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**PAVEMENT DESIGN REPORT
GLEN AT WIDEFIELD FILING NO. 12
EL PASO COUNTY, COLORADO**

Prepared for:
**Glen Development Company
c/o Cross Company
3 Widefield Boulevard
Colorado Springs, CO 80904**

Attn: Rudy Cross

Revision 2: August 22, 2024

Respectfully Submitted,

ENTECH ENGINEERING, INC.

Stuart Wood
Staff Geologist

Accepted for File

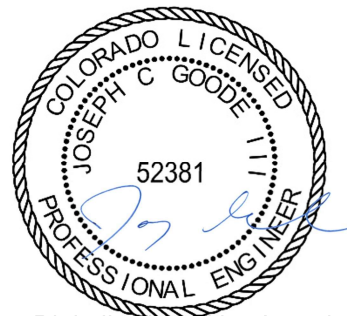
By: **Gilbert LaForce, P.E.**
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Date: **08/26/2024 11:11:53 AM**

El Paso County Department of Public Works



Reviewed by:



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Entech Job No. 231853

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1 Introduction

Entech Engineering, Inc. (Entech) completed a subsurface exploration program and a pavement design for roadways within the Glen at Widefield Development Filing No. 12. This report describes the subsurface exploration program conducted for the proposed roadway improvements and provides pavement section alternatives and construction recommendations. Entech participated in this project as a subconsultant to Glen Development Company in accordance with our subconsultant agreement, dated February 28, 2024. The contents of this report, including the pavement design recommendations, are subject to the limitations and assumptions presented in Section 7.

2 Project Description

The Glen at Widefield Filing No. 12 is located west of Marksheffel Boulevard, north of Mesa Ridge Parkway, and south of Fontaine Boulevard in southeast Colorado Springs, Colorado (Figure 1). The proposed roadway construction includes portions of Golden Buff Drive, Lanceleaf Drive, and the cul-de-sacs Ground Cherry Trail and Dwarf Clover Court. The extents of our investigation are shown in Figure 2. The topography of the site is relatively level with rough-graded roads and utilities installed. Surrounding properties include vacant land or land being developed for residential lots. Vegetation was absent due to recent site grading.

3 Subsurface Explorations and Laboratory Testing

3.1 Subsurface Exploration Program

Subsurface conditions at the project site were explored by fifteen test borings, designated TB-1 through TB-15, drilled on March 4, 5, and 12, 2024. The locations of the test borings are shown on the Site and Exploration Plan (Figure 2). The borings were drilled to depths of 5 to 10 feet below the existing ground surface (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 and bedrock samples were obtained from the borings utilizing the Standard Penetration Test (ASTM D1586) using a split-barrel 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

and bedrock 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 location 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.

One-dimensional swell or collapse testing (ASTM D4546) was performed on select samples to determine the expansive or compressive characteristics of the soil. For pavement design, a standard proctor (ASTM D698) and 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.

Strength testing was performed on two sets of soil/cement composite samples. Testing was performed on soil samples prepared with 2% and 4% Portland Cement Type 1L or Type II. A compression strength of 125 pounds per square inch (psi) is recommended for cement-stabilized subgrade. The 7-day average strength value of the 2% mix was 219 psi. The 7-day strength of the 4% mix was 255 psi. A 2% mix is recommended based on the laboratory test results. A summary of the testing results is attached in Appendix B, Table B-2.

4 Subgrade Conditions

Two primary soil types and one bedrock type 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 along the proposed roadway generally consisted of medium stiff to stiff sandy clay fill (Soil Type 1). Isolated areas of clay with sand fill and medium dense clayey sand fill were also encountered (Soil Type 1). Native dense clayey sand to very stiff to hard native sandy clay (Soil Type 2) was also encountered. Claystone bedrock (Soil Type 3) was encountered in 4 of the borings. The Type 3 claystone was encountered below the subgrade zone of influence and was not considered in this pavement design. Water soluble sulfate tests indicated that the soils exhibit a negligible to severe potential for sulfate attack. Laboratory test results are presented in Appendix B and are summarized in Table B-1. All soils for the project classified as AASHTO A-6 and A-7-6.

4.2 Groundwater

Groundwater was not encountered in the test borings. Groundwater fluctuations are possible and will depend on seasonal variations, local precipitation, runoff, and other factors, however, we do not anticipate groundwater to affect the proposed construction.

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 a representative sample of the Type 1 sandy clay fill subgrade from TB-3 to determine the support characteristic of the subgrade soils for the roadway sections. 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	1 – Sandy Clay Fill
CBR at 95%	3.44
Design CBR	3.44
Liquid Limit	37
Plasticity Index	16
Percent Passing 200	61.1
AASHTO Classification	A-6
Unified Soils Classification	CL

5.2 Swell Mitigation

El Paso County requires swell mitigation for soils with swell testing results greater than 2% under a 150 pounds per square foot (psf) surcharge. Laboratory testing on the subgrade soils resulted in a range of volume changes from 1.8% to 9.0%. Based on the swell testing, mitigation for expansive soils will be required on this site. We recommend swell mitigation in the form of moisture treatment to a depth of 3 feet. Refer to Section 6.1.1 for subgrade preparation and moisture treatment recommendations.

5.3 Traffic Loading

Traffic data is not available for The Glen at Widefield Filing No.12; however, the roadways classify as urban local residential and urban local low-volume residential based on the current development plans. Refer to the Traffic Impact Study, *The Glen at Widefield No. 12 Transportation Memorandum SF2224*, LSC Transportation Consultants for additional information. The *El Paso County Engineering Criteria Manual* provides default 18-kip equivalent single axle loadings (ESAL) based on the street classifications (ECM Section D.3.3, Table D-2). For design, default ESAL values of 292,000 and 36,500 were used for the urban local residential (Golden Buff Drive) and local low-volume residential designations, respectively.

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	Value
Reliability	80%
Standard Deviation	0.45
Serviceability Loss (Δ psi)	2.5
Design CBR	3.44
Resilient Modulus	5,160 psi
Structural Coefficients	
Hot Bituminous Pavement	0.44
Aggregate Base Course	0.11

Pavement sections recommended for the roadways at The Glen at Widefield Filing No. 12 including hot mix asphalt (HMA) over aggregate base course (ABC) composite sections are summarized in Exhibit 3. The pavement design calculations are presented in Appendix C.

Exhibit 3: Recommended Pavement Sections

Pavement Area	Design ESAL	Alternative ¹
Golden Buff Drive	292,000	1. 5.0 inches HMA over 8.0 inches ABC
Ground Cherry Trail, Dwarf Clover Court, and Lanceleaf Drive	36,500	1. 4.0 inches HMA over 4.0 inches ABC

ABC = Aggregate Base Course; ESAL = equivalent single axle loads; HMA = Hot Mix Asphalt

Notes:

1. All pavement alternatives meet the minimum HMA and ABC thickness required per El Paso County Pavement Design Manual.

6 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 will be constructed according to the *El Paso County Engineering Criteria Manual* and the Pikes Peak Region Asphalt Paving Specifications.

6.1 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, if any, should be removed by stripping, with the depth to be field determined.

6.1.1 Moisture Treatment

To provide the recommended swell mitigation we recommend moisture treatment to a depth of 3 feet. This will require overexcavating 2 feet of subgrade soils, scarifying an additional 12 inches, moisture conditioning the scarified subgrade to within +1% to +3% of its optimum moisture content, and compacting it to 95% of the Standard Proctor Maximum Dry Density ASTM D698.

The overexcavated subgrade soils can then be replaced in 6-inch compacted lifts to the same specifications as described above.

6.1.2 Subgrade Preparation – Aggregate Base Course Alternatives

If pavement section alternatives are selected utilizing aggregate base course (ABC), the final moisture-treated subgrade surface 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.

6.1.3 Fill Placement and Compaction

Granular fill placed as part of the pavement subgrade shall consist of non-expansive, 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 10. All granular fill placed within the pavement subgrade should be compacted to a minimum of 95% of its maximum Modified Proctor Dry Density (ASTM D1557) 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.

6.2 Aggregate Base Course

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

6.3 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% to 0.23% soluble sulfate (by weight). The test results indicate the sulfate component of the in-place soils presents a negligible to severe exposure threat to concrete placed below the site grade.

Type V cement is typically recommended for the manufacture of any concrete that will come into contact with the site materials presenting severe exposure. If Type V cement is not readily available, concrete which includes cement that meets ASTM C150 Type II requirements, 20% fly ash, and has a maximum water-to-cement ratio of 0.45 and air entrainment of 5% to 7% can be used to provide similar resistance. 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 foundation excavation prior to the placement of concrete. If standing water is present in the foundation excavation, it should be removed by ditching to sumps and pumping the water away from the foundation area prior to concrete placement. 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.

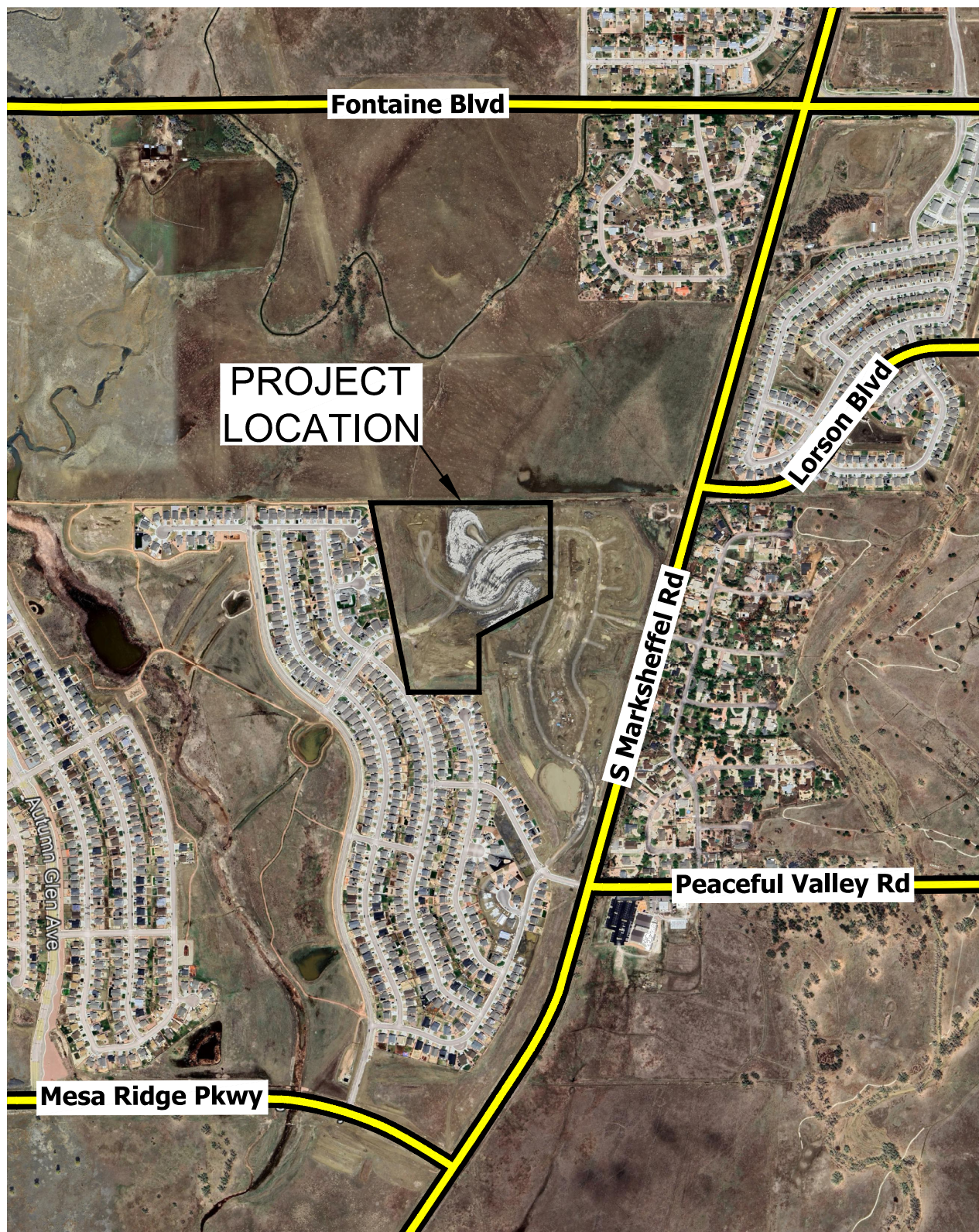
6.4 Construction Observation

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.

7 Closure

The subsurface investigation, geotechnical evaluation, and recommendations presented in this report are intended for use by Glen Development Company with application to the paving of the Glen at Widefield Filing No. 12 project in southeast 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.

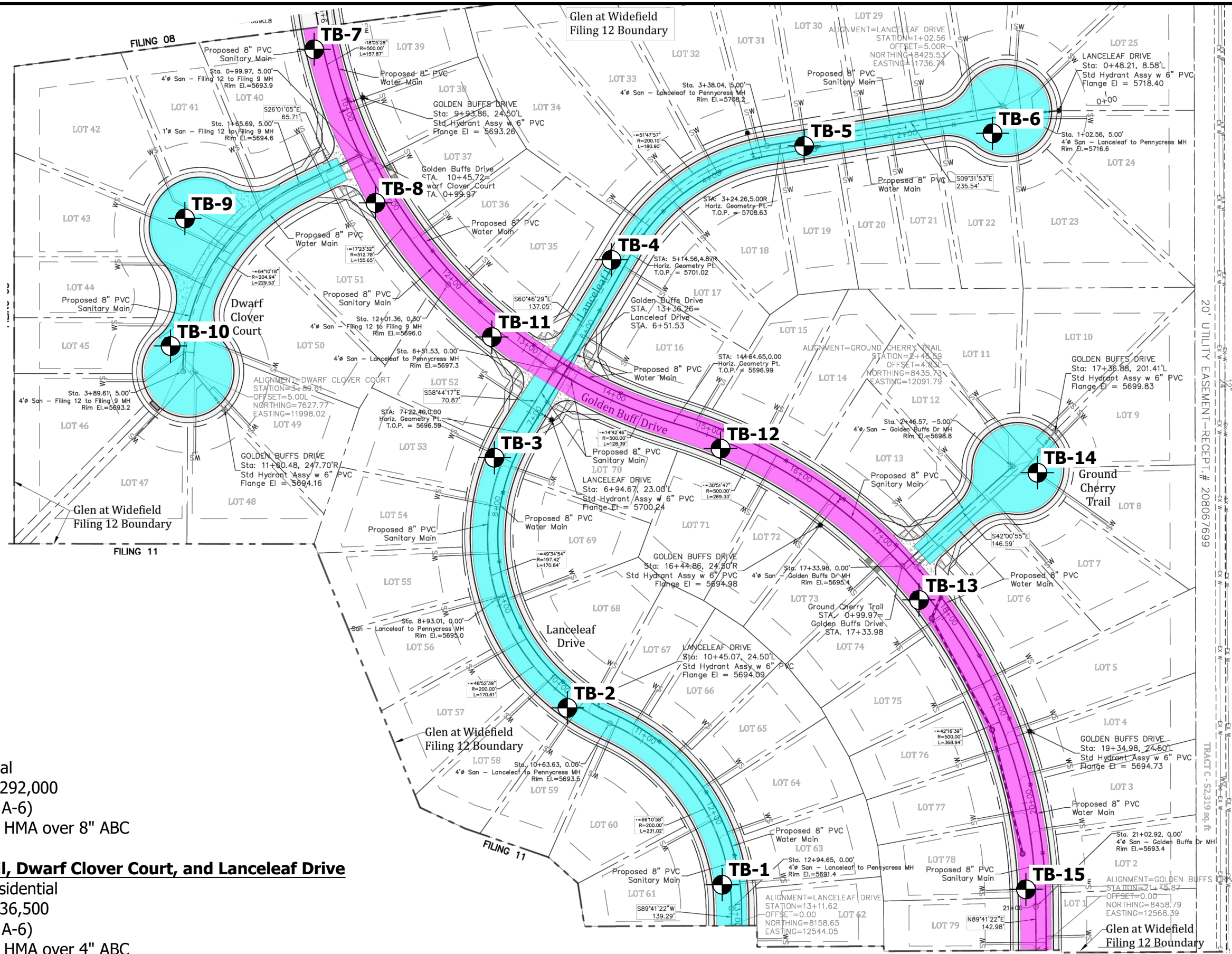
If there are any questions regarding the information provided herein, or if Entech Engineering, Inc. can be of further assistance, please do not hesitate to contact us.



VICINITY MAP
GLEN AT WIDFIELD FILING No. 12
GLEN DEVELOPMENT

JOB NO.
231853

FIG. 1



Golden Bluff Drive
 Urban Local Residential
 Design 18-KIP ESAL=292,000
 Soil Type 1 (AASHTO A-6)
 Pavement Section: 5" HMA over 8" ABC

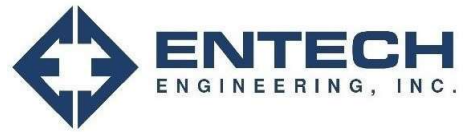
Ground Cherry Trail, Dwarf Clover Court, and Lanceleaf Drive
 Local Low-Volume Residential
 Design 18-KIP ESAL=36,500
 Soil Type 1 (AASHTO A-6)
 Pavement Section: 4" HMA over 4" ABC

TB- APPROXIMATE TEST BORING LOCATION AND NUMBER
 SCALE: 1" = 100'-0" 0 50 100



SITE AND EXPLORATION PLAN
 GLEN AT WIDEFIELD FILING No. 12
 GLEN DEVELOPMENT

JOB NO.
 231853
FIG. 2



APPENDIX A: Test Boring Logs

TEST BORING 1
 DATE DRILLED 3/4/2024
 REMARKS

DRY TO 5', 3/4/24

FILL 0-5', SAND, CLAYEY, BROWN,
 MEDIUM DENSE, MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
			19	9.9	1
5			17	13.5	1
10					
15					
20					

TEST BORING 2
 DATE DRILLED 3/4/2024
 REMARKS

DRY TO 5', 3/4/24

FILL 0-5', CLAY, SANDY, BROWN,
 STIFF, MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
			14	12.2	1
5			10	13.9	1
10					
15					
20					



TEST BORING LOGS
 GLEN AT WIDEFIELD, FILING NO. 12
 GLEN DEVELOPMENT

JOB NO.
 231853

FIG. A-1

TEST BORING 3
 DATE DRILLED 3/4/2024
 REMARKS

DRY TO 10', 3/4/24

FILL 0-10', CLAY, SANDY, BROWN,
 STIFF to VERY STIFF, MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
			9	22.0	1
5			23	12.8	1
10			24	16.0	1
15					
20					

TEST BORING 4
 DATE DRILLED 3/4/2024
 REMARKS

DRY TO 5', 3/4/24

FILL 0-5', CLAY, SANDY, BROWN,
 STIFF to VERY STIFF, MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
			10	9.8	1
5			17	10.5	1
10					
15					
20					



TEST BORING LOGS
 GLEN AT WIDFIELD, FILING NO. 12
 GLEN DEVELOPMENT



JOB NO.
 231853

FIG. A-2

TEST BORING 5
 DATE DRILLED 3/4/2024
 REMARKS

DRY TO 5', 3/4/24

FILL 0-5', CLAY, WITH SAND,
 BROWN, STIFF, MOIST



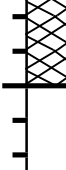
Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
5			11	10.5	1
5			11	15.2	1
10					
15					
20					

TEST BORING 6
 DATE DRILLED 3/4/2024
 REMARKS

DRY TO 10', 3/4/24

FILL 0-1', CLAY, SANDY, BROWN
 CLAY, SANDY, LIGHT BROWN,
 VERY STIFF to HARD, MOIST

CLAYSTONE, VERY WEAK, GRAY,
 WEATHERED (CLAY, SANDY,
 HARD, MOIST)

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
5			22	7.2	1
5			33	8.8	2
10			50 6"	8.5	3
15					
20					



TEST BORING LOGS
 GLEN AT WIDEFIELD, FILING NO. 12
 GLEN DEVELOPMENT



JOB NO.
 231853

FIG. A-3

TEST BORING 7
 DATE DRILLED 3/5/2024
 REMARKS

DRY TO 5', 3/5/24



FILL 0-5', CLAY, SANDY, BROWN,
 STIFF, MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
5			10	14.6	1
5			15	12.4	1
10					
15					
20					

TEST BORING 8
 DATE DRILLED 3/5/2024
 REMARKS

DRY TO 5', 3/5/24

FILL 0-5', CLAY, SANDY, BROWN,
 STIFF to MEDIUM STIFF, MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
5			9	12.5	1
5			6	18.3	1
10					
15					
20					





TEST BORING LOGS
 GLEN AT WIDFIELD, FILING NO. 12
 GLEN DEVELOPMENT




JOB NO.
 231853

FIG. A-4

TEST BORING 9
 DATE DRILLED 3/5/2024
 REMARKS

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
DRY TO 5', 3/5/24					
FILL 0-1', CLAY, SANDY, BROWN CLAY, SANDY, GRAY, HARD, MOIST (CLAYSTONE, VERY WEAK, HIGHLY WEATHERED)			39	9.7	1
					2
5			50 9"	9.3	3
10					
15					
20					

TEST BORING 10
 DATE DRILLED 3/5/2024
 REMARKS

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
DRY TO 10', 3/5/24					
FILL 0-5', CLAY, SANDY, BROWN, VERY STIFF, MOIST			19	11.5	1
5			15	12.3	1
10			50 10"	12.3	3
15					
20					



TEST BORING LOGS
 GLEN AT WIDEFIELD, FILING NO. 12
 GLEN DEVELOPMENT

JOB NO.
 231853

FIG. A-5

TEST BORING 11
 DATE DRILLED 3/5/2024
 REMARKS

DRY TO 10', 3/5/24

FILL 0-1', CLAY, SANDY, BROWN
 CLAY, SANDY, BROWN, HARD,
 MOIST

CLAYSTONE, VERY WEAK,
 BROWN, SLIGHTLY WEATHERED
 (CLAY, SANDY, HARD, MOIST)

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
			40	10.6	1
5			36	12.7	2
10			50 6"	11.7	3
15					
20					

TEST BORING 12
 DATE DRILLED 3/5/2024
 REMARKS

DRY TO 5', 3/5/24

FILL 0-5', CLAY, SANDY, VERY
 STIFF, MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
			26	11.6	1
5			25	12.4	1
10					
15					
20					



TEST BORING LOGS
 GLEN AT WIDEFIELD, FILING NO. 12
 GLEN DEVELOPMENT

JOB NO.
 231853

FIG. A-6

TEST BORING 13
 DATE DRILLED 3/12/2024
 REMARKS

DRY TO 5', 3/12/24

FILL 0-5', CLAY, SLIGHTLY SANDY,
 BROWN, VERY STIFF to MEDIUM
 STIFF, MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
			16	18.1	1
5			7	15.0	1
10					
15					
20					

TEST BORING 14
 DATE DRILLED 3/12/2024
 REMARKS

DRY TO 5', 3/12/24

FILL 0-1', CLAY, SANDY, BROWN
 SAND, CLAYEY, GRAY, DENSE,
 MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
			30	8.7	1
					2
5			37	7.6	2
10					
15					
20					



TEST BORING LOGS
 GLEN AT WIDEFIELD, FILING NO. 12
 GLEN DEVELOPMENT

JOB NO.
 231853

FIG. A-7

TEST BORING 15
DATE DRILLED 3/12/2024
REMARKS

DRY TO 10', 3/12/24

FILL 0-10', CLAY, SANDY, BROWN,
MEDIUM STIFF to VERY STIFF,
MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
			10	11.0	1
5			6	17.5	1
10			17	15.5	1
15					
20					



TEST BORING LOGS
GLEN AT WIDFIELD, FILING NO. 12
GLEN DEVELOPMENT

JOB NO.
231853
FIG. A-8



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.	USCS	SOIL DESCRIPTION
1, CBR	3	0-3			61.1	37	21	16			A-6	CL	FILL, CLAY, SANDY
1	1	1-2	13.7	117.7	41.1	30	17	13			A-6	SC	FILL, SAND, CLAYEY
1	2	1-2	14.6	113.7	57.2	36	17	19	0.20		A-6	CL	FILL, CLAY, SANDY
1	3	1-2	27.3	106.4	60.6	37	19	18			A-6	CL	FILL, CLAY, SANDY
1	4	1-2	12.8	105.3	59.5	35	18	17	0.23		A-6	CL	FILL, CLAY, SANDY
1	5	1-2	12.5	111.4	71.5	37	22	15			A-6	CL	FILL, CLAY, WITH SAND
1	7	1-2	17.6	102.6	50.5	38	19	19			A-6	CL	FILL, CLAY, SANDY
1	8	1-2	16.6	107.4	67.0	44	21	23			A-7-6	CL	FILL, CLAY, SANDY
1	10	1-2	11.6	111.5	60.7	36	20	16			A-6	CL	FILL, CLAY, SANDY
1	12	1-2	13.0	119.2	62.0	36	18	18			A-6	CL	FILL, CLAY, SANDY
1	13	1-2	19.0	96.7	87.7	52	29	23			A-7-6	CH	FILL, CLAY, SLIGHTLY SANDY
1	15	1-2	14.0	103.1	59.3	36	17	19			A-6	CL	FILL, CLAY, SANDY
2	6	1-2	8.0	90.3	61.5	31	21	10	0.00		A-6	CL	CLAY, SANDY
2	9	1-2	11.7	114.7	66.6	39	22	17			A-6	CL	CLAY, SANDY
2	11	1-2	12.1	121.2	51.6	32	22	10			A-6	CL	CLAY, SANDY
2	14	1-2	9.8	117.2	37.7	30	20	10			A-6	SC	SAND, CLAYEY
2	11	1-3			65.3							CL	CLAY, SANDY
3	6	10	9.9	117.7	57.4	33	17	16	<0.01		A-6	CL	CLAYSTONE (CLAY, SANDY)
3	9	5	12.2	115.6	60.1	41	21	20			A-7-6	CL	CLAYSTONE (CLAY, SANDY)
3	10	10	14.8	113.3	67.7	27	13	14			A-6	CL	CLAYSTONE (CLAY, SANDY)
3	11	10	12.5	116.7	67.2	35	18	17			A-6	CL	CLAYSTONE (CLAY, SANDY)

TABLE B-2
SUMMARY OF CTS TEST RESULTS

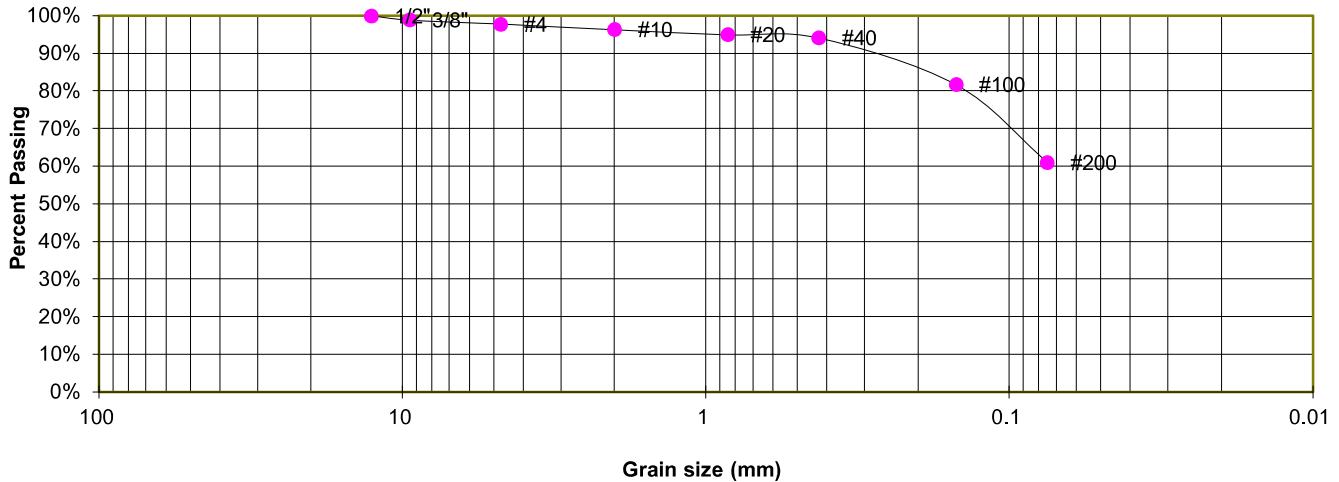
FIELD SAMPLE ID	<u>SAND, SILTY</u>
SOIL ADDITIVE	<u>TYPE I/II CEMENT</u>
CURING METHOD	<u>100° HUMIDIFIED OVEN</u>

<i>ADDITIVE</i> %	<i>WATER</i> %	<i>DENSITY</i> (dry)	<i>AGE</i> (days)	<i>STRENGTH</i> (psi)
2	11.1	109.6	7	214
2	11.1	109.5	7	224
2	11.1	109.1	7	219
AVERAGE:				219
4	11.1	109.0	7	269
4	11.1	109.3	7	256
4	11.1	109.2	7	240
AVERAGE:				255

TEST BORING 3
DEPTH (FT) 0-3

SOIL DESCRIPTION FILL, CLAY, SANDY
SOIL TYPE 1, CBR

**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"	98.9%
4	97.8%
10	96.3%
20	95.0%
40	94.1%
100	81.7%
200	61.1%

ATTERBERG LIMITS

Plastic Limit	21
Liquid Limit	37
Plastic Index	16

SOIL CLASSIFICATION

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



LABORATORY TEST RESULTS

GLEN AT WIDEFIELD, FILING NO. 12
GLEN DEVELOPMENT

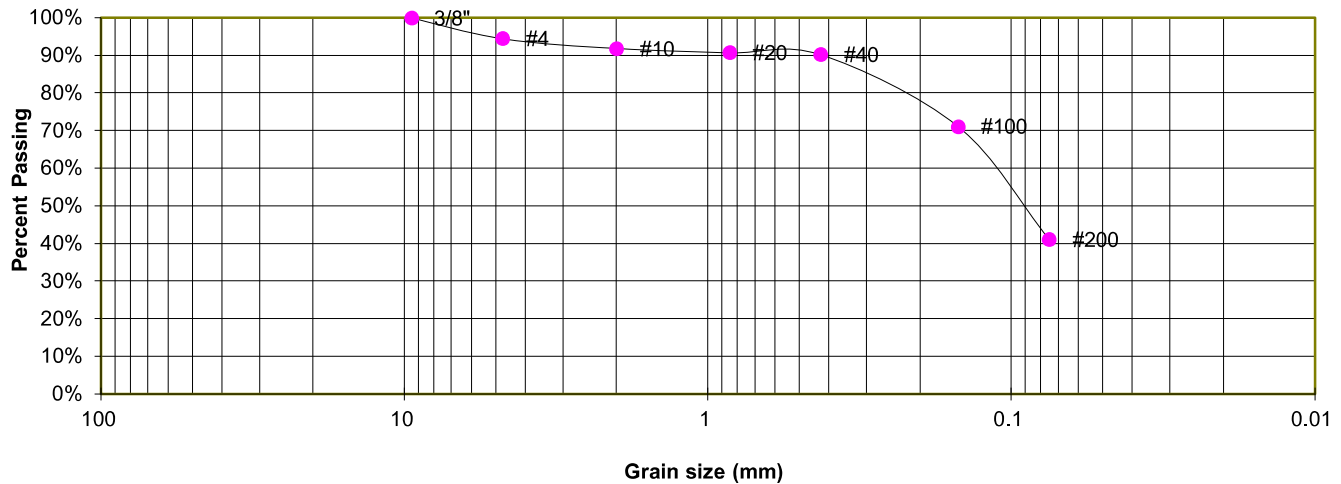
JOB NO.
231853

FIG. B-1

TEST BORING 1
DEPTH (FT) 1-2

SOIL DESCRIPTION FILL, SAND, CLAYEY
SOIL TYPE 1

Sieve Analysis Grain Size Distribution



GRAIN SIZE ANALYSIS

U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	94.5%
10	91.8%
20	90.8%
40	90.2%
100	71.1%
200	41.1%

ATTERBERG LIMITS

Plastic Limit	17
Liquid Limit	30
Plastic Index	13

SOIL CLASSIFICATION

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



LABORATORY TEST RESULTS

GLEN AT WIDEFIELD, FILING NO. 12
GLEN DEVELOPMENT

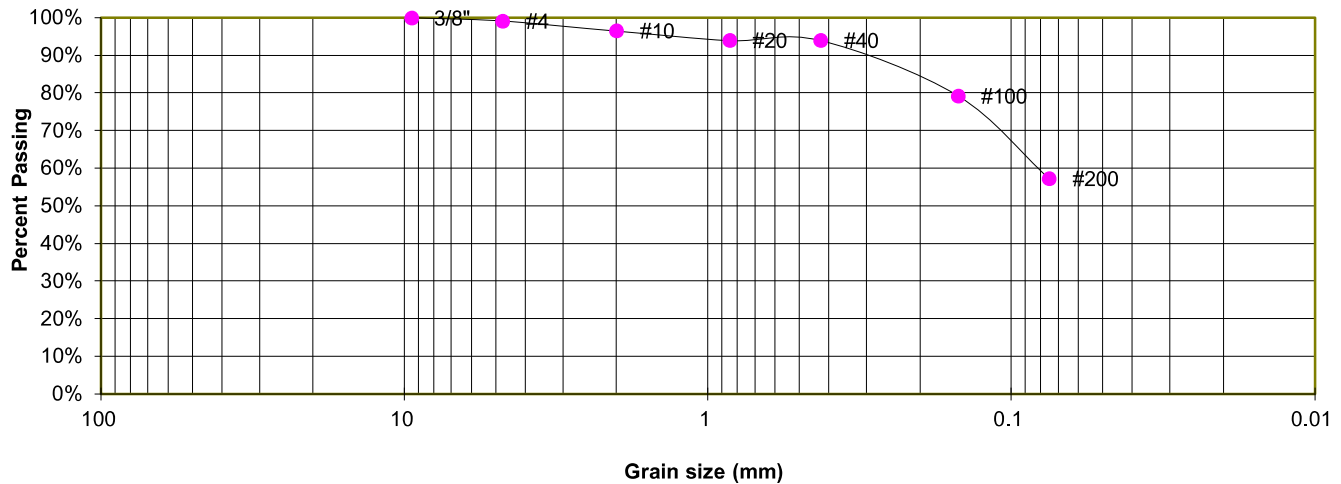
JOB NO.
231853

FIG. B-2

TEST BORING 2
DEPTH (FT) 1-2

SOIL DESCRIPTION FILL, CLAY, SANDY
SOIL TYPE 1

Sieve Analysis Grain Size Distribution



GRAIN SIZE ANALYSIS

U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	99.2%
10	96.5%
20	94.0%
40	94.0%
100	79.2%
200	57.2%

ATTERBERG LIMITS

Plastic Limit	17
Liquid Limit	36
Plastic Index	19

SOIL CLASSIFICATION

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



LABORATORY TEST RESULTS

GLEN AT WIDEFIELD, FILING NO. 12
GLEN DEVELOPMENT

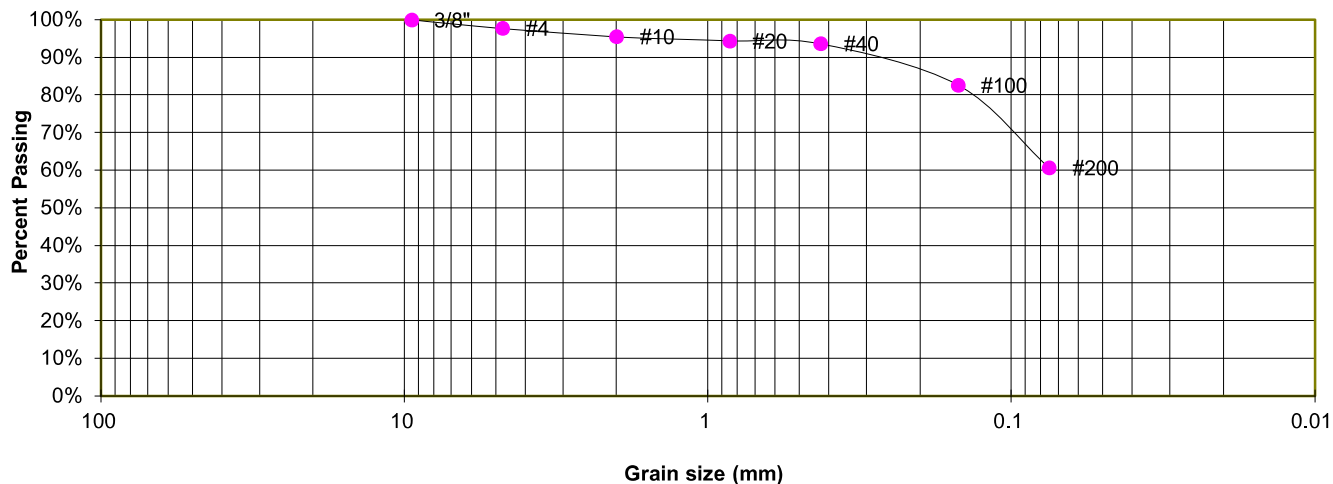
JOB NO.
231853

FIG. B-3

TEST BORING 3
DEPTH (FT) 1-2

SOIL DESCRIPTION FILL, CLAY, SANDY
SOIL TYPE 1

Sieve Analysis Grain Size Distribution



GRAIN SIZE ANALYSIS

U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	97.7%
10	95.5%
20	94.4%
40	93.6%
100	82.6%
200	60.6%

ATTERBERG LIMITS

Plastic Limit	19
Liquid Limit	37
Plastic Index	18

SOIL CLASSIFICATION

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



LABORATORY TEST RESULTS

GLEN AT WIDEFIELD, FILING NO. 12
GLEN DEVELOPMENT

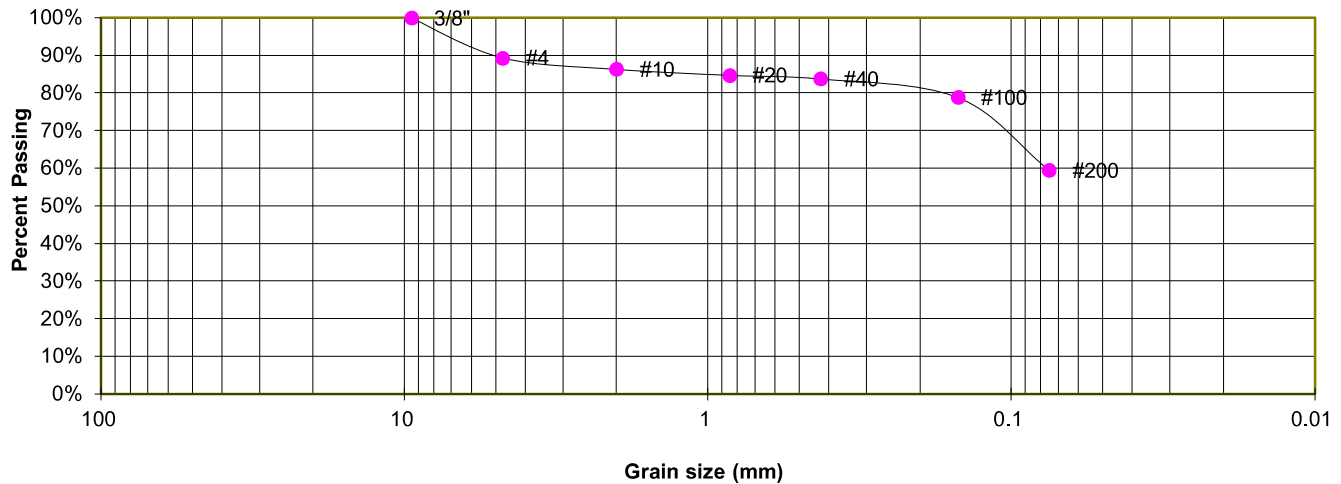
JOB NO.
231853

FIG. B-4

TEST BORING 4
DEPTH (FT) 1-2

SOIL DESCRIPTION FILL, CLAY, SANDY
SOIL TYPE 1

Sieve Analysis Grain Size Distribution



GRAIN SIZE ANALYSIS

U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	89.3%
10	86.3%
20	84.7%
40	83.8%
100	78.9%
200	59.5%

ATTERBERG LIMITS

Plastic Limit	18
Liquid Limit	35
Plastic Index	17

SOIL CLASSIFICATION

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



LABORATORY TEST RESULTS

GLEN AT WIDEFIELD, FILING NO. 12
GLEN DEVELOPMENT

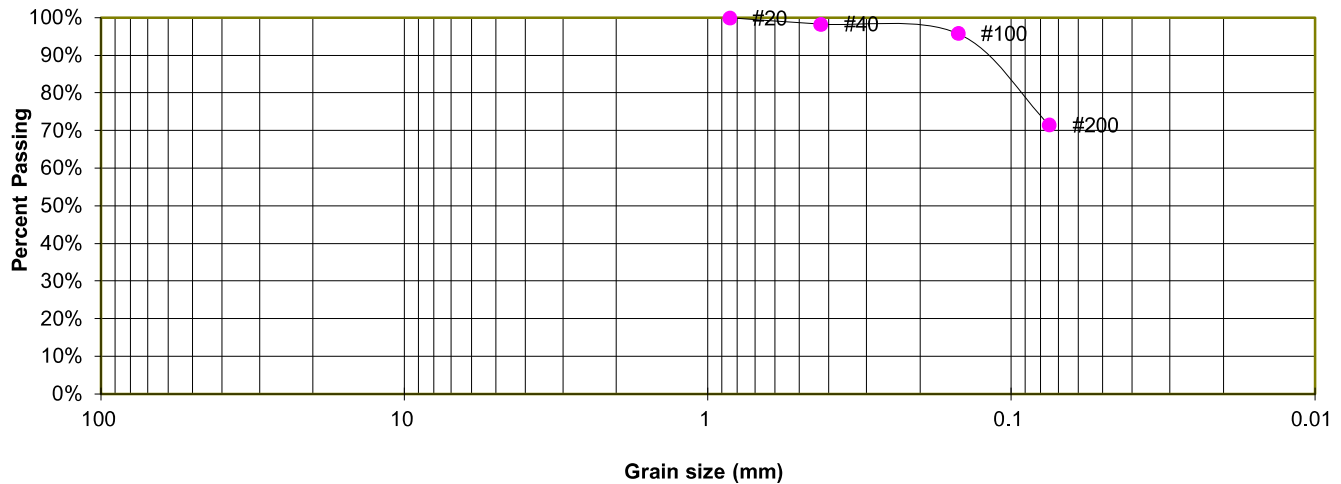
JOB NO.
231853

FIG. B-5

TEST BORING 5
DEPTH (FT) 1-2

SOIL DESCRIPTION FILL, CLAY, WITH SAND
SOIL TYPE 1

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	
20	100.0%
40	98.3%
100	95.9%
200	71.5%

ATTERBERG LIMITS

Plastic Limit	22
Liquid Limit	37
Plastic Index	15

SOIL CLASSIFICATION

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



LABORATORY TEST RESULTS

GLEN AT WIDEFIELD, FILING NO. 12
GLEN DEVELOPMENT

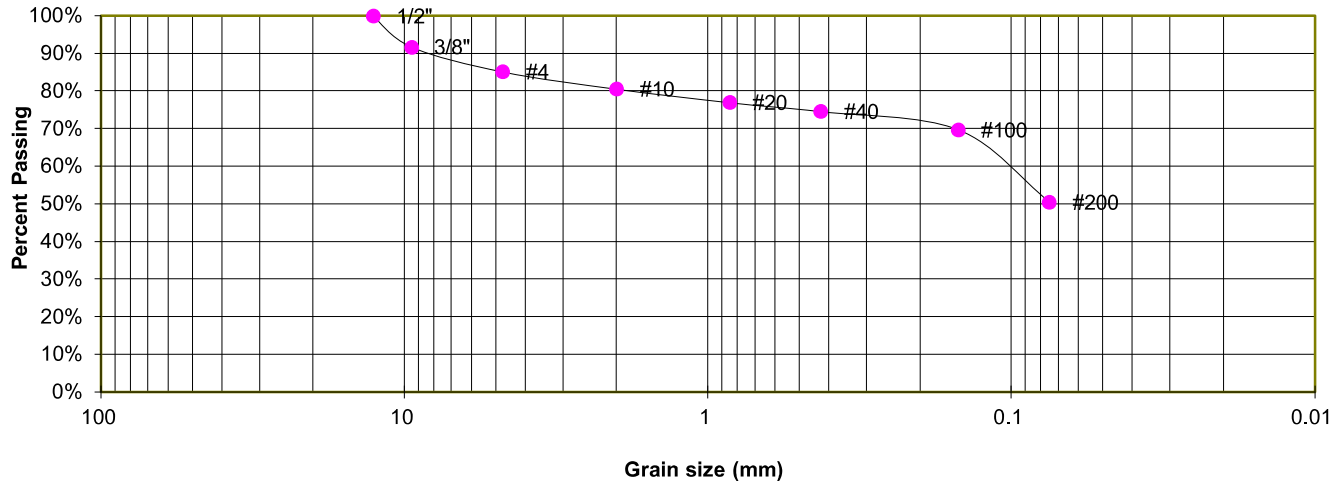
JOB NO.
231853

FIG. B-6

TEST BORING 7
DEPTH (FT) 1-2

SOIL DESCRIPTION FILL, CLAY, SANDY
SOIL TYPE 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"	91.7%
4	85.1%
10	80.6%
20	77.0%
40	74.6%
100	69.8%
200	50.5%

ATTERBERG LIMITS

Plastic Limit	19
Liquid Limit	38
Plastic Index	19

SOIL CLASSIFICATION

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



LABORATORY TEST RESULTS

GLEN AT WIDEFIELD, FILING NO. 12
GLEN DEVELOPMENT

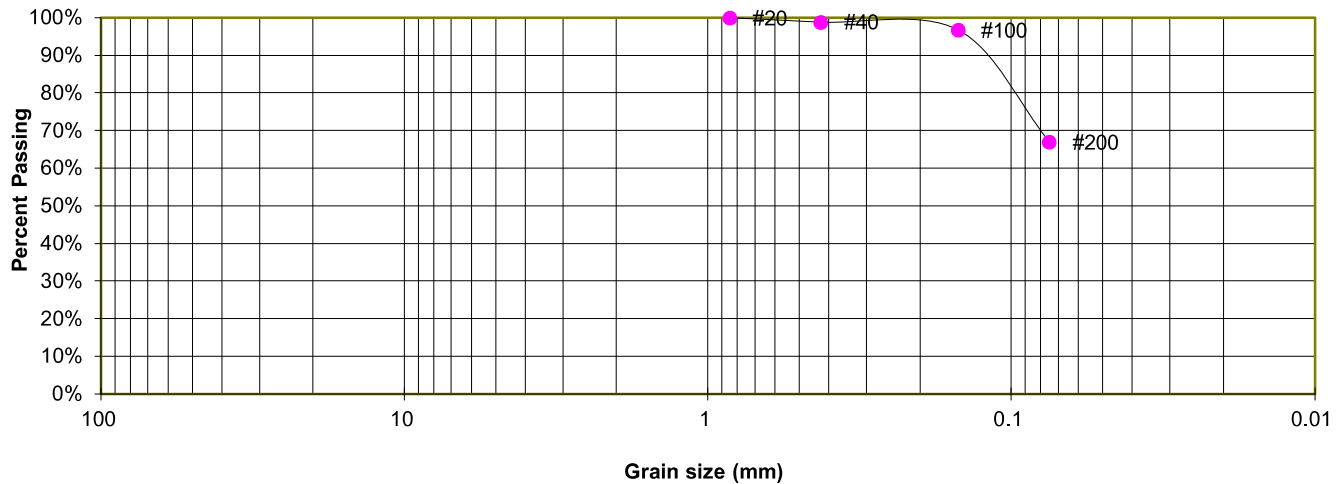
JOB NO.
231853

FIG. B-7

TEST BORING 8
DEPTH (FT) 1-2

SOIL DESCRIPTION FILL, CLAY, SANDY
SOIL TYPE 1

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	
20	100.0%
40	98.9%
100	96.8%
200	67.0%

ATTERBERG LIMITS

Plastic Limit	21
Liquid Limit	44
Plastic Index	23

SOIL CLASSIFICATION

USCS CLASSIFICATION: CL
AASHTO CLASSIFICATION: A-7-6
AASHTO GROUP INDEX: 14



LABORATORY TEST RESULTS

GLEN AT WIDEFIELD, FILING NO. 12
GLEN DEVELOPMENT

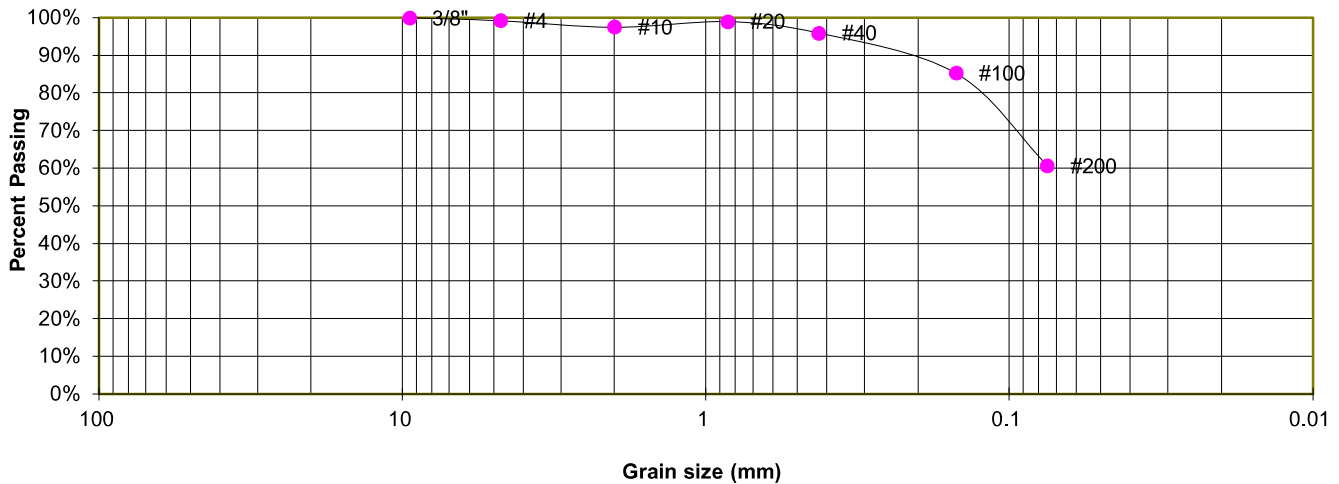
JOB NO.
231853

FIG. B-8

TEST BORING 10
DEPTH (FT) 1-2

SOIL DESCRIPTION FILL, CLAY, SANDY
SOIL TYPE 1

**Sieve Analysis
Grain Size Distribution**



GRAIN SIZE ANALYSIS

U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	99.3%
10	97.5%
20	99.0%
40	96.0%
100	85.3%
200	60.7%

ATTERBERG LIMITS

Plastic Limit	20
Liquid Limit	36
Plastic Index	16

SOIL CLASSIFICATION

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



LABORATORY TEST RESULTS

GLEN AT WIDEFIELD, FILING NO. 12
GLEN DEVELOPMENT

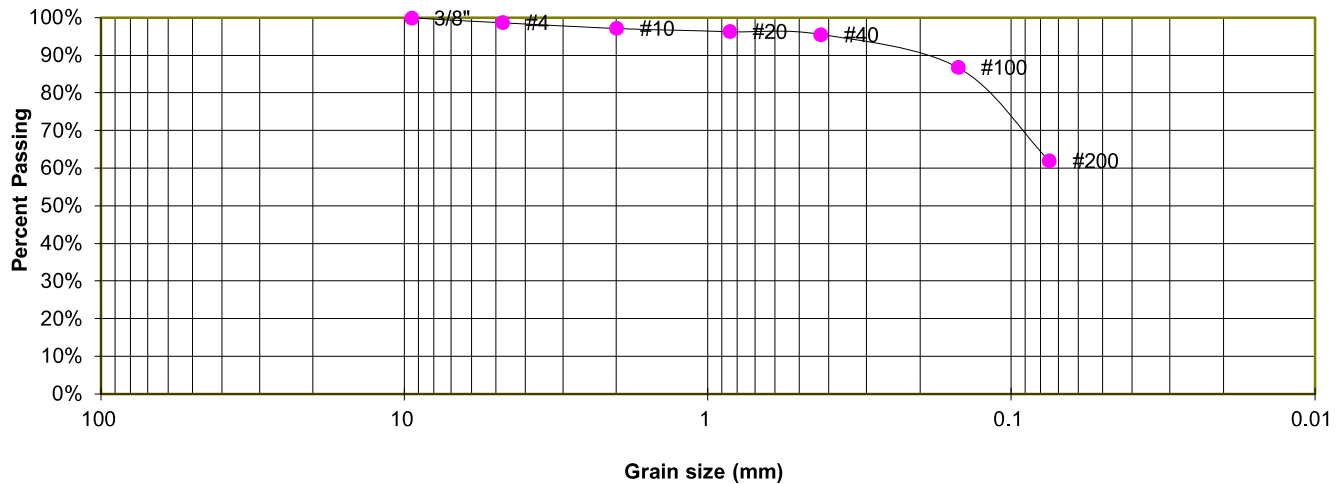
JOB NO.
231853

FIG. B-9

TEST BORING 12
DEPTH (FT) 1-2

SOIL DESCRIPTION FILL, CLAY, SANDY
SOIL TYPE 1

Sieve Analysis Grain Size Distribution



GRAIN SIZE ANALYSIS

U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	98.7%
10	97.2%
20	96.4%
40	95.6%
100	86.9%
200	62.0%

ATTERBERG LIMITS

Plastic Limit	18
Liquid Limit	36
Plastic Index	18

SOIL CLASSIFICATION

USCS CLASSIFICATION: CL
AASHTO CLASSIFICATION: A-6
AASHTO GROUP INDEX: 9



LABORATORY TEST RESULTS

GLEN AT WIDEFIELD, FILING NO. 12
GLEN DEVELOPMENT

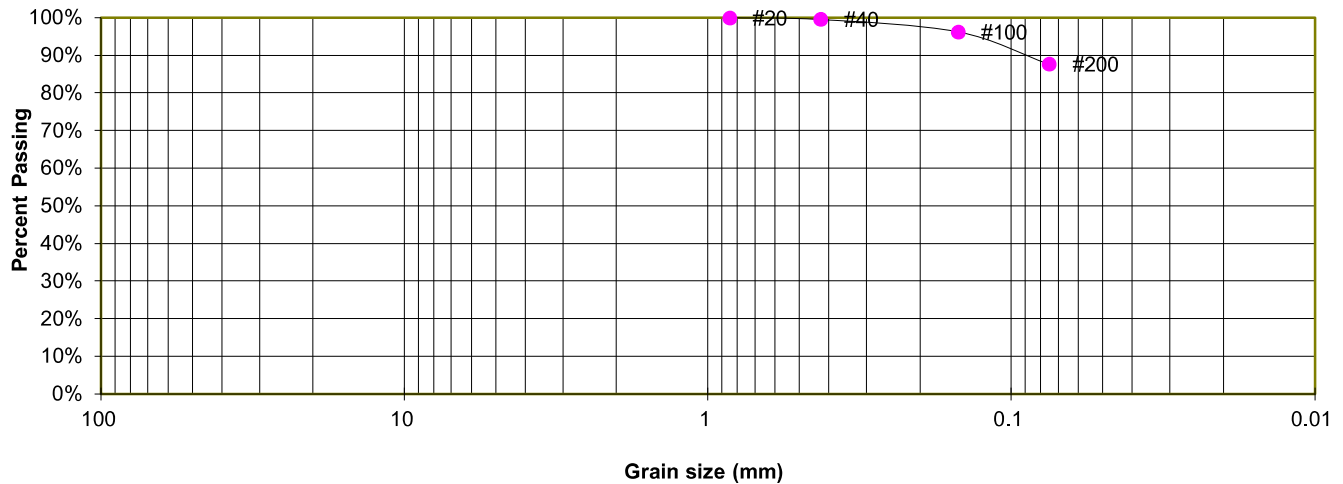
JOB NO.
231853

FIG. B-10

TEST BORING	13
DEPTH (FT)	1-2

SOIL DESCRIPTION FILL, CLAY, SLIGHTLY SANDY
SOIL TYPE 1

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	
20	100.0%
40	99.6%
100	96.3%
200	87.7%

ATTERBERG LIMITS

Plastic Limit	29
Liquid Limit	52
Plastic Index	23

SOIL CLASSIFICATION

USCS CLASSIFICATION:	CH
AASHTO CLASSIFICATION:	A-7-6
AASHTO GROUP INDEX:	20



LABORATORY TEST RESULTS

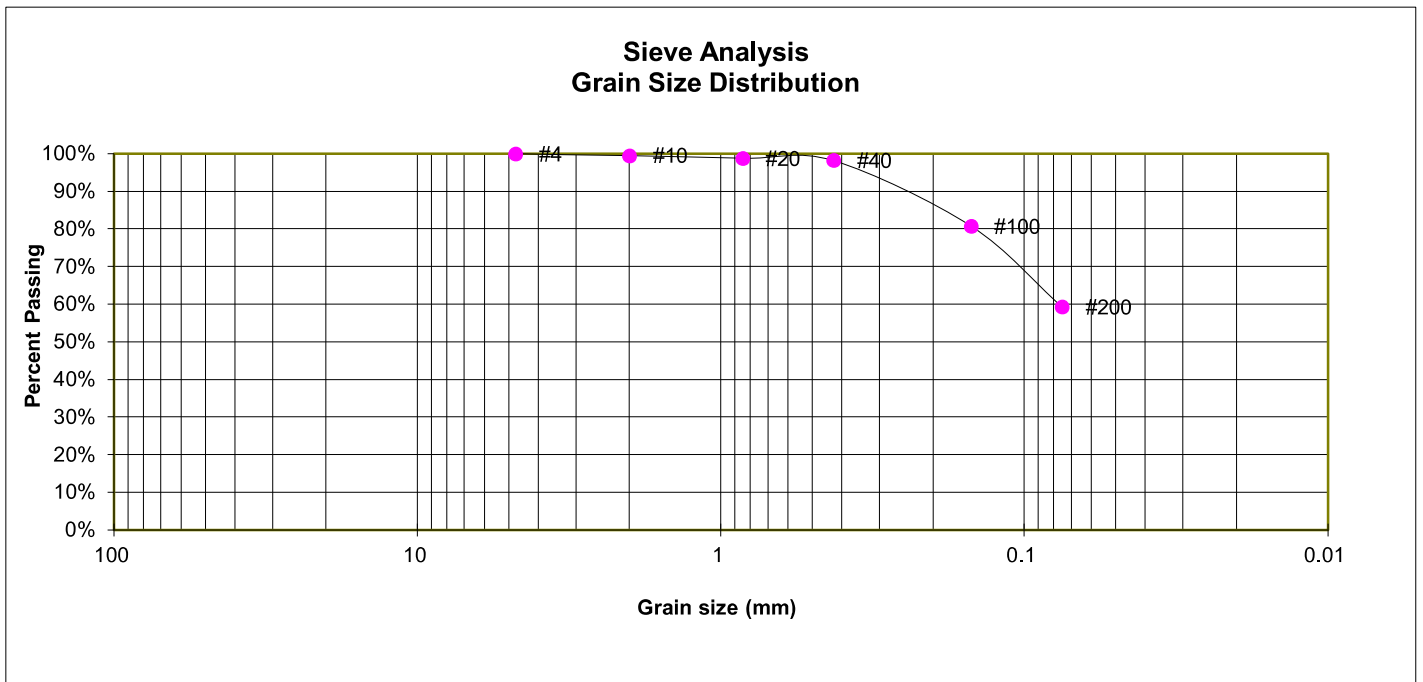
GLEN AT WIDEFIELD, FILING NO. 12
GLEN DEVELOPMENT

JOB NO.
231853

FIG. B-11

TEST BORING	15
DEPTH (FT)	1-2

SOIL DESCRIPTION FILL, CLAY, SANDY
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	99.5%
20	98.8%
40	98.2%
100	80.8%
200	59.3%

ATTERBERG LIMITS

Plastic Limit	17
Liquid Limit	36
Plastic Index	19

SOIL CLASSIFICATION

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



LABORATORY TEST RESULTS

GLEN AT WIDEFIELD, FILING NO. 12
GLEN DEVELOPMENT

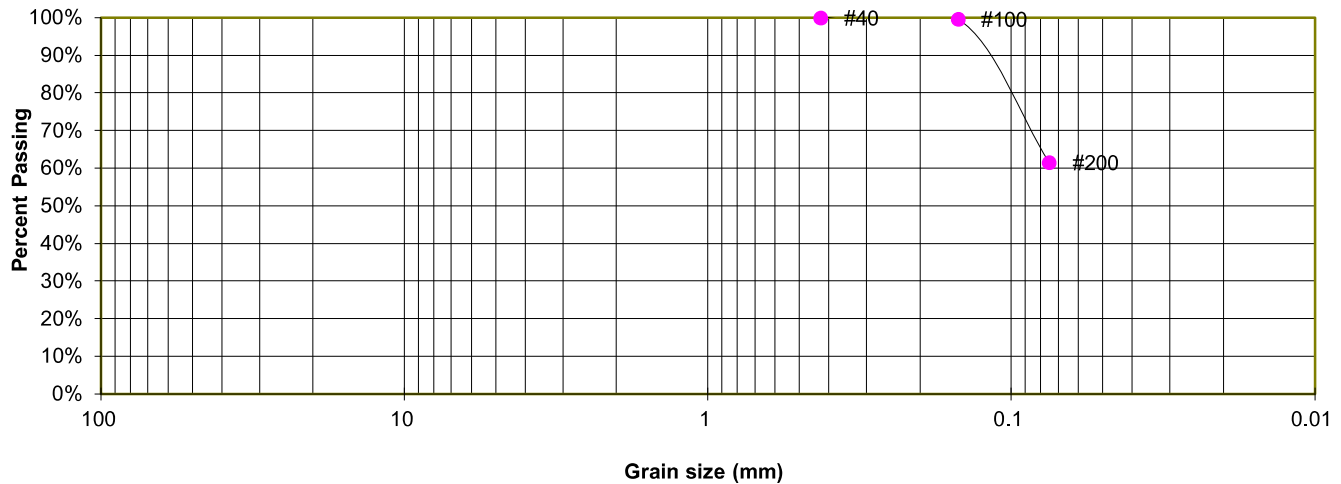
JOB NO.
231853

FIG. B-12

TEST BORING 6
DEPTH (FT) 1-2

SOIL DESCRIPTION CLAY, SANDY
SOIL TYPE 2

**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	
20	
40	100.0%
100	99.7%
200	61.5%

ATTERBERG LIMITS

Plastic Limit	21
Liquid Limit	31
Plastic Index	10

SOIL CLASSIFICATION

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



LABORATORY TEST RESULTS

GLEN AT WIDEFIELD, FILING NO. 12
GLEN DEVELOPMENT

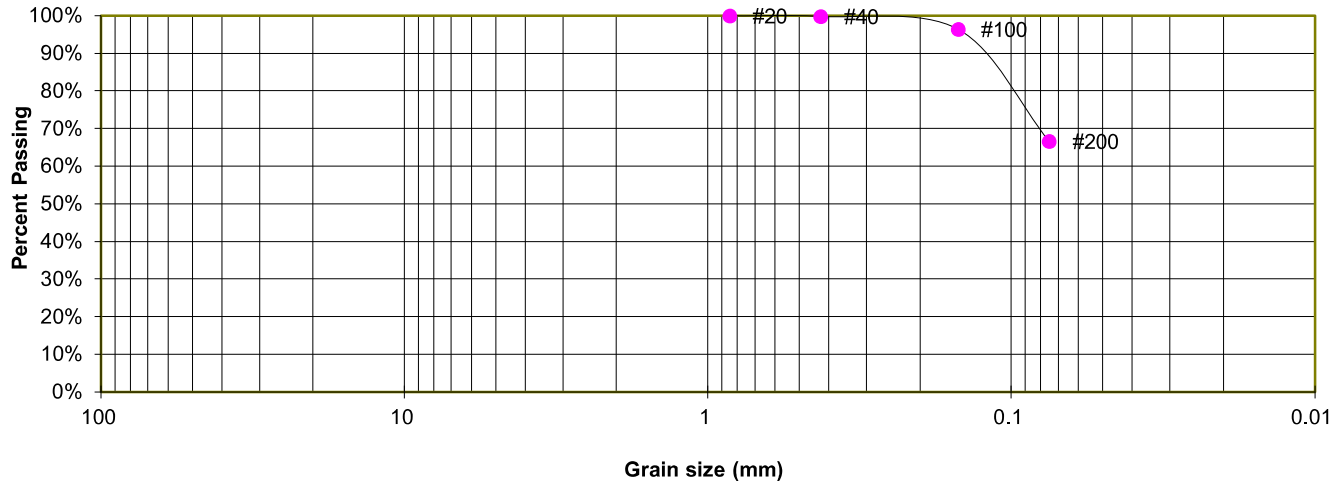
JOB NO.
231853

FIG. B-13

TEST BORING 9
DEPTH (FT) 1-2

SOIL DESCRIPTION CLAY, SANDY
SOIL TYPE 2

**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	
20	100.0%
40	99.8%
100	96.4%
200	66.6%

ATTERBERG LIMITS

Plastic Limit	22
Liquid Limit	39
Plastic Index	17

SOIL CLASSIFICATION

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



LABORATORY TEST RESULTS

GLEN AT WIDEFIELD, FILING NO. 12
GLEN DEVELOPMENT

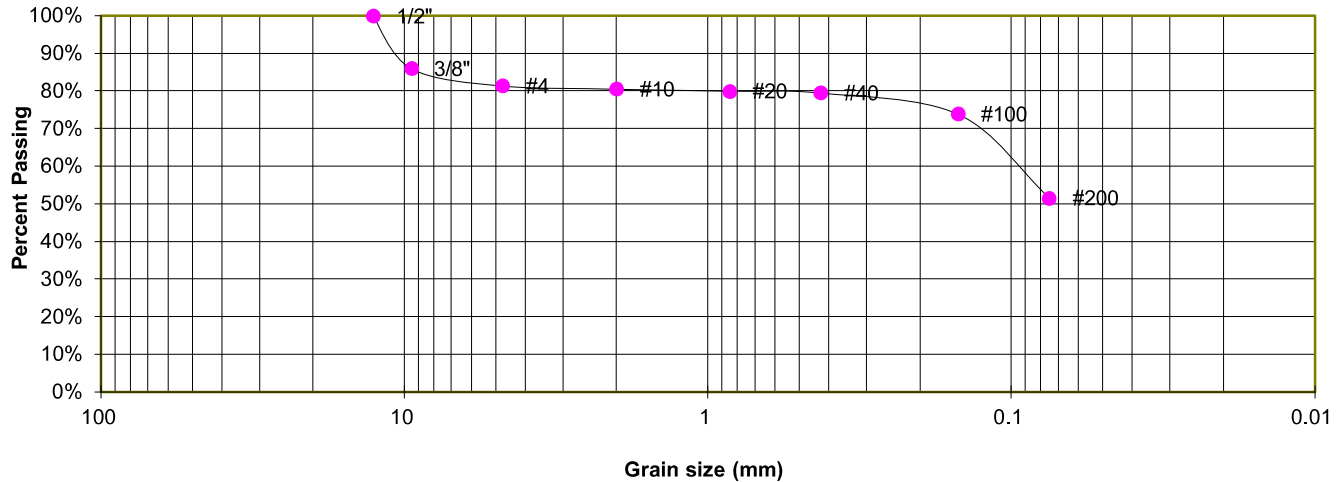
JOB NO.
231853

FIG. B-14

TEST BORING	11
DEPTH (FT)	1-2

SOIL DESCRIPTION	CLAY, SANDY
SOIL TYPE	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"	86.0%
4	81.4%
10	80.6%
20	80.0%
40	79.5%
100	73.9%
200	51.6%

ATTERBERG LIMITS

Plastic Limit	22
Liquid Limit	32
Plastic Index	10

SOIL CLASSIFICATION

USCS CLASSIFICATION: CL
AASHTO CLASSIFICATION: A-6
AASHTO GROUP INDEX: 3



LABORATORY TEST RESULTS

GLEN AT WIDEFIELD, FILING NO. 12
GLEN DEVELOPMENT

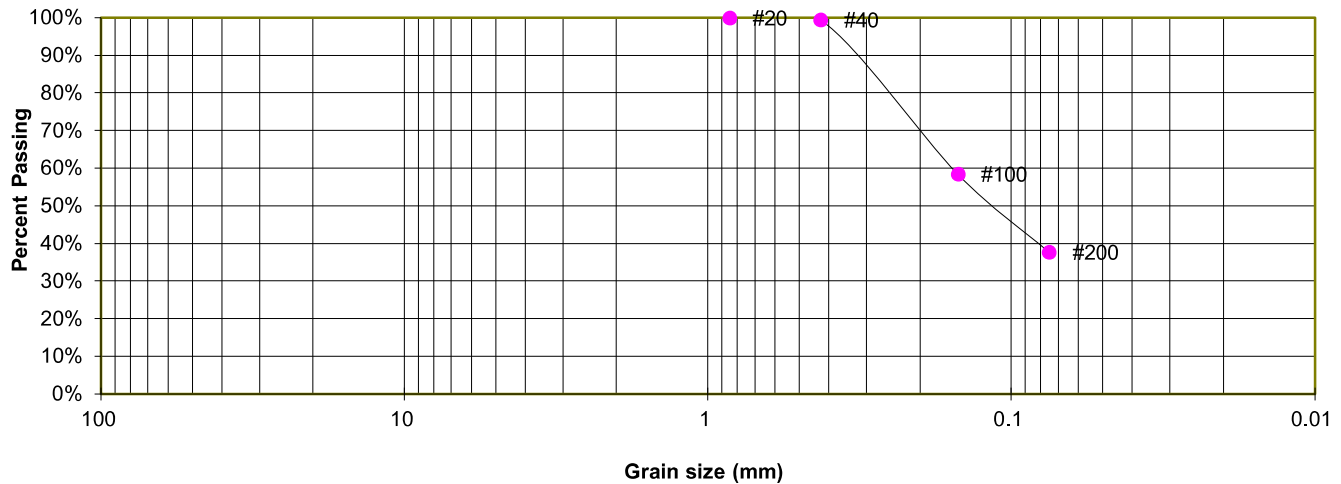
JOB NO.
231853

FIG. B-15

TEST BORING	14
DEPTH (FT)	1-2

SOIL DESCRIPTION SAND, CLAYEY
SOIL TYPE 2

**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	
20	100.0%
40	99.5%
100	58.4%
200	37.7%

ATTERBERG LIMITS

Plastic Limit	20
Liquid Limit	30
Plastic Index	10

SOIL CLASSIFICATION

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



LABORATORY TEST RESULTS

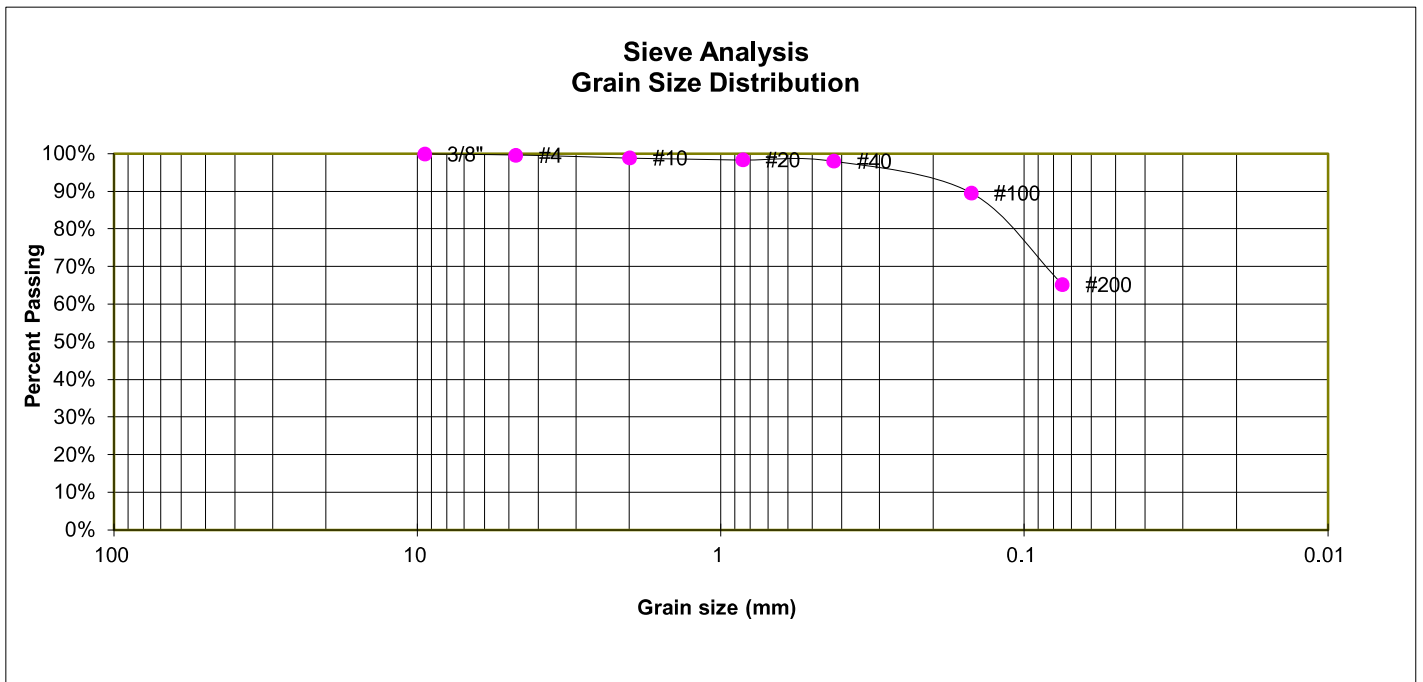
GLEN AT WIDEFIELD, FILING NO. 12
GLEN DEVELOPMENT

JOB NO.
231853

FIG. B-16

TEST BORING 11
DEPTH (FT) 1-3

SOIL DESCRIPTION CLAY, SANDY
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	98.9%
20	98.4%
40	98.1%
100	89.6%
200	65.3%

SOIL CLASSIFICATION

USCS CLASSIFICATION: CL
AASHTO CLASSIFICATION:
AASHTO GROUP INDEX:



LABORATORY TEST RESULTS

GLEN AT WIDEFIELD, FILING NO. 12
GLEN DEVELOPMENT

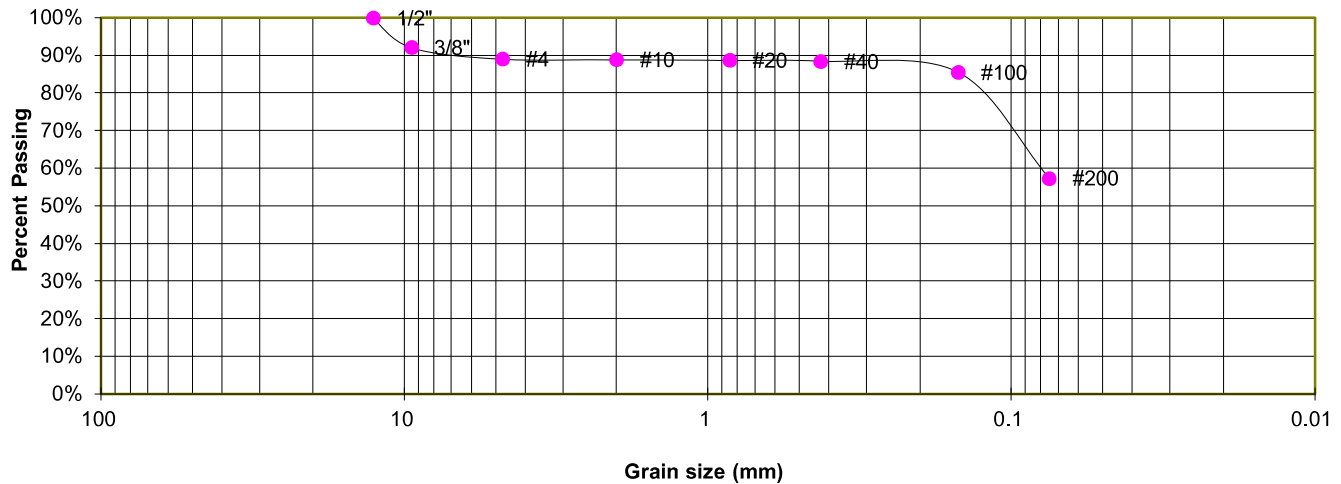
JOB NO.
231853

FIG. B-17

TEST BORING 6
DEPTH (FT) 10

SOIL DESCRIPTION CLAYSTONE (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"	100.0%
3/8"	92.1%
4	89.0%
10	88.9%
20	88.7%
40	88.5%
100	85.5%
200	57.4%

ATTERBERG LIMITS

Plastic Limit	17
Liquid Limit	33
Plastic Index	16

SOIL CLASSIFICATION

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



LABORATORY TEST RESULTS

GLEN AT WIDEFIELD, FILING NO. 12
GLEN DEVELOPMENT

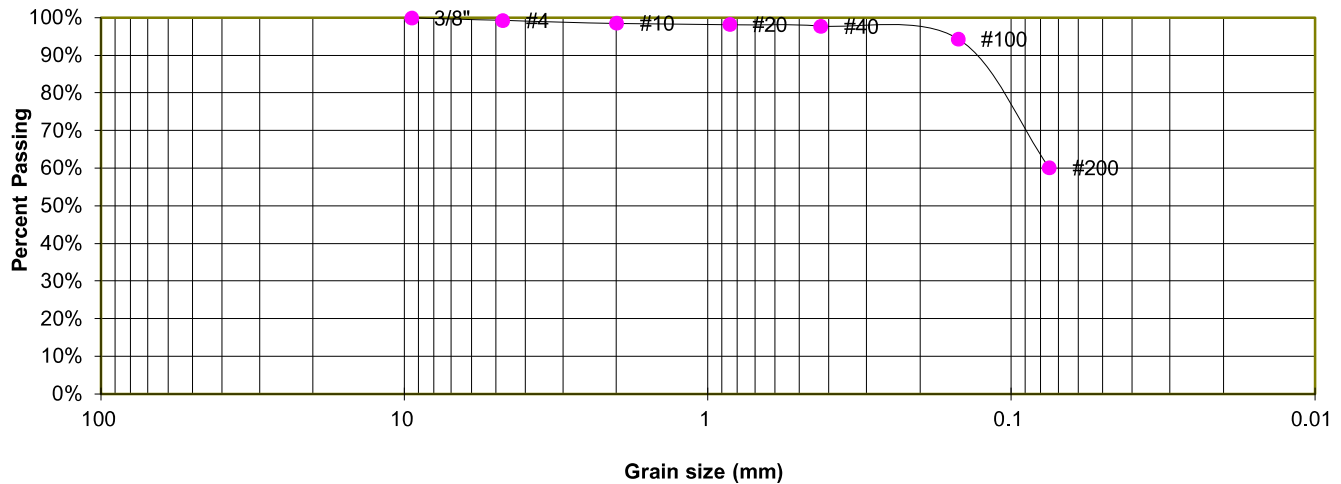
JOB NO.
231853

FIG. B-18

TEST BORING 9
DEPTH (FT) 5

SOIL DESCRIPTION CLAYSTONE (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"	100.0%
4	99.3%
10	98.6%
20	98.2%
40	97.8%
100	94.4%
200	60.1%

ATTERBERG LIMITS

Plastic Limit	21
Liquid Limit	41
Plastic Index	20

SOIL CLASSIFICATION

USCS CLASSIFICATION: CL
AASHTO CLASSIFICATION: A-7-6
AASHTO GROUP INDEX: 10



LABORATORY TEST RESULTS

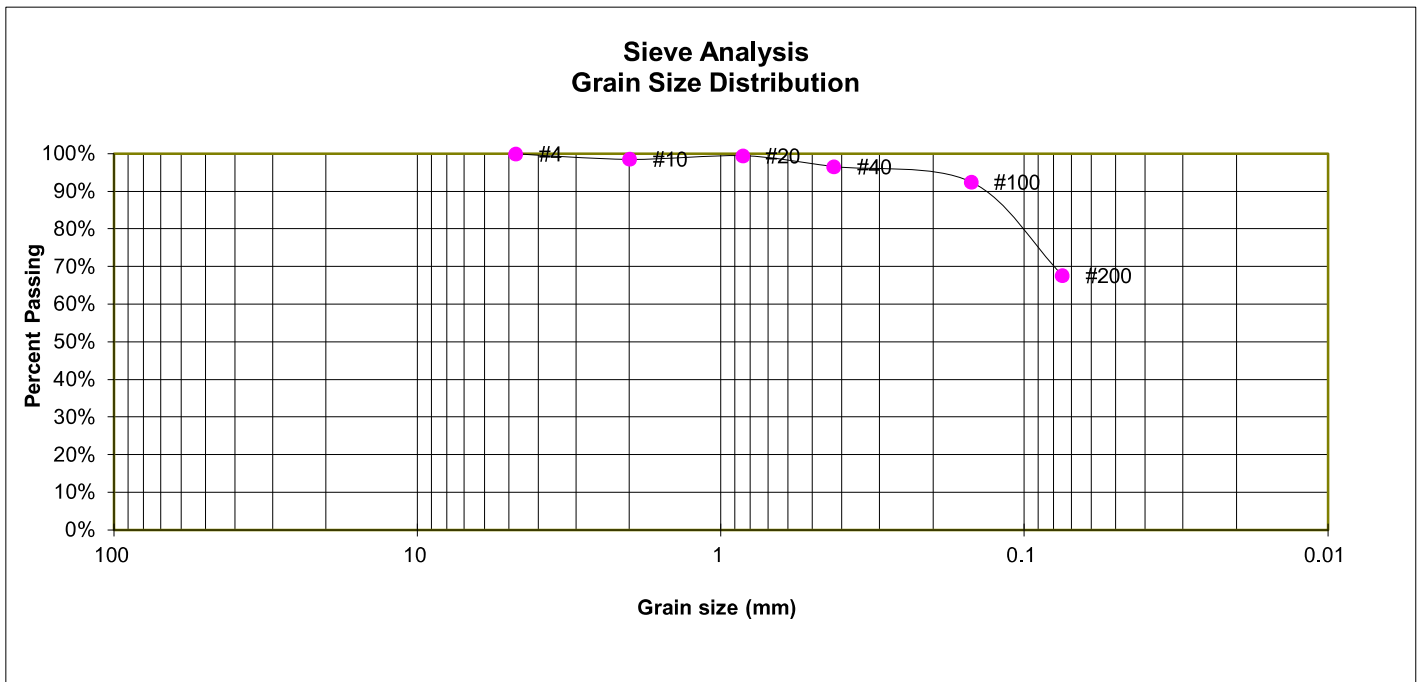
GLEN AT WIDEFIELD, FILING NO. 12
GLEN DEVELOPMENT

JOB NO.
231853

FIG. B-19

TEST BORING	10
DEPTH (FT)	10

SOIL DESCRIPTION	CLAYSTONE (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	98.6%
20	99.5%
40	96.6%
100	92.5%
200	67.7%

ATTERBERG LIMITS

Plastic Limit	13
Liquid Limit	27
Plastic Index	14

SOIL CLASSIFICATION

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



LABORATORY TEST RESULTS

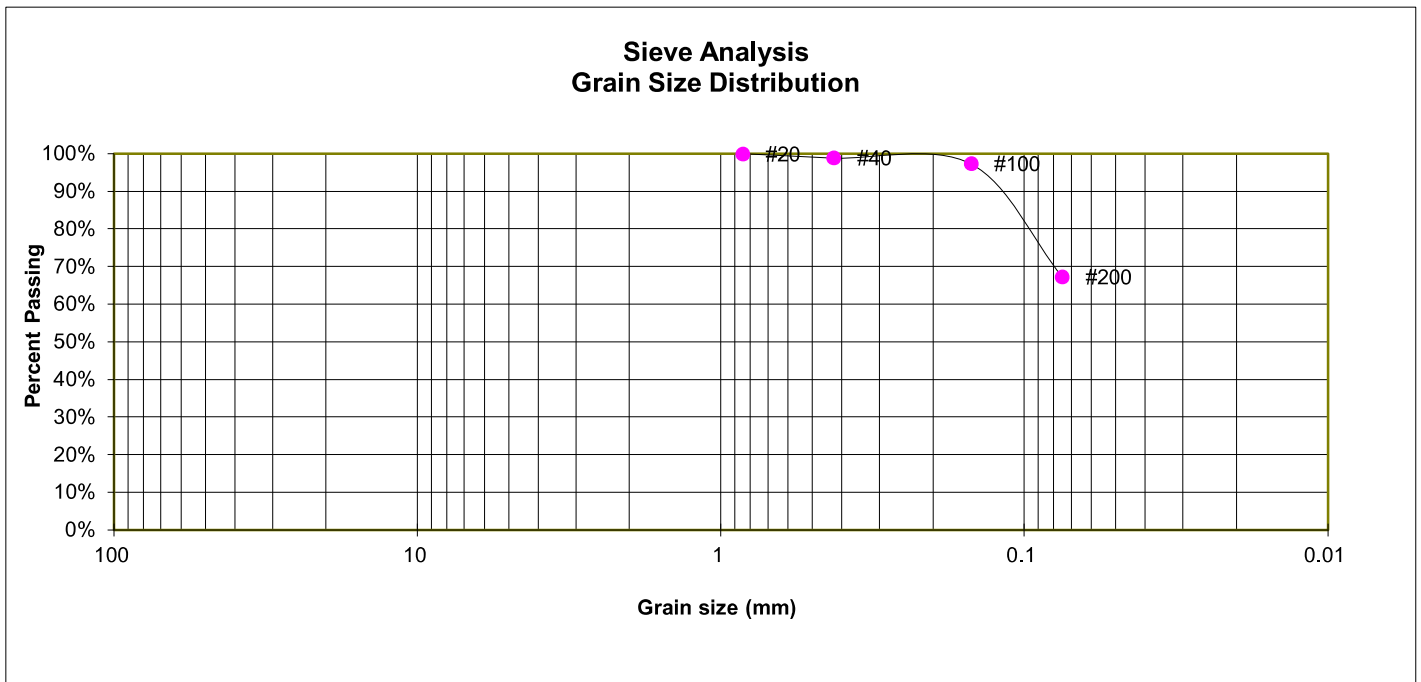
GLEN AT WIDEFIELD, FILING NO. 12
GLEN DEVELOPMENT

JOB NO.
231853

FIG. B-20

TEST BORING	11
DEPTH (FT)	10

SOIL DESCRIPTION CLAYSTONE (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	
20	100.0%
40	98.9%
100	97.4%
200	67.2%

ATTERBERG LIMITS

Plastic Limit	18
Liquid Limit	35
Plastic Index	17

SOIL CLASSIFICATION

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



LABORATORY TEST RESULTS

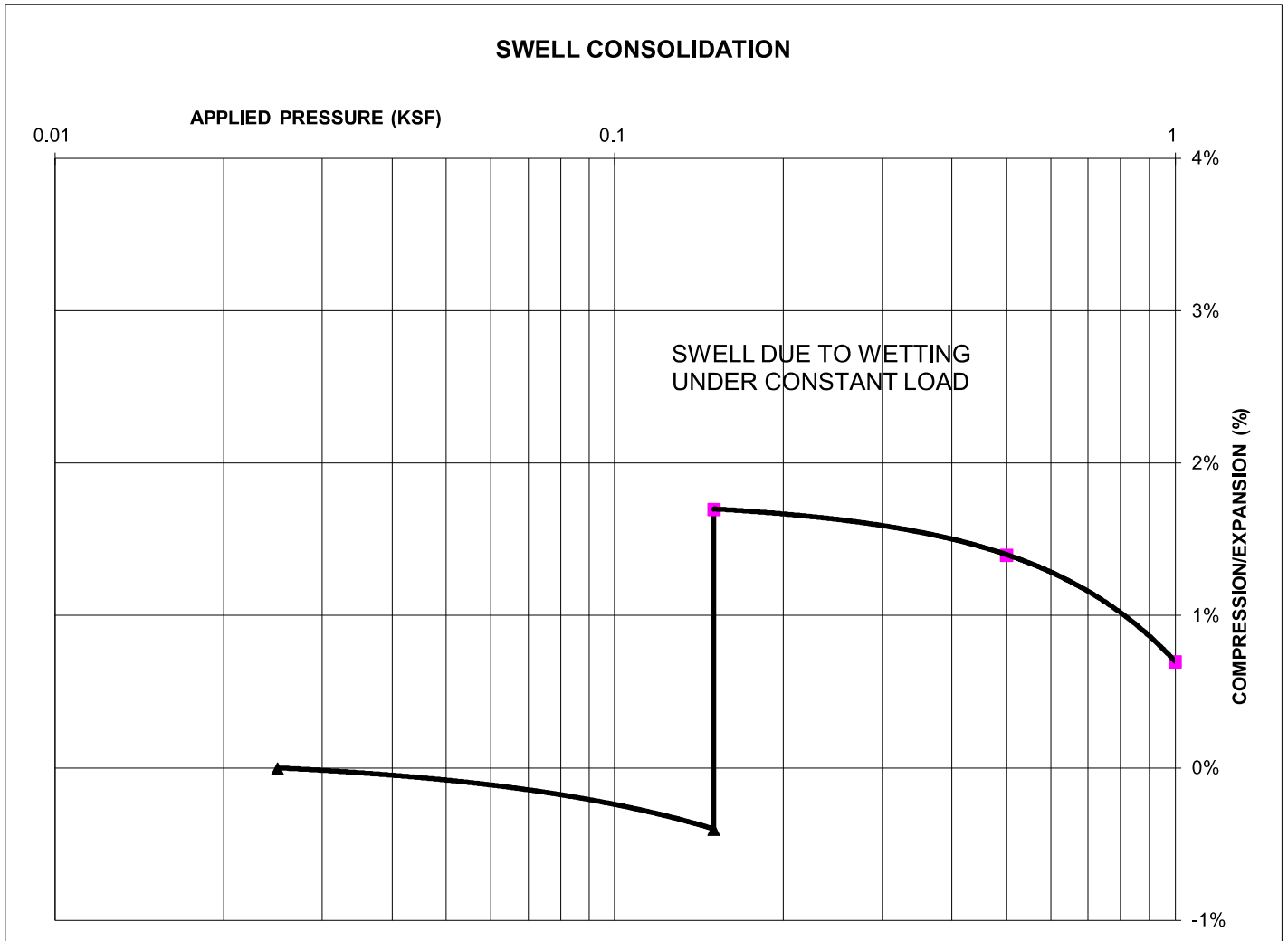
GLEN AT WIDEFIELD, FILING NO. 12
GLEN DEVELOPMENT

JOB NO.
231853

FIG. B-21

TEST BORING 1
DEPTH (FT) 1-2

SOIL DESCRIPTION FILL, SAND, CLAYEY
SOIL TYPE 1



SWELL/COLLAPSE TEST RESULTS

NATURAL UNIT DRY WEIGHT (PCF): 118
NATURAL MOISTURE CONTENT: 13.7%
SWELL/COLLAPSE (%): 2.1%



SWELL TEST RESULTS

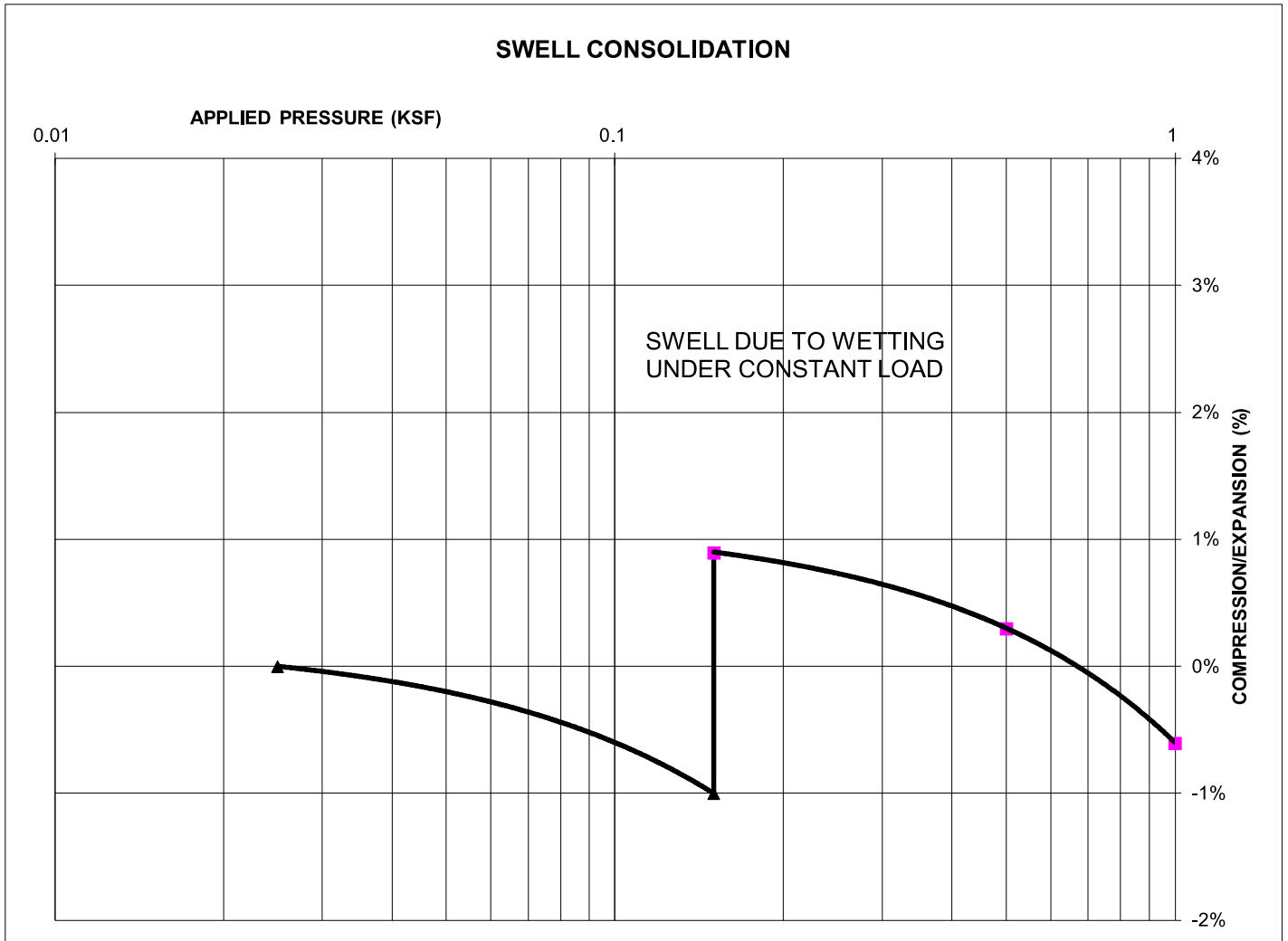
GLEN AT WIDEFIELD, FILING NO. 12
GLEN DEVELOPMENT

JOB NO.
231853

FIG. B-22

TEST BORING 2
DEPTH (FT) 1-2

SOIL DESCRIPTION FILL, CLAY, SANDY
SOIL TYPE 1



SWELL/COLLAPSE TEST RESULTS

NATURAL UNIT DRY WEIGHT (PCF): 114
NATURAL MOISTURE CONTENT: 14.6%
SWELL/COLLAPSE (%): 1.9%



SWELL TEST RESULTS

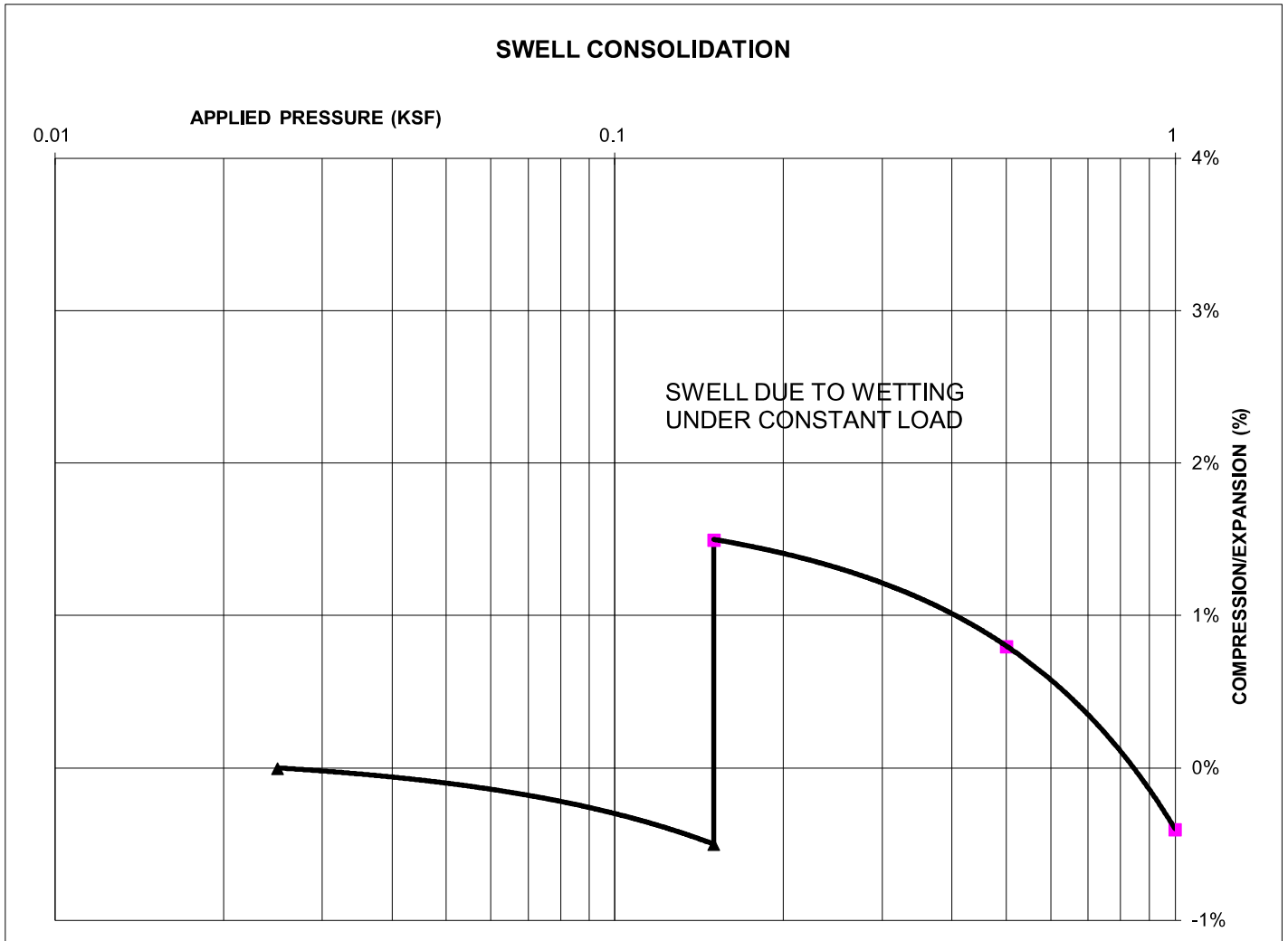
GLEN AT WIDEFIELD, FILING NO. 12
GLEN DEVELOPMENT

JOB NO.
231853

FIG. B-23

TEST BORING 3
DEPTH (FT) 1-2

SOIL DESCRIPTION FILL, CLAY, SANDY
SOIL TYPE 1



SWELL/COLLAPSE TEST RESULTS

NATURAL UNIT DRY WEIGHT (PCF): 106
NATURAL MOISTURE CONTENT: 27.3%
SWELL/COLLAPSE (%): 2.0%



SWELL TEST RESULTS

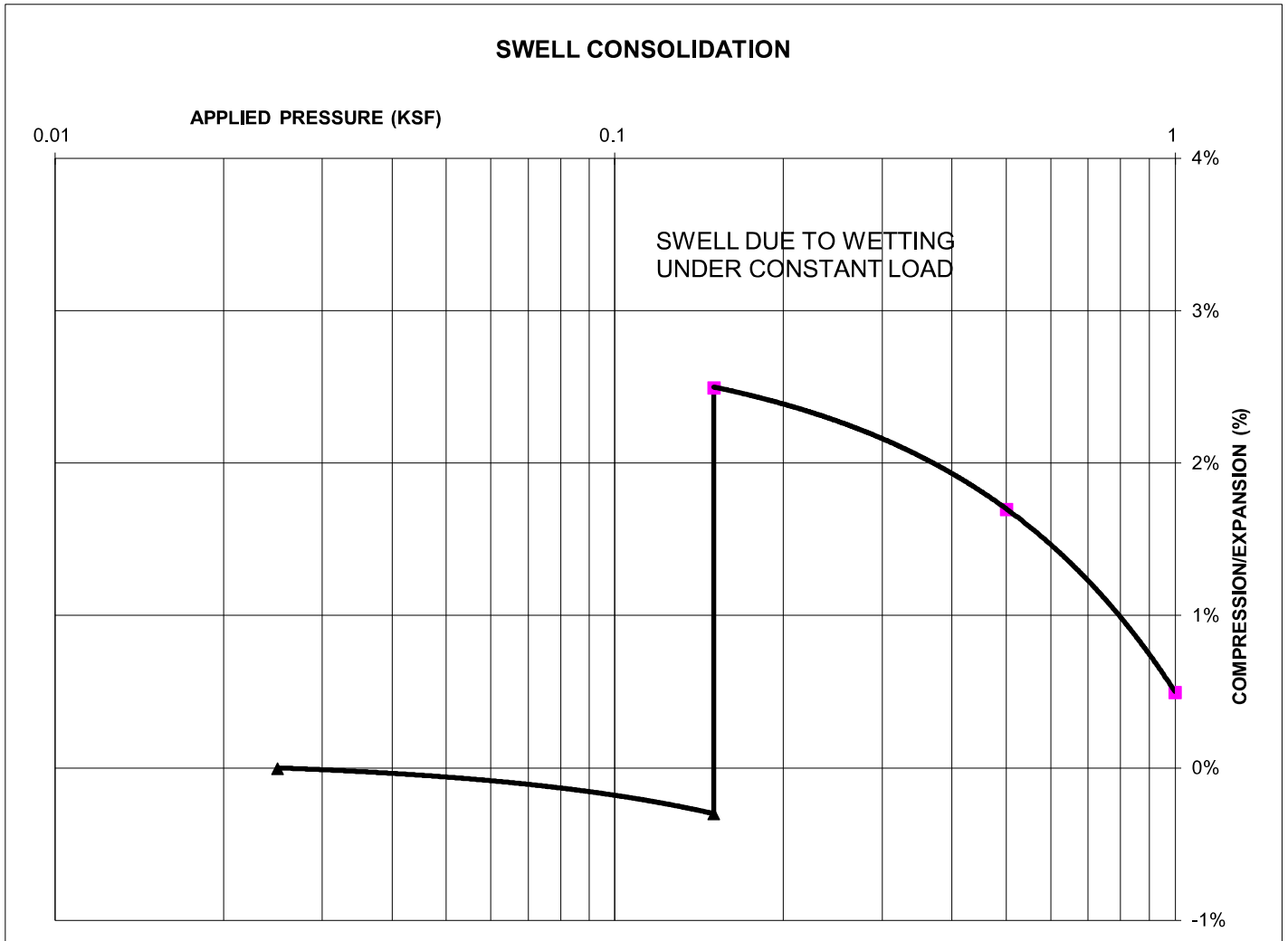
GLEN AT WIDFIELD, FILING NO. 12
GLEN DEVELOPMENT

JOB NO.
231853

FIG. B-24

TEST BORING 4
DEPTH (FT) 1-2

SOIL DESCRIPTION FILL, CLAY, SANDY
SOIL TYPE 1



SWELL/COLLAPSE TEST RESULTS

NATURAL UNIT DRY WEIGHT (PCF): 105
NATURAL MOISTURE CONTENT: 12.8%
SWELL/COLLAPSE (%): 2.8%



SWELL TEST RESULTS

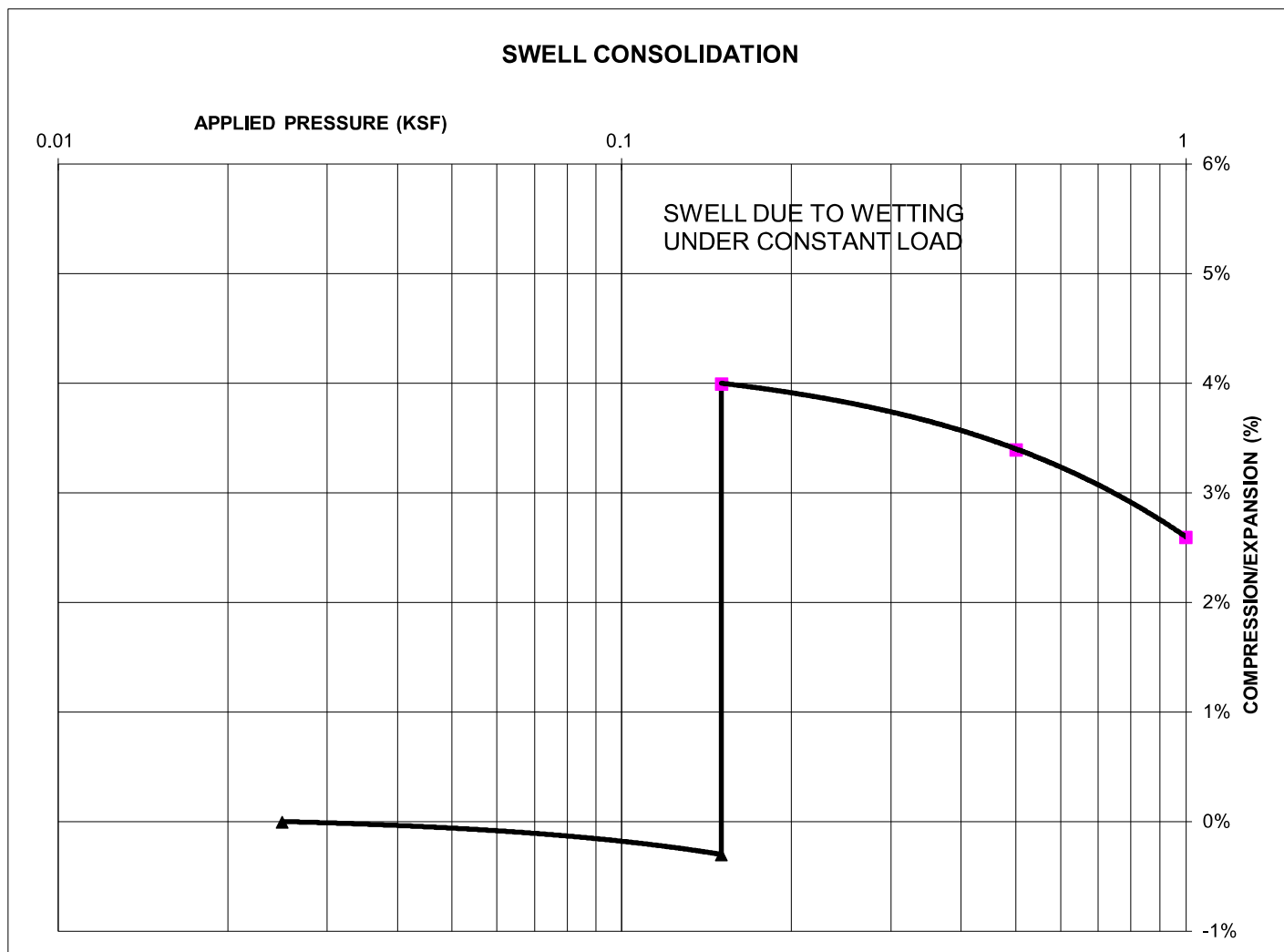
GLEN AT WIDEFIELD, FILING NO. 12
GLEN DEVELOPMENT

JOB NO.
231853

FIG. B-25

TEST BORING 5
DEPTH (FT) 1-2

SOIL DESCRIPTION FILL, CLAY, SANDY
SOIL TYPE 1



SWELL/COLLAPSE TEST RESULTS

NATURAL UNIT DRY WEIGHT (PCF): 111
NATURAL MOISTURE CONTENT: 12.5%
SWELL/COLLAPSE (%): 4.3%



SWELL TEST RESULTS

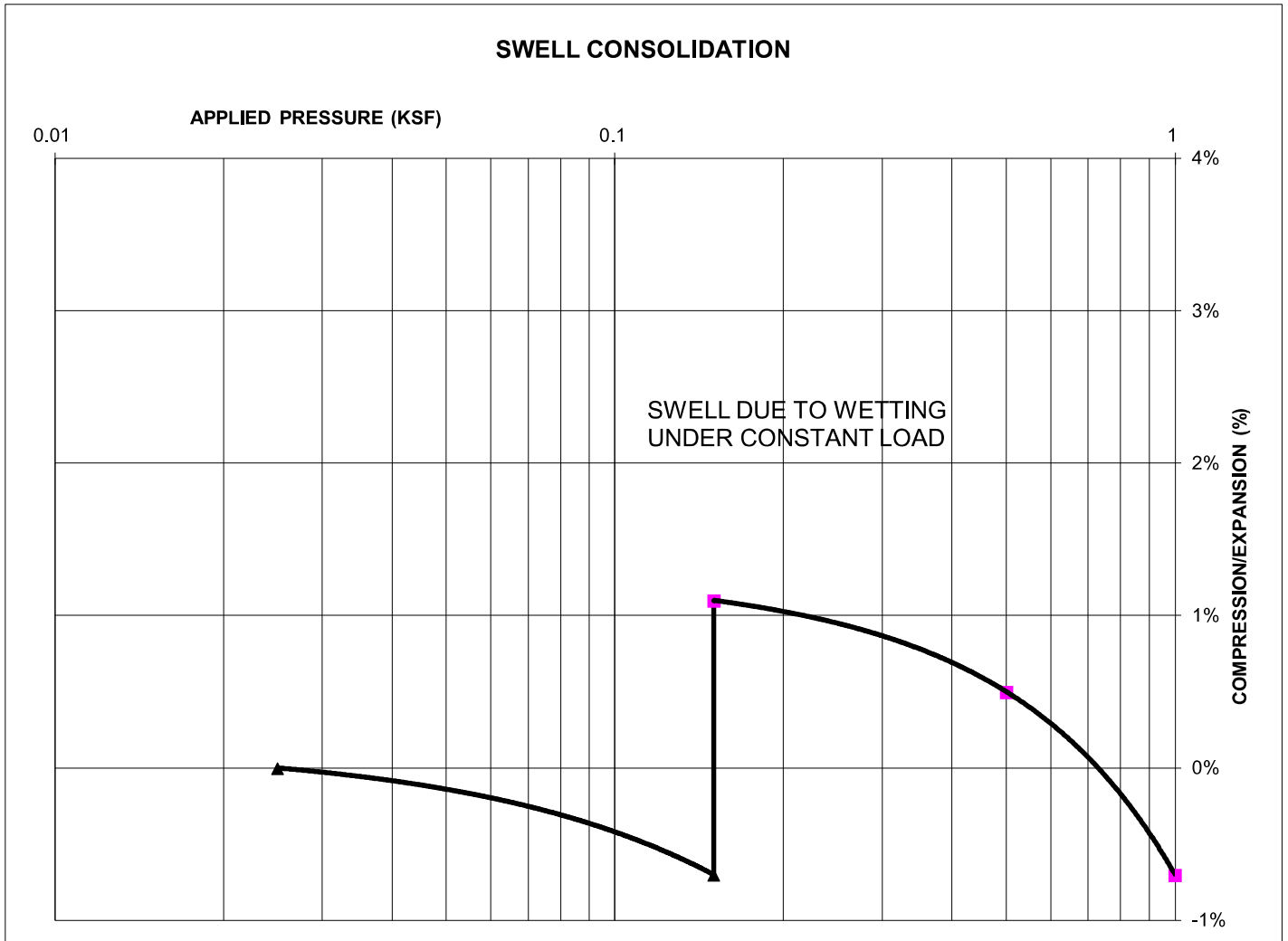
GLEN AT WIDEFIELD, FILING NO. 12
GLEN DEVELOPMENT

JOB NO.
231853

FIG. B-26

TEST BORING 7
DEPTH (FT) 1-2

SOIL DESCRIPTION FILL, CLAY, SANDY
SOIL TYPE 1



SWELL/COLLAPSE TEST RESULTS

NATURAL UNIT DRY WEIGHT (PCF): 103
NATURAL MOISTURE CONTENT: 17.6%
SWELL/COLLAPSE (%): 1.8%



SWELL TEST RESULTS

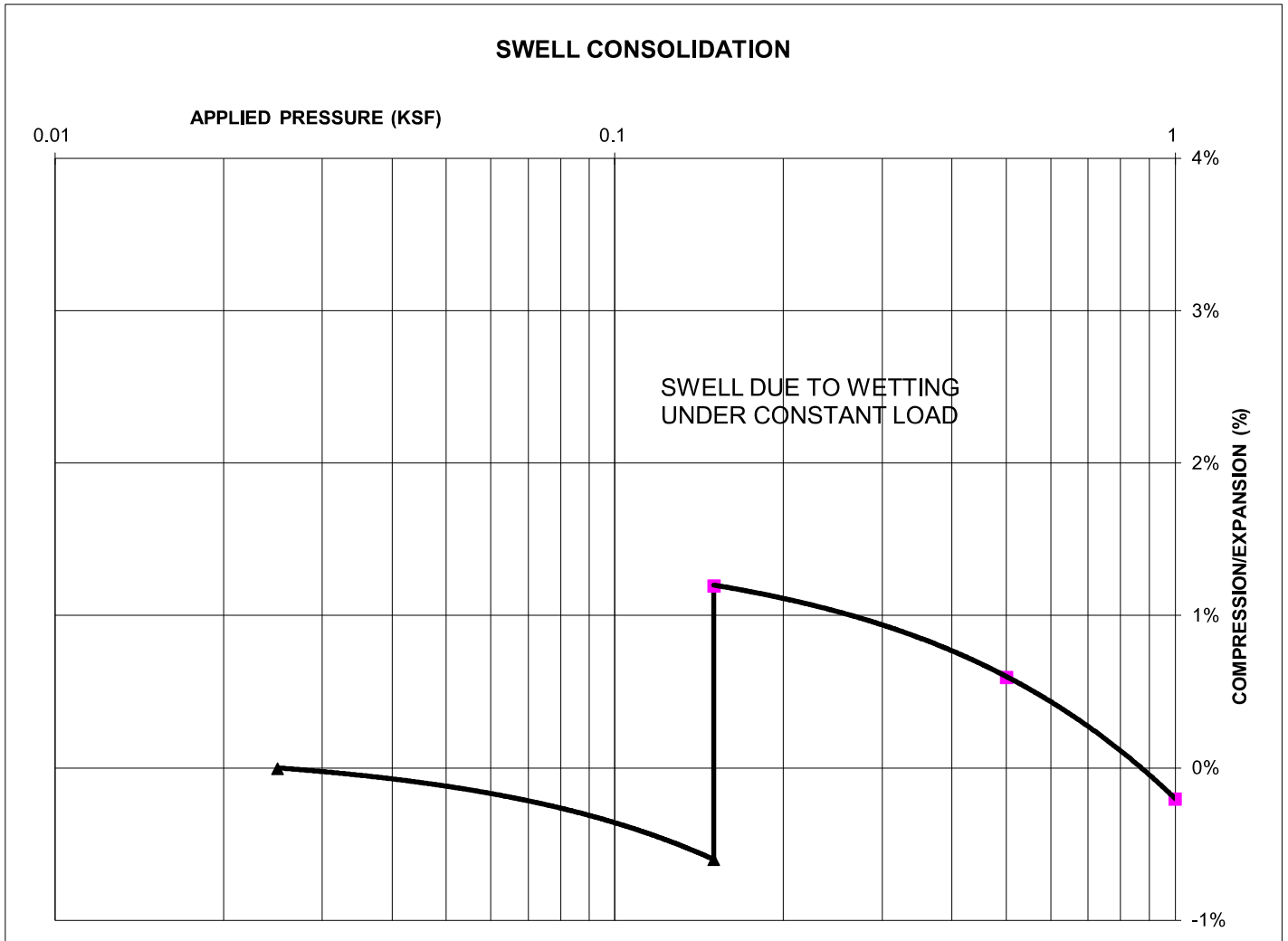
GLEN AT WIDEFIELD, FILING NO. 12
GLEN DEVELOPMENT

JOB NO.
231853

FIG. B-27

TEST BORING 8
DEPTH (FT) 1-2

SOIL DESCRIPTION FILL, CLAY, SANDY
SOIL TYPE 1



SWELL/COLLAPSE TEST RESULTS

NATURAL UNIT DRY WEIGHT (PCF): 107
NATURAL MOISTURE CONTENT: 16.6%
SWELL/COLLAPSE (%): 1.8%



SWELL TEST RESULTS

GLEN AT WIDEFIELD, FILING NO. 12
GLEN DEVELOPMENT

JOB NO.
231853

FIG. B-28

TEST BORING 10
DEPTH (FT) 1-2

SOIL DESCRIPTION FILL, CLAY, SANDY
SOIL TYPE 1



SWELL/COLLAPSE TEST RESULTS

NATURAL UNIT DRY WEIGHT (PCF): 111
NATURAL MOISTURE CONTENT: 11.6%
SWELL/COLLAPSE (%): 4.3%



SWELL TEST RESULTS

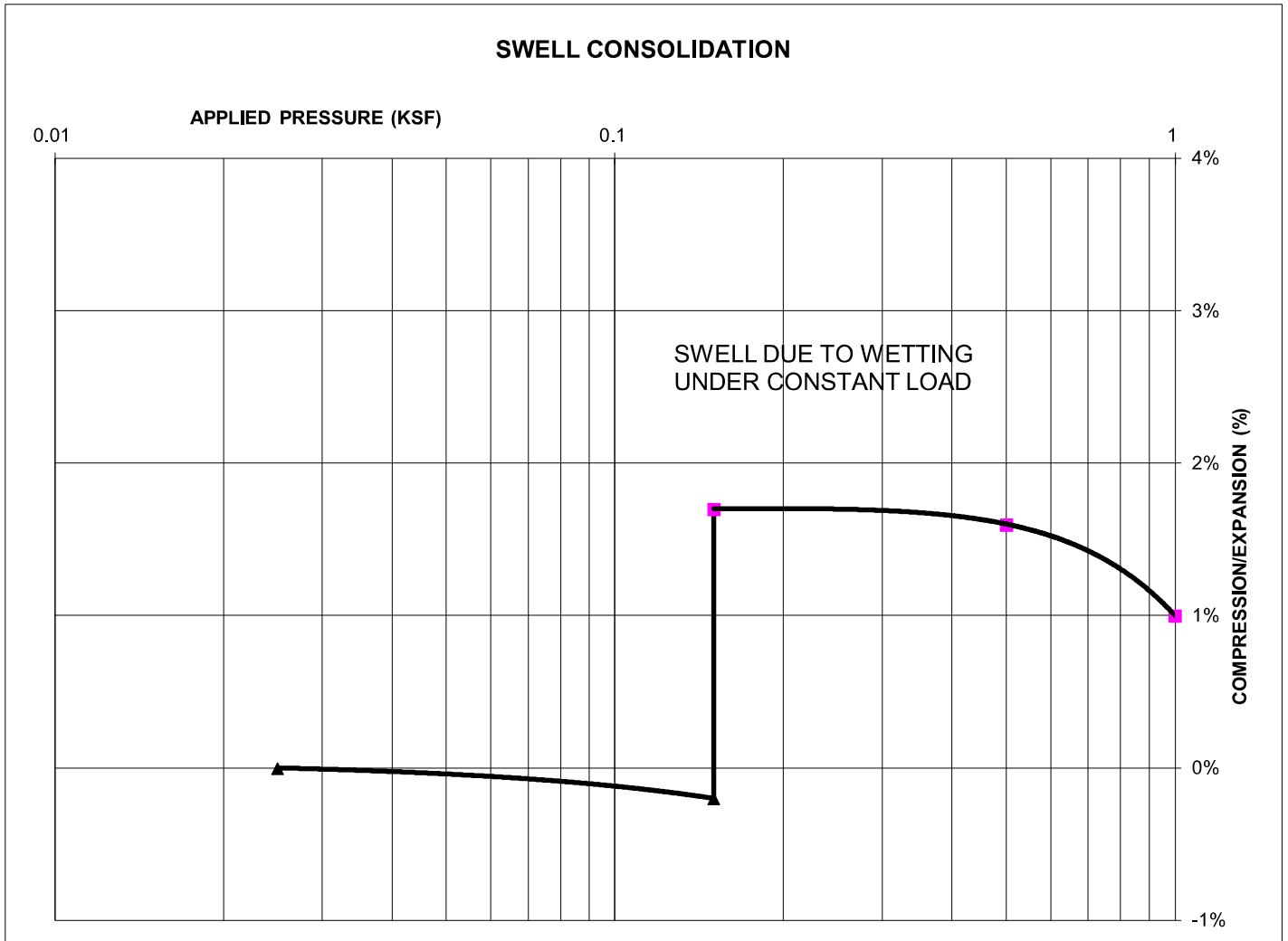
GLEN AT WIDEFIELD, FILING NO. 12
GLEN DEVELOPMENT

JOB NO.
231853

FIG. B-29

TEST BORING 12
DEPTH (FT) 1-2

SOIL DESCRIPTION FILL, CLAY, SANDY
SOIL TYPE 1



SWELL/COLLAPSE TEST RESULTS

NATURAL UNIT DRY WEIGHT (PCF): 119
NATURAL MOISTURE CONTENT: 13.0%
SWELL/COLLAPSE (%): 1.9%



SWELL TEST RESULTS

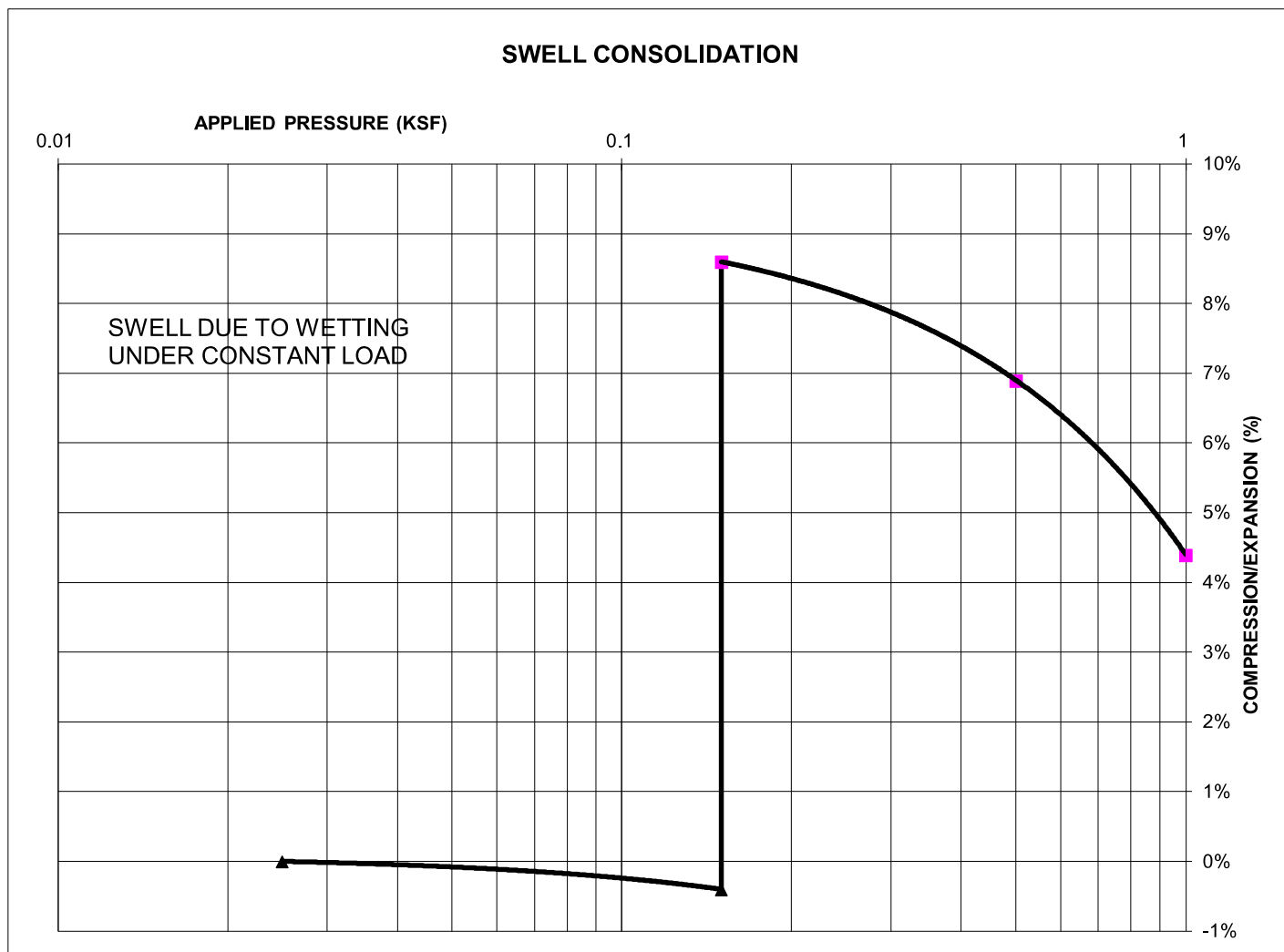
GLEN AT WIDFIELD, FILING NO. 12
GLEN DEVELOPMENT

JOB NO.
231853

FIG. B-30

TEST BORING 13
DEPTH (FT) 1-2

SOIL DESCRIPTION FILL, CLAY, WITH SAND
SOIL TYPE 1



SWELL/COLLAPSE TEST RESULTS

NATURAL UNIT DRY WEIGHT (PCF): 97
NATURAL MOISTURE CONTENT: 19.0%
SWELL/COLLAPSE (%): 9.0%



SWELL TEST RESULTS

GLEN AT WIDFIELD, FILING NO. 12
GLEN DEVELOPMENT

JOB NO.
231853

FIG. B-31

TEST BORING 15
DEPTH (FT) 1-2

SOIL DESCRIPTION FILL, SAND, CLAYEY
SOIL TYPE 1



SWELL/COLLAPSE TEST RESULTS

NATURAL UNIT DRY WEIGHT (PCF): 103
NATURAL MOISTURE CONTENT: 14.0%
SWELL/COLLAPSE (%): 1.5%



SWELL TEST RESULTS

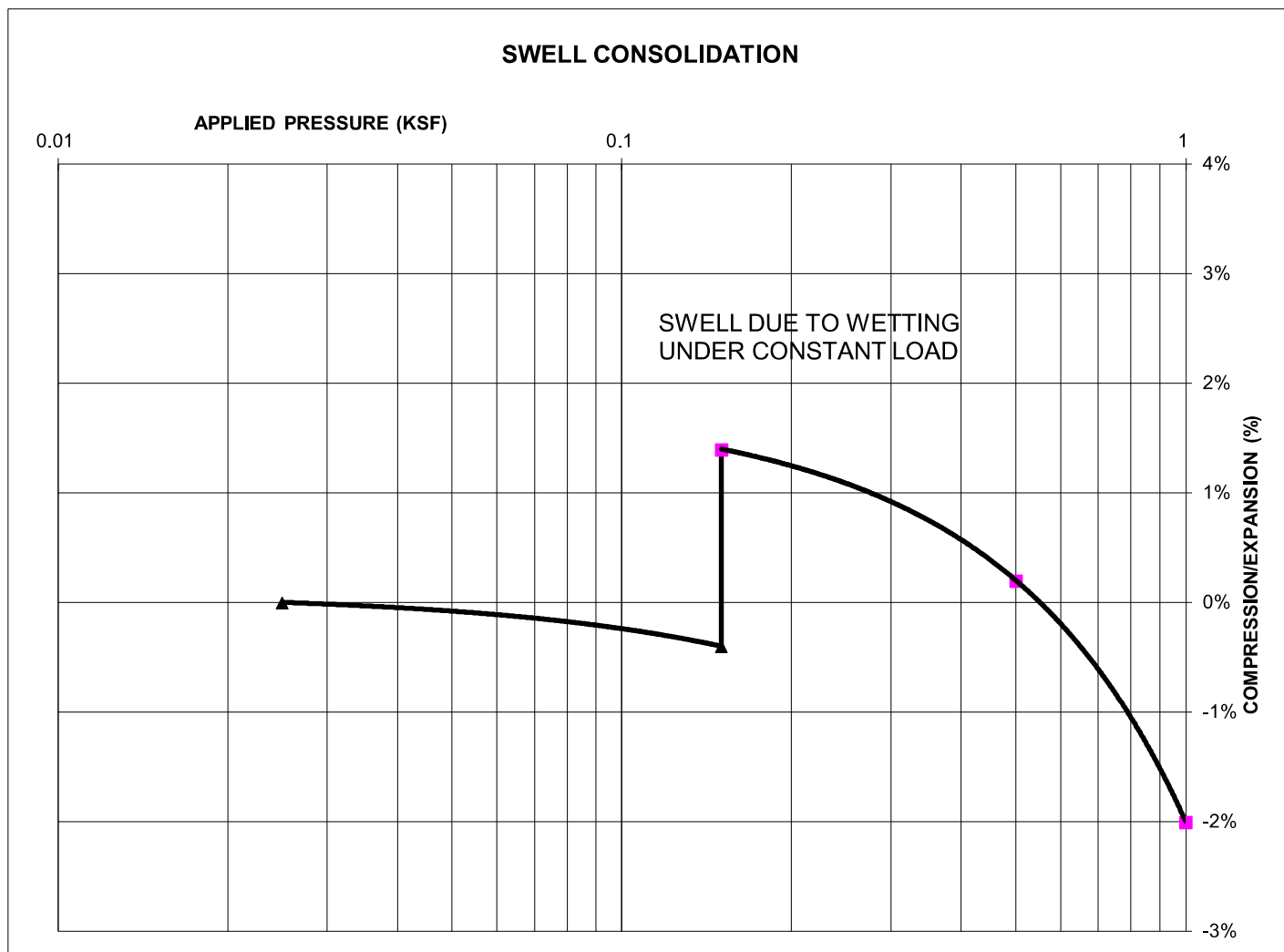
GLEN AT WIDEFIELD, FILING NO. 12
GLEN DEVELOPMENT

JOB NO.
231853

FIG. B-32

TEST BORING 6
DEPTH (FT) 1-2

SOIL DESCRIPTION CLAY, SANDY
SOIL TYPE 2



SWELL/COLLAPSE TEST RESULTS

NATURAL UNIT DRY WEIGHT (PCF): 90
NATURAL MOISTURE CONTENT: 8.0%
SWELL/COLLAPSE (%): 1.8%



SWELL TEST RESULTS

GLEN AT WIDFIELD, FILING NO. 12
GLEN DEVELOPMENT

JOB NO.
231853

FIG. B-33

TEST BORING 9
DEPTH (FT) 1-2

SOIL DESCRIPTION CLAY, SANDY
SOIL TYPE 2



SWELL/COLLAPSE TEST RESULTS

NATURAL UNIT DRY WEIGHT (PCF): 115
NATURAL MOISTURE CONTENT: 11.7%
SWELL/COLLAPSE (%): 4.6%



SWELL TEST RESULTS

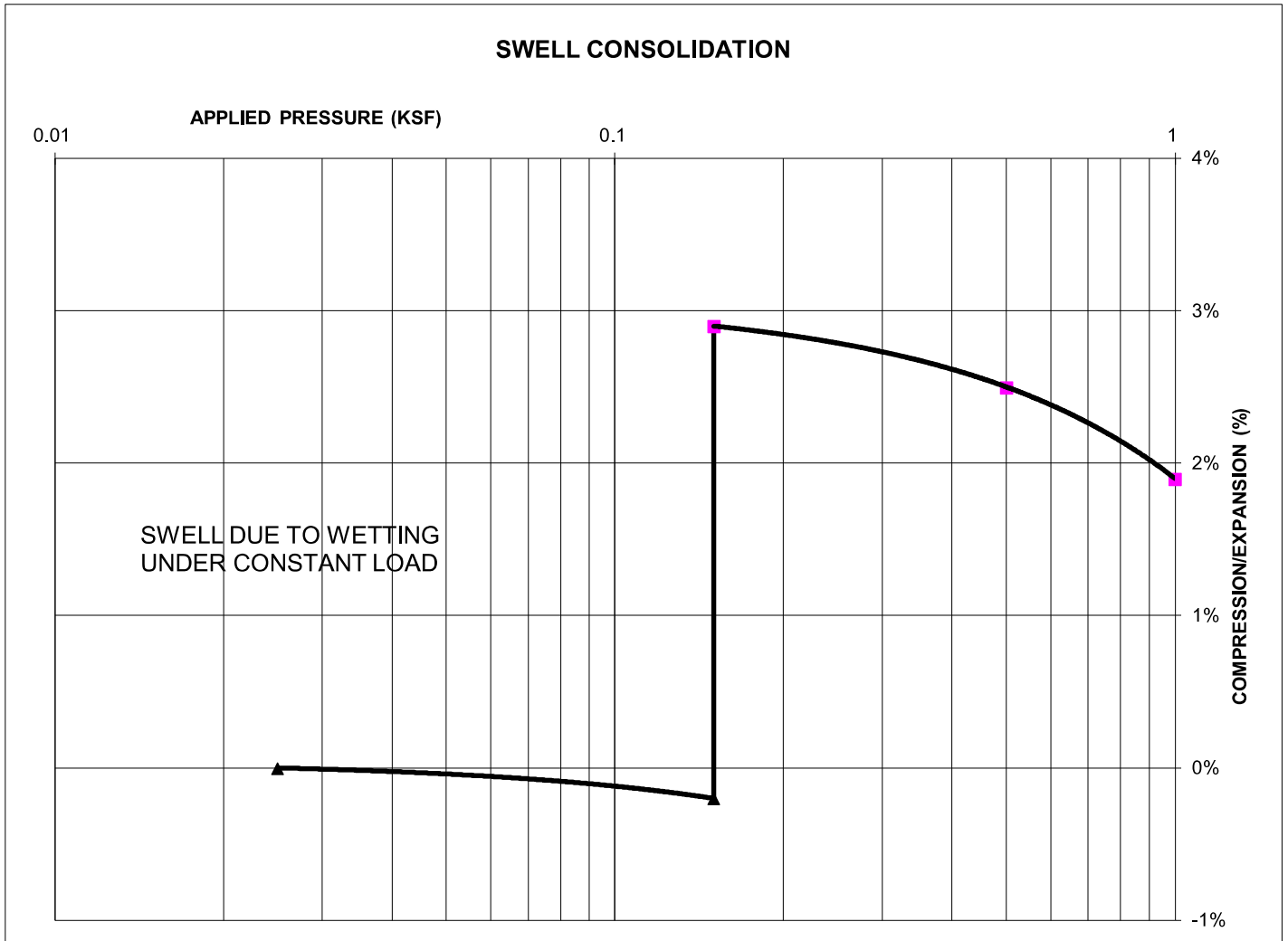
GLEN AT WIDEFIELD, FILING NO. 12
GLEN DEVELOPMENT

JOB NO.
231853

FIG. B-34

TEST BORING 11
DEPTH (FT) 1-2

SOIL DESCRIPTION CLAY, SANDY
SOIL TYPE 2



SWELL/COLLAPSE TEST RESULTS

NATURAL UNIT DRY WEIGHT (PCF): 121
NATURAL MOISTURE CONTENT: 12.1%
SWELL/COLLAPSE (%): 3.1%



SWELL TEST RESULTS

GLEN AT WIDEFIELD, FILING NO. 12
GLEN DEVELOPMENT

JOB NO.
231853

FIG. B-35

TEST BORING 14
DEPTH (FT) 1-2

SOIL DESCRIPTION SAND, CLAYEY
SOIL TYPE 2



SWELL/COLLAPSE TEST RESULTS

NATURAL UNIT DRY WEIGHT (PCF): 117
NATURAL MOISTURE CONTENT: 9.8%
SWELL/COLLAPSE (%): 5.5%



SWELL TEST RESULTS

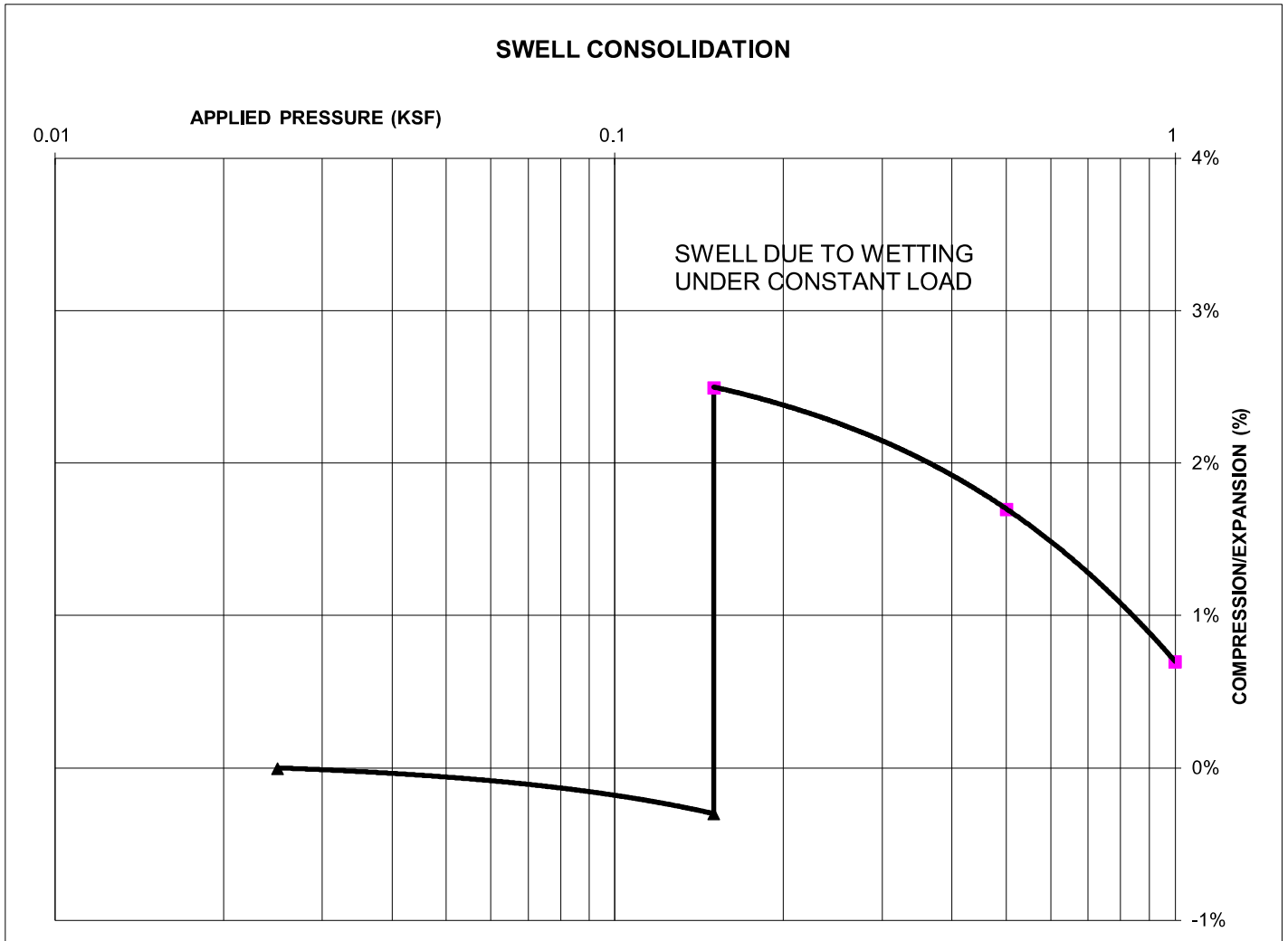
GLEN AT WIDEFIELD, FILING NO. 12
GLEN DEVELOPMENT

JOB NO.
231853

FIG. B-36

TEST BORING 6
DEPTH (FT) 10

SOIL DESCRIPTION CLAYSTONE (CLAY, SANDY)
SOIL TYPE 3



SWELL/COLLAPSE TEST RESULTS

NATURAL UNIT DRY WEIGHT (PCF): 118
NATURAL MOISTURE CONTENT: 9.9%
SWELL/COLLAPSE (%): 2.8%



SWELL TEST RESULTS

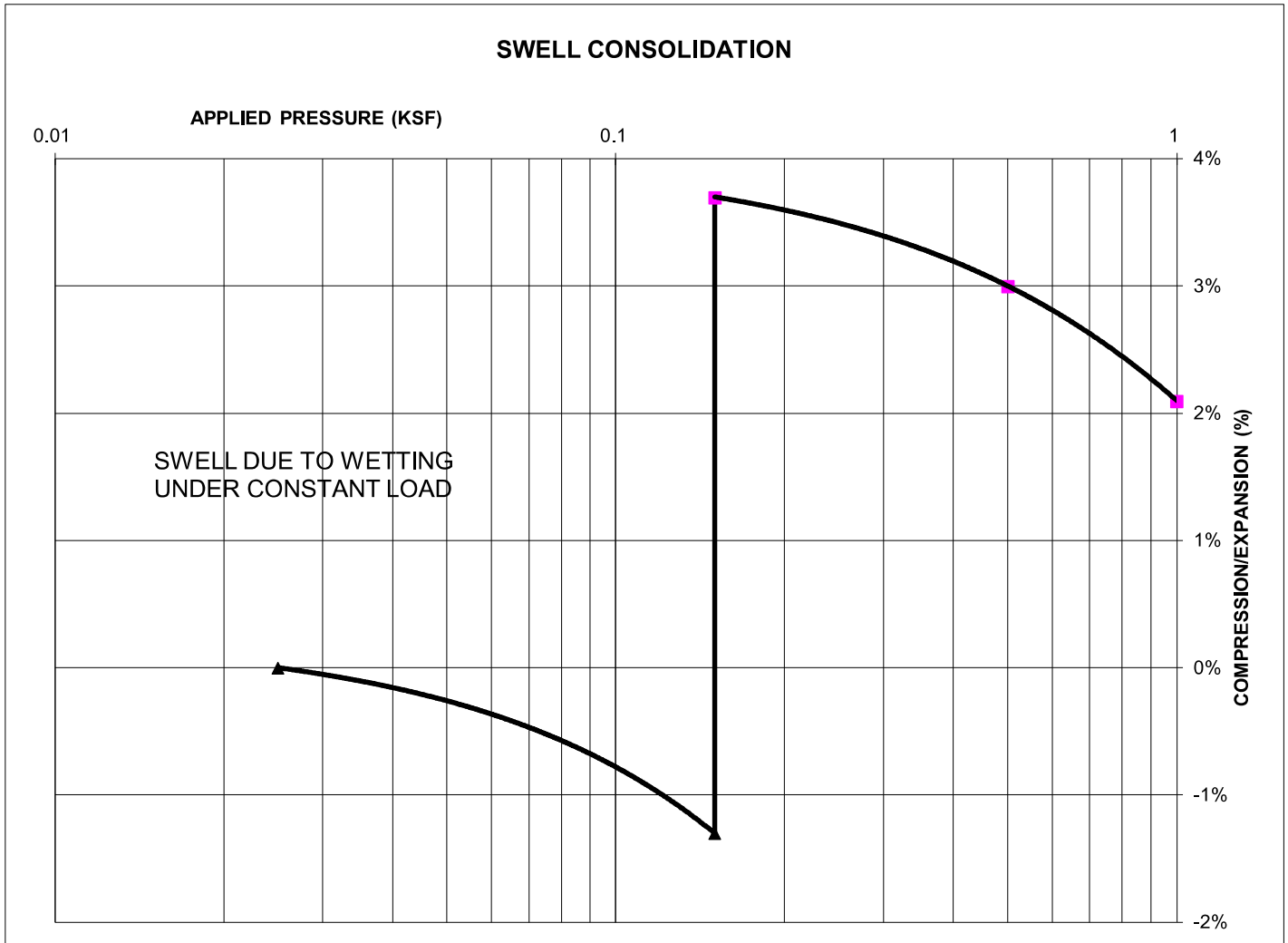
GLEN AT WIDEFIELD, FILING NO. 12
GLEN DEVELOPMENT

JOB NO.
231853

FIG. B-37

TEST BORING 9
DEPTH (FT) 5

SOIL DESCRIPTION CLAYSTONE (CLAY, SANDY)
SOIL TYPE 3



SWELL/COLLAPSE TEST RESULTS

NATURAL UNIT DRY WEIGHT (PCF): 116
NATURAL MOISTURE CONTENT: 12.2%
SWELL/COLLAPSE (%): 5.0%



SWELL TEST RESULTS

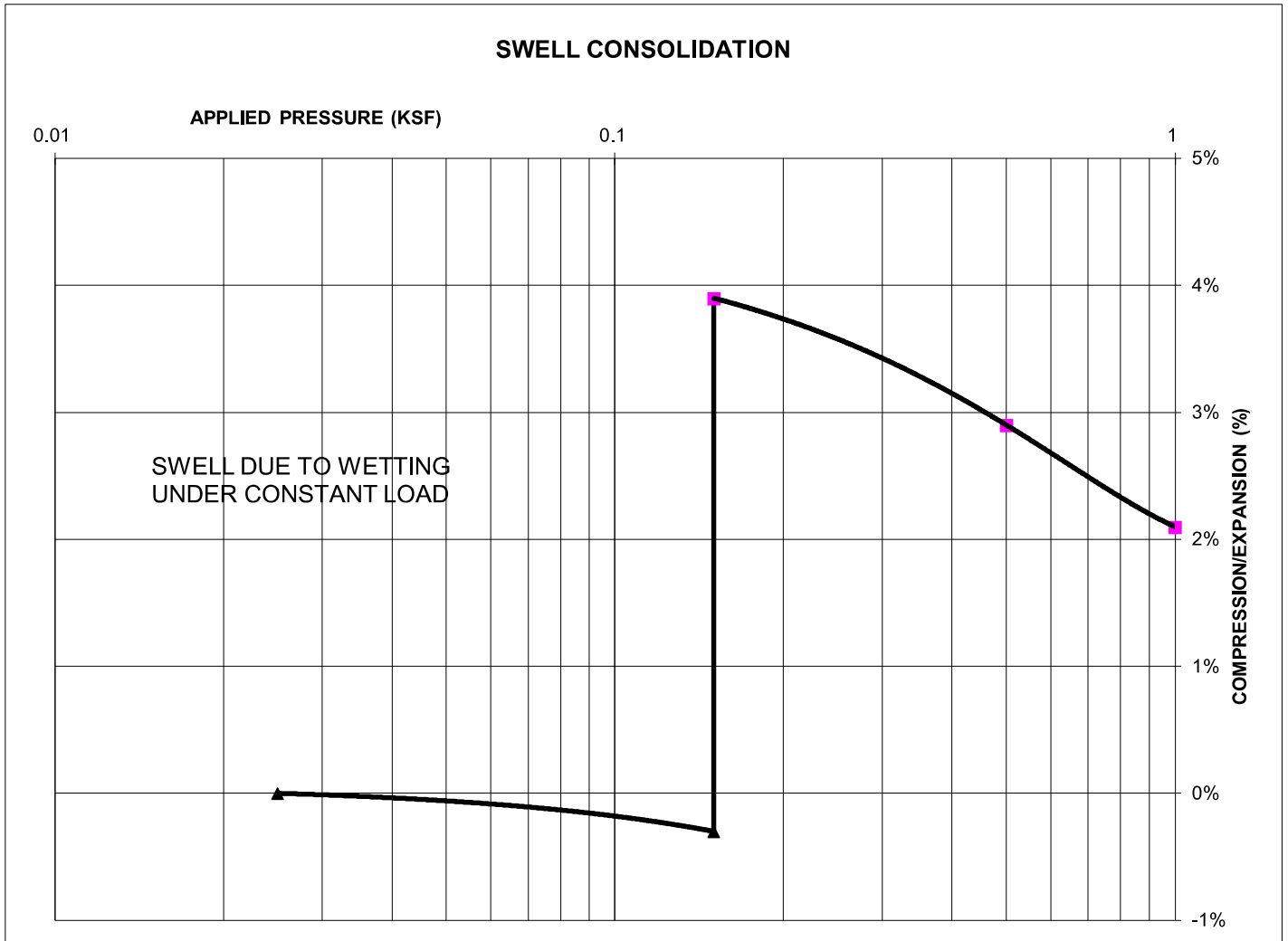
GLEN AT WIDFIELD, FILING NO. 12
GLEN DEVELOPMENT

JOB NO.
231853

FIG. B-38

TEST BORING 10
DEPTH (FT) 10

SOIL DESCRIPTION CLAYSTONE (CLAY, SANDY)
SOIL TYPE 3



SWELL/COLLAPSE TEST RESULTS

NATURAL UNIT DRY WEIGHT (PCF): 113
NATURAL MOISTURE CONTENT: 14.8%
SWELL/COLLAPSE (%): 4.2%



SWELL TEST RESULTS

GLEN AT WIDFIELD, FILING NO. 12
GLEN DEVELOPMENT

JOB NO.
231853

FIG. B-39

TEST BORING 11
DEPTH (FT) 10

SOIL DESCRIPTION CLAYSTONE (CLAY, SANDY)
SOIL TYPE 3



SWELL/COLLAPSE TEST RESULTS

NATURAL UNIT DRY WEIGHT (PCF): 117
NATURAL MOISTURE CONTENT: 12.5%
SWELL/COLLAPSE (%): 2.4%



SWELL TEST RESULTS

GLEN AT WIDEFIELD, FILING NO. 12
GLEN DEVELOPMENT

JOB NO.
231853

FIG. B-40

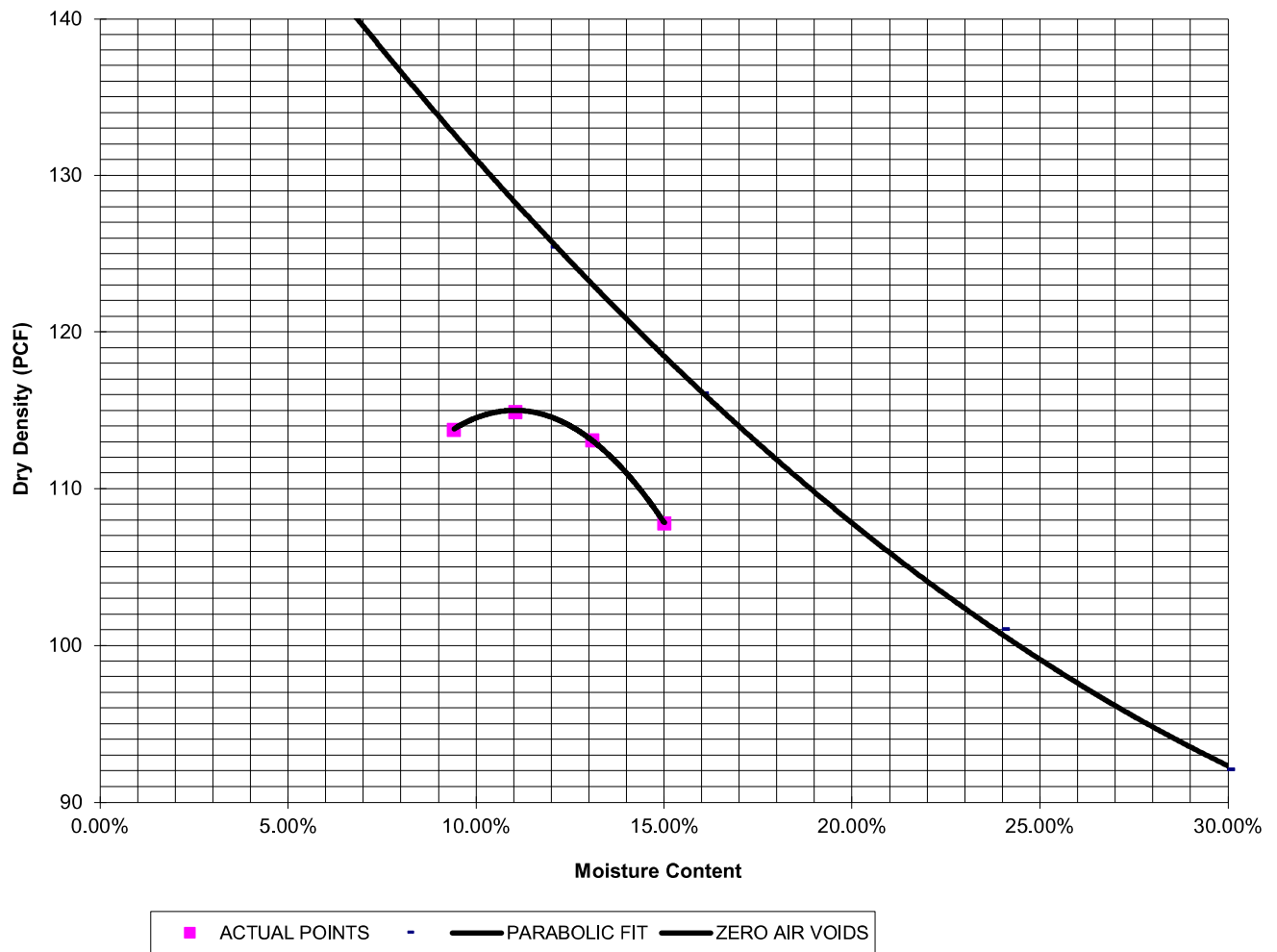
SAMPLE LOCATION TB-3 @ 0-3'

SOIL DESCRIPTION FILL, CLAY, SANDY, BROWN
SOIL TYPE 1

PROCTOR DATA

IDENTIFICATION: CL
PROCTOR TEST #: 1
TEST BY: BL
TEST DESIGNATION: ASTM-698-A
MAXIMUM DRY DENSITY (PCF): 114.9
OPTIMUM MOISTURE: 11.1

Compaction Curve



LABORATORY TEST RESULTS

GLEN AT WIDEFIELD, FILING NO. 12
GLEN DEVELOPMENT

JOB NO.
231853

FIG. B-41

SAMPLE LOCATION TB-3 @ 0-3'

SOIL DESCRIPTION FILL, CLAY, SANDY, BROWN

SOIL TYPE 1

CBR TEST LOAD DATA

Piston Diameter (cm): 4.958

Piston Area (in²): 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	35	11.70	68	22.72	121	40.43
0.050	45	15.04	88	29.41	158	52.80
0.075	51	17.04	98	32.75	181	60.48
0.100	56	18.71	106	35.42	204	68.17
0.125	61	20.38	119	39.77	221	73.85
0.150	64	21.39	126	42.11	226	75.52
0.175	69	23.06	131	43.78	232	77.53
0.200	71	23.73	133	44.44	244	81.54
0.300	78	26.07	156	52.13	299	99.92
0.400	84	28.07	173	57.81	332	110.94
0.500	93	31.08	186	62.16	365	121.97

MOISTURE AND DENSITY DATA

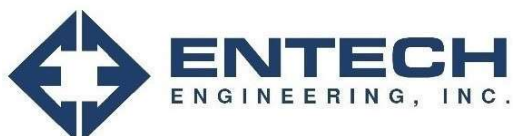
	Mold # 1	Mold # 2	Mold # 3
Can #	117	307	361
Wt. Can	8.55	9.06	8.58
Wt. Can+Wet	297.65	245.68	230.46
Wt. Can+Dry	238.6	202.08	191.66
Wt. H2O	59.05	43.6	38.8
Wt. Dry Soil	230.05	193.02	183.08
Moisture Content	25.67%	22.59%	21.19%
Wet Density (PCF)	114.1	121.7	128.4
Dry Density (PCF)	102.7	109.6	115.6
% Compaction	89%	95%	101%
CBR	1.87	3.54	6.82

PROCTOR DATA

Maximum Dry Density (pcf)	114.9
Optimum Moisture	11.1
90% of Max. Dry Density (pcf)	103.4
95% of Max. Dry Density (pcf)	109.2

CBR at 90% of Max. Density = 2.04 ~ R VALUE 6

CBR at 95% of Max. Density = 3.44 ~ R VALUE 7.5

**LABORATORY TEST RESULTS**

GLEN AT WIDEFIELD, FILING NO. 12
GLEN DEVELOPMENT

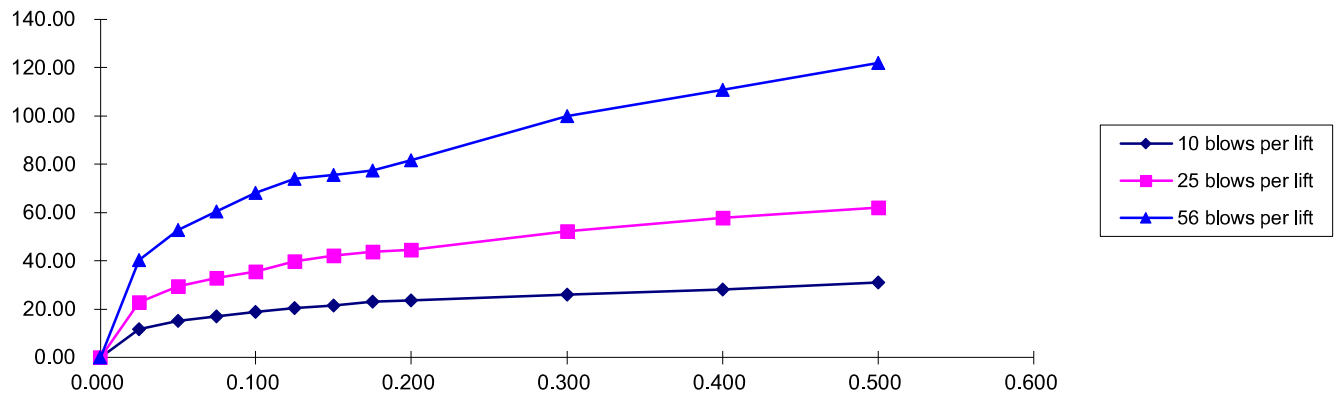
JOB NO.
231853

FIG. B-42

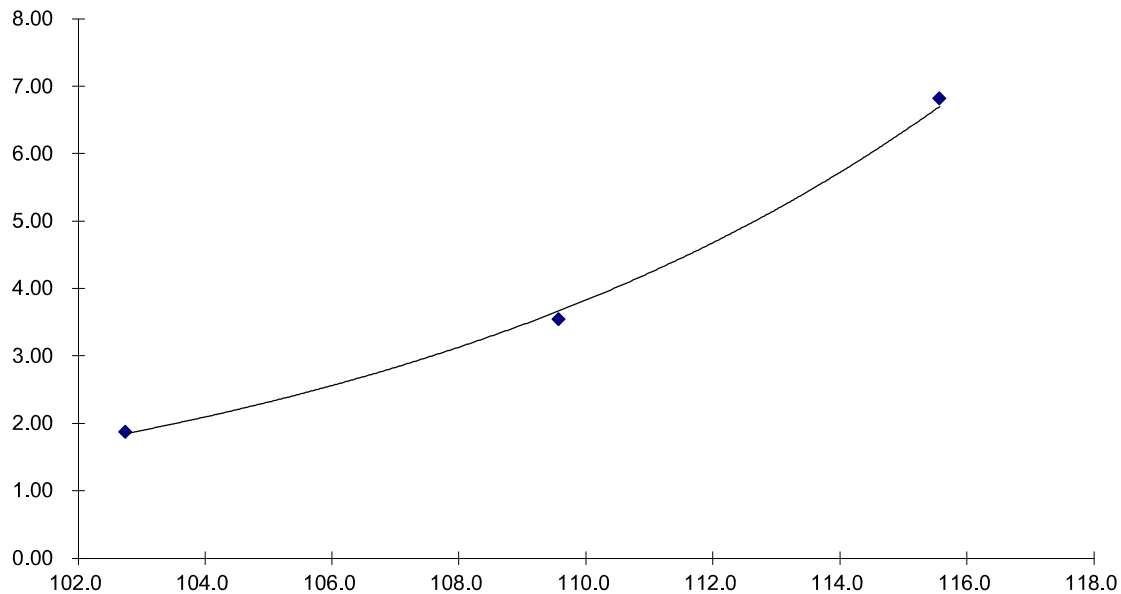
SAMPLE LOCATION TB-3 @ 0-3'

SOIL DESCRIPTION FILL, CLAY, SANDY, BROWN
SOIL TYPE 1

Stress VS Penetration



Bearing Ratio VS Dry Density



LABORATORY TEST RESULTS

GLEN AT WIDEFIELD, FILING NO. 12
GLEN DEVELOPMENT

JOB NO.
231853

FIG. B-43



APPENDIX C: Pavement Design Calculations

FLEXIBLE PAVEMENT DESIGN

PROJECT DATA

Project Location: Glen at Widefield F12 - Urban Local

Job Number: 231853

DESIGN DATA

Equivalent (18-kip) Single Axle Load Applications (ESAL):	ESAL (W_{18}) =	292,000
Design CBR	CBR =	3.4
Standard Deviation	S_o =	0.45
Loss in Serviceability	$\Delta\psi$ =	2.5
Reliability	Reliability =	80
Reliability (z-statistic)	Z_R =	-0.84
Soil Resilient Modulus	M_R =	5,100 psi

Required Structural Number (SN):  SN = 2.90

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	Coefficient	Thickness (D_i^*)	SN_i^*	SN
1	HMA	$C_1 = 0.44$	5.0 inches	2.200	-
2	ABC	$C_2 = 0.11$	8.0 inches	0.880	
SN* = 3.080					2.90

Pavement SN > Required SN, Design is Acceptable

FIG. C-1

FLEXIBLE PAVEMENT DESIGN

PROJECT DATA

Project Location: Glen at Widefield F12 - Urban Local Low Volume

Job Number: 231853

DESIGN DATA

Equivalent (18-kip) Single Axle Load Applications (ESAL):	ESAL (W_{18}) =	36,500
Design CBR	CBR =	3.4
Standard Deviation	S_o =	0.45
Loss in Serviceability	$\Delta\psi$ =	2.5
Reliability	Reliability =	80
Reliability (z-statistic)	Z_R =	-0.84
Soil Resilient Modulus	M_R =	5,100 psi

Required Structural Number (SN):  SN = 2.12

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	Coefficient	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					2.12

Pavement SN > Required SN, Design is Acceptable

FIG. C-3