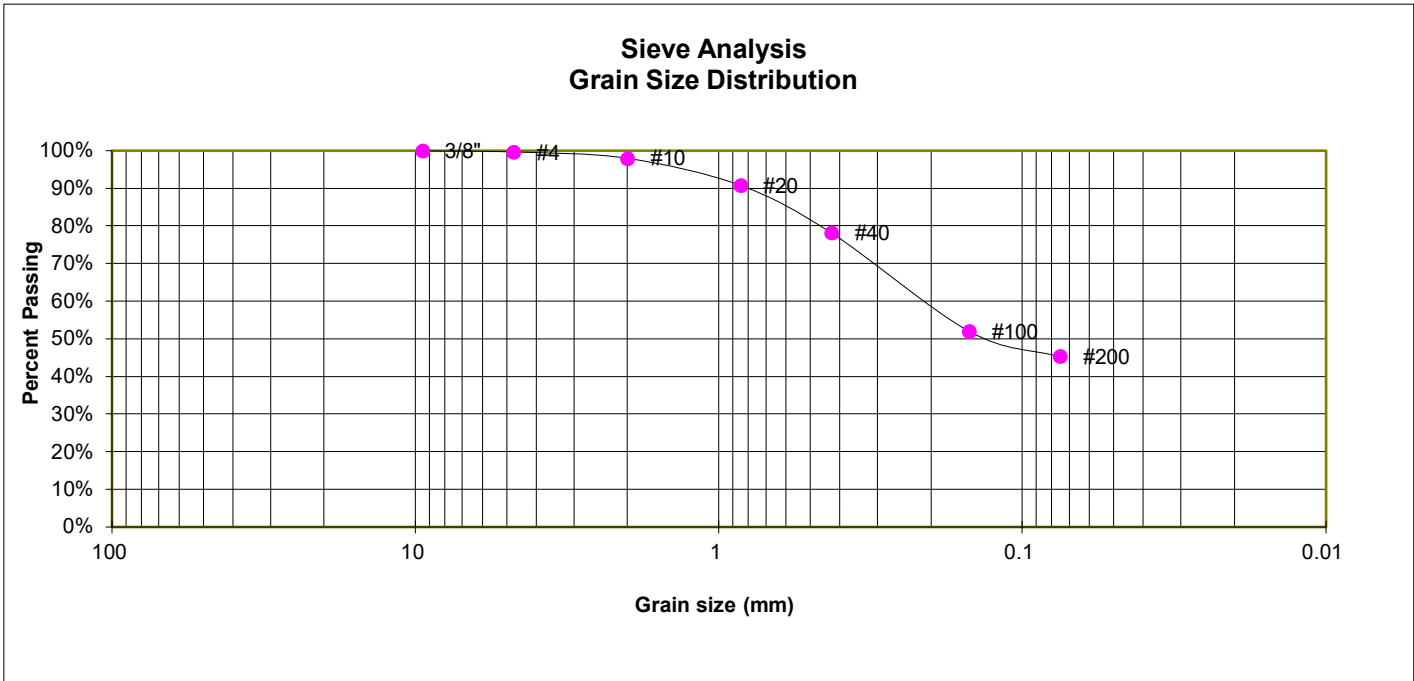
TANNER RANCH, PHASE 1  
 PUSAN HOLDINGS, LLC

JOB NO.  
 251259

**FIG. B-10**

TEST BORING 17  
 DEPTH (FT) 1-2

SOIL DESCRIPTION SAND, CLAYEY  
 SOIL TYPE 2



**GRAIN SIZE ANALYSIS**

U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	99.7%
10	98.0%
20	90.8%
40	78.1%
100	52.0%
200	45.3%

**ATTERBERG LIMITS**

Plastic Limit	19
Liquid Limit	27
Plastic Index	8

**SOIL CLASSIFICATION**

USCS CLASSIFICATION: SC  
 AASHTO CLASSIFICATION: A-4  
 AASHTO GROUP INDEX: 1



**LABORATORY TEST RESULTS**

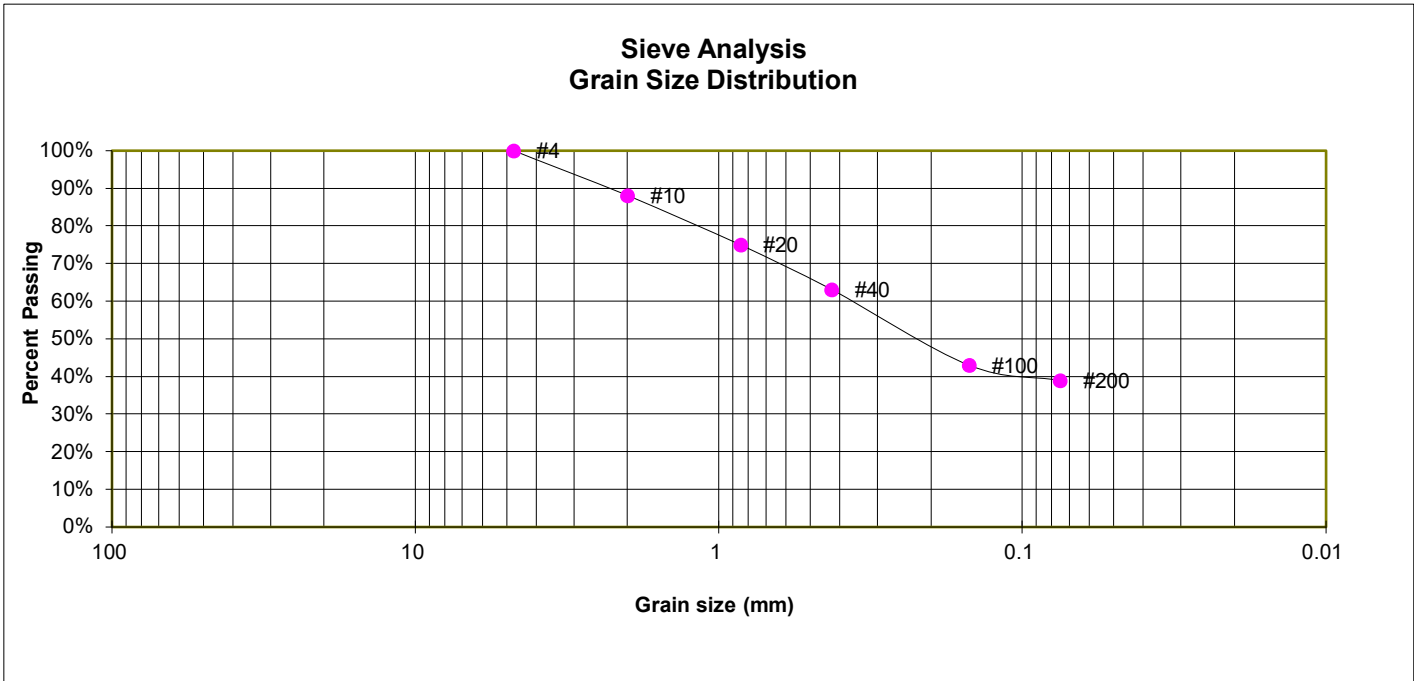
TANNER RANCH, PHASE 1  
 PUSAN HOLDINGS, LLC

JOB NO.  
 251259

**FIG. B-11**

TEST BORING 22  
 DEPTH (FT) 1-2

SOIL DESCRIPTION SAND, CLAYEY  
 SOIL TYPE 2



**GRAIN SIZE ANALYSIS**

U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	88.1%
20	75.0%
40	63.1%
100	43.0%
200	38.9%

**ATTERBERG LIMITS**

Plastic Limit	20
Liquid Limit	35
Plastic Index	15

**SOIL CLASSIFICATION**

USCS CLASSIFICATION:	SC
AASHTO CLASSIFICATION:	A-6
AASHTO GROUP INDEX:	2



**LABORATORY TEST RESULTS**

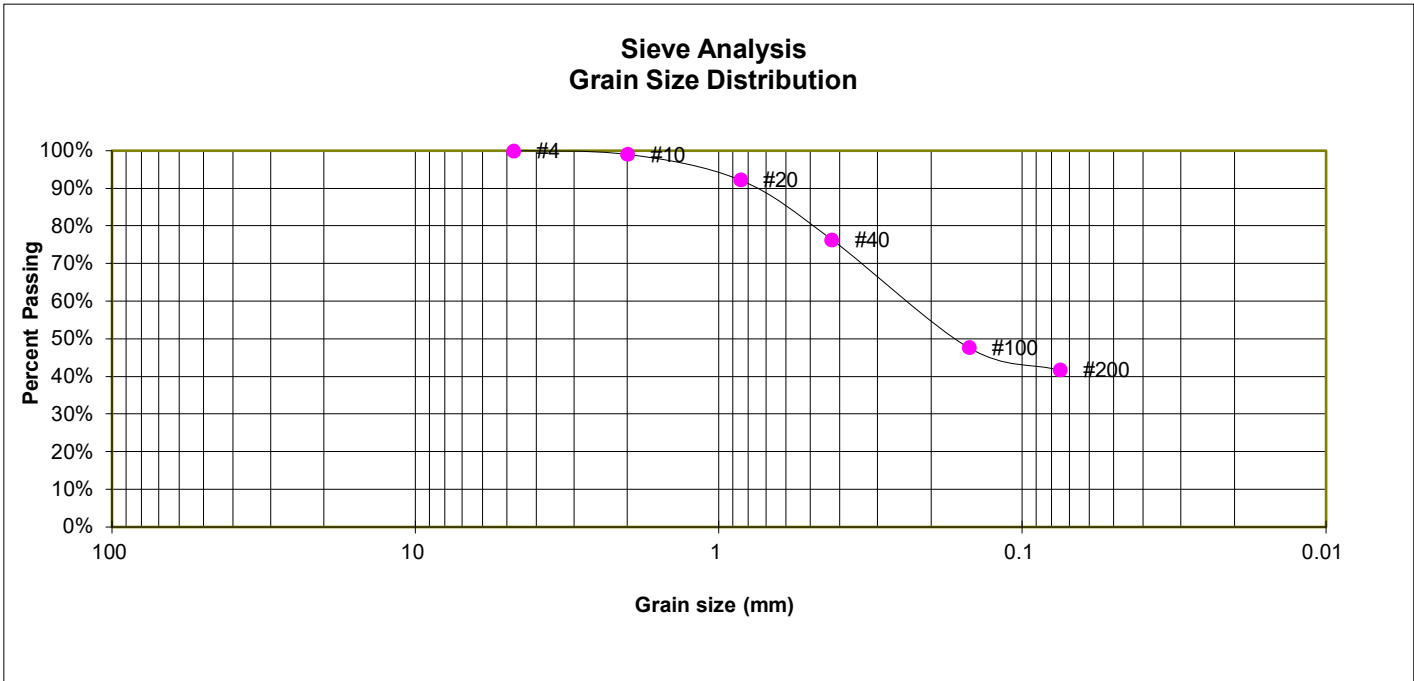
TANNER RANCH, PHASE 1  
 PUSAN HOLDINGS, LLC

JOB NO.  
 251259

**FIG. B-12**

TEST BORING 23  
 DEPTH (FT) 1-2

SOIL DESCRIPTION SAND, CLAYEY  
 SOIL TYPE 2



**GRAIN SIZE ANALYSIS**

U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	99.1%
20	92.3%
40	76.4%
100	47.7%
200	41.8%

**ATTERBERG LIMITS**

Plastic Limit	22
Liquid Limit	31
Plastic Index	9

**SOIL CLASSIFICATION**

USCS CLASSIFICATION: SC  
 AASHTO CLASSIFICATION: A-4  
 AASHTO GROUP INDEX: 1



**LABORATORY TEST RESULTS**

TANNER RANCH, PHASE 1  
 PUSAN HOLDINGS, LLC

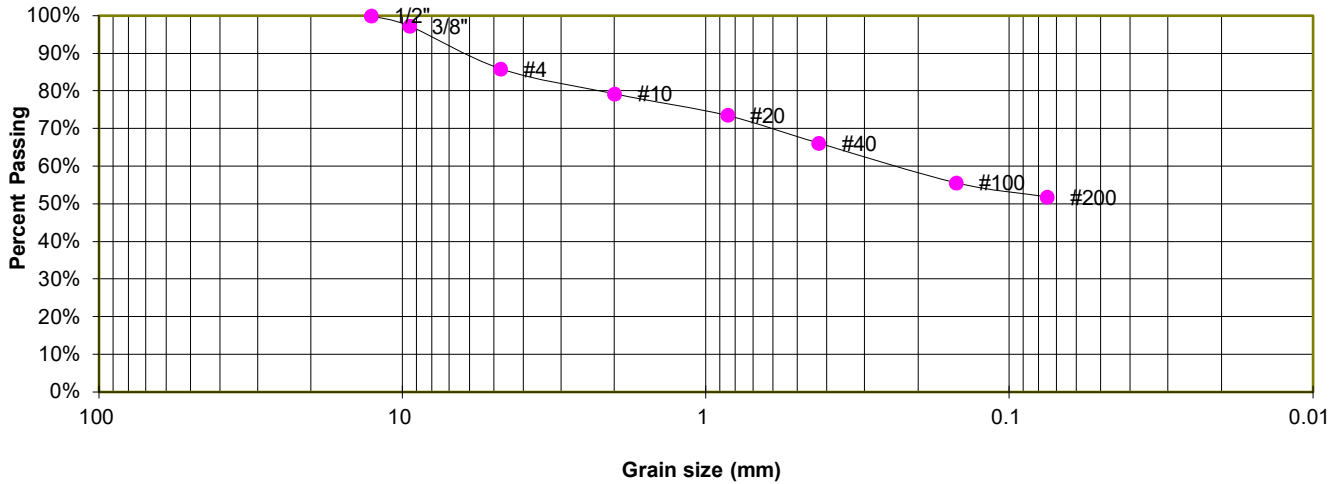
JOB NO.  
 251259

**FIG. B-13**

TEST BORING 15  
 DEPTH (FT) 0-3

SOIL DESCRIPTION CLAY, SANDY  
 SOIL TYPE 3, CBR #2

**Sieve Analysis  
 Grain Size Distribution**



**GRAIN SIZE ANALYSIS**

U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	100.0%
3/8"	97.3%
4	85.9%
10	79.2%
20	73.6%
40	66.1%
100	55.6%
200	51.9%

**ATTERBERG LIMITS**

Plastic Limit	21
Liquid Limit	35
Plastic Index	14

**SOIL CLASSIFICATION**

USCS CLASSIFICATION:	CL
AASHTO CLASSIFICATION:	A-6
AASHTO GROUP INDEX:	4



**LABORATORY TEST RESULTS**

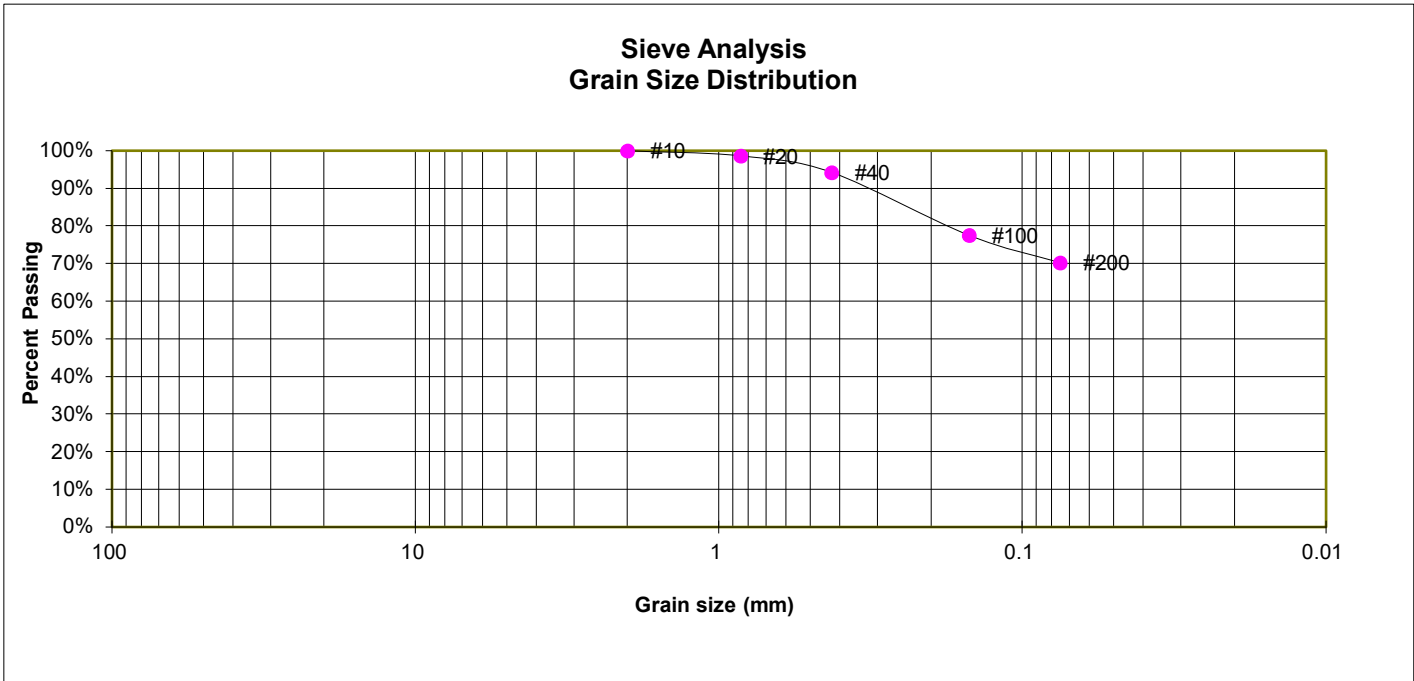
TANNER RANCH, PHASE 1  
 PUSAN HOLDINGS, LLC

JOB NO.  
 251259

**FIG. B-14**

TEST BORING 4  
 DEPTH (FT) 1-2

SOIL DESCRIPTION CLAY, WITH SAND  
 SOIL TYPE 3



**GRAIN SIZE ANALYSIS**

U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	
10	100.0%
20	98.7%
40	94.3%
100	77.6%
200	70.2%

**ATTERBERG LIMITS**

Plastic Limit	23
Liquid Limit	33
Plastic Index	10

**SOIL CLASSIFICATION**

USCS CLASSIFICATION:	CL
AASHTO CLASSIFICATION:	A-6
AASHTO GROUP INDEX:	5



**LABORATORY TEST RESULTS**

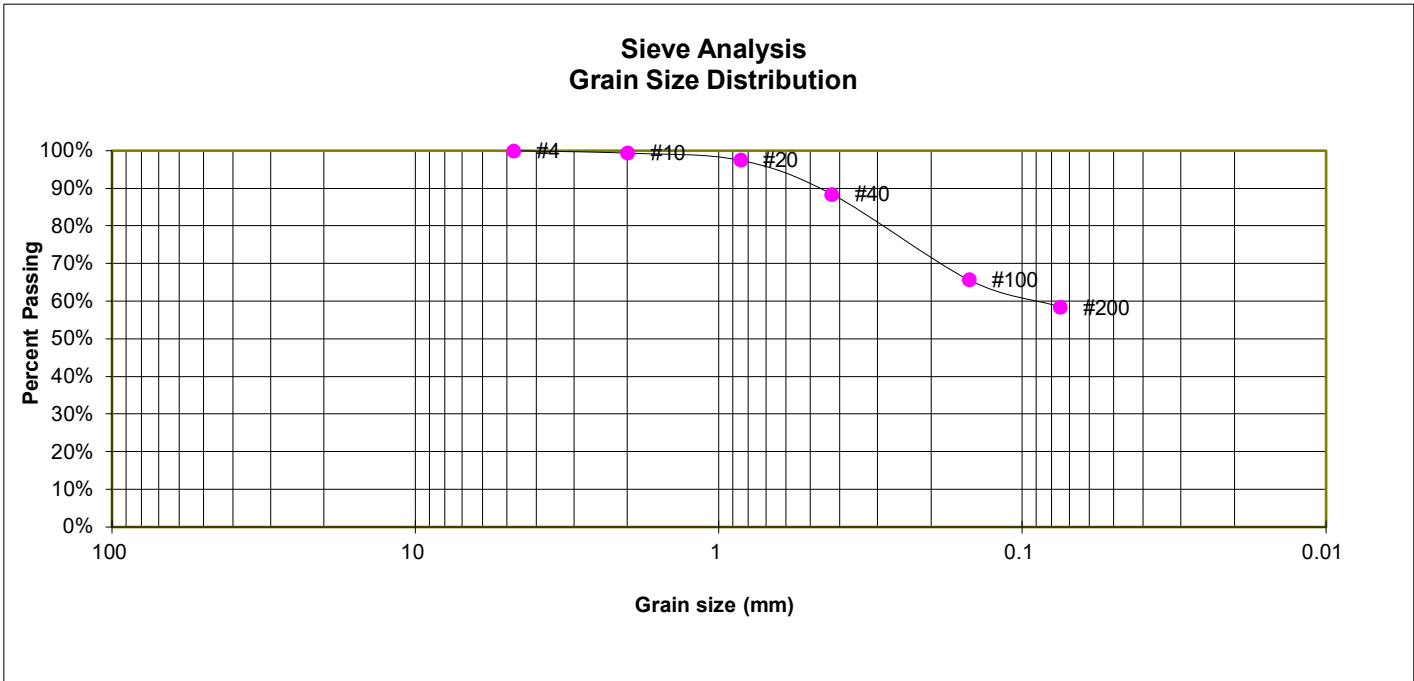
TANNER RANCH, PHASE 1  
 PUSAN HOLDINGS, LLC

JOB NO.  
 251259

**FIG. B-15**

TEST BORING 5  
 DEPTH (FT) 1-2

SOIL DESCRIPTION CLAY, SANDY  
 SOIL TYPE 3



**GRAIN SIZE ANALYSIS**

U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	99.4%
20	97.5%
40	88.5%
100	65.8%
200	58.5%

**ATTERBERG LIMITS**

Plastic Limit	17
Liquid Limit	25
Plastic Index	8

**SOIL CLASSIFICATION**

USCS CLASSIFICATION:	CL
AASHTO CLASSIFICATION:	A-4
AASHTO GROUP INDEX:	2



**LABORATORY TEST RESULTS**

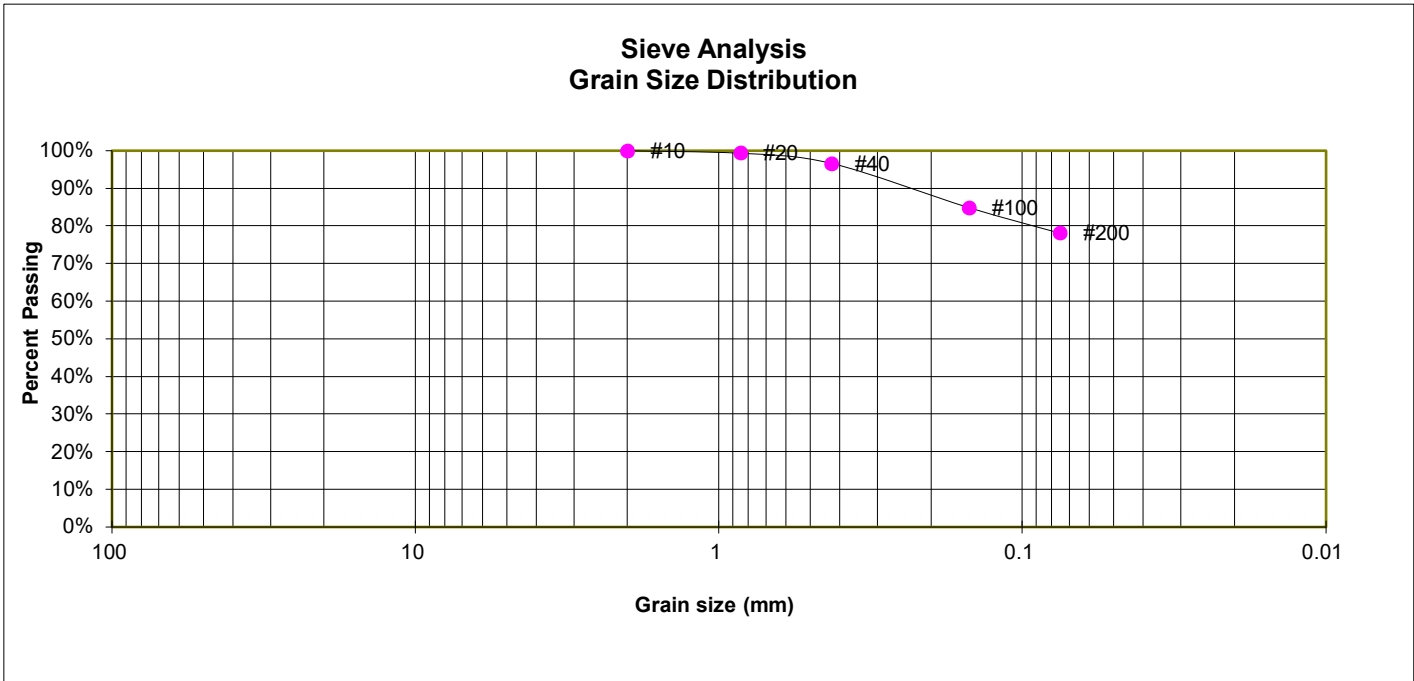
TANNER RANCH, PHASE 1  
 PUSAN HOLDINGS, LLC

JOB NO.  
 251259

**FIG. B-16**

TEST BORING 7  
 DEPTH (FT) 1-2

SOIL DESCRIPTION CLAY, WITH SAND  
 SOIL TYPE 3



**GRAIN SIZE ANALYSIS**

U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	
10	100.0%
20	99.4%
40	96.7%
100	84.9%
200	78.1%

**ATTERBERG LIMITS**

Plastic Limit	22
Liquid Limit	41
Plastic Index	19

**SOIL CLASSIFICATION**

USCS CLASSIFICATION: CL  
 AASHTO CLASSIFICATION: A-7-6  
 AASHTO GROUP INDEX: 15



**LABORATORY TEST RESULTS**

TANNER RANCH, PHASE 1  
 PUSAN HOLDINGS, LLC

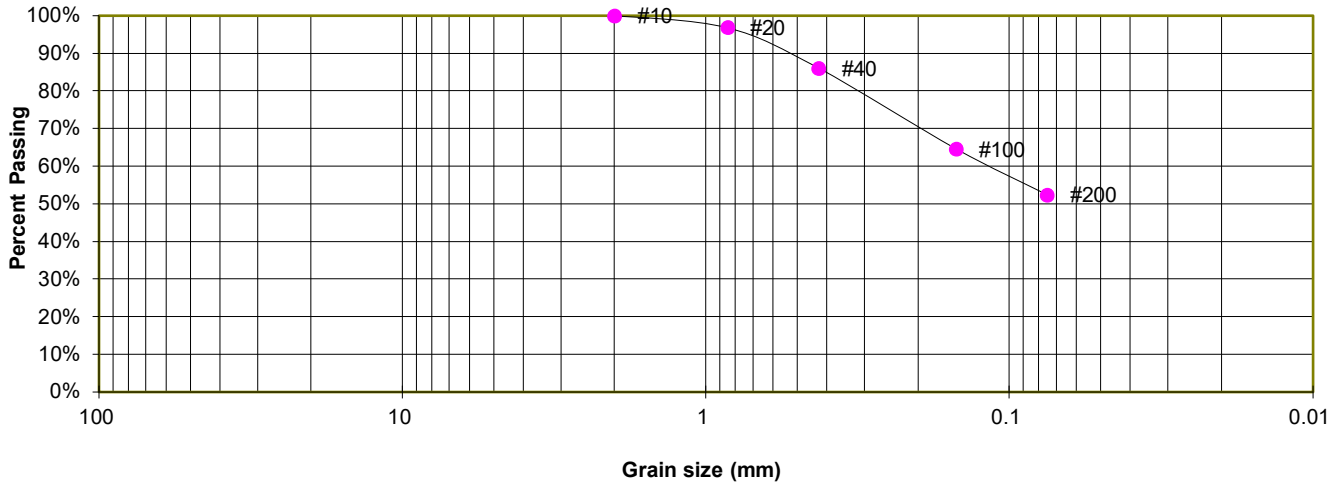
JOB NO.  
 251259

**FIG. B-17**

TEST BORING 8  
 DEPTH (FT) 1-2

SOIL DESCRIPTION CLAY, SANDY  
 SOIL TYPE 3

**Sieve Analysis  
 Grain Size Distribution**



**GRAIN SIZE ANALYSIS**

U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	
10	100.0%
20	96.9%
40	86.1%
100	64.6%
200	52.4%

**ATTERBERG LIMITS**

Plastic Limit	17
Liquid Limit	25
Plastic Index	8

**SOIL CLASSIFICATION**

USCS CLASSIFICATION:	CL
AASHTO CLASSIFICATION:	A-4
AASHTO GROUP INDEX:	2



**LABORATORY TEST RESULTS**

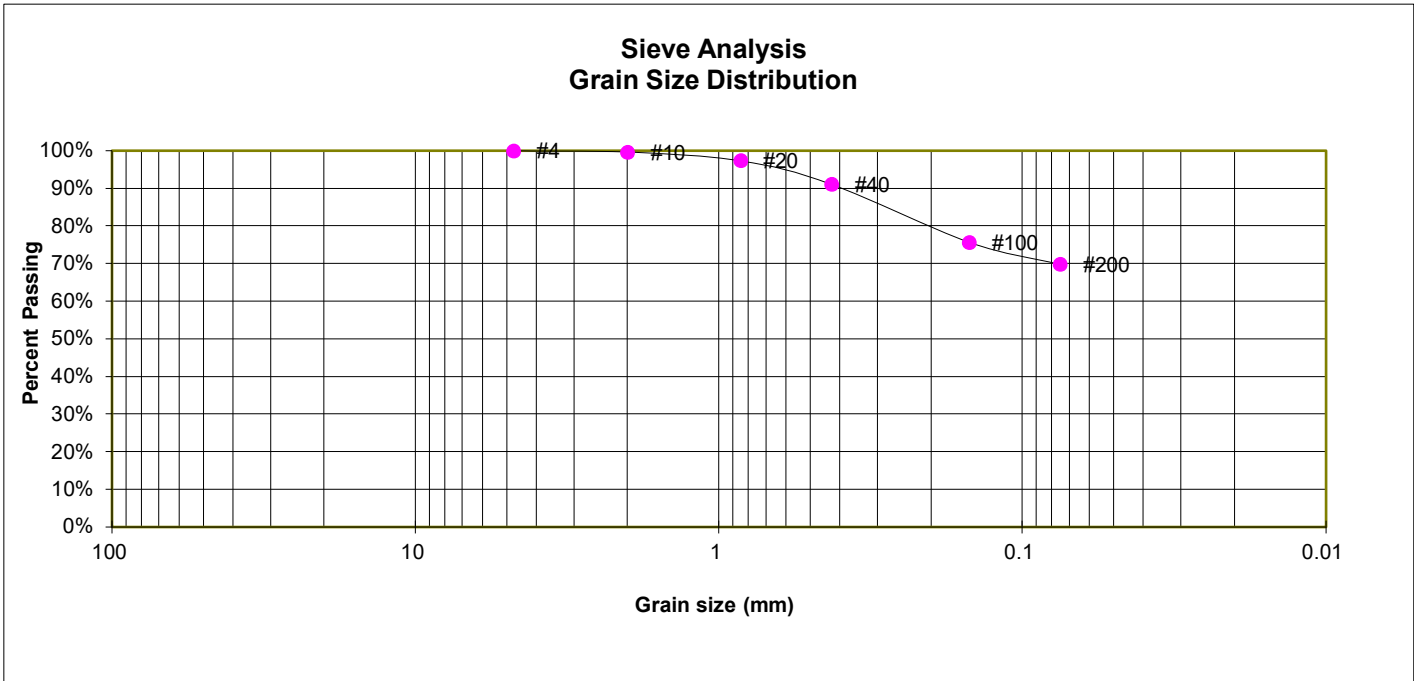
TANNER RANCH, PHASE 1  
 PUSAN HOLDINGS, LLC

JOB NO.  
 251259

**FIG. B-18**

TEST BORING 9  
 DEPTH (FT) 1-2

SOIL DESCRIPTION CLAY, SANDY  
 SOIL TYPE 3



**GRAIN SIZE ANALYSIS**

U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	99.6%
20	97.4%
40	91.1%
100	75.7%
200	69.8%

**ATTERBERG LIMITS**

Plastic Limit	18
Liquid Limit	26
Plastic Index	8

**SOIL CLASSIFICATION**

USCS CLASSIFICATION:	CL
AASHTO CLASSIFICATION:	A-4
AASHTO GROUP INDEX:	4



**LABORATORY TEST RESULTS**

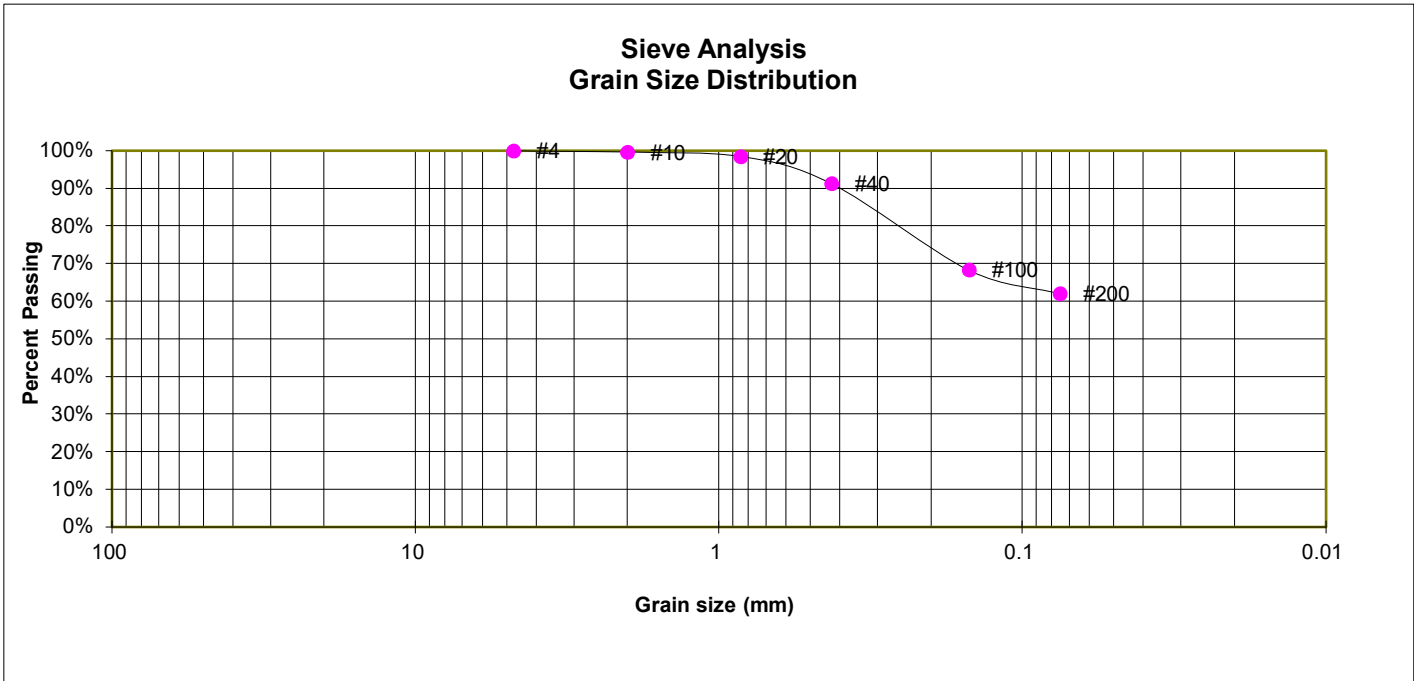
TANNER RANCH, PHASE 1  
 PUSAN HOLDINGS, LLC

JOB NO.  
 251259

**FIG. B-19**

TEST BORING 11  
 DEPTH (FT) 1-2

SOIL DESCRIPTION CLAY, SANDY  
 SOIL TYPE 3



**GRAIN SIZE ANALYSIS**

U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	99.7%
20	98.5%
40	91.2%
100	68.3%
200	62.0%

**ATTERBERG LIMITS**

Plastic Limit	27
Liquid Limit	40
Plastic Index	13

**SOIL CLASSIFICATION**

USCS CLASSIFICATION:	CL
AASHTO CLASSIFICATION:	A-6
AASHTO GROUP INDEX:	7



**LABORATORY TEST RESULTS**

TANNER RANCH, PHASE 1  
 PUSAN HOLDINGS, LLC

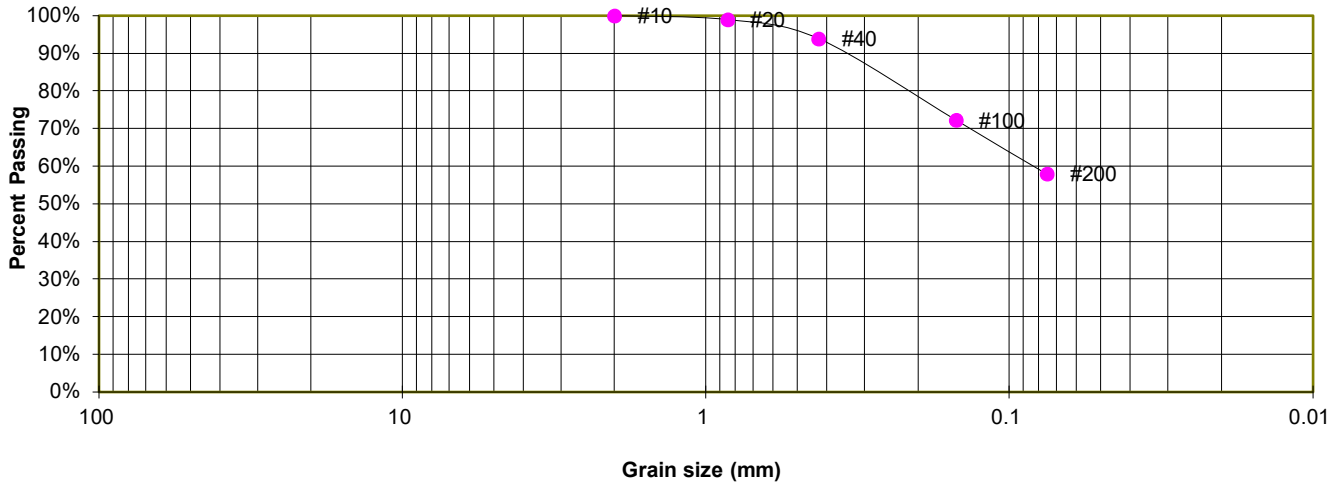
JOB NO.  
 251259

**FIG. B-20**

TEST BORING 12  
 DEPTH (FT) 1-2

SOIL DESCRIPTION CLAY, SANDY  
 SOIL TYPE 3

**Sieve Analysis  
 Grain Size Distribution**



**GRAIN SIZE ANALYSIS**

U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	
10	100.0%
20	99.0%
40	93.9%
100	72.3%
200	57.9%

**ATTERBERG LIMITS**

Plastic Limit	9
Liquid Limit	29
Plastic Index	20

**SOIL CLASSIFICATION**

USCS CLASSIFICATION:	CL
AASHTO CLASSIFICATION:	A-6
AASHTO GROUP INDEX:	8



**LABORATORY TEST RESULTS**

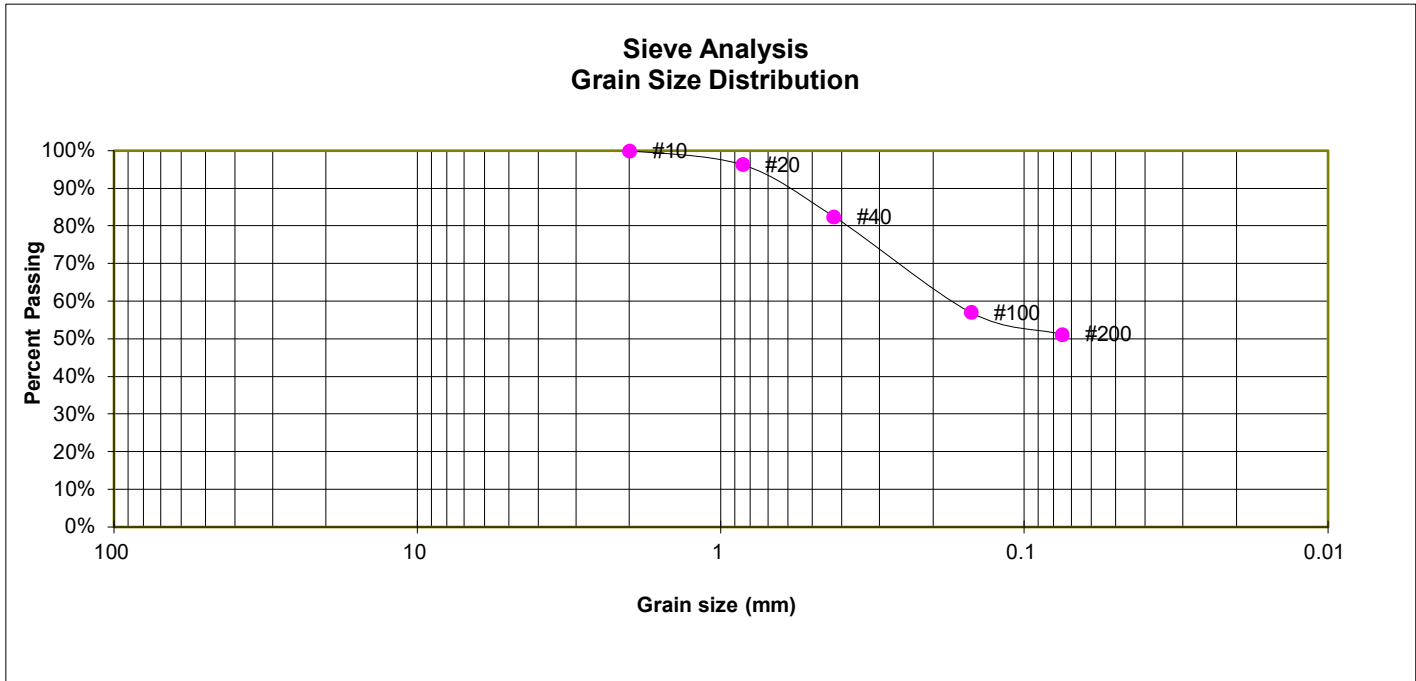
TANNER RANCH, PHASE 1  
 PUSAN HOLDINGS, LLC

JOB NO.  
 251259

**FIG. B-21**

TEST BORING 14  
 DEPTH (FT) 1-2

SOIL DESCRIPTION CLAY, SANDY  
 SOIL TYPE 3



**GRAIN SIZE ANALYSIS**

U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	
10	100.0%
20	96.3%
40	82.5%
100	57.1%
200	51.2%

**ATTERBERG LIMITS**

Plastic Limit	17
Liquid Limit	24
Plastic Index	7

**SOIL CLASSIFICATION**

USCS CLASSIFICATION:	CL
AASHTO CLASSIFICATION:	A-6
AASHTO GROUP INDEX:	1



**LABORATORY TEST RESULTS**

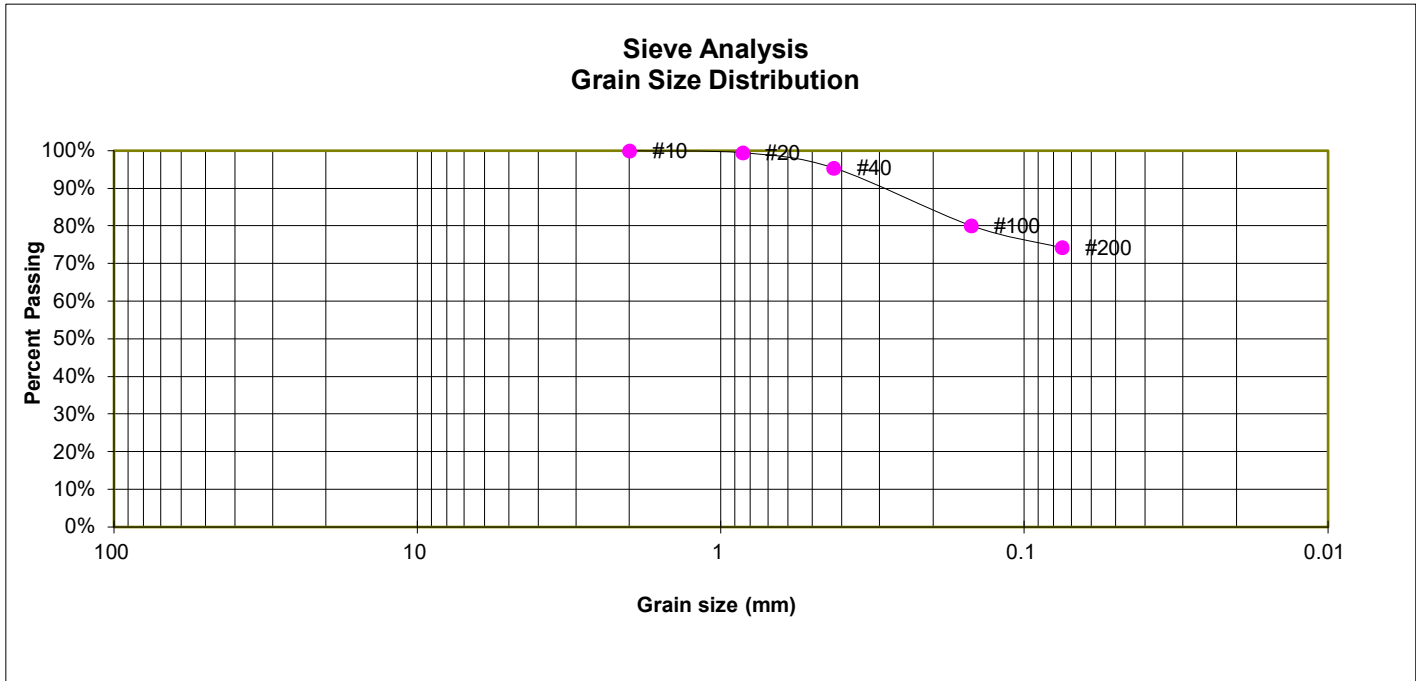
TANNER RANCH, PHASE 1  
 PUSAN HOLDINGS, LLC

JOB NO.  
 251259

**FIG. B-22**

TEST BORING 15  
 DEPTH (FT) 1-2

SOIL DESCRIPTION CLAY, WITH SAND  
 SOIL TYPE 3



**GRAIN SIZE ANALYSIS**

U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	
10	100.0%
20	99.5%
40	95.5%
100	80.1%
200	74.2%

**ATTERBERG LIMITS**

Plastic Limit	25
Liquid Limit	42
Plastic Index	17

**SOIL CLASSIFICATION**

USCS CLASSIFICATION: CL  
 AASHTO CLASSIFICATION: A-7-6  
 AASHTO GROUP INDEX: 12



**LABORATORY TEST RESULTS**

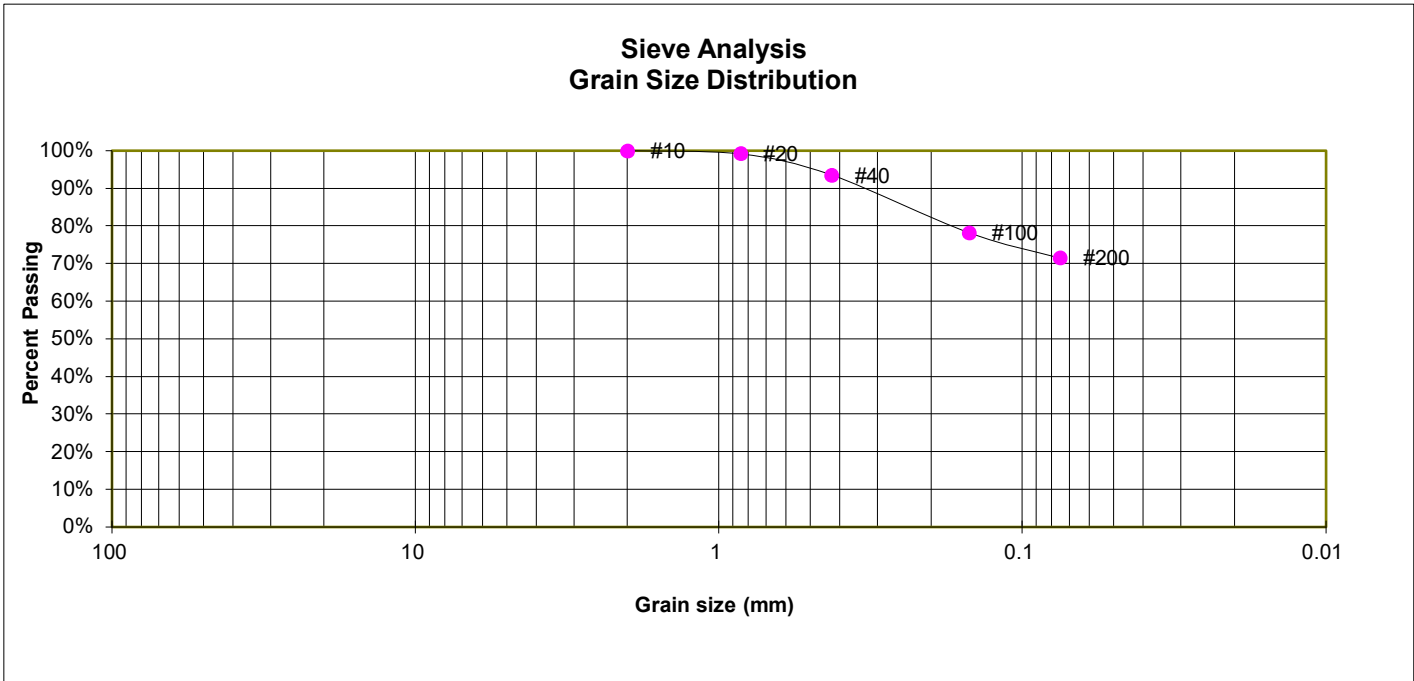
TANNER RANCH, PHASE 1  
 PUSAN HOLDINGS, LLC

JOB NO.  
 251259

**FIG. B-23**

TEST BORING 16  
 DEPTH (FT) 1-2

SOIL DESCRIPTION CLAY, WITH SAND  
 SOIL TYPE 3



**GRAIN SIZE ANALYSIS**

U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	
10	100.0%
20	99.2%
40	93.6%
100	78.2%
200	71.5%

**ATTERBERG LIMITS**

Plastic Limit	23
Liquid Limit	35
Plastic Index	12

**SOIL CLASSIFICATION**

USCS CLASSIFICATION:	CL
AASHTO CLASSIFICATION:	A-6
AASHTO GROUP INDEX:	8



**LABORATORY TEST RESULTS**

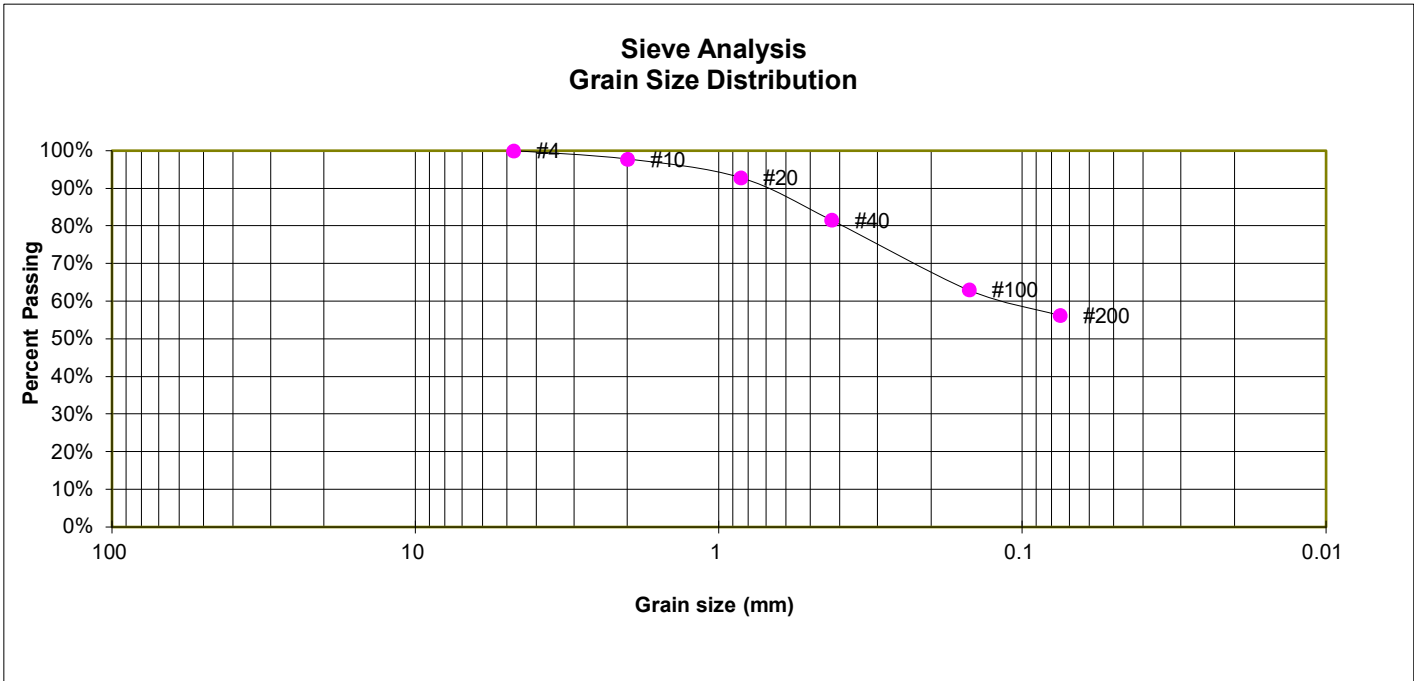
TANNER RANCH, PHASE 1  
 PUSAN HOLDINGS, LLC

JOB NO.  
 251259

**FIG. B-24**

TEST BORING 21  
 DEPTH (FT) 1-2

SOIL DESCRIPTION CLAY, SANDY  
 SOIL TYPE 3



**GRAIN SIZE ANALYSIS**

U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	97.8%
20	92.9%
40	81.6%
100	63.0%
200	56.2%

**ATTERBERG LIMITS**

Plastic Limit	22
Liquid Limit	36
Plastic Index	14

**SOIL CLASSIFICATION**

USCS CLASSIFICATION:	CL
AASHTO CLASSIFICATION:	A-6
AASHTO GROUP INDEX:	6



**LABORATORY TEST RESULTS**

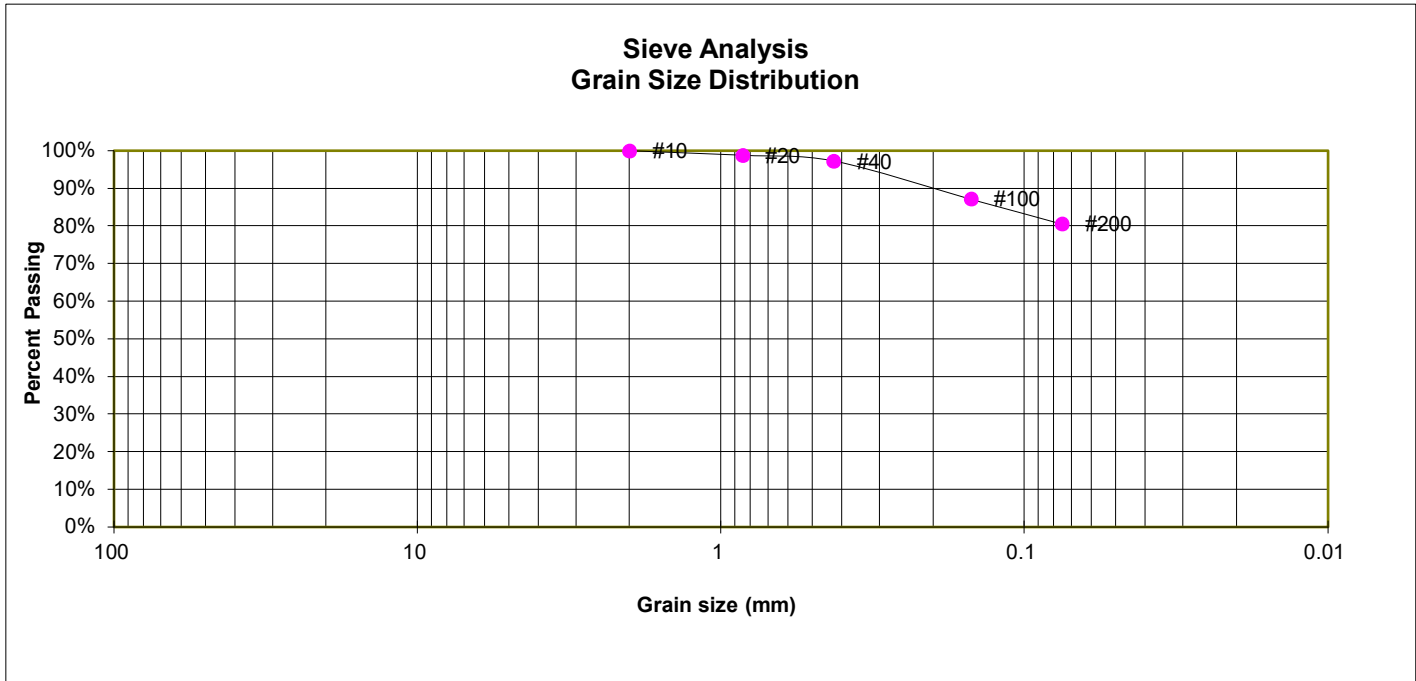
TANNER RANCH, PHASE 1  
 PUSAN HOLDINGS, LLC

JOB NO.  
 251259

**FIG. B-25**

TEST BORING 1  
 DEPTH (FT) 5

SOIL DESCRIPTION CLAY, WITH SAND  
 SOIL TYPE 3



**GRAIN SIZE ANALYSIS**

U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	
10	100.0%
20	98.8%
40	97.3%
100	87.2%
200	80.6%

**ATTERBERG LIMITS**

Plastic Limit	21
Liquid Limit	35
Plastic Index	14

**SOIL CLASSIFICATION**

USCS CLASSIFICATION:	CL
AASHTO CLASSIFICATION:	A-6
AASHTO GROUP INDEX:	10



**LABORATORY TEST RESULTS**

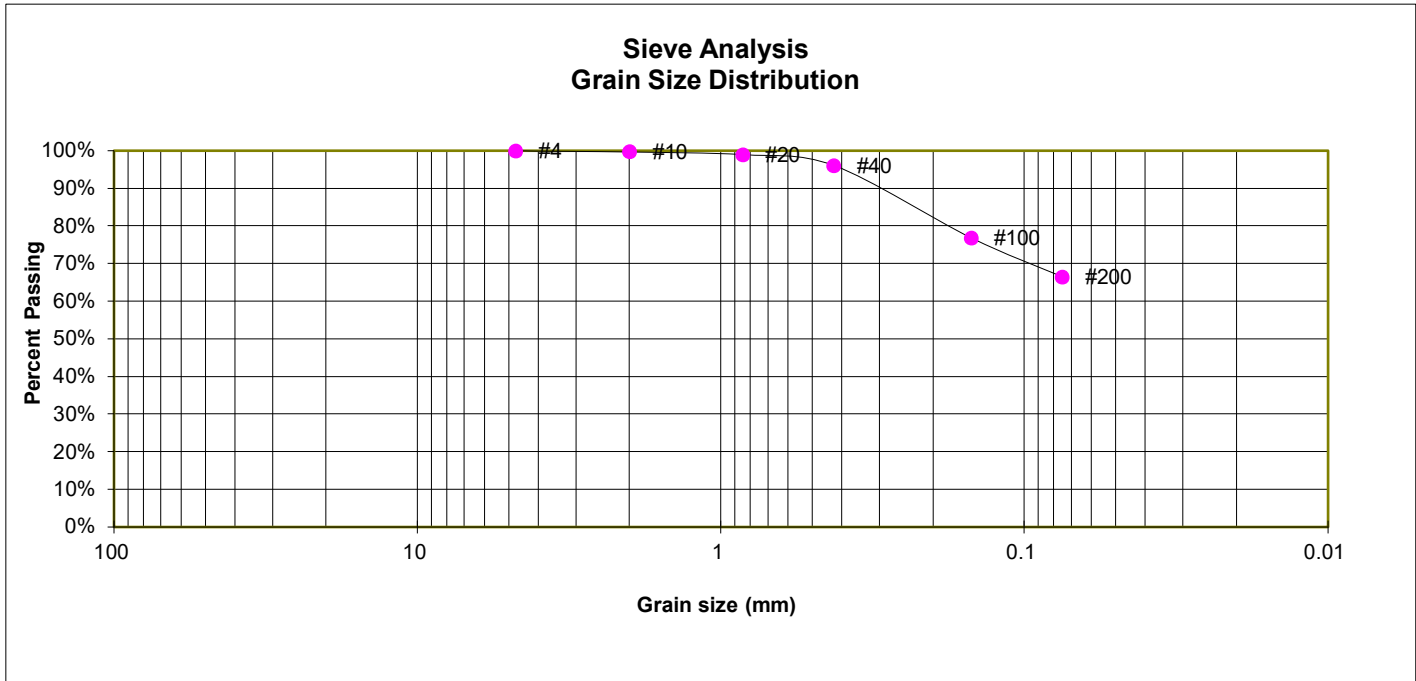
TANNER RANCH, PHASE 1  
 PUSAN HOLDINGS, LLC

JOB NO.  
 251259

**FIG. B-26**

TEST BORING 2  
 DEPTH (FT) 5

SOIL DESCRIPTION CLAY, SANDY  
 SOIL TYPE 3



**GRAIN SIZE ANALYSIS**

U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	99.7%
20	99.0%
40	96.1%
100	76.9%
200	66.5%

**ATTERBERG LIMITS**

Plastic Limit	17
Liquid Limit	26
Plastic Index	9

**SOIL CLASSIFICATION**

USCS CLASSIFICATION:	CL
AASHTO CLASSIFICATION:	A-4
AASHTO GROUP INDEX:	3



**LABORATORY TEST RESULTS**

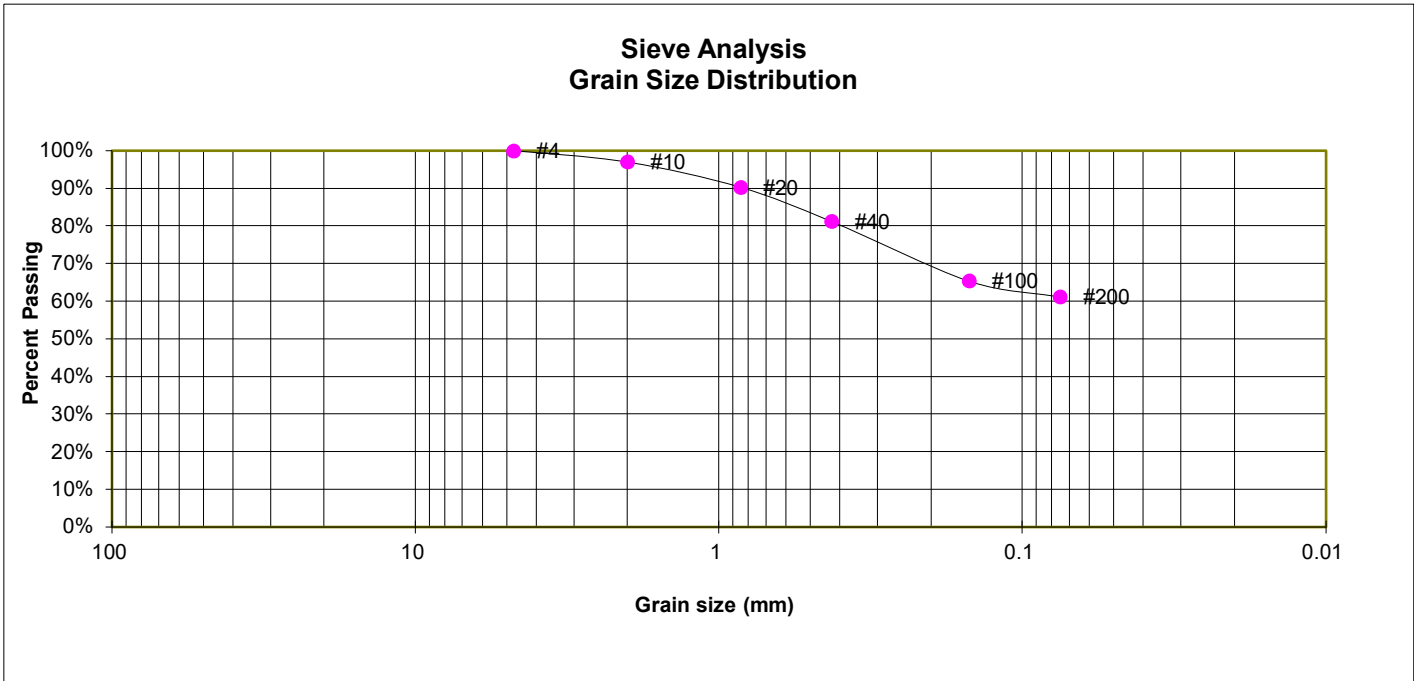
TANNER RANCH, PHASE 1  
 PUSAN HOLDINGS, LLC

JOB NO.  
 251259

**FIG. B-27**

TEST BORING 3  
DEPTH (FT) 5

SOIL DESCRIPTION CLAY, SANDY  
SOIL TYPE 3



**GRAIN SIZE ANALYSIS**

U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	97.1%
20	90.3%
40	81.2%
100	65.4%
200	61.2%

**SOIL CLASSIFICATION**

USCS CLASSIFICATION: CL  
AASHTO CLASSIFICATION:  
AASHTO GROUP INDEX:



**LABORATORY TEST RESULTS**

TANNER RANCH, PHASE 1  
PUSAN HOLDINGS, LLC

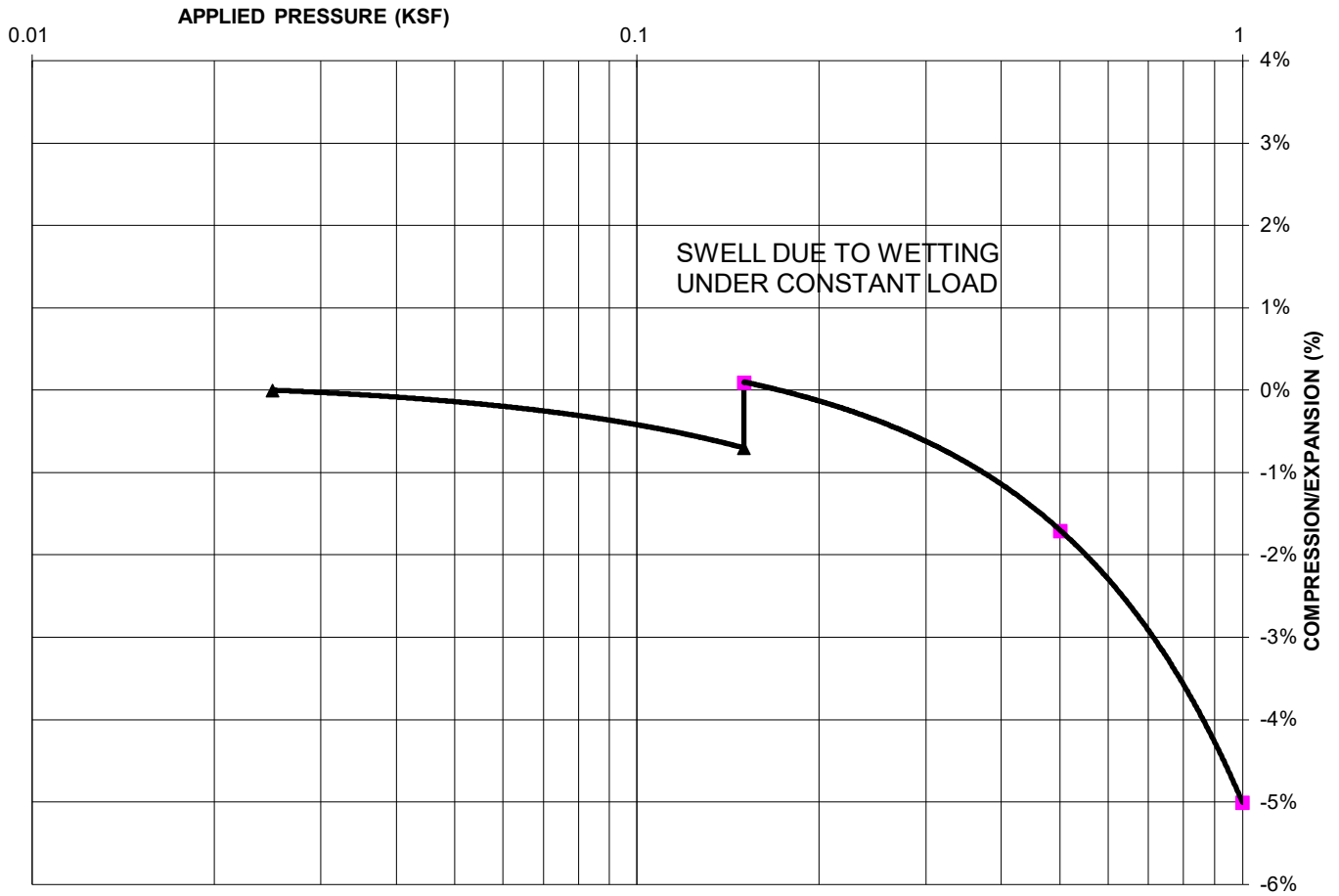
JOB NO.  
251259

**FIG. B-28**

TEST BORING 20  
DEPTH (FT) 1-2

SOIL DESCRIPTION SAND, CLAYEY  
SOIL TYPE 2

### SWELL CONSOLIDATION



#### **SWELL/COLLAPSE TEST RESULTS**

NATURAL UNIT DRY WEIGHT (PCF): 103  
NATURAL MOISTURE CONTENT: 9.0%  
SWELL/COLLAPSE (%): 0.8%



### SWELL TEST RESULTS

TANNER RANCH, PHASE 1  
PUSAN HOLDINGS, LLC

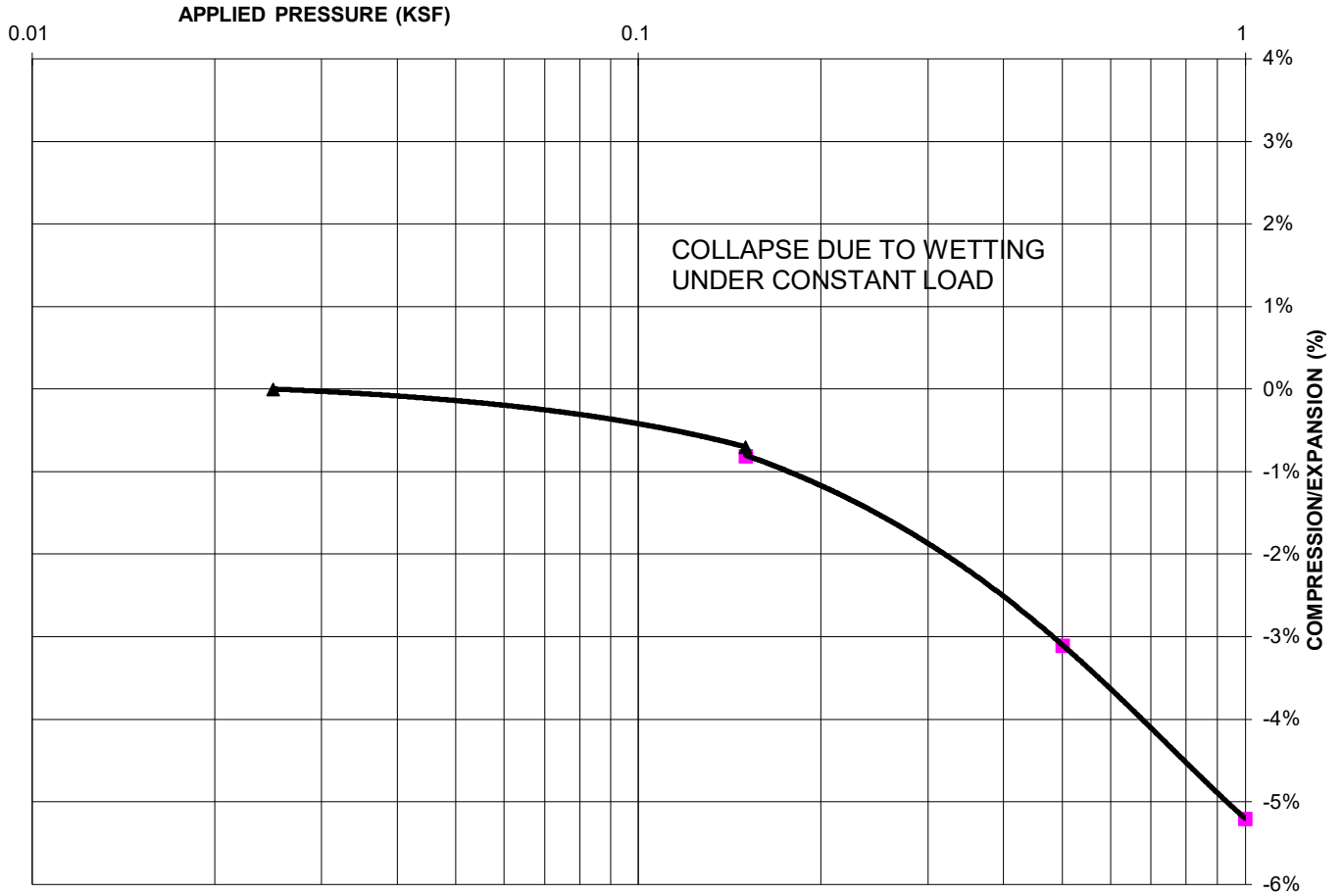
JOB NO.  
251259

**FIG. B-29**

TEST BORING 10  
DEPTH (FT) 1-2

SOIL DESCRIPTION SAND, CLAYEY  
SOIL TYPE 2

### SWELL CONSOLIDATION



#### **SWELL/COLLAPSE TEST RESULTS**

NATURAL UNIT DRY WEIGHT (PCF): 96  
NATURAL MOISTURE CONTENT: 7.9%  
SWELL/COLLAPSE (%): -0.1%



### SWELL TEST RESULTS

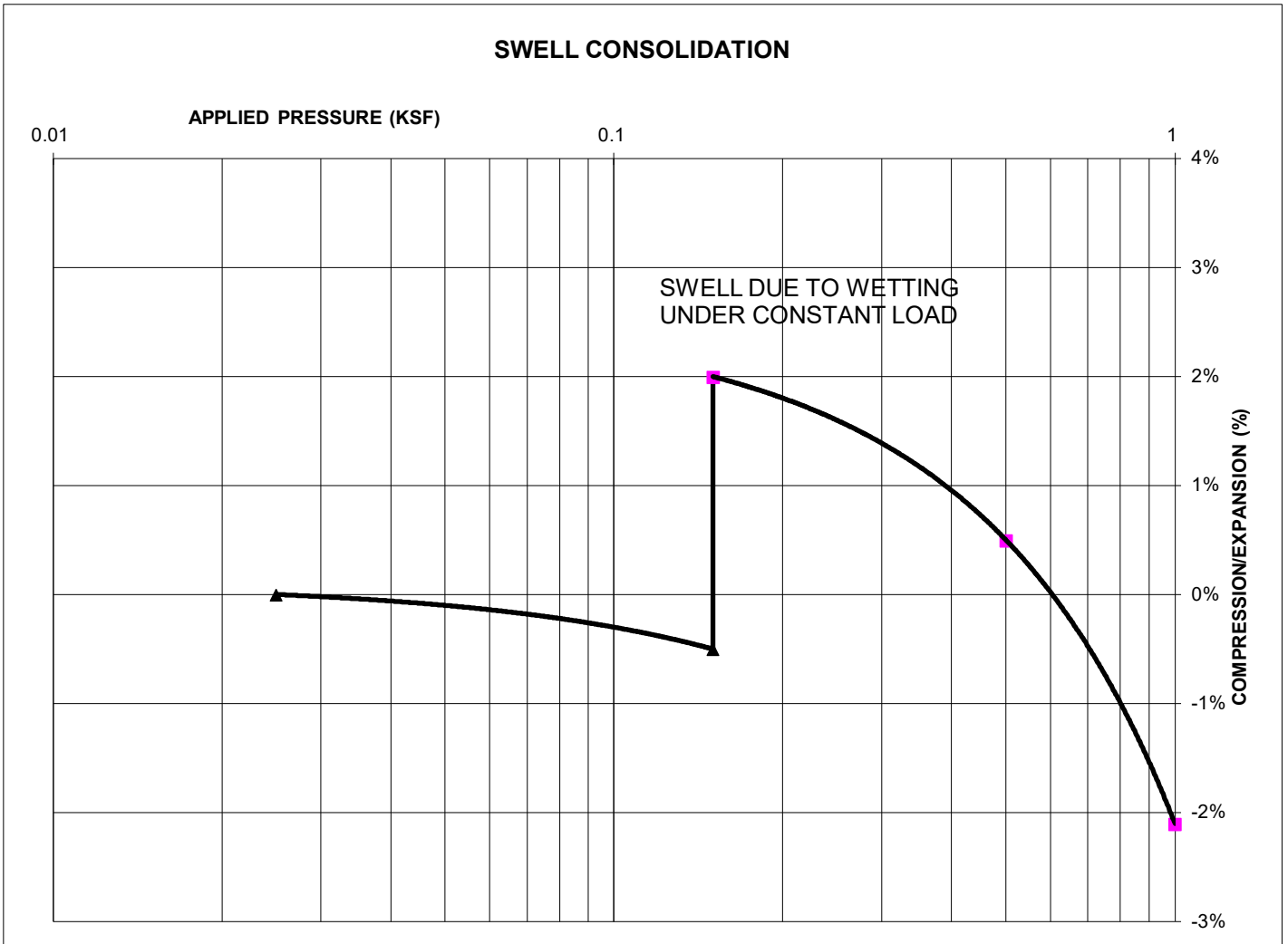
TANNER RANCH, PHASE 1  
PUSAN HOLDINGS, LLC

JOB NO.  
251259

**FIG. B-30**

TEST BORING 13  
DEPTH (FT) 1-2

SOIL DESCRIPTION SAND, CLAYEY  
SOIL TYPE 2



**SWELL/COLLAPSE TEST RESULTS**

NATURAL UNIT DRY WEIGHT (PCF): 99  
NATURAL MOISTURE CONTENT: 13.0%  
SWELL/COLLAPSE (%): 2.5%



**SWELL TEST RESULTS**

TANNER RANCH, PHASE 1  
PUSAN HOLDINGS, LLC

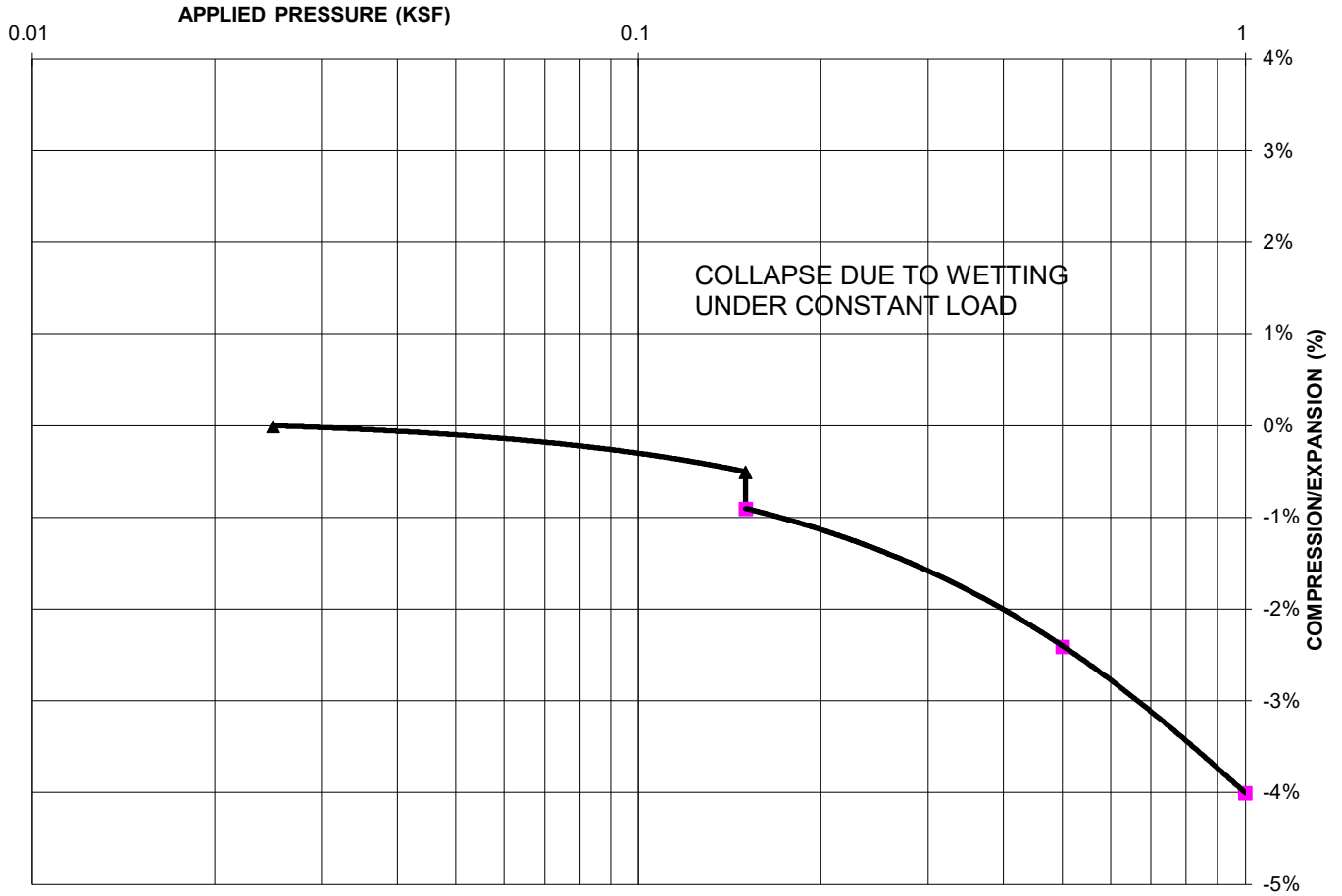
JOB NO.  
251259

**FIG. B-31**

TEST BORING 17  
DEPTH (FT) 1-2

SOIL DESCRIPTION SAND, CLAYEY  
SOIL TYPE 2

### SWELL CONSOLIDATION



#### **SWELL/COLLAPSE TEST RESULTS**

NATURAL UNIT DRY WEIGHT (PCF): 105  
NATURAL MOISTURE CONTENT: 11.6%  
SWELL/COLLAPSE (%): -0.4%



### SWELL TEST RESULTS

TANNER RANCH, PHASE 1  
PUSAN HOLDINGS, LLC

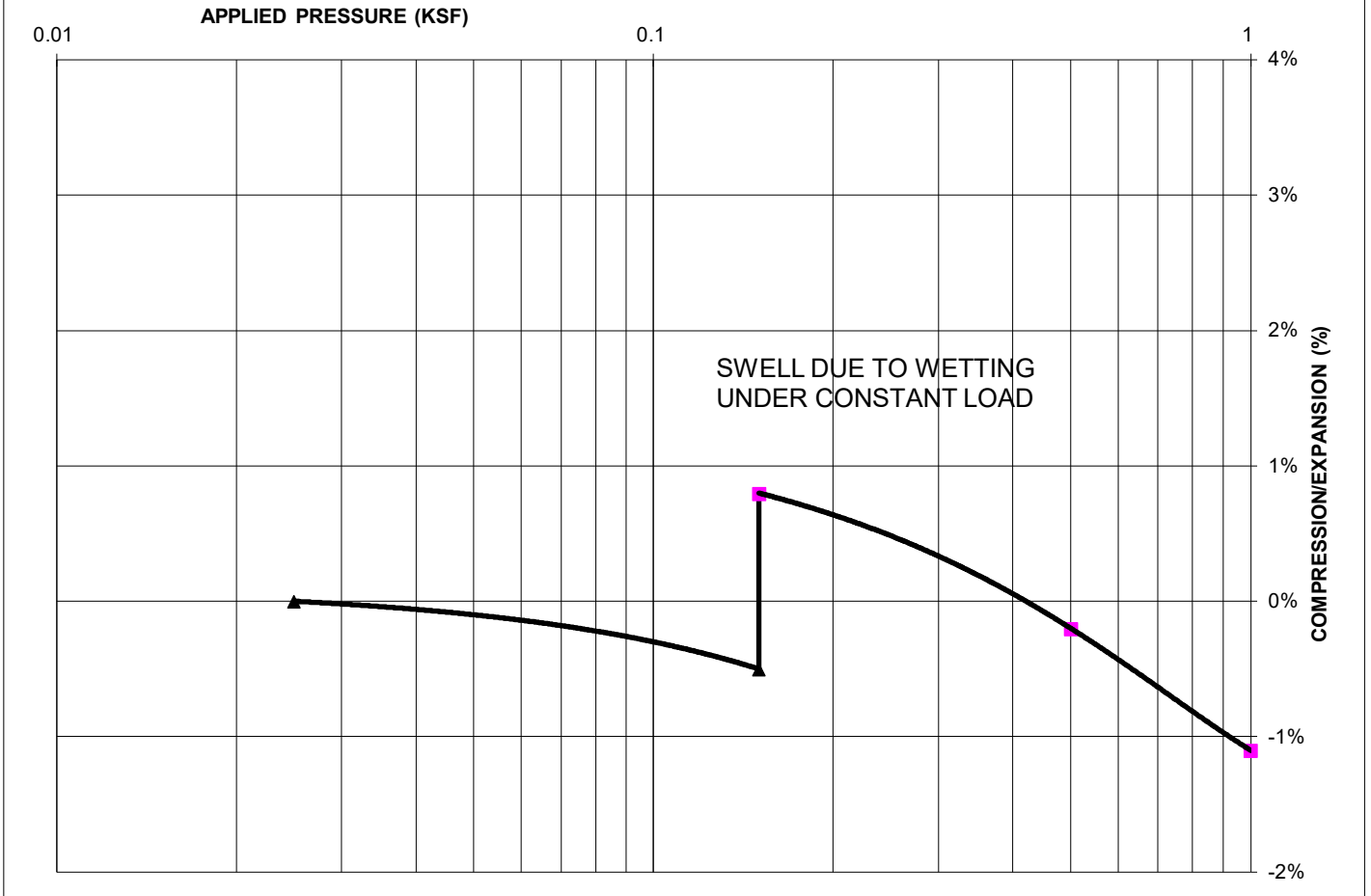
JOB NO.  
251259

**FIG. B-32**

TEST BORING 22  
DEPTH (FT) 1-2

SOIL DESCRIPTION SAND, CLAYEY  
SOIL TYPE 2

### SWELL CONSOLIDATION



#### **SWELL/COLLAPSE TEST RESULTS**

NATURAL UNIT DRY WEIGHT (PCF): 124  
NATURAL MOISTURE CONTENT: 10.6%  
SWELL/COLLAPSE (%): 1.3%



### SWELL TEST RESULTS

TANNER RANCH, PHASE 1  
PUSAN HOLDINGS, LLC

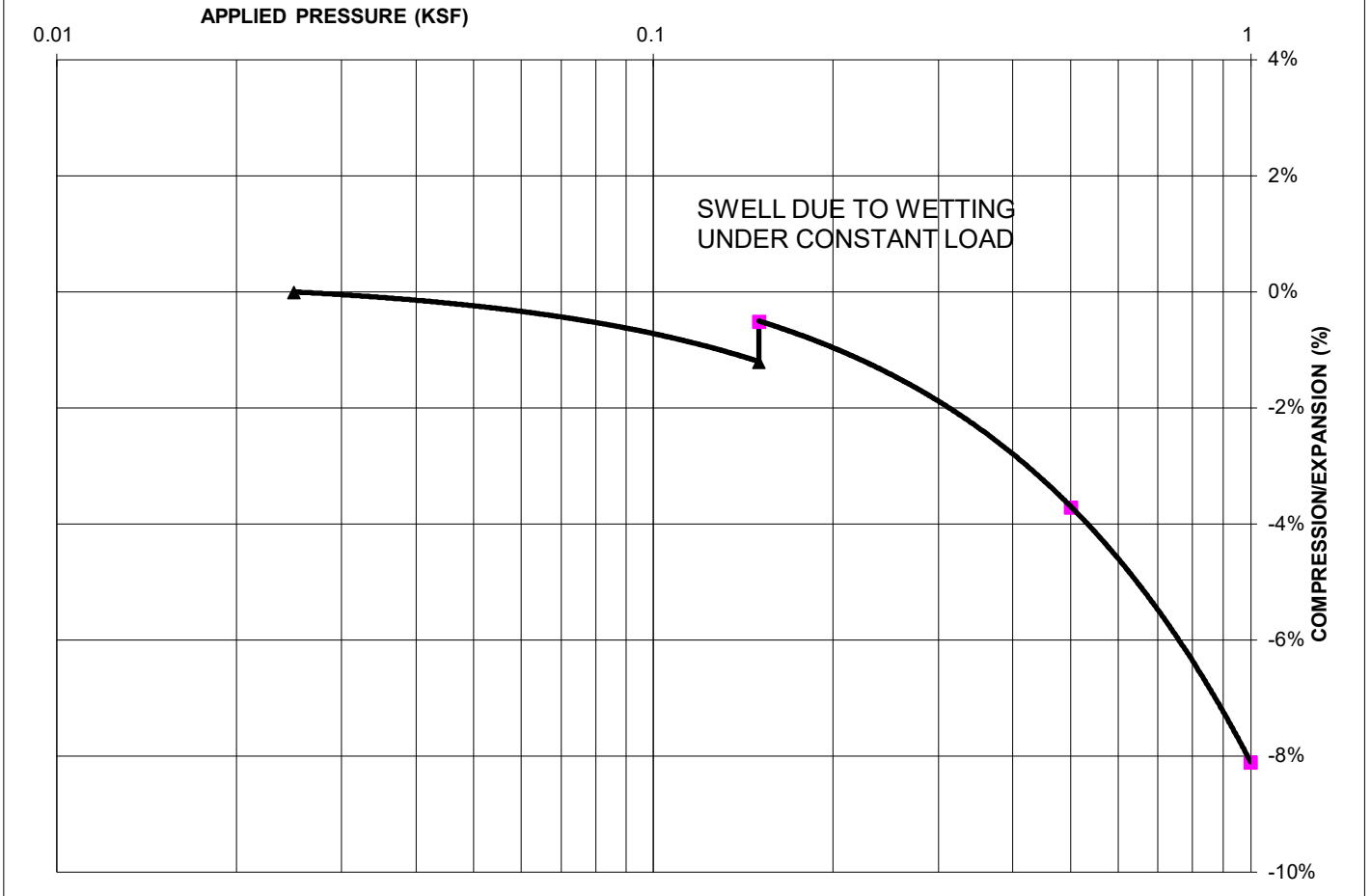
JOB NO.  
251259

**FIG. B-33**

TEST BORING 5  
DEPTH (FT) 1-2

SOIL DESCRIPTION CLAY, SANDY  
SOIL TYPE 3

### SWELL CONSOLIDATION



#### **SWELL/COLLAPSE TEST RESULTS**

NATURAL UNIT DRY WEIGHT (PCF): 83  
NATURAL MOISTURE CONTENT: 11.0%  
SWELL/COLLAPSE (%): 0.7%



### SWELL TEST RESULTS

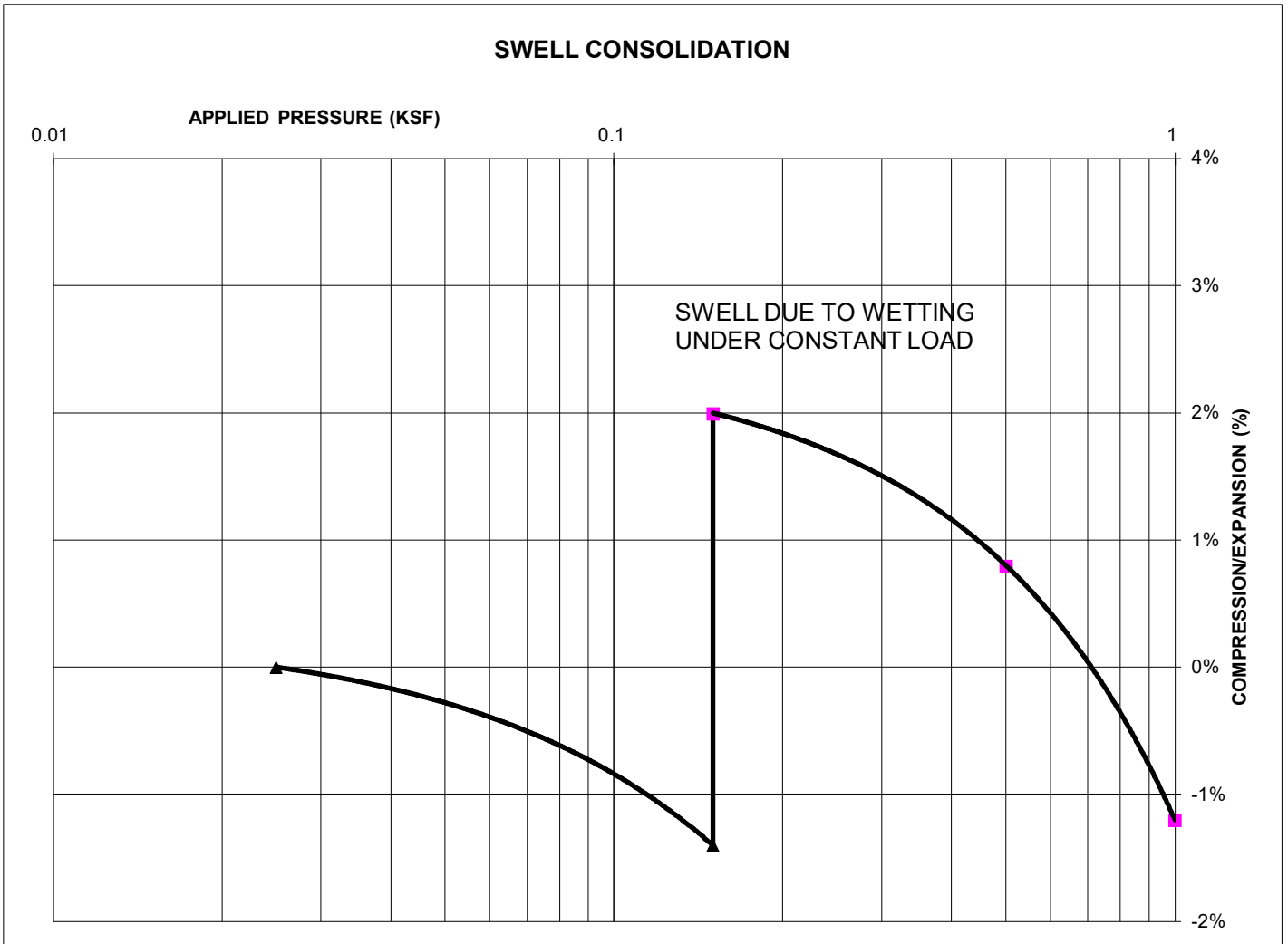
TANNER RANCH, PHASE 1  
PUSAN HOLDINGS, LLC

JOB NO.  
251259

**FIG. B-34**

TEST BORING 7  
DEPTH (FT) 1-2

SOIL DESCRIPTION CLAY, WITH SAND  
SOIL TYPE 3



**SWELL/COLLAPSE TEST RESULTS**

NATURAL UNIT DRY WEIGHT (PCF): 95  
NATURAL MOISTURE CONTENT: 11.5%  
SWELL/COLLAPSE (%): 3.4%



**SWELL TEST RESULTS**

TANNER RANCH, PHASE 1  
PUSAN HOLDINGS, LLC

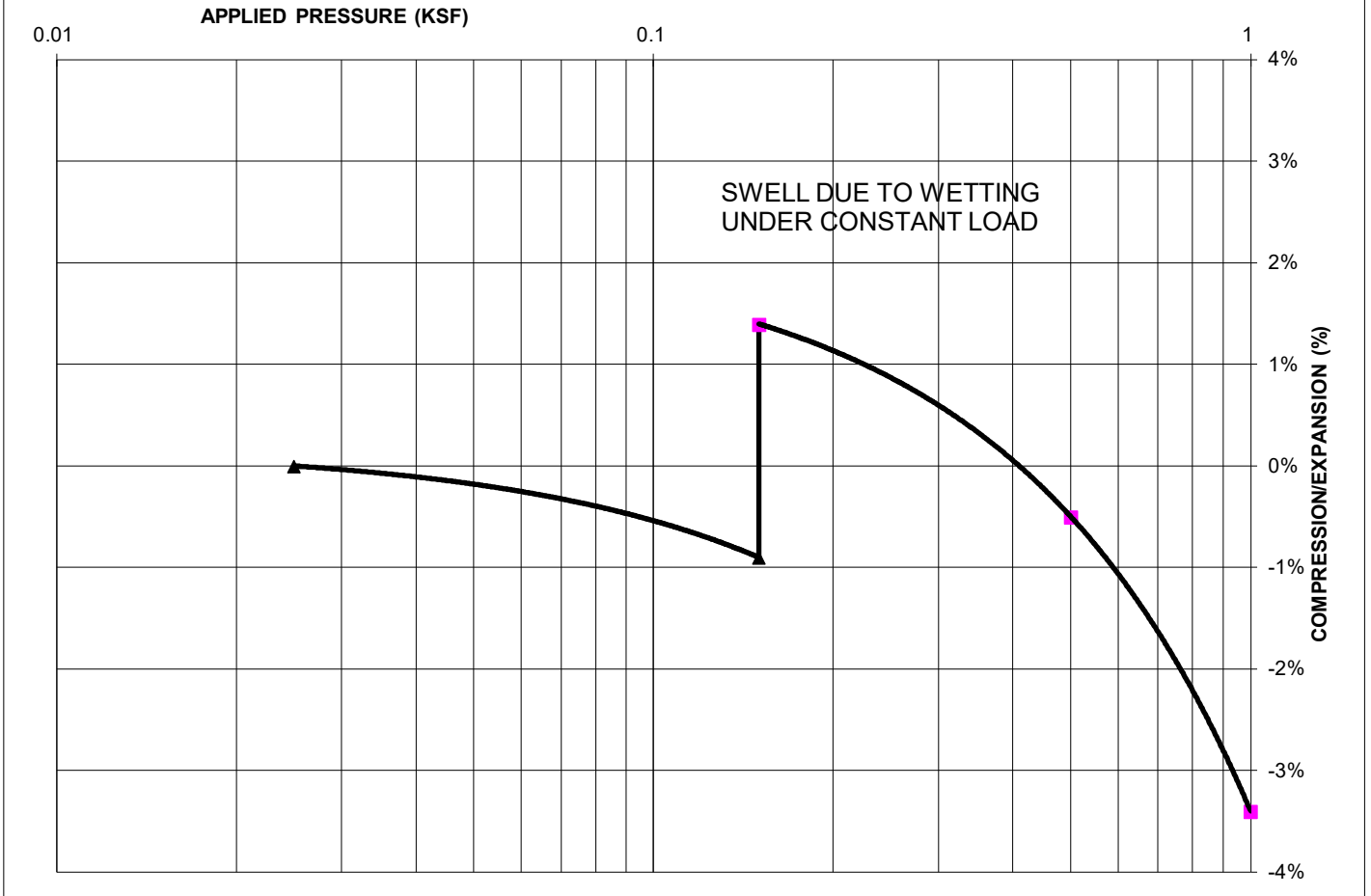
JOB NO.  
251259

**FIG. B-35**

TEST BORING 12  
DEPTH (FT) 1-2

SOIL DESCRIPTION CLAY, SANDY  
SOIL TYPE 3

### SWELL CONSOLIDATION



#### **SWELL/COLLAPSE TEST RESULTS**

NATURAL UNIT DRY WEIGHT (PCF): 100  
NATURAL MOISTURE CONTENT: 11.5%  
SWELL/COLLAPSE (%): 2.3%



### SWELL TEST RESULTS

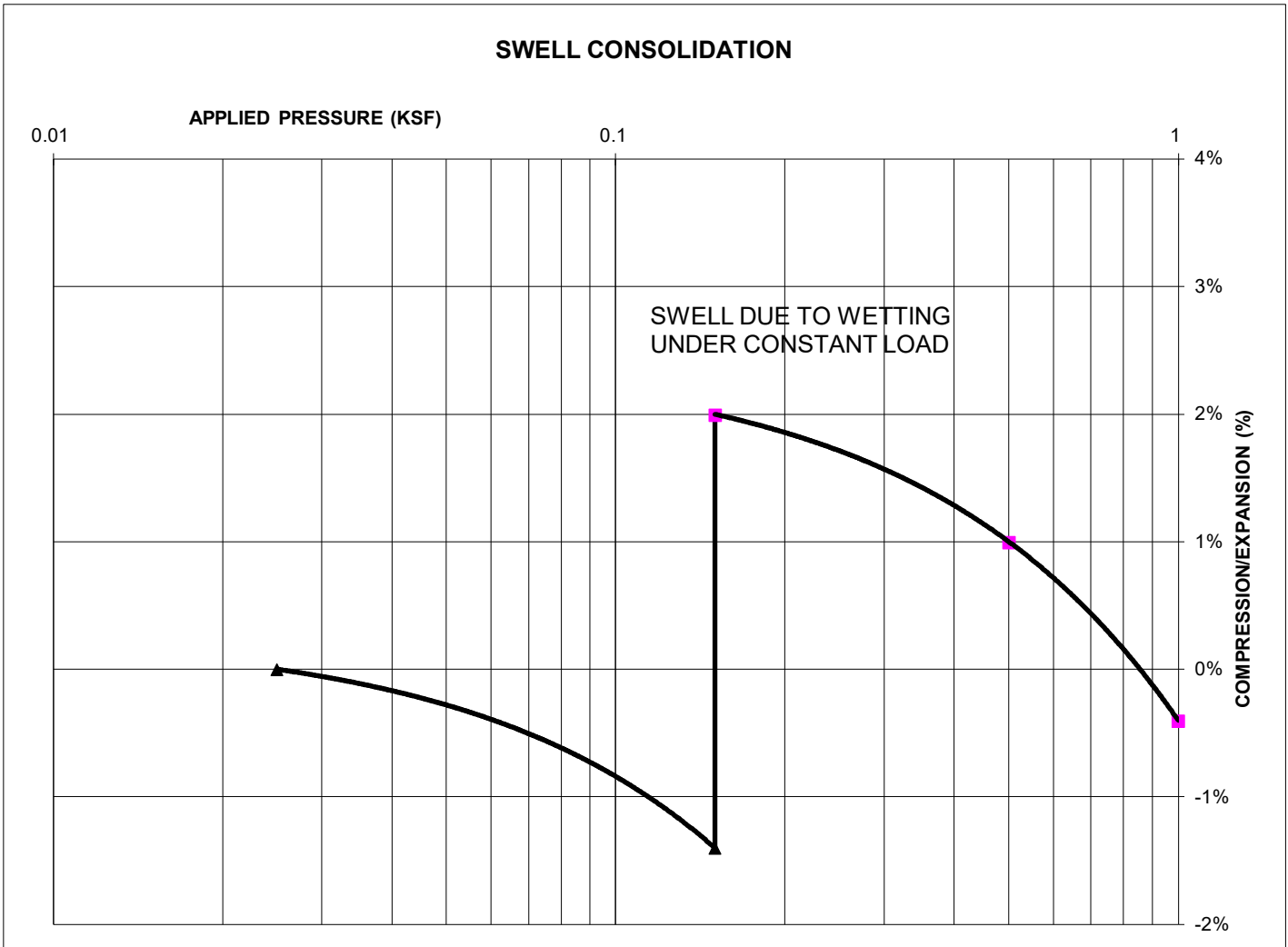
TANNER RANCH, PHASE 1  
PUSAN HOLDINGS, LLC

JOB NO.  
251259

**FIG. B-36**

TEST BORING 15  
DEPTH (FT) 1-2

SOIL DESCRIPTION CLAY, WITH SAND  
SOIL TYPE 3



**SWELL/COLLAPSE TEST RESULTS**

NATURAL UNIT DRY WEIGHT (PCF): 107  
NATURAL MOISTURE CONTENT: 15.6%  
SWELL/COLLAPSE (%): 3.4%



**SWELL TEST RESULTS**

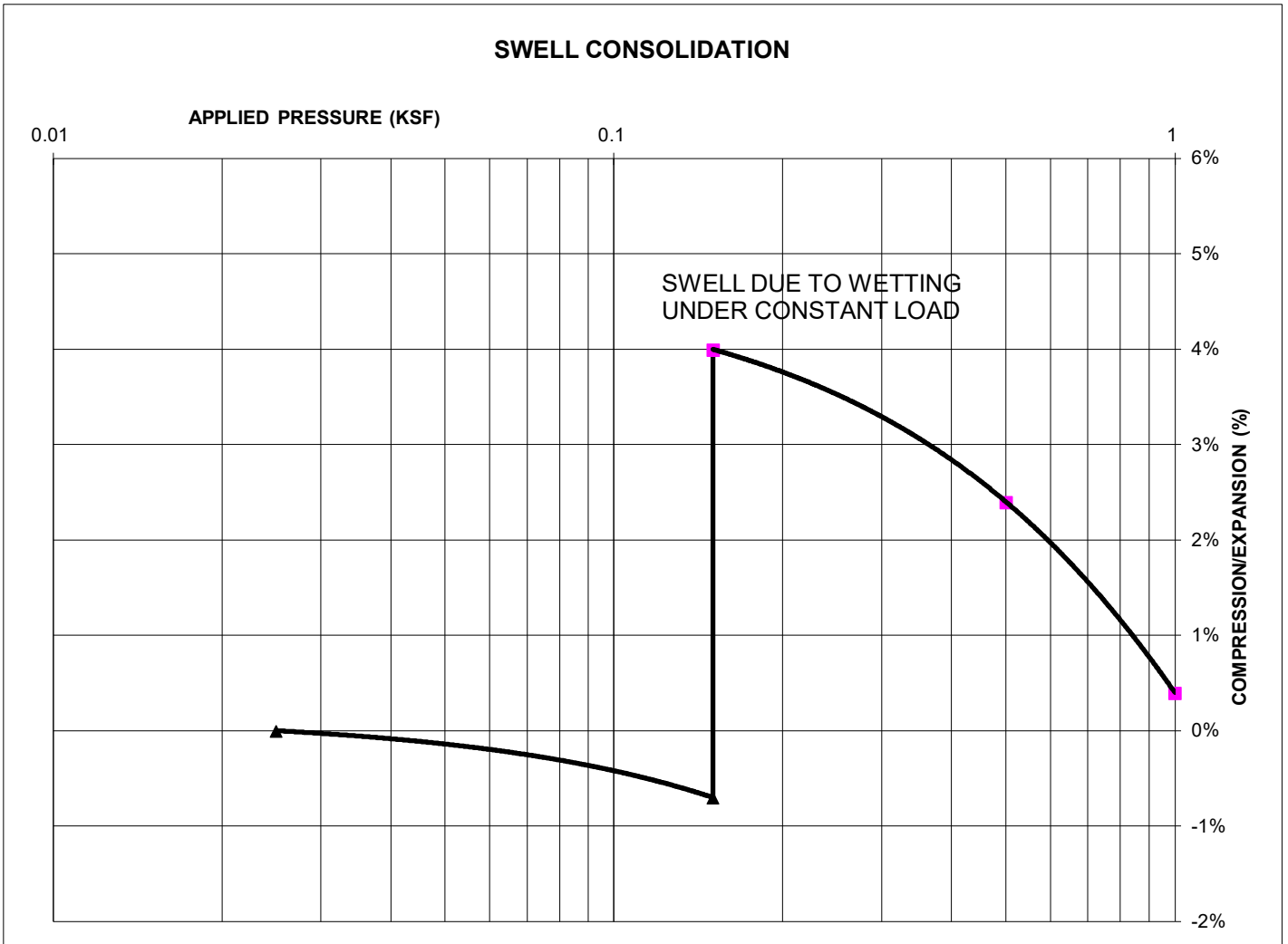
TANNER RANCH, PHASE 1  
PUSAN HOLDINGS, LLC

JOB NO.  
251259

**FIG. B-37**

TEST BORING 16  
DEPTH (FT) 1-2

SOIL DESCRIPTION CLAY, WITH SAND  
SOIL TYPE 3



**SWELL/COLLAPSE TEST RESULTS**

NATURAL UNIT DRY WEIGHT (PCF): 108  
NATURAL MOISTURE CONTENT: 13.5%  
SWELL/COLLAPSE (%): 4.7%



**SWELL TEST RESULTS**

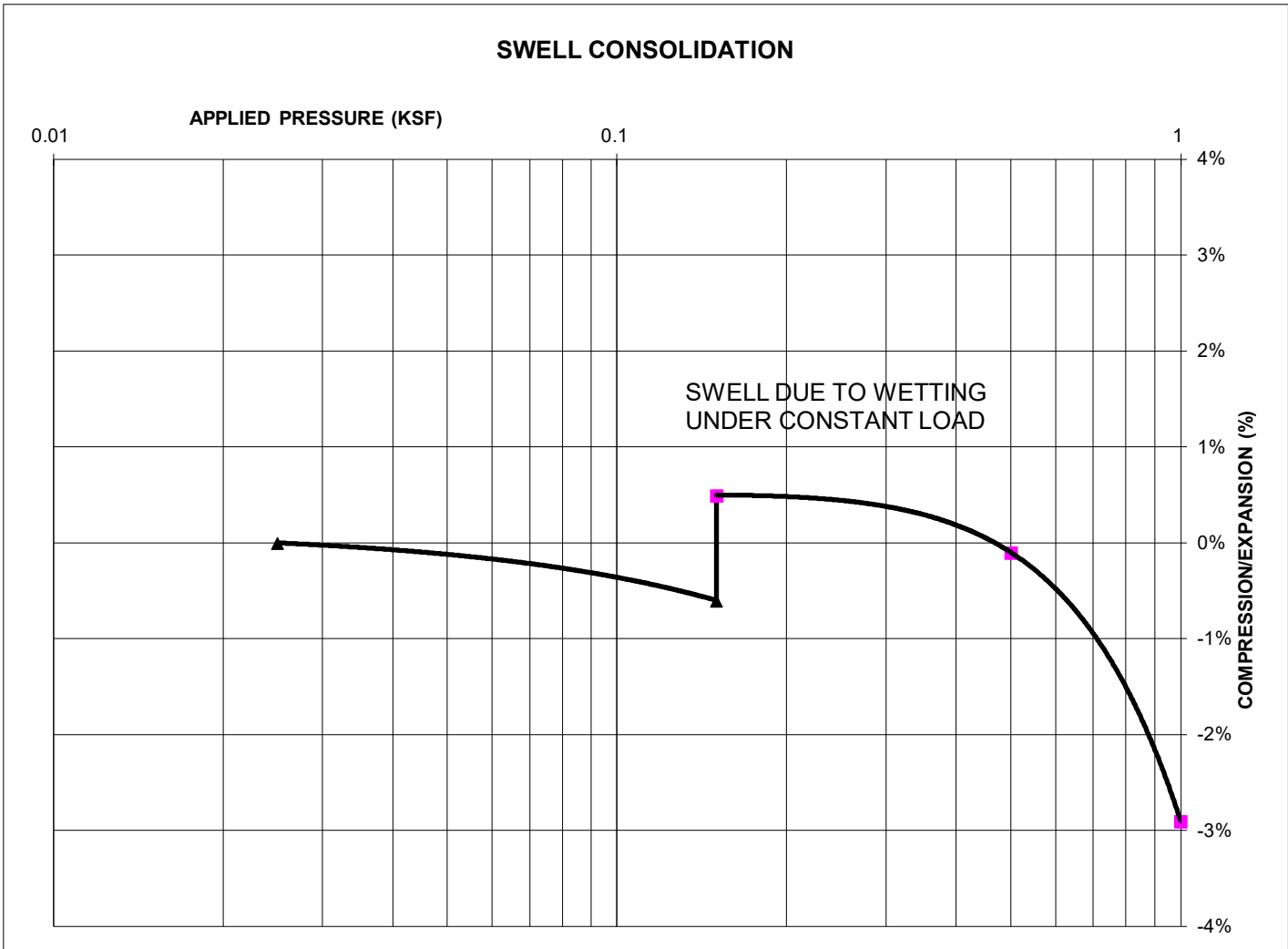
TANNER RANCH, PHASE 1  
PUSAN HOLDINGS, LLC

JOB NO.  
251259

**FIG. B-38**

TEST BORING 21  
 DEPTH (FT) 1-2

SOIL DESCRIPTION CLAY, SANDY  
 SOIL TYPE 3



**SWELL/COLLAPSE TEST RESULTS**

NATURAL UNIT DRY WEIGHT (PCF): 116  
 NATURAL MOISTURE CONTENT: 14.4%  
 SWELL/COLLAPSE (%): 1.1%



**SWELL TEST RESULTS**

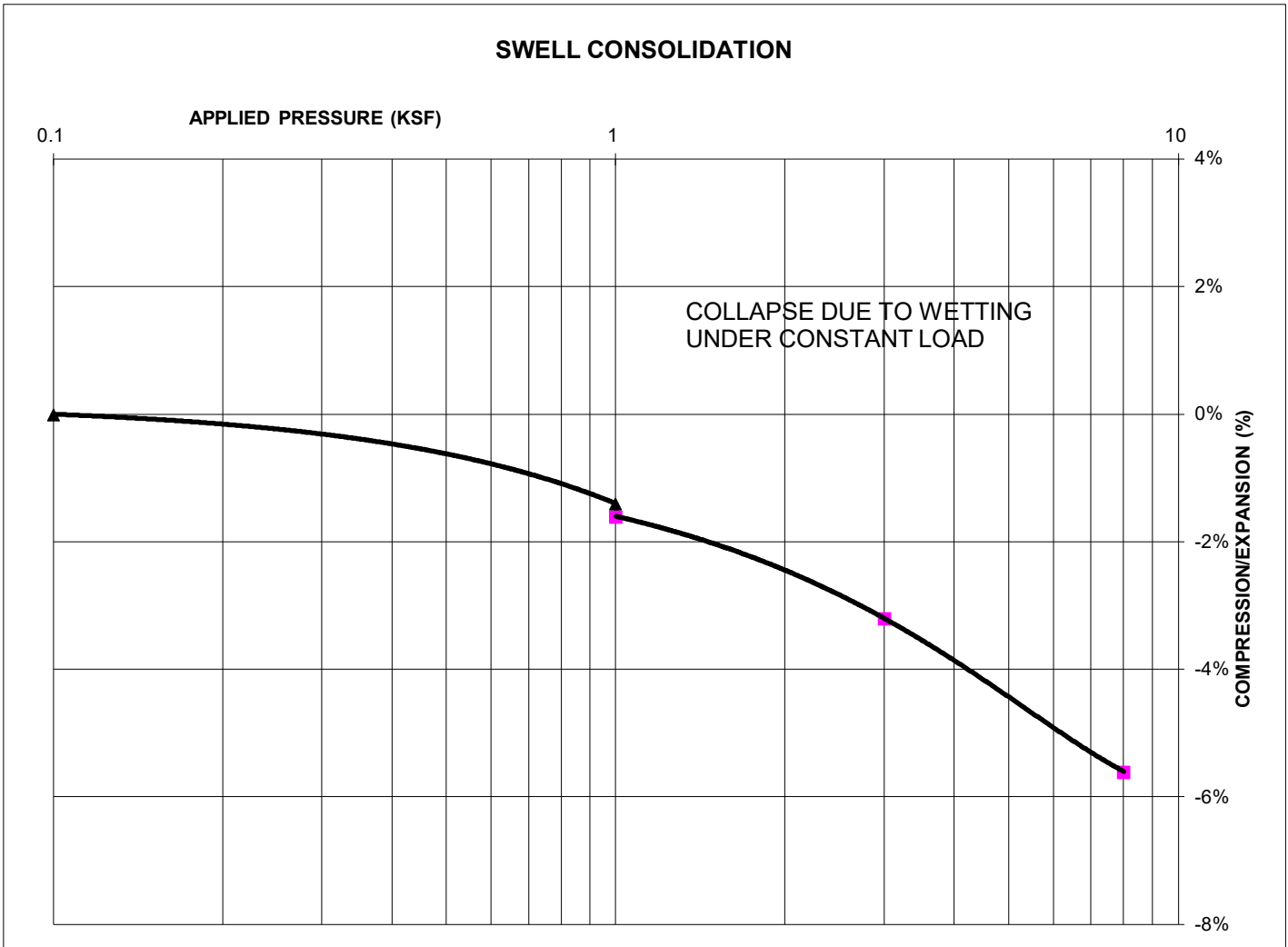
TANNER RANCH, PHASE 1  
 PUSAN HOLDINGS, LLC

JOB NO.  
 251259

**FIG. B-39**

TEST BORING 1  
DEPTH (FT) 5

SOIL DESCRIPTION CLAY, WITH SAND  
SOIL TYPE 3



**SWELL/COLLAPSE TEST RESULTS**

NATURAL UNIT DRY WEIGHT (PCF): 121  
NATURAL MOISTURE CONTENT: 11.6%  
SWELL/COLLAPSE (%): -0.2%



**SWELL TEST RESULTS**

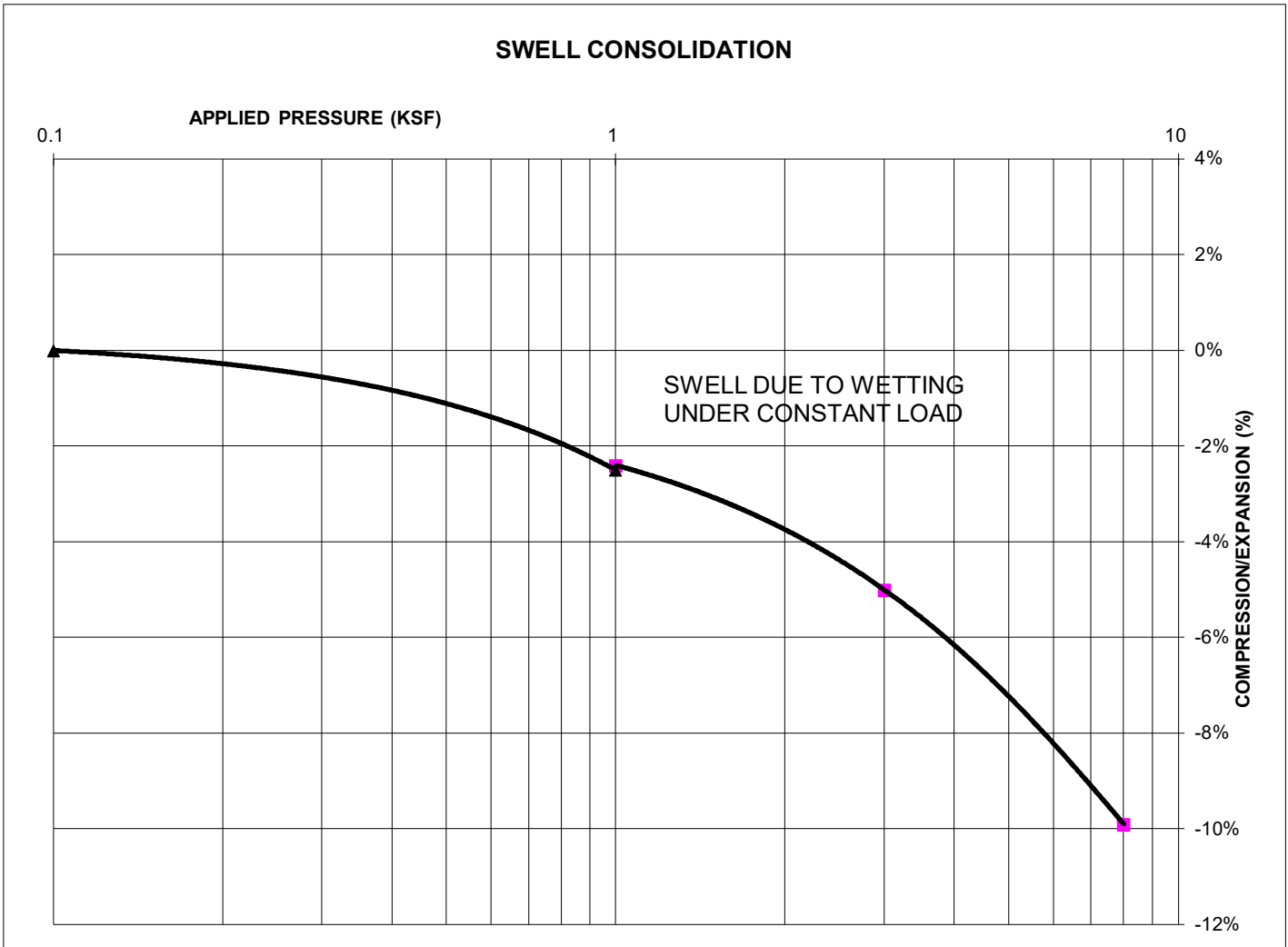
TANNER RANCH, PHASE 1  
PUSAN HOLDINGS, LLC

JOB NO.  
251259

**FIG. B-40**

TEST BORING 2  
DEPTH (FT) 5

SOIL DESCRIPTION CLAY, SANDY  
SOIL TYPE 3



**SWELL/COLLAPSE TEST RESULTS**

NATURAL UNIT DRY WEIGHT (PCF): 92  
NATURAL MOISTURE CONTENT: 13.7%  
SWELL/COLLAPSE (%): 0.1%



**SWELL TEST RESULTS**

TANNER RANCH, PHASE 1  
PUSAN HOLDINGS, LLC

JOB NO.  
251259

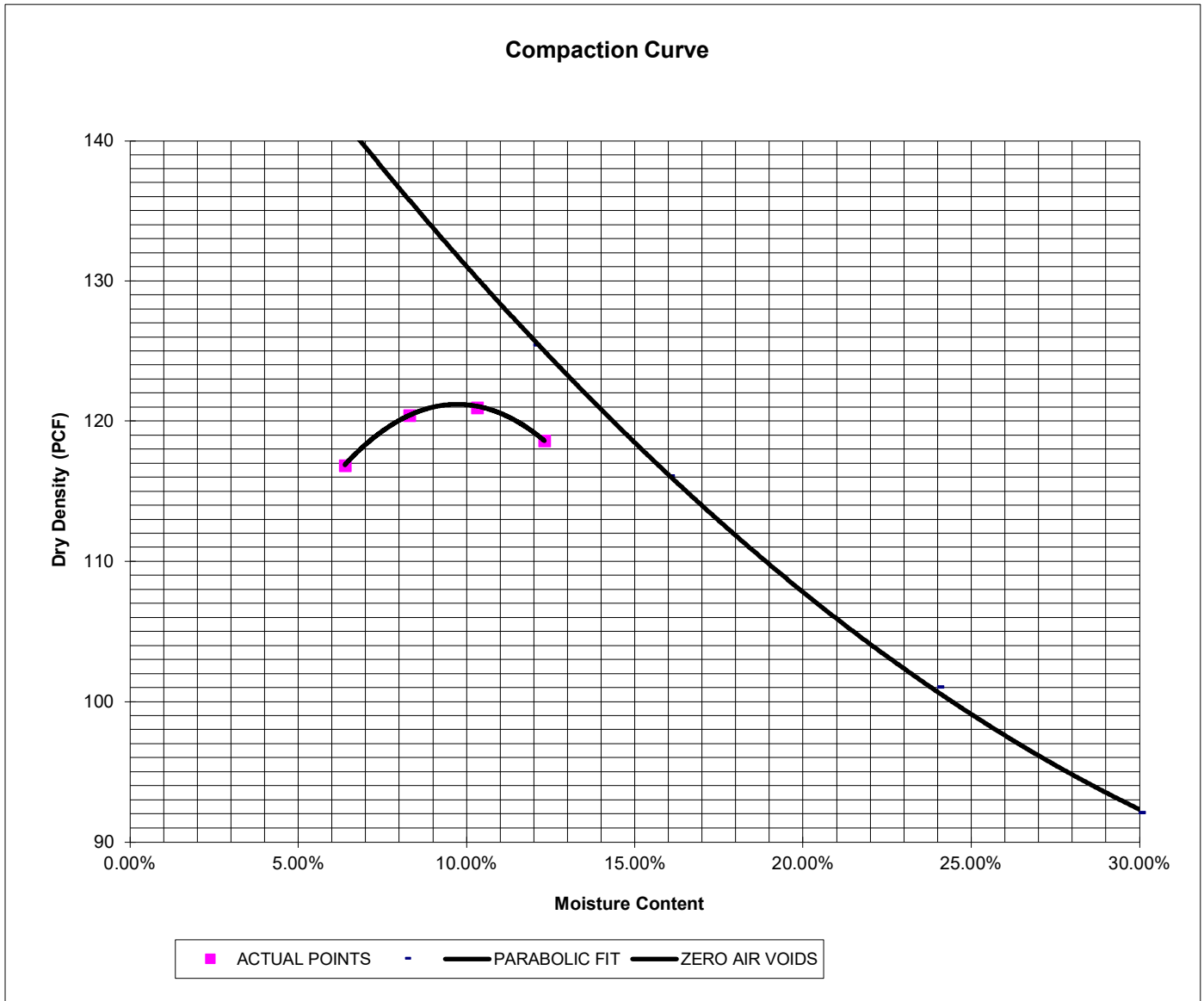
**FIG. B-41**

SAMPLE LOCATION TB-13 @ 0-3'

SOIL DESCRIPTION SAND, CLAYEY, BROWN  
SOIL TYPE 1

**PROCTOR DATA**

IDENTIFICATION: SC  
PROCTOR TEST #: 1, SOIL TYPE #2  
TEST BY: CGM  
TEST DESIGNATION: ASTM-1557-A  
MAXIMUM DRY DENSITY (PCF): 121.1  
OPTIMUM MOISTURE: 9.8



**LABORATORY TEST RESULTS**

TANNER RANCH, PHASE 1  
PUSAN HOLDINGS, LLC

JOB NO.  
251259

**FIG. B-42**

SAMPLE LOCATION TB-13 @ 0-3'

SOIL DESCRIPTION SAND, CLAYEY, BROWN  
SOIL TYPE 2, CBR #1

**CBR TEST LOAD DATA**

Piston Diameter (cm): 4.958

Piston Area (in<sup>2</sup>): 2.993

Penetration Depth (inches)	10 BLOWS Mold # 1		25 BLOWS Mold # 2		56 BLOWS Mold # 3	
	Load (lbs)	Stress (psi)	Load (lbs)	Stress (psi)	Load (lbs)	Stress (psi)
0.000	0	0.00	0	0.00	0	0.00
0.025	62	20.72	91	30.41	109	36.42
0.050	76	25.40	110	36.76	138	46.12
0.075	84	28.07	116	38.76	155	51.80
0.100	93	31.08	129	43.11	176	58.81
0.125	103	34.42	148	49.46	212	70.84
0.150	118	39.43	179	59.82	252	84.21
0.175	129	43.11	189	63.16	272	90.89
0.200	129	43.11	196	65.50	296	98.91
0.300	139	46.45	217	72.51	355	118.63
0.400	154	51.46	251	83.88	405	135.34
0.500	174	58.15	287	95.91	452	151.04

**MOISTURE AND DENSITY DATA**

	Mold # 1	Mold # 2	Mold # 3
Can #	350	351	352
Wt. Can	8.04	7.96	8.27
Wt. Can+Wet	274.19	204.29	230.4
Wt. Can+Dry	229.96	171.36	197.85
Wt. H2O	44.23	32.93	32.55
Wt. Dry Soil	221.92	163.4	189.58
Moisture Content	19.93%	20.15%	17.17%
Wet Density (PCF)	121.9	128.5	131.1
Dry Density (PCF)	111.0	117.0	119.4
% Compaction	92%	97%	99%
CBR	3.11	4.31	5.88

**PROCTOR DATA**

Maximum Dry Density (pcf)	121.1
Optimum Moisture	9.8
90% of Max. Dry Density (pcf)	109.0
95% of Max. Dry Density (pcf)	115.0

CBR at 90% of Max. Density = 2.7 ~ R VALUE 6  
CBR at 95% of Max. Density = 3.9 ~ R VALUE 7.5



**LABORATORY TEST RESULTS**

TANNER RANCH, PHASE 1  
PUSAN HOLDINGS, LLC

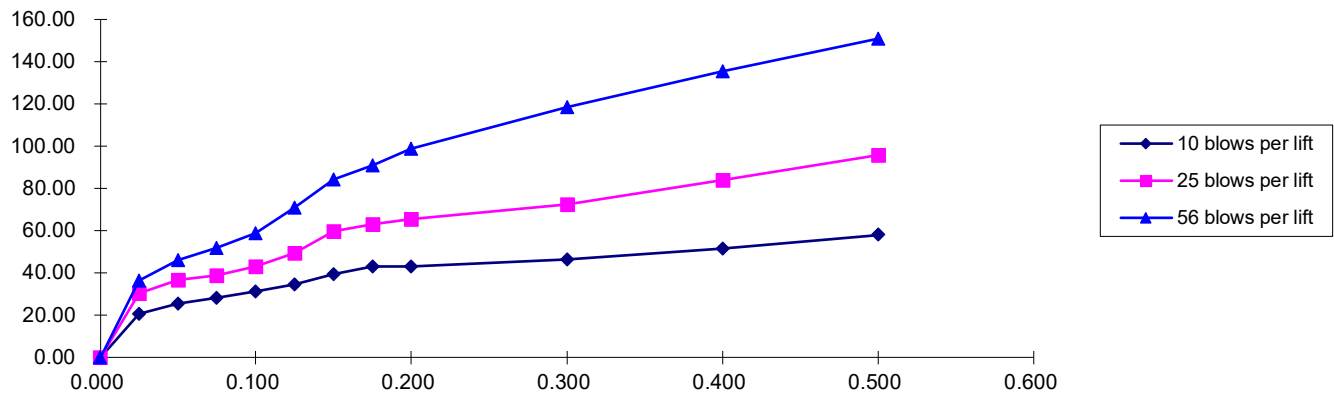
JOB NO.  
251259

**FIG. B-43**

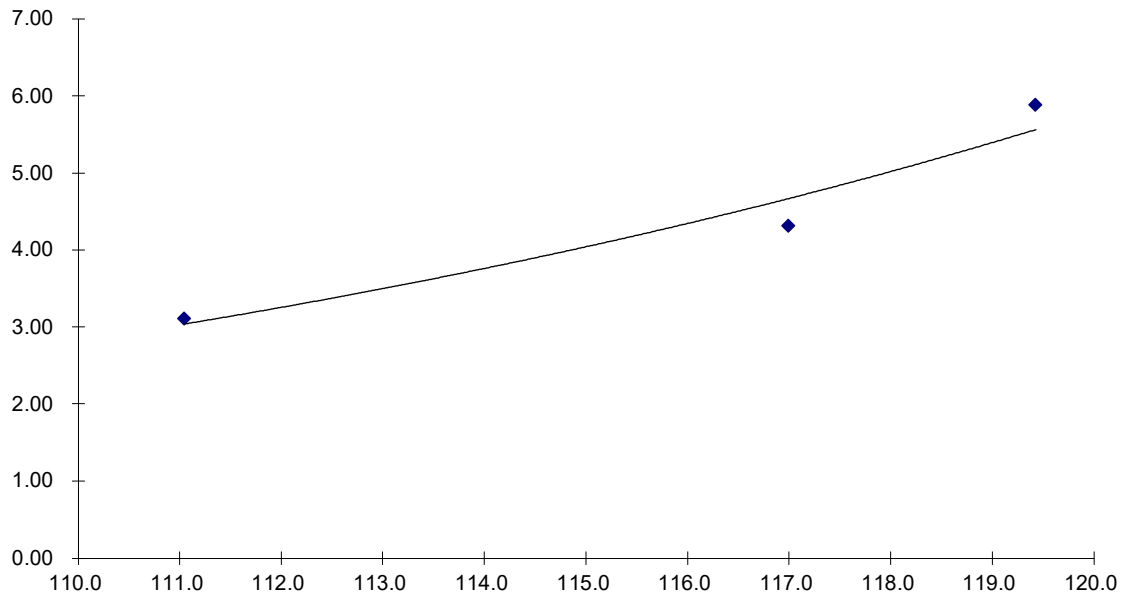
SAMPLE LOCATION TB-13 @ 0-3'

SOIL DESCRIPTION SAND, CLAYEY, BROWN  
SOIL TYPE 2, CBR #1

Stress VS Penetration



Bearing Ratio VS Dry Density



LABORATORY TEST RESULTS

TANNER RANCH, PHASE 1  
PUSAN HOLDINGS, LLC

JOB NO.  
251259

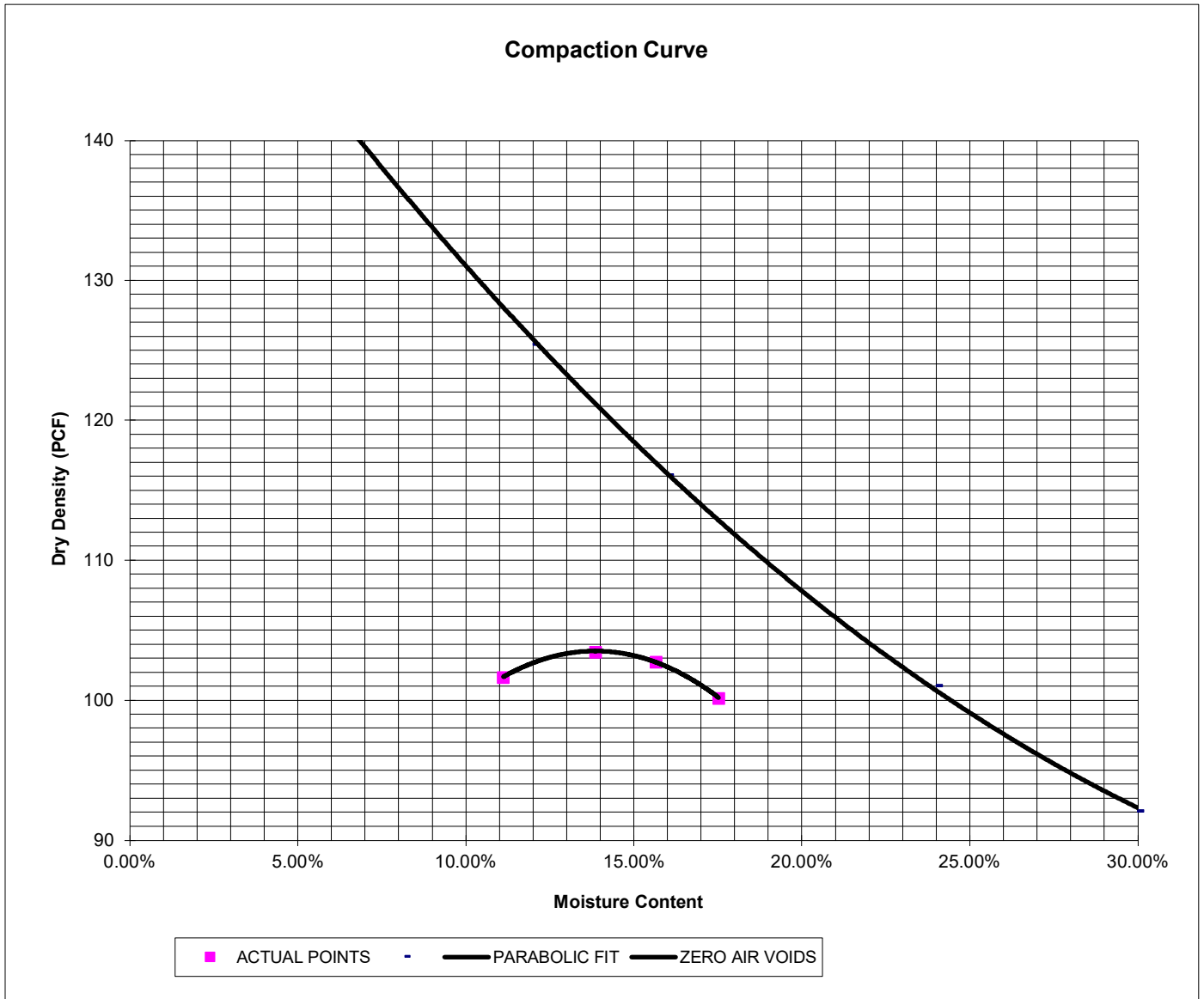
FIG. B-44

SAMPLE LOCATION TB-15 @ 0-3'

SOIL DESCRIPTION CLAY, SANDY, BROWN  
SOIL TYPE 1

**PROCTOR DATA**

IDENTIFICATION: CL  
PROCTOR TEST #: 2, SOIL TYPE #3  
TEST BY: KB  
TEST DESIGNATION: ASTM-698-A  
MAXIMUM DRY DENSITY (PCF): 103.7  
OPTIMUM MOISTURE: 13.9



**LABORATORY TEST RESULTS**

TANNER RANCH, PHASE 1  
PUSAN HOLDINGS, LLC

JOB NO.  
251259

**FIG. B-45**

SAMPLE LOCATION TB-15 @ 0-3'

SOIL DESCRIPTION CLAY, SANDY, BROWN

SOIL TYPE 3, CBR #2

**CBR TEST LOAD DATA**

Piston Diameter (cm): 4.958

Piston Area (in<sup>2</sup>): 2.993

Penetration Depth (inches)	10 BLOWS Mold # 1		25 BLOWS Mold # 2		56 BLOWS Mold # 3	
	Load (lbs)	Stress (psi)	Load (lbs)	Stress (psi)	Load (lbs)	Stress (psi)
0.000	0	0.00	0	0.00	0	0.00
0.025	26	8.69	53	17.71	102	34.09
0.050	30	10.03	59	19.72	222	74.19
0.075	33	11.03	64	21.39	231	77.19
0.100	35	11.70	68	22.72	239	79.87
0.125	37	12.36	73	24.39	251	83.88
0.150	40	13.37	79	26.40	266	88.89
0.175	43	14.37	85	28.40	276	92.23
0.200	45	15.04	88	29.41	287	95.91
0.300	47	15.71	93	31.08	294	98.25
0.400	52	17.38	101	33.75	314	104.93
0.500	60	20.05	109	36.42	334	111.61

**MOISTURE AND DENSITY DATA**

	Mold # 1	Mold # 2	Mold # 3
Can #	303	345	343
Wt. Can	8.56	8.84	8.6
Wt. Can+Wet	155	200.28	205.55
Wt. Can+Dry	145	173	169.32
Wt. H2O	10	27.28	36.23
Wt. Dry Soil	136.44	164.16	160.72
Moisture Content	7.33%	16.62%	22.54%
Wet Density (PCF)	103.9	111.1	117.9
Dry Density (PCF)	91.2	97.6	103.5
% Compaction	88%	94%	100%
CBR	1.17	2.27	7.99

**PROCTOR DATA**

Maximum Dry Density (pcf)	103.7
Optimum Moisture	13.9
90% of Max. Dry Density (pcf)	93.3
95% of Max. Dry Density (pcf)	98.5

CBR at 90% of Max. Density = 1.5	~ R VALUE 1
CBR at 95% of Max. Density = 3.2	~ R VALUE 7.5



**LABORATORY TEST RESULTS**

TANNER RANCH, PHASE 1  
PUSAN HOLDINGS, LLC

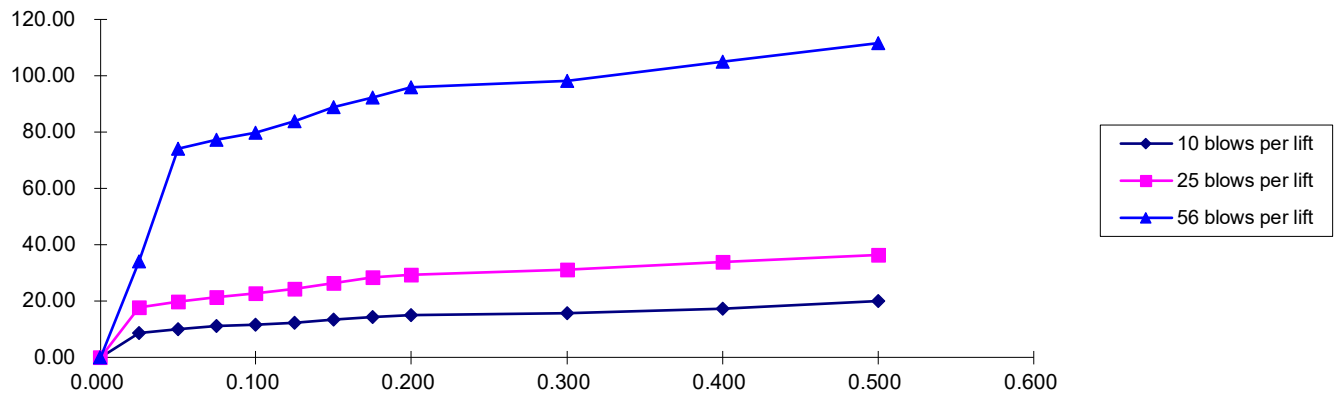
JOB NO.  
251259

**FIG. B-46**

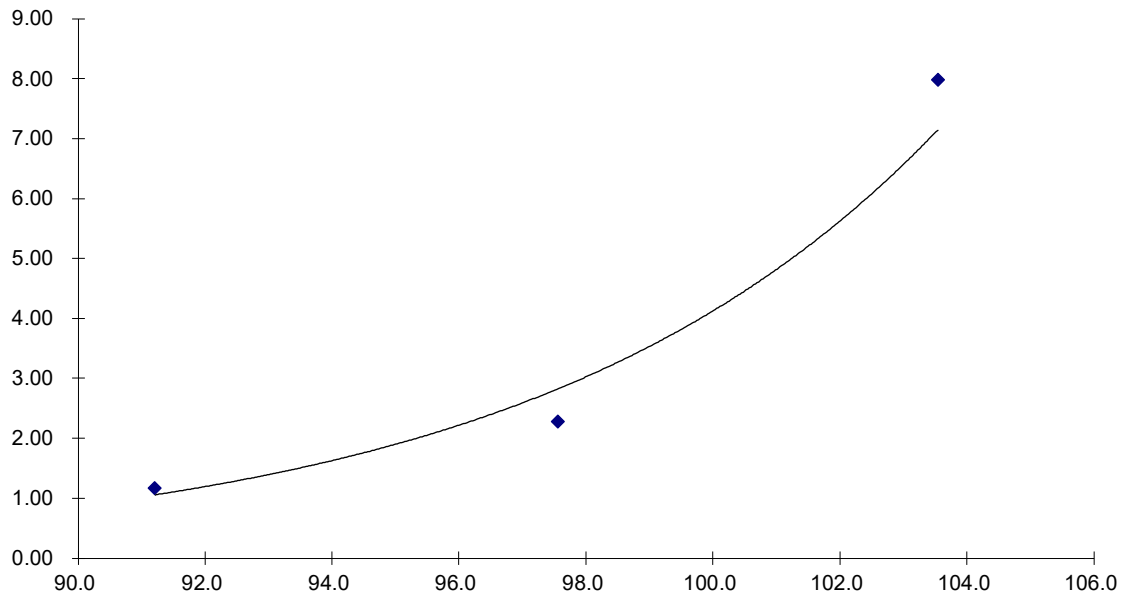
SAMPLE LOCATION TB-15 @ 0-3'

SOIL DESCRIPTION CLAY, SANDY, BROWN  
SOIL TYPE 3, CBR #2

Stress VS Penetration



Bearing Ratio VS Dry Density



LABORATORY TEST RESULTS

TANNER RANCH, PHASE 1  
PUSAN HOLDINGS, LLC

JOB NO.  
251259

FIG. B-47



## **APPENDIX C: Pavement Design Calculations**

## FLEXIBLE PAVEMENT DESIGN

### PROJECT DATA

Project Location: Tanner Ranch, Phase 1

Job Number: 251259

### DESIGN DATA

Equivalent (18-kip) Single Axle Load Applications (ESAL):	ESAL ( $W_{18}$ ) =	36,500
Design CBR	CBR =	3.2
Standard Deviation	$S_o$ =	0.45
Loss in Serviceability	$\Delta\psi$ =	2.5
Reliability	Reliability =	75
Reliability (z-statistic)	$Z_R$ =	-0.67
Soil Resilient Modulus	$M_R$ =	4,800    psi

Required Structural Number (SN): ➔ SN = 2.10

### DESIGN EQUATIONS

#### Resilient Modulus

If using CBR:

$$M_R = (\text{CBR}) \times 1,500$$

If using R-Value:

$$M_R = 10^{[(S_1 + 18.72) / 6.24]} \text{ where: } S_1 = [(R\text{-value} - 5) / 11.29] + 3$$

#### Required Structural Number

$$\log_{10} W_{18} = Z_R \cdot S_o + 9.36 \cdot \log_{10}(SN+1) - 0.20 + \frac{\log_{10} \left[ \frac{\Delta \text{PSI}}{4.2 - 1.5} \right]}{0.40 + \frac{1094}{(SN+1)^{5.19}}} + 2.32 \cdot \log_{10} M_R - 8.07$$

#### Pavement Section Thickness

$$SN^* = C_1 D_1 + C_2 D_2 \quad \text{where:}$$

- $C_1$  = Strength Coefficient - HMA
- $C_2$  = Strength Coefficient - ABC
- $D_1$  = Depth of HMA (inches)
- $D_2$  = Depth of ABC (inches)

### RECOMMENED THICKNESSES

Layer	Material	Structural Layer	Thickness ( $D^*_i$ )	$SN^*_i$	SN
1	HMA	$C_1 = 0.44$	4.0 inches	1.760	-
2	ABC	$C_2 = 0.11$	4.0 inches	0.440	
				$SN^* = 2.200$	2.10

Pavement SN > Required SN, Design is Acceptable

FIG. C-1