URS

August 19, 2011

Mr. Ken Gerling
Burns & McDonnell
1010 Tavern Road, Bldg.1
Alpine, CA 92901

Subject: Response to Comments
Evaluation of Liquefaction Potential
Structures EP361, EP362-1 and EP363-1
SDG&E Sunrise Powerlink Project
San Diego and Imperial Counties, California
URS Project No. 27661032.01001

Dear Mr. Gerling:

URS Corporation (URS) previously provided an evaluation of liquefaction potential at structures EP361, EP362-1 and EP363-1 in a letter dated May 17, 2011 (attached to this letter for reference). A review of that letter was performed by Geotechnical Consultants, Inc. (GTC) for the California Public Utilities Commission (CPUC), and their comments were provided in a memorandum dated August 3, 2011. The discussion below and attachments present the additional supporting documentation requested by GTC.

GTC's conclusions and recommendations regarding our May 17, 2011 letter are stated below:

> *This report adequately covers the requirements of Mitigation Measure G-4b (Conduct geotechnical investigations for liquefaction) in relationship to structures EP361, EP362-1, and EP363-1. Although this document satisfies the intent of Mitigation Measure G-4b, it only included a very brief statement of the results of URS's liquefaction analyses without any supporting documentation of their calculations.*

EVALUATION

As discussed in our May 17, 2011 letter, the borings performed at EP361 and EP363-1 encountered primarily dense to very dense sands and stiff to hard clay, respectively. Groundwater was interpreted to occur at a depth greater than 45 feet bgs at EP361 and at about 39 feet bgs at EP363-1. Further, no water was encountered in the drilled shafts excavated for structures EP361, EP362-1 and EP363-1 (shaft depths of approximately 30 feet).

For our engineering evaluations, we conservatively assumed groundwater was at a depth of 35 feet below the ground surface. A liquefaction evaluation was performed for Boring B-EP363-1, which encountered primarily very dense sand and silty sand below the groundwater depth of 35 feet. Boring B-EP361 encountered clay below the groundwater depth of 35 feet, with refusal blow

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counts in silty sand at the bottom of the boring; for this boring, the potential for cyclic softening that could lead to strength loss was evaluated.

Liquefaction potential in B-EP363-1 was evaluated using the Standard Penetration Test blow counts (SPT N-Values) from the boring in accordance with current criteria and procedures (Youd, *et al.*, 2001; Idriss and Boulanger, 2008). The procedure for evaluating liquefaction potential is empirical and it is based on data and observations at sites that have, and have not liquefied during an earthquake. The potential for liquefaction was assessed in terms of a factor of safety against liquefaction, FS_{liq}. The factor of safety is defined as the Cyclic Resistance Ratio required to resist liquefaction (CRR) divided by the Cyclic Stress Ratio (CSR) generated by the design ground motion. The seismic demand is a function of the anticipated peak ground acceleration (PGA). The assessment adopted a PGA of 0.4 g, representative of an earthquake with a probability of exceedance of 10 percent in 50 years, and an earthquake magnitude of M7.5. Soils are typically not considered potentially liquefiable if the factor of safety against liquefaction is above about 1.3. Our calculations are attached to this letter. The results indicate factors of safety are greater than 1.3.

For B-EP361, a screening evaluation was performed by comparing the laboratory test data to evaluation criteria that relates potential behavior to index properties. The evaluation was performed using the EERI Monograph "Soil Liquefaction During Earthquakes" (Idriss and Boulanger, 2008). Screening evaluations indicate that the fine-grained soils encountered in the boring should exhibit clay-like behavior and should not be susceptible to liquefaction-type behavior or strength loss. A copy of the pertinent pages from this reference is attached.

CONCLUSION

Based on the results of our calculations and analyses, we conclude that the potential for liquefaction at the three structures is low. Further, subsurface conditions encountered in the drilled shaft excavations for the structures were consistent with the types and density/stiffness of materials encountered in the borings.

If you have further questions, please contact me at (858) 812-9292.

Sincerely,

URS CORPORATION

Kelly C. Giesing, G.E. 2749
Project Geotechnical Engineer

Attachments: 1. Atterberg Limits Chart
2. Calculations and Analyses
3. URS letter dated May 17, 2011

SOIL LIQUEFACTION DURING EARTHQUAKES

by

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This monograph was sponsored by the
Earthquake Engineering Research Institute
with support from the Federal Emergency Management Agency

EERI

EARTHQUAKE ENGINEERING RESEARCH INSTITUTE
MNO-12

The MSF is limited to a maximum value of 1.13 for small-magnitude earthquakes that can be dominated by a single cycle of loading. In that case, the peak shear stress induced by the earthquake must exceed 139% of the monotonic undrained shear strength to trigger cyclic softening (for shear strains exceeding 3%). This ratio of 1.39 is simply the effect of the loading rate, whereby the shear resistance of cohesive soils is significantly greater during the rapid loading of an earthquake, compared with the very slow loading rates at which the monotonic undrained shear strengths are determined.

For M = 7.5 earthquakes (MSF = 1), the peak shear stress induced by the earthquake must still exceed 123% of the monotonic undrained shear strength to trigger peak strains of 3%. In this case, the ratio of 1.23 represents the combined effects of the loading rate and cyclic degradation from numerous loading cycles.

The procedures for evaluating the potential for cyclic softening in saturated clays and plastic silts may be expressed in a number of different formats, as illustrated by the above equations. In certain applications, the potential for yielding and deformations in cohesive soils may be evaluated by combining stability and Newmark sliding block types of analyses. In other applications, there are advantages to comparing the cyclic resistance of cohesive soils with those of cohesionless soils in a common framework. The procedures presented in this section and in Section 6.5 serve this latter purpose, as well as illustrating the common features and differences of behavior between sands (cohesionless soils) and clays/plastic silts (cohesive soils).

6.7 Transition from Sand-Like to Clay-Like Behavior in Fine-Grained Soils

Fine-grained soils appear to transition from behavior that is more fundamentally like sands to behavior that is more fundamentally like clays over a fairly narrow range of Atterberg limits. On one end of this transition are fine-grained soils that are essentially nonplastic and behave very similarly to sands in most respects. These soils are difficult to sample, are strongly affected by sampling disturbance, and do not exhibit unique stress-history normalized strength properties. The cyclic strengths of these sand-like soils are more appropriately estimated within the framework of liquefaction correlations that are based on in-situ tests. On the other end of the transition are clays and plastic silts that are more easily sampled, are less affected by sampling disturbance, and exhibit stress-history normalized strength

B-EP361 Sample @ 40.0' ⊠ } Exhibit
B-EP361 sample @ 15.5' ● } clay-like behavior

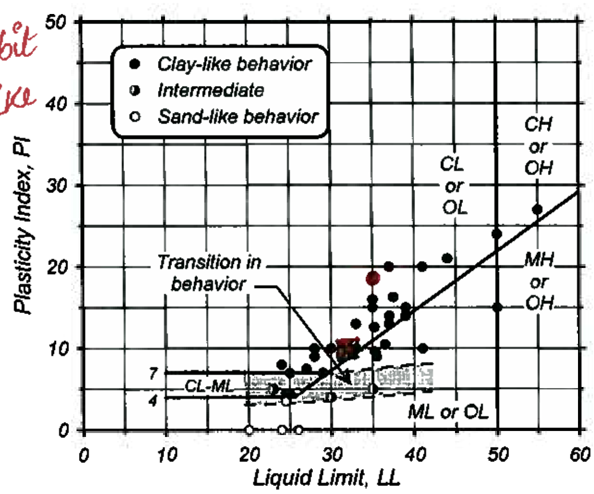

Figure 134. Atterberg limits chart, showing representative values for each soil that exhibited cohesive, cohesionless, or intermediate behavior.

properties. The cyclic strengths of these soils are more appropriately estimated on the basis of information from in-situ testing, laboratory testing, and empirical correlations that are similar to, or that build upon, established procedures for evaluating the monotonic undrained shear strengths of such soils. Thus, the transition from more sand-like to more clay-like behavior has a direct correspondence to the types of engineering procedures that are best suited to evaluating their seismic behavior.

Atterberg limits for fine-grained soils exhibiting a range of behaviors in monotonic and cyclic undrained loading were compiled from the literature and summarized by Boulanger and Idriss (2004b, 2006). Each soil was categorized as exhibiting sand-like, clay-like, or intermediate behavior in the context of the classic behaviors described in Sections 2.1–2.2 and 6.1–6.2. The Atterberg limits for all three groups of soils are plotted together in Figure 134, with a focus on the low-plasticity portion of the chart. The soils exhibiting clay-like behavior included some ML soils with PI values as low as 9 and some CL-ML soils with PI values as low as 4. Intermediate behavior was observed for samples classified as CL-ML and ML with PI values of 4–5. Sand-like behavior was observed only for ML soils (below the A-line) with PI values of 3.5 or smaller.

LIQUEFACTION ANALYSIS
B-EP363-1

Project Name: Sunrise Powerlink Project
Location: San Diego and Imperial Counties, California
Project Number: 27661032.02002
By: PB Checked By: MC
Date: 08/18/11 Date: 08/19/11

N	Field blowcount
C_R	Rod length corrention factor
C_B	Borehole diameter correction factor
C_s	Sampler correction factor (SPT = 1.0; 2.5-in ID = 0.65)
C_n	Overburden pressure correction factor
C_E	Energy ratio correction factor (1.0 for CME Auto hammer)
$CSR_{(eq)}$	Cyclic stress ratio induced by earthquake
alpha	coefficient to covert to an equivalent clean sand blowcount
beta	coefficient to covert to an equivalent clean sand blowcount
$(N_1)_{60cs}$	Equivalent clean sand blowcount
$CRR_{7.5}$	Cyclic resistance ratio of soil for a 7.5 earthquake
MSF	Magnitude scaling factor (for magnitudes other than 7.5)
r_m	Stress Ratio Factor for liquefaction settlement analyses

r_m	1.00	
Eq. Mag. (M_w)	7.5	
Amax	0.4	
Wt. Water	62	pcf
Elev. WT	-22.6	ft, NAVD 88 (35 feet below ground surface)
Elev. GS	12.4	ft, NAVD 88
Borehole Diam.	3.8	inches

Boring	Sample No.	Depth (m)	Depth (ft)	Sample Elev. (ft, NAVD 88)	Soil Type (USCS)	Geologic Unit	Sampling Method	Unit Weight (pcf)	Fines Content (%)	Stresses S_v (psf)	Stresses S_v' (psf)	N	Correction Factors C_R	C_B	C_s	C_n	A_{max}_z	R_d	$CSR_{(eq)}$	uncorr. $(N_1)_{60}$	alpha	beta	$(N_1)_{60cs}$	$CRR_{7.5}$	MSF	FS	LIQUEFY?
B-EP363-1	1	0.9	3.0	9.4	SC	Lake Dep	spt	99	35	297	297	23	0.75	1.00	1	1.63	0.398	0.99	0.259	28	5.00	1.20	38.8	Too Dense	1.00	Not Liquefiable	NO
B-EP363-1	2	1.7	5.5	6.9	SC	Lake Dep	2.5-in dia	99	35	545	545	36	0.75	1.00	0.7	1.49	0.396	0.99	0.257	26	5.00	1.20	36.5	Too Dense	1.00	Not Liquefiable	NO
B-EP363-1	3	2.4	8.0	4.4	CL	Lake Dep	spt	115	78	832	832	30	0.75	1.00	1	1.36	0.393	0.98	0.256	31	5.00	1.20	41.8	Too Dense	1.00	Not Liquefiable	NO
B-EP363-1	4	3.2	10.5	1.9	SW-SM	Lake Dep	2.5-in dia	130	13	1,157	1,157	50	1.00	1.00	0.7	1.24	0.391	0.98	0.254	40	1.89	1.04	43.6	Too Dense	1.00	Not Liquefiable	NO
B-EP363-1	5	4.0	13.0	-0.6	SW-SM	Lake Dep	2.5-in dia	130	13	1,482	1,482	84	1.00	1.00	0.7	1.13	0.389	0.97	0.253	62	1.89	1.04	66.1	Too Dense	1.00	Not Liquefiable	NO
B-EP363-1	6	4.7	15.5	-3.1	SW-SM	Lake Dep	spt	130	6	1,807	1,807	38	1.00	1.00	1	1.05	0.387	0.97	0.252	40	0.03	1.00	40.0	Too Dense	1.00	Not Liquefiable	NO
B-EP363-1	7	6.2	20.5	-8.1	SW-SM	Lake Dep	spt	130	6	2,457	2,457	37	1.00	1.00	1	0.91	0.382	0.96	0.248	34	0.03	1.00	33.7	3.64	1.00	14.66	NO
B-EP363-1	8	7.8	25.5	-13.1	SW-SM	Lake Dep	2.5-in dia	120	6	3,057	3,057	50	1.00	1.00	0.7	0.81	0.376	0.94	0.244	26	0.03	1.00	26.4	0.32	1.00	1.32	NO
B-EP363-1	9	9.3	30.5	-18.1	SW-SM	Lake Dep	spt	120	12	3,657	3,657	50	1.00	1.00	1	0.73	0.367	0.92	0.239	36	1.55	1.03	39.0	Too Dense	1.00	Not Liquefiable	NO
B-EP363-1	10	10.8	35.5	-23.1	SW-SM	Lake Dep	spt	130	12	4,307	4,276	50	1.00	1.00	1	0.66	0.355	0.89	0.232	33	1.55	1.03	35.5	Too Dense	1.00	Not Liquefiable	NO
B-EP363-1	11	12.3	40.5	-28.1	SM	Lake Dep	spt	130	12	4,957	4,616	50	1.00	1.00	1	0.63	0.339	0.85	0.236	31	1.55	1.03	33.9	10.28	1.00	43.49	NO
B-EP363-1	12	13.9	45.5	-33.1	SM	Lake Dep	spt	130	18	5,607	4,956	90	1.00	1.00	1	0.60	0.319	0.80	0.235	54	3.23	1.07	60.6	Too Dense	1.00	Not Liquefiable	NO
B-EP363-1	13	15.4	50.5	-38.1	CH	Lake Dep	spt	130	78	6,257	5,296	18	1.00	1.00	1	0.57	0.299	0.75	0.230	10	5.00	1.20	17.3	Too Fine	1.00	Not Liquefiable	NO

URS

May 17, 2011

Mr. Ken Gerling
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Alpine, California 91901

Subject: Evaluation of Liquefaction Potential
Structures EP361, EP362-1 and EP363-1
SDG&E Sunrise Powerlink Project
San Diego and Imperial Counties, California
URS Project No. 27661032.01001

Dear Mr. Gerling:

URS Corporation Americas (URS) is submitting this letter to summarize the evaluation of the potential for liquefaction at structures EP361, EP362-1, and EP363-1 for the Sunrise Powerlink Project. This letter addresses Mitigation Measure G-4b, which requires evaluation of the potential for liquefaction at identified structures for the Project.

BACKGROUND

Liquefaction is a phenomenon where saturated coarse-grained soils (less than 50% passing the No. 200 sieve) lose their strength and acquire some mobility from strong ground motion. While not related to liquefaction, some fine-grained soils (more than 50% passing the No. 200 sieve) are vulnerable to a similar ground shaking induced strength loss.

Geologic hazards, including the potential for liquefaction, were discussed in the October 1, 2010 URS report titled “Geotechnical and Geologic Hazards Investigation, Sunrise Powerlink Project, San Diego and Imperial Counties, California”. The report concluded that the potential for liquefaction required additional evaluation in several areas along the alignment, including the eastern end of the alignment and structures EP361, EP362-1 and EP363-1.

EVALUATION

URS completed two subsurface explorations consisting of one boring at structure EP361 and one boring at structure EP363-1. The borings were drilled to a depth of approximately 51.5 feet. Laboratory testing was performed to evaluate grain size distribution and plasticity characteristics to support the assessment of the potential for liquefaction.

The findings from the subsurface exploration and laboratory testing indicate that this area is underlain by Quaternary-age lake deposits consisting of interbedded sands, silts and clays. The boring at EP361 encountered medium dense silty sand to a depth of 8.5 feet below ground surface

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(bgs) and stiff to hard lean clay to 49 feet bgs. At EP363-1, dense and very dense well graded sand with silt and silty sand was observed to 47 feet bgs, and below that depth, a very stiff lean clay was observed to the bottom of the exploration. Groundwater was interpreted to occur at a depth greater than 45 feet bgs at EP361 and at about 39 feet bgs at EP363-1.

The potential for liquefaction in coarse grained soils was evaluated using the Standard Penetration Test blow counts (SPT N-Values) from the borings in accordance with current criteria and procedures (Youd, *et al.*, 2001; Idriss and Boulanger, 2008). The procedure for evaluating liquefaction potential is empirical and it is based on data and observations at sites that have, and have not, liquefied during an earthquake. At borings B-EP361 and B-EP363-1, the blow counts in coarse grained sands below the water table were over 90 blows per foot.

A screening evaluation for fine grained soils was completed by comparing the laboratory test data to evaluation criteria that relates potential behavior to index properties. Based on this evaluation, the fine grained soils encountered in the two borings are not susceptible to liquefaction.

CONCLUSIONS AND RECOMMENDATIONS

Due to the relatively deep occurrence of groundwater, the presence of stiff and hard fine grained soils, and dense and very dense coarse grained soils, there is a very low potential for liquefaction to occur at structures EP361, EP362-1, and EP363-1. Therefore, mitigation to reduce the potential for liquefaction or related ground shaking effects is not needed at these structure locations.

If you any questions regarding the letter please contact us at (858) 812-9292.

Sincerely,

URS CORPORATION

REGISTERED PROFESSIONAL ENGINEER
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Exp. 9/30/11
GEOTECHNICAL
STATE OF CALIFORNIA

CERTIFIED ENGINEERING GEOLOGIST
MICHAEL E. HATCH
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Kelly Giesing, G.E. 2749
Project Geotechnical Engineer

Michael E. Hatch, C.E.G. 1925
Principal Engineering Geologist

Attachments: Logs of Borings B-EP361 and EP363-1
Results of Laboratory Testing

ATTACHMENTS

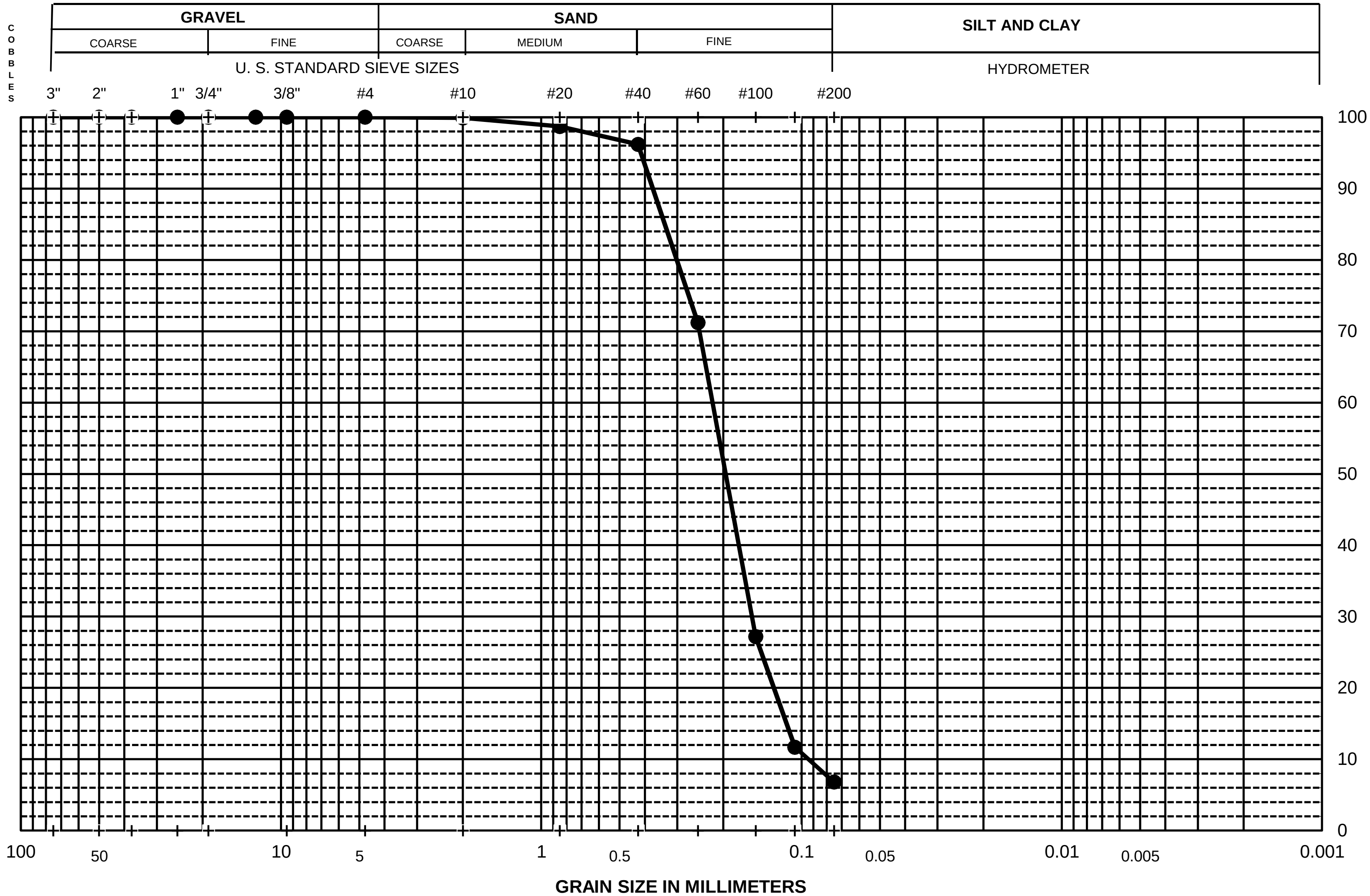
Project: Sunrise Powerlink Project	Log of Boring B-EP361
Section/Tower No.: San Diego and Imperial Counties, California	Sheet 1 of 2
Project Number: 27661032	

Date(s) Drilled	05/10/11	Logged By	A. Avakian	Checked By	K. Shaner
Drilling Method	Rotary Wash/Coring	Drill Bit Size/Type	HWT/HQ-3	Total Depth of Borehole	51.5 feet
Drill Rig Type	Burley 4000, Rig #1	Drilling Contractor	Crux	Approximate Surface Elevation	16.3 ft (NAVD 88)
Water Level Depth (Feet)	>45 feet	Sampling Method(s)	SPT/2.5" ID	Hammer Data	140 lbs/30" automatic hammer
Borehole Backfill	Bentonite chips	Coordinate Location (NAD 83)	32.72084 -115.72813	Location	Link 1, Section 10B

Elevation, feet	Depth, feet	SAMPLES Type	SAMPLES Number	SAMPLES Blows per foot	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Dry Density, pcf	Drill Time and Rate (ft/hr)	REMARKS AND OTHER TESTS
	0					LAKE DEPOSITS Loose, dry, very pale brown, poorly graded SAND (SP), very fine to fine grained, with some fine to coarse gravel, some silt			1028	
15										
						Becomes medium dense, very fine to coarse grained sand with some fine gravel				
			1	23					1030	CORR
	5		2*	29		Medium dense, moist, pale brown, SAND with silt (SP-SM), very fine to fine grained, with some medium to coarse grained sand	10		1051	*Sandcatcher used in shoe SA(7)
10										
			3*	77					1106	WA(20)
						Hard, moist, pale brown, CLAY (CL), some silt, weak cementation				
	10		4*	57					1145	WA(84)
5										
	15		5*	23			17		1210	SA(94), LL(35), PI(18)
0										
									1225	Switched to coring at 17'
						Fine to medium grained sand layer				
	20		6*	73					1228 1245	WA(69)
-5										
						6" interbedded clay layer				
	25		7*	50					1251 1305	
-10										
						Interbedded silt and clay				
	30								1311	

Elevation, feet	Depth, feet	SAMPLES Type	SAMPLES Number	SAMPLES Blows per foot	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Dry Density, pcf	Drill Time and Rate (ft/hr)	REMARKS AND OTHER TESTS
	30		8	38		Stiff, moist, pale brown to brown, lean CLAY (CL)	28		1325	SA(100)
-15										
	35		9	12			26		1333 1346	
-20										
	40		10	**			28		1355 1411	**disregarded WA(99), LL(32), PI(10)
-25										
	45		11	13					1420 1435	
-30										
						Very dense, wet, yellowish brown, silty SAND (SM), fine grained				On 05/11/11, measured water level. Hole dry at 45' below ground surface.
	50		12	50/4"					1446	
-35										
						Bottom of boring at 51.5 feet				
	55									
-40										
	60									
-45										
	65									

UNIFIED SOIL CLASSIFICATION



Sieve No.	Dia. mm	% Finer
3"	75.0	100.0
2"	50.0	100.0
1.5"	37.5	100.0
1"	25.0	100.0
3/4"	19.00	100.0
1/2"	12.50	100.0
3/8"	9.50	100.0
#4	4.75	100.0
#10	2.00	99.9
#20	0.850	98.7
#40	0.425	96.2
#60	0.250	71.2
#100	0.150	27.2
#140	0.106	11.7
#200	0.075	6.8
Hydrometer Analysis		

% Cobbles	XX
% Gravel	0.0
% Sand	93.2
% Fines	6.8
D_{85}	0.335
D_{60}	0.220
D_{50}	0.195
D_{30}	0.155
D_{15}	0.114
D_{10}	0.094
C_u	2.3
C_c	1.2

Boring No.	Sample No.	Depth (ft)	SYMBOL	Wn (%)	LL	PI	% 2 μm	Description and Classification
B-EP361	2	5.0	●	9.9	NA	NA	NA	**Pale brown poorly graded Sand with silt (SP-SM)**

PROJECT NAME: Sunrise Powerlink

PROJECT NUMBER: 27661032

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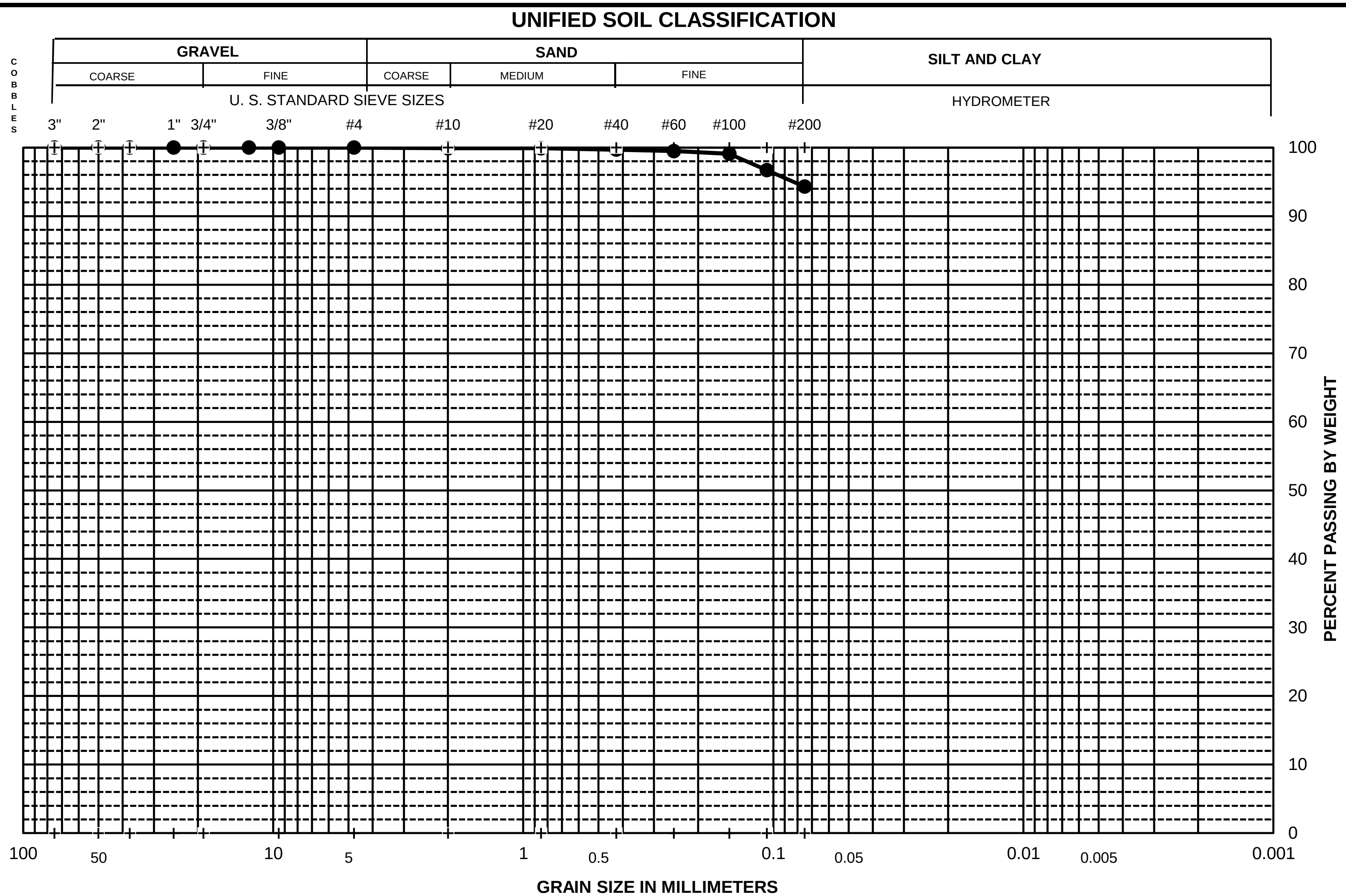

Sieve No.	Dia. mm	% Finer
3"	75.0	100.0
2"	50.0	100.0
1.5"	37.5	100.0
1"	25.0	100.0
3/4"	19.00	100.0
1/2"	12.50	100.0
3/8"	9.50	100.0
#4	4.75	100.0
#10	2.00	99.9
#20	0.850	99.9
#40	0.425	99.7
#60	0.250	99.5
#100	0.150	99.1
#140	0.106	96.7
#200	0.075	94.3
Hydrometer Analysis		

% Cobbles	XX
% Gravel	0.0
% Sand	5.7
% Fines	94.3
D_{85}	#N/A
D_{60}	#N/A
D_{50}	#N/A
D_{30}	#N/A
D_{15}	#N/A
D_{10}	#N/A
C_u	XXX
C_c	XXX

Boring No.	Sample No.	Depth (ft)	SYMBOL	Wn (%)	LL	PI	% 2 μm	Description and Classification
B-EP361	6	15.0	●	16.7	35	18	NA	**Pale brown Clay (CL)**

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PARTICLE-SIZE DISTRIBUTION CURVES

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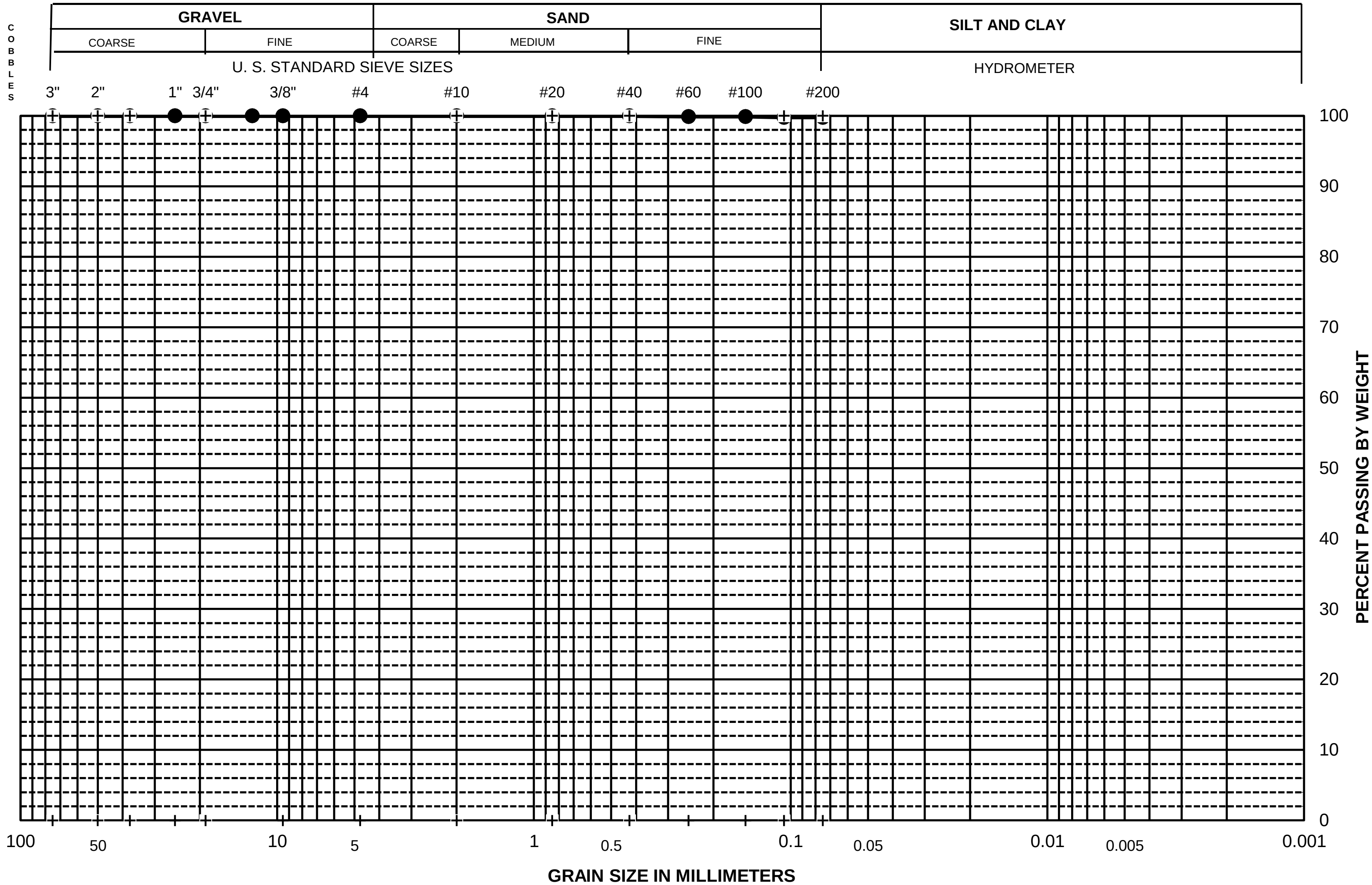
UNIFIED SOIL CLASSIFICATION



Sieve No.	Dia. mm	% Finer
3"	75.0	100.0
2"	50.0	100.0
1.5"	37.5	100.0
1"	25.0	100.0
3/4"	19.00	100.0
1/2"	12.50	100.0
3/8"	9.50	100.0
#4	4.75	100.0
#10	2.00	100.0
#20	0.850	100.0
#40	0.425	100.0
#60	0.250	99.9
#100	0.150	99.9
#140	0.106	99.8
#200	0.075	99.8
Hydrometer Analysis		

% Cobbles	XX
% Gravel	0.0
% Sand	0.2
% Fines	99.8
D_{85}	#N/A
D_{60}	#N/A
D_{50}	#N/A
D_{30}	#N/A
D_{15}	#N/A
D_{10}	#N/A
C_u	XXX
C_c	XXX

Boring No.	Sample No.	Depth (ft)	SYMBOL	Wn (%)	LL	PI	% 2 μm	Description and Classification
B-EP361	9	30.0	●	29.0	NA	NA	NA	**Brown Clay (CL)**

PROJECT NAME: **Sunrise Powerlink**

PROJECT NUMBER: **27661032**

PARTICLE-SIZE DISTRIBUTION CURVES

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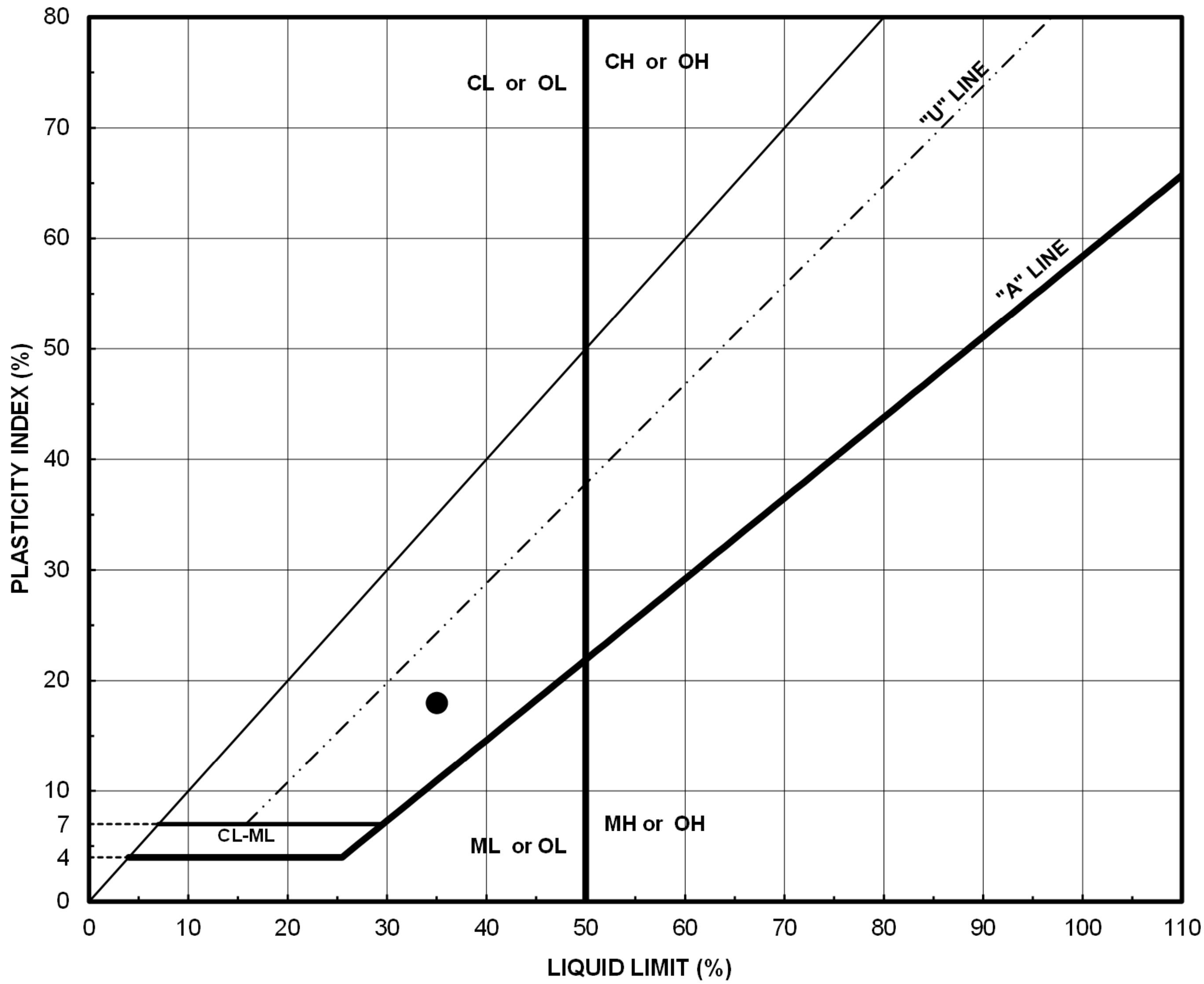
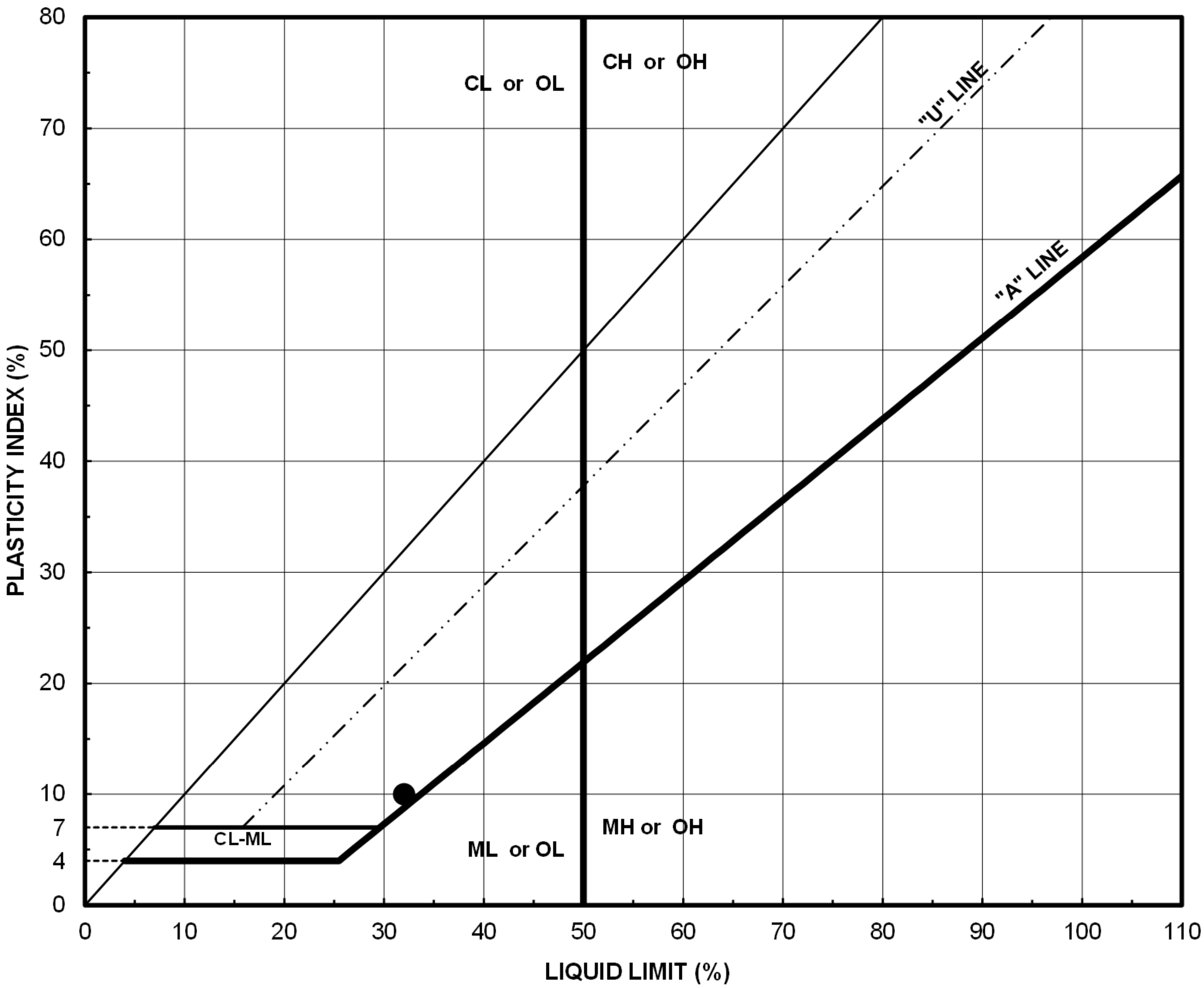


Boring Number	Sample Number	Depth (ft)	Water Content (%)	LL	PI	DESCRIPTION / CLASSIFICATION
B-EP361	6	15.0	16.7	35	18	Pale brown Clay (CL)

Project Name: **Sunrise Powerlink**

Project Number: **27661032**

PLASTICITY CHART



Boring Number	Sample Number	Depth (ft)	Water Content (%)	LL	PI	DESCRIPTION / CLASSIFICATION
B-EP361	11	40.0	28.2	32	10	Brown Clay (CL)

Project Name: **Sunrise Powerlink**

Project Number: **27661032**

PLASTICITY CHART

Project: Sunrise Powerlink Project
Section/Tower No.: San Diego and Imperial Counties, California
Project Number: 27661032

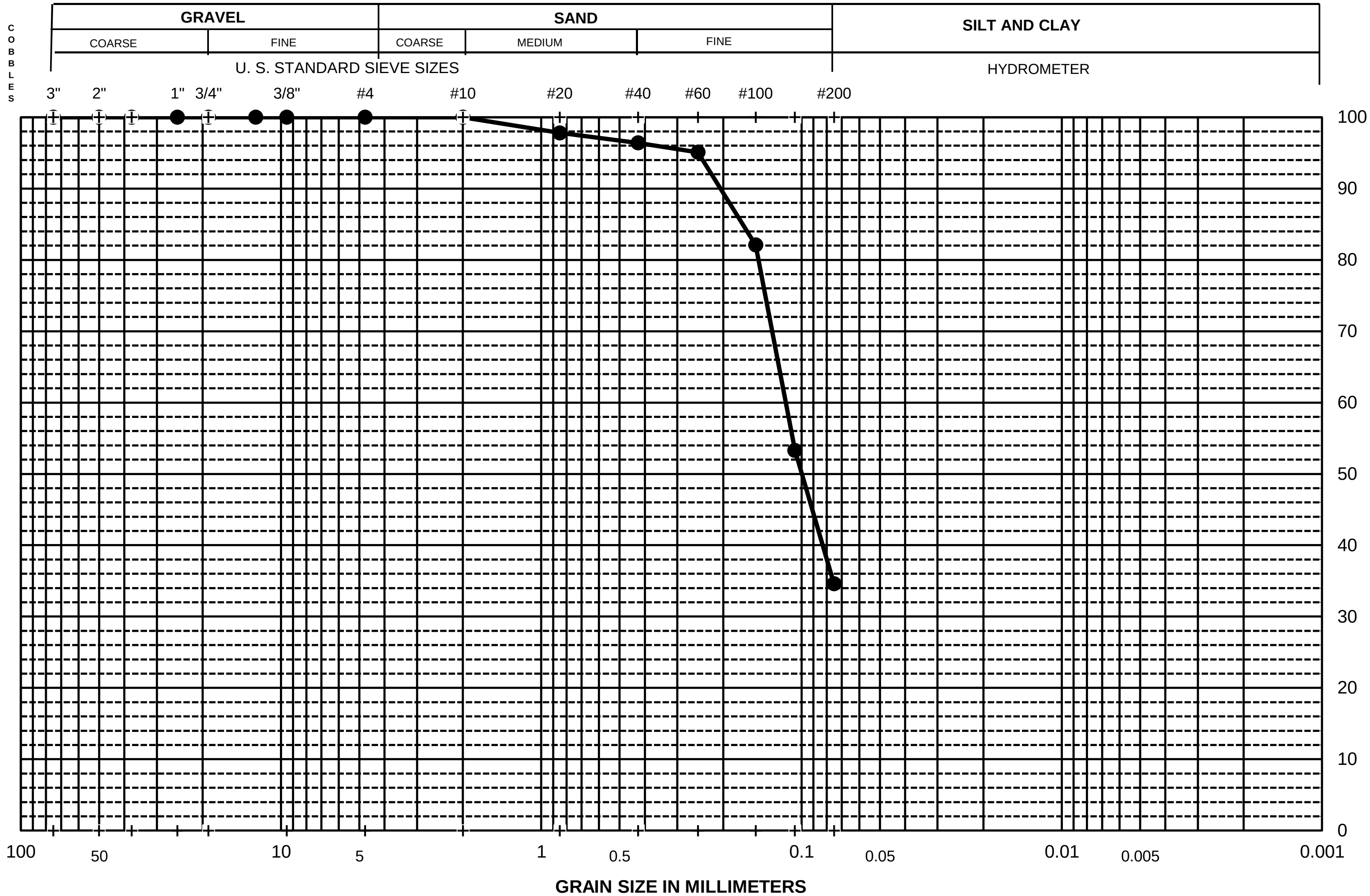
Log of Boring B-EP363-1

Date(s) Drilled	**05/09/11 - 05/10/11**	Logged By	**A. Avakian**	Checked By	**K. Shaner**
Drilling Method	**Rotary Wash/ Coring**	Drill Bit Size/Type	**HWT/HQ-3**	Total Depth of Borehole	**51.5 feet**
Drill Rig Type	**Burley 4000, Rig #1**	Drilling Contractor	**Crux**	Approximate Surface Elevation	**12.4 ft (NAVD 88)**
Water Level Depth (Feet)	**39.15 (after 14 hours)**	Sampling Method(s)	**SPT/2.5" ID**	Hammer Data	**140 lbs/30" automatic hammer**
Borehole Backfill	**Bentonite chips**	Coordinate Location (NAD 83)	**32.7165 -115.71883**	Location	**Link 1, Section 10B**

Elevation, feet	Depth, feet	SAMPLES Number	Blows per foot	MATERIAL DESCRIPTION	Water Content, %	Dry Density, pcf	Drill Time and Rate [ft/hr]	REMARKS AND OTHER TESTS
	0			LAKE DEPOSITS Loose, dry, pale brown, clayey SAND (SC), very fine to fine grained, some mica, trace fine to coarse gravel			1129	
10		1*	23	Becomes medium dense			1152	*Sandcatcher used in shoe CORR
	5	2*	36		4	95	1145 1203	SA(35)
				Hard, moist, light gray CLAY (CL) with spots of iron oxide stains, weak cementation				
5		3*	30				1226	
	10	4*	50/5"				1207 1242	WA(78)
				Very dense, moist, grayish brown, well graded SAND with silt (SW-SM), spots of iron oxide stains, no cementation				
0		5*	84		12	116		WA(13)
	15	6*	38	Becomes dense	14		1230 1242	SA(6)
-5							1245 1255	
	20	7*	37	Interbedding of 2"-3" coarse grained sand layers			1257 1305	
-10								
	25	8*	50/5"	Becomes very dense	11	108	1311 1322	
-15								
	30							

Elevation, feet	Depth, feet	SAMPLES Type	Number	Blows per foot	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Dry Density, pcf	Drill Time and Rate (ft/hr)	REMARKS AND OTHER TESTS
	30		9*	50/5"		Becomes brown			1325	SA(12)
-20									1350	Begin coring at 32'
	35		10*	50/ 5.5"					1353 1405	
-25						Fat clay layer (1" thick), brown Iron oxide/manganese stained layers near horizontal Well cemented sand layer (1/2" thick)				
	40		11*	50/4"		Very dense, moist, brown, silty SAND (SM)	20		1409 1428	
-30										
	45		12*	90					1432 1457	SA(18)
-35						Very stiff, moist, brown, fat clay (CH)				
	50		13*	18			28		1512	LL(72), PI(50)
						Bottom of boring at 51.5 feet				
-40										
	55									
-45										
	60									
-50										
	65									

UNIFIED SOIL CLASSIFICATION



Sieve No.	Dia. mm	% Finer
3"	75.0	100.0
2"	50.0	100.0
1.5"	37.5	100.0
1"	25.0	100.0
3/4"	19.00	100.0
1/2"	12.50	100.0
3/8"	9.50	100.0
#4	4.75	100.0
#10	2.00	100.0
#20	0.850	97.8
#40	0.425	96.4
#60	0.250	95.1
#100	0.150	82.1
#140	0.106	53.3
#200	0.075	34.6
Hydrometer Analysis		

% Cobbles	XX
% Gravel	0.0
% Sand	65.4
% Fines	34.6
D_{85}	0.168
D_{60}	0.115
D_{50}	0.100
D_{30}	#N/A
D_{15}	#N/A
D_{10}	#N/A
C_u	XXX
C_c	XXX

Boring No.	Sample No.	Depth (ft)	SYMBOL	Wn (%)	LL	PI	% 2 μm	Description and Classification
B-EP363	2	5.0	●	3.6	NA	NA	NA	**Pale brown clayey Sand (SC)**

PROJECT NAME: **Sunrise Powerlink**

PROJECT NUMBER: **27661032**

PARTICLE-SIZE DISTRIBUTION CURVES

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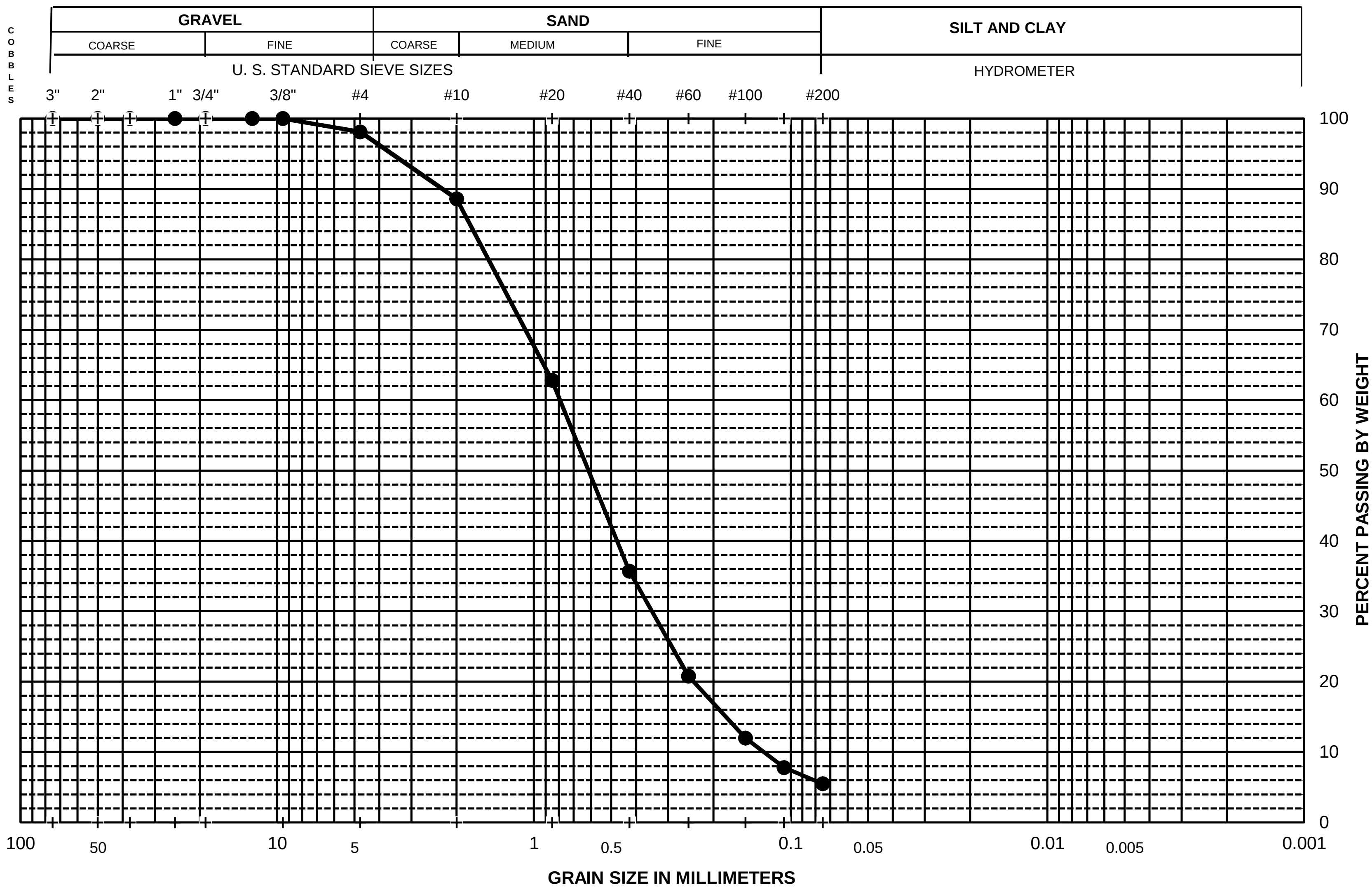
UNIFIED SOIL CLASSIFICATION



Sieve No.	Dia. mm	% Finer
3"	75.0	100.0
2"	50.0	100.0
1.5"	37.5	100.0
1"	25.0	100.0
3/4"	19.00	100.0
1/2"	12.50	100.0
3/8"	9.50	100.0
#4	4.75	98.1
#10	2.00	88.6
#20	0.850	62.8
#40	0.425	35.7
#60	0.250	20.8
#100	0.150	12.0
#140	0.106	7.8
#200	0.075	5.5
Hydrometer Analysis		

% Cobbles	XX
% Gravel	1.9
% Sand	92.6
% Fines	5.5
D_{85}	1.775
D_{60}	0.791
D_{50}	0.613
D_{30}	0.347
D_{15}	0.179
D_{10}	0.127
C_u	6.2
C_c	1.2

Boring No.	Sample No.	Depth (ft)	SYMBOL	Wn (%)	LL	PI	% 2 µm	Description and Classification
B-EP363	6	15.0	●	14.3	NA	NA	NA	**Grayish brown well-graded Sand with silt (SW-SM)**

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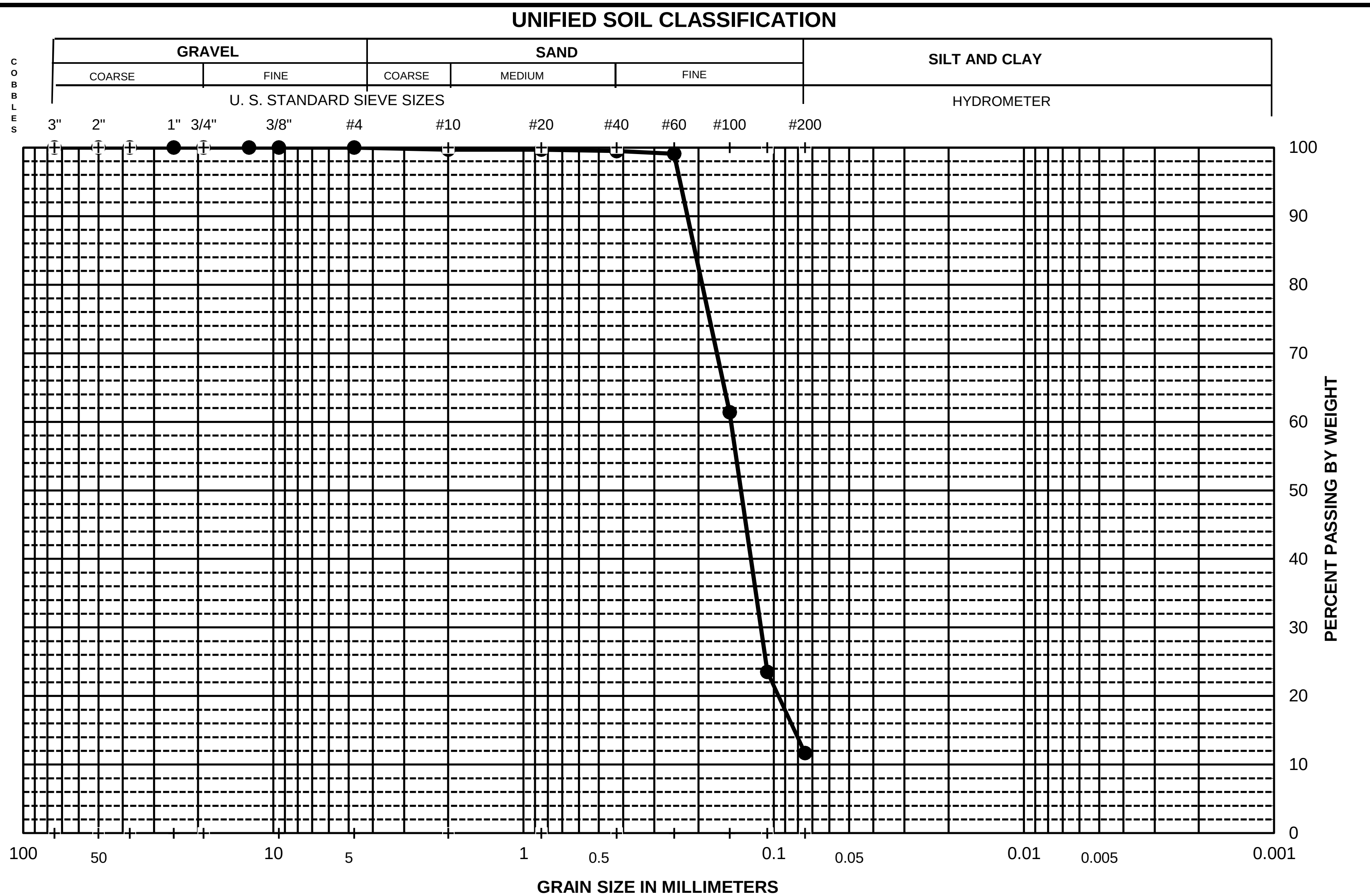
PARTICLE-SIZE DISTRIBUTION CURVES

URS



Sieve No.	Dia. mm	% Finer
3"	75.0	100.0
2"	50.0	100.0
1.5"	37.5	100.0
1"	25.0	100.0
3/4"	19.00	100.0
1/2"	12.50	100.0
3/8"	9.50	100.0
#4	4.75	100.0
#10	2.00	99.7
#20	0.850	99.7
#40	0.425	99.5
#60	0.250	99.1
#100	0.150	61.4
#140	0.106	23.5
#200	0.075	11.7
Hydrometer Analysis		

% Cobbles	XX
% Gravel	0.0
% Sand	88.3
% Fines	11.7
D_{85}	0.207
D_{60}	0.148
D_{50}	0.135
D_{30}	0.113
D_{15}	0.083
D_{10}	0.075
C_u	2.0
C_c	1.1

Boring No.	Sample No.	Depth (ft)	SYMBOL	Wn (%)	LL	PI	% 2 μm	Description and Classification
B-EP363	9	30.0	●	NA	NA	NA	NA	**Brown poorly graded Sand with silt (SP-SM)**

PROJECT NAME: **Sunrise Powerlink**
PROJECT NUMBER: **27661032**

PARTICLE-SIZE DISTRIBUTION CURVES

Sieve Sunrise EP363 0301

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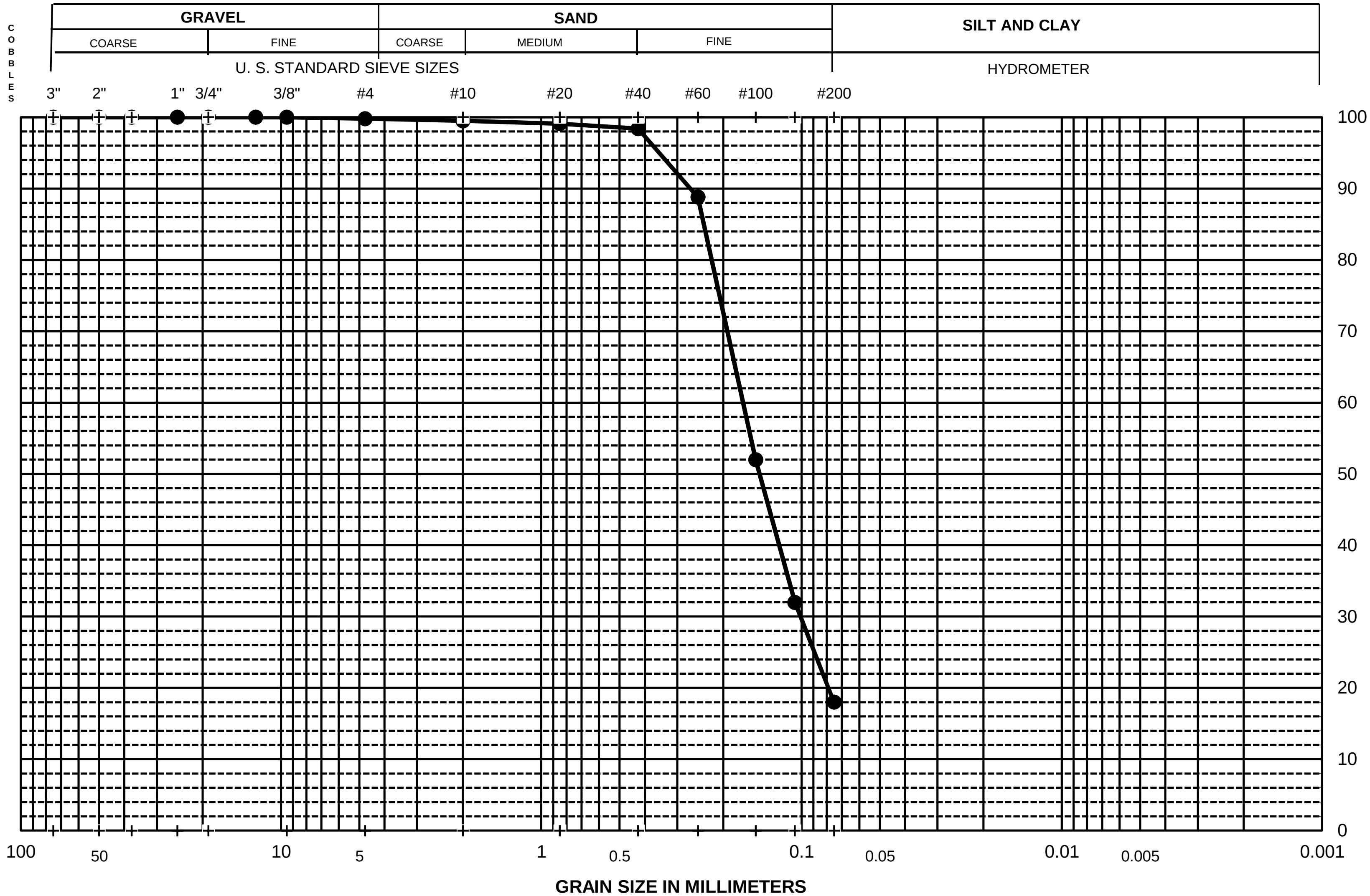
UNIFIED SOIL CLASSIFICATION



Sieve No.	Dia. mm	% Finer
3"	75.0	100.0
2"	50.0	100.0
1.5"	37.5	100.0
1"	25.0	100.0
3/4"	19.00	100.0
1/2"	12.50	100.0
3/8"	9.50	100.0
#4	4.75	99.8
#10	2.00	99.5
#20	0.850	99.1
#40	0.425	98.4
#60	0.250	88.8
#100	0.150	52.0
#140	0.106	32.0
#200	0.075	18.0
Hydrometer Analysis		

% Cobbles	XX
% Gravel	0.2
% Sand	81.8
% Fines	18.0
D_{85}	0.237
D_{60}	0.168
D_{50}	0.145
D_{30}	0.101
D_{15}	#N/A
D_{10}	#N/A
C_u	XXX
C_c	XXX

Boring No.	Sample No.	Depth (ft)	SYMBOL	Wn (%)	LL	PI	% 2 μm	Description and Classification
B-EP363	12	45.0	●	NA	NA	NA	NA	**Brown silty Sand (SM)**

PROJECT NAME: **Sunrise Powerlink**

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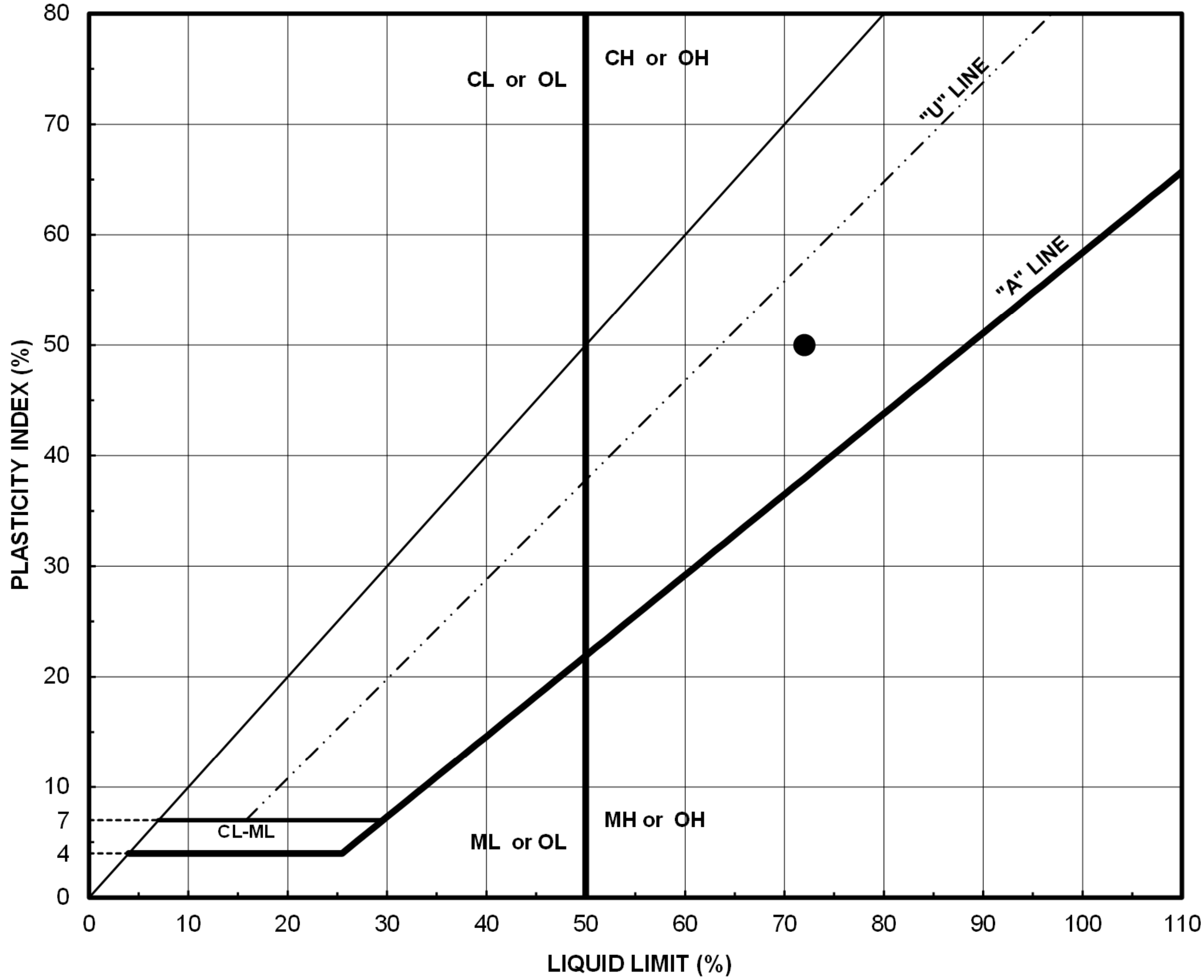
PARTICLE-SIZE DISTRIBUTION CURVES



Boring Number	Sample Number	Depth (ft)	Water Content (%)	LL	PI	DESCRIPTION / CLASSIFICATION
B-EP363	13	50.0	27.6	72	50	Brown Clay (CH)

Project Name: **Sunrise Powerlink** **PLASTICITY CHART**

Project Number: **27661032**