ALR ENGINEERING & TESTING

Civil & Geotechnical Engineering w/ Material Testing

18361 Symeron Road, Apple Valley, Ca. 92307

760-810-2031 Cell # - 760-242-3130 Office #

(alrengineeringtesting@gmail.com)

REPORT

PRELIMINARY GEOTECHNICAL INVESTIGATION

APN 3066-261-10

On a 8.14 acre parcel on the East side of Sheepcreek Road and 300' North of Warbler Road, in the Phelan, County of San Bernardino, California

Prepared for

PHELAN PINON HILLS CSD

4037 Phelan Road, Suite C-1
Phelan, CA. 92329-4049

October 30, 2013
Revised April 25, 2022

Project No. 1308020

Engineers Do It To Your Specifications – Engineering Excellence

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PHELAN PINON HILLS CSD
Attn: DON BARTZ
4037 Phelan Road, Suite C-1
Phelan, CA. 92329-4049

Attention: Mr. Don Bartz,

Subject: ***Preliminary Geotechnical Investigation*** on the **8.14** acre parcel, **APN 3066-261-10**, located on the East side of Sheepcreek Road and 300' North of Warbler Road, in Phelan, County of San Bernardino, California.

In accordance with your authorization, **ALR Engineering & Testing**. performed a ***Preliminary Geotechnical Investigation*** for the above mentioned property for the purpose of a proposed ***Phase 1 Administration and the Phase 2 Future Gymnasium Development***. The enclosed report contains the results of our field investigation and laboratory testing and classification. Our efforts were directed towards providing classification and strength of the soils for determination of the foundation design.

We sincerely appreciate the opportunity of being service to you on this aspect of the project. Please do not hesitate to call us should you have any questions regarding the content of the reports.

Respectfully submitted,
ALR ENGINEERING & TESTING

John Longoria, EIT, QSP, NICET III, CESSWI, ICC
Senior Associate Engineer

Stephan M. Longoria, PE, QSD/QSP
Registered Civil Engineer

1.0 INTRODUCTION AND SCOPE OF WORK

1.1 Introduction

This report presents the results of our **P**reliminary **G**eotechnical **I**nvestigation for the **8.14** acre site, **APN 3066-261-10**. Located on the East side of Sheepcreek Road and 300' North of Warbler Road, in Phelan, County of San Bernardino, California. **Figures 1** and **2** show the location. We understand that the site will be utilized for an Administration, Service, and Future Gynasium Building Development.

1.2 Scope of Work

Our scope of work included:

* Review of available soils data.
* Subsurface investigation by CAT Backhoe.
* Perform laboratory testing.
* Geotechnical Engineering considerations.
* Report preparation with conclusions and recommendations.

2.0 FIELD INVESTIGATION AND LABORATORY TESTING

2.1 Field Investigation

A field investigation using a CAT backhoe equipped with a 30" bucket was performed on **October 26, 2013**. Five **(5)** trenches were excavated to an approximate depth of fifteen **(15)** feet measured from the existing ground surface. **Figure 3** shows the approximate location of the trenches.

The purpose of our investigation was to ascertain the geotechnical properties of near surface underlying soils for foundation recommendations, and was not intended to provide evidence of potential environmental conditions. **Appendix A** presents the trench logs. The trench logs and related data depict subsurface conditions only at the specific locations and time indicated.

2.2 Laboratory Testing

Laboratory testing on select representative samples included:

* Maximum Density Tests
* Inplace Dry Density Tests
* Gradation/Sieve Analysis

Inplace dry density in conjunction with laboratory maximum dry density, provides an indication of relative density (or relative compaction). This inplace relative compaction is utilized in estimation of potential shrinkage factors during grading and recommendations for site preparations, with relative compaction ranging from **84%** to **86%**. A total of eight **(8)** inplace density tests were performed using the sand cone method, two **(2)** Maximum Density Tests was performed in the laboratory on representative bulk samples.

Gradation/Sieve Analysis is useful in classifying of soils in accordance with the Unified Soil Classification System, ASTM D2487. A total of ten **(10)** Gradation/Sieve Analysis tests were performed. Gradation analysis can be utilized in qualitative determination of other engineering properties, such as compressibility, shear strength, and R-value.

Sand Equivalent Test (SE) is an indicator for cleanliness of the coarse grained soils and is useful in qualitative estimation of the R-value. A total of ten **(10)** sand equivalent tests were performed.

"R" Values are useful in determining the strength of soil for structural section design, ASTM 2844. A total of **(1)** "R" Value Test was performed in Sheepcreek Road.

Results of our laboratory testing are contained in **Appendix B**.

3.0 SITE AND SUBSURFACE CONDITIONS

3.1 Site Conditions

The subject site is vacant. The proposed location of the ***Proposed Phase 1-Administration, and Phase 2-Future Gymnasium Development*** is shown on **Figure 1-3**. The property is located on the East side of Sheepcreek Road and 300' North of Warbler Road, in Phelan. The property is in Section 24, T4N, R7W, **APN 3066-261-10**. The surface topography is relatively flat with a slight grade of approximately 1% and drains towards the Northeast.

3.2 Subsurface Conditions

Our field investigation and laboratory testing revealed that the near surface soils consist predominantly of silty **SANDS (SM)** and well graded **SANDS** with silts **(SW-SM). Appendix A** presents the detailed logs of soils encountered in our trenches.

4.0 GEOTECHNICAL ENGINEERING CONSIDERATIONS

Our geotechnical engineering evaluations are based on the limited field investigation and laboratory testing performed for the subject project.

4.1 Foundation System Considerations

Allowable bearing pressure for foundations depends upon the shear strength, settlement characteristics of the underlying soils, types of foundation system, acceptable differential movement, and depth of embedment. Based on the type of structures, our evaluations are directed towards the isolated footings as well as continuous footings.

4.2 Settlement and Heaving considerations:

Although no swell consolidation testing was performed, based on low field densities and our observations, the four feet of soils are likely to settle due to loading and introduction of water. In general, desert soils are cemented and undergo rapid consolidation due to saturation known as hydroconsolidation. Based on the loose to medium dense condition, the site is susceptible to low to moderate collapse potential according to criteria given below. This condition can be mitigated by overexcavation and recompaction.

Collapse Potential, %	Severity of Problem
0 - 1	No Problem
1 - 5	Moderate Trouble
5 - 10	Trouble
10 - 20	Severe Trouble
> 20	Very Severe Trouble

Clayey soils tend to swell upon saturation. Based on our observations the site soils are classified as very low (<20) expansion potential as per the IBC as given below.

Expansion Index	Potential Expansion
0 - 20	Very Low
21 - 50	Low
51 - 90	Medium
91 - 130	High

4.3 Seismic Considerations

Review of available Alquist-Priolo Special Studies Maps indicate that the site is not located within any known or published active fault zone. Detailed geologic study was not within the scope of this report. It is noted that there are several active faults situated in Southern California. Some of these major fault zones are located within thirty (30) miles of the project location.

According to the **2019 California Building Code (CBC)** the site soils can be classified as **Type D**. The site is considered to be located in **Seismic Zone 4**. The Table below provides the seismic parameters as contained in **2019 CBC**. Any changes in the present code should be considered during the design. ***Latitude: 34.422515 Longitude: -117.572272***

Site Classification:	**D**
Short period spectral site acceleration:	**S_S = 1.544g**
Spectral acceleration for a 1-sec condition period:	**S_1 = 0.634g**
Short period acceleration coefficient:	**Fa = 1.20**
1-second acceleration coefficient:	**Fv = null**
Modified:	**SMs = Fa*Ss = (1.2)(1.544) = 1.852g**
	SM_1 = Fv*S_1 = (null)(0.634) = null
Design Values:	**SDs = 2/3*(SMs) = 2/3*1.852 = 1.235g**
	SD_1 = 2/3*(SM_1) = 2/3*null = null
Seismic Design Category:	**null**

4.4 Seismically Induced Settlement

Ground movement and settlement can occur when relatively low density soils are subject to ground vibrations. Potential for settlement of near surface soils due to earthquake cannot be precluded. **The anticipated settlement is less than one inch. The potential total and differential seismically induced settlement shall be mitigated with subexcavation and recompaction.**

4.5 Liquefaction Potential

There was no observable springs or water seeping from this site or neighboring properties. The depth of the groundwater is obtained from the California Water Resources Data available on their web site. The approximate depth of groundwater from this data shows a depth of **680'**. As for the possibility of liquefaction, the criteria is listed below;

"Liquefaction occurs only when all of the following criteria have been met:

- The soil is cohesionless,
- The soil is loose,
- The soil is saturated,
- The earthquake produces ground shaking with sufficient intensity and duration,
- The ground shaking produces undrained conditions in the soil" (1)

Although our field investigation did not extend to great depths, based on our general experience, the site is not subject to liquefaction.

(1) Geotechnical Engineering Principles and Practices (p.692), by Donald P. Caduto, 1999, Upper Saddle River, NJ 07458, Prentice Hall

4.6 Wind Consideration

The site is located in the high wind zone. Design provisions of the latest California Building Code should be followed.

5.0 CONCLUSIONS

In our opinion the soils encountered on this project site are suitable for the proposed development of the administration and future gymnasium project, provided recommendations contained in this report are followed.

5.1 Upper four (4) feet of the soils are loose to medium dense, and dry. These materials are subject to settlement due to consolidation and ground vibrations. Overexcavation and recompaction of near surface soils, and other mitigating measures are discussed in **Section 6.0** of this report.

5.2 Our investigation and testing indicate that the near surface soils are likely to exhibit very low to low expansion potential.

5.3 Seismic considerations contained in **Section 4.3** should be considered during planning and design in conjunction with requirements of latest California Building Code.

5.4 The site is situated in a high wind speed area. The design should consider wind forces meeting the current requirements of the latest California Building Code.

6.0 RECOMMENDATIONS

6.1 Site Preparation

To achieve uniform support for foundations and slab-on-grade, the site should be cleared of all vegetation, debris and any deleterious materials. As described earlier herein, the upper four (4) feet of material is relatively loose to medium dense. To mitigate rapid settlement, and or expansion, we recommend that the building pad areas, extending five **(5)** feet beyond the outer most limits should be over-excavated to a depth of at least three **(3)** feet below the existing or lowest cut grade and further scarified to a depth of twelve **(12)** inches. The scarified surface should be inspected by **ALR Engineering & Testing** prior to recompaction. Upon approval of the soils engineer, the material should be uniformly moisture conditioned and recompacted to relative compaction of at least 90 percent. All grading operation, including excavation, removal and recompaction, shall be observed by **ALR Engineering & Testing** or his/her representative.

6.2 Shrinkage and Compaction Settlement During Grading

Our field investigation and field and laboratory testing determined that the near surface soils are loose to medium dense. Accordingly, we estimate the shrinkage factor to be approximately **15** to **20** percent during overexcavation and recompaction. Shrinkage is defined as the decrease in volume of soil due to artificial compaction, expressed as percentage of ratio of compacted dry density minus inplace density to compacted dry density. Shrinkage factors provided herein assumes an average relative compaction of 92 percent. Additionally, approximately **0.30** to **0.40** feet of compaction settlement should be considered during site grading.

6.3 Overexcavation and Recompaction

To provide uniform consistent soil support and drainage, we recommend that the upper three **(3)** feet below the existing grade or lowest cut grade be over excavated and recompacted. Once the pads have been excavated the bottom should be scarified an additional twelve **(12)** inches, the scarified surface should be observed by an experienced engineer and the bottom should be tested prior to the recompaction. Upon approval of the engineer, the material shall be uniformly moisture conditioned to near optimum moisture content and recompacted to a minimum relative compaction of 90%. The excavation then backfilled and compacted in loose lifts not exceeding eight **(8)** inches, after uniformly moisture conditioned as per compaction criteria provided herein this report.

6.4 Imported Fill

Imported fill should be free of all deleterious substances, and non expansive. The source of the imported fill should verified by the Engineer prior to being brought to the site.

6.5 Compaction Criteria

Following compaction criteria should be observed:

Structural Fill-Building areas extending at least 5' beyond the outermost building limit	90% or greater @ -2 to +2% of OMC
Backfill around retaining walls, Trench backfill from 1' to 4' below the subgrade	90% or greater @ -2 to +3% of OMC

All compaction and moisture content criteria are relative to ASTM D1557 Maximum Dry Density (MDD) and Optimum Moisture Content (OMC).

6.6 Foundation Design

The use of shallow, continuous and isolated footing foundation system is recommended provided other recommendations given in our report are followed. The max allowable bearing pressure and minimum footing foundation requirements are given below.

Maximum Allowable Bearing Pressure	# of Floors	Continuous Footings		Isolated Footings		Lateral Bearing Capacity	Sliding Coefficient
		Width	Depth	Width	Depth		
1800 psf	**Single Story**	**12"**	**12"**	**15"**	**15"**	**180 psf**	**0.25**

The bearing pressure can be increased by one-third for seismic or wind loading. As a minimum, all footings should be reinforced with one **(1)** No. 4 bar at the top and one **(1)** No. 4 bar at the bottom. Additional reinforcing should be determined by a structural engineer. A total settlement on the order of **0.75** inches should be anticipated, with differential settlement of about **0.35** inches.

6.7 Slab on Grade

We recommend a minimum thickness of four **(4)** inches. Two **(2)** inches of granular bedding (clean sand) underneath all slabs-on-grade underlain by a **6** mil thick Visqueen is recommended. All slabs should be reinforced with steel reinforcement of No. 3 bars twenty-four (24) inches on center both ways, placed at mid-height of the slab is recommended. An equivalent-welded wire mesh reinforcement, **6x6 - 6x6** may be used in lieu of No. **3** bars. We recommend construction joints at every approximately **200** square feet.

Concrete works exposed to an outside environment should be air contained with an air content of four (4) percent at the time of placement. All concrete should be placed at a slump not exceeding four (4) inches at time of placement.

6.8 Cement Type and Corrosion Potential

Based on our experience, we recommend Type II cement for all concrete works in contact with soils. Additionally we recommend 15 to 20% Type F Fly Ash as substitute for cement by weight.

6.9 Trench Backfill

Utility trench backfill material should be non-expansive, free of debris and any deleterious substances. Local onsite material is suitable for trench backfill. Granular bedding of one (1) foot underneath the water and sewer line pipes and six (6) inches above the pipes should be considered. The backfill should be compacted in loose lifts not exceeding six (6) inches to achieve relative compaction as set in **Section 6.4 Compaction Criteria**.

6.10 Surface Drainage and Landscaping

All grading should be such to direct surface runoff away from the building foundations. Roof runoff should also be directed away from the foundations. To mitigate settlement and potential swelling/collapse of near surface soils which could lead to distress to a structure, we recommend desert landscaping.

6.11 Pavement Structure

Sheepcreek Road is already paved but will need to be widened and curb and gutter and a Commercial driveway will need to be constructed. Following pavement recommendations are based on previous testing the area for bidding purposes.

Onsite paving	**4.0" of AC over compacted native soils**
Sheepcreek Road	**5.0" of AC over 12" of compacted CL II Base**

It is recommended that areas of and in front of the trash encloure be paved with 6" of PCC due to the trash truck frequent visits and the constant turns.

6.12 Field Observations and Testing

The recommendations contained in this report are based on the results of our limited preliminary investigation and our general experience with the similar soil conditions. It is critical that **ALR Engineering & Testing** observe the earthworks operation and test for compaction at various stages of the related construction activities. These activities include but may not be limited to:

* Overexcavation and scarification.
* Fill placement and backfilling.
* Subgrade preparation
* Placement of Base Course
* Trench and Utility backfill
* When any unusual conditions are encountered

Based on these observations and testing, it may be necessary to modify the recommendations contained herein.

6.14 Final Report

A final report should be prepared which will contain field observations, test results and additional recommendations, as warranted.

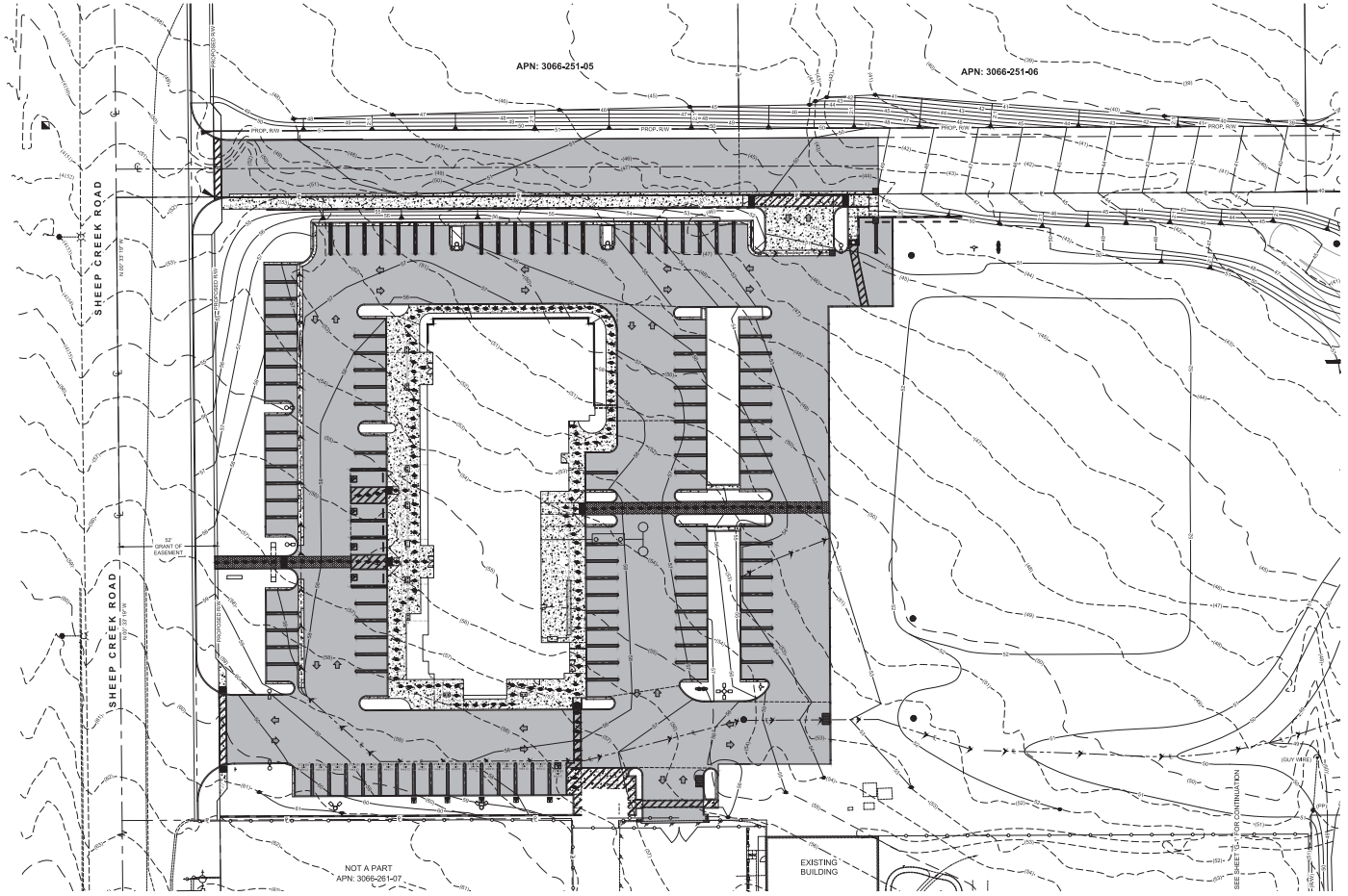
7.0 LIMITATIONS

Conclusions, recommendations and professional opinions resulting from our site observations, field investigation and laboratory testing are intended solely for the ***Proposed Administration and the Future Gymnasium Development***.

Our conclusions and recommendations are based on our understanding of the project and consistent with the level of skill ordinarily exercised by other professional consultants under similar circumstances at the same time our services were provided.

This report is exclusively prepared to assist the PPHCSD in the design of the footings and foundation support for the ***Proposed Administration and the Future Gymnasium Development*** on site.

ALR Engineering & Testing should be consulted to provide written modifications to the Recommendations contained in this report, depending upon the project requirements.



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1-800-422-4133
UNDERGROUND SERVICE ALERT
Call at least 2 working days prior to excavating

BENCHMARK:

U.S.G.S. BENCHMARK H 35, LOCATED 3.0 MI NORTH ALONG JOHNSON RD, FROM THE INTERSECTION OF PHELAN RD, 49 FT NORTHEAST OF THE CENTER OF THE INTERSECTION OF DUNCAN RD, 34 FT EAST OF THE CENTER LINE OF JOHNSON RD, 32.5 FT NORTH OF THE CENTER LINE DUNCAN RD, 6.6 FT WEST OF A FENCE, 6.3 FT NORTH OF A SECTION MARKER PIPE, 0.6 FT EAST OF A WITNESS POST, ABOUT 1 FT HIGHER THAN THE ROAD AND SET IN THE TOP OF A CONCRETE POST PROJECTING 0.4 FT ABOVE THE GROUND.
ELEV= 3616.50

NO.	REVISION	DATE	BY

REGISTERED PROFESSIONAL ENGINEER
Jerry L. Miles
No. C 42593
Civil
STATE OF CALIFORNIA

JERRY L. MILES R.C.E. 42593 - EXP. 3/31/22

PLANS PREPARED BY:
TRLS ENGINEERING Inc.
10770 I AVENUE, SUITE 108
Hesperia, CA 92345
Phone: (760) 948-4900

COUNTY OF SAN BERNARDINO
DEPARTMENT OF PUBLIC WORKS

DESIGNED BY: TER	DRAWN BY: TER	CHECKED BY:

APPROVED BY:

RECOMMENDED/APPROVED BY:
LAND DEVELOPMENT ENGINEER — DATE

ASST. DIRECTOR OF PUBLIC WORKS
DIRECTOR OF PUBLIC WORKS — DATE

- GRAD-2021-00235
- PRAA-2021-00040
- DRNSTY-2021-00054
- SIP-2021-00031
- NEWNR-2021-00230
- WQMP-2021-00153

DRAWN BY: TRLS DATE: 02/24/2022	PHELAN PINON HILLS COMMUNITY SERVICES DISTRICT CIVIC CENTER DEVELOPMENT PHASE 1 9535 SHEEPCREEK RD, PHELAN, CA, 92329 (APN: 3066-261-10, 3066-261-08 & 3066-251-14)
DESIGNED BY: TER DATE: -	
APPROVED BY: DATE:	GRADING PLAN

SCALE: AS SHOWN
SHEET 1 OF 1
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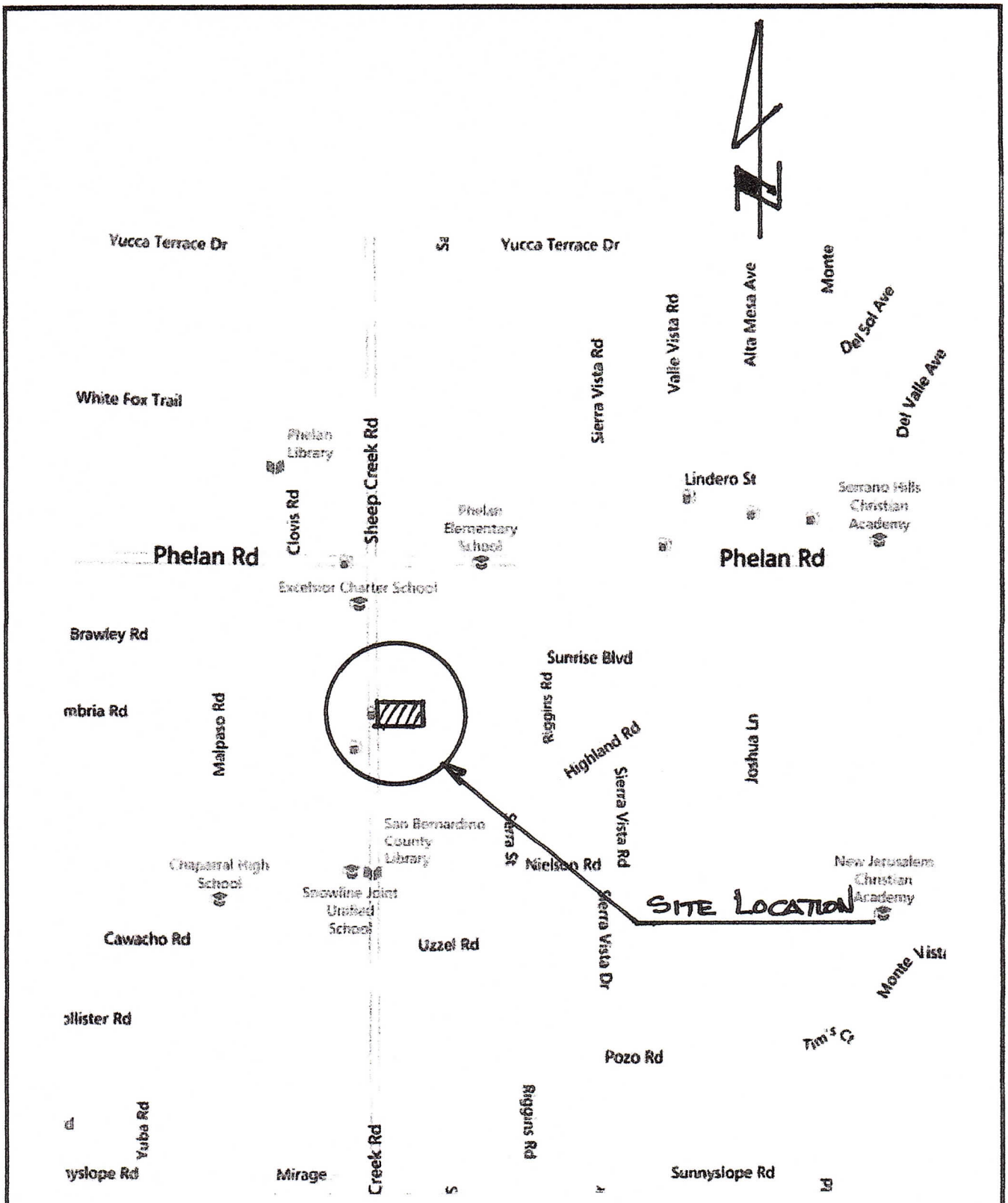
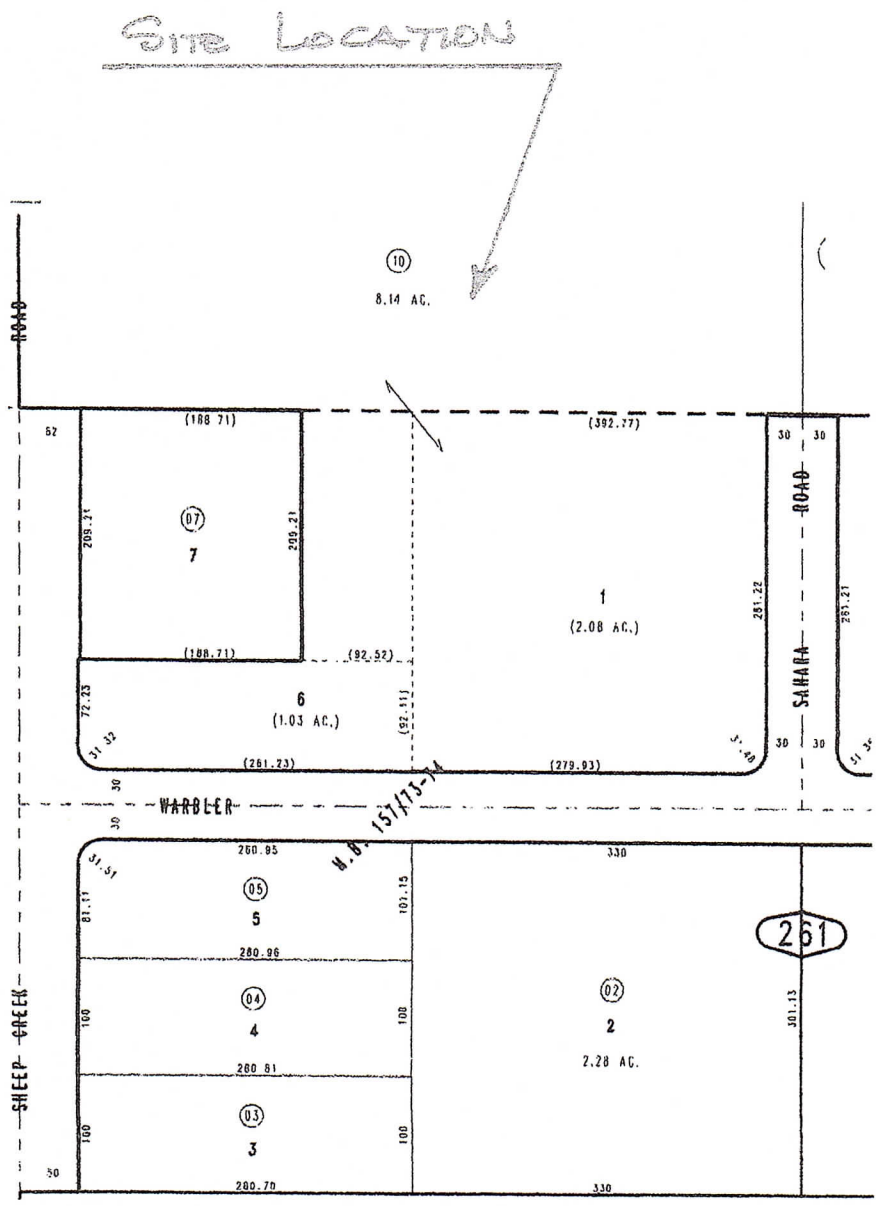


ALR ENGINEERING & TESTING Civil & Geotechnical Engineering w/ Material Testing 18361 Symeron Road Apple Valley, Ca. 92307 (760) 810-2031 Cell # (760) 242-3130 Office #	Phelan	Project No. 1308020
	APN 3066-251-10	
	PHELAN PINON HILLS CSD	
	VICINITY MAP	Figure No. 1



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	APN 3066-251-10	
	PHELAN PINON HILLS CSD	
	ASSESSOR'S MAP	Figure No. 2

APPENDIX A

TABLE 1 Soil Classification Chart

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests[A]				Soil Classification	
				Group Symbol	Group Name[B]
Coarse-Grained Soils More than 50 % retained on No. 200 sieve	Gravels More than 50 % of coarse fraction retained on No. 4 sieve	Clean Gravels Less than 5 % fines[C]	$Cu \geq 4$ and $1 \leq Cc \leq 3$[E]	GW	Well-graded gravel[F]
			$Cu < 4$ and/or $1 > Cc > 3$[E]	GP	Poorly graded gravel[F]
		Gravels with Fines More than 12 % fines[C]	Fines classify as ML or MH	GM	Silty gravel[F,G,H]
			Fines classify as CL or CH	GC	Clayey gravel[F,G,H]
	Sands 50 % or more of coarse fraction passes No. 4 sieve	Clean Sands Less than 5 % fines[D]	$Cu \geq 6$ and $1 \leq Cc \leq 3$[E]	SW	Well-graded sand
			$Cu < 6$ and/or $1 > Cc > 3$[E]	SP	Poorly graded sand[I]
		Sands with Fines More than 12 % fines[D]	Fines classify as ML or MH	SM	Silty sand[G,H,J]
			Fines classify as CL or CH	SC	Clayey sand[G,H,I]
Fine-Grained Soils 50 % or more passes the No. 200 sieve	Silts and Clays Liquid limit less than 50	inorganic	PI > 7 and plots on or above "A" line[J]	CL	Lean clay[K,L,M]
			PI < 4 or plots below "A" line[J]	ML	Silt[K,L,M]
		organic	$\frac{\text{Liquid limit - oven dried}}{\text{Liquid limit - not dried}} < 0.75$	OL	Organic clay[K,L,M,N] / Organic silt[K,L,M,O]
	Silts and Clays Liquid limit 50 or more	inorganic	PI plots on or above "A" line	CH	Fat clay[K,L,M]
			PI plots below "A" line	MH	Elastic silt[K,L,M]
		organic	$\frac{\text{Liquid limit - oven dried}}{\text{Liquid limit - not dried}} < 0.75$	OH	Organic clay[K,L,M,P] / Organic silt[K,L,M,Q]
Highly organic soils		Primarily organic matter, dark in color, and organic odor		PT	Peat

[A] Based on the material passing the 3-in. (75-mm) sieve.

[B] If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.

[C] Gravels with 5 to 12 % fines require dual symbols:
GW-GM well-graded gravel with silt
GW-GC well-graded gravel with clay
GP-GM poorly graded gravel with silt
GP-GC poorly graded gravel with clay

[D] Sands with 5 to 12 % fines require dual symbols:
SW-SM well-graded sand with silt
SW-SC well-graded sand with clay
SP-SM poorly graded sand with silt
SP-SC poorly graded sand with clay

[E] $Cu = D_{60}/D_{10}$ $\quad \frac{(D_{30})^2}{D_{10} \times D_{60}}$

[F] If soil contains ≥ 15 % sand, add "with sand" to group name.

[G] If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.

[H] If fines are organic, add "with organic fines" to group name.

[I] If soil contains ≥ 15 % gravel, add "with gravel" to group name.

[J] If Atterberg limits plot in hatched area, soil is a CL-ML, silty clay.

[K] If soil contains 15 to 29 % plus No. 200, add "with sand" or "with gravel," whichever is predominant.

[L] If soil contains ≥ 30 % plus No. 200, predominantly sand, add "sandy" to group name.

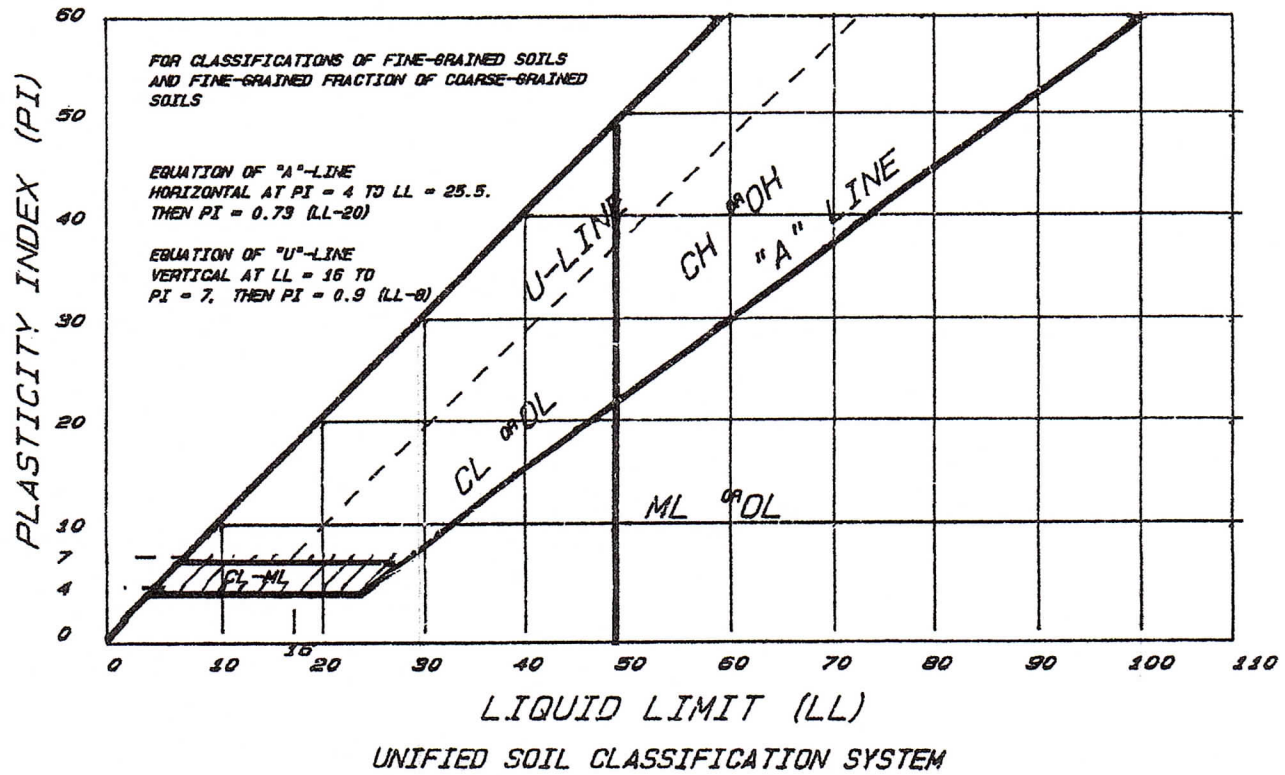
[M] If soil contains ≥ 30 % plus No. 200, predominantly gravel, add "gravelly" to group name.

[N] PI ≥ 4 and plots on or above "A" line.

[O] PI < 4 or plots below "A" line.

[P] PI plots on or above "A" line.

[Q] PI plots below "A" line.



UNIFIED SOIL CLASSIFICATION SYSTEM

ASTM D2487

ALR ENGINEERING AND TESTING

TEST PIT NO. TP-1

Project: APN 3066-261-10 **Project # 1308020**

Client: PHELAN PINON HILLS CSD **Date: 10-26-2013**

Depth Feet	Sample Type	Moisture Content %	Dry Density pcf.	Lab Test Type	Soil Class		Geotechnical Description
0.5'					SW-SM		Well graded SAND with silts and much gravel and traces of rock to 3", Coarse to medium, Light Brown, Damp, Medium Dense
1.0'							
1.5'							
2.0'							
2.5'							
3.0'							
3.5'							
4.0'	**BAG**	**8.5%**	**128.25**	**MAX SIEVE SE**			
4.5'							
5.0'							
5.5'							
6.0'	**BAG**			**SIEVE SE**	**SW-SM**		Well graded SAND with silts and some gravel, Medium to fine, Tan, Damp, Medium Dense
6.5'							
7.0'							
7.5'							
8.0'							
8.5'							
9.0'							
10.0'							
11.0'					SW-SM		Well graded SAND with silts, Medium to fine, Tan, Damp, Medium Dense to Loose
12.0'	**BAG**			**SIEVE SE**			
13.0'							
14.0'							**Bottom of Exploratory Trench**

Test Pit No. TP-1 **Plate A-1**

ALR ENGINEERING AND TESTING

TEST PIT NO. TP-2

Project: APN 3066-261-10 **Project # 1308020**

Client: PHELAN PINON HILLS CSD **Date: 10-26-2013**

Depth Feet	Sample Type	Moisture Content %	Dry Density pcf.	Lab Test Type	Soil Class		Geotechnical Description
0.5'					SM		Silty SAND, Coarse to medium, Tan, Dry, Medium Dense
1.0'							
1.5'	BAG	8.5%	124.25	MAX SIEVE SE			
2.0'							
2.5'							
3.0'					SW-SM		Well graded SAND with silts, Coarse to medium, Tan, Damp, Medium Dense
3.5'	BAG			SIEVE SE			
4.0'							
4.5'							
5.0'	BAG			SIEVE SE	SW-SM		Well graded SAND with silts and some gravel, Coarse to medium, Tan, Damp, Medium Dense
5.5'							
6.0'							
6.5'							
7.0'	BAG				SW-SM		Well graded SAND with silt, Medium to fine, Tan, Damp, Medium Dense
7.5'							
8.0'							
8.5'							Traces of rock to 4"
9.0'							
10.0'							
11.0'							
12.0'							
13.0'							
14.0'							Bottom of Exploratory Trench

ALR ENGINEERING AND TESTING

TEST PIT NO. TP-3

Project: APN 3066-261-10 **Project # 1308020**

Client: PHELAN PINON HILLS CSD **Date: 10-26-2013**

Depth Feet	Sample Type	Moisture Content %	Dry Density pcf.	Lab Test Type	Soil Class		Geotechnical Description
0.5'					SM		Silty SAND, Medium to fine, Light Brown, Dry, Medium Dense to Loose
3.0'					SW-SM		Well graded SAND with silts and traces of gravel, Coarse to medium, Tan, Dry, Medium Dense
6.5'					SW-SM		Well graded SAND with silts and much gravel with rock to 6", Coarse to medium, Tan, Dry, Medium Dense
14.0'							Bottom of Exploratory Trench

Test Pit No. TP-3 **Plate A-3**

ALR ENGINEERING AND TESTING

TEST PIT NO. TP-4

Project: APN 3066-261-10 **Project # 1308020**

Client: PHELAN PINON HILLS CSD **Date: 10-26-2013**

Depth Feet	Sample Type	Moisture Content %	Dry Density pcf.	Lab Test Type	Soil Class		Geotechnical Description
0.5'					SM		Silty SAND with traces of gravel, Coarse to medium Tan, Dry, Medium Dense
2.0'					SW-SM		Well graded SAND with silts and gravel, Coarse to medium, Tan, Dry, Medium Dense
3.0'	BAG			SIEVE SE			
4.0'					SW-SM		Well graded SAND with silts and much gravel and some rock to 16", Tan, Dry, Medium dense
5.0'	BAG			SIEVE SE			
8.0'					SW-SM		Well graded SAND with silts and much gravel with rock to 6", Coarse to medium, Tan, Dry, Medium Dense
14.0'							Bottom of Exploratory Trench

ALR ENGINEERING AND TESTING

TEST PIT NO. TP-5

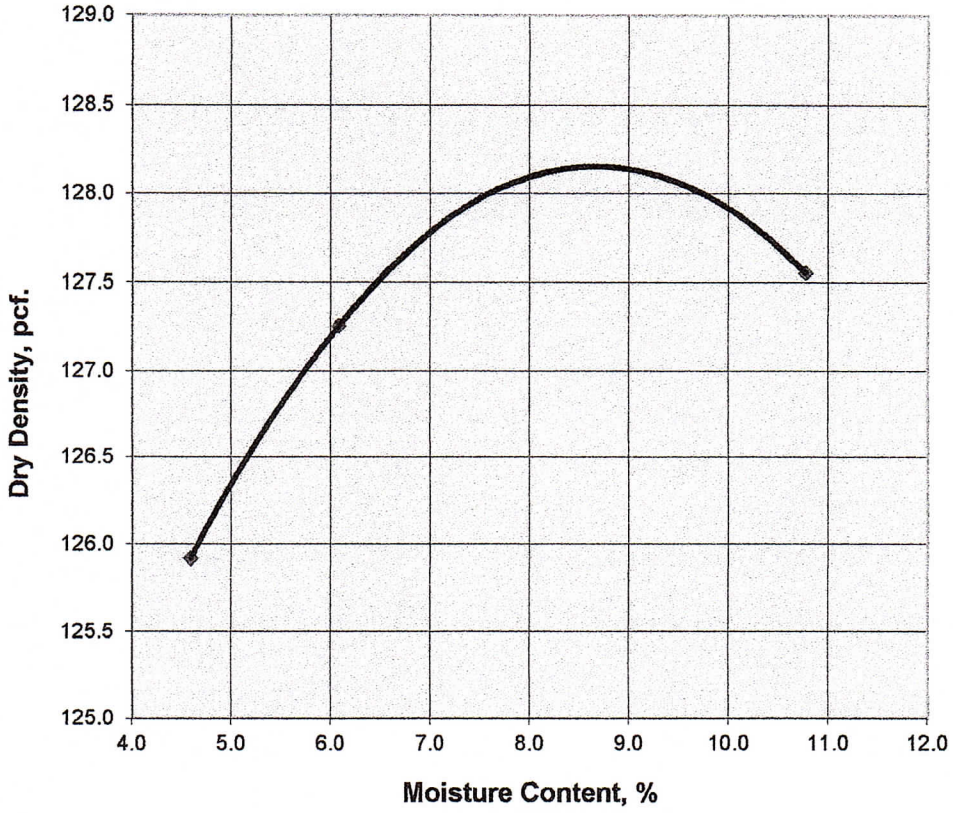
Project: APN 3066-261-10 **Project # 1308020**

Client: PHELAN PINON HILLS CSD **Date: 10-26-2013**

Depth Feet	Sample Type	Moisture Content %	Dry Density pcf.	Lab Test Type	Soil Class		Geotechnical Description
0.5'					SM		Silty SAND, Medium to fine, Light Brown, Dry, Medium Dense
2.0'	BAG			SIEVE SE	SM		Silty SAND with some clumping and gravel, Light Brown, Damp, Medium Dense
6.0'					SM		Silty SAND with much gravel and rock to 6", Light Brown, Damp, Medium Dense
14.0'							Bottom of Exploratory Trench

APPENDIX B

Dry Density - Moisture Content Relationship



Date: 10/25/2013 Location : TP-1

Field Density Test No. 1 Depth: 4.0'

Soil Type: SM

Method of Compaction: ASTM D 1557A Maximum Dry Density: 128.25 pcf

Optimum Moisture Content: 8.50%

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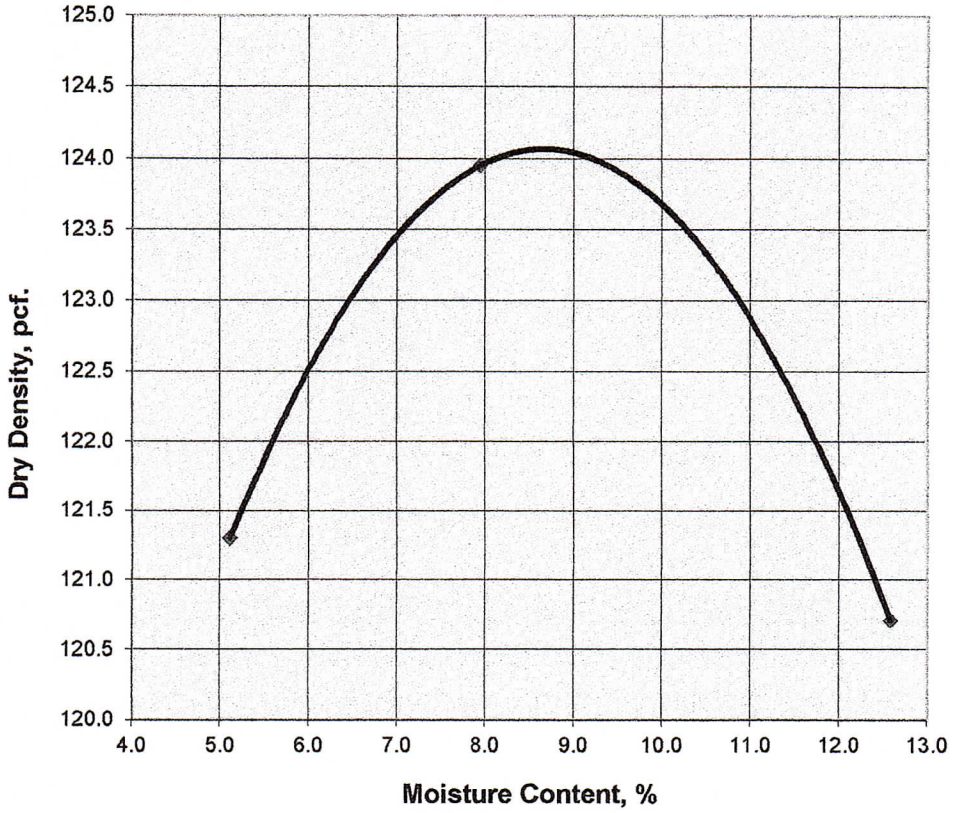
Phelan	Project No. 1308020
APN 3066-251-10	
PLATE B - 1	

Dry Density - Moisture Content Relationship



Date: 10/25/2013 Location : TP-2

Field Density Test No. 2 Depth: 1.5'

Soil Type: SM

Method of Compaction: ASTM D 1557A

Maximum Dry Density: 124.25 pcf

Optimum Moisture Content: 8.50%

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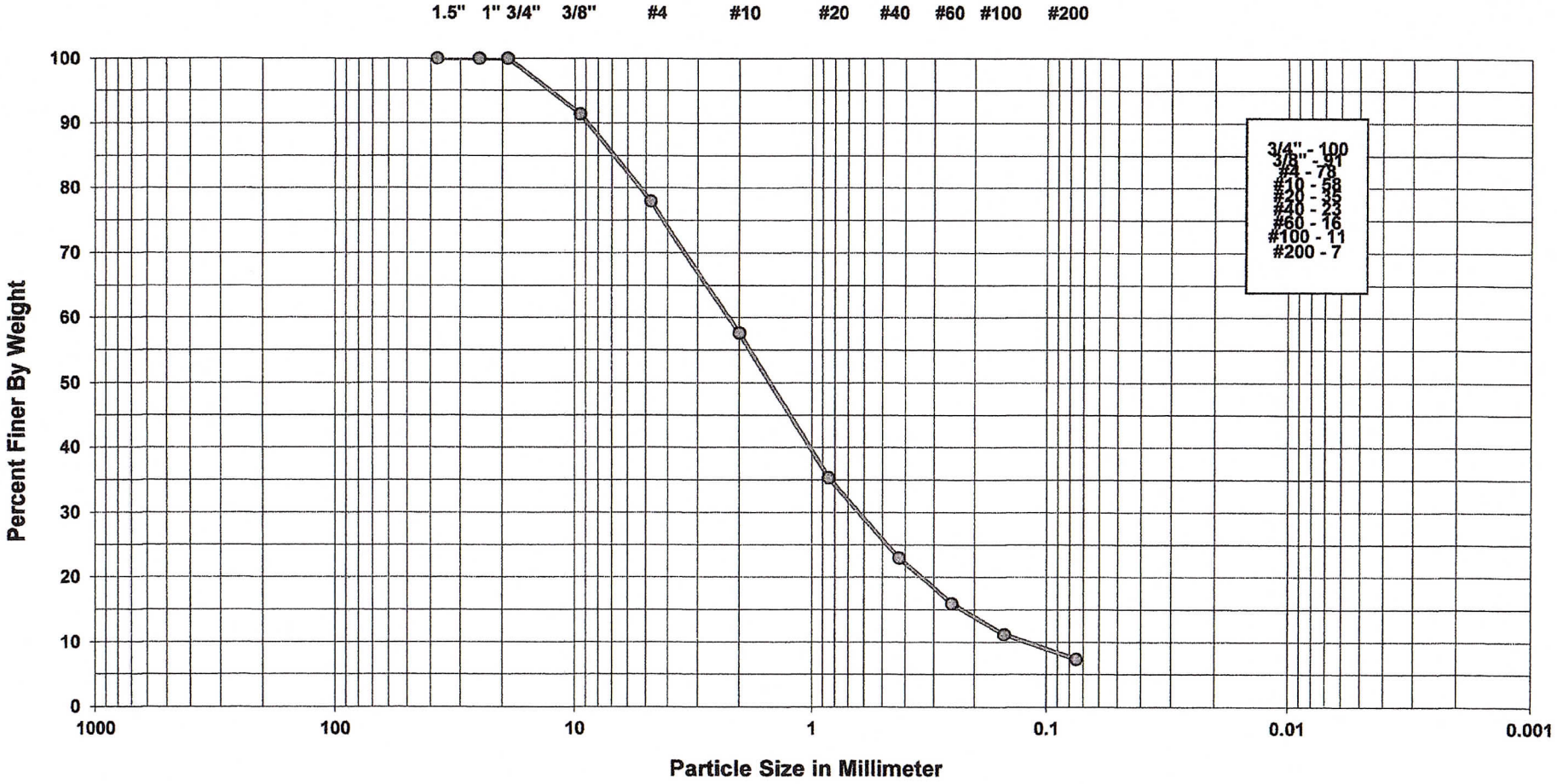
Phelan	Project No. 1308020
APN 3066-251-10	
PLATE B - 2	

U.S. STANDARD SIEVE SIZE

HYDROMETER ANALYSIS



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

Location	Type	Depth, ft.	MDD, pcf	Opt H_2O	SE		Soil Classification
TP-1	BAG	4.0'	128.25	8.50%	72		Well-graded SAND with silts (SW-SM)

PARTICLE SIZE ANALYSIS

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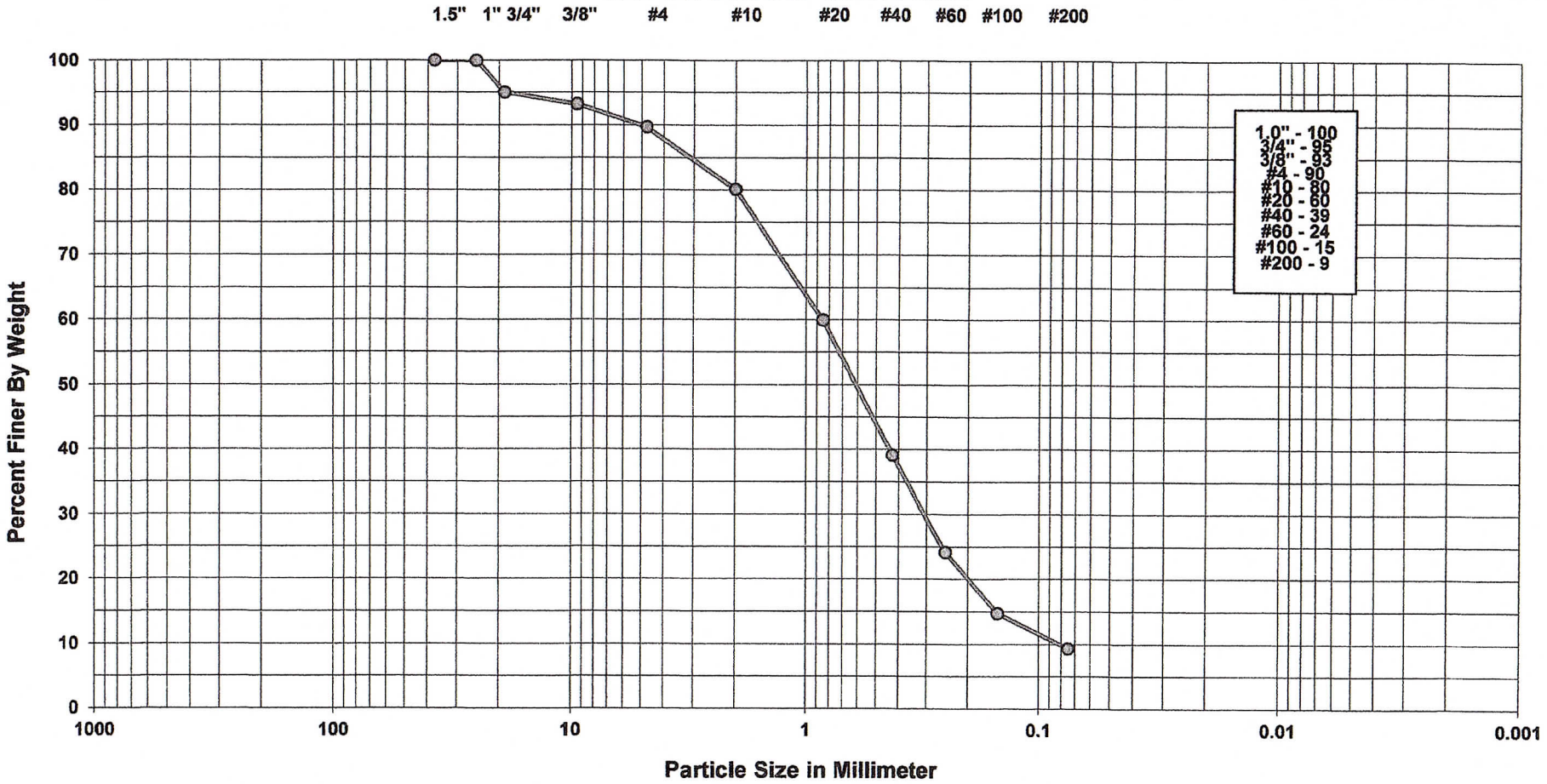
APN 3066-251-10	
PHELAN PINON HILLS CSD	
PLATE B-3	

U.S. STANDARD SIEVE SIZE

HYDROMETER ANALYSIS



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

Location	Type	Depth, ft.			SE		Soil Classification
TP-1	BAG	6.0'			68		Well graded Sand with silts (SW-SM)

PARTICLE SIZE ANALYSIS

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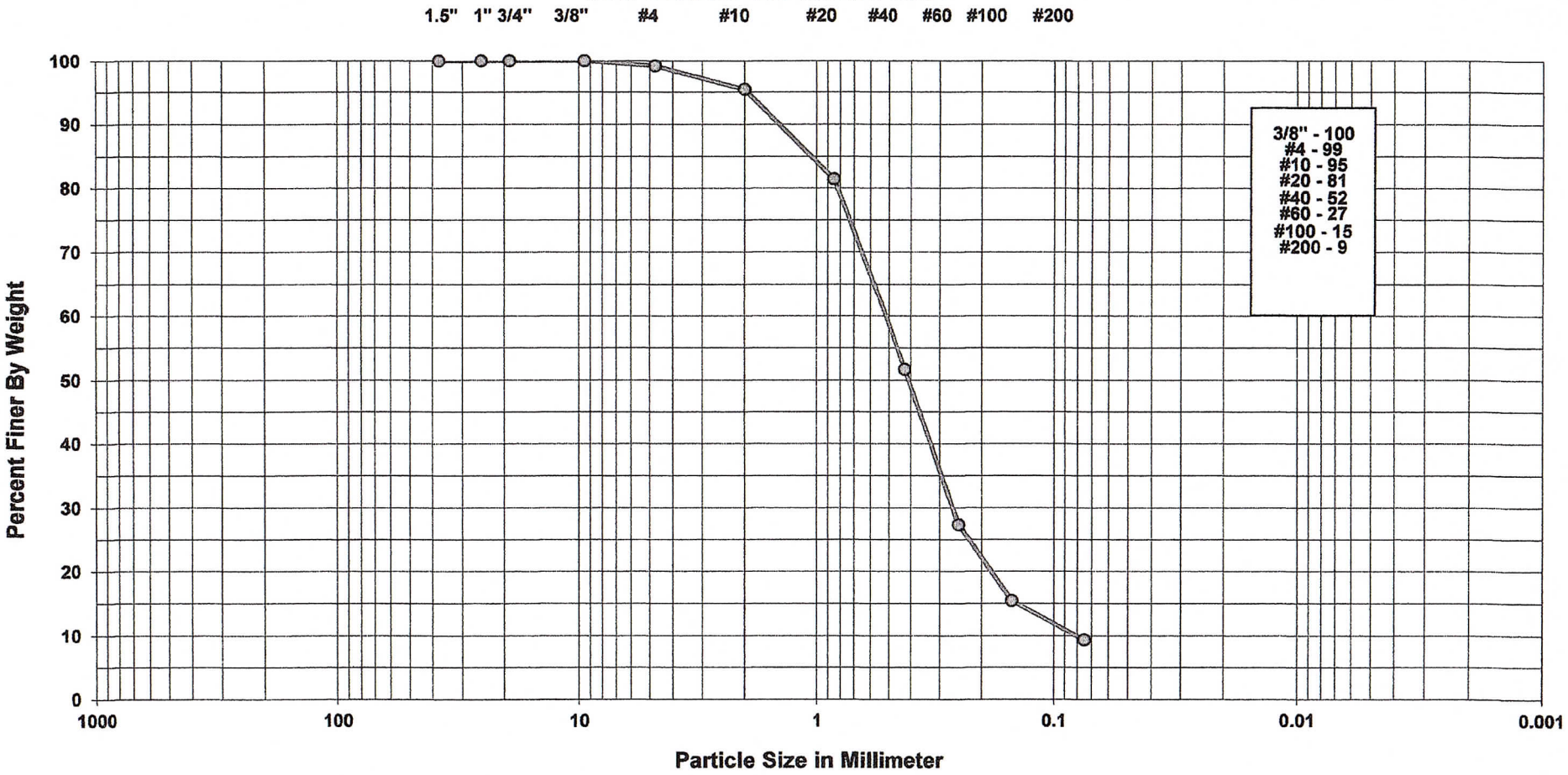
APN 3066-251-10	
PHELAN PINON HILLS CSD	
PLATE B-4	

U.S. STANDARD SIEVE SIZE

HYDROMETER ANALYSIS



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

Location	Type	Depth, ft.			SE		Soil Classification
TP-1	BAG	12.0'			61		Well graded Sand with silts (SW-SM)

PARTICLE SIZE ANALYSIS

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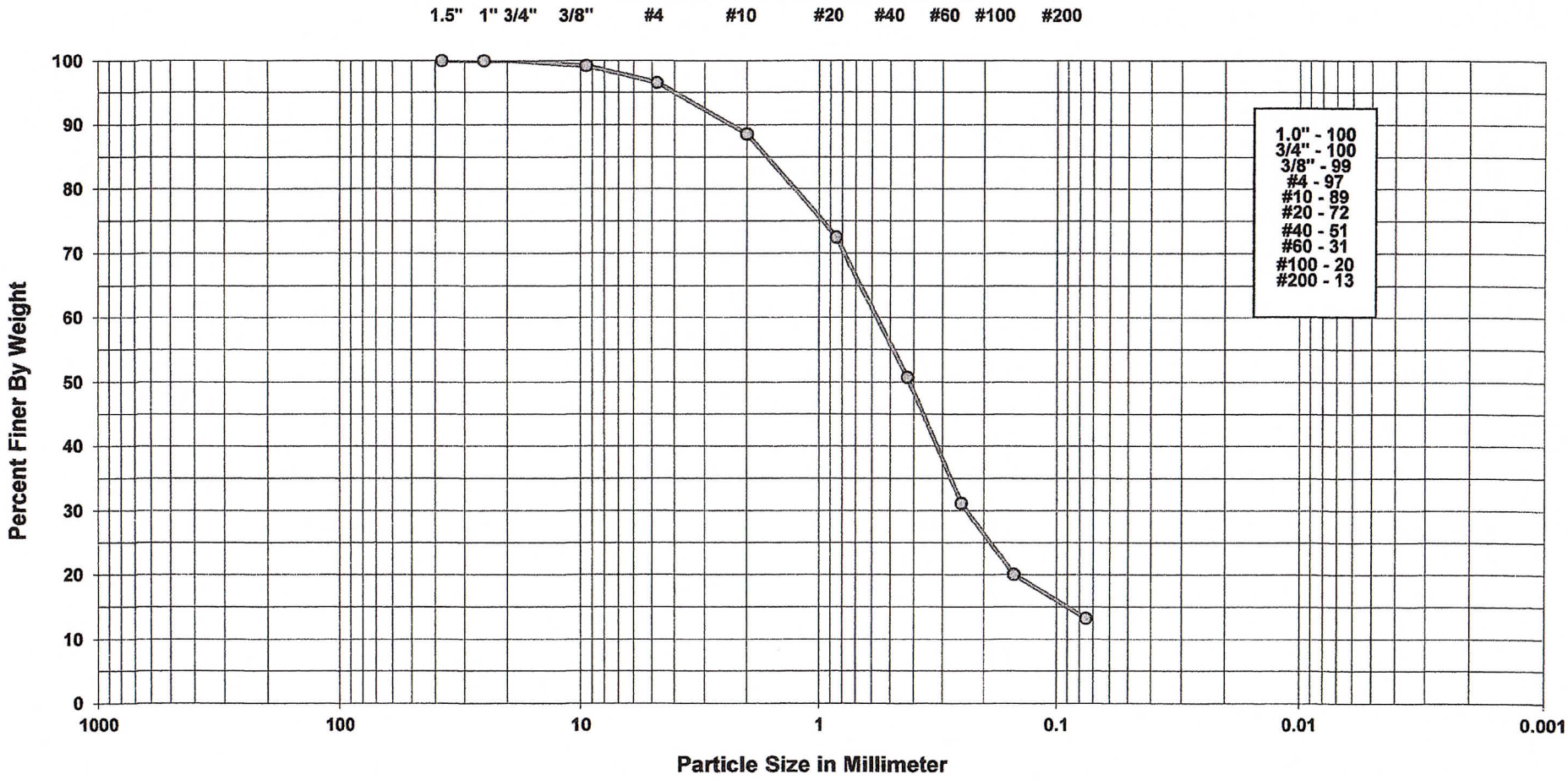
Phelan	Project No. 1308020
APN 3066-251-10	
PHELAN PINON HILLS CSD	
PLATE B-5	

HYDROMETER ANALYSIS



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

Location	Type	Depth, ft.	MDD, pcf	Opt H2O	SE		Soil Classification
TP-2	BAG	1.5'	124.25	8.50%	55		Silty SAND (SM)

PARTICLE SIZE ANALYSIS

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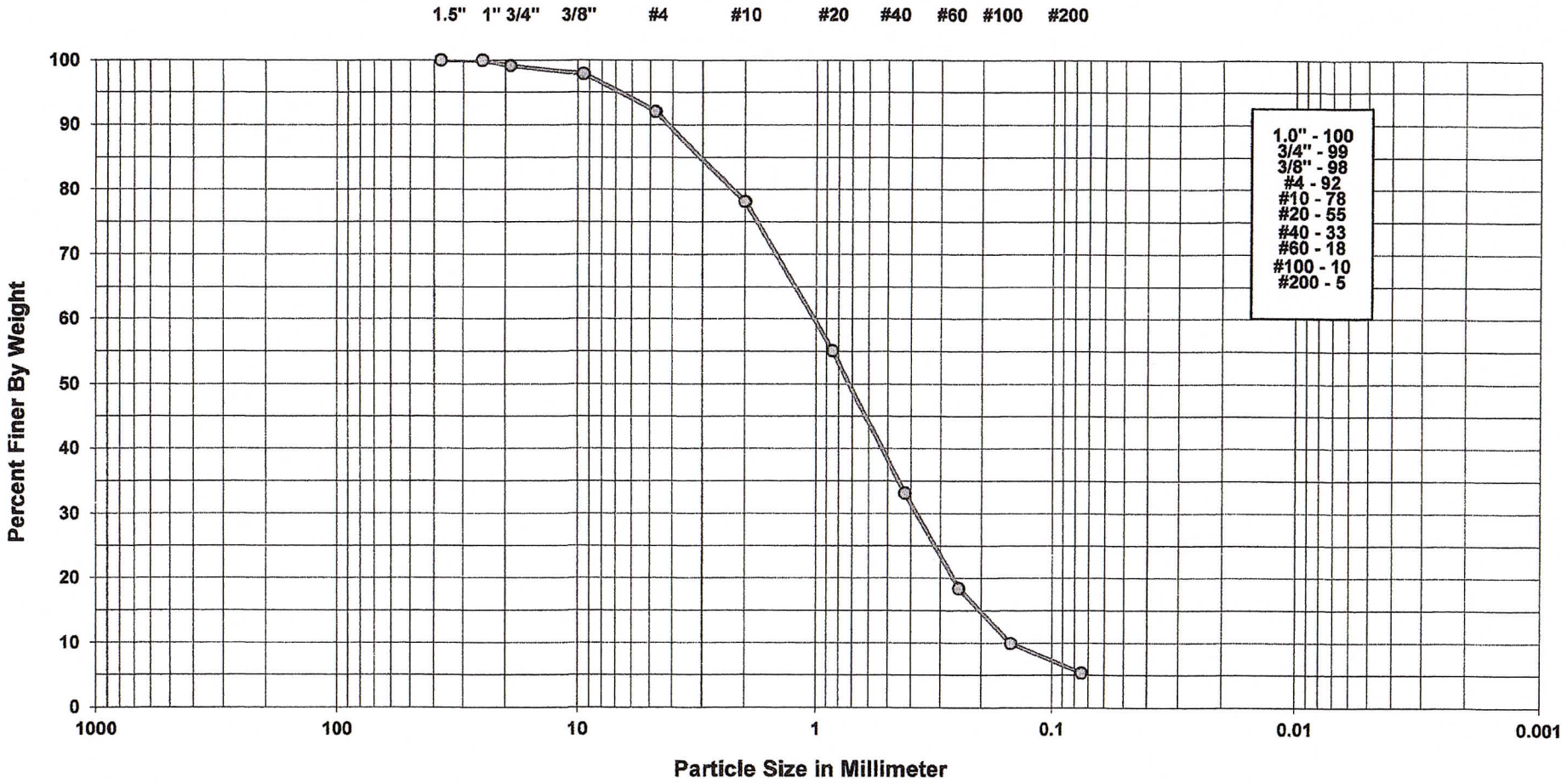
Phelan	Project No. 1308020
APN 3066-251-10	
PHELAN PINON HILLS CSD	
PLATE B-6	

U.S. STANDARD SIEVE SIZE

HYDROMETER ANALYSIS



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

Location	Type	Depth, ft.			SE		Soil Classification
TP-2	BAG	3.5'			71		Well graded Sand with silts (SW-SM)

PARTICLE SIZE ANALYSIS

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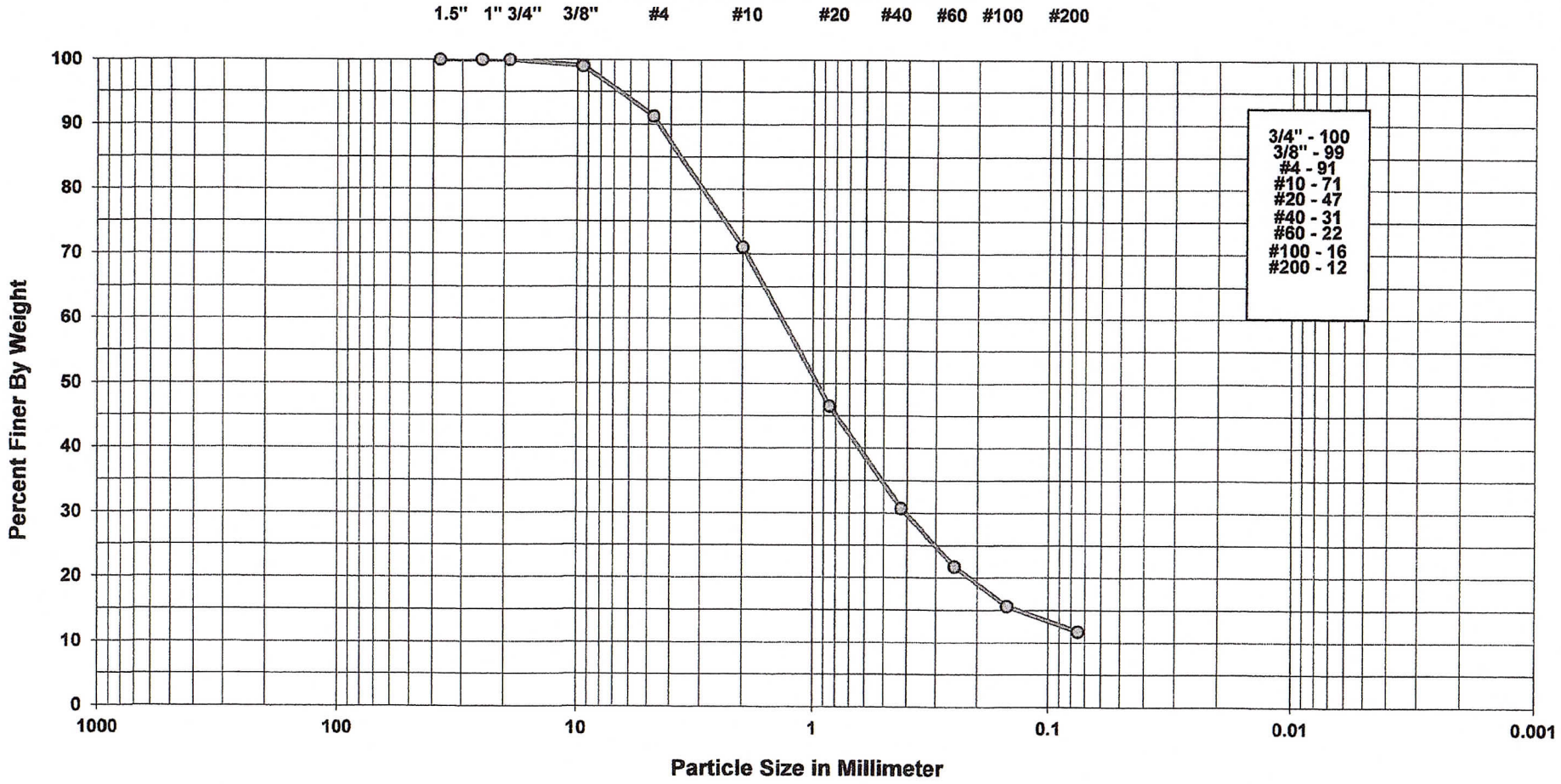
APN 3066-251-10	
PHELAN PINON HILLS CSD	
PLATE B-7	

U.S. STANDARD SIEVE SIZE

HYDROMETER ANALYSIS



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

Location	Type	Depth, ft.			SE		Soil Classification
TP-2	BAG	5.0'			55		Well graded Sand with silts (SW-SM)

PARTICLE SIZE ANALYSIS

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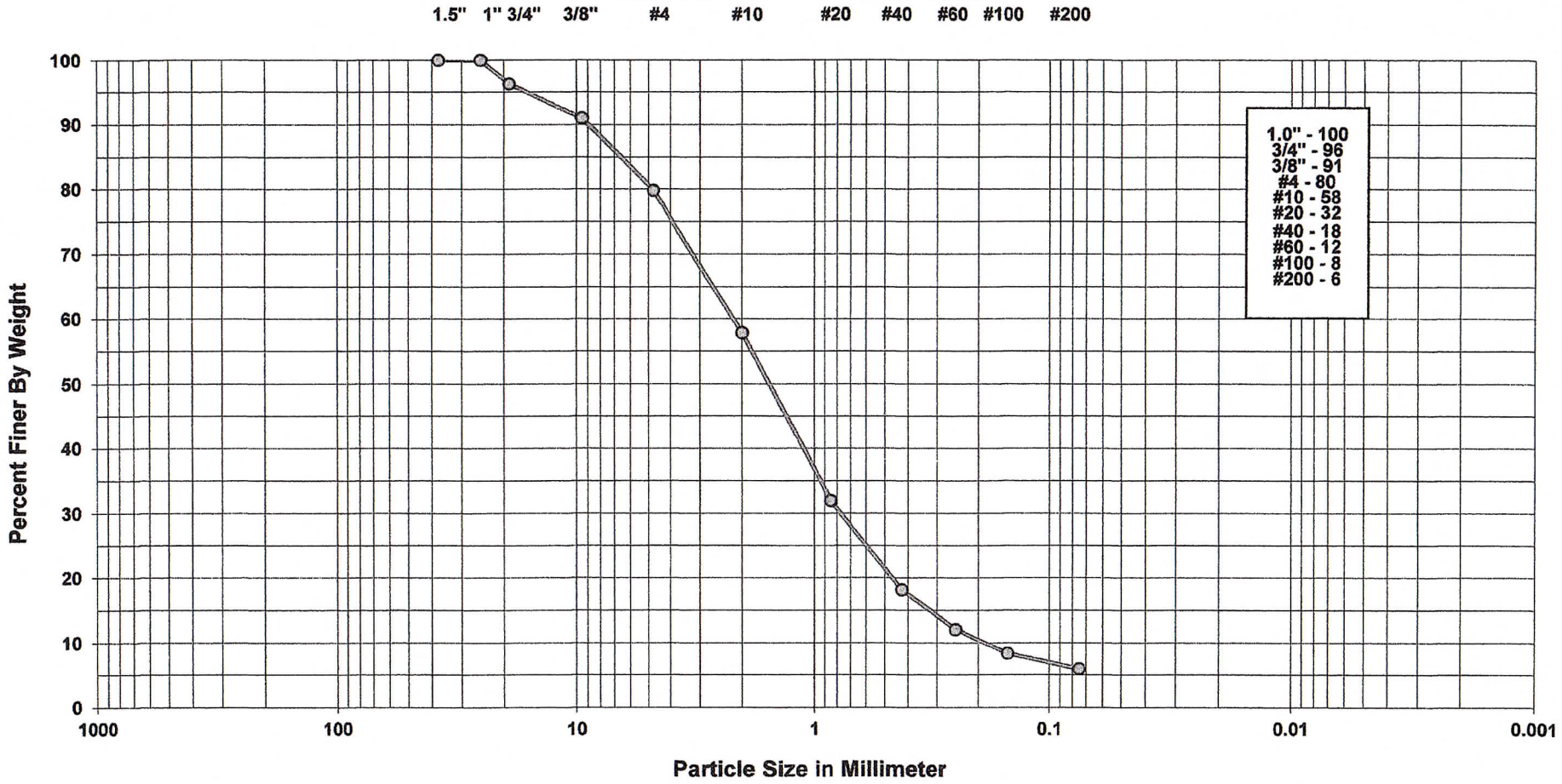
PHELAN PINON HILLS CSD	
PLATE B-8	

U.S. STANDARD SIEVE SIZE

HYDROMETER ANALYSIS



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

Location	Type	Depth, ft.			SE		Soil Classification
TP-4	BAG	3.0'			69		Well graded Sand with silts (SW-SM)

PARTICLE SIZE ANALYSIS

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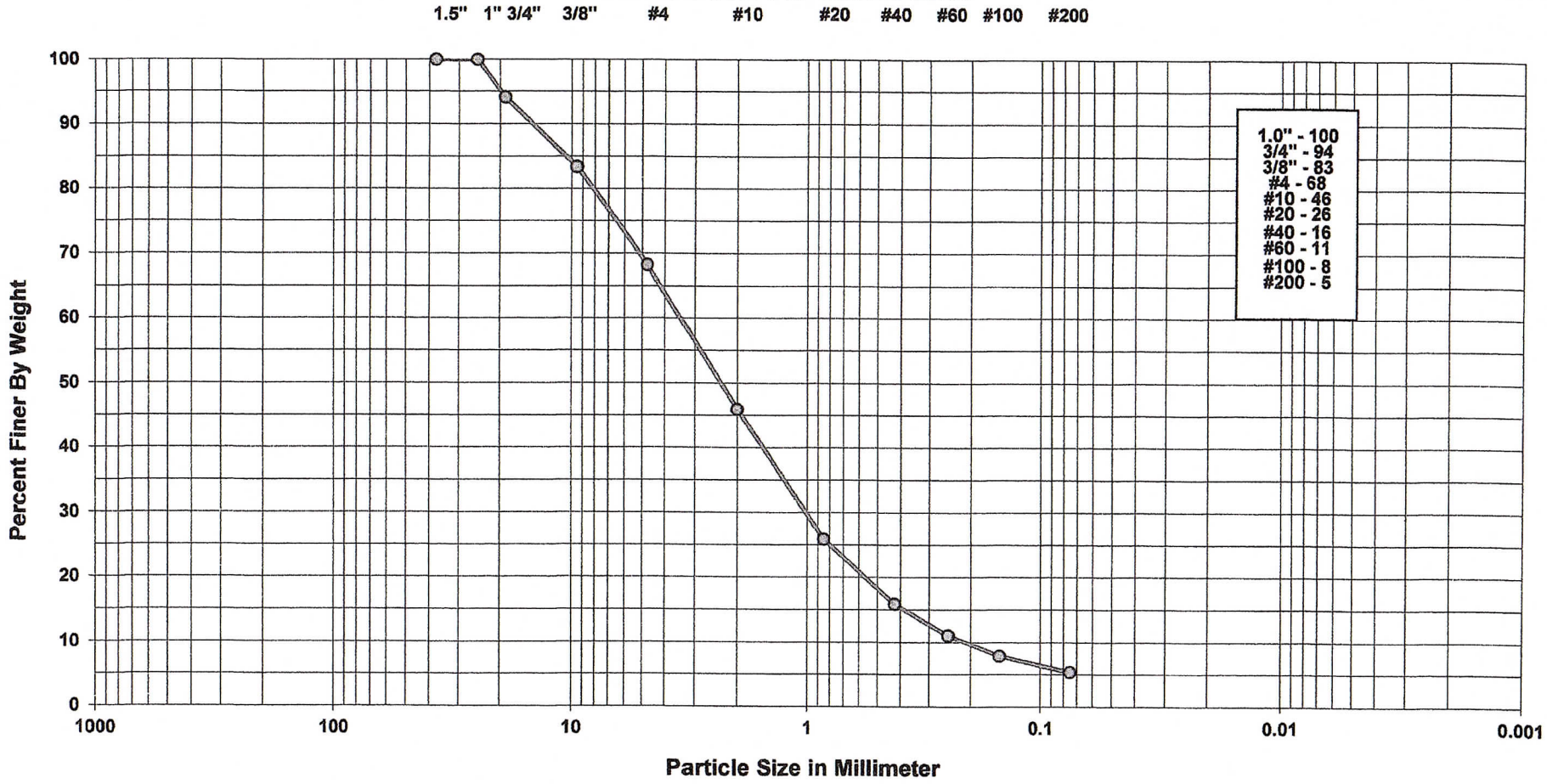
PHELAN PINON HILLS CSD	
PLATE B-9	

U.S. STANDARD SIEVE SIZE

HYDROMETER ANALYSIS



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

Location	Type	Depth, ft.			SE		Soil Classification
TP- 4	BAG	5.0'			63		Well graded Sand with silts (SW-SM)

PARTICLE SIZE ANALYSIS

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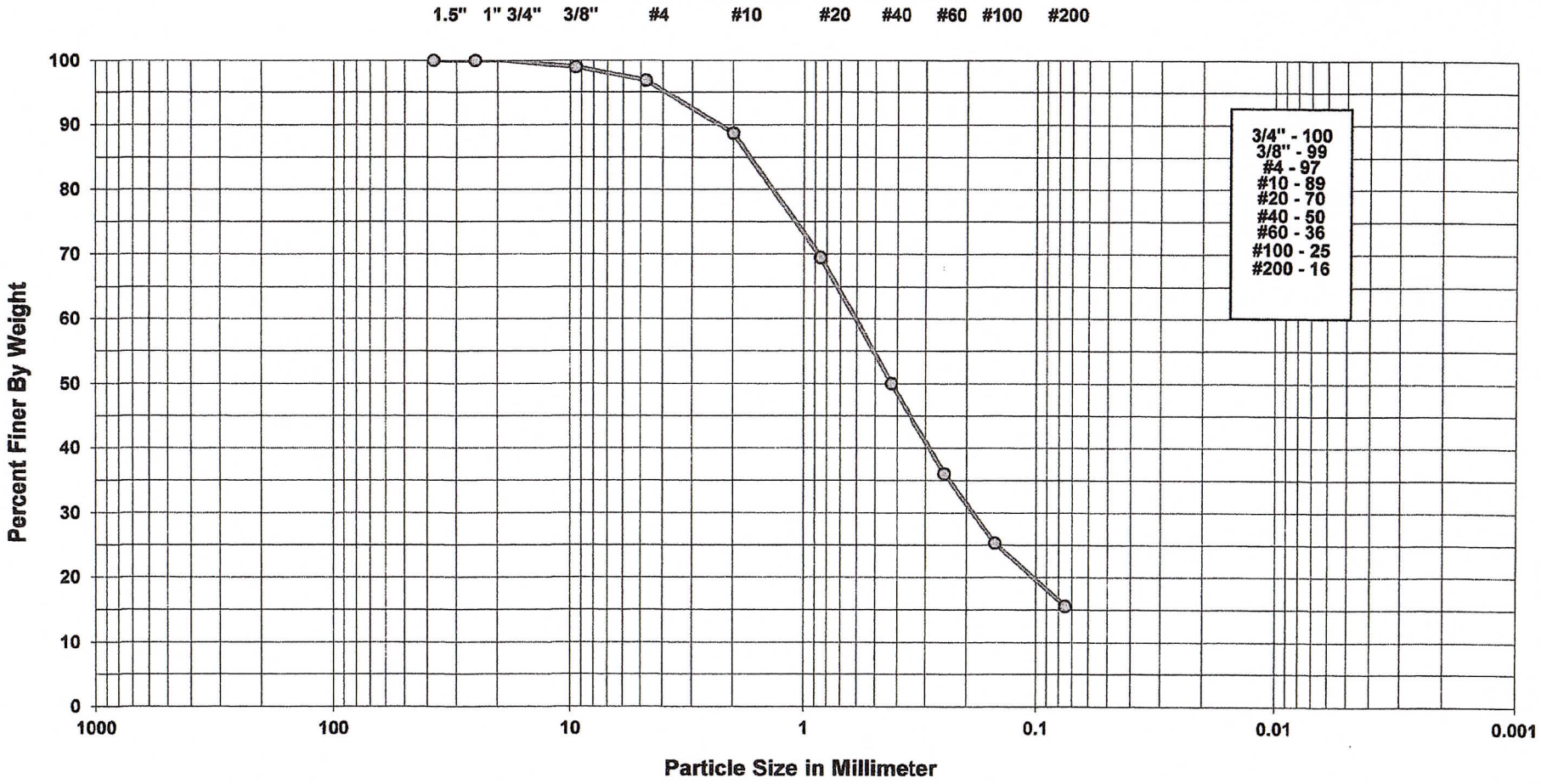
APN 3066-251-10	
PHELAN PINON HILLS CSD	
PLATE B-10	

U.S. STANDARD SIEVE SIZE

HYDROMETER ANALYSIS



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

Location	Type	Depth, ft.			SE		Soil Classification
TP-5	BAG	2.0'			55		Silty Sand (SM)

PARTICLE SIZE ANALYSIS

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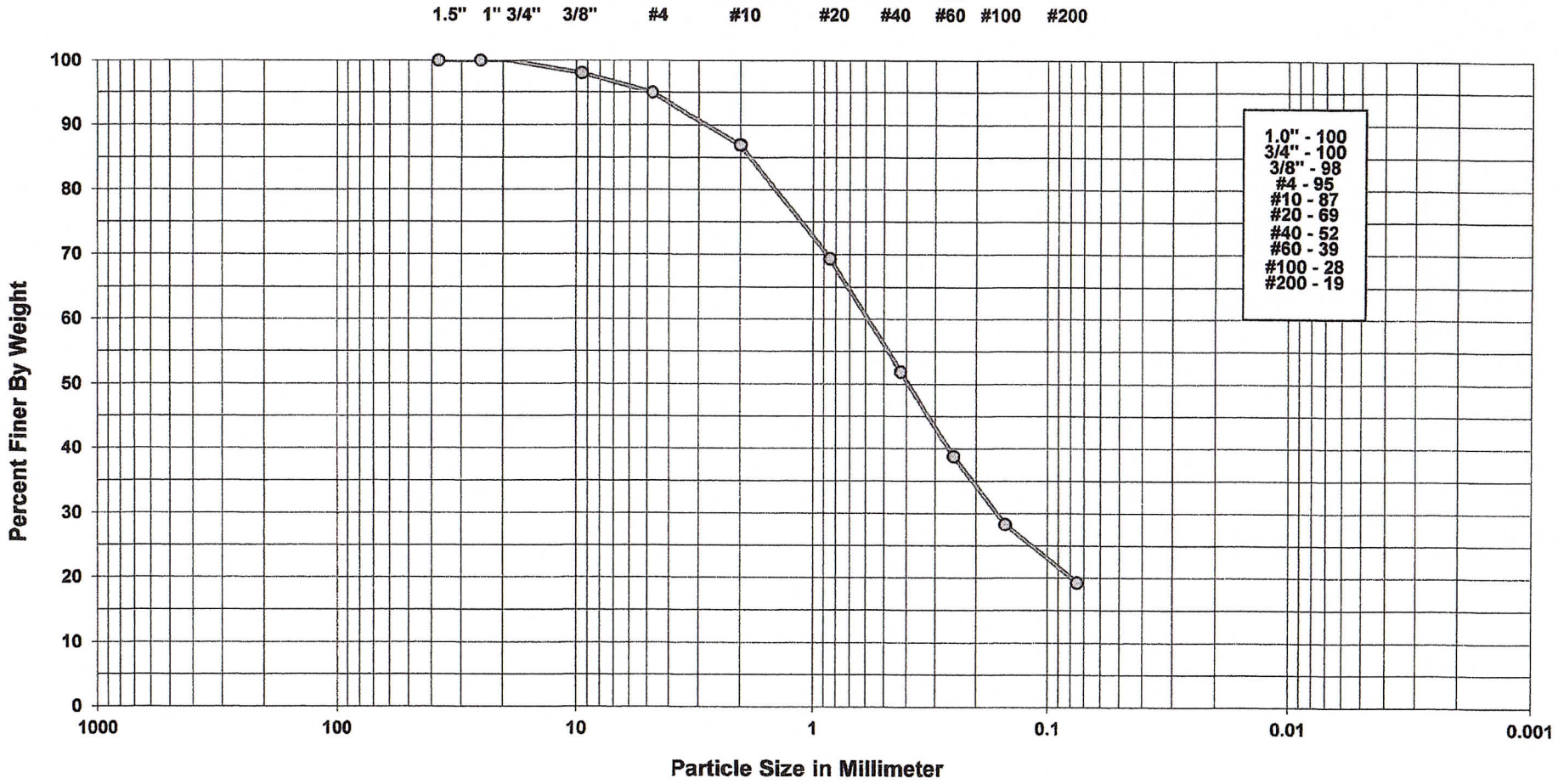
PLATE B-11	

U.S. STANDARD SIEVE SIZE

HYDROMETER ANALYSIS



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

Location	Type	Depth, ft.			SE		Soil Classification
	BAG	12"-18"			47		Silty Sand (SM)

PARTICLE SIZE ANALYSIS

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PHELAN PINON HILLS CSD	
PLATE B-12	

APPENDIX C

APPENDIX C

GUIDELINE TECHNICAL SPECIFICATIONS FOR EARTHWORKS

1.0 INTRODUCTION

The purpose of these guideline technical specifications is to supplement geotechnical report and the project requirements including the following pertinent code requirements. In case of conflict, recommendations provided in the report and interpretations of the engineer (civil engineer, geotechnical engineer or his/her representative) will govern. Additionally, the specifications are subject to modification if the site subsurface conditions change during the construction.

2.0 TERMS AND DEFINITIONS

2.1 **Earth Materials**: Natural soils encountered at the site or imported, free of organics, vegetation matter and deleterious materials.

2.2 **Suitable Materials**: Local excavated materials are suitable except organic materials, trash, debris, pit, highly-expansive clays. Suitable materials are generally classified as: Sand (SP, SW), silty, gravely or clayey sand (SM- SC), and silty and/or sandy clays (CL) with low plasticity. The classifications of soils are in accordance with United Soil Classification System, (USCS), ASTM D2487.

2.3 **Unsuitable Materials**: Organic soils, debris, trash, pit and highly expansive clays (fat clays) are not suitable. Expansive soils shall require special treatment to be used as foundation support.

2.4 **Unstable Materials**: Unstable materials are generally termed as collapsing and expansive soils. These soils require special treatment including removal and re-compaction, also the material cannot be properly compacted or will not support construction equipment due to high moisture content or very loose is considered to be unstable.

2.5 **Backfill**: Earth material meeting requirements of Section 2.2 "Suitable Materials".

2.6 **ASTM**: American Society for Testing and Materials, latest edition.

2.7 **I.B.C.**: International Building Code, latest edition.

2.8 **Maximum Dry Density (MDD):** is the laboratory maximum dry density determined in a soil sample in conformance with testing procedures of ASTM D1557 unless otherwise specified in the geotechnical report.

2.9 **Optimum Moisture Content (OMC):** is the moisture content corresponding maximum dry density as determined by test procedures conforming to ASTM D1557.

2.10 **Moisture Content (MC):** is the ratio of the weight of water to the weight of the dry solid material expressed as a percentage and determined by ASTM D2216, D3017 or the method approved by the engineer.

2.11 **Field Dry Density (FDD):** is the dry density of natural or compacted material as determined by ASTM D1556 - Sand Cone Method or ASTM D2922 - Nuclear Methods or ASTM D2937 - Drive-Cylinder Method.

2.12 **Relative Compaction**: is the ratio of the field dry density to the maximum dry density, expressed as a percentage.

3.0 GENERAL NOTES

3.1 The Owner shall retain the Soil Engineer for quality assurance and testing services.

3.2 The Contractor shall be responsible for quality control through out the prosecution of the work.

3.3 Contractor shall visit the project site and become familiar with the site conditions prior to the bidding.

3.4 Contractor shall verify the site and subsurface conditions at no cost to the owner. The preliminary soil engineering report does not constitute the actual subsurface conditions at the time of constructions or at the locations different from the excavated test pits/borings.

3.5 All excavations and foundations for the structures shall be inspected and approved by the soil engineer, prior to the preparations of sub-grade, and backfill.

3.6 All foundation soils underneath the retaining wall footings shall be scarified to a depth of at least one (1') foot, brought to uniform moisture content near optimum moisture content and re-compacted to a minimum relative compaction of 95% and as specified in the report.

4.0 FIELD OBSERVATIONS AND TESTING

Field observations and testing shall be performed by an experienced and qualified engineer (civil engineer, geotechnical engineer and their representatives). The engineer will observe and perform adequate amount of testing to meet the project and regulatory requirements. It will be the contractor's responsibility to assist the engineer, allow sufficient time and provide adequate notice to carry out the testing and schedule the personnel.

5.0 PREPARATION OF FILL AREAS

5.1 **Clearing, Over-excavation and Re-compaction**: All areas receiving fill and used as foundation support shall be cleared of topsoil, vegetation, trash, debris and other deleterious materials. After clearing and grubbing, the over excavating, as stated in the preliminary geotechnical report, the area should be scarified as recommended in the report or to a minimum depth of 12 inches.

The over-excavation should extend to a depth recommended in the report or until stable ground is reached. The material scarified will be uniformly moisture conditioned to near optimum moisture content and re-compacted to a relative compaction of 90 percent or greater. The placement of fill will commence upon completion of preparation and approved by the engineer.

5.2 **Benching**: Prior to the construction of fill slopes (embankments) and placement of fill on ground surface sloping steeper than 5 horizontal: 1 vertical, the ground shall be cut in benches. The lowest bench should be at least 12 feet wide to facilitate the fill placement in horizontal lifts. Under certain circumstances and if approved by the engineer, the width may be reduced to the size of the widest equipment (i.e., scraper, compactor or tractor) to be used. The lowest bench shall be at least two (2) feet deep. Other benches will be excavated to a firm material for a minimum width of four (4) feet.

6.0 EXCAVATION AND FILL MATERIAL

6.1 **Excavation**: All excavations should be carried out as per project documents. In general, all channel excavations can be accomplished by conventional heavy earth-moving equipment.

6.2 **Fill Materials**:

6.2.1 **Structural Fill**: The fill material shall be suitable material as defined in Section 2.2 and shall be approved by the engineer. Cobbles (rocks) six (6) inches or greater in size should not be used as structural fill. In general, the fill for structural fill shall be no-to-low in expansion potential meeting the following criteria:

a) **Liquid Limit** **<35**

b) **Plasticity Index** **<15**

c) **Expansion Index Under 200 psf Surcharge Load** **<20**

This material should extend to a minimum depth of five (5) feet below the foundation footing.

6.2.2 **Bedding Material Underneath Pipes and Culverts**: A one (1') foot thick class 2 aggregate base course shall be constructed underneath all culvert slabs and footing foundations for the retaining walls. The base course shall be placed over the prepared sub-grade and shall meet the requirements of "Class 2 Aggregate Base (3/4" max.)" , Section 26 of Standard Specifications. The base course shall meet the placement and compaction requirements of sections 26-1.035, 26-1.04, and 26-1.05 of the Standard Specifications.

6.2.3 **Backfill Behind Retaining Structures**: All backfill material behind the retaining structures and box culverts shall be classified as sands (SP, SW) to silty Sand (SM), and meet the requirements of Section 2.2 "Suitable Materials" and shall be approved by the Civil Engineer. Excavated materials from the site meeting the requirements of Section 2.2 shall be used as backfill.

6.2.4 The pervious material (SP, SW) behind the retaining structures shall be hard, durable and free of any organics, vegetation, clay, and other deleterious materials. Contractor shall identify the source of material and furnish 30 days in advanced at least 50 pounds of material for testing and approval. The pervious granular material shall meet the following gradation criteria.

SIEVE SIZE	PERCENT PASSING
3/4 inch	100
3/8 inch	85-100
#4	60-80
#10	30-70
#40	0-30
#100	0-5

6.2.5 **Aggregate Base Course**: Aggregate base shall be Class 2 conforming to Section 26 "Standard Specifications:, California Department of Transportation, and shall be approved by the Engineer.

6.2.6 **Imported Material**: Import material to be used as structural fill shall meet the criteria as per Section 6.2.1.

7.0 FILL PLACEMENT

7.1 **General**: Suitable material to be used as fill shall be uniformly moisture conditioned either in stockpile or in-place. Prior to the placement, the area to receive fill shall be prepared as described in Section 4.0 and scarified to provide bond between existing compacted surface and new lift.

7.2 **Fill Placement**: Fill material shall be placed in uniform horizontal lifts not exceeding eight (8) inches, measured loose. The material shall be uniformly spread and should not contain any large rock particles, clods of clay lumps. Clods and clay lumps shall be broken down and thoroughly mixed. Large rock particles greater than six (6) inches shall be removed from the fill area. Fill material shall have uniform moisture content, near optimum as specified under Compaction Criteria, Section 7.4.

7.3 **Compaction**: Each loose lift shall be compacted using proper compaction equipment well suited to the type of material being compacted to produce uniform compaction. After the layer has been compacted, the compacted surface shall be scarified prior to the placement of another lift. Fill slopes should be compacted by back rolling. It may be necessary to overbuild the slopes and trimmed to achieve final finished slope.

7.4 **Compaction Criteria**: In general the compaction criteria given below should be followed. All compaction is relative to ASTM D1557 unless otherwise specifically stated.

Area	Relative Moisture Content Compaction at the time of (Relative Compaction to MDD) (Relative to OMC)
a) Structural fill	90% or greater-2 to +2% of OMC
b) Backfill around retaining walls	90% or greater-2 to +2% of OMC
c) Embankment Fill (levees)	90% or greater-2 to +2% of OMC
d) Trench backfill from 1' below the sub-grade to 4' below the sub-grade	90% or greater-2 to +2% of OMC
e) Trench backfill upper 1'	95% or greater-2 to +2% of OMC
f) Paved areas, both concrete & asphaltic aggregate base & upper 1' of sub-grade	95% or greater-2 to +2% of OMC
g) Sub-grade below concrete slabs at wet crossing, upper 1'	95% or greater-2 to +2% of OMC
h) General nonstructural backfill, (i.e., landscape area)	85% or greater-1 to +3% of OMC

7.5 **Quality Assurance and Testing**: As quality assurance, Engineer will observe over-excavation and placement of fill and conduct field density tests. Field density testing will be performed in conformance with ASTM D1556 - Sand Cone Method and ASTM D2922 - Nuclear Methods. Test location and frequency of testing will be at the discretion of the engineer. However, in general, field density tests will be performed at every two-foot compacted lift and/or every 1,000 cubic yards of fill placed. Additional testing will be performed at the discretion of the engineer. When test results and/or observations indicate, as determined by the engineer, that compaction is not as specified, the material shall be removed, replaced and re-compacted to meet the specifications. It is the contractor's responsibility that both moisture content and relative compaction are met in a consistent manner.

8.0 TRENCH EXCAVATION AND BACKFILLS

8.1 **General**: Excavations for utility trenches greater than five (5) feet deep may require shoring. All excavations should be carried out in accordance with applicable standard specifications, Cal-OSHA requirements and local government agency requirements. Backfill shall be observed and tested by the engineer.

8.2 **Bedding Material**: Bedding material shall conform to applicable requirements of standard specifications and local government agency requirements. In general, granular bedding comprising of coarse sand and gravel is ideally suitable as bedding material. Local sandy soils may be used if acceptable to the governing agency.

8.3 **Backfill Material**: Granular backfill one (1) foot above the pipe is ideally suitable. Local sandy soil may be used if acceptable to the governing agency. Remainder of the trench shall be backfilled with local suitable material.

8.4 **Placement, Moisture Conditioning and Compaction**: Backfill shall be uniformly moisture conditioned and compacted. Compaction criteria provided in Section 6.4 should be followed. Upper one (1) foot of backfill should be compacted to 95 percent relative compaction.

9.0 EXCAVATIONS

Excavations and over-excavations shall be performed in accordance with plans and recommendations contained in the preliminary geotechnical investigation report. All excavations will be observed by the engineer. If unsuitable soils are discovered, the engineer will determine the extent of over-excavation. No fill placement over cut area will commence prior to approval by the engineer. Prior to placement of fill, cut surface shall be scarified and uniformly moisture conditioned and re-compacted.

10.0 UNDER DRAINS

Under drains, if required, shall be constructed in accordance with plans and project requirements. Location of under drains will be surveyed to provide as-built location. Engineer may modify the location and requirement of the under drain depending upon the field condition.