APPENDIX D-6:
GROUP DELTA CONSULTANTS, INC., EVALUATION OF SUBSIDENCE DUE TO LOWERING OF GROUNDWATER, VILLAGE AT PLAYA VISTA, PLAYA VISTA DEVELOPMENT, PLAYA VISTA PROJECT, APRIL 15, 2003

GROUP DELTA CONSULTANTS

Certified MBE

Geotechnical Engineering
Geology
Hydrogeology
Earthquake Engineering
Materials Testing & Inspection
Forensic Services

April 15, 2003

Playa Capital LLC
12555 W. Jefferson Blvd., Suite 300
Los Angeles, California 90066

Attention: Mr. Marc Huffman

Subject: Evaluation of Subsidence
Due to Lowering of Groundwater
Village at Playa Vista
Playa Vista Development
Los Angeles, California
GDC Project No. L-232 D

Dear Marc:

In July 2000, Group Delta Consultants, Inc., (GDC, 2000) performed a review of subsidence in the vicinity of the Playa Vista project. Based on our review of survey data maintained by the City of Los Angeles and data obtained by Psomas and Associates, we concluded that only very minor changes in elevation in the vicinity of the Playa Vista project had occurred since 1974. Due to the minor changes in elevation, we concluded that no changes to our recommendations for the foundation systems and structural systems were required for Phase I development at Playa Vista.

This report addresses the issue of potential subsidence due to lowering of groundwater (where needed) as a part of development of the Village at Playa Vista, the second part of the development to the east. The Playa Vista Project and the proposed development within the Playa Vista Site are shown in the Site Location Map, Figure 1. The area of the proposed development is shown in Figure 2. This report was submitted in draft on March 26, 2003 and includes review comments provided by you on April 15, 2003.

1.0 HISTORIC SUBSIDENCE

Details of historic subsidence in the area are presented in our letter of July 12, 2000 (GDC, 2000a) and the response to the City of Los Angeles Review comments dated September 6, 2000 (GDC, 2000b).

1.1 Data Before 1974

The California Division of Oil and Gas (DOG) Sixtieth Annual Report in 1974 evaluated the subsidence of the Playa Del Rey Oil and Gas Field from 1925 to 1970. Based on a composite record of three benchmarks, the DOG reported that

during the period from 1925 to 1970, a maximum cumulative subsidence of 1.75 feet occurred in the Venice area of the Playa Del Rey Oil and Gas Field.

Between 1964 and 1970, DOG reported a rate of subsidence of 0.34-inch per year in the Venice area of the Playa Del Rey Oil Field. DOG also reported minor subsidence along the Ballona Creek at a rate of 0.25-inch per year from 1935 through 1970. The DOG concluded in its report that the subsidence along the Ballona Creek area was attributable to ground water withdrawal. The subsidence in the Venice area was attributed to oil field fluids production and regional groundwater extractions. The paper concludes that at the present time (1974), because of the extremely low rate of subsidence, subsidence is not a problem in the Playa Del Rey area.

1.2 Recent Data

Group Delta conducted a review of leveling (survey) records in the Playa Del Rey area. These records were obtained from the Department of Public Works of the City of Los Angeles. The Department of Public Works provides leveling records (survey data) for many areas of the City including the Playa Del Rey area. The latest data collected by Psomas is shown in Table 1. The locations of the benchmarks are shown in Figures 3 and 4. Based on the latest Psomas survey in 2002, the maximum settlement is 2.05 inch and average settlement is 0.88 inches between 1985 and 2002. The settlement at point 17-05820 near the proposed development is 1.04 inches between 1985 and 2002, a period of 17 years.

2.0 SUBSURFACE CONDITIONS

2.1 Soil Conditions

The subsurface conditions in the vicinity of the area were investigated for development of the Runway Road (GDC, 1998, 1999) and EMT Infrastructure Development (GDC, 1999). We also reviewed the report by Law Crandall (1991) for the project. Relevant borings from these reports are plotted in Figure 2 and the boring logs and laboratory data are shown in Attachment A.

The original boring location plan from the Runway Road report is shown in Figure 5. Generalized soil profile based on the GDC and LeRoy Crandall borings are shown in Figure 6 (Section A-A') and Figure 7 (Section B-B' and Section C-C'). Subsurface materials encountered in borings consisted of variable amounts of fill materials generally ranging from 3 to 7 feet in depth. Slightly deeper fills may be present locally where stockpiles are present above general site grade.

The fill consists of soils ranging from silty and clayey sands to sandy clays. These fill soils are underlain by soft to stiff layers of clays, and silts and medium dense to dense silty and gravelly sands to about El. -30 feet. These soils are underlain by dense to very dense sands and gravels to the maximum of 60 feet in depth explored (El. -49 feet). The clayey soils between depths of El. +3 ft and El. -10 feet have variable plasticity with liquid limits of 38 to 67 and PI of 21 to 40 and contain traces of organic matter. The natural moisture content in the high plasticity clays ranges between 40 and 47 % and liquidity index is about 0.5. These clays appear to be slightly overconslidated and are soft to medium stiff in consistency.

The results of the consolidation tests indicate that the $C_c/1+e_o$ ranges from 0.02 to 0.11. The recompression coefficient $C_r/1+e_o$ ranges between 0.01 and 0.04. For the sandy soils we used a modulus equal to 24 times the SPT N-value based on published correlations between blow counts and elastic modulus.

2.2 Groundwater

The groundwater data are summarized in Figure 2. These water levels include data from Borings 1, 21, and 22 performed by Law Crandall in 1986 and Borings B-101H, B-106H, B-107H, B-108H, B-109H, B-118H, B401R, B403R, and B405R drilled by Group Delta Consultants in 1998 and 1999. A review of these data indicates the following:

- The groundwater levels range from deeper than El. -6 ft at Boring B-118H near Bluff Creek Drive to about El. +4.5 ft near the west end of Runway Road.
- In general, groundwater levels are deeper than El. -6 feet south of "B" Street.
- Along Runway road the groundwater levels are between El. -5 ft and El. +2 ft except for one reading by Law Crandall at Boring 1 of El. +4.5 feet.
- The Law Crandall 1986 water levels appear to be higher than the GDC 1998-99 readings. Law Crandall borings were done using a rotary wash rig and the water levels are less reliable than the GDC water levels which were obtained in borings drilled by a hollow stem auger rig.

Based on this discussion, it is concluded that the groundwater levels in the area range from El.-6 ft to El. +2 feet.

3.0 PROPOSED CONSTRUCTION

The proposed construction will consist of buildings with one- or two-level basements and up to four levels of wood-frame construction similar to the existing Playa Vista Phase I Development which is already completed or is currently under construction. The projects with one- or two-level basements require a methane collection system which also includes a dewatering system to keep the methane pipes free of groundwater. The finished pad elevation will be between El. 23.5 ft to El. 26 ft and the two-level basement excavations will extend to about El. 0.5 ft to El. +2 feet. The actual excavation will extend about 2 ft below this elevation to accommodate methane and dewatering pipes. Thus, the dewatering system for a two-level basement and finished pad elevation at El. 23.5 ft will lower the water table to about El. -1.5 feet. For one-level basement or no basement the highest water table in the area at El. +4.5 ft is lower than the basement floor and thus the water table will not be lowered for one-level or no basement construction.

The dewatering system at Playa Vista is a passive system which requires placement of dewatering pipes below the methane collection system pipes. In case the groundwater is present or in future rises to an elevation above the elevation of the groundwater pipes, the water is conveyed to a sump where it is removed by automatic pumps. The dewatering system does not include dewatering by pumping from deep wells or well points.

To evaluate the maximum potential settlement due to dewatering, we have assumed that all buildings have two-level basements. We have further assumed that all buildings with two-level basements will be supported on piles and all roadway or other higher level areas around the building perimeter will be surcharged prior to construction.

4.0 SETTLEMENT DUE TO DEWATERING

4.1 Settlement Estimate

Some of the site areas have been subjected to temporary stockpiles and the surcharge placed for construction of the Runway Road and Millennium Street (Phase I Roadways). Typical stockpile elevations are shown in Figure 8. To analyze the worst case, we assumed the following:

We selected an area north of Boring 1 and located near the west end of the project (see Figure 2) with surface grade of El. +12 feet. This area will be used to construct a building with two-level basement with dewatering pipes at El. -1.5 feet.

The highest water level in the area is El. +4.5 feet. Thus after construction of the building, the water level will be lowered by 6 ft from the highest water level of El. +4.5 ft to El. -1.5 feet This lowering of water table is equivalent to a loading of 6x62.4 = 375 psf. Also the site will be excavated from El. +12 ft to El. +1.5 ft (top of slab/mat) or an unloading of 10.5 ft of soil or (12-4.5)x115+(4.5-1.5)x53 =1021 psf. The net effect of lowering the water table by 6 ft and lowering the ground by 10.5 ft is an unloading of 1,021-375 = 646 psf. Note that the buildings are supported on pile foundations and no building loads are supported on the soil at El. 0.5 feet. Based on our experience at other Playa Vista sites where surcharge and unloading were performed and settlement and heave measurements made (see Figure 9) for MP-6, a heave of about 1.2 inches occurred due to removal of about 21 feet of soil. Using this data, we anticipate that due to a net unloading of 646 psf (combined effect of lowering the water table and cutting the site grade) will be about 646x1.2/(21x120) = 0.3 inches.

4.2 Settlement Calculation

We also performed settlement/heave calculations due to lowering of the groundwater from El. +4.5 ft to El. -1.5 ft and lowering the site grade from El. +12 ft to El. +1.5 feet. This calculation was performed by using the generalized soil profile shown in Figure 7 and the program SETTL/G (Geosoft, 1988). These calculations indicate that due to the combined effect of lowering the site grade and lowering the groundwater the calculated heave is 2.18 inches. The calculations are summarized in Attachment B. It is well known that the heave or recompression of overconsolidated soils when calculated with recompression or unloading index is about 4 times the measured values (Terzaghi and Peck, 1967). Thus the actual heave will be about 0.54 inches. This value is similar to the value estimated from measured heave data discussed in Section 4.1. The heave would occur quickly and be completed shortly after completion of the excavation.

5.0 CONCLUSION

Based on the calculations and discussion in Section 4, it is our opinion that the combined effect of lowering the groundwater and lowering the site grade is a net heave of about 0.5 inches. There will be no net settlement or subsidence due to lowering the groundwater by about 6 feet to the level of the dewatering pipes for the two-basement buildings. For one-level basement and no basement buildings, no lowering of the groundwater is necessary or anticipated.

6.0 REFERENCES

Group Delta Consultants, Inc., (GDC 1999) "Geotechnical Investigation Report, EMT Infrastructure Developments, Tract 52092, Playa Vista – Marina Del Rey, Los Angeles, California," a report (Project No. L-194A) prepared for Playa Capital LLC, dated May 4, 1999.

Group Delta Consultants, Inc., (GDC 1998) "Geotechnical Investigation Report, Proposed Runway Road, Playa Vista – Marina Del Rey, Los Angeles, California," a report (Project No. L-194A) prepared for Playa Capital LLC, dated November 10, 1998 revised April 28, 1999.

Group Delta Consultants, Inc., (GDC 2000a) "Subsidence Evaluation Review, Playa Vista Development, Playa Del Rey, California," a report (Project No. L-232) prepared for Playa Capital LLC, dated July 12, 2000.

Group Delta Consultants, Inc. (GDC 2000b), "Response to City of Los Angeles Review Comments Subsidence Evaluation Review, Playa Vista Development, California, City of Los Angeles Log No. 31309," a report (Project No. L-232) prepared for Playa Capital LLC, dated September 6, 2000.

LeRoy Crandall Associates, "Geotechnical Studies, Proposed Playa Vista Project – Area D, Tentative Tract No. 49104, Jefferson Boulevard Between Lincoln and Centinela Avenues, Los Angeles, California", a report prepared for Maguire Thomas Partners and dated January 3, 1991.

Terzaghi K., and Peck, R. B., "Soil Mechanics in Engineering Practice," 2nd Edition, John Wiley and Sons, New York, 1967.

7.0 LIMITATIONS

This investigation was performed in accordance with generally accepted geotechnical engineering principles and practice. The professional engineering work and judgments presented in this report meet the standard of care of our profession at this time. No other warranty, expressed or implied, is made.

The following Table, Figures and Attachments are included and complete this report.

Table 1	Bench Mark Data (after Psomas, 2000)
Figure 1	Site Location Map
Figure 2	Groundwater Data
Figure 3	City of Los Angeles Bench Mark Locations
Figure 4	Bench Mark Locations (after Psomas)
Figure 5	Site Plan Runway Road
Figure 6	Generalized Soil Profile Section A-A'
Figure 7	Generalized Soil Profile Sections B-B' and C-C'
Figure 8	Temporary Stockpile Contours
Figure 9	Settlement Data During Surcharge Program
Attachment A	Boring Logs and Laboratory Data from Existing GDC Reports (GDC, 1998 and GDC, 1999)
Attachment B	Settlement Output

We appreciate the opportunity to provide our services on this very important project and look forward to our continued association in future phases of the Playa Vista Development.

Sincerely,
GROUP DELTA CONSULTANTS, INC.

Kul Bhushan, Ph. D., G.E.
President

REGISTERED PROFESSIONAL ENGINEER
KUL BHUSHAN
No. GE 000144
Exp. 12/31/05
GEOTECHNICAL
STATE OF CALIFORNIA

Cc: Tim Connors, Playa Vista

TABLES

Table 1
Playa Vista
Group Delta - Bench Mark Data

BM Letter	City of LA BM No	Status	Current Adj	Psomas 2002 Elev	Psomas 2000 Elev	Diff Pso 2000-1985	Diff Pso2002-1985	1985 Adj - feet	1980 Adj - feet	1975 Adj - feet	1974s Adj - feet	1974p Adj - feet	1970 Adj - feet	1968 Adj - feet	1968p Adj - feet	1963 Adj - feet	1960 Adj - feet	1956 Adj - feet	1955 Adj - feet	1953 Adj - feet
A	17-02610		1974		Not Shot							14.639	14.650		14.691	14.784	14.826			
B	17-02350	Gone 1972											4.577		4.616	4.721	4.772	4.925		
C	17-02490		1985		6.928	-0.060		6.988	6.913	7.094		7.017	7.003							
D	17-02510	Gone 1968														6.752	6.814	6.864	6.921	6.964
E	17-05830	Gone 1972											9.180		9.217	9.393	9.467	9.508		
F	17-05870	Gone 1970											7.930		7.968	8.086	8.151	8.203		
G	17-02560		1975		Not Shot					6.570	6.457	6.486	6.506	6.545						
H	17-11500		1985		8.846	-0.094		8.940	8.948	9.030	8.918	8.948								
I	17-05865		1985		12.646	-0.100		12.746	12.694	12.883	12.783	12.823								
J	17-05845		1985		12.224	-0.063		12.287	12.208	12.388	12.290	12.317								
K	17-05826		1985		Gone			13.963	13.967	14.154	14.072	14.096								
PSO-1	17-02492		1985		11.723	-0.118		11.841	11.811	12.008	11.908	11.949								
PSO-2	17-05820		1985		12.306	-0.079		12.385	12.310	12.506	12.423	12.453								
	17-05650			27.221	27.221	0.000	0.000	27.221												
	17-05771			13.817	13.809	-0.040	-0.031	13.848												
	17-05781			13.369	13.367	-0.046	-0.046	13.415												
	17-05785			14.104	14.100	-0.083	-0.079	14.183												
	17-05820			12.298	12.306	-0.079	-0.087	12.385												
	17-05845			12.219	12.221	-0.066	-0.068	12.287												
	17-05865			12.630	12.643	-0.103	-0.116	12.746												
	17-05724			16.113	16.111	-0.047	-0.045	16.158												
	17-05708			20.630	20.631	-0.016	-0.016	20.646												
	17-05670			22.519	22.518	-0.172	-0.171	22.690												
		Maximum Settelemnt (inches)					-2.055													
		Average settlement (inches)					-0.881													

Note:
1) Psomas 2000 elevation was derived by holding the elevation of bench mark 17-05650, 1985 adjustment, Elev = 27.221 feet
2) Psomas 2002 elevation was derived by holding the elevation of bench mark 17-05650, 1985 adjustment, Elev = 27.221 feet
3) Bench mark 17-05820 was shot in lieu of bench mark 17-05826, which is gone
4) Bench mark 17-02610, located at the Marina Freeway and Lincoln Boulevard, was not shot
5) Bench mark 17-02560 located at the centerline of Lincoln Boulevard, was not shot

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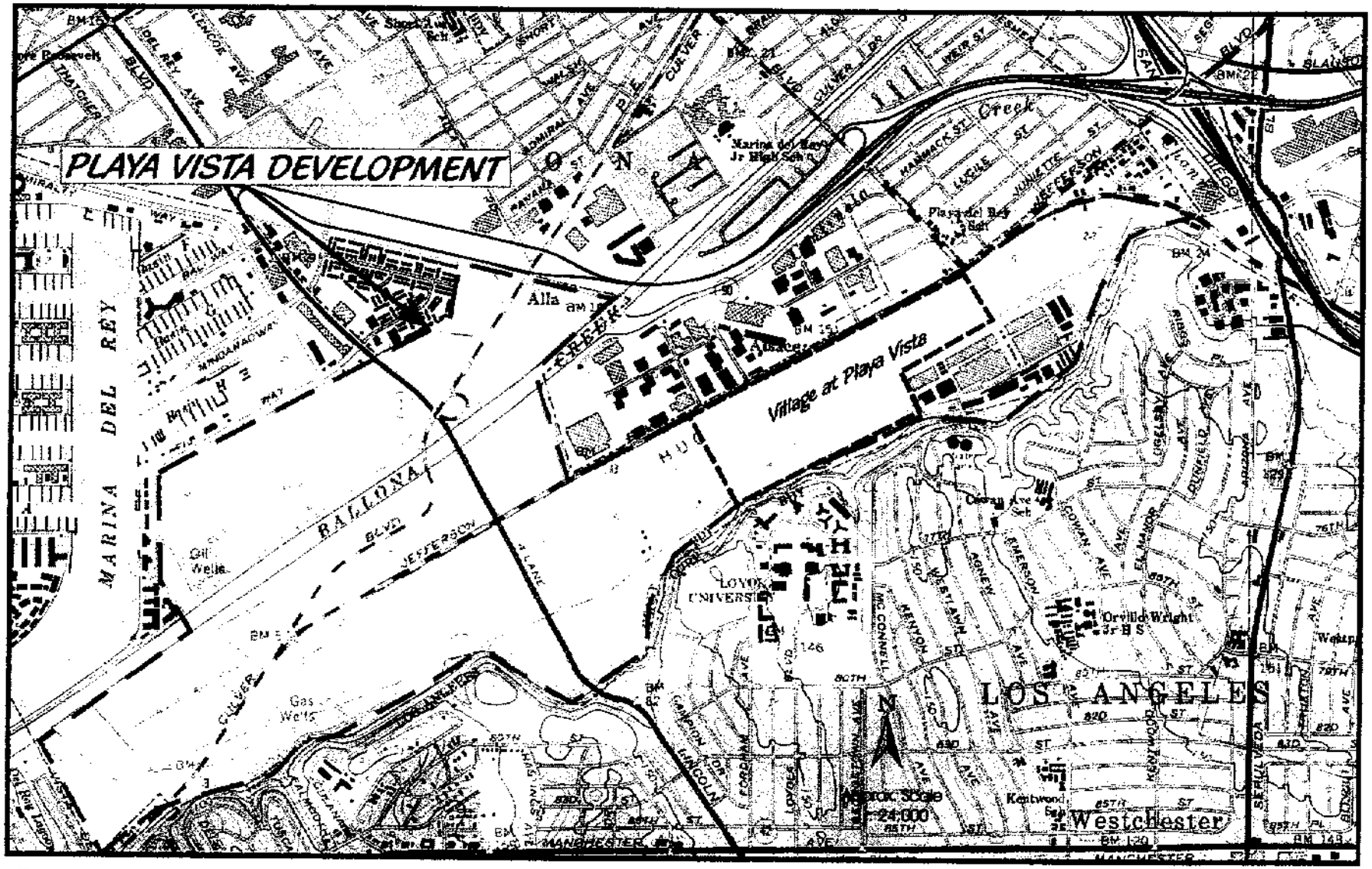
FIGURES



The base map is from the USGS 7.5 minute Venice Calif. Quadrangle, 1964 Photorevised 1981

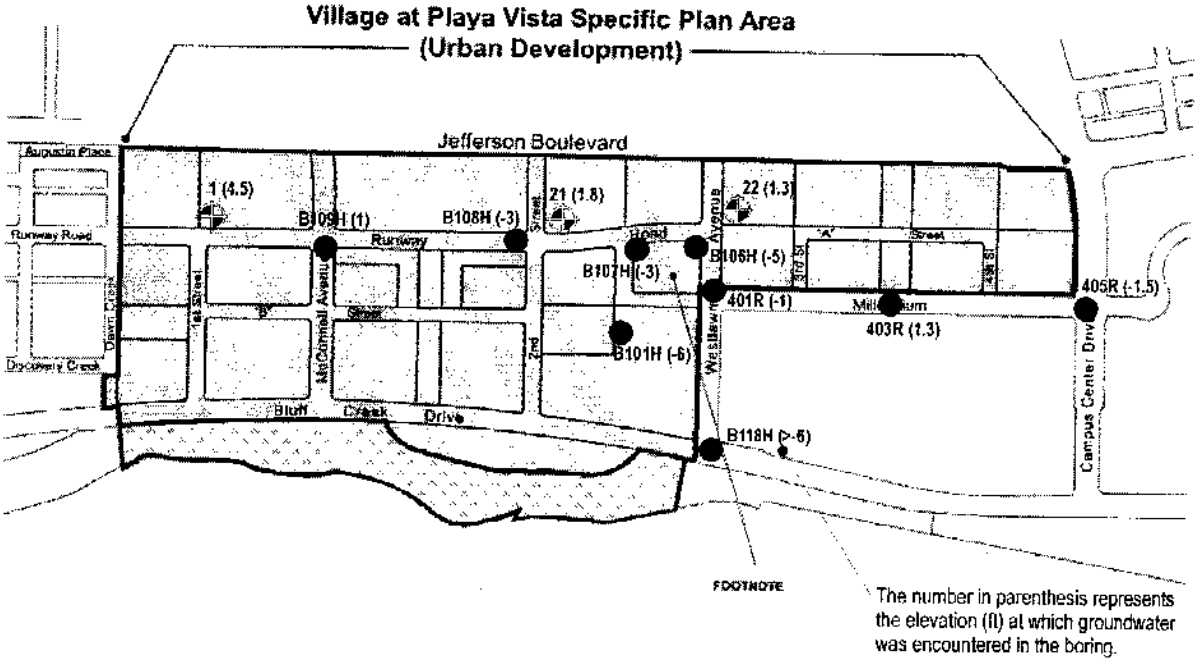
GROUP DELTA

GDC Project No.L232

Subsidence Investigation
Village at Playa Vista

Site Location Map

Figure 1



LEGEND

- Proposed Village at Playa Vista Specific Plan
- Habitat Creation / Restoration Component
- Boring by Group Delta
- Boring by Law Crandall

0 600 1200 Feet

FOOTNOTE:
This parcel was included in the First Phase Project and is also included in the Village Center Project for further consideration.

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GDC Project No.L232

Subsidence Investigation
Village at Playa Vista

Groundwater Data

Figure 2

Ref,: PCR Services Corporation, 2002

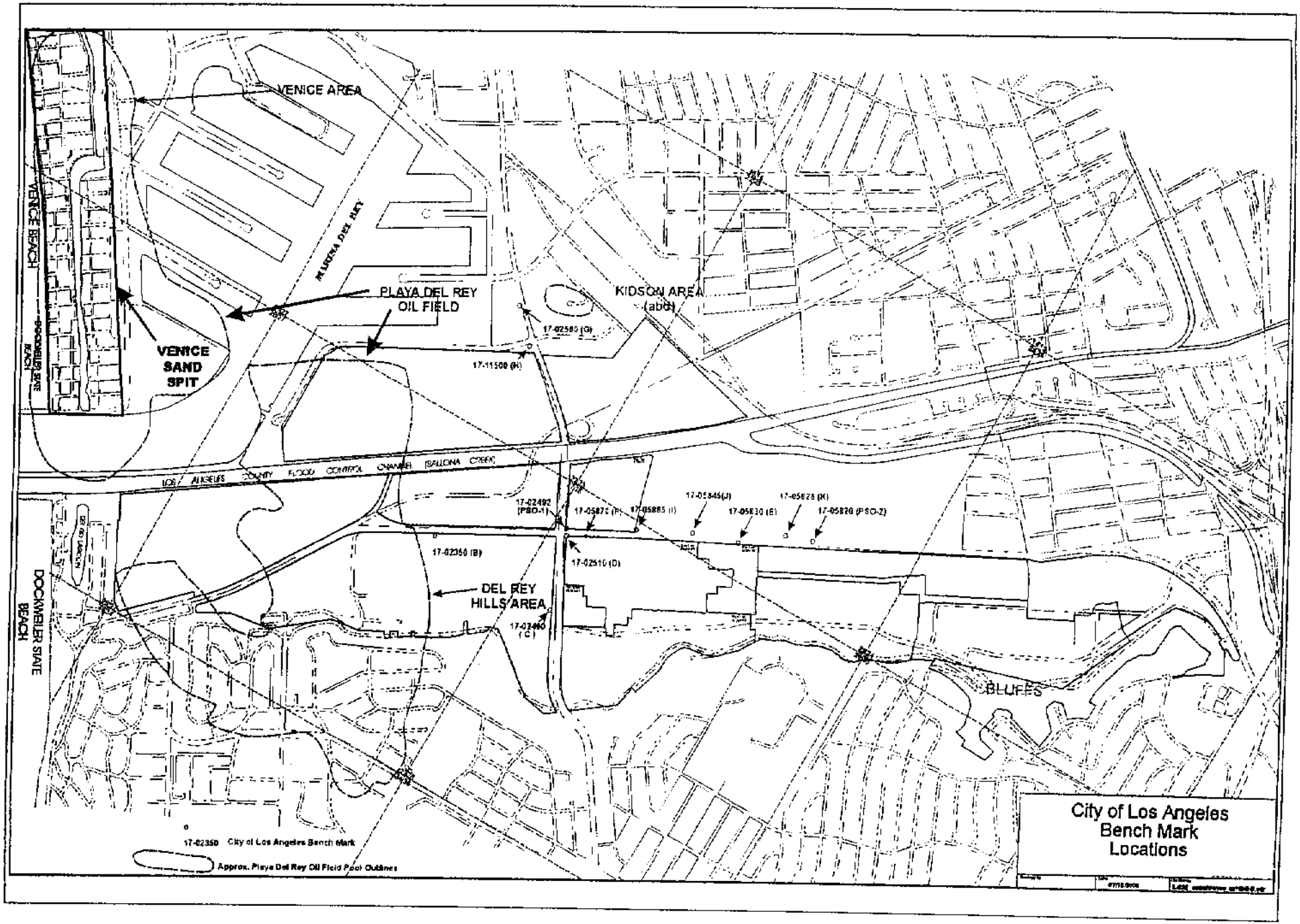
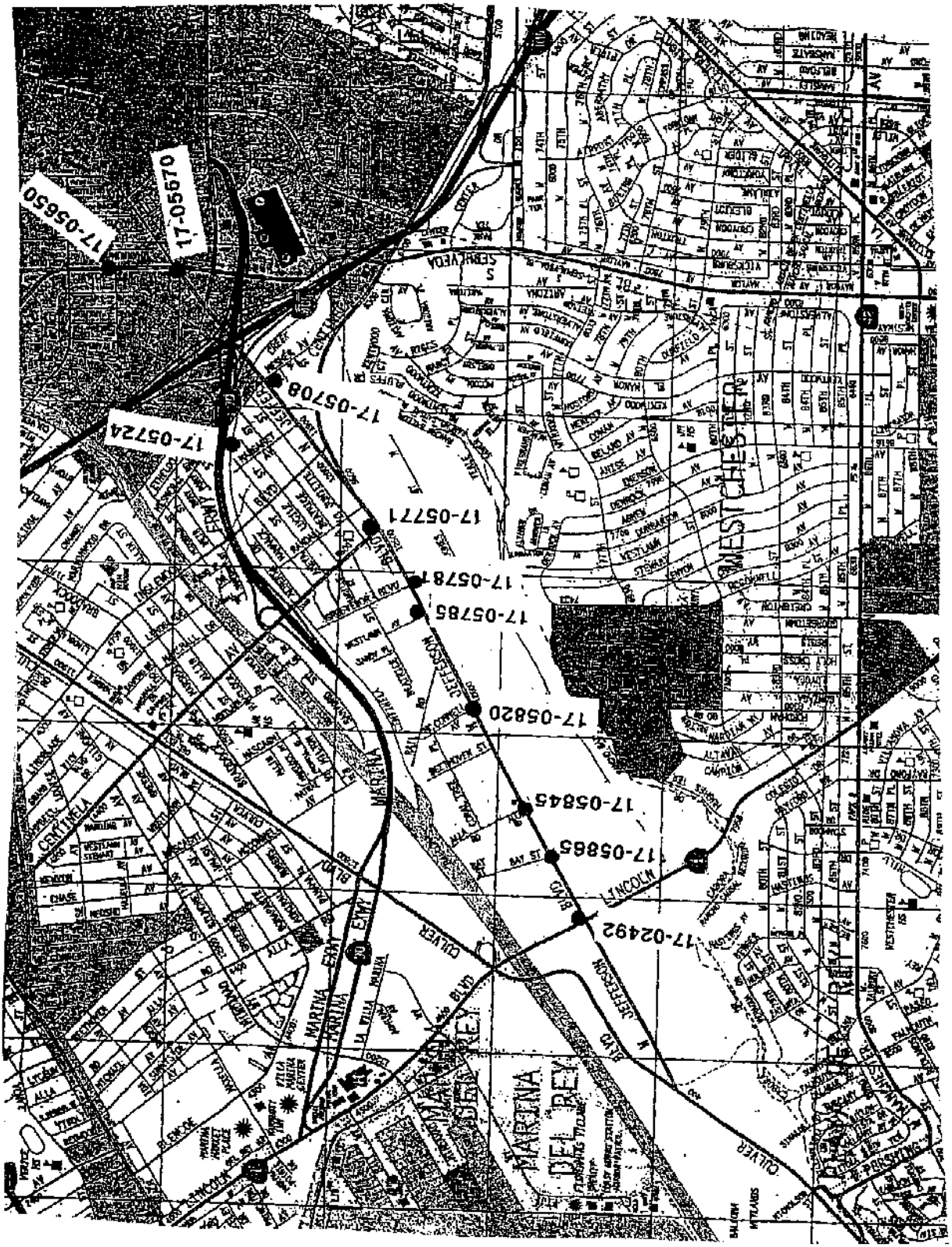
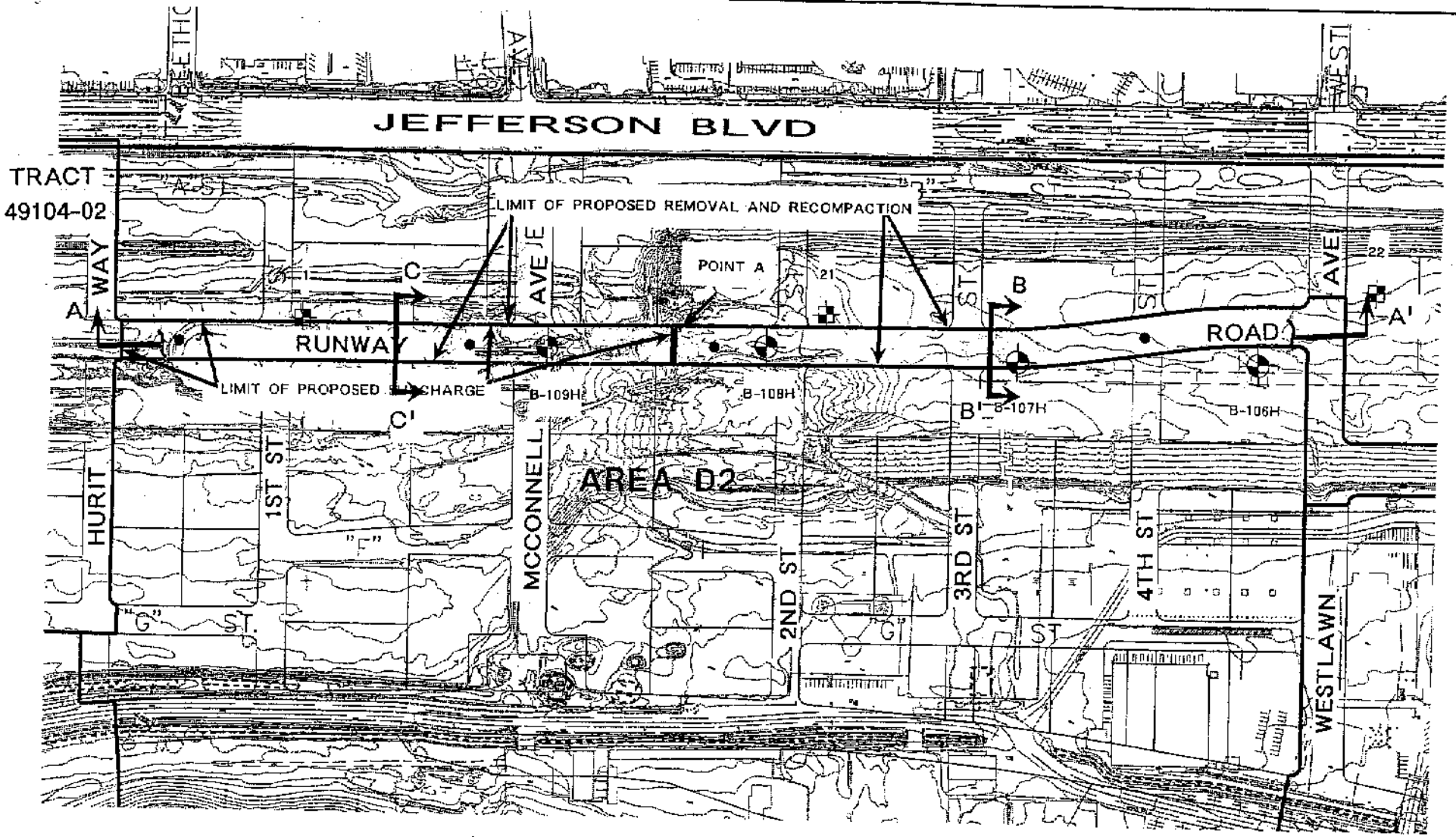

VENICE AREA
VENICE BEACH
MARINA DEL REY
PLAYA DEL REY OIL FIELD
KIDSON AREA (abd)
VENICE SAND SPIT
17-02585 (G)
17-11500 (H)
LOS ANGELES COUNTY FLOOD CONTROL CHANNEL (BALLONA CREEK)
17-02492 (PSO-1)
17-05870 (F)
17-05885 (I)
17-05845(J)
17-05830 (E)
17-05825 (K)
17-05820 (PSO-2)
17-02350 (B)
17-02510 (D)
DEL REY HILLS AREA
17-02460 (C)
DOCKWEILER STATE BEACH
BLUFFS
17-02350 City of Los Angeles Bench Mark
Approx. Playa Del Rey Oil Field Pool Outlines
City of Los Angeles
Bench Mark
Locations

Figure 3



Project No. L-232	Playa Vista Project
GROUP DELTA CONSULTANTS, INC.	Bench Mark Locations (after Psomas) Figure 4



LEGEND

- LOCATION OF BORINGS GDC, 1998
- SETTLEMENT MONITORING PLATE
- PREVIOUS LEROY CRANDALL BORING LOCATION, 1991

REFERENCE: Playa Vista Site with Fresh Water Marsh & Federal Delineated Wetlands, PSOMAS, 10/12/98

Figure 5

SITE PLAN - Runway Road

Playa Vista - Marina del Rey, California

PROJECT NUMBER	L-194A
DATE	11/11/98
SCALE	1" = 200'
DRAWN BY	NN
APPROVED BY	MDR
REVISION	03/26/99
DRAWING NUMBER	

GROUP DELTA CONSULTANTS, INC.

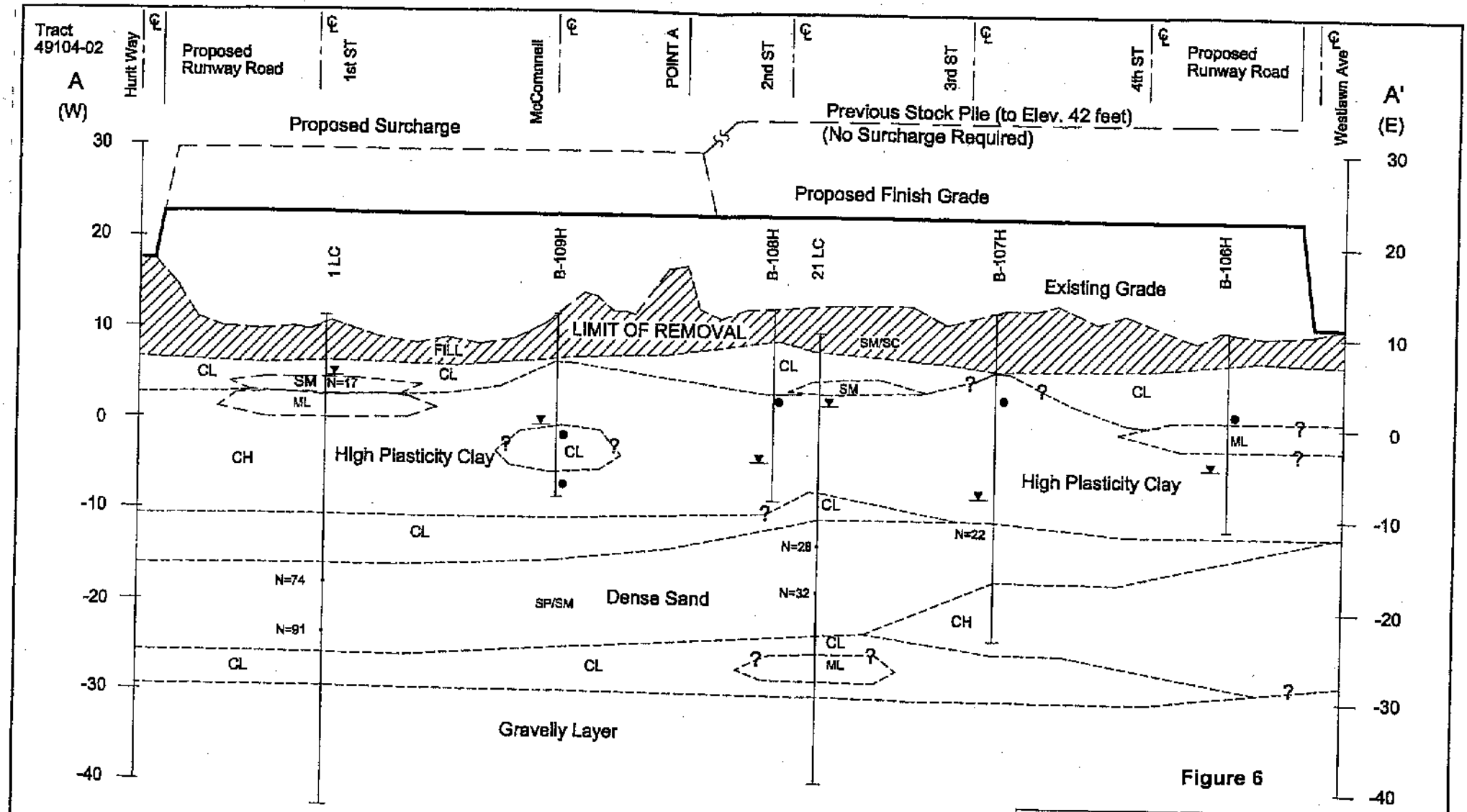


Figure 6

Section A - A'

Playa Vista - Marina del Rey, California

L-194A

04/28/99

NN

MDR

GROUP DELTA CONSULTANTS, INC.

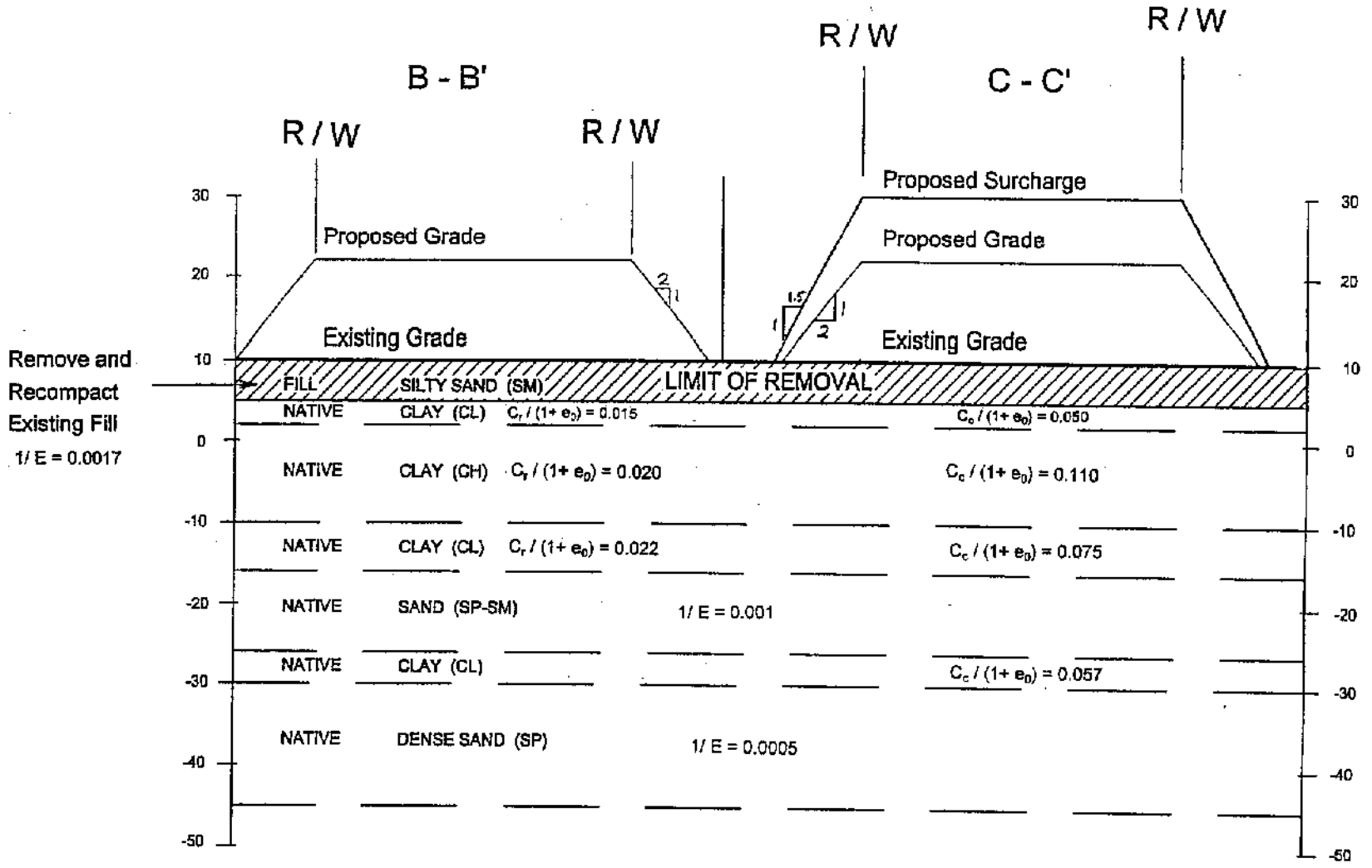


Figure 7

NOTES:

(1) Minimum width of top of surcharge shall be equal to total right-of-way width.

(2) To minimize the effects of future surcharge north and south of the roadway, the surcharge limits may be extended 10 ft outside the right-of-way limits.

Section B-B' and C-C'

Playa Vista - Marina del Rey, California

PROJECT NUMBER: L-194A

DATE: 04/28/99

SCALE:

DRAWN BY: LBN

APPROVED BY: MDR

REVISED:

FIGURE NUMBER:

GROUP DELTA CONSULTANTS, INC.

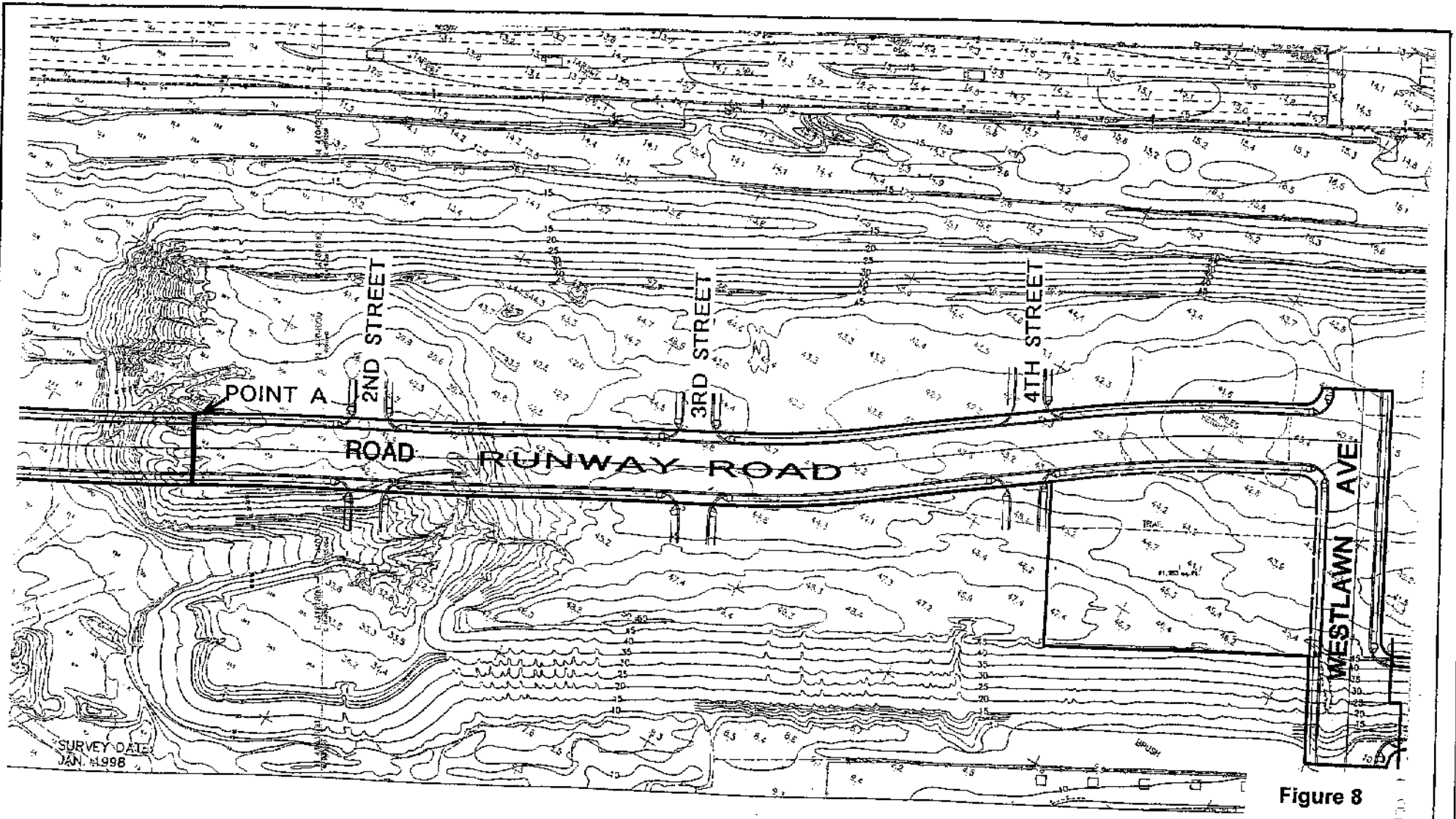
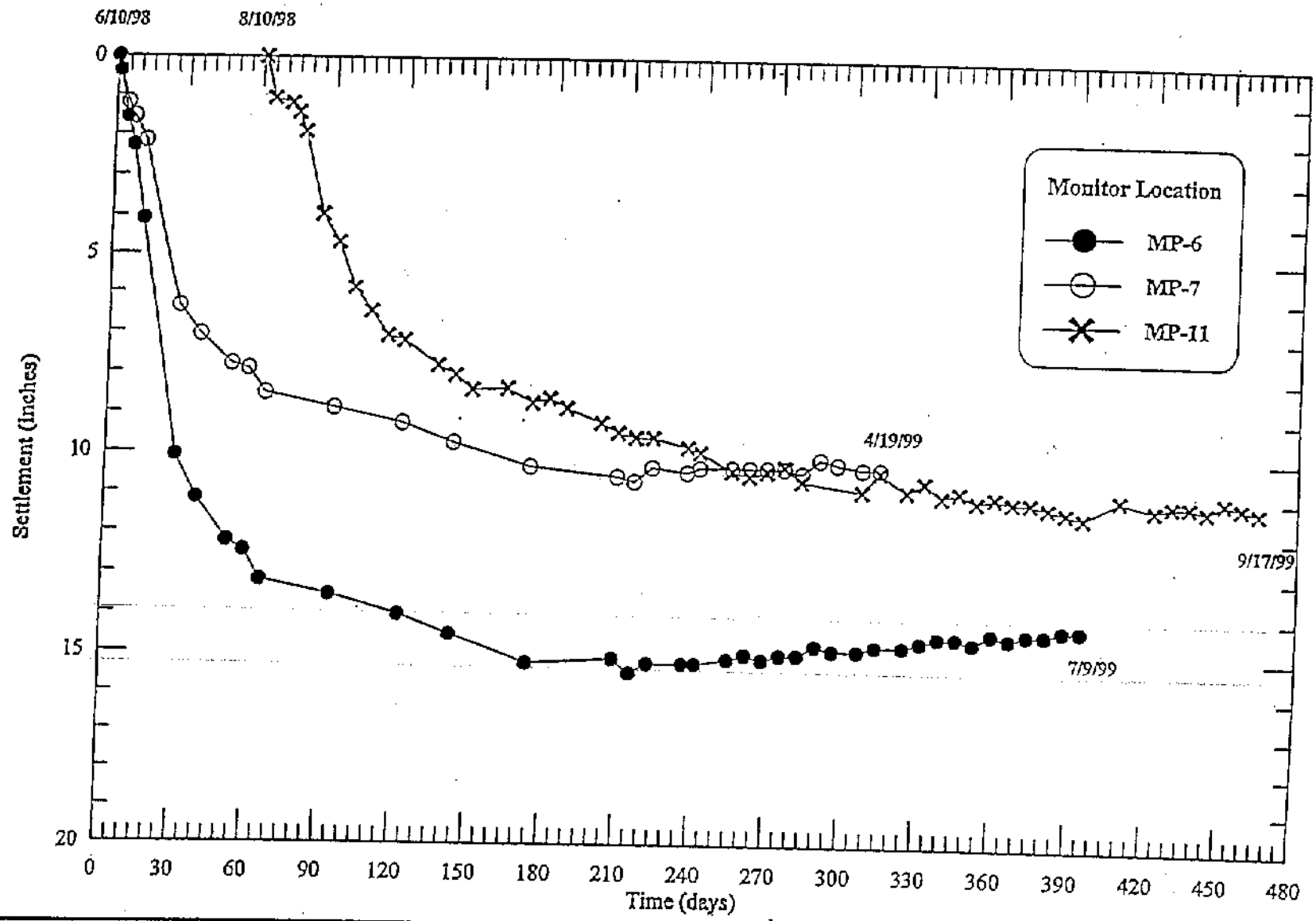


Figure 8

REFERENCE: Playa Vista Site, PSOMAS, Jan 98 & Jul 97

TEMPORARY STOCKPILE CONTOURS		
Playa Vista - Marina del Rey, California		PROJECT NUMBER: L-209
		DATE: 04/28/99
SCALE:	DRAWN BY: NN	REVISION:
	APPROVED BY: MDR	DRAWING NUMBER:
GROUP DELTA CONSULTANTS, INC.		



PROJECT NO. L-196	PLAYA VISTA DEVELOPMENT PROJECT (LOS ANGELES, CALIFORNIA)
Group Delta Consultants, Inc.	SETTLEMENT DATA DURING SURCHARGE PROGRAM
	Figure 9

C:\PROJECTS\PLAYA\SETDAT9.GRF

ATTACHMENT A
Boring Logs and Laboratory Data from Existing GDC Reports (GDC, 1998 and GDC, 1999)

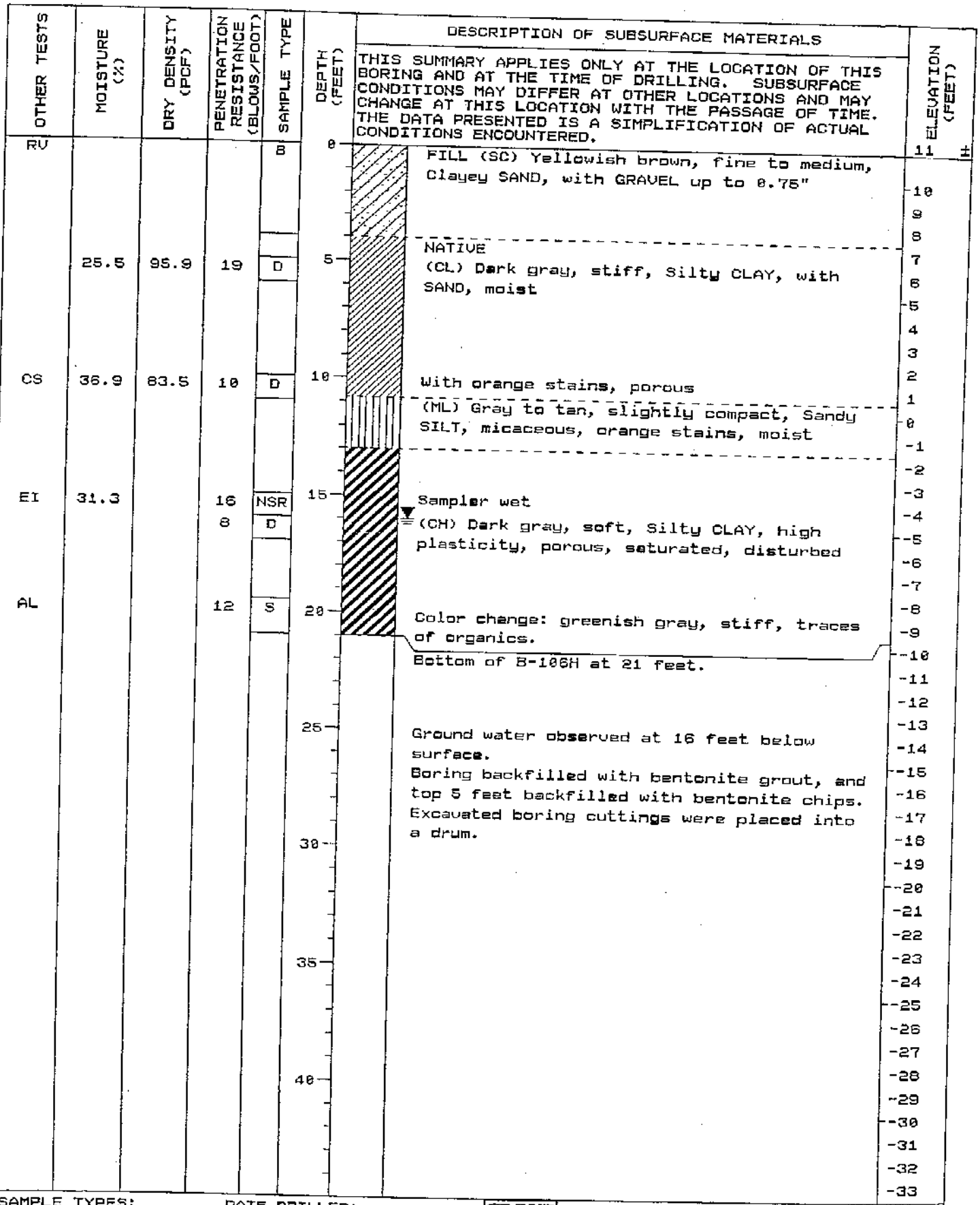
APPENDIX A
FIELD EXPLORATION

The field exploration was performed on October 12, 1998 at the subject project utilizing a truck mounted hollow stem auger drill rig. The field exploration consisted of observing subsurface conditions for four borings ranging from 21 to 36 feet below the existing ground surface. Subsurface materials were visually classified and recorded by a GDC field engineer in accordance with the Unified Soil Classification System (USCS).

Relatively undisturbed samples and bulk samples of the encountered materials were obtained from the borings and logged on the boring logs. Relatively undisturbed samples were obtained by a driven 2.41-inch inside diameter sampler with a 140-pound hammer free-falling 30 inches. The samples were retained in brass rings and placed in sealed plastic canisters to prevent moisture loss. Standard penetration tests (SPT) were conducted using a 1.4-inch sampler driven with a 140-pound hammer free-falling 30 inches, in accordance to ASTM D 1586. Bulk samples were obtained by a shovel and placed into polyethylene bags.

The approximate locations of the borings are illustrated on Figure 3, Site Plan. Pertinent details of the subsurface conditions encountered for each boring are presented in Figures A-1 through A-4. Copies of previous soil borings performed in the site vicinity by LeRoy Crandall are presented as Figures A-5 through A-10. Results of moisture content and dry density testing are shown on these logs. Additional soil testing is identified in the column labeled "Other Test". The following abbreviations are used for other tests:

- AL - Atterberg Limits
- CP - Compaction
- CS - Consolidation
- EI - Expansion Index
- RV - R-Value



SAMPLE TYPES:
- C Rock Core
- S Std Pen. Test
- D Drive Sample
- B Bulk Sample
- T Tube Sample

DATE DRILLED: 10-12-98

EQUIPMENT USED: HSA-CME 75

GROUNDWATER LEVEL: 16.0

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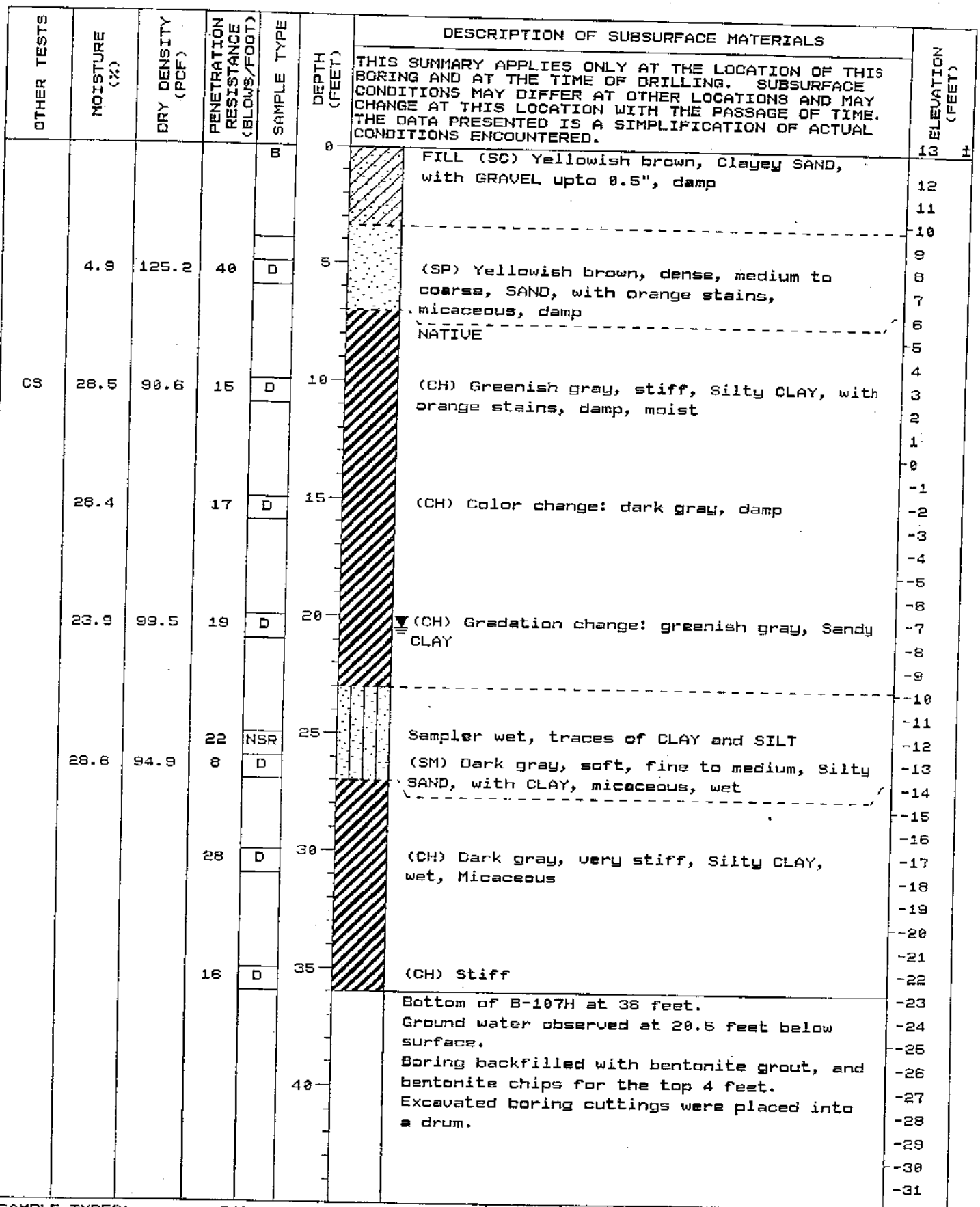
PROJECT NO. L-194A

PLAYA VISTA - Runway Road

LOG OF BORING NO. B-106H

PAGE 1 OF 1 FIGURE A-1

GDC002 L194A 11-9-98



SAMPLE TYPES:
- C Rock Core
- S Std Pen. Test
- D Drive Sample
- B Bulk Sample
- T Tube Sample

DATE DRILLED: 10-12-98

EQUIPMENT USED: HSA-CME 75

GROUNDWATER LEVEL: 20.5

GROUP DELTA

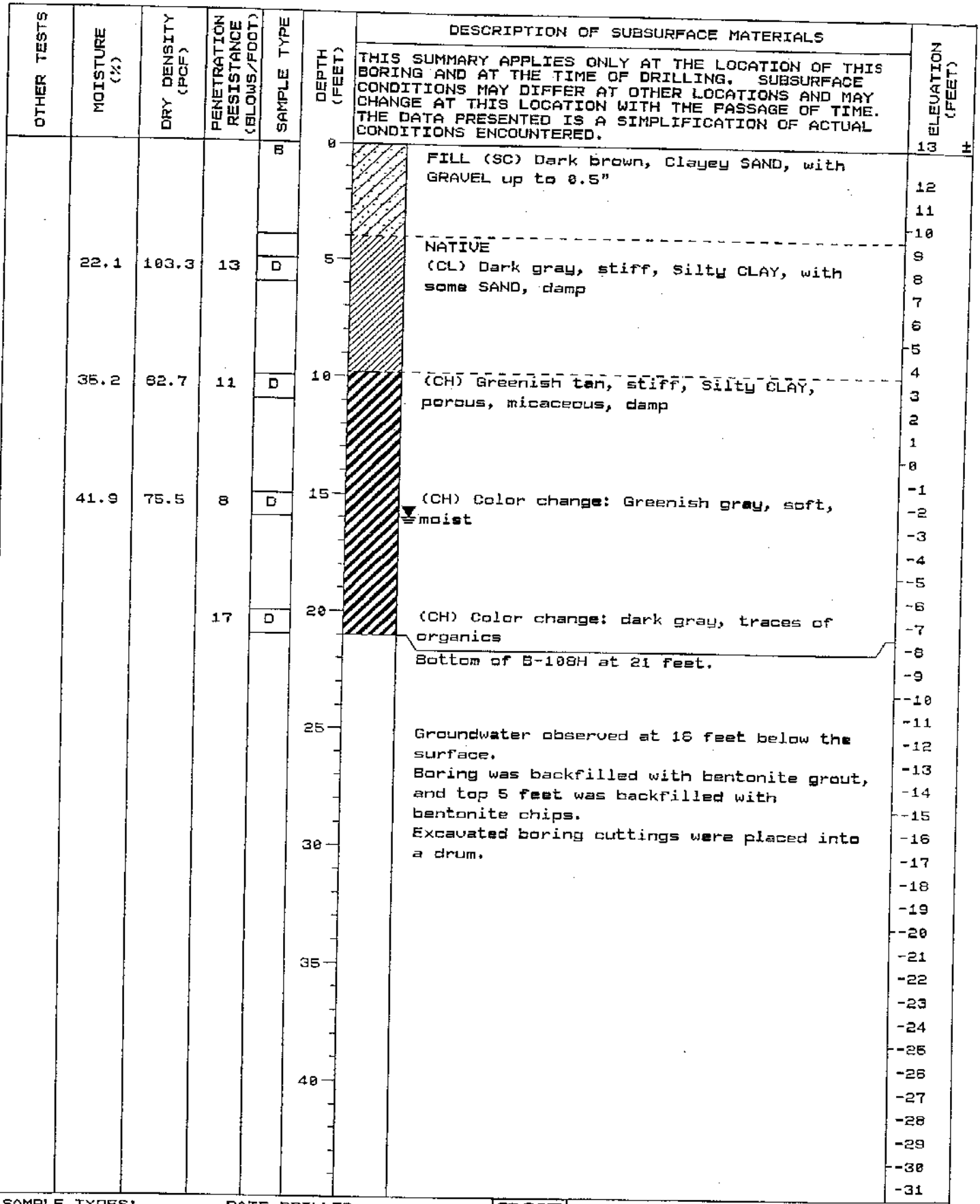
PROJECT NO. L-194A

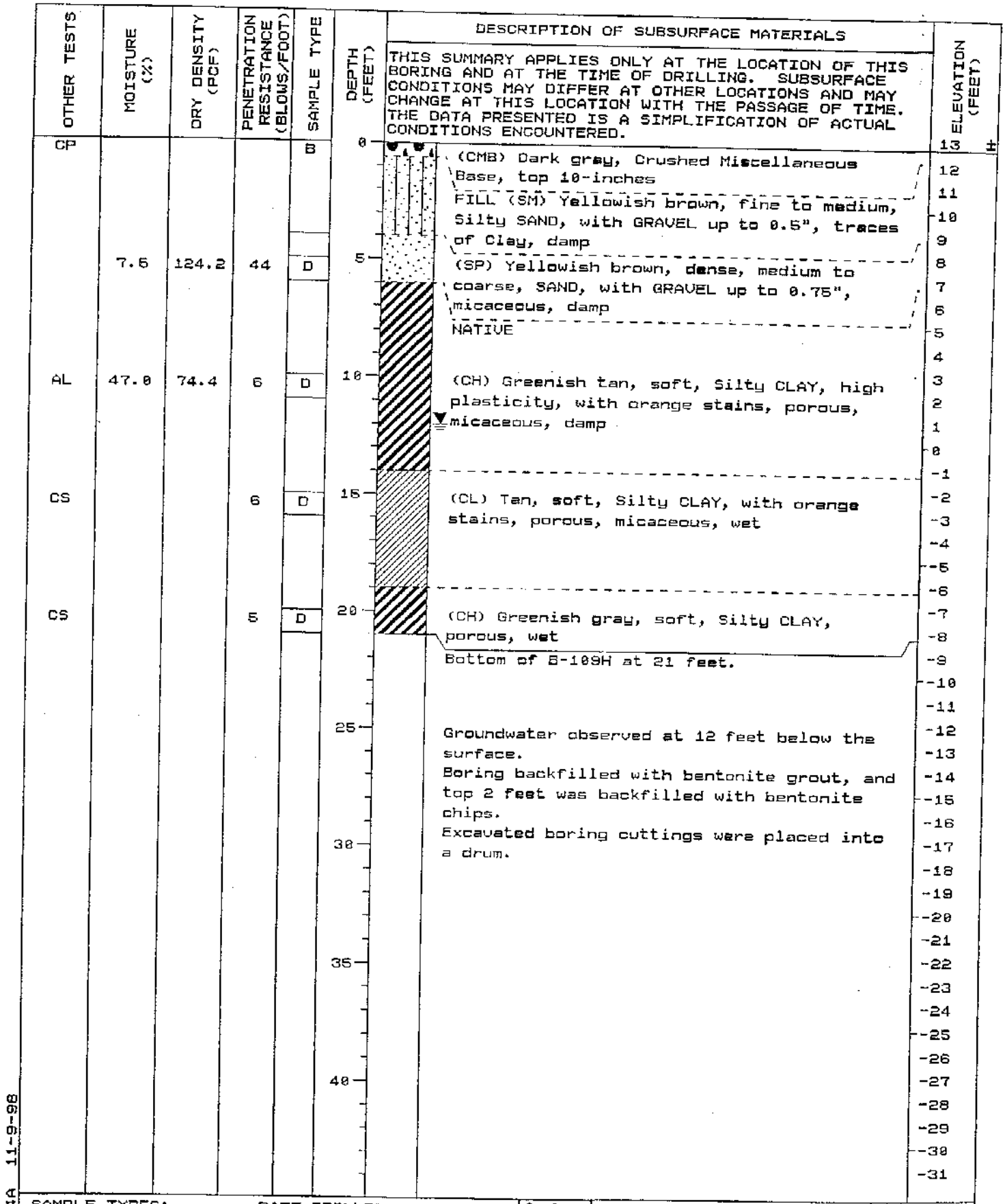
PLAYA VISTA - Runway Road

LOG OF BORING NO. B-107H

PAGE 1 OF 1 FIGURE A-2

GDC002 L194A 11-9-98


OTHER TESTS
MOISTURE (%)
DRY DENSITY (PCF)
PENETRATION RESISTANCE (BLOWS/FOOT)
SAMPLE TYPE
DEPTH (FEET)
DESCRIPTION OF SUBSURFACE MATERIALS
THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS BORING AND AT THE TIME OF DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF ACTUAL CONDITIONS ENCOUNTERED.
ELEVATION (FEET)
13 ±
FILL (SC) Dark brown, Clayey SAND, with GRAVEL up to 0.5"
NATIVE
(CL) Dark gray, stiff, Silty CLAY, with some SAND, damp
22.1
103.3
13
D
35.2
82.7
11
D
(CH) Greenish tan, stiff, Silty CLAY, porous, micaceous, damp
41.9
75.5
8
D
(CH) Color change: Greenish gray, soft, moist
17
D
(CH) Color change: dark gray, traces of organics
Bottom of B-108H at 21 feet.
Groundwater observed at 16 feet below the surface.
Boring was backfilled with bentonite grout, and top 5 feet was backfilled with bentonite chips.
Excavated boring cuttings were placed into a drum.
SAMPLE TYPES:
C Rock Core
S Std Pen. Test
D Drive Sample
B Bulk Sample
T Tube Sample
DATE DRILLED: 10-12-98
EQUIPMENT USED: HSA-CME 75
GROUNDWATER LEVEL: 16.0
GROUP DELTA
PROJECT NO. L-194A
PLAYA VISTA - Runway Road
LOG OF BORING NO. B-108H
PAGE 1 OF 1
FIGURE A-3
GDC002 L194A 11-9-98



GDC002 L194A 11-9-98

SAMPLE TYPES:
- C Rock Core
- S Std Pen. Test
- D Drive Sample
- B Bulk Sample
- T Tube Sample

DATE DRILLED: 10-12-98

EQUIPMENT USED: HSA-CME 75

GROUNDWATER LEVEL: 12.0

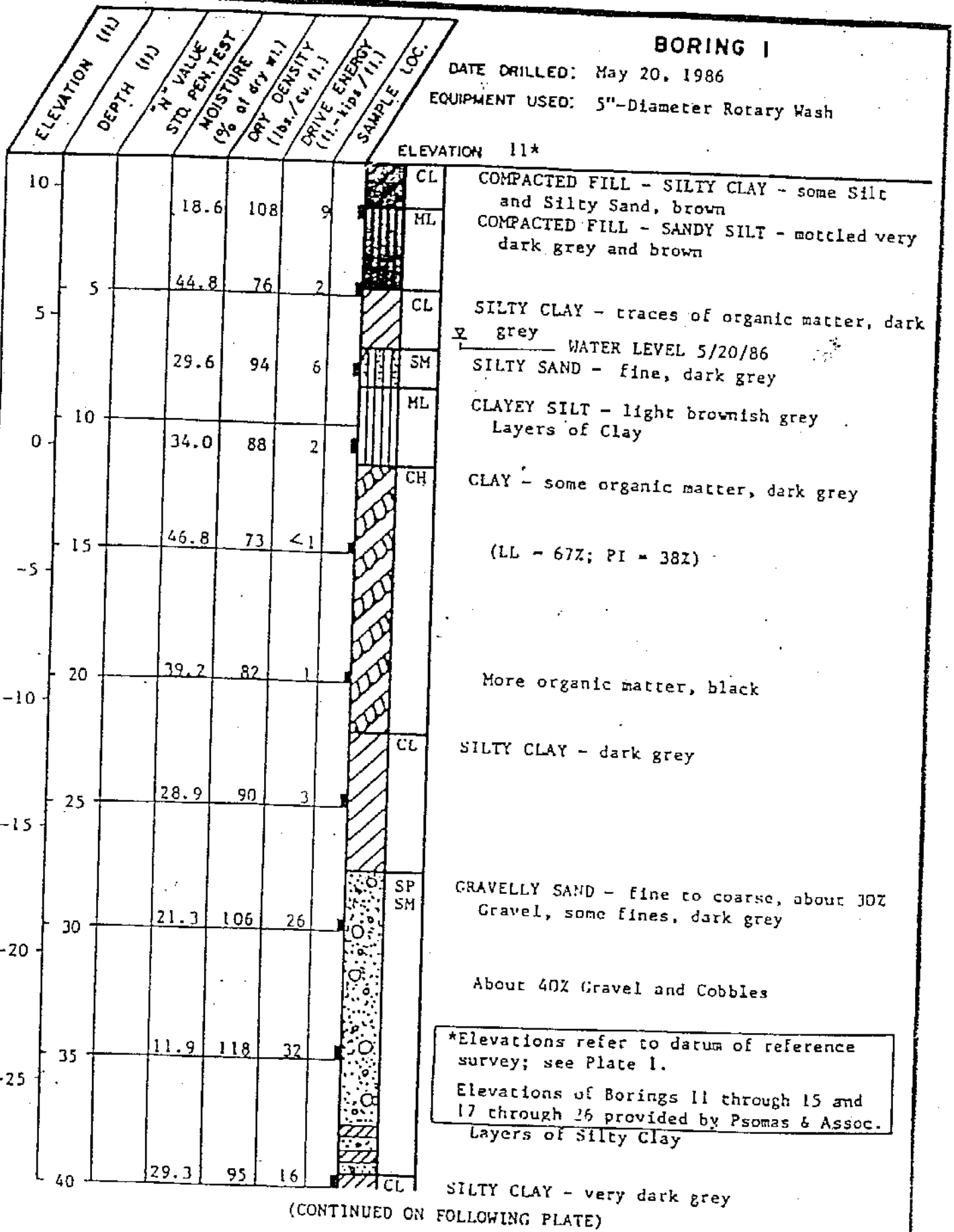
GROUP DELTA

PROJECT NO. L-194A

PLAYA VISTA - Runway Road

LOG OF BORING NO. B-109H

PAGE 1 OF 1 FIGURE A-4



NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

LOG OF BORING

FIGURE A-5

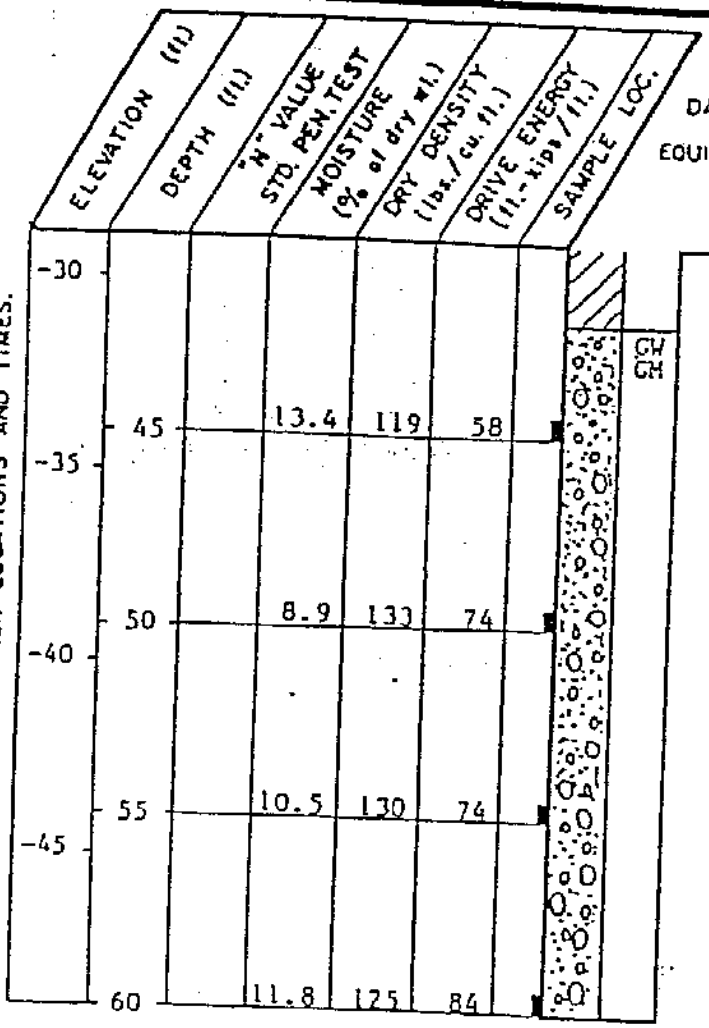
LeROY CRANDALL AND ASSOCIATES

PLATE A-1.1a A-6

BORING 1 (CONTINUED)

DATE DRILLED: May 20, 1986

EQUIPMENT USED: 5"-Diameter Rotary Wash



SANDY GRAVEL - well graded, about 50% Sand, some fines, dark grey

NOTE: Drilling mud used in drilling process. Mud removed at completion of drilling to a depth of about 30'. Water level measured at 6½' 30 minutes after removal of mud; bottom of boring at 28'.

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

LOG OF BORING

FIGURE A-6

LeROY CRANDALL AND ASSOCIATES

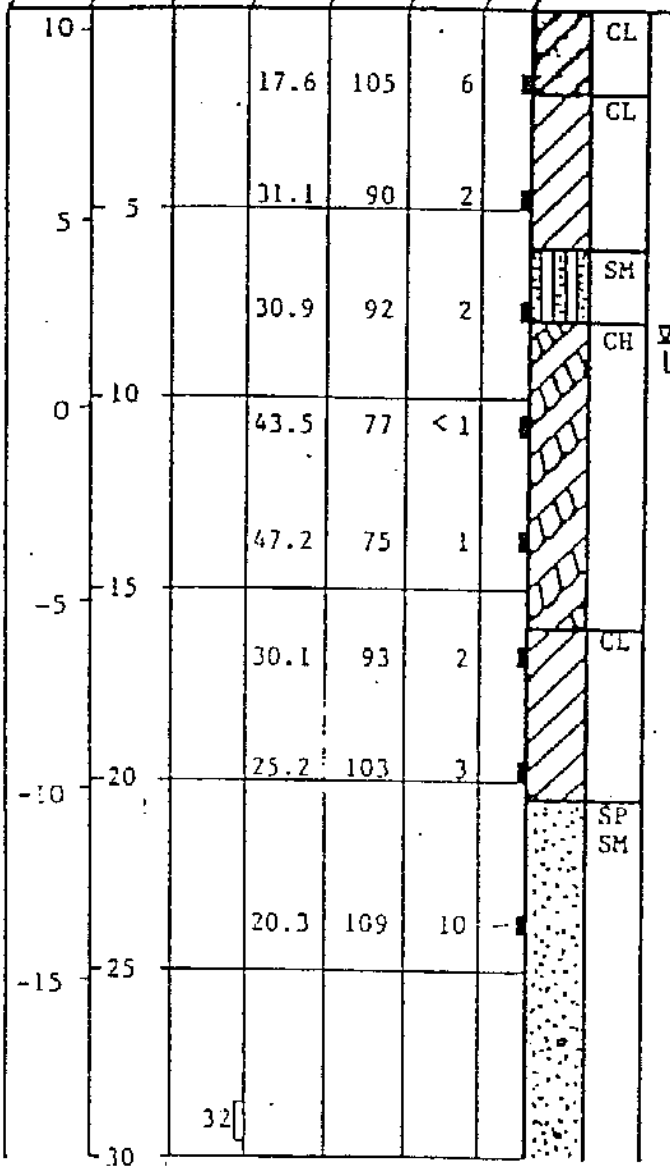
PLATE A-1.1E A-7

BORING 21

DATE DRILLED: February 18, 1987

EQUIPMENT USED: 5"-Diameter Rotary Wash

ELEVATION 10.3



COMPACTED FILL - SANDY CLAY - dark grey to black

SILTY CLAY - grey and dark grey

SILTY SAND - fine, greyish brown

CLAY - grey

▽ WATER LEVEL 4/6/87

Traces of organic matter

SILTY CLAY - traces of organic matter, dark grey

SAND - fine to medium, some fines, grey

Few Gravel

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

(CONTINUED ON FOLLOWING PLATE)

LOG OF BORING

FIGURE A-7

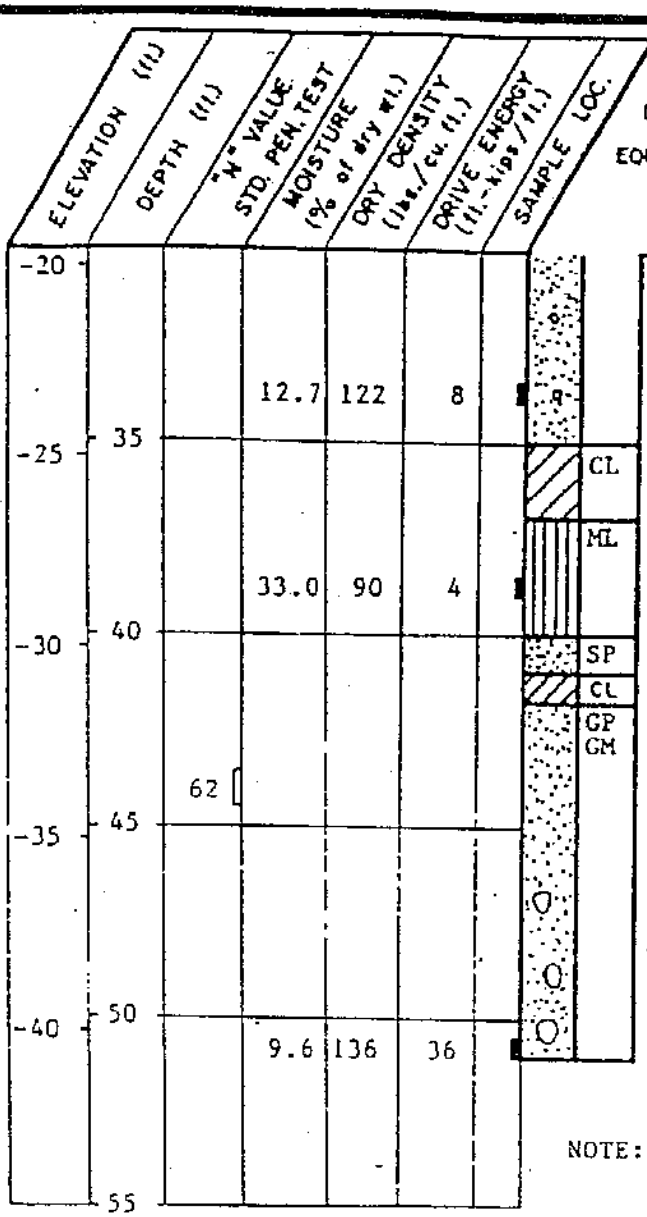
LeROY CRANDALL AND ASSOCIATES

PLATE A-1.21a

BORING 21 (CONTINUED

DATE DRILLED: February 18, 1987

EQUIPMENT USED: 5"-Diameter Rotary Wash



SILTY CLAY - dark grey

SILT - some organic matter, dark grey

SAND - fine, dark grey
SILTY CLAY - grey
SANDY GRAVEL - fine to coarse, about 40% Sand, some fines, grey

Some Cobbles

NOTE: Drilling mud used in drilling process. Mud removed to a depth of about 30'. Water level measured at 9-1/2' 30 minutes after removal of mud and at 8-1/2' on 2/23/87.

Set 18-1/2' of 2"-diameter PVC pipe for water level determination. Backfilled annular space with pea gravel. Water level measured at 8-1/2' on 4/6/87.

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

JOB 490-42 DATE 6/24/87 BY DE

LOG OF BORING

FIGURE A-8

LeROY CRANDALL AND ASSOCIATES

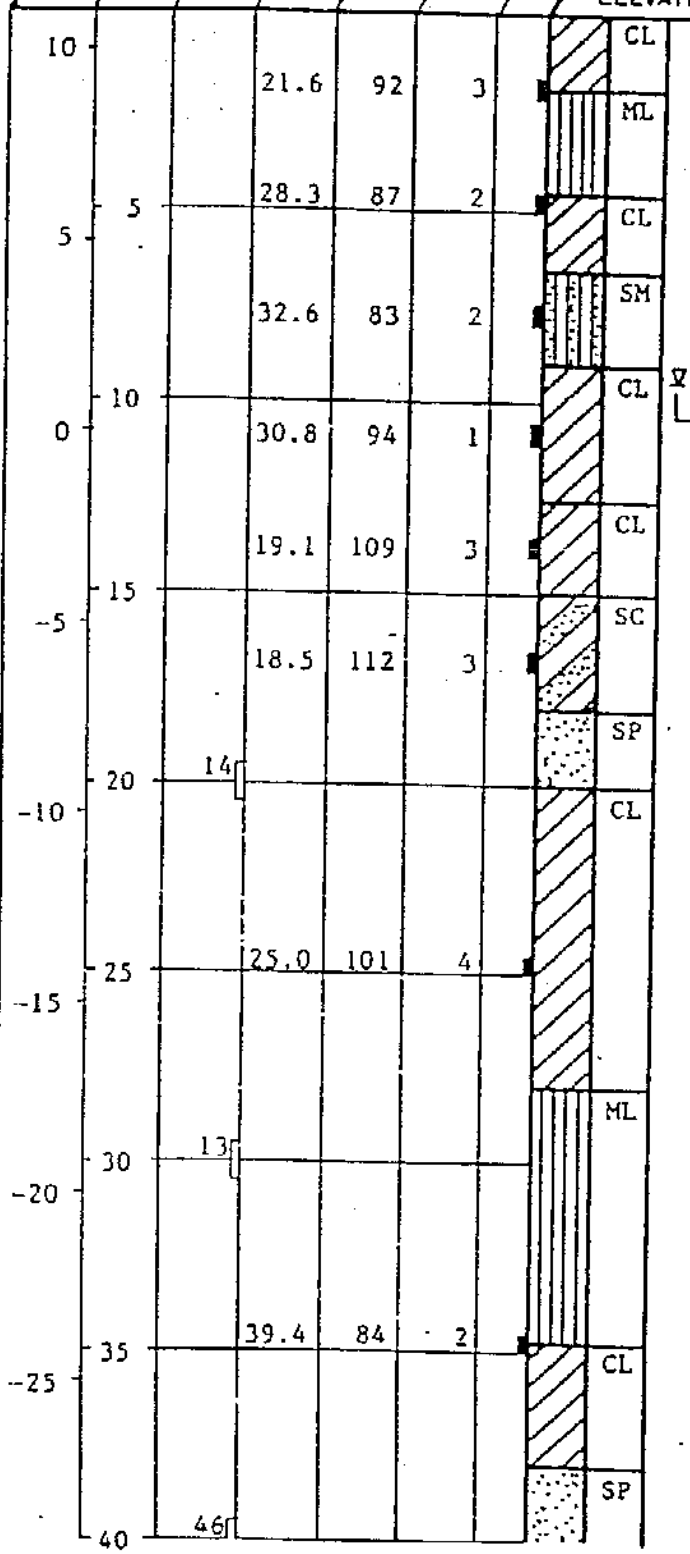
PLATE A-1.2

BORING 22

DATE DRILLED: February 18, 1987

EQUIPMENT USED: 5"-Diameter Rotary Wash

ELEVATION 10.8



CL SILTY CLAY - some roots, dark grey

ML SANDY SILT - greyish brown

CL SILTY CLAY - grey

SM SILTY SAND - fine, greyish brown

CL SILTY CLAY - dark grey

▽ WATER LEVEL 4/6/87

CL SANDY CLAY - grey

SC CLAYEY SAND - fine, grey

SP SAND - fine to medium, few Gravel, grey

CL SILTY CLAY - grey

ML SANDY SILT - dark grey

CL SILTY CLAY - dark grey

SP SAND - fine, grey

(CONTINUED ON FOLLOWING PLATE)

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

LOG OF BORING

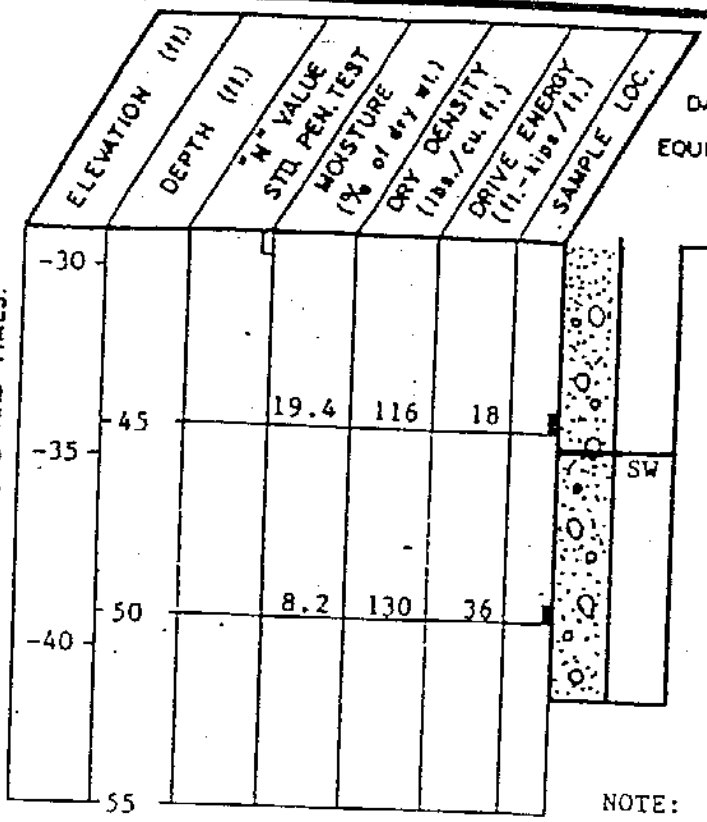
FIGURE A-9

LeROY CRANDALL AND ASSOCIATES

BORING 22 (CONTINUED)

DATE DRILLED: February 18, 1987

EQUIPMENT USED: 5"-Diameter Rotary Wash



Fine to medium Sand, few Gravel

GRAVELLY SAND - well graded, about 30% Gravel and Cobbles, grey

NOTE: Drilling mud used in drilling process. Mud removed to a depth of about 30'. Water level measured at 9-1/2' 30 minutes after removal of mud and at 9-1/2' on 2/20/87.

Set 19-1/2' of 2"-diameter PVC pipe for water level determination. Backfilled annular space with pea gravel. Water level measured at 9-1/2' on 4/6/87. Water level measured at 10-1/2' on 9/19/90.

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

LOG OF BORING

FIGURE A-10

LeROY CRANDALL AND ASSOCIATES

APPENDIX B
LABORATORY TESTING

General

The laboratory testing performed for this investigation includes determination of Moisture Content and Dry Unit Weight, Atterberg Limits, Expansion Index, Consolidation, Resistance Value, and Maximum Dry Density. Descriptions of these tests are given below.

Moisture Content and Dry Unit Weight

The field moisture and dry unit weight of each relatively undisturbed sample were determined in general accordance with ASTM D2216. Results of these tests are presented on the boring logs in Figures A-1 through A-4.

Atterberg Limits

Characterization of the fine-grained fractions of the encountered soils was evaluated using the Atterberg Limits. This test includes Liquid Limit and Plastic Limit tests to determine the Plasticity Index in accordance with ASTM D4318. Results of these tests are listed in Table B-1, Atterberg Limits.

Expansion Index

The expansion potential of the soil was determined by the Expansion Index test method (ASTM D4829). The result of the test is listed in Table B-2, Expansion Index.

Consolidation

The consolidation characteristics of the foundation soils were determined by performing one-dimensional consolidation in general accordance with ASTM D2435-90, using a floating ring consolidometer and dead weight system. Results of the tests are listed in Figure B-1 through B-5, Consolidation vs. Pressure. The Deformation vs. Square Root Time for a selected sample is presented as Figure B-6.

Resistance Value

A Resistance Value (R-Value) test was performed on the representative subgrade soil sample in accordance with the ASTM D2844 procedure. The results of the test are listed in Table B-3, Resistance Value.

Maximum Dry Density

The maximum dry density and optimum water content for compacted soils were determined in accordance with ASTM D1557-91. The result of the test is listed in Table B-4, Maximum Dry Density.

Table B-1: Atterberg Limits

Location	Depth (ft)	Soil Type	Liquid Limit	Plastic Limit	Plasticity Index
B-106H	20	CL	46	17	29
B-109H	10	CH	67	27	40

Table B-2: Expansion Index

Location	Depth (ft)	Soil Description	Dry Density (pcf)	Moist. Cont. (%)	Sat. (%)	EI
B-106H	15-20	CL – Dark Gray Silty CLAY	105.1	11.5	51	95

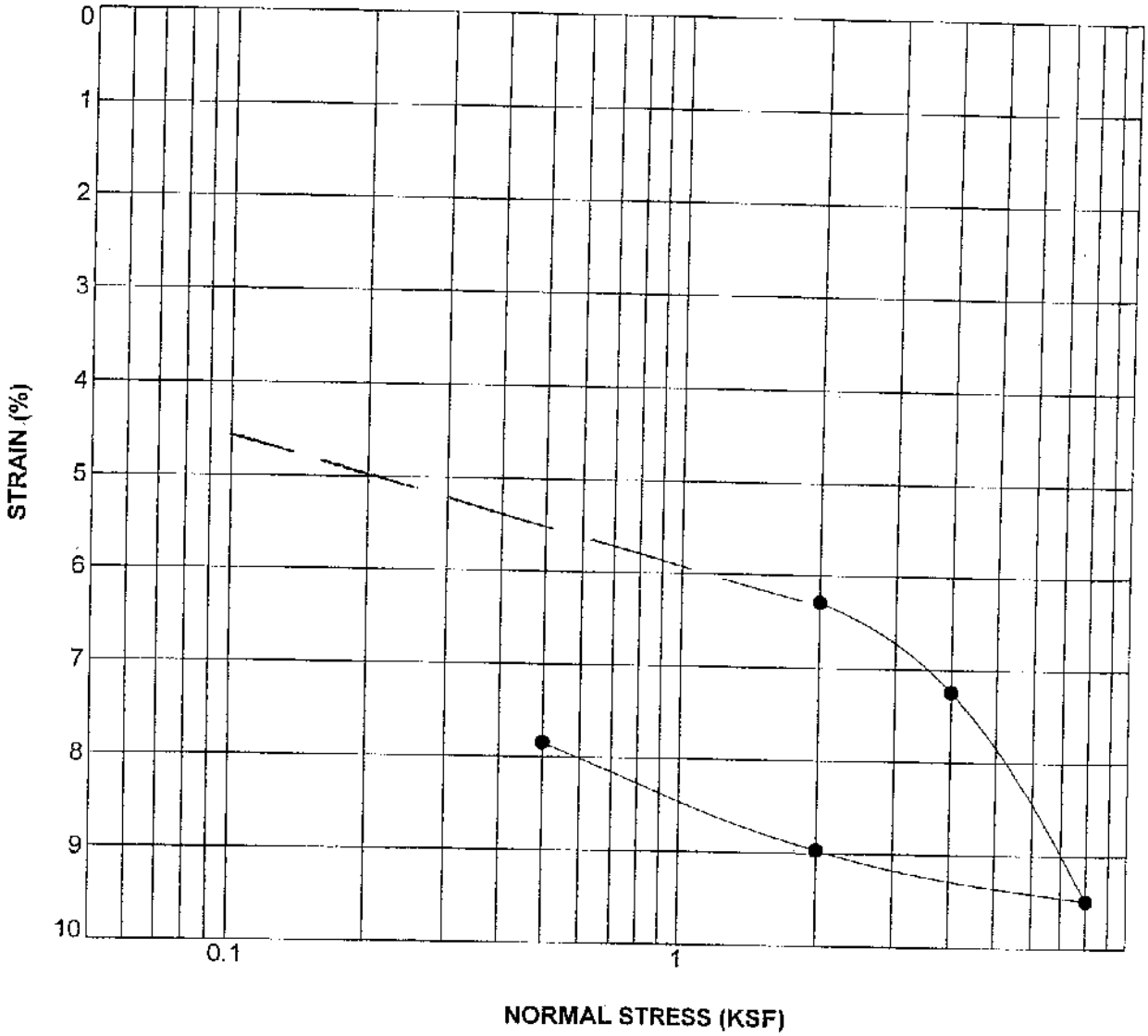
Table B-3: Resistance Value

Location	Depth (ft)	Soil Description	R-Value Exudation	R-Value Expansion	Equilibrium R-Value
B-106H	0-5	SC – Dark Brown Clayey SAND	14	30	14

Table B-4: Maximum Dry Density

Location	Depth (ft)	Soil Description	Maximum Dry Density (pcf)	Moisture Content (%)
B-109H	0-5	SC – Dark Brown Clayey SAND, with gravel and some Asphalt	137.5	5.9

Note: Curve below 1 ksf loading was adjusted for sample disturbance.



SYMBOL	BORING	DEPTH (ft)	DESCRIPTION	Liquid Limit	Plastic Limit
●	B-106	10.0	(CH) Dark Brown Clay		

	Moisture Content (%)	Dry Density (pcf)	Percent Saturation (%)	Void Ratio
INITIAL	36.9	83.5	97.9	1.018
FINAL	27.1	90.6	85.1	0.860

Specific Gravity: 2.7

Remark: SAMPLE SATURATED AT 2.0 KSF

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GROUP DELTA CONSULTANTS

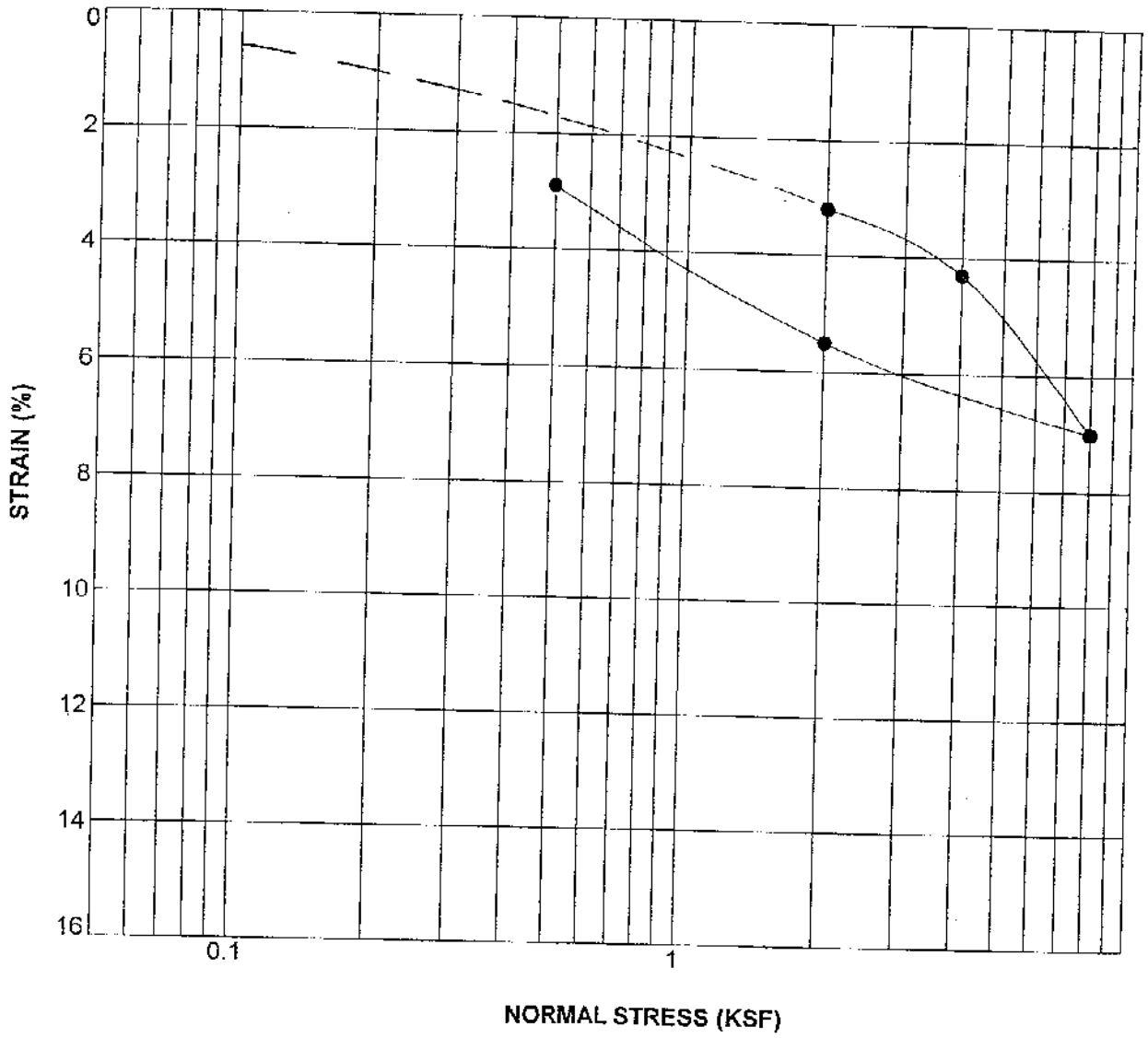
CONSOLIDATION TEST

GROUP DELTA CONSULTANTS, INC.

Project: Playa Vista - Runway Road
Location: Marina del Rey
Number: L-194A

FIGURE B-1

Note: Curve below 1 ksf loading was adjusted for sample disturbance.



SYMBOL	BORING	DEPTH (ft)	DESCRIPTION	Liquid Limit	Plastic Limit
●	B-107	10.0	(CH) Olive Clay		

	Moisture Content (%)	Dry Density (pcf)	Percent Saturation (%)	Void Ratio
INITIAL	24.7	93.0	82.2	0.812
FINAL	35.1	97.9	100.0	0.721

Specific Gravity: 2.7

Remark: **SAMPLE SATURATED AT 2.0 KSF**

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GROUP DELTA CONSULTANTS

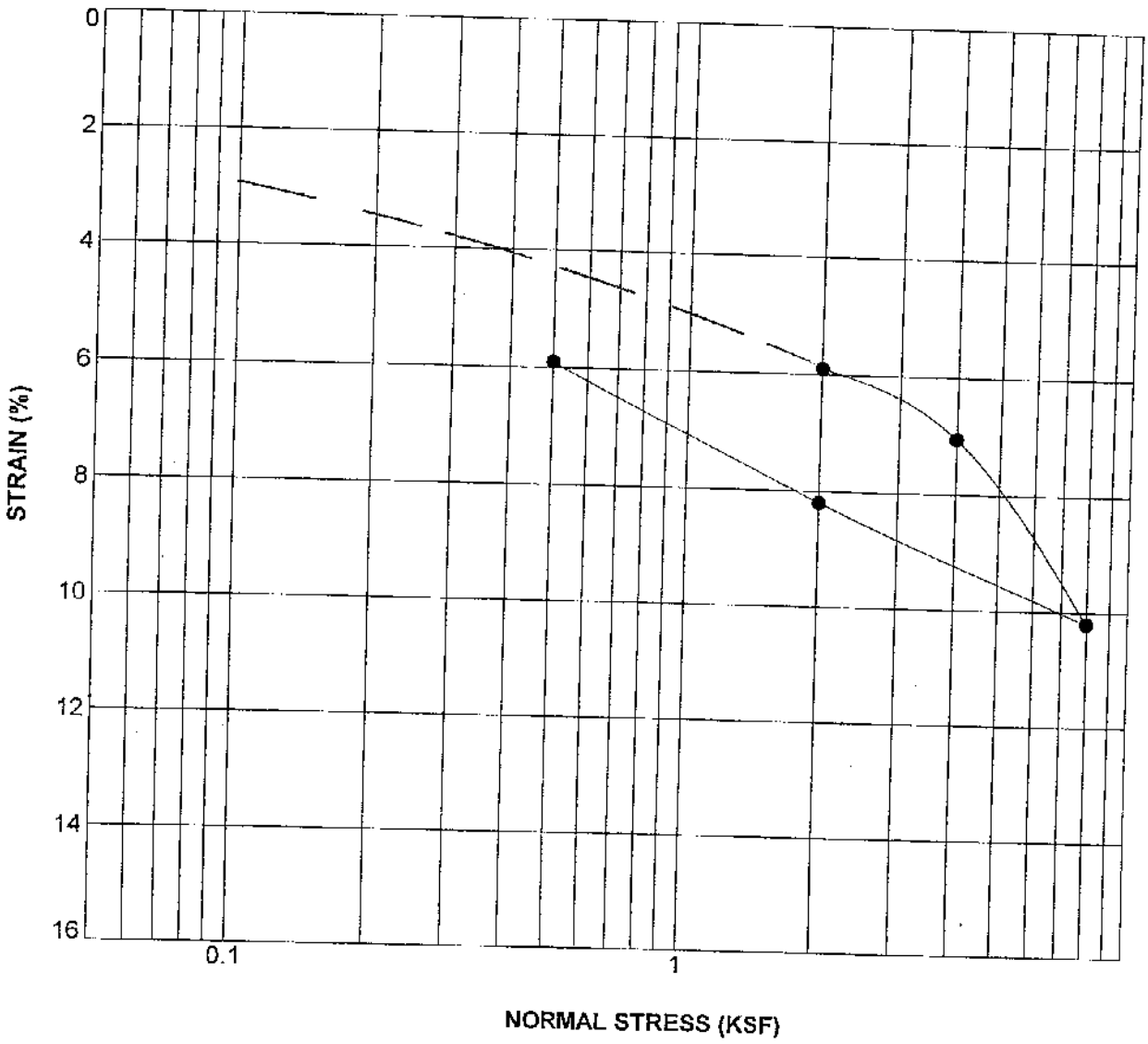
CONSOLIDATION TEST

GROUP DELTA CONSULTANTS, INC.

Project: Playa Vista - Runway Road
Location: Marina del Rey
Number: L-194A

FIGURE B-2

Note: Curve below 1 ksf loading was adjusted for sample disturbance.



SYMBOL	BORING	DEPTH (ft)	DESCRIPTION	Liquid Limit	Plastic Limit
●	B-108	10.0	(CH) Olive Gray Clay		

	Moisture Content (%)	Dry Density (pcf)	Percent Saturation (%)	Void Ratio
INITIAL	35.2	82.7	91.6	1.037
FINAL	43.7	87.9	100.0	0.917

Specific Gravity: 2.7

Remark: SAMPLE SATURATED AT 2.0 KSF

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GROUP DELTA CONSULTANTS

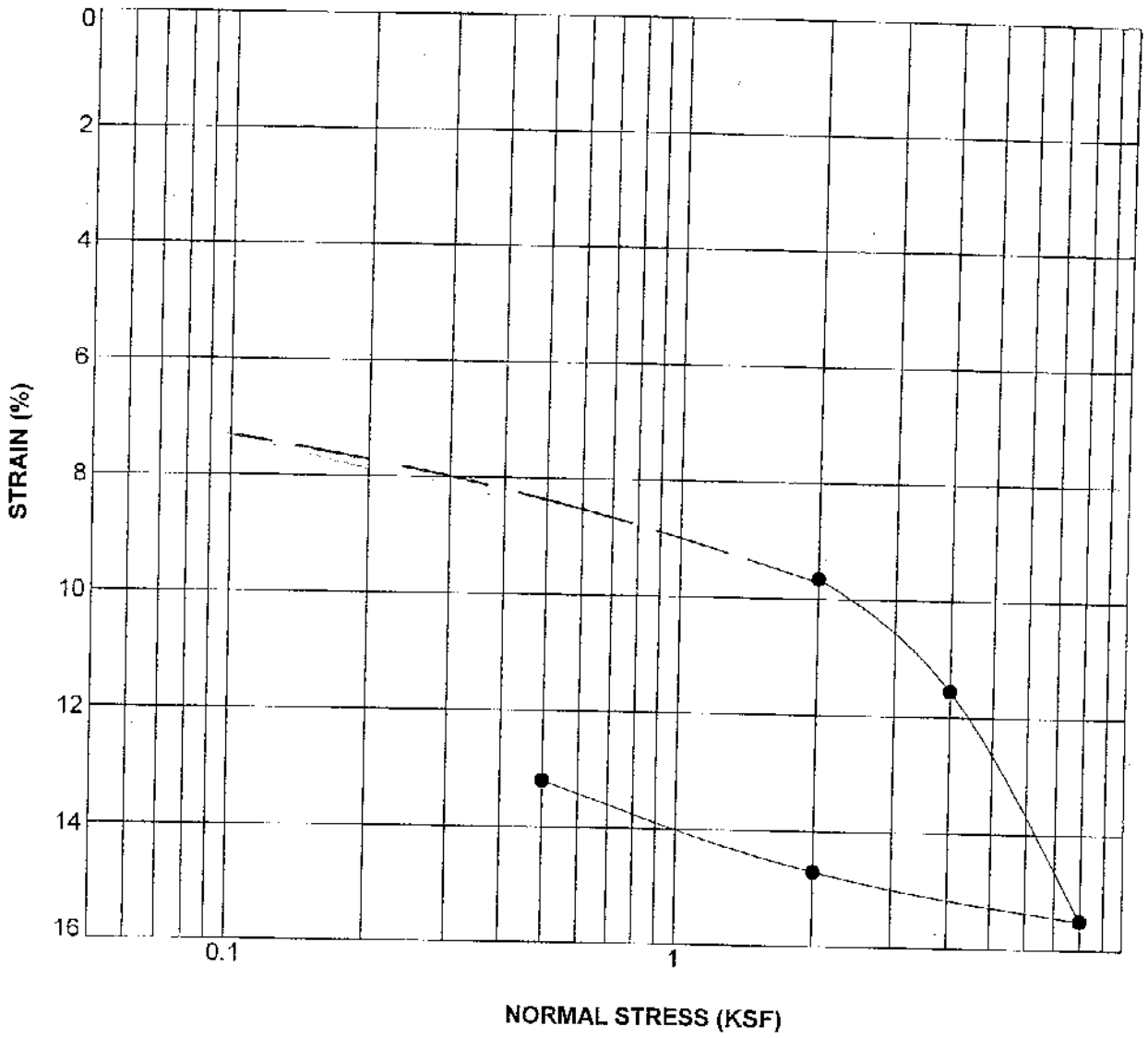
CONSOLIDATION TEST

GROUP DELTA CONSULTANTS, INC.

Project: Playa Vista - Runway Road
Location: Marina del Rey
Number: L-194A

FIGURE B-3

Note: Curve below 1 ksf loading was adjusted for sample disturbance.



SYMBOL	BORING	DEPTH (ft)	DESCRIPTION	Liquid Limit	Plastic Limit
●	B-109	15.0	(CL) Olive Silty Clay		

	Moisture Content (%)	Dry Density (pcf)	Percent Saturation (%)	Void Ratio
INITIAL	45.7	75.3	99.7	1.237
FINAL	37.7	86.2	100.0	0.955

Specific Gravity: 2.7

Remark: SAMPLE SATURATED AT 2.0 KSF

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GROUP DELTA CONSULTANTS

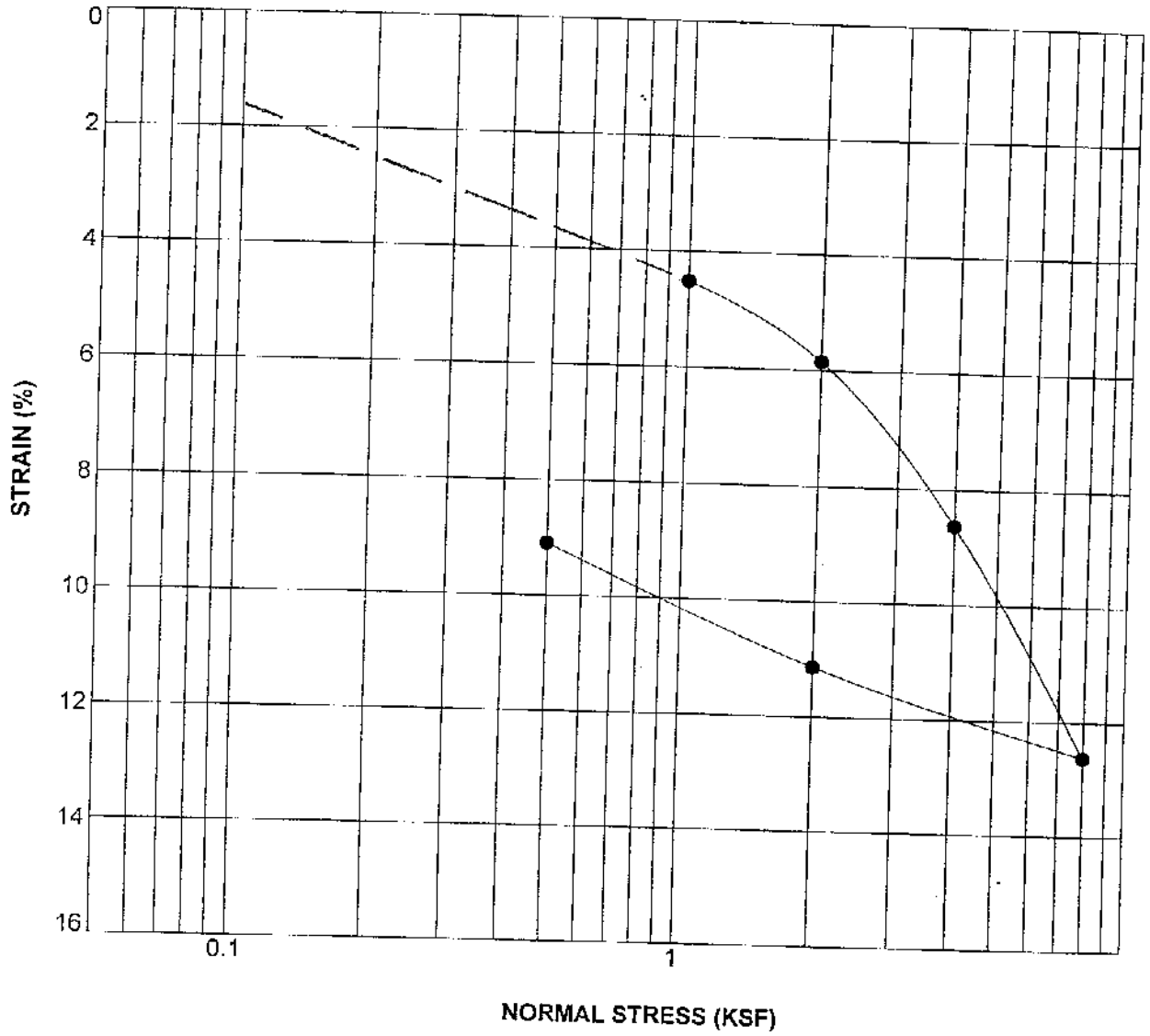
CONSOLIDATION TEST

GROUP DELTA CONSULTANTS, INC.

Project: Playa Vista - Runway Road
Location: Marina del Rey
Number: L-194A

FIGURE B-4

Note: Curve below 1 ksf loading was adjusted for sample disturbance.



SYMBOL	BORING	DEPTH (ft)	DESCRIPTION	Liquid Limit	Plastic Limit
●	B-109	20.0	(CH) Gray Clay		

	Moisture Content (%)	Dry Density (pcf)	Percent Saturation (%)	Void Ratio
INITIAL	59.7	64.2	99.4	1.622
FINAL	62.9	72.4	100.0	1.327

Specific Gravity: 2.7

Remark: SAMPLE SATURATED AT 1.0 KSF

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GROUP DELTA CONSULTANTS

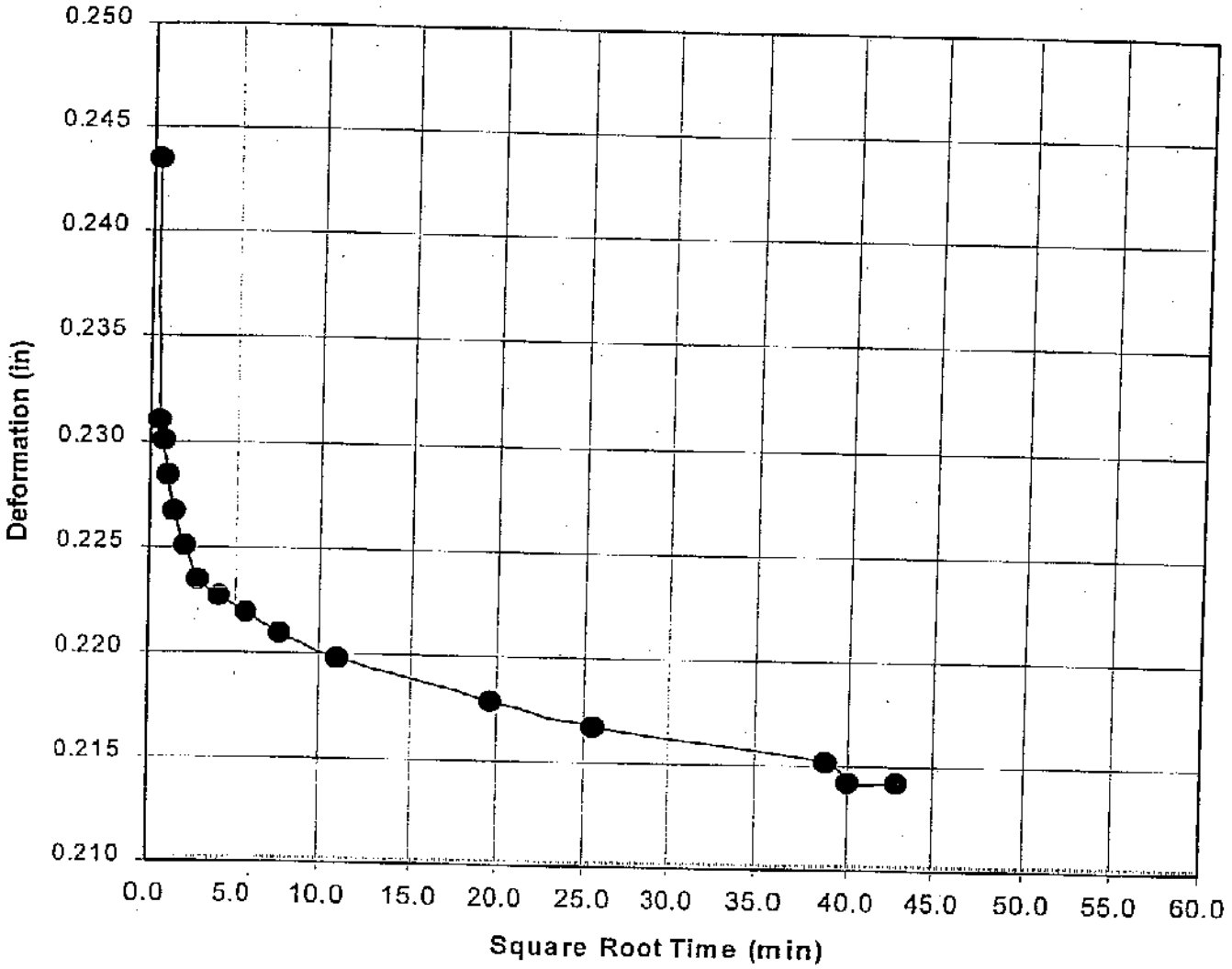
CONSOLIDATION TEST

GROUP DELTA CONSULTANTS, INC.

Project: Playa Vista - Runway Road
Location: Marina del Rey
Number: L-194A

FIGURE B-5

Deformation Vs. Square Root Time



● SUBMERGED SAMPLE

PRESSURE (Ksf): 4

SAMPLE LOCATION: B-109H

SAMPLE DEPTH: 20'

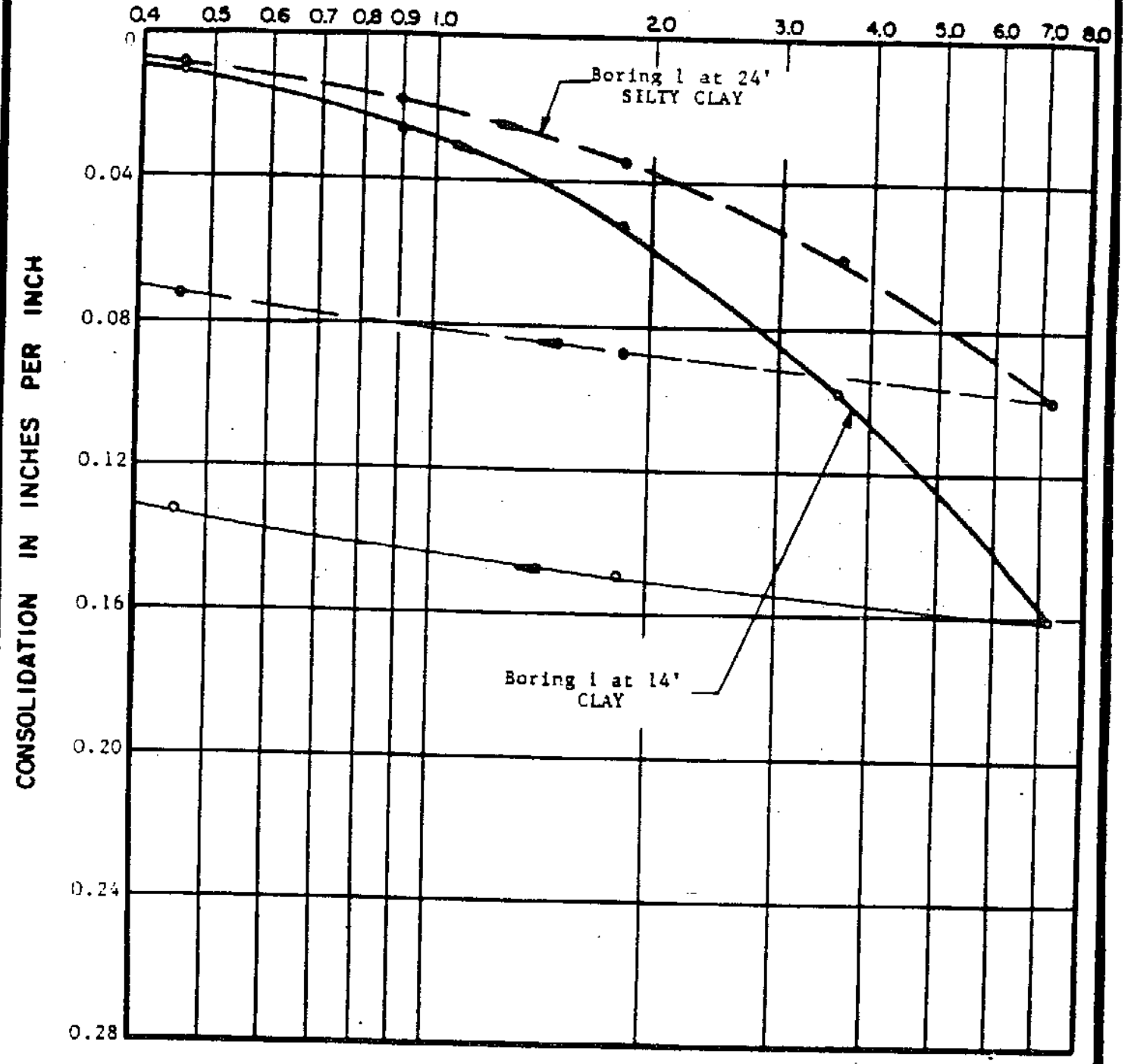
SOIL DESCRIPTION: CH-GRAY SOFT CLAY

GROUP DELTA CONSULTANTS, INC.

PROJECT NAME: PLAYA VISTA / RUNWAY RD.

PROJECT No: L-194A

FIGURE NUMBER: B-6



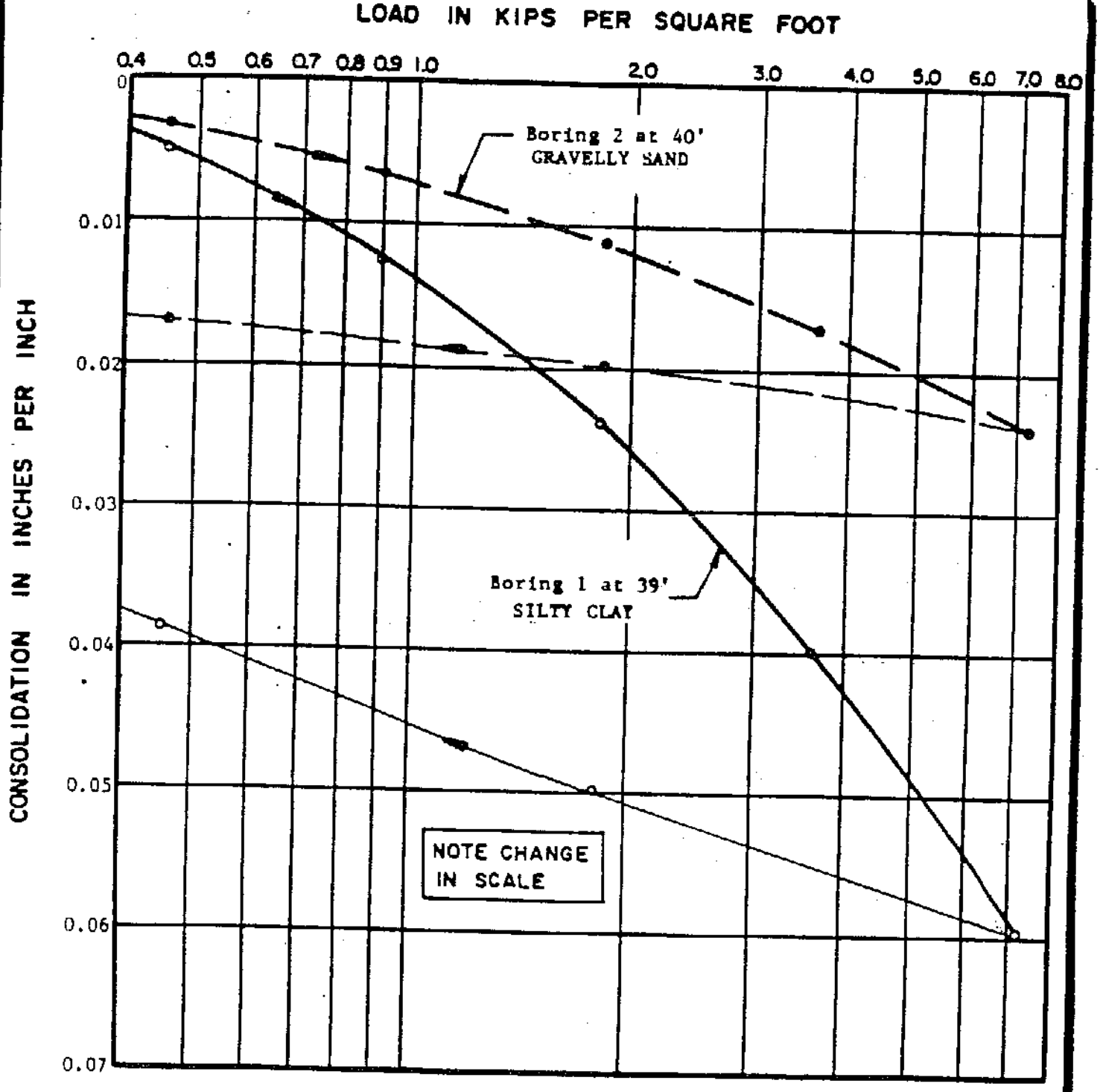
NOTE: Samples tested at field moisture content.

CONSOLIDATION TEST DATA

LeROY CRANDALL AND ASSOCIATES

PLATE A-4.1

A21

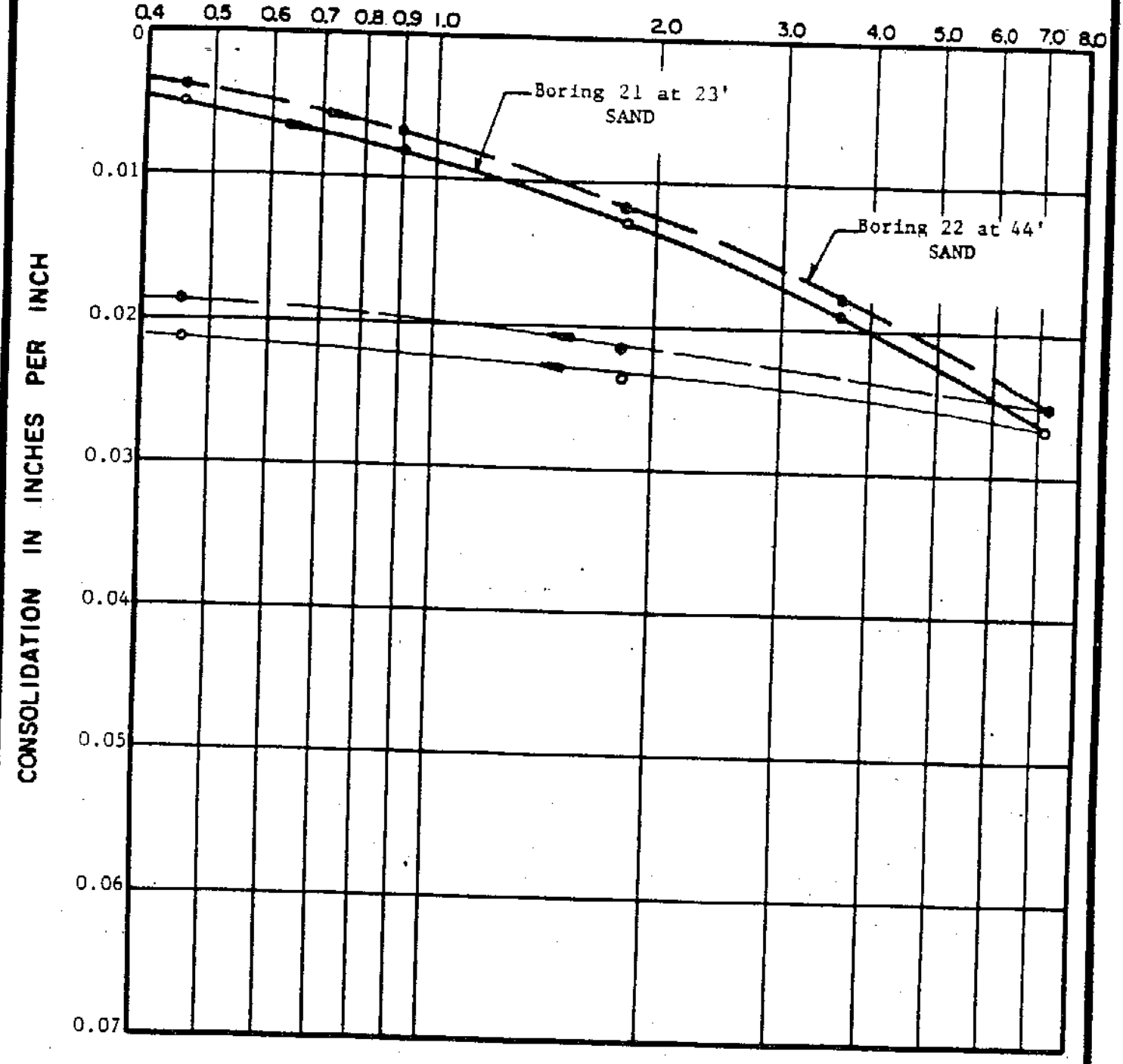


NOTE: Samples tested at field moisture content.

CONSOLIDATION TEST DATA

LeROY CRANDALL AND ASSOCIATES

PLATE A-4.7



NOTE: Samples tested at field moisture content.

CONSOLIDATION TEST DATA

LeROY CRANDALL AND ASSOCIATES

PLATE A-4.14

A-23

A-24 Intentionally Left Blank

APPENDIX A

FIELD EXPLORATION