Appendix F Infiltration Testing

Appendices

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May 22, 2018

Peregrine Construction, Inc.
30211 Avenida de las Banderas,
Second Floor
Rancho Santa Margarita, California 92688

Attention: Mr. John Atherton
President

Project No.: **18G118-2**

Subject: **Results of Infiltration Testing**
Proposed Multi-Unit Apartment Complex
SEC Berry Street and Mercury Lane
Brea, California

Reference: Geotechnical Investigation, Proposed Multi-Unit Residential Development, SEC Berry Street and Mercury Lane, Brea, California, prepared by Southern California Geotechnical, Inc. (SCG) for Peregrine Construction, Inc., SCG Project No. 18G118-1, dated April 20, 2018.

Gentlemen:

In accordance with your request, we have conducted infiltration testing at the subject site. We are pleased to present this report summarizing the results of the infiltration testing and our design recommendations.

Scope of Services

The scope of services performed for this project was in general accordance with our Proposal No. 18P164-2, dated April 13, 2018. The scope of services included site reconnaissance, subsurface exploration, field testing, and engineering analysis to determine the infiltration rates of the onsite soils. The infiltration testing was performed in general accordance with the guidelines published by Orange County: Technical Guidance Document for the Preparation of Conceptual/Preliminary and/or Project Water Quality Management Plans (WQMPs), Appendix VII. These guidelines are dated December 20, 2013.

Site and Project Description

The site is located at the southeast corner of Berry Street and Mercury Lane in Brea, California. The site is bounded to the north by Mercury Lane, to the east and south by existing commercial developments, and to the west by Berry Street. The general location of the site is illustrated on the Site Location Map, included as Plate 1 of this report.

The subject site consists of a rectangular-shaped property, approximately 1.01 acres in size. The site is currently undeveloped with the ground surface cover consisting of exposed soils with select areas of crushed rock in the eastern portion of the site. Multiple shrubs and medium-sized trees are located in the northeastern area of the site and in the southwest and southeast corners

of the site. The eastern portion of the site is currently being utilized as a temporary tractor-trailer storage lot. A drainage swale and a 2:1 slope, sloping downward to the east, are located along the eastern perimeter of the site. The site is surrounded with chain-link fencing along the outer boundary of the subject site with a section of chain-link fencing through the center of the site, which trends north to south.

Detailed topographic information was not available at the time of this report. However, based on visual observations, the site topography slopes downward to the south at an estimated gradient of approximately 1 to 2 percent. There was estimated to be 3 to 4± feet of elevation differential across the site.

Proposed Development

Our office was provided with architectural plans prepared by Humphreys & Partners Architects, L.P. (H&P), dated April 4, 2018. Based on our review of these documents, the site will be developed with a 120-unit multi-story residential development. The site massing study identifies the ground surface adjacent to the proposed building as "Level 1." The study indicates that the vertical distance from the ground level to the proposed finish floor of subterranean level "Level B1" is 10½± feet. The study also indicates that the vertical distances between floors above the ground level range from 9 feet to 12 feet. The study identifies a total of 7 levels consisting of the subterranean Level B1, the ground level (Level 1), levels 2 through 5, and the roof deck. The total height of the apartment complex is 65 feet, 10 inches above the ground level, as indicated on the H&P study.

Based on our review of the building sections included in the H&P study, our understanding of the project layout is described below:

- The lowest parking garage floor is located at a depth of approximately 10½ feet below the ground level and the lowest parking garage walls retain up to approximately 10½ feet of soil.
- Levels B-1, 1, and 2 are planned for residential parking and limited residential units.
- A podium level is planned for Level 3, which contains a courtyard, residential units, amenity rooms and a laundry room.
- Levels 4 and 5 contain residential units and a laundry room.
- The walls of the residential units do not retain any soil.
- The proposed apartment complex is located approximately 5 to 10 feet horizontally from the surrounding property lines.

We understand that the proposed development may include on-site infiltration to dispose of storm water. Based on our conversations with Mr. John Olivier from Fuscoe Engineering, Inc., the project civil engineer, the infiltration system is expected consist of either an infiltration trench or a drywell system. The bottom of the infiltration trench will be approximately 5 feet below the existing site grades and the proposed drywell will extend to a depth of 10 to 15± feet below the existing side grades.

Previous Study

Southern California Geotechnical, Inc. (SCG) previously performed a geotechnical investigation at the subject site, which is referenced above. As a part of this study, five (5) borings were advanced to depths 75± feet below the existing site grades. The approximate locations of the five borings from the previous study are indicated on the Infiltration Test Location Plan, included as Plate 2 of this report.

Pavements consisting of 5 to 6± inches of aggregate base were encountered at the ground surface at three of the boring locations. Fill soils were encountered at the ground surface or beneath the existing pavements at three of the boring locations, extending to depths of 2½ to 4½± feet below the existing site grades. The fill soils generally consisted of loose to medium dense silty fine to coarse sands with varying amounts of clay and fine to coarse gravel. Native alluvium was encountered below the pavements and artificial fill soils at all of the boring locations, extending to at least the maximum depth explored of 75± feet below existing site grades. The native alluvial soils, extending to depths of 8 to 12± feet, generally consisted of stiff to very stiff fine sandy clays with occasional layers of loose to medium dense silty fine sands. Beneath these soils, the native alluvium generally consisted of medium dense fine to coarse sands, silty fine sands, and clayey sands extending to depths of 27 to 33½± feet. Beneath these soils, the native alluvium generally consisted of stiff to hard sandy clays and silty clays and dense to very dense clayey sands and fine to coarse sands and occasional layers of medium dense fine to coarse sands and clayey sands extending to the maximum depth explored of 75± feet.

Groundwater

Free water was encountered during drilling at depths of 25 to 27± feet below the existing site grades. Based on the water level measurements and the moisture contents of the recovered soil samples, the static groundwater table is considered to have existed at depths of 25 to 27± feet below the ground surface at the time of the subsurface investigation. As part of our research of historic groundwater levels we reviewed CA DMG Open-File Report 97-09 for the La Habra Quadrangle. Plate 1.2 of OFR 97-09 is a map which displays the historically highest ground water levels using contour lines. The water levels mapped in the vicinity of the subject site indicate the historic high groundwater table to be at a depth of 10± feet.

Subsurface Exploration

Scope of Exploration

The subsurface exploration conducted for the infiltration testing consisted of four (4) infiltration test borings advanced to depths of 5 and 15± feet below the existing site grades. The infiltration borings were advanced using a truck-mounted drilling rig, equipped with 8-inch diameter hollow stem augers and were logged during drilling by a member of our staff. The approximate locations of the infiltration borings (identified as I-1 through I-4) are indicated on the Infiltration Test Location Plan, enclosed as Plate 2 of this report.

Upon the completion of the infiltration borings, the bottom of each test boring was covered with 2± inches of clean ¾-inch gravel. A sufficient length of 3-inch-diameter perforated PVC casing

was then placed into each test hole so that the PVC casing extended from the bottom of the test hole to the ground surface. Clean ¾-inch gravel was then installed in the annulus surrounding the PVC casing.

Geotechnical Conditions

Artificial fill soils were encountered at the ground surface at Infiltration Boring Nos. I-1, I-2, and I-4, extending to depths of 3 to 5½± feet below existing site grades. The fill soils generally consist of very loose to dense silty fine sands and clayey fine sands with varying amounts of medium to coarse sands. The fill soils possess a disturbed appearance and trace amounts of debris, including brick and asphaltic concrete fragments within Infiltration Boring No. I-4, resulting in their classification as artificial fill.

Native alluvial soils were encountered at the ground surface at Infiltration Boring No. I-3 and beneath the artificial fill soils at the remaining infiltration boring locations, extending to at least 15± feet below existing site grades. The alluvial soils generally consist of very loose to medium dense clayey fine sands and medium stiff to very stiff fine sandy clays with varying amounts of medium sand and silt content. Free water was not encountered during the drilling of the infiltration borings. The Boring Logs, which illustrate the conditions encountered at the boring locations, are included with this report.

Infiltration Testing

As previously mentioned, the infiltration testing was performed in general accordance with the Orange County guidelines published in Technical Guidance Document for the Preparation of Conceptual/Preliminary and/or Project Water Quality Management Plans (WQMPs), Appendix VII.

Pre-soaking

The first phase of the infiltration testing consisted of pre-soaking all four (4) of the infiltration test holes. The pre-soaking process for the two (2) 5± foot borings consisted of filling the borings by inverting a full 5-gallon bottle of clear water supported over the hole so that the water flow into the hole holds constant at a level at least 5 times the hole's radius above the gravel at the bottom of both infiltration borings. The two (2) 15± foot drywell infiltration borings were filled with water to a maximum depth of 4± feet below the surface of the ground. Pre-soaking was completed after all of the water had percolated through each test hole or after 15 hours since initiating the pre-soak.

Infiltration Testing

Following the pre-saturation process, SCG subsequently performed the infiltration testing the following day on May 4, 2018. The two (2) shallow test holes were filled with water to a depth of at least 5 times the hole's radius above the gravel at the bottom of both test holes prior to each test interval. The two (2) drywell infiltration borings were filled with water to a maximum depth of 4± feet below the surface prior to each test interval. In accordance with the Orange County guidelines, since "non-sandy soils" were encountered within or at the bottoms of all four (4) of the infiltration test borings (where 6 inches of water did not infiltrate into the surrounding soils for two-consecutive 25-minute readings), readings were taken at 30-minute intervals for a total

of 6 hours at all four of the infiltration test locations. After each reading, water was added to each test boring so that the depth of the water was again at a level of at least 5 times the hole's radius above the bottom of each infiltration boring or to the initial water height. The water level readings are presented on the spreadsheets enclosed with this report. The infiltration rates for each of the timed intervals are also tabulated on the spreadsheets.

The infiltration rates for the tests are tabulated in inches per hour. In accordance with the typically accepted practice, it is recommended that the most conservative reading from the latter part of the infiltration tests be used as the design infiltration rate. The rates are summarized below:

Infiltration Test No.	Depth (feet)	Soil Description	Infiltration Rate (inches/hour)
I-1	5	Clayey fine Sand, little Silt	0.1
I-2	15	Clayey fine Sand, trace medium Sand, trace Silt	0.2
I-3	5	Clayey fine Sand to fine Sandy Clay, trace medium Sand	0.1
I-4	15	Clayey fine Sand, trace medium Sand, trace Silt	0.2

Laboratory Testing

In-situ Moisture Content

The moisture contents for the recovered soil samples within the borings were determined in accordance with ASTM D-2216 and are expressed as a percentage of the dry weight. These test results are presented on the Boring Logs.

Grain Size Analysis

The grain size distribution of selected soils taken from the bottoms and various depths within the infiltration borings has been determined using a range of wire mesh screens. The analysis was performed in general accordance with ASTM D-422 and/or ASTM D-1140. The weight of the portion of the sample retained on each screen is recorded and the percentage finer or coarser of the total weight is calculated. The results of the analysis are presented on Plates C-1 through C-10 of this report.

Design Recommendations

A total of four (4) infiltration tests were performed at the subject site. As noted above, the infiltration rates at these locations range from 0.1 to 0.2 inches per hour. The high clay and silt content of the on-site soils resulted in low infiltration rates at the infiltration test locations. **Based on the low infiltration rates at the depths tested, the on-site soils are**

generally not considered feasible for infiltration. Therefore, infiltration is not recommended for this site.

General Comments

This report has been prepared as an instrument of service for use by the client in order to aid in the evaluation of this property and to assist the architects and engineers in the design and preparation of the project plans and specifications. This report may be provided to the contractor(s) and other design consultants to disclose information relative to the project. However, this report is not intended to be utilized as a specification in and of itself, without appropriate interpretation by the project architect, structural engineer, and/or civil engineer. The design of the proposed storm water infiltration system is the responsibility of the civil engineer. The role of the geotechnical engineer is limited to determination of infiltration rate only. By using the design infiltration rate contained herein, the civil engineer agrees to indemnify, defend, and hold harmless the geotechnical engineer for all aspects of the design and performance of the proposed storm water infiltration system. The reproduction and distribution of this report must be authorized by the client and Southern California Geotechnical, Inc. Furthermore, any reliance on this report by an unauthorized third party is at such party's sole risk, and we accept no responsibility for damage or loss which may occur.

The analysis of this site was based on a subsurface profile interpolated from limited discrete soil samples. While the materials encountered in the project area are considered to be representative of the total area, some variations should be expected between boring locations and testing depths. If the conditions encountered during construction vary significantly from those detailed herein, we should be contacted immediately to determine if the conditions alter the recommendations contained herein.

This report has been based on assumed or provided characteristics of the proposed development. It is recommended that the owner, client, architect, structural engineer, and civil engineer carefully review these assumptions to ensure that they are consistent with the characteristics of the proposed development. If discrepancies exist, they should be brought to our attention to verify that they do not affect the conclusions and recommendations contained herein. We also recommend that the project plans and specifications be submitted to our office for review to verify that our recommendations have been correctly interpreted. The analysis, conclusions, and recommendations contained within this report have been promulgated in accordance with generally accepted professional geotechnical engineering practice. No other warranty is implied or expressed.

Closure

We sincerely appreciate the opportunity to be of service on this project. We look forward to providing additional consulting services during the course of the project. If we may be of further assistance in any manner, please contact our office.

Respectfully Submitted,

SOUTHERN CALIFORNIA GEOTECHNICAL, INC.

Scott McCann
Staff Scientist

Robert G. Trazo, GE 2655
Project Engineer

Distribution: (1) Addressee

Enclosures: Plate 1 - Site Location Map
Plate 2 - Infiltration Test Location Plan
Boring Log Legend and Logs (6 pages)
Infiltration Test Results Spreadsheets (4 pages)
Grain Size Distribution Graphs (10 pages)

SOURCE: ORANGE COUNTY
THOMAS GUIDE, 2013

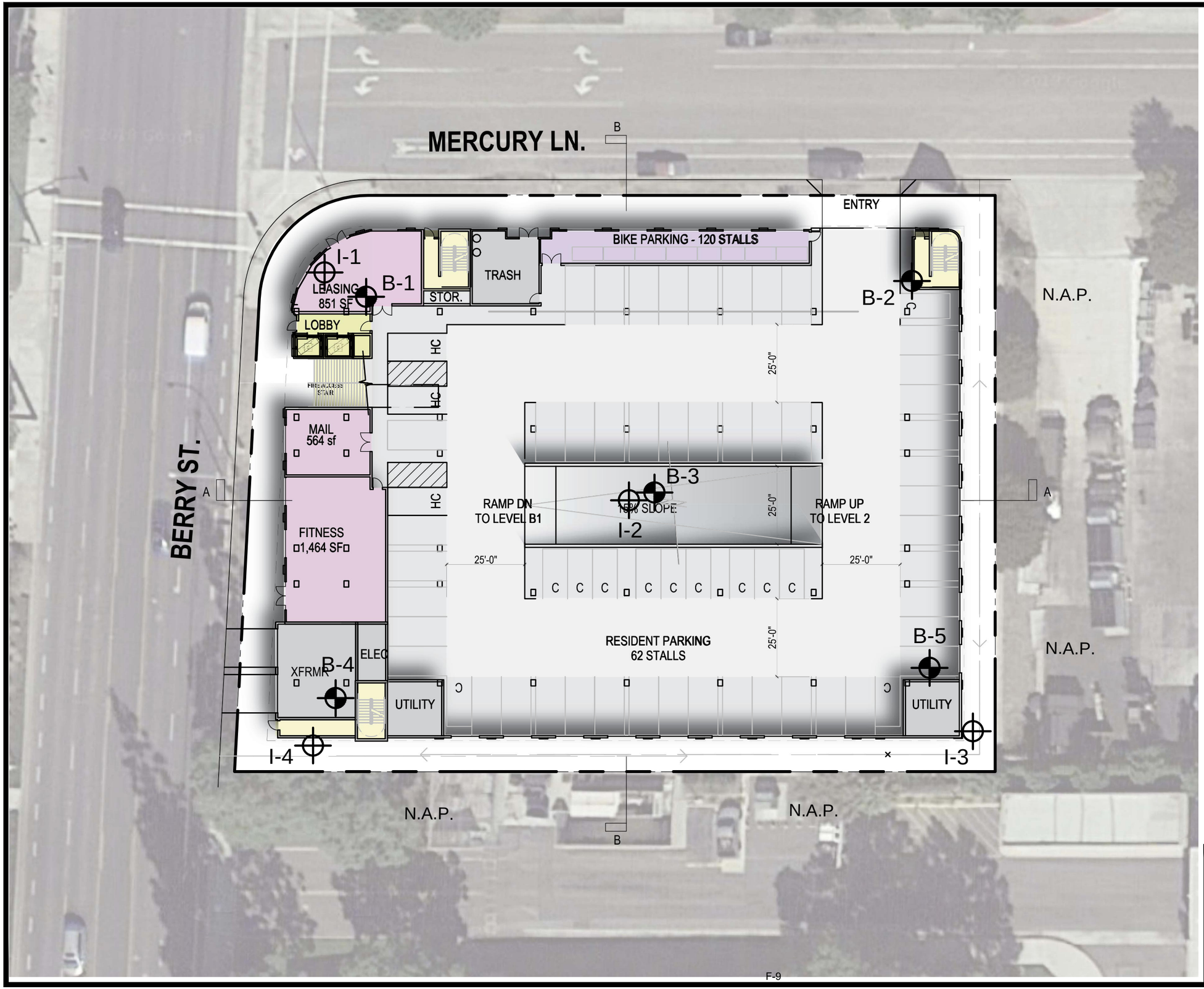
SITE LOCATION MAP

PROPOSED MULTI-UNIT APARTMENT COMPLEX

BREA, CALIFORNIA

SCALE: 1" = 2400'	
DRAWN: SM CHKD: RGT	
SCG PROJECT 18G118-2	
PLATE 1	

SoCalGeo
SOUTHERN CALIFORNIA GEOTECHNICAL



GEOTECHNICAL LEGEND

- APPROXIMATE INFILTRATION TEST LOCATION
- BORING LOCATION FROM PREVIOUS STUDY (SCG PROJECT PROJECT NO. 18G118-1)

NOTE: SITE PLAN PREPARED BY HUMPHREYS & PARTNERS ARCHITECTS, L.P.

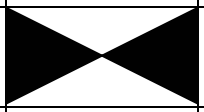
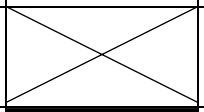
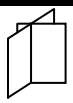
INFILTRATION TEST LOCATION PLAN

PROPOSED MULTI-UNIT APARTMENT COMPLEX

BREA, CALIFORNIA

SCALE: 1" = 30'	SOUTHERN CALIFORNIA GEOTECHNICAL
DRAWN: SM CHKD: RGT	
SCG PROJECT 18G118-2	
PLATE 2	

BORING LOG LEGEND

SAMPLE TYPE	GRAPHICAL SYMBOL	SAMPLE DESCRIPTION
AUGER		SAMPLE COLLECTED FROM AUGER CUTTINGS, NO FIELD MEASUREMENT OF SOIL STRENGTH. (DISTURBED)
CORE		ROCK CORE SAMPLE: TYPICALLY TAKEN WITH A DIAMOND-TIPPED CORE BARREL. TYPICALLY USED ONLY IN HIGHLY CONSOLIDATED BEDROCK.
GRAB		SOIL SAMPLE TAKEN WITH NO SPECIALIZED EQUIPMENT, SUCH AS FROM A STOCKPILE OR THE GROUND SURFACE. (DISTURBED)
CS		CALIFORNIA SAMPLER: 2-1/2 INCH I.D. SPLIT BARREL SAMPLER, LINED WITH 1-INCH HIGH BRASS RINGS. DRIVEN WITH SPT HAMMER. (RELATIVELY UNDISTURBED)
NSR		NO RECOVERY: THE SAMPLING ATTEMPT DID NOT RESULT IN RECOVERY OF ANY SIGNIFICANT SOIL OR ROCK MATERIAL.
SPT		STANDARD PENETRATION TEST: SAMPLER IS A 1.4 INCH INSIDE DIAMETER SPLIT BARREL, DRIVEN 18 INCHES WITH THE SPT HAMMER. (DISTURBED)
SH		SHELBY TUBE: TAKEN WITH A THIN WALL SAMPLE TUBE, PUSHED INTO THE SOIL AND THEN EXTRACTED. (UNDISTURBED)
VANE		VANE SHEAR TEST: SOIL STRENGTH OBTAINED USING A 4 BLADED SHEAR DEVICE. TYPICALLY USED IN SOFT CLAYS-NO SAMPLE RECOVERED.

COLUMN DESCRIPTIONS

DEPTH: Distance in feet below the ground surface.

SAMPLE: Sample Type as depicted above.

BLOW COUNT: Number of blows required to advance the sampler 12 inches using a 140 lb hammer with a 30-inch drop. 50/3" indicates penetration refusal (>50 blows) at 3 inches. WH indicates that the weight of the hammer was sufficient to push the sampler 6 inches or more.

POCKET PEN.: Approximate shear strength of a cohesive soil sample as measured by pocket penetrometer.

GRAPHIC LOG: Graphic Soil Symbol as depicted on the following page.

DRY DENSITY: Dry density of an undisturbed or relatively undisturbed sample in lbs/ft^3.

MOISTURE CONTENT: Moisture content of a soil sample, expressed as a percentage of the dry weight.

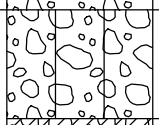
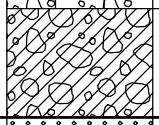
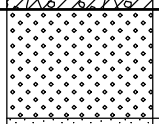
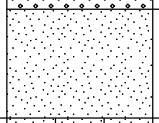
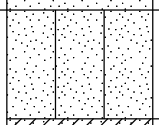
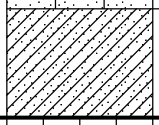
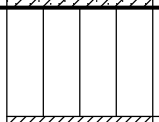
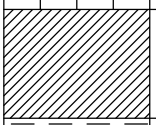
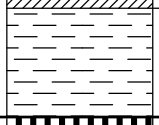
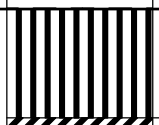
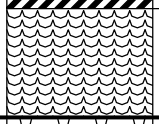
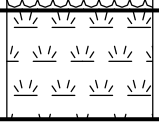
LIQUID LIMIT: The moisture content above which a soil behaves as a liquid.

PLASTIC LIMIT: The moisture content above which a soil behaves as a plastic.

PASSING #200 SIEVE: The percentage of the sample finer than the #200 standard sieve.

UNCONFINED SHEAR: The shear strength of a cohesive soil sample, as measured in the unconfined state.

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			SYMBOLS		TYPICAL DESCRIPTIONS
			GRAPH	LETTER	
COARSE GRAINED SOILS MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	GRAVEL AND GRAVELLY SOILS MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
				GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
		GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
	SAND AND SANDY SOILS MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	CLEAN SANDS (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
				SP	POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES
		SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)		SM	SILTY SANDS, SAND - SILT MIXTURES
				SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. I-1

JOB NO.: 18G118-2 | DRILLING DATE: 5/3/18 | WATER DEPTH: Dry
PROJECT: Proposed MFR Development | DRILLING METHOD: Hollow Stem Auger | CAVE DEPTH: ---
LOCATION: Brea, California | LOGGED BY: Anthony Luna | READING TAKEN: At Completion

FIELD RESULTS						LABORATORY RESULTS						
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION SURFACE ELEVATION: --- MSL	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	ORGANIC CONTENT (%)	COMMENTS
		9			FILL: Dark Brown Silty fine Sand, trace medium Sand, medium dense-moist		10					
		4			ALLUVIUM: Brown Clayey fine Sand, little Silt, very loose to loose-moist		10			37		
5					Boring Terminated at 5'							

TBL 18G118-2.GPJ SOCALGEO.GDT 5/22/18

TEST BORING LOG **PLATE I-1**

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. I-2

JOB NO.: 18G118-2 | DRILLING DATE: 5/3/18 | WATER DEPTH: Dry
PROJECT: Proposed MFR Development | DRILLING METHOD: Hollow Stem Auger | CAVE DEPTH: ---
LOCATION: Brea, California | LOGGED BY: Anthony Luna | READING TAKEN: At Completion

FIELD RESULTS						LABORATORY RESULTS						
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION SURFACE ELEVATION: --- MSL	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	ORGANIC CONTENT (%)	COMMENTS
		29			FILL: Brown Silty fine Sand, little medium Sand, trace coarse Sand, dense-damp		5					
		9	4.0		ALLUVIUM: Brown fine Sandy Clay, trace medium Sand, trace calcareous veining, slightly porous, stiff to very stiff-moist		10			52		
5		17					12			57		
		12					12			56		
10					Light Brown Clayey fine Sand, trace medium Sand, trace Silt, loose to medium dense-damp to moist							
		10					7			42		
15					Boring Terminated at 15'							

TBL 18G118-2.GPJ SOCALGEO.GDT 5/22/18

TEST BORING LOG **PLATE I-2**

SOUTHERN CALIFORNIA GEOTECHNICAL
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BORING NO. I-3

JOB NO.: 18G118-2 | DRILLING DATE: 5/3/18 | WATER DEPTH: Dry
PROJECT: Proposed MFR Development | DRILLING METHOD: Hollow Stem Auger | CAVE DEPTH: ---
LOCATION: Brea, California | LOGGED BY: Anthony Luna | READING TAKEN: At Completion

FIELD RESULTS						LABORATORY RESULTS						
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION SURFACE ELEVATION: --- MSL	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	ORGANIC CONTENT (%)	COMMENTS
		20			ALLUVIUM: Brown fine Sandy Clay, trace calcareous veining, very stiff-very moist		17					
		8			Light Brown Clayey fine Sand to fine Sandy Clay, trace medium Sand, trace calcareous veining, loose to medium stiff-moist		14			48		
5					Boring Terminated at 5'							

TBL 18G118-2.GPJ SOCALGEO.GDT 5/22/18

TEST BORING LOG **PLATE I-3**

SOUTHERN CALIFORNIA GEOTECHNICAL
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BORING NO. I-4

JOB NO.: 18G118-2 | DRILLING DATE: 5/3/18 | WATER DEPTH: Dry
PROJECT: Proposed MFR Development | DRILLING METHOD: Hollow Stem Auger | CAVE DEPTH: ---
LOCATION: Brea, California | LOGGED BY: Anthony Luna | READING TAKEN: At Completion

FIELD RESULTS						LABORATORY RESULTS						
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION SURFACE ELEVATION: --- MSL	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	ORGANIC CONTENT (%)	COMMENTS
		4			FILL: Brown Silty fine Sand, trace medium Sand, trace Asphaltic concrete fragments, very loose to loose-damp to moist		8					
		5			FILL: Brown Clayey fine Sand, trace medium Sand, trace Brick fragments, loose-moist		14			44		
5		7	4.0		ALLUVIUM: Brown fine Sandy Clay, trace medium Sand, trace calcareous veining, medium stiff to stiff-moist to very moist		19			53		
		12	4.5+				14			52		
10					Light Brown Clayey fine Sand, trace Silt, trace medium Sand, trace calcareous veining, loose-damp to moist							
		9					7			36		
15					Boring Terminated at 15'							

TBL 18G118-2.GPJ SOCALGEO.GDT 5/22/18

TEST BORING LOG **PLATE I-4**

INFILTRATION CALCULATIONS

Project Name	Proposed Multi-Unit Apartment Complex
Project Location	Brea, CA
Project Number	18G118-2
Engineer	Scott McCann

Test Hole Radius	4	(in)
Test Depth	5.0	(ft)

Infiltration Test Hole	I-1

Interval Number		Time	Time Interval (min)	Water Depth (ft)	Change in Water Level (ft)	Average Head Height (ft)	Infiltration Rate Q (in/hr)
1	Initial	9:00 AM	30.0	3.06	0.09	1.90	0.17
	Final	9:30 AM		3.15			
2	Initial	9:31 AM	30.0	3.17	0.10	1.78	0.21
	Final	10:01 AM		3.27			
3	Initial	10:02 AM	30.0	3.29	0.07	1.68	0.15
	Final	10:32 AM		3.36			
4	Initial	10:33 AM	30.0	3.30	0.07	1.67	0.15
	Final	11:03 AM		3.37			
5	Initial	11:04 AM	30.0	3.31	0.08	1.65	0.18
	Final	11:34 AM		3.39			
6	Initial	11:35 AM	30.0	3.30	0.07	1.67	0.15
	Final	12:05 PM		3.37			
7	Initial	12:06 PM	30.0	3.29	0.07	1.68	0.15
	Final	12:36 PM		3.36			
8	Initial	12:37 PM	30.0	3.30	0.07	1.67	0.15
	Final	1:07 PM		3.37			
9	Initial	1:08 PM	30.0	3.32	0.06	1.65	0.13
	Final	1:38 PM		3.38			
10	Initial	1:39 PM	30.0	3.31	0.07	1.66	0.15
	Final	2:09 PM		3.38			
11	Initial	2:10 PM	30.0	3.30	0.06	1.67	0.13
	Final	2:40 PM		3.36			
12	Initial	2:41 PM	30.0	3.31	0.06	1.66	0.13
	Final	3:11 PM		3.37			

Per County Standards, Infiltration Rate calculated as follows:

$$Q = \frac{\Delta H(60r)}{\Delta t(r + 2H_{avg})}$$

Where: Q = Infiltration Rate (in inches per hour)
ΔH = Change in Height (Water Level) over the time interval
r = Test Hole (Borehole) Radius
Δt = Time Interval H above GS= 0.1
H_{avg} = Average Head Height over the time interval

INFILTRATION CALCULATIONS

Project Name	Proposed Multi-Unit Apartment Complex
Project Location	Brea, CA
Project Number	18G118-2
Engineer	Scott McCann

Test Hole Radius	4	(in)
Test Depth	15.0	(ft)

Infiltration Test Hole	I-2

Interval Number		Time	Time Interval (min)	Water Depth (ft)	Change in Water Level (ft)	Average Head Height (ft)	Infiltration Rate Q (in/hr)
1	Initial	8:10 AM	30.0	3.82	0.80	10.78	0.29
	Final	8:40 AM		4.62			
2	Initial	8:41 AM	30.0	3.90	0.75	10.73	0.28
	Final	9:11 AM		4.65			
3	Initial	9:12 AM	30.0	3.93	0.73	10.71	0.27
	Final	9:42 AM		4.66			
4	Initial	9:43 AM	30.0	3.93	0.72	10.71	0.26
	Final	10:13 AM		4.65			
5	Initial	10:14 AM	30.0	3.91	0.70	10.74	0.26
	Final	10:44 AM		4.61			
6	Initial	10:45 AM	30.0	3.95	0.70	10.70	0.26
	Final	11:15 AM		4.65			
7	Initial	11:16 AM	30.0	3.94	0.71	10.71	0.26
	Final	11:46 AM		4.65			
8	Initial	11:47 AM	30.0	3.95	0.69	10.71	0.25
	Final	12:17 PM		4.64			
9	Initial	12:18 PM	30.0	3.95	0.67	10.72	0.25
	Final	12:48 PM		4.62			
10	Initial	12:49 PM	30.0	3.94	0.66	10.73	0.24
	Final	1:19 PM		4.60			
11	Initial	1:20 PM	30.0	3.95	0.66	10.72	0.24
	Final	1:50 PM		4.61			
12	Initial	1:51 PM	30.0	3.93	0.66	10.74	0.24
	Final	2:21 PM		4.59			

Per County Standards, Infiltration Rate calculated as follows:

$$Q = \frac{\Delta H(60r)}{\Delta t(r + 2H_{avg})}$$

Where: Q = Infiltration Rate (in inches per hour)
ΔH = Change in Height (Water Level) over the time interval
r = Test Hole (Borehole) Radius
Δt = Time Interval H above GS= 0.1
H_{avg} = Average Head Height over the time interval

INFILTRATION CALCULATIONS

Project Name	Proposed Multi-Unit Apartment Complex
Project Location	Brea, CA
Project Number	18G118-2
Engineer	Scott McCann

Test Hole Radius	4	(in)
Test Depth	4.8	(ft)

Infiltration Test Hole	I-3

Interval Number		Time	Time Interval (min)	Water Depth (ft)	Change in Water Level (ft)	Average Head Height (ft)	Infiltration Rate Q (in/hr)
1	Initial	8:00 AM	30.0	3.02	0.08	1.74	0.17
	Final	8:30 AM		3.10			
2	Initial	8:31 AM	30.0	3.10	0.07	1.67	0.15
	Final	9:01 AM		3.17			
3	Initial	9:02 AM	30.0	2.90	0.06	1.87	0.12
	Final	9:32 AM		2.96			
4	Initial	9:33 AM	30.0	2.90	0.06	1.87	0.12
	Final	10:03 AM		2.96			
5	Initial	10:04 AM	30.0	2.96	0.06	1.81	0.12
	Final	10:34 AM		3.02			
6	Initial	10:35 AM	30.0	2.92	0.05	1.86	0.10
	Final	11:05 AM		2.97			
7	Initial	11:06 AM	30.0	2.92	0.06	1.85	0.12
	Final	11:36 AM		2.98			
8	Initial	11:37 AM	30.0	2.94	0.05	1.84	0.10
	Final	12:07 PM		2.99			
9	Initial	12:08 PM	30.0	2.95	0.05	1.83	0.10
	Final	12:38 PM		3.00			
10	Initial	12:39 PM	30.0	2.93	0.05	1.85	0.10
	Final	1:09 PM		2.98			
11	Initial	1:10 PM	30.0	2.90	0.05	1.88	0.10
	Final	1:40 PM		2.95			
12	Initial	1:41 PM	30.0	2.93	0.05	1.85	0.10
	Final	2:11 PM		2.98			

Per County Standards, Infiltration Rate calculated as follows:

$$Q = \frac{\Delta H(60r)}{\Delta t(r + 2H_{avg})}$$

Where: Q = Infiltration Rate (in inches per hour)
ΔH = Change in Height (Water Level) over the time interval
r = Test Hole (Borehole) Radius
Δt = Time Interval H above GS= 0.2
H_{avg} = Average Head Height over the time interval

INFILTRATION CALCULATIONS

Project Name	Proposed Multi-Unit Apartment Complex
Project Location	Brea, CA
Project Number	18G118-2
Engineer	Scott McCann

Test Hole Radius	4	(in)
Test Depth	14.9	(ft)

Infiltration Test Hole	I-4

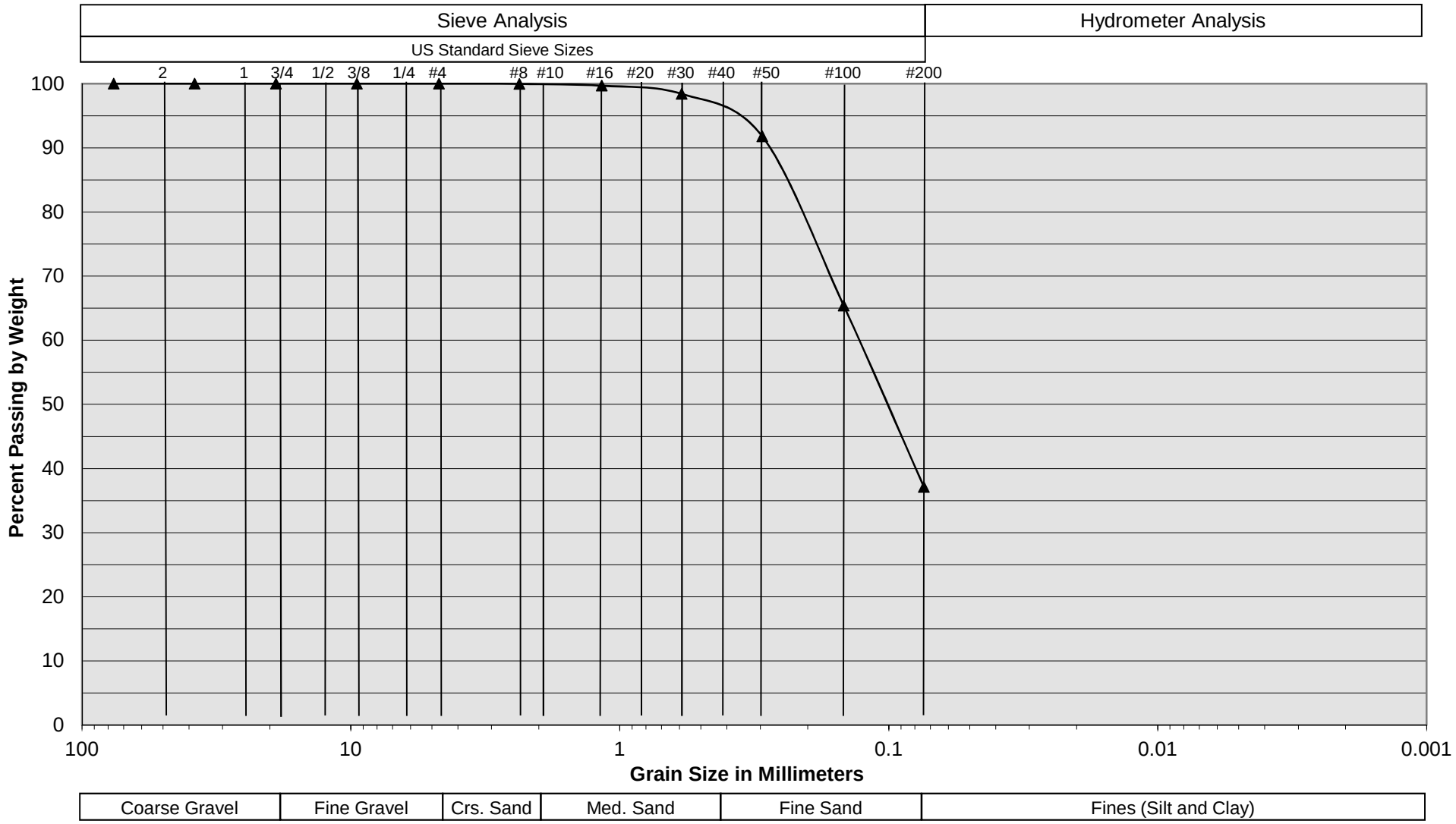
Interval Number		Time	Time Interval (min)	Water Depth (ft)	Change in Water Level (ft)	Average Head Height (ft)	Infiltration Rate Q (in/hr)
1	Initial	9:10 AM	30.0	3.90	0.78	10.61	0.29
	Final	9:40 AM		4.68			
2	Initial	9:41 AM	30.0	3.94	0.64	10.64	0.24
	Final	10:11 AM		4.58			
3	Initial	10:12 AM	30.0	3.91	0.60	10.69	0.22
	Final	10:42 AM		4.51			
4	Initial	10:43 AM	30.0	3.92	0.62	10.67	0.23
	Final	11:13 AM		4.54			
5	Initial	11:14 AM	30.0	3.93	0.61	10.67	0.23
	Final	11:44 AM		4.54			
6	Initial	11:45 AM	30.0	3.94	0.61	10.66	0.23
	Final	12:15 PM		4.55			
7	Initial	12:16 PM	30.0	3.95	0.60	10.65	0.22
	Final	12:46 PM		4.55			
8	Initial	12:47 PM	30.0	3.94	0.60	10.66	0.22
	Final	1:17 PM		4.54			
9	Initial	1:18 PM	30.0	3.97	0.58	10.64	0.21
	Final	1:48 PM		4.55			
10	Initial	1:49 PM	30.0	3.95	0.57	10.67	0.21
	Final	2:19 PM		4.52			
11	Initial	2:20 PM	30.0	3.96	0.57	10.66	0.21
	Final	2:50 PM		4.53			
12	Initial	2:51 PM	30.0	3.97	0.56	10.65	0.21
	Final	3:21 PM		4.53			

Per County Standards, Infiltration Rate calculated as follows:

$$Q = \frac{\Delta H(60r)}{\Delta t(r + 2H_{avg})}$$

Where: Q = Infiltration Rate (in inches per hour)
ΔH = Change in Height (Water Level) over the time interval
r = Test Hole (Borehole) Radius
Δt = Time Interval H above GS= 0.1
H_{avg} = Average Head Height over the time interval

Grain Size Distribution



Sample Description	I-1 @ 3.5 to 5 feet
Soil Classification	Brown Clayey fine Sand, little Silt

Proposed Multi-Unit Apartment Complex
Brea, CA
Project No. 18G118-2
PLATE C-1

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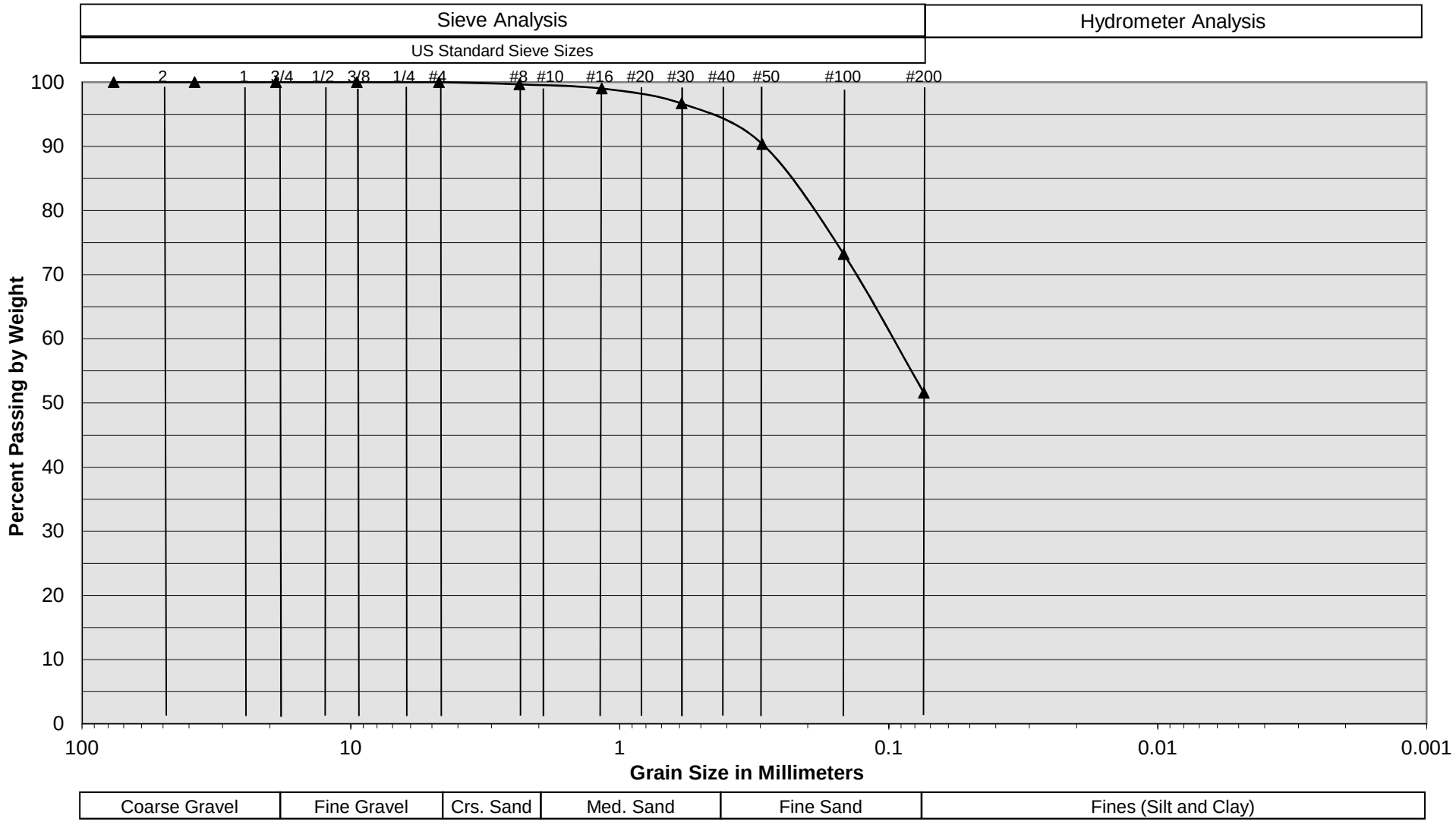
Grain Size Distribution



Sample Description	I-2 @ 3.5 to 5 feet
Soil Classification	Brown fine Sandy Clay, trace medium Sand

Proposed Multi-Unit Apartment Complex
Brea, CA
Project No. 18G118-2
PLATE C-2

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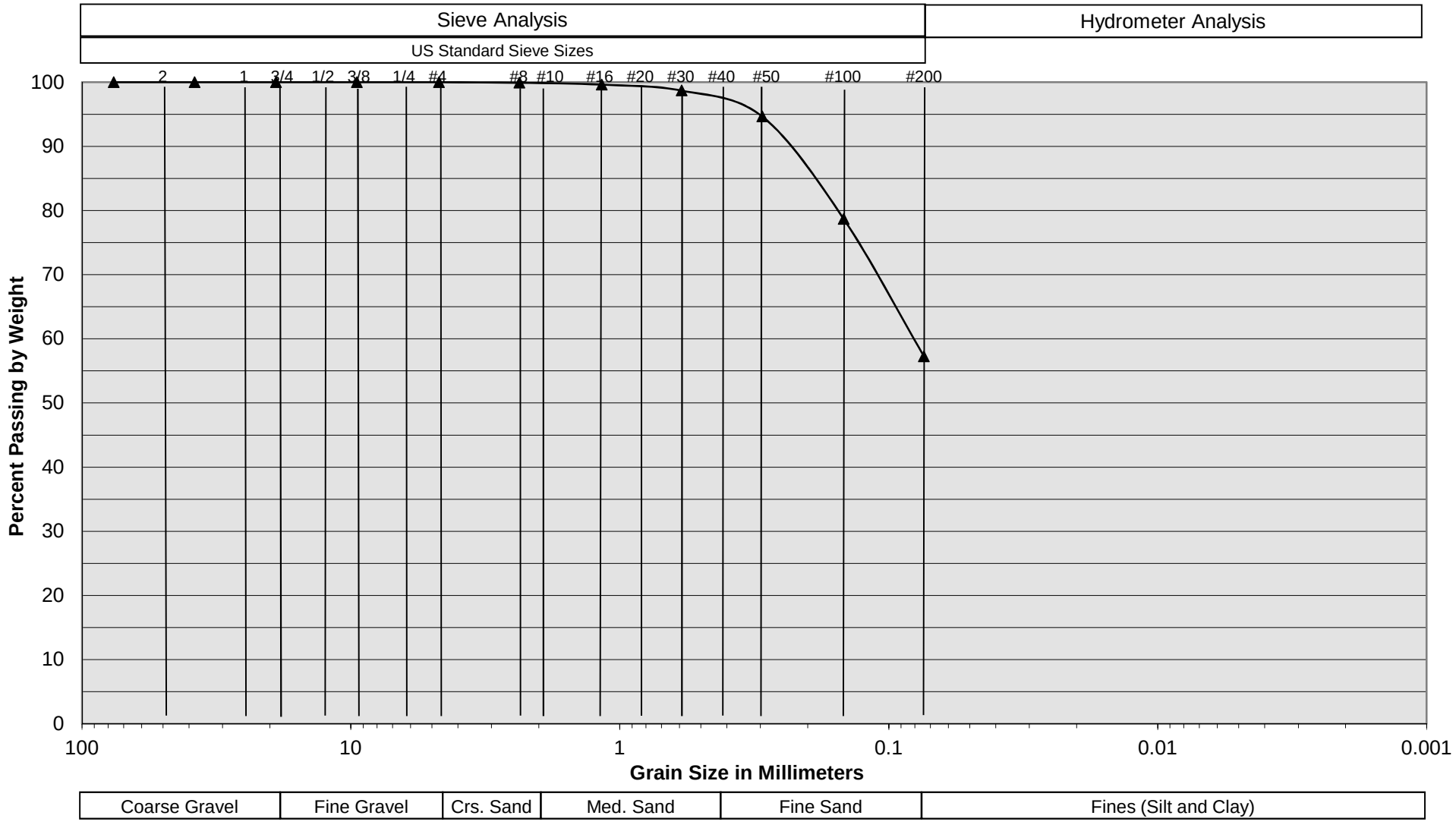
Grain Size Distribution



Sample Description	I-2 @ 6 to 7.5 feet
Soil Classification	Brown fine Sandy Clay

Proposed Multi-Unit Apartment Complex
Brea, CA
Project No. 18G118-2
PLATE C-3

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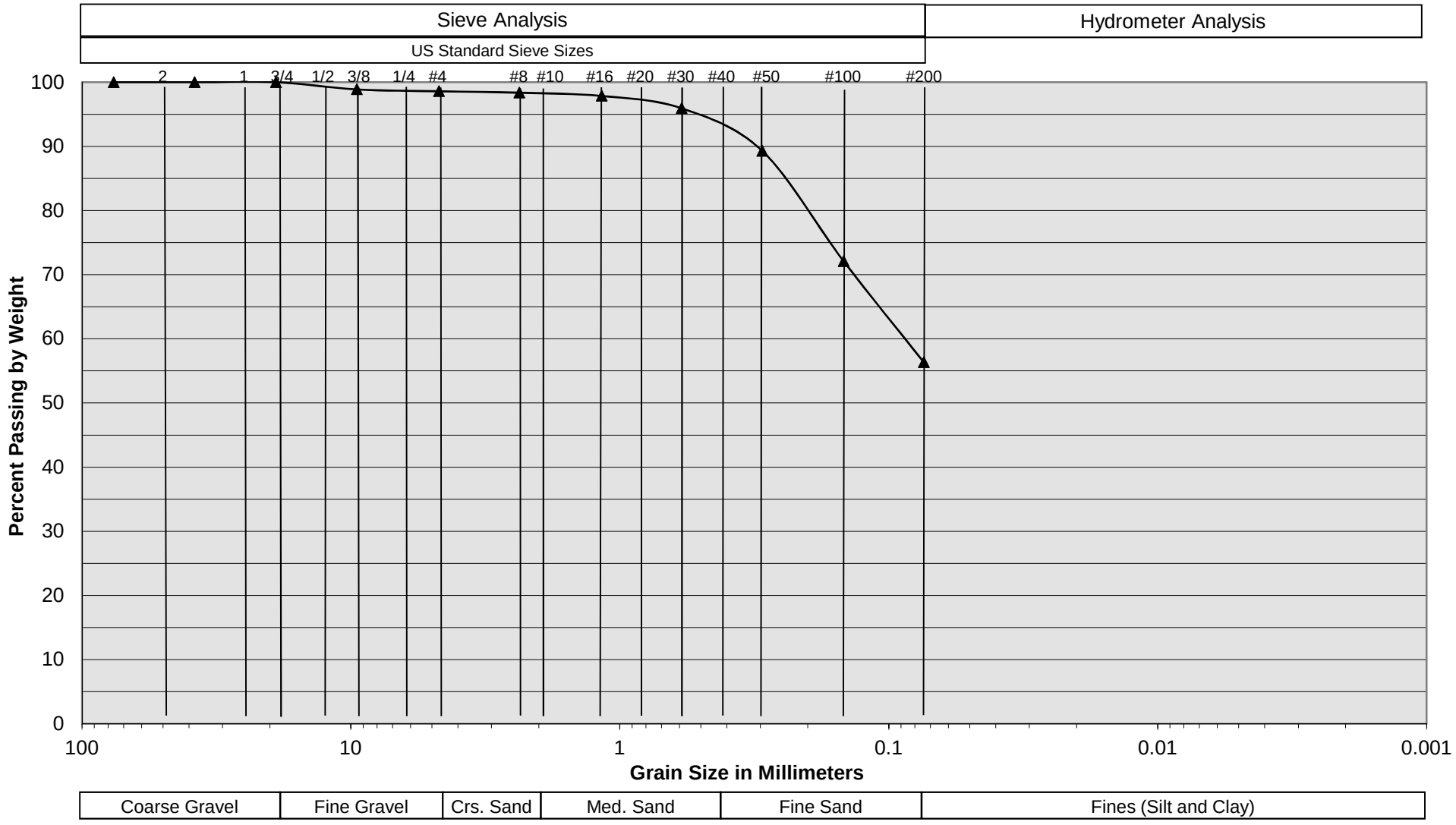
Grain Size Distribution



Sample Description	I-2 @ 8.5 to 10 feet
Soil Classification	Brown fine Sandy Clay, trace medium Sand

Proposed Multi-Unit Apartment Complex
Brea, CA
Project No. 18G118-2
PLATE C-4

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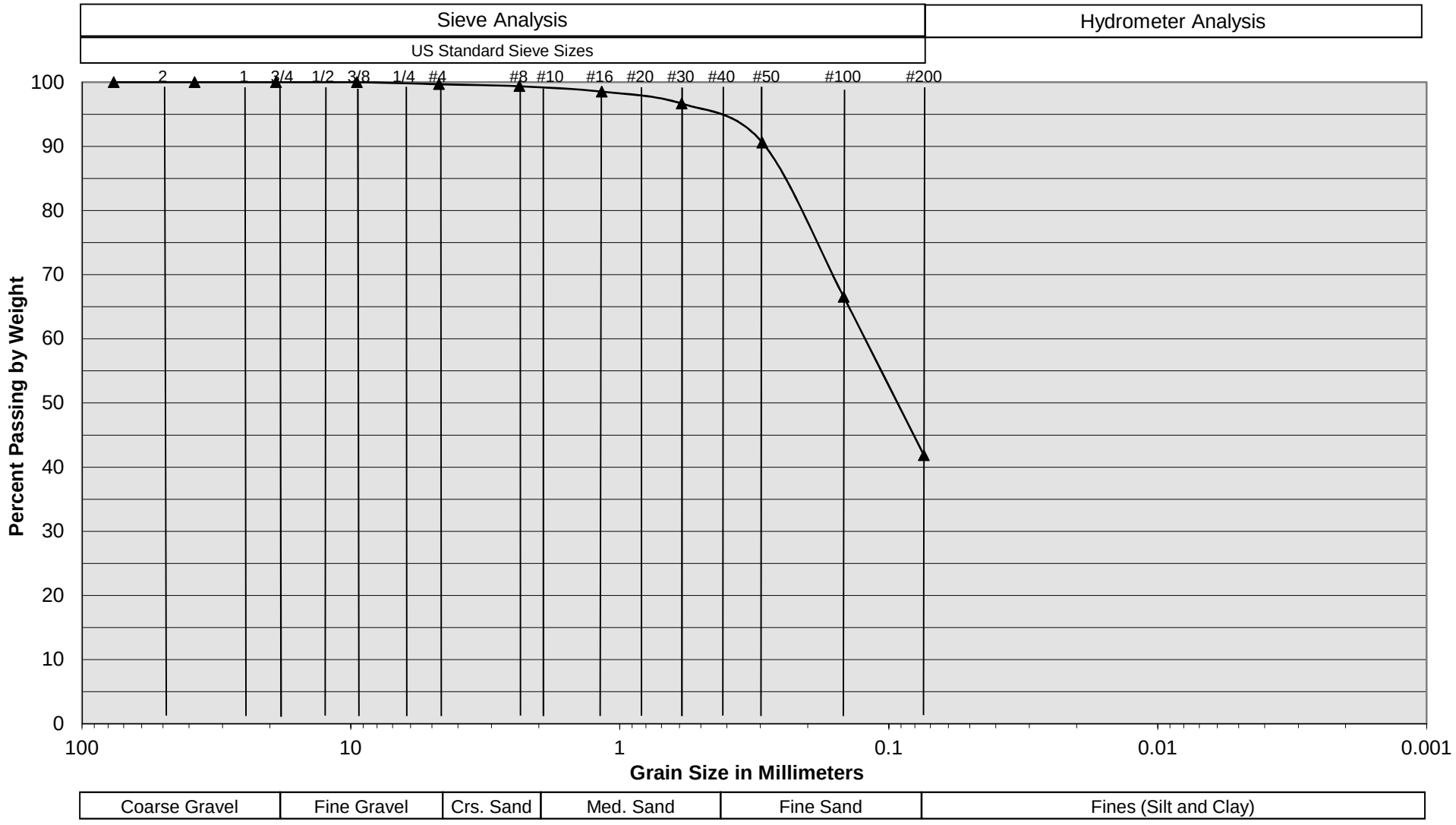
Grain Size Distribution



Sample Description	I-2 @ 13.5 to 15 feet
Soil Classification	Light Brown Clayey fine Sand, trace medium Sand, trace Silt

Proposed Multi-Unit Apartment Complex
Brea, CA
Project No. 18G118-2
PLATE C-5

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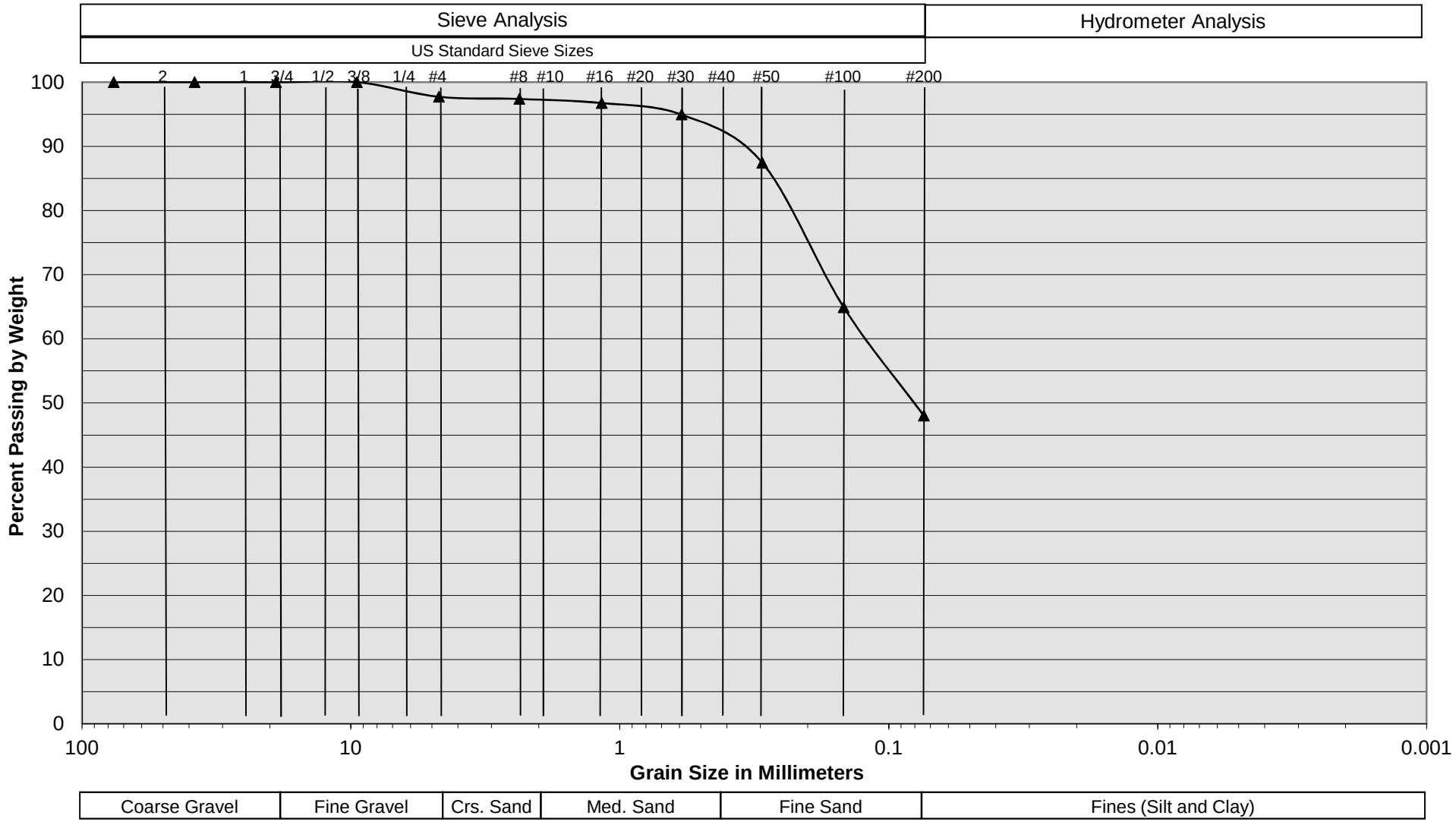
Grain Size Distribution



Sample Description	I-3 @ 3.5 to 5 feet
Soil Classification	Light Brown Clayey fine Sand to fine Sandy Clay, trace medium Sand

Proposed Multi-Unit Apartment Complex
Brea, CA
Project No. 18G118-2
PLATE C-6

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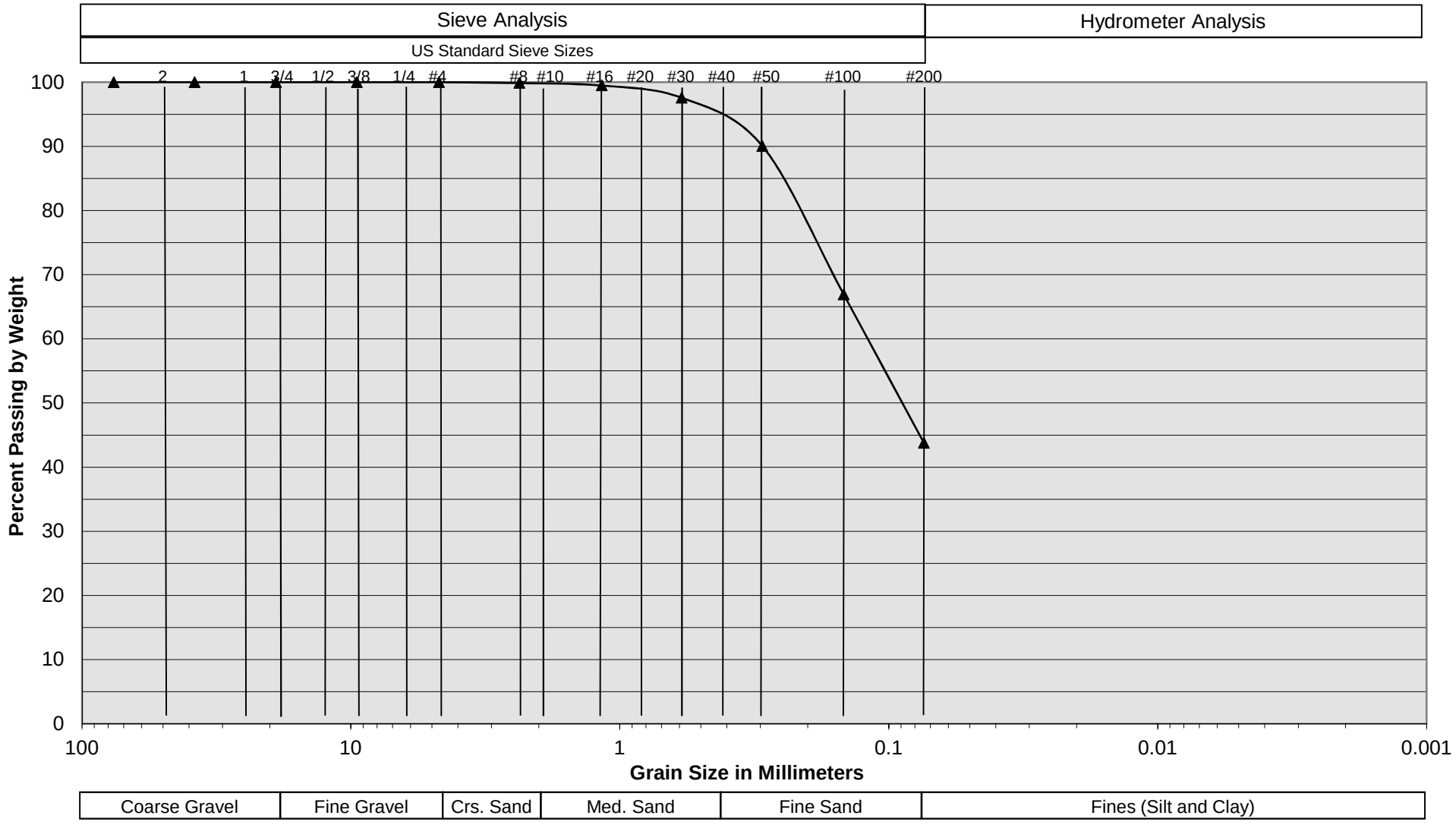
Grain Size Distribution



Sample Description	I-4 @ 3.5 to 5 feet
Soil Classification	Brown Clayey fine Sand, trace medium Sand

Proposed Multi-Unit Apartment Complex
Brea, CA
Project No. 18G118-2
PLATE C-7

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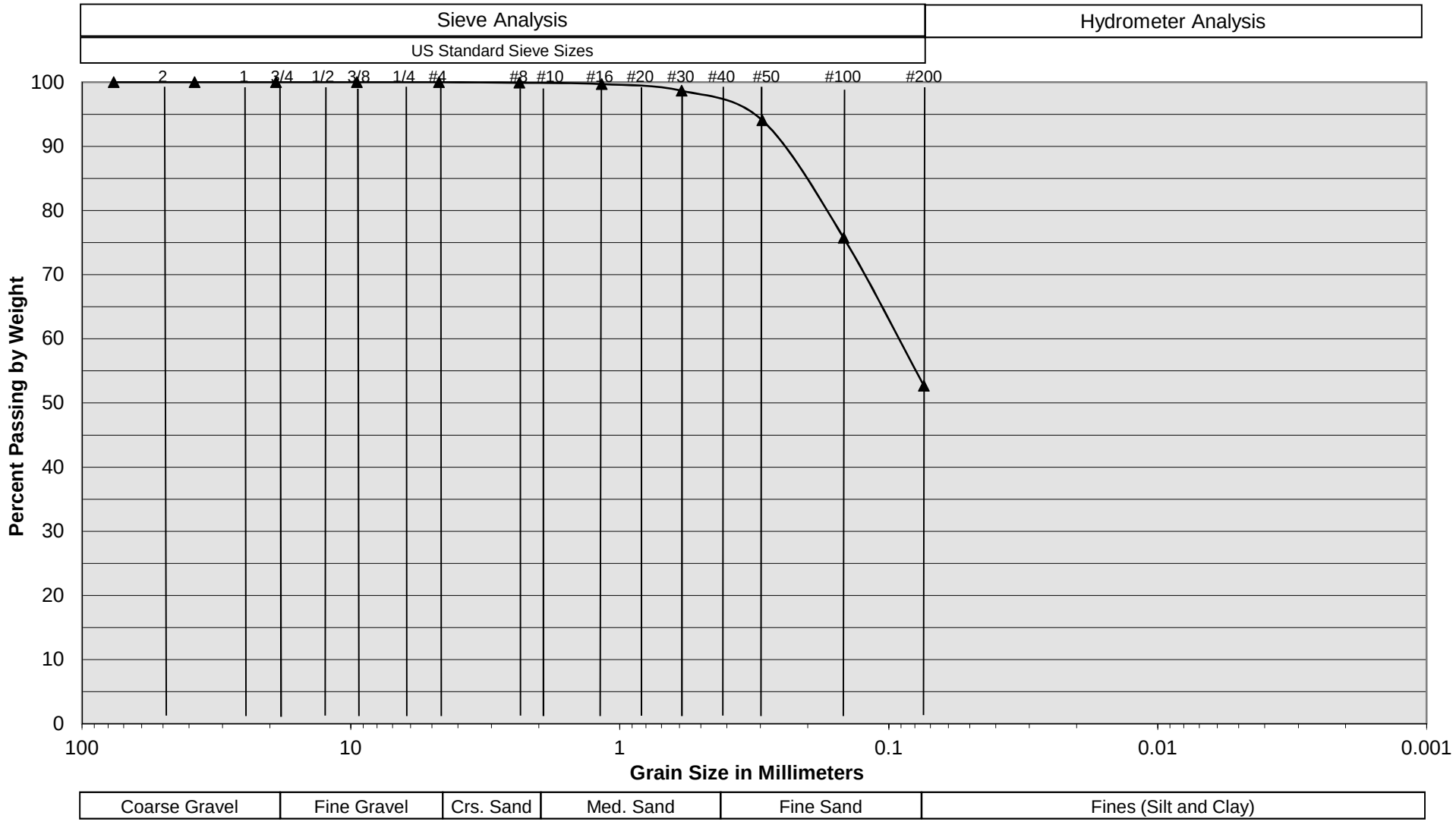
Grain Size Distribution



Sample Description	I-4 @ 6 to 7.5 feet
Soil Classification	Brown fine Sandy Clay, trace medium Sand

Proposed Multi-Unit Apartment Complex
Brea, CA
Project No. 18G118-2
PLATE C-8

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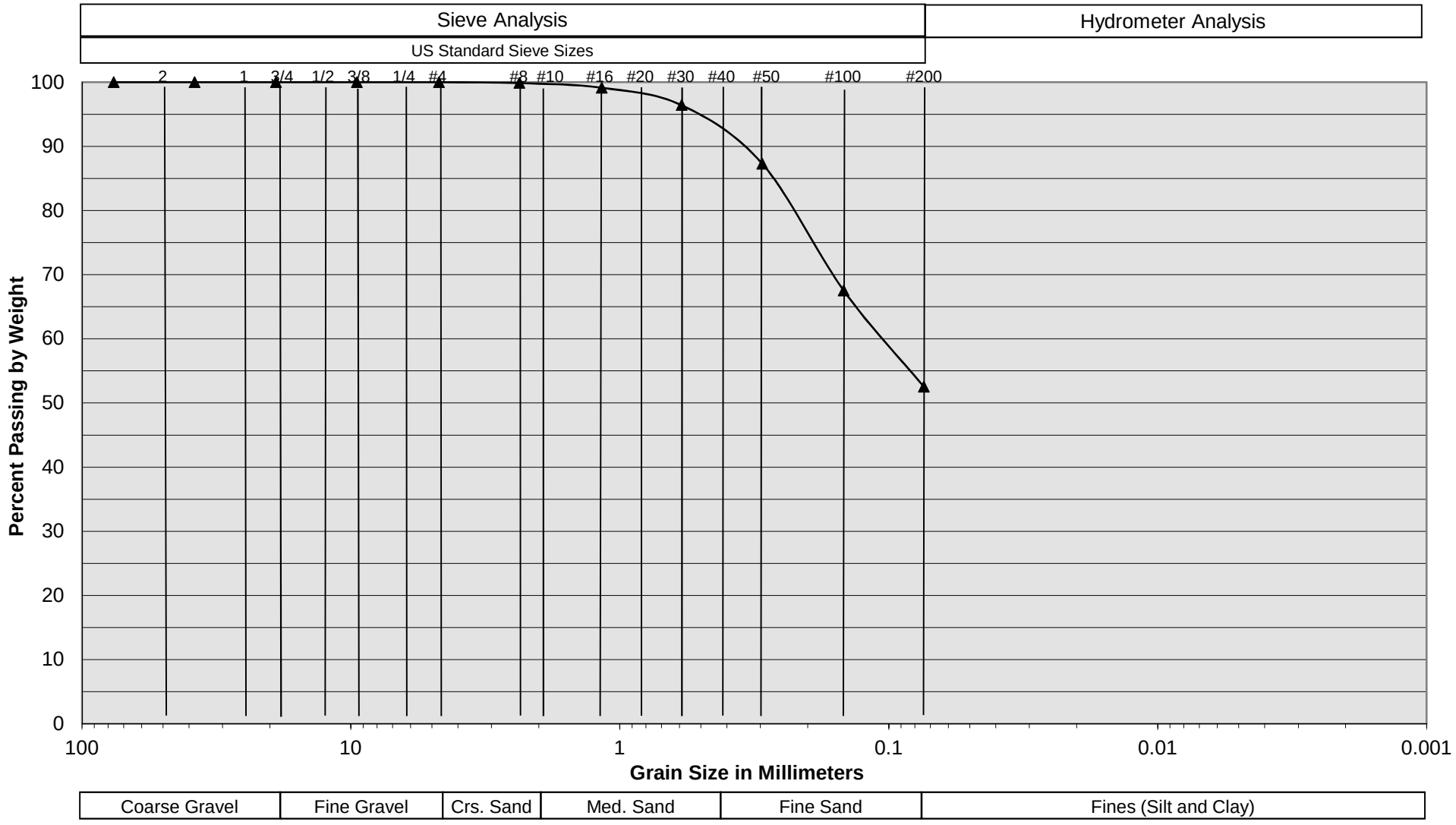
Grain Size Distribution



Sample Description	I-4 @ 8.5 to 10 feet
Soil Classification	Brown fine Sandy Clay, trace medium Sand

Proposed Multi-Unit Apartment Complex
Brea, CA
Project No. 18G118-2
PLATE C-9

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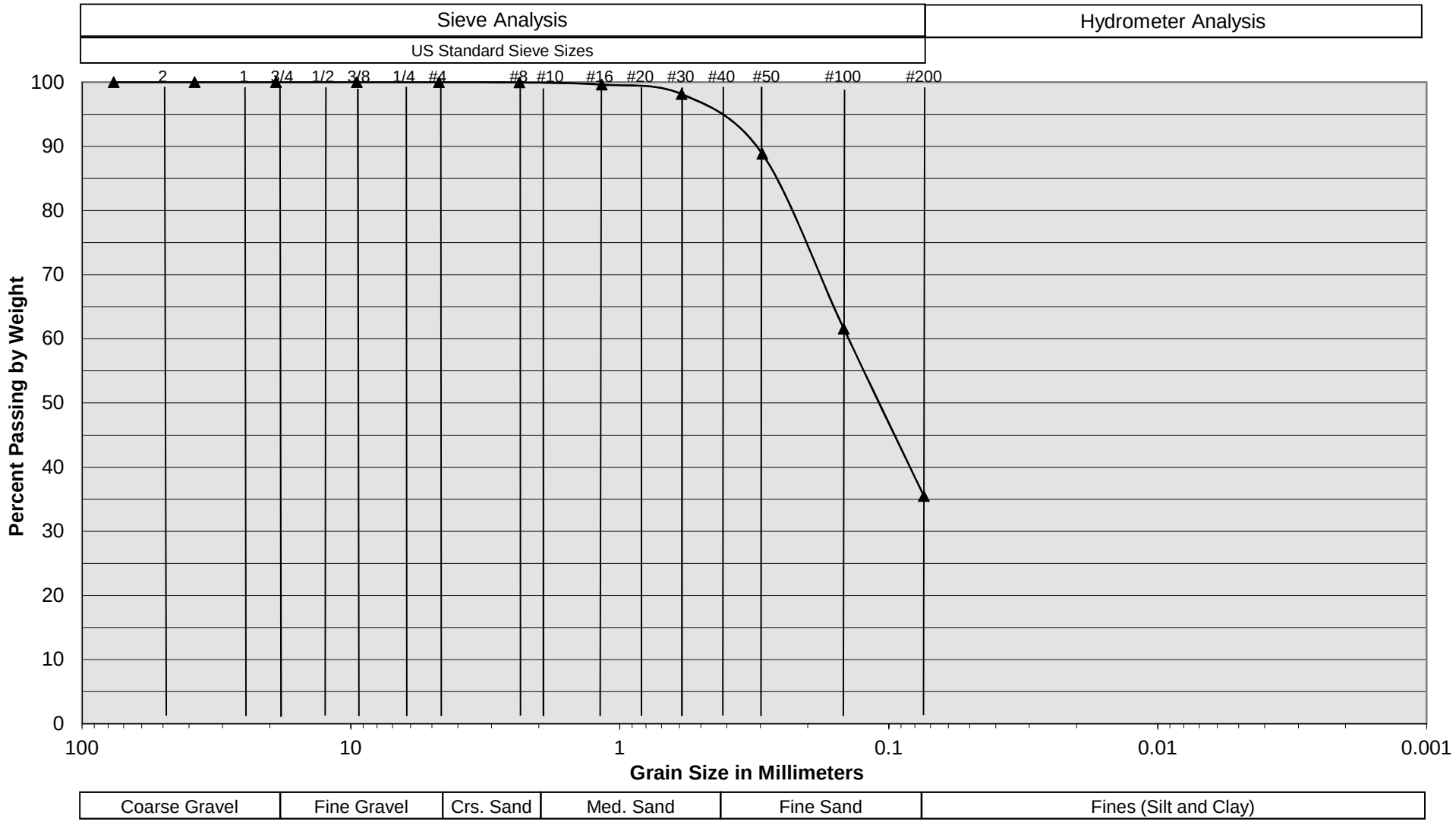
Grain Size Distribution



Sample Description	I-4 @ 13.5 to 15 feet
Soil Classification	Light Brown Clayey fine Sand, trace medium Sand, trace Silt

Proposed Multi-Unit Apartment Complex
Brea, CA
Project No. 18G118-2
PLATE C-10

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