February 6, 2018

TO: Hector J. Bordas
Design Division

Attention Nicole Mi

FROM: Greg Kelley Greg Kelley
Geotechnical and Materials Engineering Division

GEOTECHNICAL INVESTIGATION
GATES CANYON PARK REGIONAL LOW IMPACT DEVELOPMENT PROJECT
PROJECT ID DES002966 (PROJECT NO. F21816I02)

In response to the request from Project Management Division II (PMD II), Geotechnical and Materials Engineering Division (GMED) conducted a supplemental geotechnical investigation for the proposed cistern and pipelines for the subject project.

SUBSURFACE INVESTIGATION

Six exploratory borings were drilled on November 8 and 9, 2017, under the supervision of GMED personnel to evaluate the site and determine subsurface conditions. Borings were drilled by Cascade Drilling and Testing, Inc. using an 8-inch diameter hollow stem auger to a maximum depth of 30 feet below grade. The approximate boring locations are shown on Figure 1 and the Log of Borings is provided in Appendix A.

LABORATORY TESTING

Bulk and relatively undisturbed samples were collected from the borings to determine soil properties and confirm classifications made in the field. Testing was performed by the GMED Materials Laboratory. A summary of the results is provided in Appendix B.

FINDINGS

Subsurface Conditions

- The soils encountered during exploration for the cistern consisted of clay, clayey sand, and silty sand in loose to medium dense and hard to very stiff condition.

- The soils encountered during exploration for the control house consisted of clayey shale bedrock in moderately hard to hard condition.

Groundwater

- No groundwater was encountered in any of the borings.

RECOMMENDATIONS

Foundation Design

It is our understanding that Design Division (DES) proposes to construct an above ground control house and an underground concrete cistern. The control house is approximately 25 feet by 25 feet, proposed with either a retaining wall to support the slope behind the structure, or with the structure's walls designed as retaining walls. The underground cistern is approximately 120 feet by 160 feet by 12 feet at a depth of 20 feet below ground surface (bgs).

Based on discussion with the designers, the proposed structures will be designed using the Working Stress Design method. All values recommended below may be considered allowable.

<u>Control House</u>

Removal and replacement with structural backfill is recommended at a minimum of 2 feet below the bottom of the foundation of the control house. Structural backfill is subject to the Standard Specifications for Public Works Construction (SSPWC) Section 217-3 requirements. The following geotechnical design parameters may be used to design foundations for the control house:

Geotechnical Design Parameters for Control House	
Soil Type	Shale Bedrock (Tush)
Soil Unit Weight	120 pcf
Active Pressure EFP	50 pcf
At-Rest EFP	75 pcf
Passive Pressure EFP (unfactored)	400 pcf
Seismic Active EFP	15 pcf[A]
Seismic At-Rest EFP	25 pcf[A]
Peak Ground Acceleration (PGA)	0.617 g
Bearing Capacity	3,000 psf[B]

Notes:
[A] Seismic Equivalent Fluid Pressure (EFP) increments should be added to retaining walls with retained height greater than 6 feet. EFP is applied as an upright triangular pressure distribution.
[B] Bearing capacity only valid for control house foundation with minimum dimensions 25 feet by 25 feet.

Underground Cistern

Based on laboratory test results, the underground cistern should be designed for medium expansive soils. The following geotechnical design parameters may be used to design the underground cistern foundation for:

Geotechnical Design Parameters for Cistern location	
Soil Type	Clay (CL)
Soil Unit Weight	110 pcf
Active Pressure EFP	40 pcf
At-Rest EFP	64 pcf
Passive Pressure EFP (unfactored)	430 pcf
Seismic Active EFP	15 pcf[A]
Seismic At-Rest EFP	25 pcf[A]
Peak Ground Acceleration (PGA)	0.617 g

Notes:
[A] Seismic Equivalent Fluid Pressure (EFP) increments should be added to retaining walls with retained height greater than 6 feet. EFP is applied as an upright triangular pressure distribution.

Trenching and Excavation

- Excavations greater than 5 feet in depth shall either be shored or sloped back at a gradient no steeper than 1.5:1 (horizontal:vertical).
- The soils encountered in the borings may be classified Type B as defined in the California Code of Regulation Title 8, Division 1, Chapter 4, Subchapter 4, Article 6, Appendix A.
- Excavated material on-site is not suitable for use as bedding subject to the requirements of SSPWC Sections 217.1 and 217.2.
- Excavated material on-site is suitable for use as backfill subject to the requirements of SSPWC Sections 217.1 and 217.2.
- All backfill shall be compacted to a minimum relative compaction of 90 percent of the maximum dry density per ASTM D1557.
- Amendments to the specifications are provided in Appendix D and shall be included in the Special Provisions of the Project Specifications.

General

- Log of Borings and boring locations shall be included with the project plans.

- Preliminary and final design plans and specifications shall be submitted to GMED for review, comment, and approval to verify that our recommendations have been properly incorporated.

CONSTRUCTION CONSIDERATIONS

- Significant excavation depths are proposed for the cistern. GMED should be involved during construction to verify adequate quality control is performed for temporary excavations.

- Removal and replacement is recommended for the control house. GMED should be involved during construction to verify adequate compaction control is performed.

- GMED should be notified immediately to verify any change of conditions observed during construction.

SIGNATURES

If you have any questions concerning this report, please contact Kevin Phan or Yonah Halpern at (626) 458-4925.

Prepared by:

Kevin Phan
Senior Civil Engineering Assistant

Reviewed by:

REGISTERED PROFESSIONAL ENGINEER
YONAH RENDALL HALPERN
78810
CIVIL
STATE OF CALIFORNIA

2/6/18

Yonah Halpern
Associate Civil Engineer

KP

KP:YH:mc
GME-4p:\gmepub\secretarial\soilsinv\reports\gates canyon park lid project.docx

FIGURE

Figure 1 – Boring Location Map

APPENDICES

Appendix A – Log of Borings
Appendix B – Summary of Laboratory Results
Appendix C – Seismic Design Parameters
Appendix D – Amendments to Specification

FIGURE

GEOLOGY AND SOILS

COUNTY OF LOS ANGELES DEPARTMENT OF PUBLIC WORKS

GEOTECHNICAL AND MATERIALS ENGINEERING DIVISION

BORING LOCATION MAP
GATES CANYON PARK ADDENDUM
CALABASAS, CA

Date: Aug. 2016	Drafted by: KP	Scale: as shown	FIGURE 1

APPENDIX A

Log of Borings

Los Angeles County Department of Public Works
Geotechnical and Materials Engineering Division
900 South Fremont Avenue, Alhambra, CA 91803

BORING NUMBER B-1a

CLIENT

PROJECT NAME Gates Canyon Park Addendum

PROJECT NUMBER

PROJECT LOCATION Calabasas

Dates(s) Drilled **11/9/2017 - 11/9/2017**	Boring Location	Logged By **Kevin Phan**	Checked By
Drilling Contractor **Cascade**	Drill Bit Size **8 inches**	Approx. Surf. Elevation (ft)	Drilled Depth (ft) **30**
Drilling Method **CME 85 Hollowstem**	Boring Diameter **8 inches**	Depth to Groundwater	Inclination/ Bearing (°)
Drill Rig Type	Hammer Description	Sample Type(s)	
Notes/ Comments			

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0						Asphalt and Base
1.5						Lean Clay with gravel, stiff, moist, brown
5	MC R1	100	3-6-10 (16)			
10	MC R2	100	8-9-12 (21)	CL-ML		
15	MC R3	100	29-24-27 (51)			Rock in sampler
20	MC R4	100	8-10-14 (24)			
25						

(Continued Next Page)

CLIENT

PROJECT NAME Gates Canyon Park Addendum

PROJECT NUMBER

PROJECT LOCATION Calabasas

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
25	MC R5	100	22-24-25 (49)	CL-ML	30.0	Lean Clay with gravel, stiff, moist, brown *(continued)*
30	MC R6	100	7-9-19 (28)		31.5	High plasticity clay with gravel, stiff, moist, brown

Los Angeles County Department of Public Works
Geotechnical and Materials Engineering Division
900 South Fremont Avenue, Alhambra, CA 91803

BORING NUMBER B-2a

CLIENT

PROJECT NAME Gates Canyon Park Addendum

PROJECT NUMBER

PROJECT LOCATION Calabasas

Dates(s) Drilled **11/8/2017 - 11/8/2017**	Boring Location	Logged By **Kevin Phan**	Checked By
Drilling Contractor **Cascade**	Drill Bit Size **8 inches**	Approx. Surf. Elevation (ft)	Drilled Depth (ft) **20**
Drilling Method **CME 85 Hollowstem**	Boring Diameter **8 inches**	Depth to Groundwater	Inclination/ Bearing (°)
Drill Rig Type	Hammer Description	Sample Type(s)	
Notes/ Comments			

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0						
1.0				SC-SM		Clayey Sand, loose, moist, brown, with gravel up to 3-inch diameter
5.0	MC R1	100	8-20-42 (62)	CH		Bedrock, shale, clayey, weathered, moderately hard moist, dark brown
10	MC R2	100	9-12-18 (30)			@10' Angular rock fragments in sampler, harder drilling
15	MC R3	100	13-23-46 (69)			@ 15' clayey and sandy, hard, some rock fragments in sampler
20	MC R4	100	7-9-14 (23)			
21.5						

LACDPW GMED BORING LOG - BASIC - GINT STD US.GDT - 2/5/18 10:34 - \\PW01\PWPUBLIC\GMEPUB\SOILS INVESTIGATIONS\GATES CANYON PARK SUPPLEMENT.GPJ

Los Angeles County Department of Public Works
Geotechnical and Materials Engineering Division
900 South Fremont Avenue, Alhambra, CA 91803

BORING NUMBER B-3a

CLIENT

PROJECT NAME Gates Canyon Park Addendum

PROJECT NUMBER

PROJECT LOCATION Calabasas

Dates(s) Drilled	**11/8/2017 - 11/8/2017**	Boring Location		Logged By	**Kevin Phan**	Checked By	
Drilling Contractor	**Cascade**	Drill Bit Size	**8 inches**	Approx. Surf. Elevation (ft)		Drilled Depth (ft)	**30**
Drilling Method	**CME 85 Hollowstem**	Boring Diameter	**8 inches**	Depth to Groundwater		Inclination/ Bearing (°)	
Drill Rig Type		Hammer Description		Sample Type(s)			
Notes/ Comments							

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0				SM		Silty sand, loose, moist, brown, with gravel
5	MC R1	100	8-20-42 (62)	CH	5.0	High Plasticity clay, hard, moist, dark brown mottled red brown
10	MC R2	100	9-12-18 (30)			
15	MC R3	100	13-23-46 (69)			
20	MC R4	100	7-9-14 (23)	CH	20.0	Very stiff, moist, brown
25	MC R5	100	22-23-25 (48)			
30	MC R6	61	38-50		30.0	

Los Angeles County Department of Public Works
Geotechnical and Materials Engineering Division
900 South Fremont Avenue, Alhambra, CA 91803

BORING NUMBER B-4a

CLIENT

PROJECT NAME Gates Canyon Park Addendum

PROJECT NUMBER

PROJECT LOCATION Calabasas

Dates(s) Drilled	**11/9/2017 - 11/9/2017**	Boring Location		Logged By	**Kevin Phan**	Checked By	
Drilling Contractor	**Cascade**	Drill Bit Size	**8 inches**	Approx. Surf. Elevation (ft)		Drilled Depth (ft)	**10**
Drilling Method	**CME 85 Hollowstem**	Boring Diameter	**8 inches**	Depth to Groundwater		Inclination/ Bearing (°)	
Drill Rig Type		Hammer Description		Sample Type(s)			
Notes/ Comments							

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0				CL		Clay, very stiff, moist, orange-brown, some gravel
5	R1	100	8-10-14 (24)			
10					10.0	
	R2	100	12-17-32 (49)	SC-SM	11.5	Silty clay, hard, moist, orange-brown, rock in sampler, some gravel

LACDPW GMED BORING LOG - BASIC - GINT STD US.GDT - 2/5/18 10:34 - \\PW01\PWPUBLIC\GMEPUB\SOILS INVESTIGATIONS\GATES CANYON PARK SUPPLEMENT.GPJ

Los Angeles County Department of Public Works
Geotechnical and Materials Engineering Division
900 South Fremont Avenue, Alhambra, CA 91803

BORING NUMBER B-5a

CLIENT

PROJECT NAME Gates Canyon Park Addendum

PROJECT NUMBER

PROJECT LOCATION Calabasas

Dates(s) Drilled	**11/9/2017 - 11/9/2017**	Boring Location		Logged By	**Kevin Phan**	Checked By	
Drilling Contractor	**Cascade**	Drill Bit Size	**8 inches**	Approx. Surf. Elevation (ft)		Drilled Depth (ft)	**10**
Drilling Method	**CME 85 Hollowstem**	Boring Diameter	**8 inches**	Depth to Groundwater		Inclination/ Bearing (°)	
Drill Rig Type		Hammer Description		Sample Type(s)			
Notes/ Comments							

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0				CL		Clay, very stiff, moist, brown, some silt and gravel
5	MC R1	100	10-14-20 (34)			
10					10.0	
	MC R2	100	8-17-18 (35)			

LACDPW GMED BORING LOG - BASIC - GINT STD US.GDT - 2/5/18 10:34 - \\PW01\PWPUBLIC\GMEPUB\SOILS INVESTIGATIONS\GATES CANYON PARK SUPPLEMENT.GPJ

Los Angeles County Department of Public Works
Geotechnical and Materials Engineering Division
900 South Fremont Avenue, Alhambra, CA 91803

BORING NUMBER B-6a

CLIENT

PROJECT NAME Gates Canyon Park Addendum

PROJECT NUMBER

PROJECT LOCATION Calabasas

Dates(s) Drilled	**11/8/2017 - 11/8/2017**	Boring Location		Logged By	**Kevin Phan**	Checked By	
Drilling Contractor	**Cascade**	Drill Bit Size	**8 inches**	Approx. Surf. Elevation (ft)		Drilled Depth (ft)	**10**
Drilling Method	**CME 85 Hollowstem**	Boring Diameter	**8 inches**	Depth to Groundwater		Inclination/ Bearing (°)	
Drill Rig Type		Hammer Description		Sample Type(s)			
Notes/ Comments							

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0 – 5.0				SM	5.0	Silty sand, loose, moist, brown mottled with orange, with gravel
5 – 10.0	MC R1	100	11-12-14 (26)	CL	10.0	Clay, very stiff, moist, brown mottled with orange
10 – 11.5	MC R2	100	21-23-34 (57)	SM	11.5	Silty sand, very dense, moist, red brown mottled with orange, rock in lower sampler

APPENDIX B

Summary of Laboratory Results

SUMMARY OF LABORATORY TEST RESULTS
Geotechnical Laboratory

PROJECT NAME: Gates Cyn
TECHNICIAN: GP, EH
PCA: F21816i02

ENGINEER: K. Phan
DATE: 12/18/2017
PAGE: 1 **OF** 1

BORING/ SAMPLE	DEPTH	UNIFIED SOIL CLASSIFICATION					MOISTURE AND DRY DENSITY				DIRECT SHEAR				CHEMICAL				Expansion Index
		Class.	ATTERBERG LIMITS		#4	#200	γ_{field}	m.c.$_{field}$	$\gamma_{max.}$	m.c.$_{optimum}$	Φ_{ult}	c $_{ult}$	$\Phi_{maxi.}$	c $_{maxi.}$	pH	Min. Resistivity	Cl	SO_4	
B - S	(ft)		LL	PI	% Pass	% Pass	pcf	%	pcf	%	Degree	psf	Degree	psf		(K ohm-cm)	(ppm)	(ppm)	(EI / Potential)
B1a-B1		SM	47	17	66.6	32.1													
B1a-R5							72.1	26.8			10	477	12	477					
B2a-R2							80.5	27.4			26	206	27	206					
B2a-R3																			90 / Med.
B3a-R5																			75 / Med.
B3a-R6							81.4	32.6			24	769	27	769					
B4a-R2							82.4	31.9											
B5a-B1															6.70	0.4	111	687	
B5a-R3							87.8	24.4			29	241	30	241					
B6a-B1		* ML	49	21	94.2	70.0													
B6a-R2							87.7	23.2											

* Borderline CL see Atterberg wrksht

APPENDIX C

Seismic Design Parameters

USGS Design Maps Detailed Report

ASCE 7-10 Standard (34.16185°N, 118.69162°W)

Site Class E – “Soft Clay Soil”, Risk Category I/II/III

Section 11.4.1 — Mapped Acceleration Parameters

Note: Ground motion values provided below are for the direction of maximum horizontal spectral response acceleration. They have been converted from corresponding geometric mean ground motions computed by the USGS by applying factors of 1.1 (to obtain S_S) and 1.3 (to obtain S_1). Maps in the 2010 ASCE-7 Standard are provided for Site Class B. Adjustments for other Site Classes are made, as needed, in Section 11.4.3.

From Figure 22-1 [1]	S_S = 1.673 g
From Figure 22-2 [2]	S_1 = 0.602 g

Section 11.4.2 — Site Class

The authority having jurisdiction (not the USGS), site-specific geotechnical data, and/or the default has classified the site as Site Class E, based on the site soil properties in accordance with Chapter 20.

Table 20.3–1 Site Classification

Site Class	$\bar{v}_s$	$\bar{N}$ or $\bar{N}_{ch}$	$\bar{s}_u$
A. Hard Rock	>5,000 ft/s	N/A	N/A
B. Rock	2,500 to 5,000 ft/s	N/A	N/A
C. Very dense soil and soft rock	1,200 to 2,500 ft/s	>50	>2,000 psf
D. Stiff Soil	600 to 1,200 ft/s	15 to 50	1,000 to 2,000 psf
E. Soft clay soil	<600 ft/s	<15	<1,000 psf
	Any profile with more than 10 ft of soil having the characteristics: • Plasticity index *PI* > 20, • Moisture content *w* ≥ 40%, and • Undrained shear strength $\bar{s}_u$ < 500 psf		
F. Soils requiring site response analysis in accordance with Section 21.1	See Section 20.3.1		

For SI: 1ft/s = 0.3048 m/s 1lb/ft² = 0.0479 kN/m²

Section 11.4.3 — Site Coefficients and Risk–Targeted Maximum Considered Earthquake (MCE_R) Spectral Response Acceleration Parameters

Table 11.4–1: Site Coefficient F_a

Site Class	Mapped MCE_R Spectral Response Acceleration Parameter at Short Period				
	$S_S \le 0.25$	$S_S = 0.50$	$S_S = 0.75$	$S_S = 1.00$	$S_S \ge 1.25$
A	0.8	0.8	0.8	0.8	0.8
B	1.0	1.0	1.0	1.0	1.0
C	1.2	1.2	1.1	1.0	1.0
D	1.6	1.4	1.2	1.1	1.0
E	2.5	1.7	1.2	0.9	0.9
F	See Section 11.4.7 of ASCE 7				

Note: Use straight–line interpolation for intermediate values of S_S

For Site Class = E and S_S = 1.673 g, F_a = 0.900

Table 11.4–2: Site Coefficient F_v

Site Class	Mapped MCE_R Spectral Response Acceleration Parameter at 1–s Period				
	$S_1 \le 0.10$	$S_1 = 0.20$	$S_1 = 0.30$	$S_1 = 0.40$	$S_1 \ge 0.50$
A	0.8	0.8	0.8	0.8	0.8
B	1.0	1.0	1.0	1.0	1.0
C	1.7	1.6	1.5	1.4	1.3
D	2.4	2.0	1.8	1.6	1.5
E	3.5	3.2	2.8	2.4	2.4
F	See Section 11.4.7 of ASCE 7				

Note: Use straight–line interpolation for intermediate values of S_1

For Site Class = E and S_1 = 0.602 g, F_v = 2.400

Equation (11.4–1):	$S_{MS} = F_aS_S = 0.900 \times 1.673 = 1.505$ g
Equation (11.4–2):	$S_{M1} = F_vS_1 = 2.400 \times 0.602 = 1.445$ g

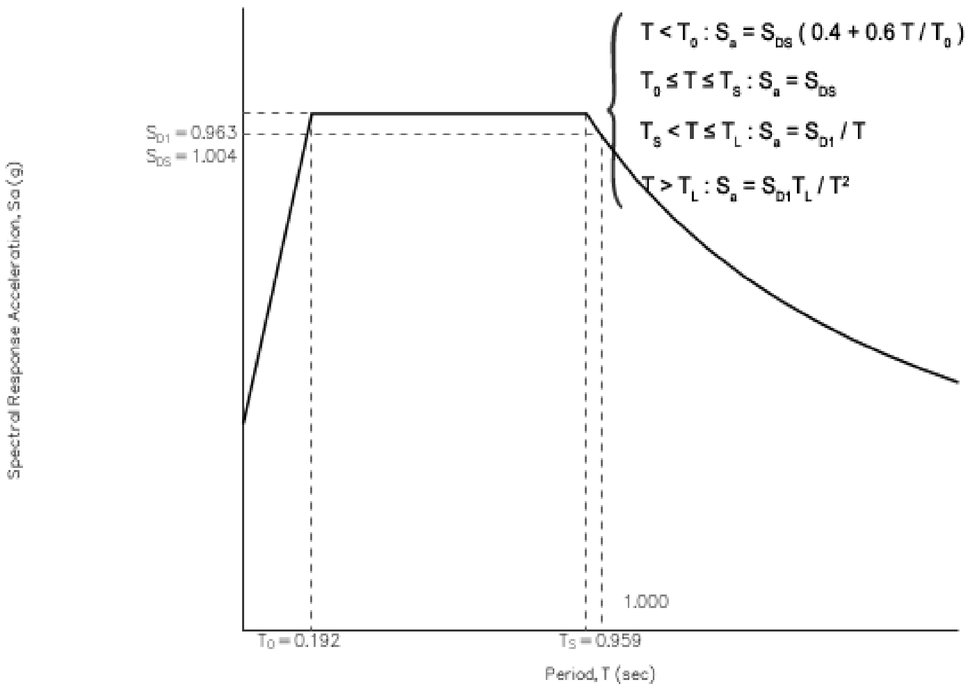
Section 11.4.4 — Design Spectral Acceleration Parameters

Equation (11.4–3):	$S_{DS} = ⅔ S_{MS} = ⅔ \times 1.505 = 1.004$ g
Equation (11.4–4):	$S_{D1} = ⅔ S_{M1} = ⅔ \times 1.445 = 0.963$ g

Section 11.4.5 — Design Response Spectrum

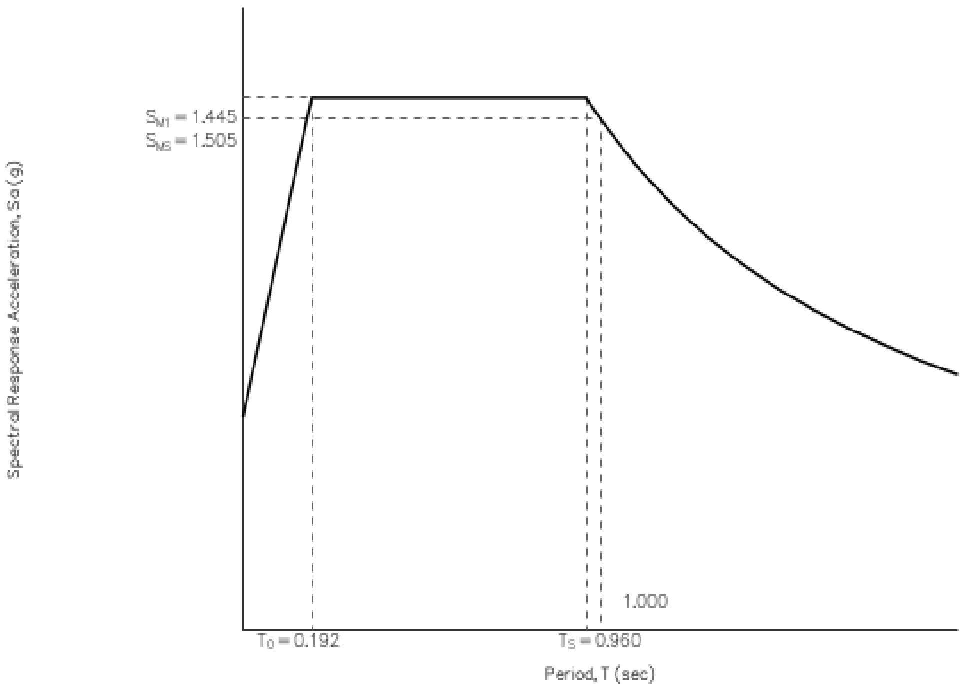
From Figure 22-12 [3]	T_L = 8 seconds

Figure 11.4–1: Design Response Spectrum



Section 11.4.6 — Risk-Targeted Maximum Considered Earthquake (MCE_R) Response Spectrum

The MCE_R Response Spectrum is determined by multiplying the design response spectrum above by 1.5.



Section 11.8.3 — Additional Geotechnical Investigation Report Requirements for Seismic Design Categories D through F

From Figure 22-7 [4]	PGA = 0.617
Equation (11.8–1):	$PGA_M = F_{PGA}PGA = 0.900 \times 0.617 = 0.555$ g

Table 11.8–1: Site Coefficient F_{PGA}

Site Class	Mapped MCE Geometric Mean Peak Ground Acceleration, PGA				
	PGA ≤ 0.10	PGA = 0.20	PGA = 0.30	PGA = 0.40	PGA ≥ 0.50
A	0.8	0.8	0.8	0.8	0.8
B	1.0	1.0	1.0	1.0	1.0
C	1.2	1.2	1.1	1.0	1.0
D	1.6	1.4	1.2	1.1	1.0
E	2.5	1.7	1.2	0.9	0.9
F	See Section 11.4.7 of ASCE 7				

Note: Use straight–line interpolation for intermediate values of PGA

For Site Class = E and PGA = 0.617 g, F_{PGA} = 0.900

Section 21.2.1.1 — Method 1 (from Chapter 21 – Site-Specific Ground Motion Procedures for Seismic Design)

From Figure 22-17 [5]	C_{RS} = 1.026
From Figure 22-18 [6]	C_{R1} = 1.036

Section 11.6 — Seismic Design Category

Table 11.6-1 Seismic Design Category Based on Short Period Response Acceleration Parameter

VALUE OF S_{DS}	RISK CATEGORY		
	I or II	III	IV
S_{DS} < 0.167g	A	A	A
0.167g ≤ S_{DS} < 0.33g	B	B	C
0.33g ≤ S_{DS} < 0.50g	C	C	D
0.50g ≤ S_{DS}	D	D	D

For Risk Category = I and S_{DS} = 1.004 g, Seismic Design Category = D

Table 11.6-2 Seismic Design Category Based on 1-S Period Response Acceleration Parameter

VALUE OF S_{D1}	RISK CATEGORY		
	I or II	III	IV
S_{D1} < 0.067g	A	A	A
0.067g ≤ S_{D1} < 0.133g	B	B	C
0.133g ≤ S_{D1} < 0.20g	C	C	D
0.20g ≤ S_{D1}	D	D	D

For Risk Category = I and S_{D1} = 0.963 g, Seismic Design Category = D

Note: When S_1 is greater than or equal to 0.75g, the Seismic Design Category is **E** for buildings in Risk Categories I, II, and III, and **F** for those in Risk Category IV, irrespective of the above.

Seismic Design Category ≡ "the more severe design category in accordance with Table 11.6-1 or 11.6-2" = D

Note: See Section 11.6 for alternative approaches to calculating Seismic Design Category.

References

1. *Figure 22-1*: https://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010_ASCE-7_Figure_22-1.pdf
2. *Figure 22-2*: https://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010_ASCE-7_Figure_22-2.pdf
3. *Figure 22-12*: https://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010_ASCE-7_Figure_22-12.pdf
4. *Figure 22-7*: https://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010_ASCE-7_Figure_22-7.pdf
5. *Figure 22-17*: https://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010_ASCE-7_Figure_22-17.pdf
6. *Figure 22-18*: https://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010_ASCE-7_Figure_22-18.pdf

APPENDIX D

Amendments to Specifications

SECTION 217 - BEDDING AND BACKFILL MATERIALS

217-1 BEDDING MATERIAL.

217-1.1 General. Add the following:

Representative samples of imported material for use as bedding must be approved by the Agency.

217-2 TRENCH BACKFILL.

217-2.1 General. Add the following:

The material obtained from the open trench excavations can be used as trench backfill, subject to the provisions specified herein, and provided that all organic material, rubbish, debris, and other objectionable materials are first removed.

Materials onsite are considered clayey and are sensitive to moisture during compaction. If trench excavation materials have excessive moisture content or too much water is added to excavated soils for use as trench backfill, the Contractor may find it necessary to do one or more of the following to attain the required relative compaction:

a) Suitably dry the wet material.

b) Blend the wet material with dry material, such dry material being from the open trench excavations or imported backfill conforming to 217-2.3.

c) Waste the wet material and use suitable open trench excavation material or imported backfill conforming to 217-2.3.

217-2.3 Imported Backfill. Replace the entire subsection with the following:

If imported backfill is required or if the Contractor elects to import material from a source outside the Project limits for use as backfill, said material shall be clean soil, free from organic material, trash, debris, rubbish, broken Portland cement concrete, bituminous pavement, or other objectionable substances, and shall have a minimum sand equivalent of 20.

The Contractor shall inform the Engineer of the actual street address or location from which the intended material will be furnished not less than 15 days prior to its proposed use. The Contractor will perform other testing as deemed appropriate by the Engineer. The Engineer will determine the suitability of the material for use as imported backfill.

SECTION 306 - OPEN TRENCH CONDUIT CONSTRUCTION

306-4 SHORING AND BRACING. Add the following before the first paragraph:

306-4.2 Additional Requirements.

The Kw values and soil types for use in the design of shoring of excavations are as follows:

Line	Station Limits	Kw (pcf)	Soil Types
Gates Canyon Park	15+67 – 10+00 29+45 – 20+00	27	CL, CH, SM, SC

The recommended Kw values are predicated on the water table being below the bottom of the excavation shoring. For a water table above the bottom of the excavation shoring, contact the Contractor for a revised Kw value.

306-4.6 Vertical Shores for Supporting Trench Excavations.

The parameters for determining the minimum penetration for vertical shores are as follows:

Line	Station Limits	Case No.	Soil Parameters			Distance D_1 ft
			A (pcf)	B (psf)	E (pcf)	
Gates Canyon Park	15+67 – 10+00 29+45 – 20+00	3	69	849	-	-

The recommended shoring parameters are predicated on the water table being below the bottom of the excavation shoring. For a water table above the bottom of the excavation shoring, contact the Contractor for a revised Kw value.

The soils encountered in the borings may be classified as Type B as defined in the California Code of Regulation Title 8, Division 1, Chapter 4, Subchapter 4, Article 6, Appendix A.

306-12.3.2 Compaction Requirements.
Replace the entire subsection with the following:

Mechanically compacted trench backfill shall be densified to the following minimum relative compaction:

a) 90 percent relative compaction.

b) 95 percent relative compaction where required by 301-1.3.

The Contractor shall perform compaction tests on mechanically compacted trench backfill as part of its Quality Control Program. The Contractor shall perform a minimum of 1 compaction test per lift for each 300 feet of mechanically compacted trench backfill placed unless otherwise directed by the Engineer.

The Contractor will determine the maximum dry density to be used in determining relative compaction. The Contractor shall furnish representative backfill material samples for the Contractor's use. The Contractor will determine the maximum dry densities prior to the start of the Work and during the progress of the Work as deemed necessary by the Engineer.

306-12 BACKFILL.

306-12.3 Mechanically Compacted Trench Backfill.

306-12.3.1 General. Add the following after the first paragraph:

During the placement of backfill by mechanical compaction methods around utilities, the use of other than hand-held vibratory plates or tamping equipment within 1 foot of any utility.

Mechanical compaction methods of placement below 1 foot over the top of pipe conduits shall be limited to the use of hand-held vibratory plates or tamping equipment. The use of impact or roller type compaction equipment will not be allowed for placement of the backfill below 1 foot over the top of the pipe.

Mechanical compaction methods of placement shall not include a sheepsfoot wheel mounted on a backhoe within the top 3 feet of the pipe or one-half of the internal diameter of the pipe, whichever is greater.

adjusted or changed as necessary to attain the specified relative compaction. Approval of equipment, thickness of layers, moisture content and compaction effort shall not be deemed to relieve the Contractor of the responsibility for attaining the specified relative compaction. The Contractor, in planning its work, shall allow sufficient time to perform the work connected with the test sections, and for the Agency to perform the necessary testing for determining compliance.

Each lift shall be evenly spread, moistened and worked by disc harrowing or other means approved by the Engineer, and then mechanically compacted until the specified relative compaction has been attained.

306-12.3.2 Compaction Requirements. Replace the entire subsection with the following:

Mechanically compacted trench backfill shall be densified to the following minimum relative compaction:

a) 90 percent relative compaction.

b) 95 percent relative compaction where required by 301-1.3.

306-12.4 Jetted Trench Backfill. 306-12.4.1 General.

Add the following as the third sentence of the first paragraph:

Jetting will not be permitted