JACOBS ENGINEERING GROUP INC.

MEMORANDUM

TO: Larry Nuzum
SOUTHWESTDIV

DATE: 21 July 1991

FROM: Cathy Quinn/CH2M HILL

SUBJECT: **Technical Memorandum**
Existing Data Review for MCAS El Toro RI/FS
Evaluation of Orange County Water District's
Investigation of Monitoring Wells

The goal of this technical memorandum was to document the condition of the Orange County Water District (OCWD) groundwater monitoring wells in the vicinity of the U.S. Marine Corps Air Station (MCAS) El Toro and to evaluate the quality of groundwater chemistry and water level data from those wells.

Two reports prepared by OCWD, dated March 29, 1989 and January 15, 1991, as well as current groundwater quality and piezometric pressure data as supplied by Roy Herndon of OCWD have been reviewed. Additional data were received from Roy Herndon by telephone. The current operating conditions of the wells and their potential future utilization were also discussed. A field inspection at the wells was completed to document the current conditions.

Presented within this memorandum are a brief synopsis of the history of well installation, sampling, and modifications performed by OCWD on wells numbered MCAS-1 through -10, consecutively. Also presented is an evaluation of the operability of these wells.

HISTORY

The OCWD investigation of trichloroethylene (TCE) contaminated groundwater in the vicinity of MCAS El Toro was conducted in two phases. Phase I was initiated after TCE was detected in water samples collected from The Irvine Company irrigation wells during routine well sampling between 1987 and 1989. Phase I consisted of: attempted rehabilitation, sampling, and testing of four inactive irrigation wells; construction, sampling, and testing of four multiple port (MP) monitoring wells (MCAS-1, -2, -3 and -7); and, continued sampling and testing of Irvine area irrigation wells. The Phase I investigation was completed in February 1989, and results were reported in the Phase I Report - Investigation of TCE Contamination in the Vicinity of the El Toro Marine Corps Air Station, (OCWD, 29 March 1989).

In the fall of 1989, OCWD constructed six 150- to 450-foot deep conventional single well screen (single port) monitoring wells for a Phase II study. The Phase II wells supplemented data gathered form the four MP wells installed during Phase I, to further characterize the extent of TCE groundwater contamination. In addition, OCWD constructed a 1200 gallons per minute (gpm) maximum capacity extraction well and volatile organic compound (VOC) removal system to provide interim remediation of groundwater contamination. The OCWD summarized the Phase II activities in the report entitled, Phase II Report - Additional Investigation and Remediation of TCE Contamination in the Vicinity of the MCAS El Toro, (OCWD, August 1990). This report contains the results of sampling and testing of the six single port monitoring wells, and a projection of the operability of the extraction well and treatment unit.

WELL CONSTRUCTION

Multiple Port Wells - Phase I

Between August and December of 1988, MP wells MCAS-1,-2,-3, and -7 were drilled and constructed at depths ranging from 600 to 1300 feet, and were tested. Well boreholes were drilled using the direct mud rotary method, and the open borehole was logged using the following geophysical logs: resistivity, spontaneous potential, natural gamma, caliper, and sonic. Results of the geophysical and lithologic logging were used to design the MP well construction. Water-bearing units to be screened were selected, and fine-grained strata were identified to be sealed off, thereby preventing vertical annular groundwater flow.

Water-bearing intervals were screened with 10-foot length, 4-inch diameter stainless steel wire-wrapped screen having a 0.040-inch slot size. Stainless steel blank casing, 10- to 20-foot lengths and 4-inch diameter, was used to construct the remainder of the well. Joints of casing were butt-welded together. The annular space surrounding each screen was filled with Monterey sand, and intervals between screens were sealed by a minimum 10-foot thickness of a 1:1 mixture of Monterey sand and granular bentonite. The OCWD boring log and well construction diagrams for the four MP wells are included in Attachment A to this memorandum. Screened intervals of each of the MP wells are as follows:

Well No.	Screened Intervals (Depths in feet for center of MP sampling port)
MCAS-1	65, 155, 215, 275, 335, 455, 545
MCAS-2	45, 135, 205, 375, 425, 495, 555, 625
MCAS-3	90, 165, 225, 345;, 425, 495
MCAS-7	94, 194, 354, 444, 514, 804, 914, 984, 1104

Following well development at each screened interval by air-lifting and swabbing, a video survey was performed to ensure that development had removed suspended clays from screened sections.

Temperature surveys were conducted in wells MCAS-1 and -3 to identify distinct water-bearing zones prior to installing the MP system. Results indicated likely transition zones between water-bearing units at the 220- to 260-foot interval and the 540- to 590-foot interval in well MCAS-1. Results of the survey in well MCAS-3 indicated no significant

variation until 435 feet, which suggests that the lower unit is vertically-isolated from higher units that are connected. Flowmeter surveys were also performed in wells MCAS-1 and MCAS-3, but the results were reportedly inconclusive.

Following well development, the MP casing, screen, and packer assembly was installed inside the stainless steel casing. The MP casing was constructed of 2-inch diameter Schedule 80 polyvinyl chloride (PVC) pipe in 5- and 10-foot lengths. The PVC couplings were all sealed with water-tight O-rings. A measurement port coupling and a pumping port coupling were installed adjacent to each screened interval, so that water samples and piezometric pressure measurements could be made at each screened interval. Screened intervals were sealed off from one another inside the well casing by hydraulic inflatable packers placed approximately 5-feet above and below each 10-foot screen. Air-lift purging was performed at each sampling interval prior to the initial sampling to purge the groundwater between the well screens of the MP system and the outer stainless steel casing so that formation water could enter the sampling port.

Water quality sampling and analysis of groundwater collected from each of the MP wells has been performed by OCWD on a semiannual basis since early 1989. Depth-specific piezometric data was collected monthly. The most recent analytical results were reported in March and April of 1991.

Single Port Monitoring Wells - Phase II

Between August and October 1989, six single port monitoring wells (MCAS-4, -5, -6, -8, -9, and -10) were drilled using an air rotary drill rig equipped with a pneumatic casing hammer. Mild steel casing, nominal 4-inch diameter, was driven as the borehole was drilled. Borings for wells MCAS-4, -5, and -6 were completed when consolidated sediments stopped the borehole from being further advanced at 275-, 150-, and 225-feet depth, respectively. Borings for wells MCAS-8 and -9 were drilled to their target depths of 430 and 450 feet, respectively. Boring for well MCAS-10 was completed at 390 feet where drilling was stopped due to heaving sands.

Screening depths for the monitoring wells were based on lithology as logged during drilling, and were also selected at intervals estimated to most likely detect the presence of TCE, based on depth-specific water quality data from the existing MP wells. These depth intervals were then perforated using a mechanical perforating tool. Once the mild steel casing had been perforated, an inner sleeve of prepacked PVC casing was installed inside the perforated steel casing to minimize sediment entry into the well. The filter pack consisted of double-wall PVC casing with 0.02-inch slots, filled with No. 3 Monterey sand in the annular space between the inner and outer PVC casing.

Each section of prepacked screen was interconnected by 2-inch PVC standpipe up to the shallowest screened interval. Boring logs and construction diagrams prepared by OCWD for the wells are included in Attachment A to this memorandum.

Composite samples of groundwater, representative of all the screened intervals combined, were collected from within the steel casing above the shallowest screened interval. Likewise, measurements of piezometric head represent the highest value from the zones screened, rather than a unique value for each screened interval. Perforated intervals of each of the wells are as follows:

Well Number	Perforated Interval Depth (feet)
MCAS-4	181-189, 204-208, 230-238
MCAS-5	142-148
MCAS-6	167-175, 187-197, 215-222
MCAS-8	392-410
MCAS-9	372-382, 400-409, 435-445
MCAS-10	355-375

Semiannual groundwater quality sampling has continued since early 1990. The most recent results were reported in February 1991.

SUMMARY OF RESULTS OF GROUNDWATER QUALITY MONITORING

Groundwater collected from specific depth intervals in the MP wells is analyzed semiannually for VOCs and general mineral content. On the basis of these results, OCWD has characterized three "hydrochemical facies," water-bearing zones that appear to be distinctly separated throughout most of the study area. These hydrochemical facies were characterized by OCWD on the basis of total dissolved solids (TDS) and nitrate concentration ranges, and TCE concentrations within certain depth intervals. The OCWD also identified certain cations and anions that appeared to dominate different hydrochemical facies; however, during a recent telephone conversation with Roy Herndon of OCWD, he indicated that the relative cation and anion percentages were calculated incorrectly during the initial analysis. Dominant cations and anions were not, therefore, considered in this evaluation. The criterion characterized by OCWD that were used in this evaluation are as follows:

Parameter	Facies 1	Facies 2	Facies 3
Depth (feet)	<200	200-450	>450
TDS (mg/l)	1600-3100	650-1400	1500-2200
Nitrate-N (mg/l)	14-38	ND-23	ND-7.7
TCE (ug/l)	ND	ND-51.9	ND

The characterization of these hydrochemical facies has provided a useful tool for evaluating performance of packers separating discrete sampling zones in the MP wells. Changes in TDS concentration, for example, in addition to unusual fluctuations in piezometric pressure values for certain zones provided the first indication of packer failure in well MCAS-7 between the January 1989 sampling period and the August 1990 sampling period. Examination of general mineral analysis results, as presented in Attachment B to this memorandum, indicates values for nitrate and TDS in well MCAS-7 at the 194-foot depth which are lower than the range expected for Facies 1. This may indicate that packers separating the 194-foot zone may not have been properly inflated during construction. At the 514-foot zone and below, values for TDS and nitrate resulting from January 1989 analyses seem reasonably representative of the Facies 3; however, August 1990 (and later) results indicate unusually high values for nitrate and TDS. This was suspected to have corresponded with packer failure in the lower zones.

Westbay, the manufacturer of the MP system used in the MCAS wells, determined that packer failure was caused by exposure to the extremely high temperatures of local groundwater, which neared 34 degrees celsius. Westbay replaced the packers in all

four of the MP wells with a temperature resistant packer. Well MCAS-7 packers were replaced by a polyester urethane material reinforced with staboxyl. When wells MCAS-1, -2, and -3 were later replaced, a harder material had been tested and approved for use in the wells; therefore, this harder material, polyester urethane, was used to replace packers in these three wells. Packer replacement was completed in all wells by November 1990.

According to OCWD and Westbay, the staboxyl reinforced packers have an expected life span of 2 to 6 years under the conditions of high temperature groundwater present at well MCAS-7. The polyester packers have an expected life span of up to 10 years under the same high temperature groundwater conditions.

The OCWD concluded that well MCAS-7 was the only well that had appeared to have lost packers integrity, therefore, only well MCAS-7 was redeveloped after packers were replaced.

In November 1990, groundwater samples were collected from each sampling interval of the MP wells. Analytical results indicated mixing of zones had occurred when packers were pulled out of the wells and replaced. Due to the relatively low groundwater flow velocities of water-bearing units in the Irvine area, considerable time seems to be required for equilibration of groundwater chemistry. Orange County Water District personnel have estimated that approximately 1 month is required for equilibration, but this is mostly an observed estimate.

March and April 1991 analytical results indicated the expected general mineral values, inferring equilibration of water quality, in all MP wells except MCAS-1 and MCAS-2. In well MCAS-1, uncharacteristically low pH values were reported for the November 1990 and March 1991 sampling episodes at the 545-foot depth. While pH values have generally been in the 8.0 to 7.0 range in all intervals at each sampling time, values of pH in the 545-foot zone were 5.7 and 5.6 in November and March, respectively. The TDS value measured at that 545-foot depth during the March 1991 sampling episode was also unusually low (820 milligrams per liter (mg/l) rather than the normal range of 1120 to 1760). In well MCAS-2, uncharacteristically high nitrate values were detected in the 425- and 495-foot intervals during the March 1991 sampling episode. In addition, the reported value of TCE concentration at the 165-foot depth, 23.4 micrograms per liter (ug/l), is the highest yet reported for that interval.

These concerns were brought to the attention of Roy Herndon during a 5 July 1991 telephone call. Mr. Herndon has offered to resample MP wells MCAS-1 and -2 within the next 4 to 6 weeks to follow up on these anomalies.

During a telephone conversation with OCWD, it was reported that some difficulty was encountered in identifying the correct pressure to apply to the polyester urethane packers found in wells MCAS-1, -2, -3, in order to create a satisfactory seal. Unexpected water quality information may not indicate packer failure, but rather insufficient packer inflation. Eric Rehtlane, of Westbay, has stated that the problem of properly inflating polyester urethane packers has recently been corrected using a newly developed tool and method for packer inflation.

SUMMARY OF PIEZOMETRIC PRESSURE DATA

Piezometric pressure has been measured by OCWD in each sampling port of the four MP MCAS wells since they were initially constructed in the fall of 1988. Packer leakage in well MCAS-7 was initially detected by observation of these piezometric values. By examining variations of pressure head data reported by OCWD to indicate failure of packers in well MCAS-7, potential failure or integrity of packers in other MCAS MP wells was inferred by observation of similar data for those wells. Piezometric pressure monitoring data tables are included in Attachment C to this memorandum. Also included are graphs of selected piezometric pressure monitoring episodes. Data which have illustrated packer failure in MCAS-7, as well as recent data (which may indicate packer failure in MCAS-1) have not been plotted in these graphs prepared by OCWD.

Piezometric pressure values measured in individual sampling ports of the MP wells appeared initially to support the idea of three separate hydrochemical facies, also supported by evaluation of hydrochemical data. By observation of variations in gradients between the three facies monitoring in MP wells, packer integrity has been inferred, and often substantiated by the hydrochemical data previously discussed. In well MCAS-7, potential failure of lower packers (between the 200-foot and 500-foot zones) was initially inferred from piezometric pressure data after the September 1989 sampling period. In the next monthly measurement, piezometric pressure values indicated that the gradient between these two zones had declined from a 10-foot to 30-foot average down to a 2-foot to 5-foot average gradient. By December 1989, the pressure values in all the sampling ports below 194 feet had nearly equilibrated to approximately 55 feet. Well MCAS-7 was then refitted with new packers constructed of polyester urethane with a staboxyl additive. Gradients between the hydrochemical facies then increased beyond those previously observed when the wells were initially installed. The larger gradients may indicate some influence on water levels by extraction of groundwater at nearby production wells. Gradients have not, however, been observed to equalize in well MCAS-7 since packers were replaced during the late spring of 1990.

Review of piezometric values recorded for MCAS-2 and MCAS-3 appear to be consistent with no noticeable equalization of piezometric pressure in all sampling ports of either well. However, review of recent data of well MCAS-1 seems to indicate a potential problem. The gradient between hydrochemical facies zones was not significant in historical data, on the order of 10 to 30 feet. The 17 April 1990 data indicated that pressure values in each of the sampling ports of well MCAS-3 equalized to 143.6 feet. Total equalization, to such accurate values, has not been observed in any other MCAS well, including MCAS-7. The values may indicate a sampling error, but no later piezometric pressure data were available to support or refute this idea. Apparently unstable water quality results for samples collected in well MCAS-1 ports representing the three hydrochemical facies would seem to support potential packer failure or improper inflation of packers. These water quality data were summarized above. As previously mentioned, OCWD is currently resampling both wells (MCAS-1, and -2) to evaluate present water quality conditions in the ports.

OTHER CONSIDERATIONS

Westbay has admitted to having had an apparent packer leakage problem in a well located in the San Gabriel Basin. Packer leakage is suspected because a slight volume exchange is detected within a packer-sealed quality assurance (QA) zone when a differential pressure is applied above and below the QA zone. The QA zone consists of a portion of the annular space between the outer casing steel wall and the inner PVC MP well casing assembly. This portion of annular space is sealed by packers that isolates this QA zone from the adjacent sampling ports above and below. Westbay is concerned that factors other than packer failure could be causing measurable QA zone volume exchange. The length of the QA zone, approximately 120 feet in the San Gabriel Basin well, is too great to isolate packer performance only. Westbay is in the process of refitting the San Gabriel well with short QA zones (approximately 10 feet) directly adjacent to sampling port packers, to better isolate and observe the performance of the packers. The packers being tested are fabricated of conventional material rather than the temperature-reinforced polyester and staboxyl packers of the MCAS wells.

CONCLUSIONS

Based on uncertain water quality data for wells MCAS-1 and -2, and uncertain piezometric data for well MCAS-1, it is not advisable to make any decision concerning purchase of these wells until the results of water quality and piezometric pressure testing of every sampling port in each of these two wells have been analyzed.

The life span expectancy of the packer materials being used at the site is also of concern. The staboxyl-reinforced packers in well MCAS-7 may only last 2 years, and they come with no warranty. Cost for replacement in one well might exceed $10,000. Proper inflation of the polyester urethane packers in wells MCAS-1, -2, and -3 is still being experimented with. Inconsistent water quality results from wells MCAS-1 and -2 may be due to improper inflation of packers rather than delayed stabilization of formation water entering the well. Pressure in packers in well MCAS-2 were reportedly adjusted approximately 5 weeks ago by addition of water to the packers, and the well ports were sampled last week. The same procedure will likely be tried on well MCAS-1 this week. Since OCWD is still adjusting pressure in their packers, the procedure is clearly not yet routine.

Westbay is attempting to verify the performance of their packers by installing short QA zones on an MP well in the San Gabriel Basin. Results of this testing may support the use of MP wells if the packers seals are proven to uphold integrity. However, these data may have a limited application to MP wells installed in the Irvine area. Irvine groundwater temperatures are relatively extreme, and the use of new, less tested materials is required. If short QA zones are proven to be beneficial to monitoring performance of the MP system, Westbay will begin installing all new MP wells with these short QA zones. Existing MP wells will not, however, be refitted with short QA zones at Westbay's expense.

RECOMMENDATIONS

It is prudent to wait on water quality results of samples collected from wells MCAS-1 and -2, and to wait until Westbay has completed short QA zone testing at their San Gabriel well before a decision is made concerning the purchase of the OCWD MP wells.

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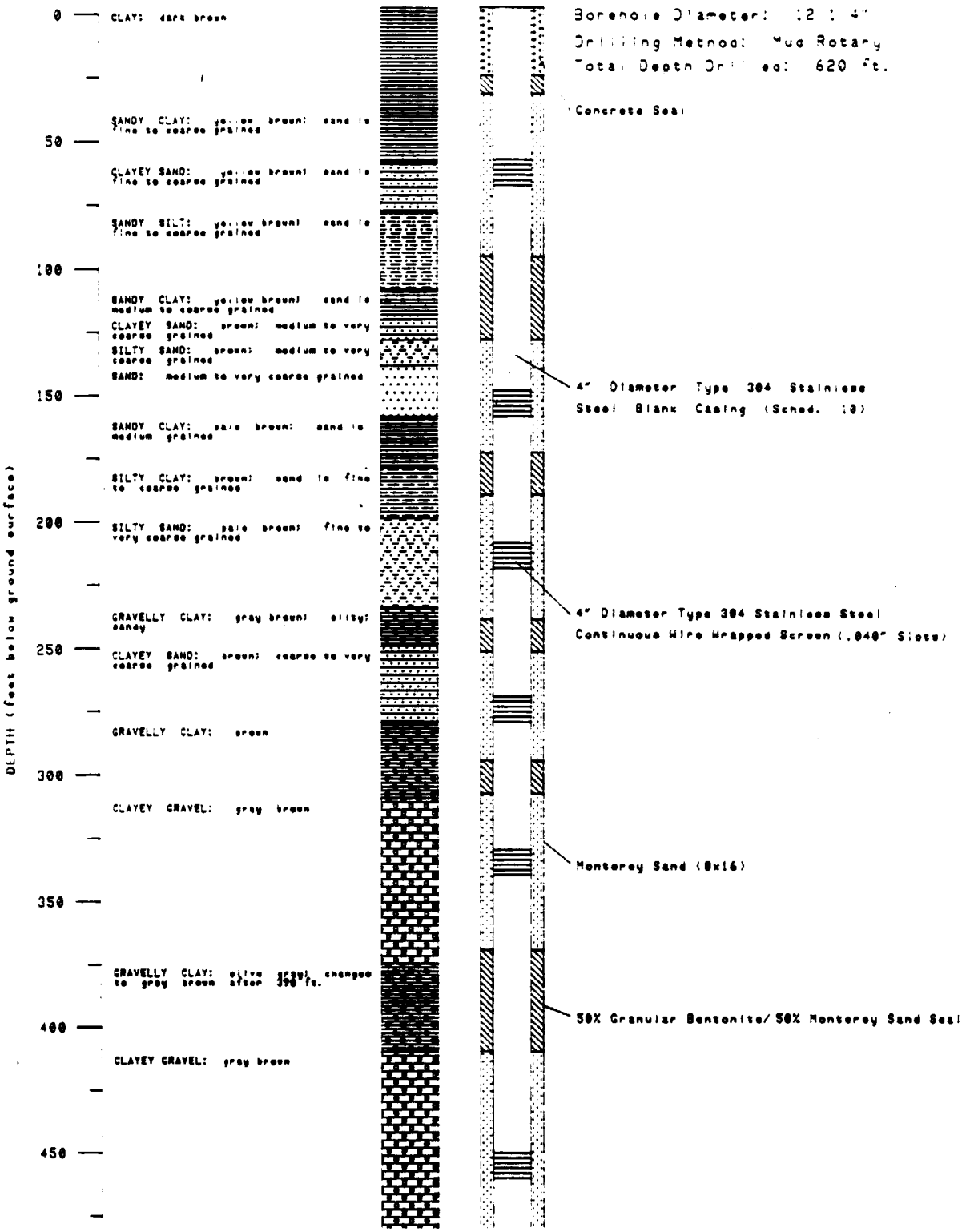
File - PMO
File - CTO Notebook/PMO
File - PAS
File - CTO Notebook/PAS
File - CH2M HILL

Attachment A

BORING LOGS AND CONSTRUCITON DIAGRAMS

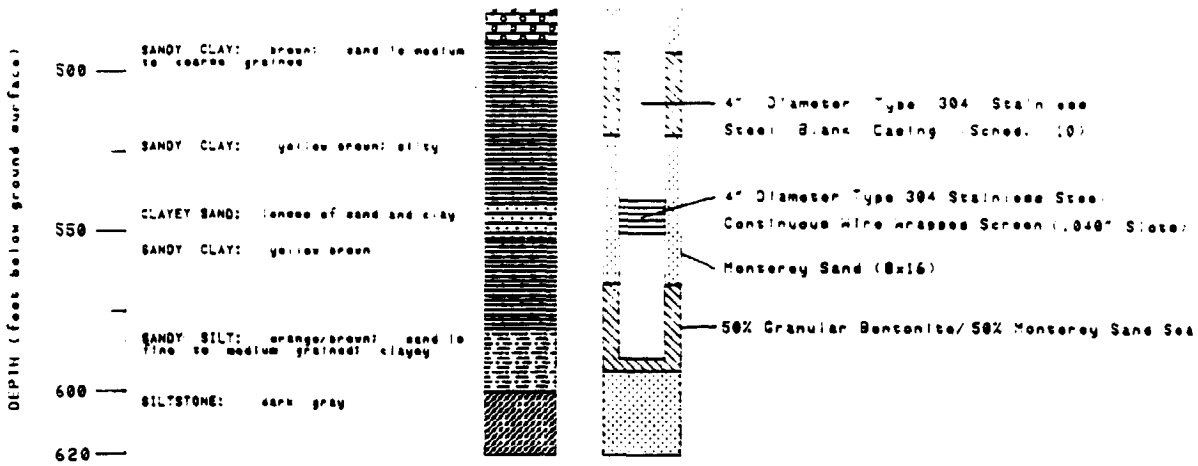
OCWD MONITORING WELLS



Sheet 1 of 2

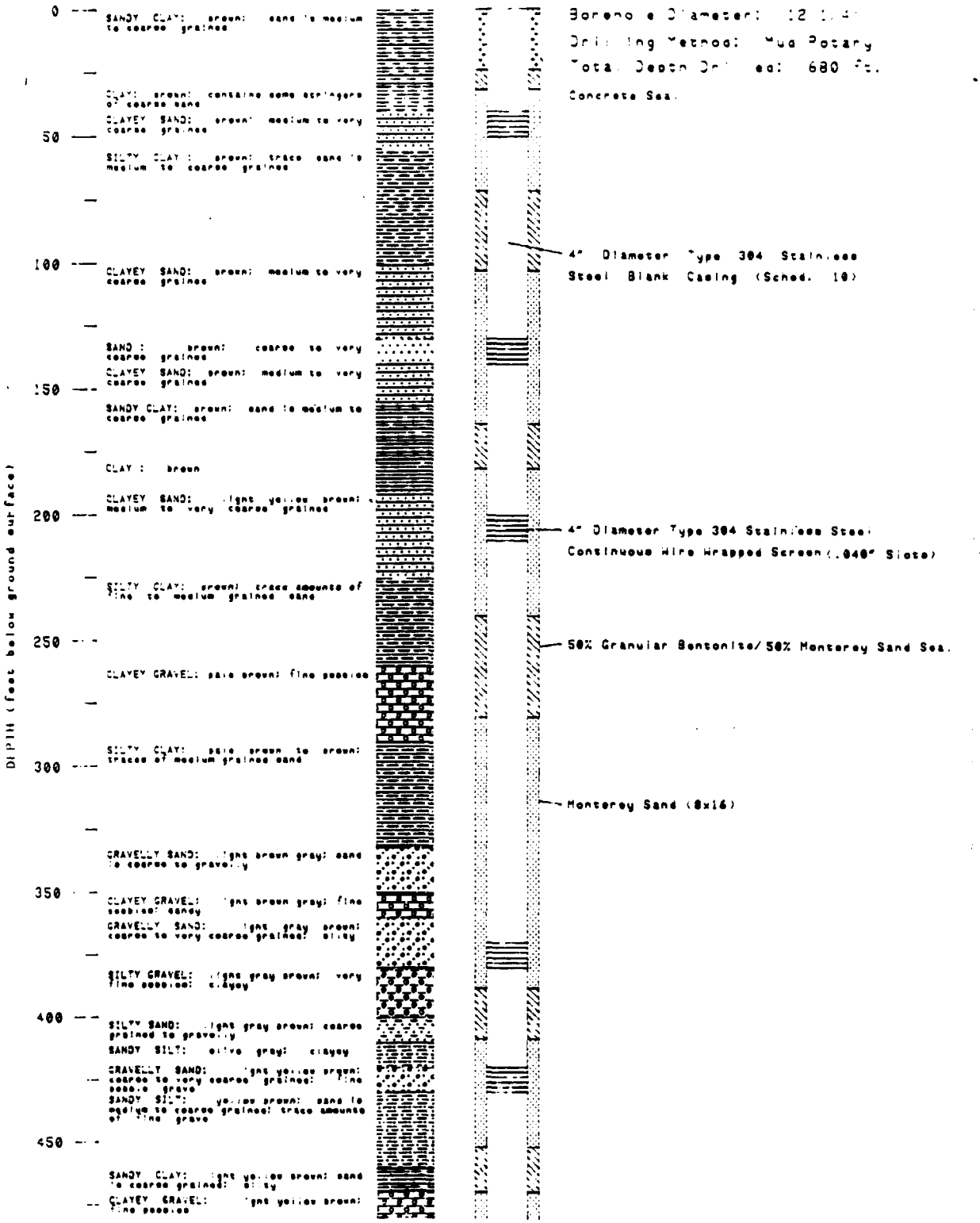
Figure B1

MCAS-1 BORING LOG AND WELL CONSTRUCTION DIAGRAM



Sheet 2 of 2

Figure	
B1	A-2 MCAS-1 BORING LOG AND WELL CONSTRUCTION DIAGRAM

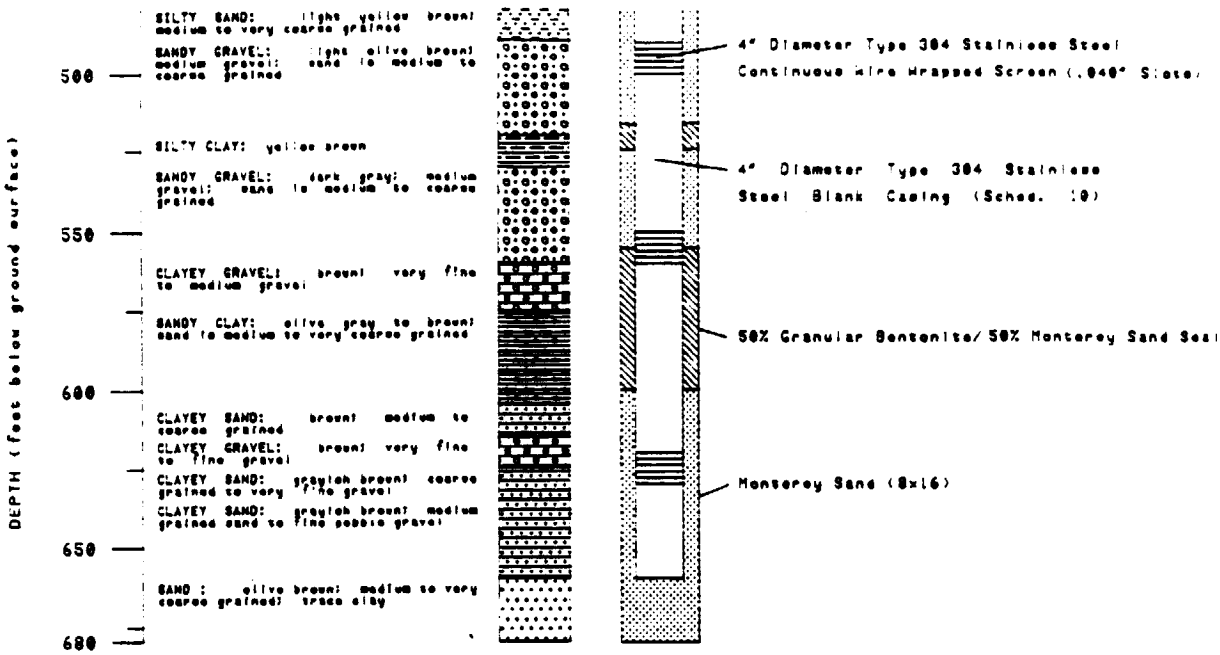


Sheet 1 of 2

Figure

B2

MCAS-2 BORING LOG AND WELL CONSTRUCTION DIAGRAM

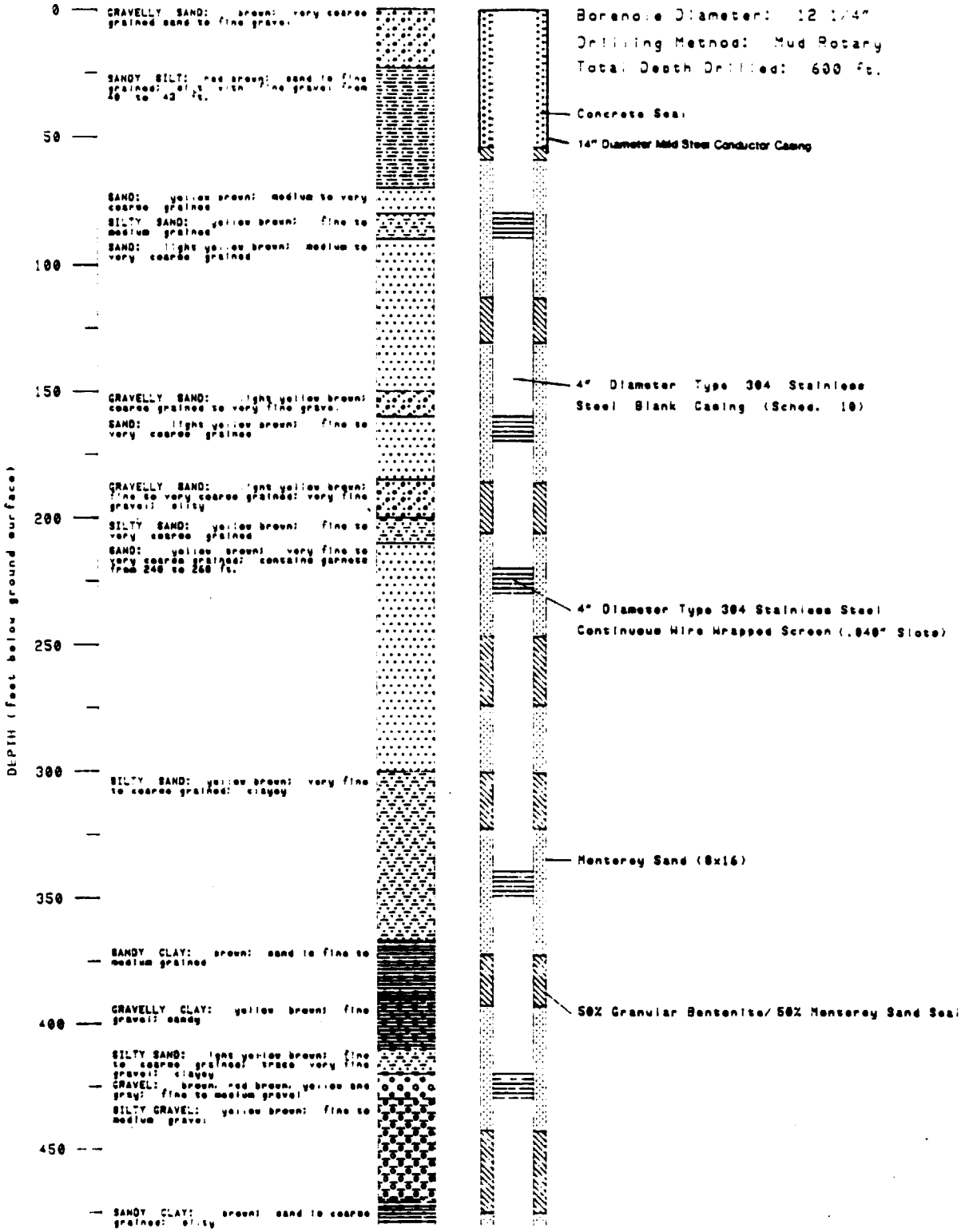


Sheet 2 of 2

Figure B2

A-4

MCAS-2 BORING LOG AND WELL CONSTRUCTION DIAGRAM

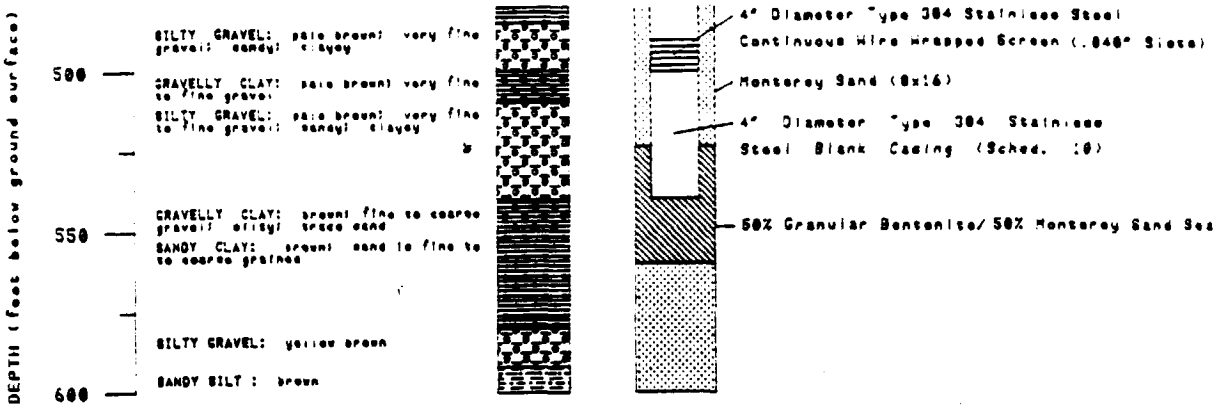


Sheet 1 of 2

Figure

B3

MCAS-3 BORING LOG AND WELL CONSTRUCTION DIAGRAM

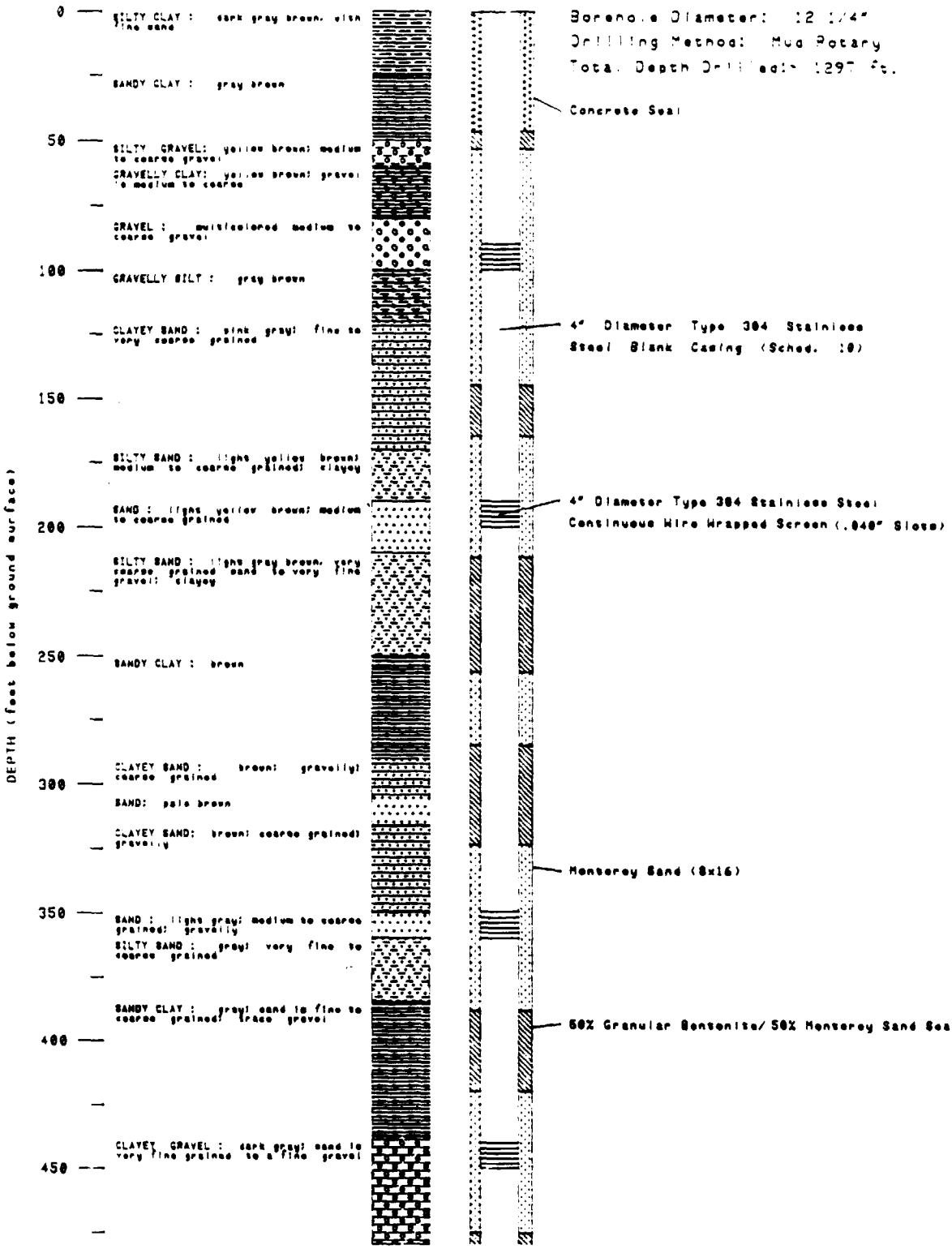


Sheet 2 of 2

Figure

B3

MCAS-3 BORING LOG AND WELL CONSTRUCTION DIAGRAM



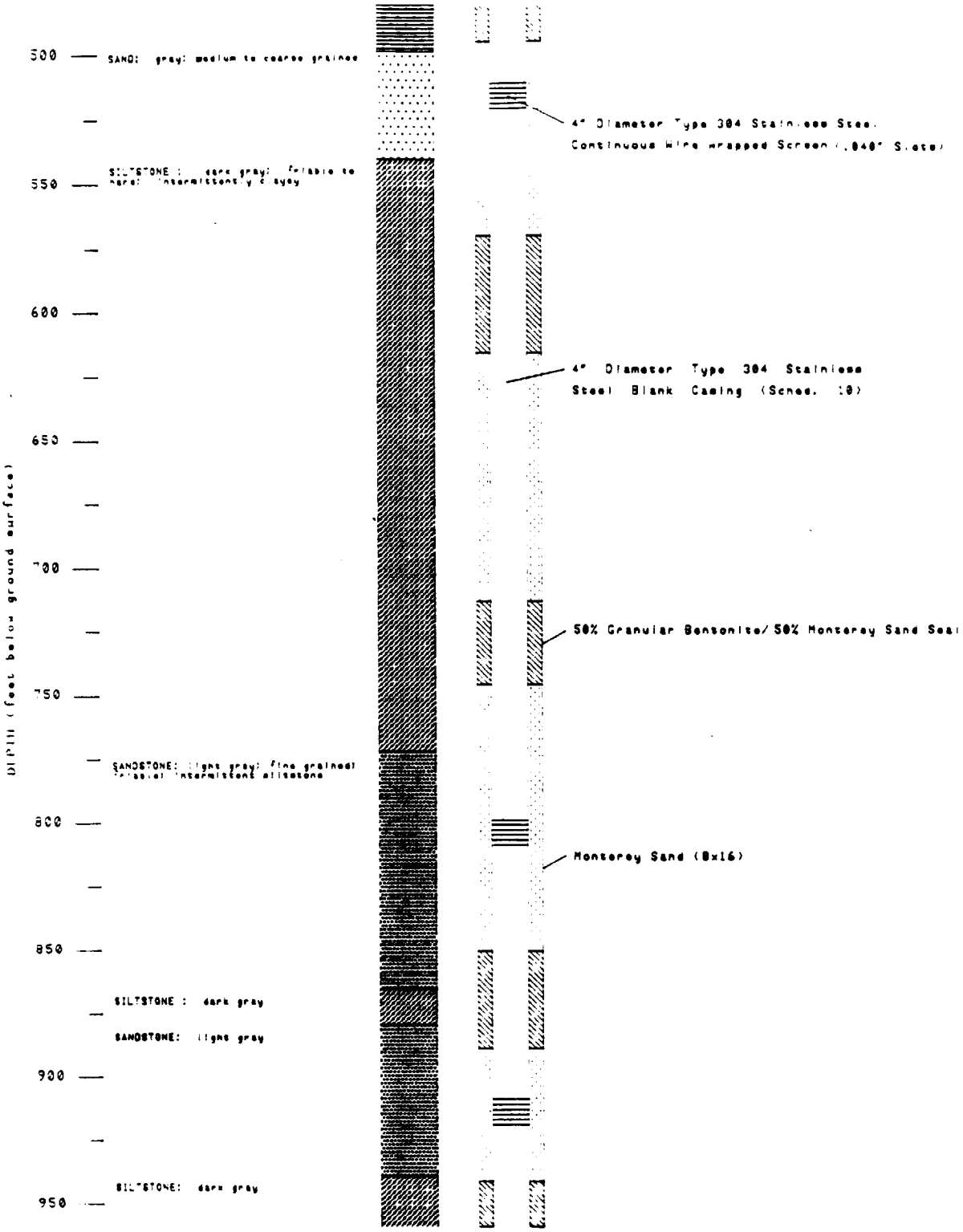
Sheet 1 of 3

Figure

B4

A-7

MCAS-7 BORING LOG AND WELL CONSTRUCTION DIAGRAM

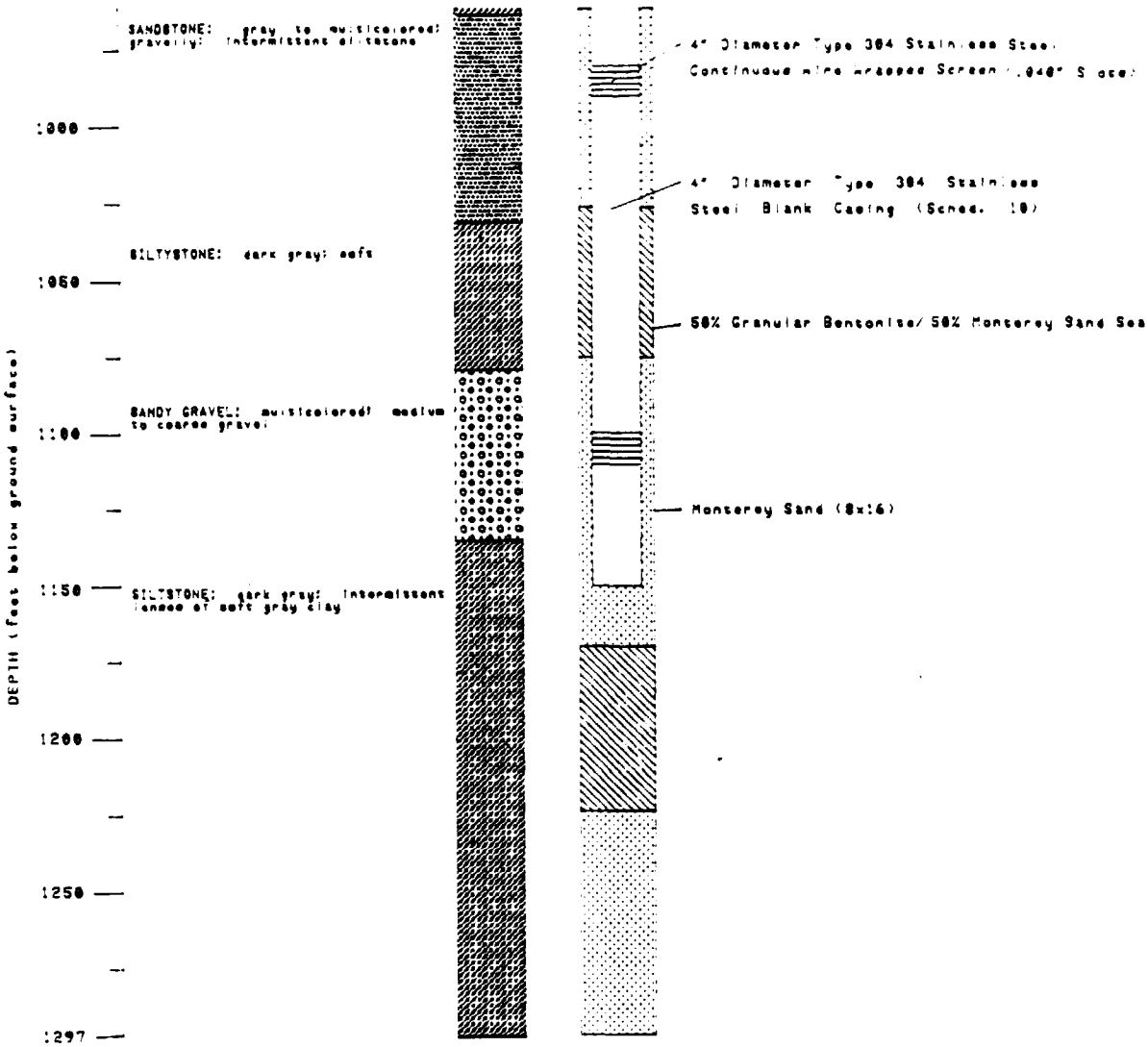


Sheet 2 of 3

Figure

B4

MCAS-7 BORING LOG AND WELL CONSTRUCTION DIAGRAM



Sheet 3 of 3

Figure

B4

MCAS-T BORING LOG AND WELL CONSTRUCTION DIAGRAM

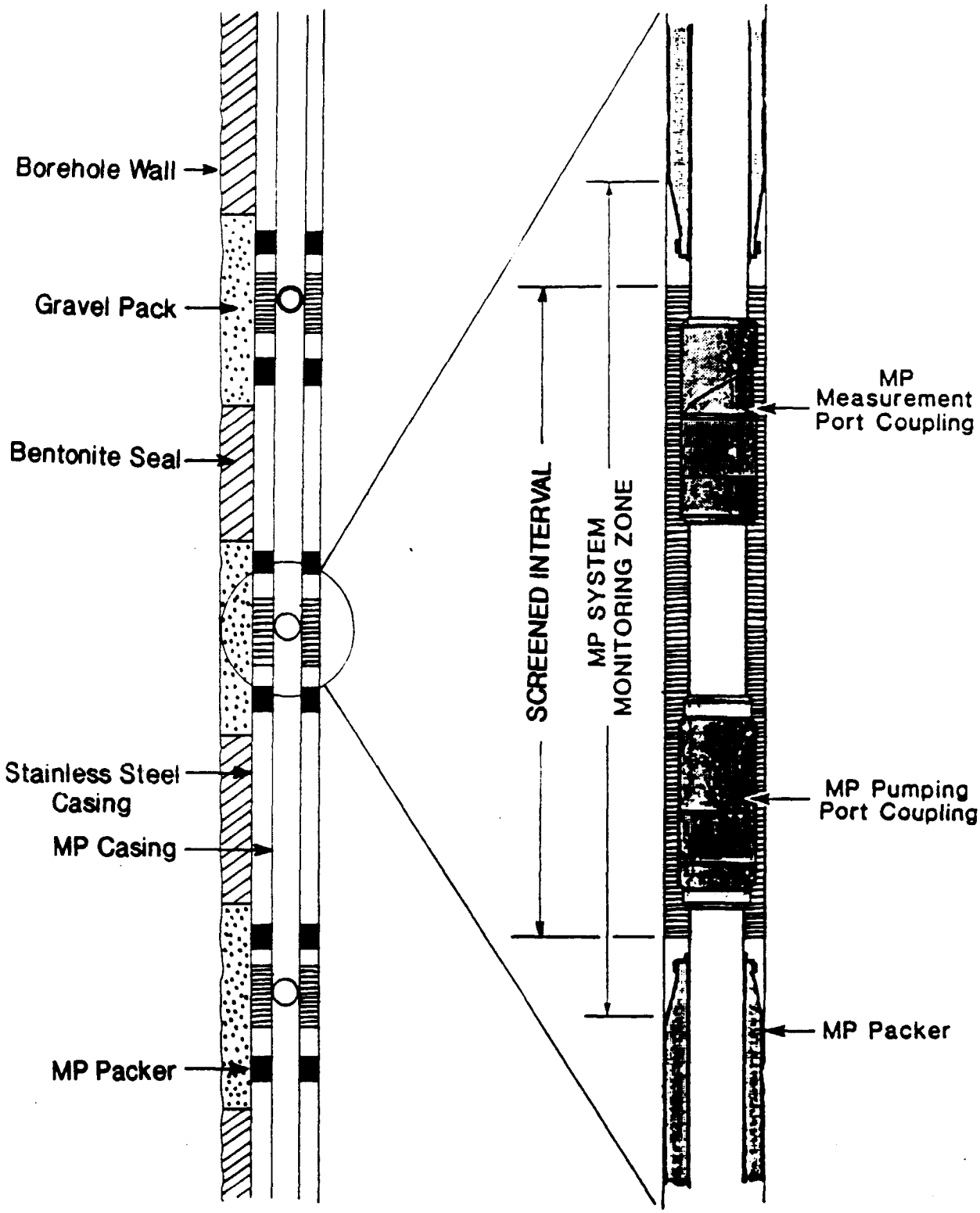
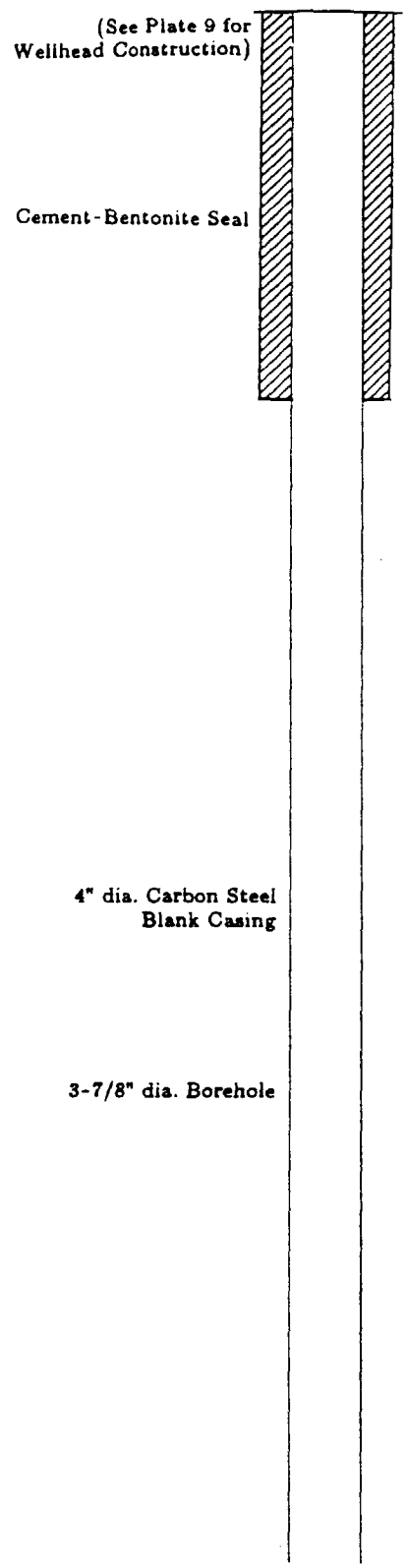


Figure B5. Typical MP System Installation

Top of Casing NA

Equipment Air Rotary

Elevation NA Date 9/21/89



Depth ft | Sample

0

DARK GRAY-BROWN CLAY (CL)
dry, with trace of fine-grained sand

10

GRAY-BROWN SANDY CLAY (CL)
dry to slightly moist, fine- to medium-grained sand

color change to dark gray-brown

20

color change to brown

BROWN SAND (SP)
dry to moist, fine grained, with some medium to coarse grained

GRAY-BROWN CLAY (CL)
dry to moist, with trace of very fine-grained sand
water level measured on 10/23/89

30

color change to tan-brown, with trace of fine-grained sand

40

no recovery

BROWN SILTY SAND (SM)
very fine to fine grained, with clay

BROWN SAND (SP)
fine to medium grained, with some clay

50

with trace of silt, little or no clay

BROWN SANDY CLAY (CL)
fine-grained sand

60

color change to light brown

BROWN CLAYEY SAND (SC)
fine grained, with silt

70

fine to medium grained

LIGHT BROWN SAND (SP)
fine to medium grained

80

Harding Lawson Associates
Engineers and Geoscientists

Log of Boring MCAS- 4 (sheet 1 of 5)

Orange County Water District
Irvine, California

PLATE **3**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
HK	9859,054.11		11/89		

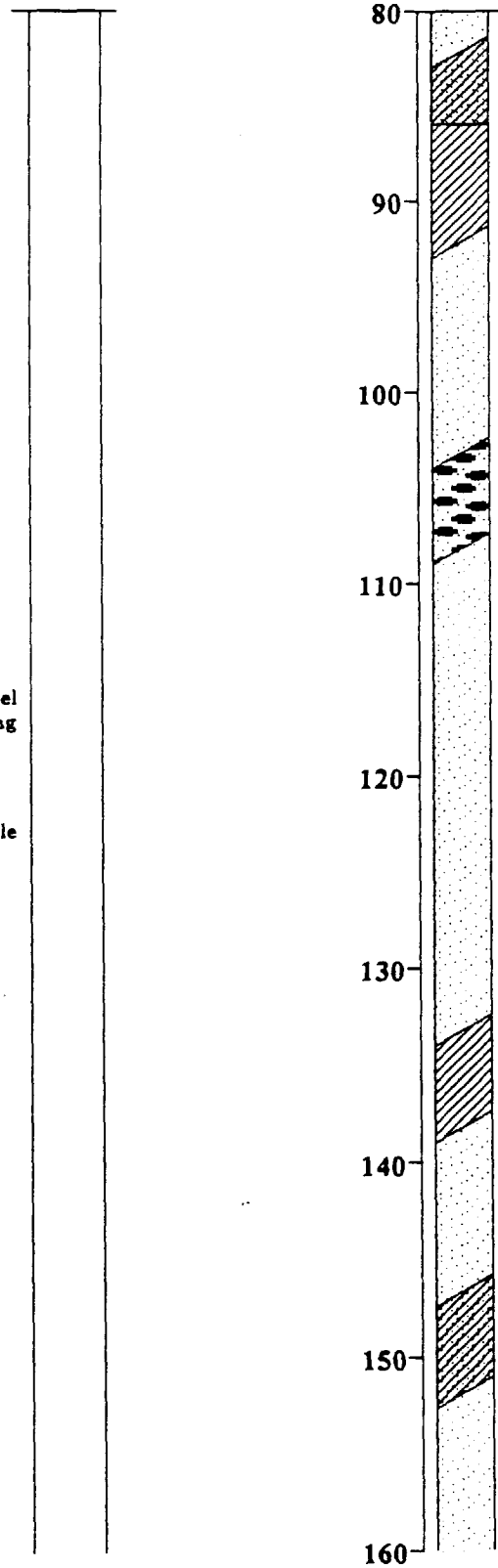
Top of Casing NA

Equipment Air Rotary

Elevation NA Date 9/21/89

Depth ft

Sample



4" dia. Carbon Steel Blank Casing

3-7/8" dia. Borehole

BROWN CLAYEY SAND (SC)
fine to medium grained

BROWN SANDY CLAY (CL)
fine grained

BROWN SAND (SP)
fine to coarse grained, with subangular gravel and trace of silt

DARK BROWN SANDY GRAVEL (GP)
with medium- to coarse-grained sand, subangular gravel

BROWN SAND (SP)
fine grained, with trace of subangular gravel and trace of silt

color change to light brown, little or no fines

with some silt

fine- to medium-grained sand and trace of gravel

no gravel

BROWN SANDY CLAY (CL)
fine grained

LIGHT BROWN SAND (SP)
fine to medium grained, with trace of silt

LIGHT BROWN CLAYEY SAND (SC)
fine to medium grained

LIGHT BROWN SAND (SP)
fine to coarse grained, with some angular to subangular gravel, quartz-rich, trace of silt

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Log of Boring MCAS- 4 (sheet 2 of 5)

Orange County Water District
Irvine, California

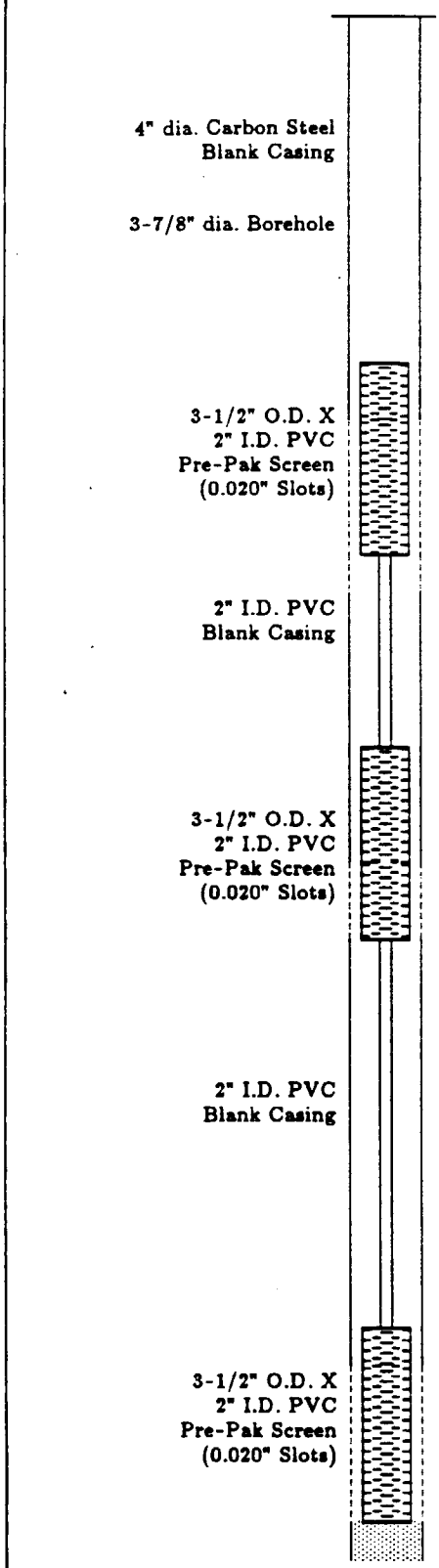
PLATE **3a**

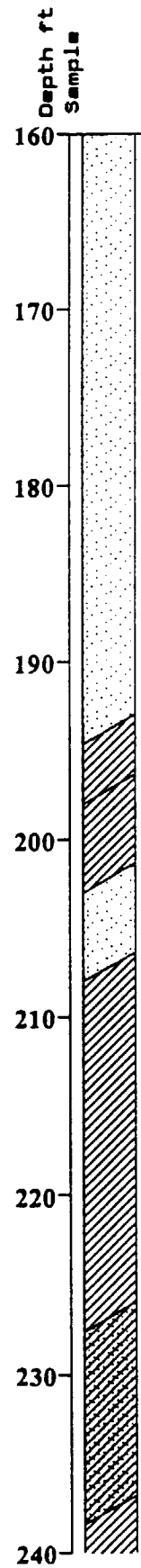
DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
HK	9859,054.11		11/89		

Top of Casing NA

Equipment Air Rotary

Elevation NA Date 9/21/89





fine to medium grained, with trace of gravel

subangular to subrounded gravels

color change to light gray-brown

color change to light orange-brown, with trace of clay

color change to light brown

BROWN CLAY (CL)
with fine-grained sand

BROWN SANDY CLAY (CL)
fine grained

LIGHT GRAY-BROWN SAND (SP)
fine grained, with trace of clay

LIGHT BROWN SANDY CLAY (CL)
fine grained

color change to medium brown

color change to brown

LIGHT BROWN CLAYEY SAND (SC)
fine grained

LIGHT BROWN SANDY CLAY (CL)
fine grained

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Log of Boring MCAS- 4 (sheet 3 of 5)

Orange County Water District
Irvine, California

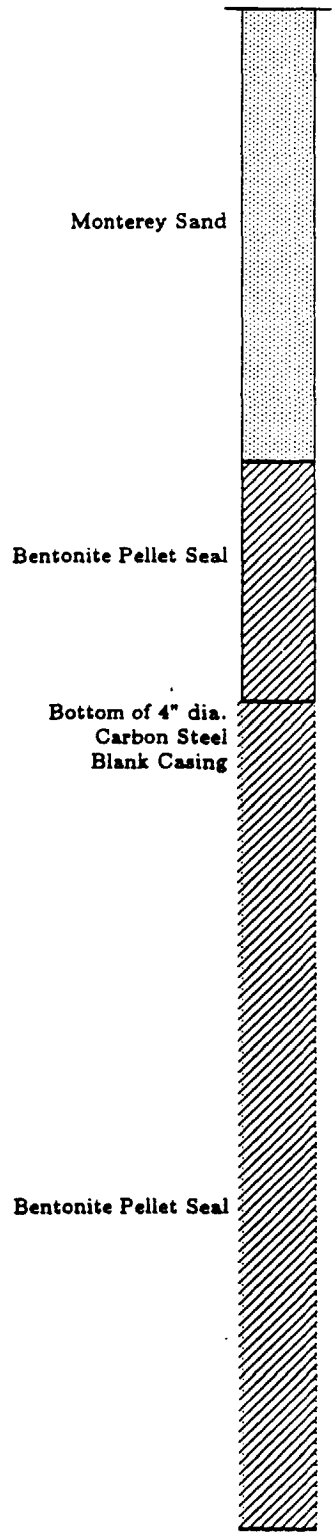
PLATE **3b**

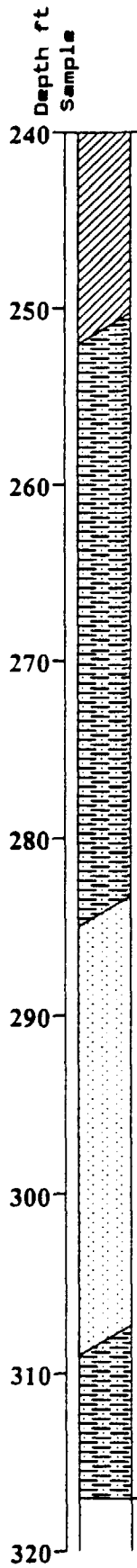
DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
HK	9859,054.11		11/89		

Top of Casing NA

Equipment Air Rotary

Elevation NA Date 9/21/89





trace of medium-grained sand

no recovery

LIGHT YELLOW-BROWN SANDY SILTSTONE
low hardness, friable, moderate weathering

with clay

color change to yellow-brown, friable, moderate to deep weathering, with clay

no recovery

YELLOW-GRAY SILTY SANDSTONE
low hardness, moderately strong, fine grained, little weathering

color change to gray-green, moderately hard, moderately strong, little weathering, fossiliferous (gastropod)

LIGHT GRAY-BROWN SILTSTONE
with clay, low hardness, weak, moderate weathering, fossiliferous (gastropod)

LIGHT BROWN SANDY SILTSTONE
moderately hard, moderately strong, little weathering

Harding Lawson Associates
Engineers and Geoscientists

Log of Boring MCAS- 4 (sheet 4 of 5)

Orange County Water District
Irvine, California

PLATE **3c**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
HK	9859,054.11		11/89		

Top of Casing NA

Equipment Air Rotary

Elevation NA Date 9/21/89

Depth ft	Sample	
320		Boring terminated at 317.0 feet. Steel casing driven to 275.25 feet in a 3-7/8-inch-diameter borehole. Ground water encountered at approximately 37.0 feet during drilling. Steel casing perforated with a mechanical wheel perforator. Boring converted to ground-water observation well on 10/21/89.
330		
340		
350		
360		
370		
380		
390		
400		

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Engineers and Geoscientists

Log of Boring MCAS- 4 (sheet 5 of 5)

Orange County Water District
Irvine, California

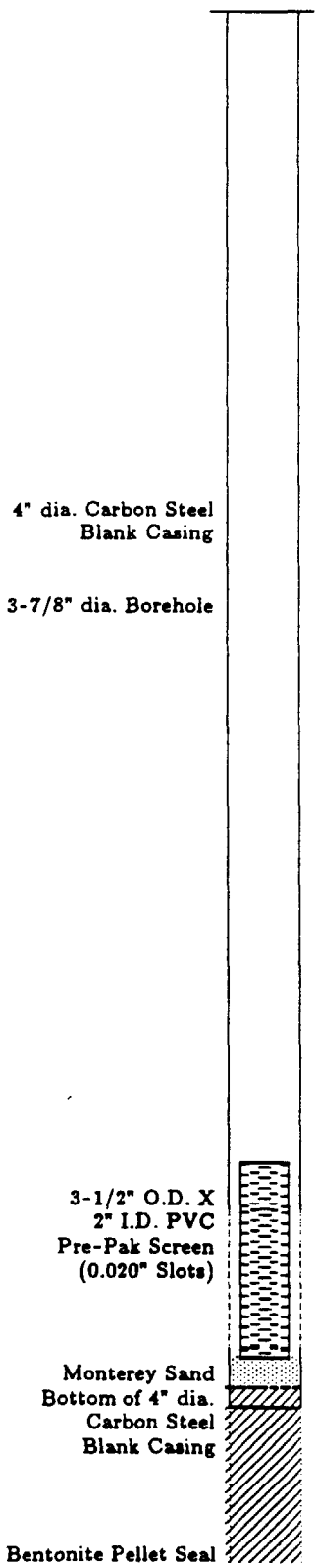
PLATE 3d

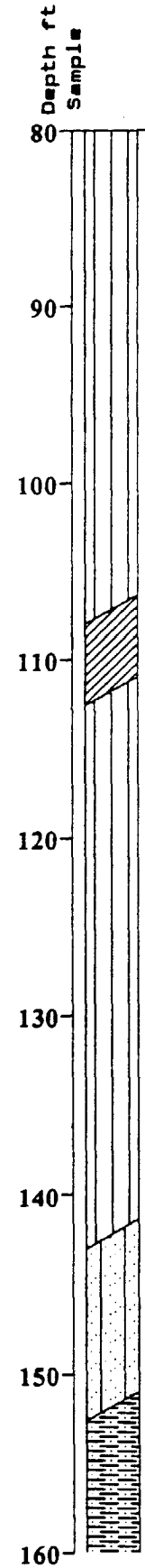
DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
HK	9859,054.11		11/89		

Top of Casing NA

Equipment Air Rotary

Elevation NA Date 9/18/89





color change to light brown

color change to yellow-brown, no clay

trace of fine-grained sand

LIGHT GRAY CLAY (CL)
moist, with silt

LIGHT YELLOW-BROWN SILT (ML)
moist, with trace of very fine-grained sand

color change to yellow-brown, with very fine-grained sand

YELLOW-BROWN SILTY SAND (SM)
fine to medium grained, with trace of clay

WEATHERED GRAY CLAYEY SILTSTONE

GRAY SILTSTONE

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Log of Boring MCAS- 5 (sheet 2 of 3)

Orange County Water District
Irvine, California

PLATE **4a**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
HK	9859,054.11		11/89		

Top of Casing NA

Equipment Air Rotary

Elevation NA Date 9/18/89

Depth ft

Sample

Bentonite Pellet Seal

160

170

180

190

200

210

220

230

240

Boring terminated at 177.0 feet.
Steel casing driven to 152.0 feet in a 3-7/8-inch-diameter borehole.
Ground water encountered at approximately 57.0 feet during drilling.
Steel casing perforated with a mechanical wheel perforator.
Boring converted to ground-water observation well on 10/19/89.

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Log of Boring MCAS- 5 (sheet 3 of 3)

Orange County Water District
Irvine, California

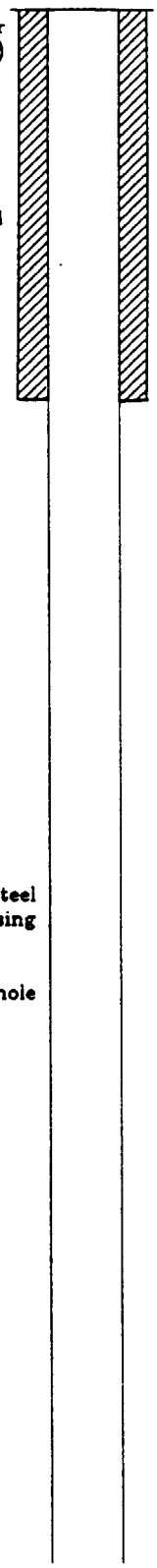
PLATE **4b**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
HK	9859,054.11		11/89		

Top of Casing NA

Equipment Air Rotary

Elevation NA Date 9/25/89



Depth ft | Sample

0

DARK BROWN SILTY SAND (SM) [FILL]
dry, fine grained, with some angular gravel, with clay

DARK BROWN SANDY SILT (ML)
fine-grained sand, with some clay

10

LIGHT BROWN CLAYEY SAND (SC)
fine grained, with some silt

20

BROWN SANDY CLAY (CL)
slightly moist, fine-grained sand, low plasticity

water level measured on 10/28/89

30

LIGHT RED-BROWN SAND (SP)
moist, fine grained, trace of medium-grained sand, with silt

BROWN SANDY CLAY (CL)
moist, fine-grained sand

40

DARK BROWN CLAYEY SAND (SC)
moist, fine grained, cohesive

50

with silt

fine to medium grained

BROWN SAND (SP)
wet, fine grained, with some medium grained, with clay

60

BROWN CLAYEY SAND (SC)
wet, fine grained

BROWN SILTY SAND (SM)
very wet, fine grained, with some clay

70

BROWN SANDY CLAY (CL)
wet, fine-grained sand, with some silt,

80

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Log of Boring MCAS- 6 (sheet 1 of 6)

Orange County Water District
Irvine, California

PLATE 5

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
HK	9859,054.11		11/89		

PAGE A-19

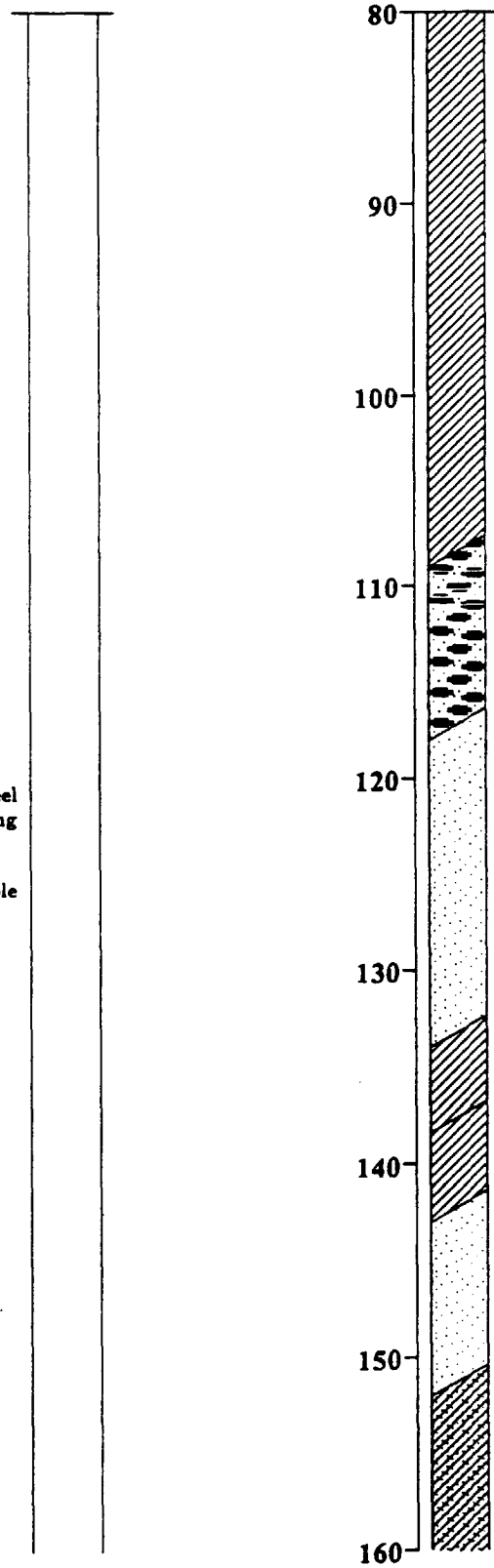
UNAVAILABLE AT THIS TIME

Top of Casing NA

Equipment Air Rotary

Elevation NA Date 9/25/89

Depth ft | Sample



low plasticity

slightly mottled

up to 30% sand content

BROWN SANDY GRAVEL (GP)
gravel subangular, quartzite, 5-20 mm diameter

BROWN SAND (SP)
wet, fine to medium grained (60% medium, 40% fine), quartz grains predominate

BROWN CLAY (CL)
wet, some fine-grained sand disseminated, medium plasticity, with sand

BROWN SANDY CLAY (CL)
moist, fine grained

BROWN SAND (SP)
wet, fine to medium grained (70% fine, 25% medium), angular to subrounded sand grains

BROWN CLAYEY SAND (SC)
very moist, fine-grained sand, cohesive

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Log of Boring MCAS- 6 (sheet 2 of 6)

Orange County Water District
Irvine, California

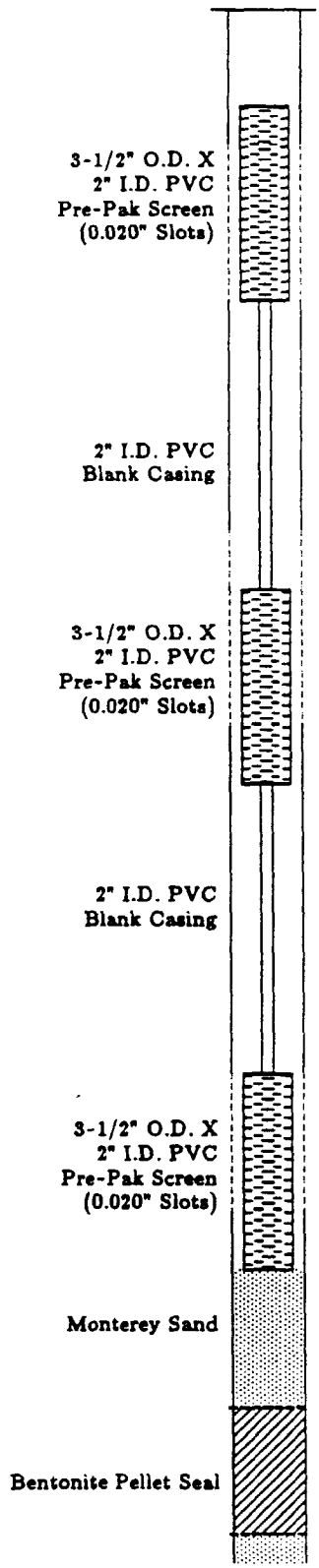
PLATE 5a

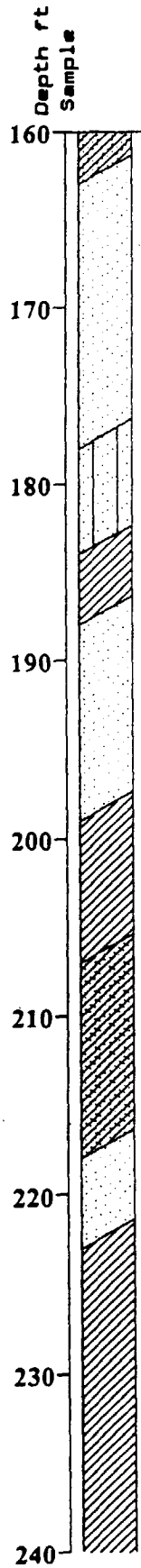
DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
HK	9859,054.11		11/89		

Top of Casing NA

Equipment Air Rotary

Elevation NA Date 9/25/89





LIGHT BROWN SAND (SP)
fine to medium grained

with 5-10% silt

LIGHT BROWN SILTY SAND (SM)
fine grained, with some clay

GRAY SANDY CLAY (CL)
fine grained, with silt

LIGHT GRAY SAND (SP)
fine grained, with some medium grained

fine and medium grained, subangular to subrounded

GRAY SANDY CLAY (CL)
fine to medium grained, low plasticity

color change to light gray, fine grained

GRAY CLAYEY SAND (SC)
fine grained

trace of angular, monoclastic gravel of siltstone

no gravel

LIGHT GRAY SAND (SP)
fine grained

GRAY SANDY CLAY (CL)
fine grained

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Log of Boring MCAS- 6 (sheet 3 of 6)

Orange County Water District
Irvine, California

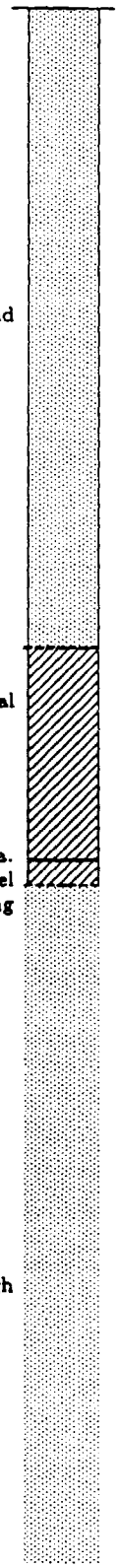
PLATE **5b**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
HK	9859,054.11		11/89		

Top of Casing NA

Equipment Air Rotary

Elevation NA Date 9/25/89



Depth ft | Sample

240
250
260
270
280
290
300
310
320

trace of angular to subangular gravel

GRAY TO BLUE-GRAY CLAY (CL)
with trace of fine-grained sand, angular to subangular

LIGHT GRAY QUARTZ SANDSTONE
low hardness, weak, moderate weathering, fine grained, well sorted, rounded subspherical

more lithic

color change to gray-brown, lithic quartz arenite

BROWN CLAYEY SANDSTONE
low hardness, weak, moderate weathering

GRAY-BROWN SANDSTONE (QUARTZ ARENITE, SLIGHTLY LITHIC)
fine grained, low hardness, weak, moderate

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Log of Boring MCAS- 6 (sheet 4 of 6)

Orange County Water District
Irvine, California

PLATE 5c

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
HK	9859,054.11		11/89		

Top of Casing NA

Equipment Air Rotary

Elevation NA Date 9/25/89

Depth ft	Sample	
320		weathering
330		slightly lithic
340		
350		
		lithic
		color change to light gray
360		
		with silt
370		
380		
		with angular fragments of gray siltstone
390		<5% fragments of siltstone
		10-20% siltstone
400		

Monterey Sand/Slough

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Log of Boring MCAS- 6 (sheet 5 of 6)

Orange County Water District
Irvine, California

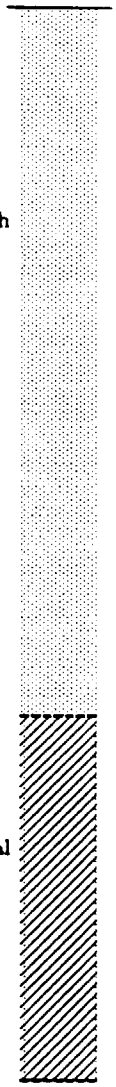
PLATE **5d**

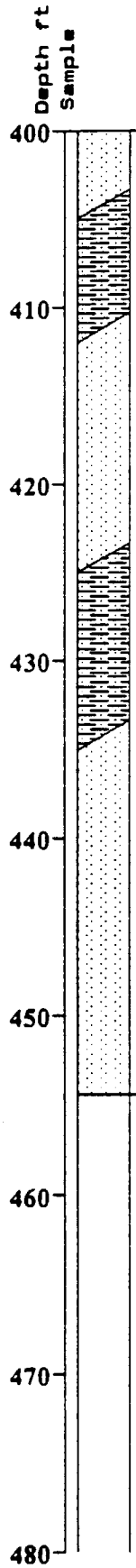
DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
HK	9859,054.11		11/89		

Top of Casing NA

Equipment Air Rotary

Elevation NA Date 9/25/89





<5% siltstone

70% siltstone fragments and 30% sandstone, increasing induration

90% sandstone

no recovery

siltstone with trace (10-20%) sandstone

sandstone with 20-30% siltstone

Boring terminated at 454.5 feet.
Steel casing driven to 285.3 feet in a 3-7/8-inch-diameter borehole.
Ground water encountered at approximately 58.5 feet during drilling.
Steel casing perforated with a mechanical wheel perforator.
Boring converted to ground-water observation well on 10/27/89.

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Log of Boring MCAS- 6 (sheet 6 of 6)

Orange County Water District
Irvine, California

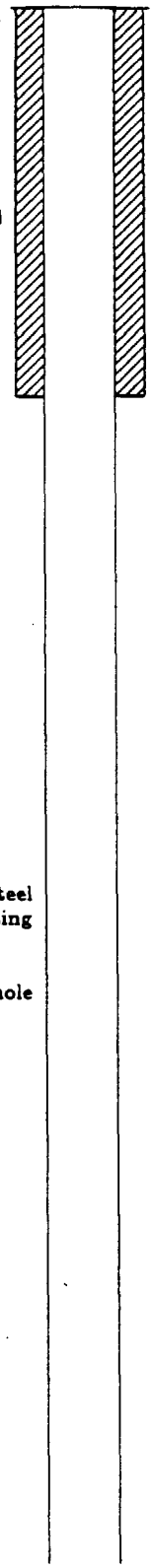
PLATE **5e**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
HK	9859,054.11		11/89		

Top of Casing NA

Equipment Air Rotary

Elevation NA Date 9/14/89



Depth ft | Sample

0

BROWN SILTY SAND (SM)
dry to slightly moist, fine grained, rootlets

no recovery

no recovery

10

BROWN CLAYEY SAND (SC)
moist, fine grained

no recovery

20

BROWN SILTY SAND (SM)
moist, fine grained, with clay

30

BROWN CLAYEY SAND (SC)
moist, fine grained

40

MEDIUM DARK BROWN SANDY CLAY (CL)
moist, fine-grained sand

BROWN SAND (SP)
moist, medium grained, trace of coarse-grained sand, with subangular gravel

50

no recovery

no recovery

60

BROWN SANDY CLAY (CL)
moist to very moist, fine grained, with trace of medium-grained sand

70

BROWN CLAYEY SAND (SC)
moist, fine grained

80

BROWN SANDY CLAY (CL)

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Log of Boring MCAS- 8 (sheet 1 of 6)

Orange County Water District
Irvine, California

PLATE 6

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
HK	9859,054.11	A-25	11/89		

Top of Casing NA

Equipment Air Rotary

Elevation NA Date 9/14/89

Depth ft | Sample

80

moist, fine-grained sand

90

BROWN SAND (SP)
wet, fine to medium grained, trace of clay

BROWN CLAYEY SAND (SC)
wet, fine to medium grained

100

BROWN CLAY (CL)
wet, with fine- to medium-grained sand (10%), low plasticity
water level measured on 11/3/89

110

fine- to medium-grained sand (15-20%)

TAN SILTY SAND WITH CLAY (SM)
fine to medium grained

TAN SANDY CLAY (CL)
fine-grained sand, trace of medium-grained sand, subrounded, low plasticity

120

4" dia. Carbon Steel Blank Casing

3-7/8" dia. Borehole

130

color change to brown, with fine- to medium-grained sand

LIGHT BROWN SAND (SP)
fine to medium grained, with some clay

140

10% coarse-grained sand

150

160

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Log of Boring MCAS- 8 (sheet 2 of 6)

Orange County Water District
Irvine, California

PLATE **6a**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
HK	9859,054.11	A-26	11/89		

Top of Casing NA

Equipment Air Rotary

Elevation NA Date 9/14/89

Depth ft
Sample

4" dia. Carbon Steel Blank Casing

3-7/8" dia. Borehole

160

color change to light gray-brown, 5-10% clay

BROWN-GRAY CLAY (CL)
with fine- to medium-grained sand

170

GRAY SAND (SP)
fine grained, micaceous

180

GRAY CLAYEY SAND (SC)
fine grained

190

GRAY SAND (SP)
fine grained, trace of medium grained

200

with trace of silt

GRAY SANDY CLAY (CL)
with fine-grained sand, medium plasticity

GRAY SAND (SP)
fine grained with medium grained, sand 70% quartz grains

210

GRAY SILTY SAND (SM)
fine grained, with trace of medium-grained sand

GRAY SANDY CLAY (CL)
fine-grained sand, low to moderate plasticity

220

230

240

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Log of Boring MCAS- 8 (sheet 3 of 6)

Orange County Water District
Irvine, California

PLATE 6b

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
HK	9859,054.11		11/89		

00418/1

Top of Casing NA

Equipment Air Rotary

Elevation NA Date 9/14/89

Depth ft | Sample

240

250

LIGHT GRAY SAND (SP)
medium grained, with angular gravel

GRAY CLAYEY SAND (SC)
fine to medium grained

260

minor clay content (5-10%)

270

15-20% clay

280

4" dia. Carbon Steel Blank Casing

3-7/8" dia. Borehole

trace of gravel (No. 4 sieve to 1/2-inch diameter)
subangular

GRAY SILTY SAND (SM)
fine grained

290

LIGHT GRAY SAND (SP)
fine grained, quartz-rich

LIGHT GRAY SANDY SILT (ML)
fine grained

300

GRAY CLAYEY SAND (SC)
fine to coarse grained

310

fine to medium grained

BROWN SANDY CLAY (CL)
fine grained, sand lenses, low plasticity

320

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Log of Boring MCAS- 8 (sheet 4 of 6)

Orange County Water District
Irvine, California

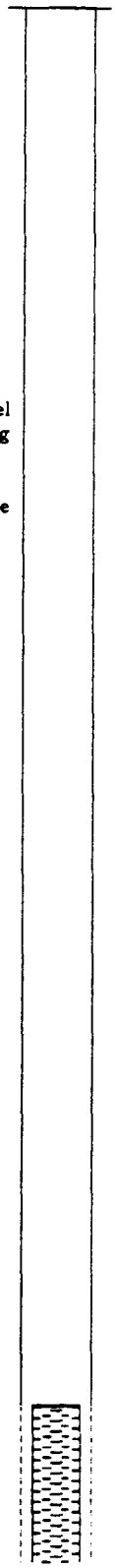
PLATE **6c**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
HK	9859,054.11		11/89		

Top of Casing NA

Equipment Air Rotary

Elevation NA Date 9/14/89



Depth ft | Sample

320

LIGHT GRAY SAND (SP)
fine grained

330

340

fine to medium grained

350

360

70% medium grained

370

trace of subangular gravel

GRAY SANDY CLAY (CL)
fine grained

380

LIGHT GRAY SAND (SP)
medium grained, 90% quartz grains, subangular

390

70% fine grained, 20% medium grained

400

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Log of Boring MCAS- 8 (sheet 5 of 6)

Orange County Water District
Irvine, California

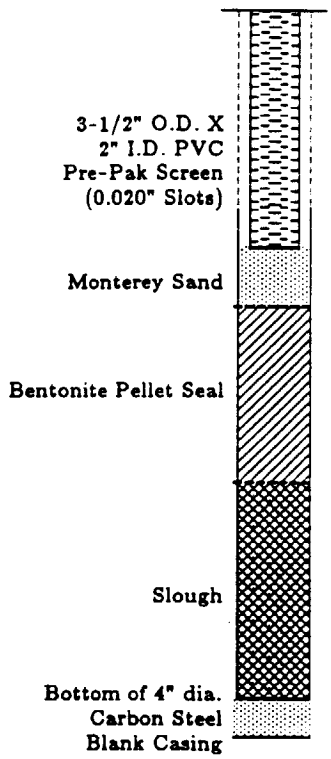
PLATE **6d**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
HK	9859,054.11		11/89		

Top of Casing NA

Equipment Air Rotary

Elevation NA Date 9/14/89



Depth ft	Sample	
400		2-5% coarse grained
410		medium grained, angular
420		trace of coarse grained
430		GRAY SILTY SAND (SM) very fine grained, with fragments of gray siltstone GRAY SAND (SP) fine grained
440		Boring terminated at 437.0 feet. Steel casing driven to 435.0 feet in a 3-7/8-inch-diameter borehole. Ground water encountered at approximately 60.0 feet during drilling. Steel casing perforated with a mechanical wheel perforator. Boring converted to ground-water observation well on 11/2/89.
450		
460		
470		
480		

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Log of Boring MCAS- 8 (sheet 6 of 6)

Orange County Water District
Irvine, California

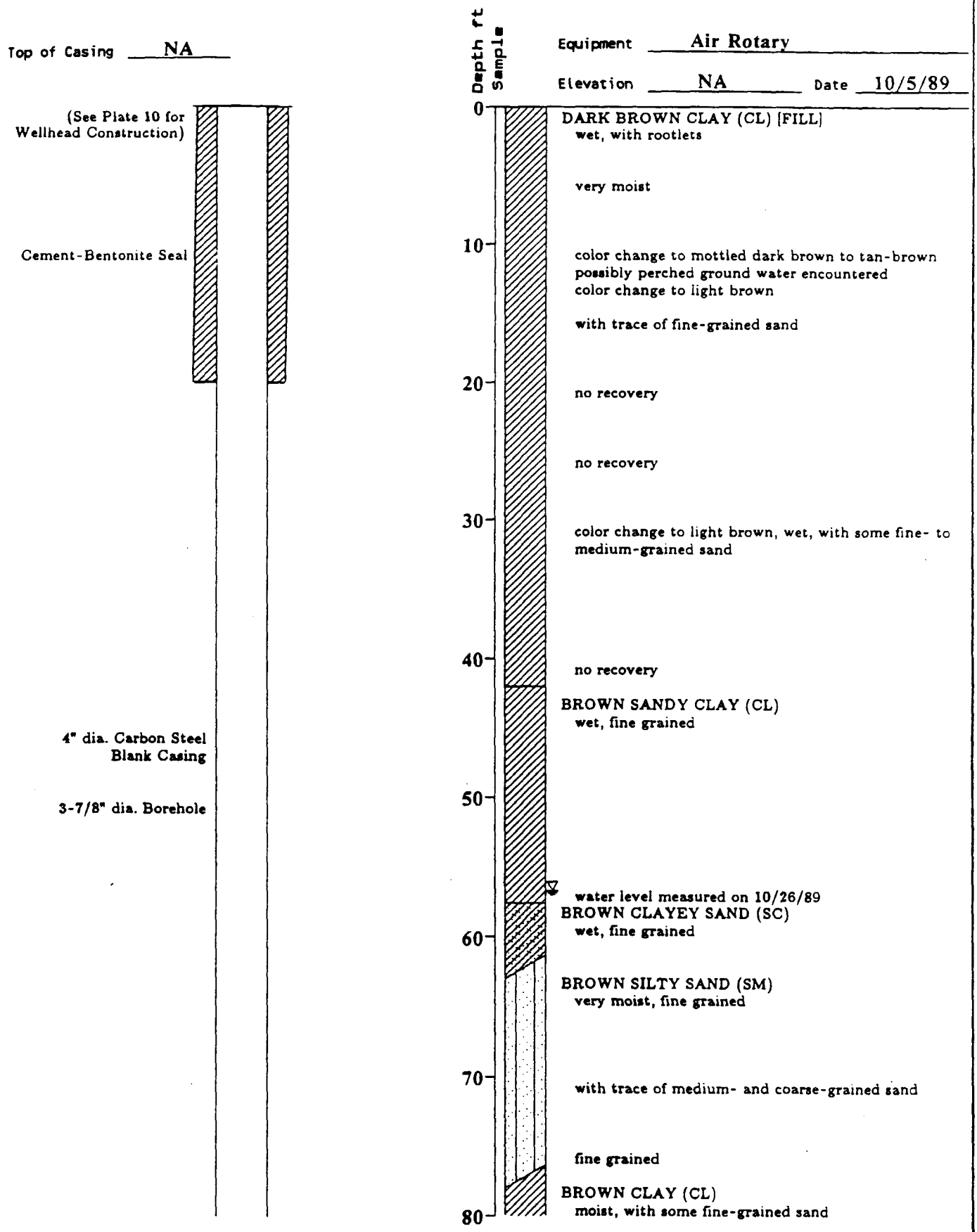
PLATE **6e**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
HK	9859,054.11	A-30	11/89		

Top of Casing NA

Equipment Air Rotary

Elevation NA Date 10/5/89



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Log of Boring MCAS- 9 (sheet 1 of 6)

Orange County Water District
Irvine, California

PLATE **7**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
HK	9859,054.11	A-31	11/89		

Top of Casing NA

Equipment Air Rotary

Elevation NA Date 10/5/89

Depth ft | Sample

80

BROWN CLAYEY SAND (SC)
slightly moist, fine grained

LIGHT BROWN SAND (SP)
dry, fine grained

90

BROWN CLAYEY SAND (SC)
dry, fine grained

100

with calcareous nodules

BROWN SANDY CLAY (CL)
moist to wet, fine grained, with some medium grained

110

BROWN CLAYEY SAND (SC)
moist, fine grained, with silt

4" dia. Carbon Steel Blank Casing

3-7/8" dia. Borehole

120

130

140

with trace of medium-grained sand

LIGHT BROWN SAND (SP)
moist, fine grained, with trace of silt

BROWN CLAYEY SAND (SC)
moist, fine grained

150

BROWN SANDY CLAY (CL)
moist, fine grained

160

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Log of Boring MCAS- 9 (sheet 2 of 6)

Orange County Water District
Irvine, California

PLATE **7a**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
HK	9859,054.11	A-32	11/89		

Top of Casing NA

Equipment Air Rotary

Elevation NA Date 10/5/89

Depth ft

Sample

4" dia. Carbon Steel Blank Casing

3-7/8" dia. Borehole

160

170

180

no recovery

BROWN CLAY (CL)
with trace of fine-grained sand

190

BROWN SANDY CLAY (CL)
very fine to fine grained

fine-grained sand

LIGHT BROWN SAND (SP)
fine grained, with trace of clay

200

210

GRAY-BROWN CLAY (CL)
with trace of fine-grained sand

LIGHT BROWN SAND (SP)
fine grained

220

GRAY-BROWN SANDY CLAY (CL)
fine-grained sand

230

5-12% sand

240

with calcareous nodules

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Log of Boring MCAS- 9 (sheet 3 of 6)

Orange County Water District
Irvine, California

PLATE **7b**

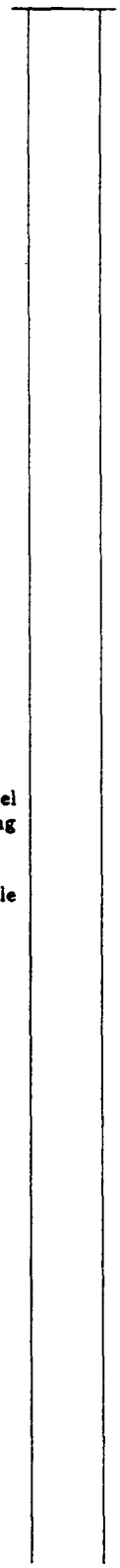
DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
HK	9859,054.11		11/89		

Top of Casing NA

Equipment Air Rotary

Elevation NA Date 10/5/89

Depth ft | Sample



12-25% sand, fine grained

GRAY-BROWN CLAYEY SAND (SC)
fine grained

GRAY-BROWN SANDY CLAY (CL)
fine grained

LIGHT BROWN CLAYEY SAND (SC)
fine grained

BROWN SANDY CLAY (CL)
with some very fine to fine-grained sand, with calcareous nodules

BROWN CLAYEY SAND (SC)
fine to medium grained

BROWN SANDY CLAY (CL)
fine-grained sand

LIGHT GRAY-BROWN SAND (SP)
fine grained, with trace of angular to subangular gravel

BROWN CLAYEY SAND (SC)
fine and coarse grained, with angular gravel, calcareous fragments of cemented fine-grained sand

GRAY SAND (SP)
fine to coarse grained, with trace of gray siltstone fragments

GRAY CLAY (CL)
with trace of fine-grained sand

LIGHT GRAY SAND (SP)
fine grained, with clay, trace of calcareous fragments of cemented fine-grained sand

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Log of Boring MCAS- 9 (sheet 4 of 6)

Orange County Water District
Irvine, California

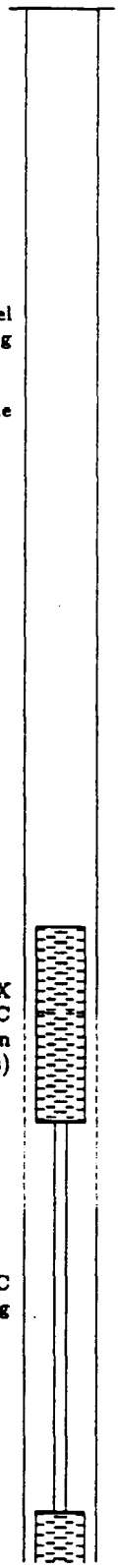
PLATE 7c

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
HK	9859,054.11		11/89		

Top of Casing NA

Equipment Air Rotary

Elevation NA Date 10/5/89



Depth ft

Sample

320

330

340

350

360

370

380

390

400

GRAY SANDY CLAY (CL)
fine-grained sand

gravels of subangular sandstone

high plasticity, little or no sand

GRAY SAND (SP)
fine to medium grained, quartz-rich, with some clay, with seashell fragments and whole shells

GRAY SILTY SAND (SM)
fine grained

LIGHT GREEN-BROWN SAND (SP)
fine grained, quartz-rich, with some seashell fragments

color change to brown

BROWN SILTY SAND (SM)
fine grained, with some clay

LIGHT GRAY-BROWN SANDY CLAY (CL)
fine grained, with trace of medium grained

LIGHT BROWN SAND (SP)
fine to medium grained, with trace of clay, with calcareous fragments of cemented sand

color change to brown, with clay

color change to light brown, with some angular to subrounded gravel

with medium-grained sand and trace of subangular gravel (passing 1/2-inch sieve)

BROWN CLAY (CL)
with fine-grained sand

LIGHT BROWN SAND (SP)
fine to medium grained, with some clay

subangular to subrounded sand grains

LIGHT BROWN CLAYEY GRAVEL (GC)
with medium- to coarse-grained sand, angular to

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Log of Boring MCAS- 9 (sheet 5 of 6)

Orange County Water District
Irvine, California

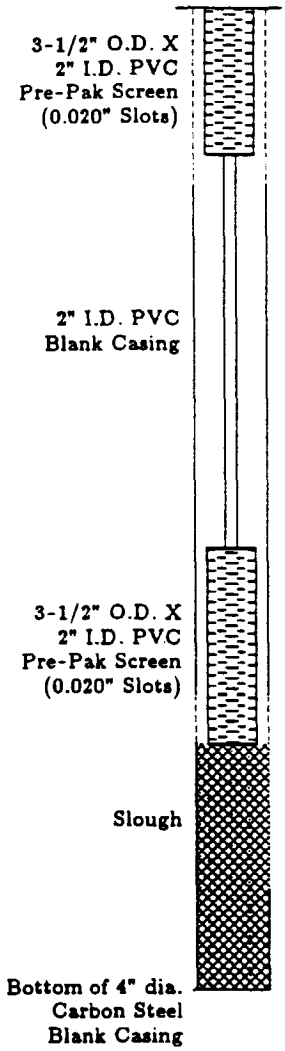
PLATE **7d**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
HK	9859,054.11		11/89		

Top of Casing NA

Equipment Air Rotary

Elevation NA Date 10/5/89



Depth ft	Sample	Description
400		subangular gravel
		LIGHT BROWN SAND (SP)
		fine to medium grained, with trace of clay
		medium to coarse grained, rounded sand, with trace of subangular gravel (passing 1/2-inch sieve)
410		medium grained
		BROWN SANDY CLAY (CL)
		fine to medium grained
420		color change to light brown
		LIGHT BROWN SAND (SP)
		fine grained, with trace of subrounded gravel, with trace of clay
		LIGHT BROWN CLAYEY SAND (SC)
430		fine grained
		LIGHT GRAY-BROWN SAND (SP)
		fine grained, with some silt
		with trace of subangular to subrounded gravel
440		
		color change to light brown, medium grained, with trace of subangular gravel
		fine to medium grained, with some clay
450		Boring terminated at 450.0 feet.
		Steel casing driven to 450.0 feet in a 3-7/8-inch-diameter borehole.
		Perched ground water encountered at approximately 12.0 feet during drilling.
		Ground water encountered at approximately 97.5 feet during drilling.
460		Steel casing perforated with a mechanical wheel perforator.
		Boring converted to ground-water observation well on 10/25/89.
470		
480		

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Log of Boring MCAS- 9 (sheet 6 of 6)

Orange County Water District
Irvine, California

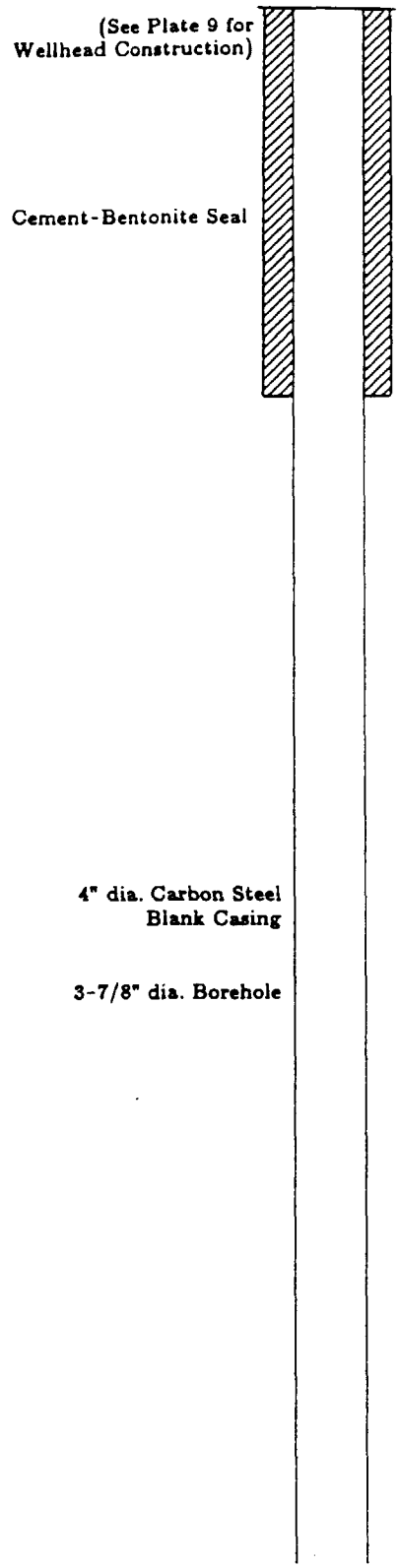
PLATE **7e**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
HK	9859,054.11	A-36	11/89		

Top of Casing NA

Equipment Air Rotary

Elevation NA Date 10/17/89



Depth ft | Sample

0

DARK BROWN CLAY (CL)
with trace of fine- to medium-grained sand
BROWN CLAYEY SAND (SC)
fine grained

10

20

no recovery

no recovery

30

40

no recovery

no recovery

no recovery

50

BROWN SANDY CLAY (CL)
fine grained, with trace of medium- to coarse-grained sand

no recovery

60

water level measured on 11/6/89
no recovery

BROWN CLAYEY SAND (SC)
fine grained

70

no recovery
LIGHT BROWN SAND (SP)
fine grained

80

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Log of Boring MCAS-10 (sheet 1 of 5)

Orange County Water District
Irvine, California

PLATE **8**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
HK	9859,054.11		11/89		

Top of Casing NA

Equipment Air Rotary

Elevation NA Date 10/17/89

Depth ft | Sample

4" dia. Carbon Steel Blank Casing

3-7/8" dia. Borehole

80

LIGHT BROWN CLAYEY SAND (SC)
fine grained, with angular to subangular gravel

90

no gravel
LIGHT BROWN SILTY SAND (SM)
fine grained, with some clay

BROWN CLAYEY SAND (SC)
fine grained, with trace of medium grained, with trace of subangular gravel

100

LIGHT BROWN SAND (SP)
fine to medium grained, with trace of subangular gravel

BROWN SILTY SAND (SM)
fine grained, with minor clay, with trace of subangular gravel

110

LIGHT GRAY-BROWN CLAYEY SAND (SC)
fine grained, with trace of medium grained, with trace of subangular gravel

120

no recovery
LIGHT BROWN SANDY CLAY (CL)
fine grained, with trace of medium-grained sand, with trace of subangular gravel

LIGHT BROWN SAND (SP)
fine to medium grained, with trace of subangular gravel

130

LIGHT BROWN GRAVELLY SAND (SP)
medium to coarse grained, angular to subangular gravel, with clay

140

minor gravel
LIGHT BROWN CLAYEY SAND (SC)
fine grained, with some medium grained

150

fine grained
BROWN SANDY CLAY (CL)
fine to medium grained, trace of coarse grained

LIGHT BROWN SAND (SP)
fine grained, with minor clay

160

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Log of Boring MCAS-10 (sheet 2 of 5)

Orange County Water District
Irvine, California

PLATE **8a**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
HK	9859,054.11		11/89		

Top of Casing NA

Equipment Air Rotary

Elevation NA Date 10/17/89

Depth ft | Sample

4" dia. Carbon Steel Blank Casing

3-7/8" dia. Borehole

160

BROWN CLAYEY SAND (SC)
fine grained

LIGHT BROWN SANDY CLAY (CL)
fine grained

170

color change to light gray-brown, with trace of medium-grained sand

180

color change to light brown, fine-grained sand

190

LIGHT BROWN CLAYEY SAND (SC)
fine to medium grained

BROWN SAND (SP)
fine to medium grained, with trace of subangular gravel
no recovery

200

color change to gray-brown, no gravel

210

with minor clay

220

LIGHT BROWN SANDY CLAY (CL)
fine to medium grained

LIGHT BROWN SAND (SP)
predominantly medium grained, with some fine grained

230

DARK BROWN AND LIGHT BROWN CLAY (CL)
laminated, with trace of fine-grained sand, high plasticity

LIGHT BROWN SAND (SP)
fine to medium grained

240

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Log of Boring MCAS-10 (sheet 3 of 5)

Orange County Water District
Irvine, California

PLATE 8b

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
HK	9859,054.11		11/89		

Top of Casing NA

Equipment Air Rotary

Elevation NA Date 10/17/89

Depth ft | Sample

240

LIGHT GRAY-BROWN SANDY CLAY (CL)
fine grained

250

260

LIGHT BROWN SAND (SP)
fine grained, with minor clay

270

fine to medium grained

280

4" dia. Carbon Steel Blank Casing

3-7/8" dia. Borehole

290

minor angular gravel

300

LIGHT GRAY-BROWN CLAYEY SAND (SC)
fine grained, trace of coarse-grained sand, clasts composed of fine-grained quartz arenite

LIGHT BROWN-GRAY CLAY (CL)
with some fine- to medium-grained sand

310

LIGHT BROWN SAND (SP)
fine grained

320

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Log of Boring MCAS-10 (sheet 4 of 5)

Orange County Water District
Irvine, California

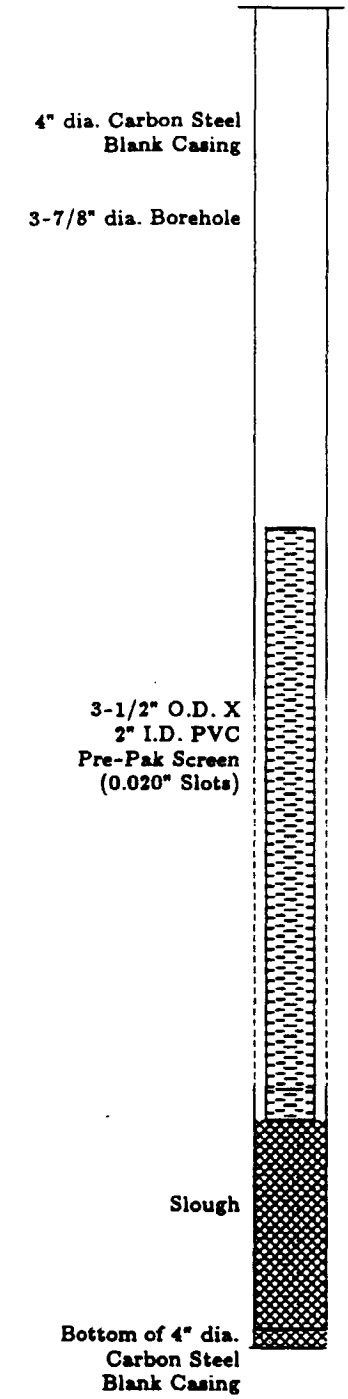
PLATE **8c**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
HK	9859,054.11	A-40	11/89		

Top of Casing NA

Equipment Air Rotary

Elevation NA Date 10/17/89



Depth ft	Sample	Description
320		no recovery
		color change to light gray-brown, medium grained, with trace of gravel
330		fine and medium grained
		TAN CLAYEY SAND (SC) fine grained
340		
350		LIGHT BROWN SANDY GRAVEL (GP) angular to subangular gravel, fine- to coarse-grained sand, with minor clay
		LIGHT BROWN SAND (SP) fine to medium grained, with trace of coarse grained, with minor clay
360		trace of subangular gravel
370		color change to light gray
380		color change to light brown
		predominantly fine grained
390		Boring terminated at 389.0 feet. Steel casing driven to 388.4 feet in a 3-7/8-inch-diameter borehole. Ground water encountered at 16.5 feet during drilling. Steel casing perforated with a mechanical wheel perforator. Boring converted to ground-water observation well on 11/6/89.
400		

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Log of Boring MCAS-10 (sheet 5 of 5)

Orange County Water District
Irvine, California

PLATE **8d**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
HK	9859,054.11		11/89		

Attachment B

WATER QUALITY ANALYSES

Table __. Water Sample Inorganic Constituent Analyses

Date Printed: 07/05/91

Well No.	Sample/ Screen Depth (feet)	Sample Date	GENERAL MINERALS (concentrations in milligrams/liter) HCO3	Ca	Cl	Mg	NO3-N	K	Na	SO4	TDS	EC	pH	METALS (concentrations in micrograms/lite Al	As	Ba	Cd	Cr	Cu	Fe	Pb	Mn	Se
Monitoring Wells Constructed and Sampled by OCWD:																							
MCAS-1	65	02/06/89	529	NT	132	48	14	2.2	287	517	1616	2330	7.8	22	9.1	86	(0.1)	3.8	15	14	4.0	31	(5.0)
		10/19/89	499	163	141	42	13	(0.1)	302	532	1520	1990	7.5	46	33	57	0.2	21	3.4	91	(1.0)	1.7	7.1
		05/14/90	495	164	142	40	11	1.6	284	429	1450	2007	7.5	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
		11/11/90	457	137	136	28	9.6	1.2	248	353	1330	1930	7.7	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
	155	02/07/89	334	340	430	106	27	3.6	158	779	2590	2994	7.4	23	14	92	(0.1)	(1.0)	(1.0)	7.9	(1.0)	15	15
		10/19/89	361	357	392	99	26	1.5	200	727	2470	2840	7.5	82	42	76	0.7	109	7.1	1500	(1.0)	43	33
		05/14/90	334	363	474	111	27	3.4	185	727	2460	2920	7.3	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
		11/11/90	314	371	380	60	20	3.3	190	571	2370	3110	7.5	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
		03/21/91	275	365	400	92	26	3.2	170	700	2500	3170	7.7	(1.0)	(5.0)	36	9.4	30	13	(1.0)	(1.0)	4.6	27
	215	02/07/89	207	180	344	49	14	3.7	172	326	1270	2035	7.6	33	(5.0)	79	0.3	(1.0)	1.4	36	NT	85	NT
		10/19/89	175	191	389	46	16	1.5	200	366	1460	2000	7.3	123	27	167	6	443	177	11	(1.0)	120	10
		05/17/90	206	206	346	50	17	3.4	161	341	1530	2000	7.2	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
		11/11/90	245	209	336	43	14	3.5	188	345	1350	2090	7.5	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
		03/21/91	215	197	339	44	14	3.9	174	350	1400	2070	7.8	3.4	(5.0)	52	5.6	18	24	22	(1.0)	6.6	15
	275	02/07/89	234	154	270	43	11	4.7	148	302	1420	1780	7.5	57	(5.0)	112	0.1	16	5.5	270	(1.0)	150	5.1
		10/19/89	213	178	303	47	13	1.5	165	326	1280	1810	7.4	178	(5.0)	121	0.9	131	7.3	2270	(1.0)	57	8.4
		05/17/90	269	196	302	49	11	3.7	161	341	1340	1810	7.2	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
		11/11/90	281	182	272	38	14	2.4	198	350	1360	2030	7.4	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
		03/21/91	210	172	290	40	12	4.0	165	330	1300	1860	7.8	(1.0)	(5.0)	43	4.8	18	23	(1.0)	(1.0)	36	9.7
	335	02/07/89	229	103	153	28	7.1	3.6	134	222	908	1316	7.7	14	(5.0)	66	0.1	(1.0)	2.0	17	(1.0)	95	(5.0)
		10/19/89	243	150	245	40	6.5	2.4	162	299	1100	1620	7.3	35	(5.0)	85	0.8	59	10	831	(1.0)	260	(5.0)
		05/17/90	233	110	157	25	4.7	3.1	149	200	946	1220	7.5	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
		11/11/90	268	106	138	23	7.5	3.0	154	240	900	1410	7.6	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
		03/21/91	233	102	154	23	6.8	3.4	150	230	870	1290	8.0	(1.0)	(5.0)	22	2.9	9.7	35	(1.0)	(1.0)	6.3	(5.0)
	455	02/06/89	217	74	132	30	(0.1)	4.7	126	208	788	1240	7.7	86	(5.0)	83	(0.1)	9.1	9.5	370	4.0	298	(5.0)
		10/19/89	191	106	175	26	(0.1)	1.5	138	227	818	1260	7.3	58	(5.0)	66	1	12	4.4	1320	(1.0)	279	(5.0)
		05/16/90	216	111	152	21	(0.1)	3.3	134	195	800	1160	7.2	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
		11/11/90	405	157	147	34	0.6	3.3	227	417	1280	1960	7.4	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
		03/19/91	300	137	183	31	0.1	4.3	184	348	1100	1644	7.2	17	(5.0)	35	3.9	14	53	7.1	(1.0)	190	(5.0)
	545	02/06/89	279	181	329	72	7.7	7.4	260	603	1760	2570	7.4	46	5.8	148	0.7	42	45	960	11	1100	(5.0)
		10/19/89	323	191	316	54	0.6	4.8	270	519	1610	2270	6.8	368	(5.0)	87	(0.1)	19	5.6	1580	(1.0)	1920	5.8
		05/14/90	315	134	210	35	(0.1)	6.1	221	336	1120	1719	7.1	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
		11/11/90	81	157	351	38	(0.1)	4.4	199	456	1460	2020	5.7	NT	NT	NT	NT	NT	NT	2100	NT	1700	NT
		03/19/91	99	78	311	15	(0.1)	3.1	162	90	820	1305	5.6	24	(5.0)	55	1.9	19	25	37	(1.0)	870	(5.0)
MCAS-2	45	02/16/89	425	160	417	56	31	1.8	348	630	1970	2780	7.7	0.5	(5.0)	75	(0.1)	4.3	(1.0)	(1.0)	(1.0)	42	17
		10/17/89	287	190	457	59	28	0.9	330	459	1880	2710	7.8	46	5.1	61	0.4	11	6.2	138	(1.0)	12	(5.0)
		05/18/90	381	229	473	61	32	1.5	376	513	2050	2820	7.4	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
		11/11/90	365	227	418	60	30.5	1.3	350	477	1980	2920	7.8	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
		04/05/91	411	246	440	52	36	1.1	346	440	2070	2890	7.9	(1.0)	(5.0)	17	6.4	22	26	3.4	(1.0)	4.3	21
	135	02/16/89	254	518	862	121	29	4.3	216	767	3120	3998	7.4	0.9	(5.0)	98	(0.1)	14	(1.0)	(1.0)	(1.0)	85	54
		10/17/89	208	516	933	119	31	0.6	275	830	3140	4110	7.5	60	(5.0)	102	33	89	7.2	601	(1.0)	40	61

AS-2 (cont'd.)

	135	05/18/90	244	478	841	123	36	4.6	275	827	3480	3960	7.2	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
		11/10/90	258	430	644	92	29	4.1	260	722	2900	3930	7.3	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
		04/05/91	276	523	795	96	30.4	4.2	256	810	2900	3900	7.7	(1.0)	(5.0)	34	11	31	27	3.7	(1.0)	6.1	42
	205	02/16/89	208	148	274	36	12	3.4	176	293	1190	1727	7.7	3.7	(5.0)	70	(0.1)	2.5	2.6	(1.0)	(1.0)	10	(5.0)
		10/17/89	200	149	278	40	12	3.3	172	307	1170	1720	8.0	40	(5.0)	75	0.3	8	7.9	36	(1.0)	2.7	9.4
		05/18/90	197	169	345	42	19	3.7	243	354	1280	1640	7.3	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
		04/05/91	282	230	320	40	18	3.7	189	362	1440	2080	8.0	(1.0)	(5.0)	30	4.8	11	19	(1.0)	(1.0)	(1.0)	22
	375	02/16/89	227	95	162	25	7.3	3.1	160	221	898	1319	7.7	6.1	(5.0)	74	(0.1)	4.3	(1.0)	18	(1.0)	44	8.0
		10/17/89	221	96	172	27	8.6	2.4	165	237	882	1360	7.7	124	5.2	64	0.3	7.6	4.6	133	(1.0)	4.8	(5.0)
		05/18/90	217	154	270	39	13	3.6	177	323	1220	1620	7.3	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
		04/05/91	268	190	290	39	14	3.0	188	359	1390	1990	8.0	1.7	(5.0)	27	4.7	9.2	34	3.5	(1.0)	31	19
	425	02/08/89	228	66	134	26	2.7	5.8	147	193	814	1210	7.9	120	6.3	63	(0.1)	11	3.6	260	(1.0)	34	(5.0)
		10/10/89	229	87	147	23	2.7	2.8	154	211	822	1230	7.6	269	5.5	64	0.4	19	7.5	3.9	(1.0)	56	49
		05/18/90	236	97	167	26	2.2	3.5	176	242	864	1160	7.4	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
		04/05/91	321	163	286	30	7.5	3.7	251	364	1390	2060	7.9	(1.0)	(5.0)	30	4.5	7.2	17	7.7	(1.0)	220	10
	495	02/08/89	269	137	450	44	4.1	9.3	384	501	1810	2656	7.6	19	5.8	91	(0.1)	29	3.8	560	1.7	550	16
		10/10/89	201	55	337	17	(0.1)	4	388	424	1320	2090	7.3	58	(5.0)	44	0.2	24	1.6	22	(1.0)	135	6.4
		05/18/90	272	139	460	37	0.2	6.1	373	383	1480	2320	6.5	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
		04/05/91	339	170	450	32	9.1	6.2	408	450	1850	2780	7.9	(1.0)	(5.0)	35	4.5	6.5	14	12	(1.0)	370	11
	555	02/08/89	240	190	596	48	6.8	8.9	467	649	2200	3205	7.5	44	7.8	87	0.3	28	1.0	1000	NT	640	25
		10/10/89	281	142	576	42	(0.1)	8	555	648	2210	3350	7.4	96	(5.0)	56	0.3	48	7.7	8	(1.0)	220	5.6
		05/18/90	327	157	618	43	(0.1)	9.6	561	663	2100	3220	6.7	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
		04/05/91	370	180	462	36	0.3	6.2	428	511	1860	2760	7.6	(1.0)	(5.0)	41	4.6	21	11	51	(1.0)	870	6.6
	625	02/08/89	195	170	528	50	(0.1)	9.7	345	518	1870	2745	6.9	46	5.2	89	(0.1)	140	8.6	3500	2.8	1600	(5.0
		10/10/89	195	93	431	24	(0.1)	7	404	402	1490	2370	6.6	47	(5.0)	60	0.2	48	2.8	9.2	(1.0)	1700	7.3
		05/18/90	201	64	450	18	(0.1)	6.7	437	362	1480	2220	6.3	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
		04/05/91	357	113	432	21	(0.1)	6.3	416	349	1550	2420	7.2	(1.0)	(5.0)	59	3.6	17	20	216	(1.0)	1600	5.7
MCAS-3	90	01/30/89	254	244	251	68	22	4.3	283	814	2072	2770	8.1	17	12	121	(0.1)	1.8	19	31	(1.0)	38	12
		10/10/89	254	282	265	76	25	3.6	300	899	2230	2930	7.8	19	5.5	88	0.3	23	2.6	0.4	(1.0)	70	(5.0
		05/17/90	201	282	348	95	26	4.1	289	981	2340	2860	7.1	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
		11/09/90	244	256	246	59	25	3.0	267	815	2100	2800	7.4	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
		04/04/91	267	337	318	73	28	3.8	300	918	2290	2870	8.1	1.3	6.9	30	8.0	24	28	9.8	(1.0)	11	50
	165	01/30/89	102	217	340	70	23	4.3	142	447	1562	2100	8.1	18	6.4	116	(0.1)	3.0	6.9	15	(1.0)	5.2	7.4
		10/09/89	174	235	350	70	21	3.3	132	440	1710	2210	7.3	278	(5.0)	133	1.2	6.6	19	2310	2.9	136	(5.0
		05/17/90	158	241	396	82	22	3.9	153	480	1690	2150	7.2	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
		11/09/90	181	245	326	60	19	3.8	132	400	1650	2110	7.3	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
		04/04/91	184	270	357	64	21	4.0	129	411	1630	2110	7.9	(1.0)	5.9	42	7.7	19	15	25	(1.0)	50	38
	225	01/30/89	178	98	180	24	23	2.6	128	120	768	1270	8.0	11	5.4	130	(0.1)	5.3	10	27	(1.0)	13	(5.0
		10/09/89	181	98	180	24	21	1.8	126	123	822	1270	7.4	58	5.2	125	0.4	18	5.3	100	(1.0)	5.7	43
		05/17/90	180	100	173	23	20	2.4	121	118	894	1190	7.4	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
		11/09/90	171	103	172	23	19	2.8	122	108	824	1260	7.4	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
		04/04/91	183	108	175	22	21	2.8	117	110	798	1210	8.0	9.3	6.9	50	3.2	9.1	19	18	(1.0)	(1.0)	8.4
	345	01/30/89	222	82	116	24	3.7	2.9	95	122	658	1040	8.2	27	6.4	89	(0.1)	2.2	11	17	(1.0)	11	(5.0
		10/09/89	214	85	123	24	4.3	1.8	98	146	688	993	7.4	244	5.6	83	0.4	18	4	814	(1.0)	26	11
		05/17/90	211	118	128	27	2.9	4.9	68	140	722	993	7.3	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
		04/04/91	224	97	121	23	5.0	3.1	89	138	694	1020	8.3	9.9	6.0	26	3.4	7.7	33	97	(1.0)	15	5.4
	425	01/30/89	234	78	96	22	1.9	3.1	114	162	656	1030	8.2	14	6.1	67	(0.1)	(1.0)	11	28	(1.0)	12	(5.0
		10/09/89	245	102	135	28	0.9	2.1	108	186	782	1130	7.3	51	(5.0)	79	0.4	15	4.7	1000	(1.0)	82	5.4
		05/17/90	239	92	88	24	0.7	2.7	87	157	684	935	7.4	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
		04/04/91	253	102	90	25	2.4	3.5	96	171	710	1050	8.0	(1.0)	6.0	27	3.5	7.9	16	(1.0)	(1.0)	25	7.1
	495	01/30/89	221	92	157	24	2.4	2.6	135	186	772	1230	8.2	18	5.2	70	(0.1)	4.4	5.2	130	(1.0)	15	(5.1

		10/09/89	206	92	153	23	2.4	1.8	132	189	804	1170	7.4	38	7.1	61	0.5	2.5	11	3380	(1.0)	67	7.4
		05/17/90	221	104	154	23	1.1	2.7	140	190	802	1130	7.2	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
		04/04/91	104	111	194	22	(0.1)	2.8	102	224	798	1210	6.9	41	(5.0)	59	8.2	11	25	2700	(1.0)	930	(5.0)
NCAS-4	181-238	10/23/89	180	106	153	20	4.8	(0.1)	142	205	886	1320	7.2	49	14	66	0.2	23	5.5	820	(1.0)	146	(5.0)
		02/23/90	188	94	156	27	3.9	2	129	232	996	1330	7.2	(1.0)	(5.0)	45	(0.1)	(1.0)	(1.0)	21	(1.0)	81	(5.0)
		07/06/90	142	108	173	28	4.6	2.3	146	270	884	1320	7.0	(1.0)	(5.0)	47	(1.0)	(1.0)	(1.0)	47	(1.0)	36	(5.0)
		02/02/91	156	112	170	29	4.5	2.8	142	267	852	1260	7.1	780	(5.0)	36	4.0	12	32	2000	(1.0)	30	(5.0)
NCAS-5	142-148	10/19/89	211	108	206	17	11	0.6	157	186	912	1410	7.7	45	(5.0)	120	0.3	4.6	2.7	100	1.6	81	6.9
		03/07/90	53	61	182	21	11	1.8	147	179	896	1380	7.4	(1.0)	(5.0)	50	0.1	2.8	(1.0)	310	1.2	120	(5.0)
		07/23/90	215	90	212	39	12	2.6	157	196	918	1480	7.6	28	(5.0)	72	(1.0)	3.2	(1.0)	870	(1.0)	81	(5.0)
		02/15/91	218	112	234	34	12	2.3	153	203	948	1480	7.2	35	(5.0)	38	3.5	25	13	790	(1.0)	56	6.0
NCAS-6	167-222	10/28/89	198	94	143	10	4	(0.1)	120	163	722	1150	7.2	100	12	172	0.3	2.1	56	102	(1.0)	264	(5.0)
		03/09/90	196	100	141	16	4	3.8	112	124	668	1050	7.4	38	9.2	140	0.1	2.2	11	860	(1.0)	220	(5.0)
		07/11/90	182	96	145	19	5.5	2.9	125	145	748	1174	7.2	20	(5.0)	20	0.2	3.1	(1.0)	400	(1.0)	73	(5.0)
		05/23/91	188	90	147	22	6.5	2.7	113	155	712	1160	7.3	(1.0)	(5.0)	56	3.8	12	23	380	(1.0)	22	(5.0)
NCAS-7	94	01/20/89	204	346	545	97	38	3.1	224	638	2560	3330	7.5	18	6.2	92	(0.1)	(1.0)	6.4	29	(1.0)	0.6	5.1
		08/02/90	328	415	493	67	40	2.6	270	716	2670	3480	7.2	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
		11/16/90	269	370	538	88	40	5.2	250	700	2640	3470	7.2	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
		03/22/91	325	350	447	87	34	3.7	245	607	2600	3460	7.8	6.5	(5.0)	39	8.9	32	64	25	(1.0)	3.9	11
	194	01/20/89	217	100	151	23	0.1	3.2	105	166	870	1190	7.6	18	6.6	51	(0.1)	(1.0)	7.3	10	(1.0)	15	(5.0)
		08/02/90	232	141	182	21	13	3.0	137	234	1030	1500	7.4	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
		11/17/90	183	94	119	19	5.8	2.5	91	150	710	1100	7.4	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
		03/22/91	212	119	141	21	7.1	2.8	111	179	780	1160	7.6	11	(5.0)	24	3.4	12	15	13	(1.0)	5.3	(5.0)
	354	01/20/89	203	65	122	17	3.1	3.8	119	126	650	1030	7.7	9.2	7.2	59	(0.1)	(1.0)	5.0	6.4	(1.0)	107	(5.0)
		08/02/90	211	112	162	17	7.4	2.9	132	173	846	1250	7.5	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
		11/17/90	171	86	143	18	5.7	2.8	106	148	724	1120	7.5	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
		03/22/91	203	97	148	19	5.3	3.0	117	160	720	1120	7.6	(1.0)	(5.0)	28	3.4	7.9	11	(1.0)	(1.0)	96	(5.0)
	444	01/20/89	196	77	137	17	(0.1)	2.7	109	132	670	1050	7.6	27	7.2	92	(0.1)	(1.0)	15	41	(1.0)	140	(5.0)
		08/02/90	227	185	261	28	(0.1)	4.2	167	347	1210	1760	7.2	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
		11/17/90	201	112	171	28	(0.1)	3.6	124	210	832	1310	7.6	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
		03/22/91	211	107	163	20	(0.1)	3.4	127	195	760	1190	7.7	13	15	33	3.9	8.0	11	17	(1.0)	140	(5.0)
	514	01/18/89	263	123	343	42	(0.1)	10	394	612	1720	2590	7.6	41	11	89	(0.1)	(1.0)	27	554	(1.0)	204	(5.0)
		08/02/90	301	376	488	72	35	3.7	289	812	2850	3730	7.1	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
		11/17/90	344	380	536	86	14	4.6	260	781	2630	3530	7.2	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
		03/22/91	403	442	580	85	(0.1)	4.8	262	791	2600	3480	7.3	(1.0)	(5.0)	43	9.2	27	11	(1.0)	(1.0)	220	(5.0)
	804	01/19/89	390	124	416	34	(0.1)	12	530	668	2030	3090	7.6	69	10	117	(0.1)	(1.0)	7.1	282	(1.0)	543	(5.0)
		08/02/90	339	410	494	59	29	4.2	287	784	2670	3570	7.1	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
		11/17/90	287	346	528	78	2.9	5.8	254	759	2490	3310	7.3	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
		03/22/91	276	402	579	84	(0.1)	7.0	257	791	2400	3500	7.2	20	(5.0)	48	7.9	27	21	68	(1.0)	510	(5.0)
	914	01/19/89	311	62	239	18	(0.1)	9.6	416	534	1480	2260	7.8	87	12	66	(0.1)	2.6	16	210	(1.0)	186	(5.0)
		08/02/90	333	458	584	75	32	4.3	315	787	2780	3620	7.1	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
		11/16/90	292	360	562	88	16	5.8	261	745	2430	3490	7.2	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
		03/25/91	336	331	387	86	2.9	6.6	260	755	2600	3400	7.2	(1.0)	(5.0)	44	8.9	26	17	(1.0)	(1.0)	220	7.8
	984	01/19/89	363	141	443	38	(0.1)	12	495	671	2070	3070	7.3	95	8	90	(0.1)	(1.0)	22	2160	(1.0)	850	(5.0)
		08/02/90	183	428	562	68	(0.1)	4.3	301	927	2620	3360	7.1	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
		11/16/90	202	340	483	73	(0.1)	5.5	340	805	2380	3180	6.5	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
		03/25/91	280	262	391	61	(0.1)	5.4	236	583	2200	2930	6.6	(1.0)	(5.0)	49	7.3	23	13	480	(1.0)	750	(5.0)
	1104	01/18/89	355	196	434	44	(0.1)	12	401	632	2034	2950	6.8	120	12	113	(0.1)	5.4	13	3280	(1.0)	883	(5.0)
		08/02/90	223	156	148	19	5.6	4.7	97	231	864	1290	7.1	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
		11/16/90	370	370	562	90	14	4.0	280	749	2690	3590	7.1	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
		03/25/91	421	440	582	92	2.5	4.6	269	721	2700	3530	7.2	(1.0)	(5.0)	38	9.8	28	15	7.1	(1.0)	620	6.5

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MCAS-8	392-410	02/06/90	201	27	399	5.4	(0.1)	2.4	296	(0.5)	860	1570	7.9	(1.0)	(5.0)	263	(0.1)	6.6	(1.0)	1282	(1.0)	60	(5.0)
		12/01/90	188	27	423	4.7	(0.1)	2.5	302	(0.5)	842	1560	7.9	(1.0)	(5.0)	160	(1.0)	(1.0)	14	30	(1.0)	50	(5.0)
		05/22/91	194	28	394	4.4	(0.1)	2.4	294	(0.5)	860	1544	7.9	(1.0)	(5.0)	180	(1.0)	(1.0)	9.8	62	(1.0)	50	(5.0)
MCAS-9	372-438	10/26/89	166	53	51	7.6	0.5	(0.1)	78	120	454	698	7.5	48	6.7	76	0.2	4	3.5	113	(1.0)	238	(5.0)
		02/09/90	186	52	51	14	1.0	2.2	80	123	536	722	7.3	(1.0)	(5.0)	46	0.4	153	(1.0)	1180	(1.0)	80	(5.0)
		07/13/90	200	62	56	14	1.1	2.5	80	129	564	744	7.6	29	(5.0)	46	0.7	2.0	(1.0)	1400	(1.0)	64	(5.0)
		03/18/91	217	73	59	15	(0.1)	2.8	89	135	560	832	7.5	21	(5.0)	31	2.9	15	16	1.3	(1.0)	37	5.4
MCAS-10	355-375	01/31/90	227	78	99	34	2.3	2.9	119	245	826	1250	7.4	(4)	5.2	22	0.6	16	(0.09)	962	(1.0)	110	(5.0)
		07/20/90	273	90	119	53	2.4	3.2	121	233	864	1360	7.2	34	(5.0)	30	0.3	(1.0)	(1.0)	980	(1.0)	35	(5.0)
		02/03/91	295	103	123	43	2.5	3.3	126	264	914	1220	7.4	20	(5.0)	20	4.0	12	26	1100	(1.0)	48	(1.0)

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Table __. Water Sample Analyses Showing Those VOCs Found Above Reportable Limits

Date Printed: 07/05/91

Well No.	Sample/ Screen Depth (feet)	Date Sampled	EC	TDS	PCE	trans-1,2 DCE	1,1,1 TCA	1,2 DCA	CCl4	Chloroform	Chloro-benzene	Ethyl-benzene	Toluene
Monitoring Wells Constructed and Sampled by OCWD:													
MCAS-1	65	01/04/89	2191	ND	ND	ND	TR*		ND	2.0	ND	ND	TR*
		02/06/89	2329	ND	ND	ND	ND		ND	2.0	ND	ND	ND
		05/05/89	2323	ND	ND	ND	ND		ND	2.1	ND	ND	ND
		10/19/89	2110	ND	ND	ND	ND		ND	1.5	ND	ND	ND
		02/08/90	NT	ND	ND	ND	ND		ND	1.0	ND	ND	ND
		05/14/90	2007	ND	ND	ND	ND		ND	0.7	ND	ND	ND
		12/01/90	2020	ND	ND	ND	ND		ND	1.2	ND	ND	ND
	155	01/04/89	2905	ND	ND	ND	TR*		ND	ND	ND	ND	TR*
		02/06/89	3050	ND	ND	ND	ND		ND	ND	ND	ND	ND
		05/05/89	2952	ND	ND	ND	ND		ND	ND	ND	ND	ND
		10/19/89	2970	ND	ND	ND	ND		ND	ND	ND	ND	ND
		02/08/90	NT	ND	ND	ND	ND		ND	ND	ND	ND	ND
		05/17/90	2920	ND	ND	ND	ND		ND	ND	ND	ND	ND
		12/01/90	3100	ND	ND	ND	ND		ND	ND	ND	ND	ND
		03/21/91	3590	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	215	01/04/89	1871	[illegible].8	ND	ND	TR*		ND	ND	ND	ND	TR*
		02/06/89	1973	[illegible].5	ND	ND	ND		ND	ND	ND	ND	ND
		05/05/89	2009	1.6	ND	ND	ND		ND	ND	ND	ND	ND
		10/19/89	1950	1.3	ND	ND	ND		ND	ND	ND	ND	ND
		02/08/90	NT	[illegible].5	ND	ND	ND		ND	ND	ND	ND	ND
		05/17/90	2000	1.6	ND	ND	ND		ND	ND	ND	ND	ND
		12/01/90	2030	[illegible].0	ND	ND	ND		ND	ND	ND	ND	ND
		03/21/91	2790	1.9	ND	ND	ND	ND	ND	ND	ND	ND	ND
	275	01/04/89	1713	[illegible].8	ND	ND	TR*		ND	TR	ND	ND	TR*
		02/07/89	1178	1.2	ND	ND	ND		ND	TR	ND	ND	ND
		05/05/89	1694	8.1	ND	ND	ND		ND	TR	ND	ND	ND
		10/19/89	1800	3.8	ND	ND	ND		ND	ND	ND	ND	ND
		02/08/90	NT	[illegible].5	ND	ND	ND		ND	ND	ND	ND	ND
		05/17/90	1810	[illegible].6	ND	ND	ND		ND	ND	ND	ND	ND
		12/01/90	2040	0.7	ND	ND	ND		ND	TR	ND	ND	ND
		03/21/91	2660	[illegible].0	ND	ND	ND	ND	ND	ND	ND	ND	ND
	335	01/04/89	NT	34.6	ND	TR	ND		ND	TR	ND	ND	ND
		02/06/89	NT	39.1	ND	TR	ND		ND	0.5	ND	ND	ND
		05/05/89	1316	47.5	ND	TR	ND		ND	TR	ND	ND	ND
		10/19/89	1580	17.7	ND	ND	ND		ND	ND	ND	ND	ND
		02/08/90	NT	36.5	ND	ND	ND		ND	ND	ND	ND	ND
		05/17/90	1220	33.4	ND	ND	ND		ND	TR	ND	ND	ND
		12/01/90	1345	32.1	ND	ND	ND		ND	TR	ND	ND	ND
		03/21/91	1498	19.7	ND	ND	ND	ND	ND	ND	ND	ND	ND
	455	01/04/89	1477	45.1	ND	1.4	ND		ND	TR	ND	ND	ND
		02/06/89	1189	51.9	ND	1.8	ND		ND	TR	ND	ND	ND
		05/05/89	1162	46.1	ND	1.9	ND		ND	ND	ND	ND	ND
		10/19/89	1240	30.0	ND	1.4	ND		ND	ND	ND	ND	ND
		02/08/90	NT	38.0	ND	3.3	ND		ND	ND	ND	ND	ND

MCAS-1 (cont'd.)

	455	05/14/90	1160	8.3	ND	1.3	ND		ND	ND	ND	ND	ND
		12/01/90	1956	3.8	ND	ND	ND		ND	0.6	ND	ND	ND
		03/19/91	[illegible]	6.4	ND	ND	ND	ND	ND	ND	ND	ND	ND
	545	01/04/89	2550	TR	ND	ND	ND		ND	0.7	TR	ND	ND
		02/06/89	2534	ND	ND	ND	ND		ND	0.5	TR	ND	ND
		05/05/89	2420	ND	ND	ND	ND		ND	TR	TR	ND	ND
		10/19/89	2260	ND	ND	ND	ND		ND	ND	0.5	ND	ND
		02/08/90	NT	ND	ND	ND	ND		ND	ND	TR	ND	ND
		05/14/90	1719	ND	ND	ND	ND		ND	ND	TR	ND	ND
		12/01/90	1914	ND	ND	ND	ND		ND	ND	1.6	1.0	0.6
		03/19/91	2040	ND	ND	ND	ND	ND	ND	ND	1.0	0.9	TR
MCAS-2	45	12/27/88	2732	ND	ND	ND	ND		ND	ND	ND	ND	ND
		02/07/89	2900	ND	ND	ND	ND		ND	ND	ND	ND	ND
		05/03/89	2904	ND	ND	ND	ND		ND	ND	ND	ND	ND
		10/17/89	2820	ND	ND	ND	ND		ND	ND	ND	ND	ND
		03/13/90	NT	ND	ND	ND	ND		ND	ND	ND	ND	ND
		05/18/90	2820	ND	ND	ND	ND		ND	ND	ND	ND	ND
		12/01/90	2920	ND	ND	ND	ND		ND	ND	ND	ND	ND
		04/05/91	2870	ND	ND	ND	ND	ND	ND	TR	ND	ND	ND
	135	12/27/88	3939	ND	ND	ND	ND		ND	ND	ND	ND	ND
		02/07/89	3943	ND	ND	ND	ND		ND	ND	ND	ND	ND
		05/03/89	4211	ND	ND	ND	ND		ND	ND	ND	ND	ND
		10/17/89	4143	ND	ND	ND	ND		ND	ND	ND	ND	ND
		03/13/90	NT	ND	ND	ND	ND		ND	ND	ND	ND	ND
		05/18/90	3960	ND	ND	ND	ND		ND	ND	ND	ND	ND
		11/10/90	NT	ND	ND	ND	ND		ND	ND	ND	ND	ND
		04/05/91	3920	ND	ND	ND	ND	ND	ND	0.5	ND	ND	ND
	205	12/27/88	1699	1.4	ND	ND	ND		ND	ND	ND	ND	ND
		02/07/89	1810	1.8	TR	ND	ND		ND	ND	ND	ND	ND
		05/03/89	1839	2.0	TR	ND	ND		ND	ND	ND	ND	ND
		10/17/89	1800	3.0	TR	ND	ND		ND	ND	ND	ND	ND
		03/13/90	NT	2.2	ND	ND	ND		ND	ND	ND	ND	ND
		05/18/90	1640	1.8	ND	ND	ND		ND	ND	ND	ND	ND
		04/05/91	2110	3.3	TR	ND	ND	ND	ND	0.6	ND	ND	ND
	375	12/27/88	1280	34.6	ND	ND	ND		ND	TR	ND	ND	ND
		02/06/89	1376	29.5	ND	ND	ND		ND	TR	ND	ND	ND
		05/03/89	1384	32.2	TR	ND	ND		ND	TR	ND	ND	ND
		10/17/89	1390	37.2	TR	ND	ND		ND	TR	ND	ND	ND
		03/13/90	NT	25.6	ND	ND	ND		ND	TR	ND	ND	ND
		05/18/90	1620	5.3	TR	ND	ND		ND	ND	ND	ND	ND
		04/05/91	2360	11.1	ND	ND	ND	ND	ND	1.4	ND	ND	ND
	425	12/27/88	1172	38.9	ND	0.6	ND		ND	ND	ND	ND	ND
		02/08/89	1256	37.0	ND	0.5	ND		ND	ND	ND	ND	ND
		05/03/89	1273	33.9	ND	TR	ND		ND	ND	ND	ND	ND
		10/10/89	1310	51.9	ND	0.5	ND		ND	ND	ND	ND	ND
		03/13/90	NT	28.7	ND	TR	ND		ND	ND	ND	ND	ND
		05/18/90	1160	22.5	ND	ND	ND		ND	ND	ND	ND	ND
		04/05/91	2030	6.1	ND	ND	ND	ND	ND	TR	ND	ND	ND
	495	12/27/88	2637	ND	ND	ND	ND		ND	ND	ND	ND	ND
		02/08/89	2807	ND	ND	ND	ND		ND	ND	ND	ND	ND
		05/03/89	2614	ND	ND	ND	ND		ND	ND	ND	ND	ND
		10/10/89	2130	ND	ND	ND	ND		ND	ND	ND	ND	ND
		03/13/90	NT	ND	ND	ND	ND		ND	ND	TR	0.6	ND
		05/18/90	2320	ND	ND	ND	ND		ND	ND	0.8	0.8	ND
		04/05/91	2840	ND	ND	ND	ND	ND	ND	TR	ND	ND	ND

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MCAS-2 (cont'd.)	555	12/27/88	3033	ND	ND	ND	ND		ND	ND	ND	ND	0.5
		02/09/89	3371	ND	ND	ND	ND		ND	ND	ND	ND	ND
		05/03/89	3340	ND	ND	ND	ND		ND	ND	0.6	ND	TR
		10/10/89	3460	ND	ND	ND	ND		ND	ND	1.0	ND	TR
		03/13/90	NT	ND	ND	ND	ND		ND	ND	1.0	0.7	0.5
		05/18/90	3220	ND	ND	ND	ND		ND	ND	0.9	0.6	TR
		04/05/91	2450	ND	ND	ND	ND	ND	ND	ND	ND	TR	ND
	625	12/27/88	2609	ND	ND	ND	ND		ND	ND	TR	ND	0.9
		02/08/89	2918	ND	ND	ND	ND		ND	ND	0.6	0.5	0.6
		05/03/89	2904	ND	ND	ND	ND		ND	ND	0.7	1.0	TR
		10/10/89	2450	ND	ND	ND	ND		ND	ND	0.7	1.3	TR
		03/13/90	NT	ND	ND	ND	ND		ND	ND	0.8	1.2	TR
		05/18/90	2220	ND	ND	ND	ND		ND	ND	0.6	0.7	TR
		04/05/91	2430	ND	ND	ND	ND	ND	ND	ND	ND	TR	ND
MCAS-3	90	12/06/88	2606	ND	ND	ND	ND		ND	2.8	ND	ND	ND
		01/30/89	2750	ND	ND	ND	ND		ND	2.1	ND	ND	ND
		04/13/89	2682	ND	ND	ND	ND		ND	2.1	ND	ND	ND
		10/10/89	2530	ND	ND	ND	ND		ND	1.6	ND	ND	ND
		02/09/90	NT	ND	ND	ND	ND		ND	1.1	ND	ND	ND
		03/13/90	NT	ND	ND	ND	ND		ND	0.8	ND	ND	ND
		05/17/90	2660	ND	ND	ND	ND		ND	0.5	ND	ND	ND
		11/09/90	2630	ND	ND	ND	ND		ND	0.7	ND	ND	ND
		04/04/91	2650	ND	ND	ND	ND		ND	1.2	ND	ND	ND
	165	12/06/88	1929	ND	ND	ND	ND		ND	0.7	ND	ND	ND
		01/30/89	2036	ND	ND	ND	ND		ND	TR	ND	ND	ND
		04/13/89	2131	ND	ND	ND	ND		ND	TR	ND	ND	ND
		10/10/89	2210	6.8	ND	ND	ND		ND	1.0	ND	ND	ND
		02/09/90	NT	14.6	ND	ND	ND		ND	0.5	ND	ND	ND
		03/13/90	NT	18.1	TR	ND	ND		ND	TR	ND	ND	ND
		05/17/90	2150	7.6	ND	ND	ND		ND	TR	ND	ND	ND
		11/09/90	2010	15.7	0.7	ND	ND		ND	0.7	ND	ND	ND
		04/04/91	2007	23.4	1.1	ND	ND		ND	2.7	ND	ND	ND
	225	12/06/88	1263	ND	ND	ND	ND		ND	ND	ND	ND	ND
		01/30/89	1243	ND	ND	ND	ND		ND	ND	ND	ND	ND
		04/13/89	1143	ND	ND	ND	ND		ND	ND	ND	ND	ND
		10/09/89	1273	ND	ND	ND	ND		ND	ND	ND	ND	ND
		02/09/90	NT	ND	ND	ND	ND		ND	ND	ND	ND	ND
		03/13/90	NT	ND	ND	ND	ND		ND	ND	ND	ND	ND
		05/17/90	1190	ND	ND	ND	ND		ND	ND	ND	ND	ND
		11/09/90	1220	ND	ND	ND	ND		ND	ND	ND	ND	ND
		04/04/91	1208	ND	ND	ND	ND		ND	ND	ND	ND	ND
	345	12/06/88	1041	ND	ND	ND	TR		ND	ND	ND	ND	ND
		01/30/89	1013	ND	ND	ND	ND		ND	ND	ND	ND	ND
		04/13/89	1073	ND	ND	ND	ND		ND	ND	ND	ND	ND
		10/09/89	1050	ND	ND	ND	ND		ND	ND	ND	ND	ND
		02/09/90	NT	ND	ND	ND	ND		ND	ND	ND	ND	ND
		05/17/90	993	ND	ND	ND	ND		ND	ND	ND	ND	ND
		04/04/91	1010	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	425	12/06/88	1203	ND	ND	ND	ND		ND	ND	ND	ND	ND
		01/30/89	1013	ND	ND	ND	ND		ND	ND	ND	ND	ND
		04/13/89	1044	ND	ND	ND	ND		ND	ND	ND	ND	ND
		10/09/89	1190	ND	ND	ND	ND		ND	ND	ND	ND	ND
		02/09/90	NT	ND	ND	ND	ND		ND	ND	ND	ND	ND
		05/17/90	935	ND	ND	ND	ND		ND	ND	ND	ND	ND
		04/04/91	1332	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	495	12/06/88	1203	ND	ND	ND	ND		ND	ND	ND	ND	ND

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MCAS-3 (cont'd.)	495	01/30/89	1215	ND	ND	ND	ND		ND	ND	ND	ND	ND
		04/13/89	1265	ND	ND	ND	ND		ND	ND	ND	ND	ND
		10/09/89	1220	ND	ND	ND	ND		ND	ND	ND	ND	ND
		02/09/90	NT	ND	ND	ND	ND		ND	ND	ND	ND	ND
		05/17/90	1130	ND	ND	ND	ND		ND	ND	ND	ND	ND
		04/04/91	1268	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MCAS-4	181-238	10/23/89	1320	3.1	ND	ND	ND		ND	5.8	ND	ND	ND
		02/23/90	1330	3.1	ND	ND	ND		ND	ND	ND	ND	ND
		07/06/90	1320	3.4	ND	ND	ND		ND	ND	ND	ND	ND
		11/01/90	NT	4.0	TR	ND	ND		ND	ND	ND	ND	ND
		02/02/91	1320	3.3	ND	ND	ND		ND	ND	ND	ND	ND
MCAS-5	142-148	10/19/89	1430	1.2	ND	ND	ND		ND	TR	ND	ND	ND
		03/07/90	1380	1.4	ND	ND	ND		ND	ND	ND	ND	ND
		07/23/90	1480	1.2	ND	ND	ND		ND	ND	ND	ND	ND
		11/16/90	NT	1.1	ND	ND	ND		ND	ND	ND	ND	ND
		02/15/91	1490	ND	ND	ND	ND		ND	1.2	ND	ND	ND
MCAS-6	167-222	10/28/89	1150	2.2	ND	ND	ND		ND	TR	TR	ND	ND
		03/09/90	1050	1.5	ND	ND	ND		ND	ND	ND	ND	ND
		07/11/90	1174	2.5	ND	ND	ND		ND	ND	ND	ND	ND
		11/01/90	NT	2.5	ND	ND	ND		ND	ND	ND	ND	ND
MCAS-7	94	10/17/88	3210	ND	ND	ND	ND		ND	ND	ND	ND	ND
		11/30/88	3294	ND	ND	ND	ND		ND	ND	ND	ND	ND
		01/20/89	3211	ND	ND	ND	ND		ND	ND	ND	ND	ND
		05/04/89	3480	ND	ND	ND	ND		ND	ND	ND	ND	ND
		08/02/90	3480	ND	ND	ND	ND		ND	ND	ND	ND	ND
		11/16/90	3700	ND	ND	ND	ND		ND	ND	ND	ND	ND
		03/22/91	3370	ND	ND	ND	ND		ND	TR	ND	ND	ND
	194	10/17/88	NT	3.0	ND	ND	ND		ND	ND	ND	ND	ND
		11/30/88	1203	2.6	ND	ND	ND		ND	ND	ND	ND	ND
		01/20/89	1141	3.2	ND	ND	ND		ND	ND	ND	ND	ND
		05/04/89	1190	2.7	ND	ND	ND		ND	ND	ND	ND	ND
		08/02/90	1500	1.0	ND	ND	ND		ND	ND	ND	ND	ND
		11/17/90	1182	0.8	ND	ND	ND		ND	ND	ND	ND	TR
		03/22/91	1355	1.1	ND	ND	ND		ND	ND	ND	ND	ND
	354	10/17/88	1195	20.0	ND	TR	ND		ND	ND	ND	ND	ND
		11/30/88	1076	24.8	ND	0.5	ND		ND	ND	ND	ND	ND
		01/20/89	1003	19.8	ND	TR	ND		ND	ND	ND	ND	ND
		05/04/89	1860	13.9	ND	ND	ND		ND	ND	ND	ND	ND
		08/02/90	1250	30.3	ND	ND	ND	ND	ND	ND	ND	ND	0.6
		11/17/90	1164	61	TR	TR	ND	0.5	ND	ND	ND	ND	ND
		03/22/91	1220	32.2	ND	ND	ND	1.8	ND	0.6	ND	ND	ND
	444	10/17/88	1050	19.4	ND	4.1	ND		ND	ND	ND	ND	ND
		11/30/88	1036	19.7	ND	4.2	ND		ND	ND	ND	ND	ND
		01/19/89	1005	23.6	ND	4.1	ND		ND	ND	ND	ND	ND
		05/04/89	1090	24.8	ND	5.3	ND		ND	ND	ND	ND	ND
		08/02/90	1760	9.9	ND	ND	ND		ND	ND	ND	ND	TR
		11/17/90	1378	36.0	ND	ND	ND		ND	ND	ND	ND	ND
		03/22/91	1242	23.6	ND	ND	ND	ND	ND	TR	ND	ND	ND
	514	10/17/88	3000	ND	ND	ND	ND		ND	ND	ND	ND	ND
		11/30/88	2797	ND	ND	ND	TR		ND	ND	ND	ND	TR
		01/18/89	2500	ND	ND	ND	ND		ND	ND	ND	ND	ND
		05/04/89	2300	ND	ND	ND	ND		ND	ND	ND	ND	ND
		08/02/90	3730	ND	ND	ND	ND		ND	ND	ND	ND	ND
		11/17/90	3590	ND	ND	ND	ND		ND	ND	ND	ND	ND
		03/22/91	3400	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

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MCAS-7 (cont'd.)	804	10/17/88	3242	ND	0.6	ND	ND		ND	ND	0.6	ND	0.8
		11/30/88	3112	ND	0.7	ND	0.6		ND	ND	ND	TR	0.7
		01/19/89	2964	ND	TR	ND	ND		ND	ND	0.7	ND	ND
		05/04/89	2570	ND	ND	ND	ND		ND	ND	ND	ND	TR
		08/02/90	3570	ND	ND	ND	ND		ND	ND	ND	ND	0.5
		11/17/90	3350	ND	ND	ND	ND		ND	ND	ND	ND	ND
		03/22/91	3200	ND	ND	ND	ND	ND	ND	ND	ND	ND	TR
	916	10/17/88	2468	ND	0.8	ND	ND		ND	ND	ND	TR	TR
		11/30/88	2244	ND	0.8	ND	TR		ND	ND	ND	TR	0.6
		01/19/89	2305	ND	TR	ND	ND		ND	ND	ND	ND	ND
		05/04/89	2280	ND	0.6	ND	ND		ND	ND	ND	TR	ND
		08/02/90	3620	ND	ND	ND	ND		ND	ND	ND	ND	ND
		11/16/90	3670	ND	ND	ND	ND		ND	ND	ND	ND	TR
		03/25/91	3580	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	984	10/17/88	3194	ND	0.7	ND	ND		ND	ND	ND	TR	0.9
		11/30/88	3093	ND	0.6	ND	TR		ND	ND	TR	TR	0.8
		01/19/89	2974	ND	0.5	ND	TR		ND	ND	TR	ND	TR
		05/04/89	3180	TR	TR	ND	ND		ND	ND	ND	0.9	TR
		08/02/90	3360	ND	ND	ND	ND		ND	ND	ND	TR	TR
		11/16/90	3320	ND	ND	ND	ND		ND	ND	ND	TR	ND
		03/25/91	3080	ND	ND	ND	ND	ND	ND	ND	ND	0.6	TR
	1104	10/17/88	3049	ND	0.7	ND	ND		ND	ND	ND	0.8	1.0
		11/30/88	2892	ND	0.5	ND	TR		ND	ND	TR	0.9	0.7
		01/18/89	2866	ND	TR	ND	ND		ND	ND	TR	0.7	TR
		05/04/89	2950	ND	TR	ND	ND		ND	ND	TR	1.0	TR
		08/02/90	1290	ND	ND	ND	ND		ND	ND	ND	ND	ND
		11/16/90	3770	ND	ND	ND	ND		ND	ND	ND	TR	1.5
		03/25/91	3320	ND	ND	ND	ND	ND	ND	ND	ND	TR	1.2
MCAS-8	392-410	11/03/89	NT	ND	ND	ND	ND		ND	3.0	ND	ND	0.9
		02/06/90	1570	ND	ND	ND	ND		ND	TR	ND	ND	1.6
		12/02/90	1560	ND	ND	ND	ND		ND	ND	ND	ND	ND
MCAS-9	372-445	10/27/89	721	TR	ND	ND	ND		ND	1.8	TR	ND	ND
		02/12/90	722	1.0	ND	ND	ND		ND	ND	ND	ND	ND
		07/13/90	744	1.5	ND	ND	ND		ND	ND	ND	ND	ND
		11/17/90	NT	1.3	ND	ND	ND		ND	ND	ND	ND	ND
		03/18/91	835	1.8	ND	ND	ND		ND	ND	ND	ND	ND
MCAS-10	355-375	11/07/89	NT	ND	ND	ND	ND		ND	9.7	ND	ND	ND
		01/31/90	1250	ND	ND	ND	ND		ND	ND	ND	ND	ND
		07/20/90	1350	ND	ND	ND	ND		ND	ND	ND	ND	ND
		11/18/90	1300	ND	ND	ND	ND		ND	ND	ND	ND	ND
		02/03/91	1290	ND	ND	ND	ND		ND	ND	ND	ND	ND

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Attachment C

PRESSURE PROFILES FOR MULTIPLE PORT MONITORING WELLS

PRESSURE PROFILE FOR WELL NO. MCAS-1

PIEZOMETRIC LEVELS (FEET ABOVE MSL)

DATE	ZONE NO.:	1	2	3	4	5	6	7
	ZONE DEPTH: (FEET BGS)	65	155	215	275	335	455	545
12/29/88		114.7	113.5	111.0	99.0	99.0	97.6	90.2
1/10/88		110.0	113.6	111.8	100.2	100.7	99.2	91.9
2/23/89		115.1	113.9	112.6	100.6	101.0	99.6	92.8
3/30/89		115.1	113.5	110.2	94.6	94.7	92.6	91.6
5/5/89		115.1	113.1	108.0	83.3	82.4	79.8	84.7
6/2/89		114.8	112.7	105.6	82.1	81.5	78.2	80.8
7/5/89		115.6	112.4	102.8	82.1	81.7	79.3	80.7
8/17/89		115.1	111.9	100.0	74.8	74.6	71.7	75.1
9/8/89		115.4	111.7	98.6	70.3	69.2	65.7	71.9
10/24/89		114.4	111.4	98.7	71.0	70.1	66.0	70.1
12/3/89		114.4	112.0	101.0	77.6	76.9	74.3	73.3
1/15/90		114.4	112.3	105.0	85.4	86.2	81.3	79.0
2/13/90		114.1	112.4	107.6	95.4	95.6	93.8	86.9
3/20/90		114.1	112.6	108.0	95.9	95.8	94.3	89.8
4/16/90		NO MOSI	112.8	107.3	94.3	NO MOSDA	92.5	90.4
5/16/90		114.4	112.1	103.6	84.7	84.8	82.8	85.2
6/28/90		114.1	111.6	101.6	80.7	80.2	78.0	81.2
7/10/90		113.9	111.5	100.7	80.1	79.2	77.0	80.0
8/8/90		113.7	110.9	97.5	78.4	69.2	66.7	72.6
10/15/90		112.7	110.4	96.1	68.0	67.0	63.6	68.3
10/31/90		112.6	109.5	92.0	58.7	58.2	53.2	62.8
12/4/90		112.5	109.4	93.0	62.0	61.5	57.2	62.5
1/8/91		112.3	109.4	94.7	66.7	66.7	62.8	64.4
1/29/91		112.1	109.9	95.6	67.4	67.1	63.1	66.6
3/8/91		112.3	109.8	100.7	81.3	81.6	79.7	73.5
4/17/91		143.6	143.6	143.6	143.6	143.6	143.6	143.6

RETROFIT

PRESSURE PROFILE DATA FOR WELL NO. MCAS-2

PIEZOMETRIC LEVELS (FEET ABOVE MSL)

DATE	ZONE NO.:	1	2	3	4	5	6	7	8
	ZONE DEPTH: (FEET BGS)	45	135	205	375	425	495	555	625
10/26/88		126.2	124.2	118.2	108.7	107.7	109.1	112.2	112.4
12/27/88		125.1	124.1	120.4	113.6	115.0	108.0	108.6	107.7
2/23/89		125.5	125.0	121.6	115.9	117.7	113.8	114.6	112.8
3/30/89		125.4	124.7	119.8	108.0	107.4	113.6	114.4	112.1
5/3/89		125.1	124.6	117.4	99.1	99.3	110.6	111.1	110.2
6/2/89		128.2	124.1	117.0	98.9	100.0	106.2	106.6	106.1
7/5/89		125.0	124.2	116.4	99.0	99.9	104.7	105.0	105.0
8/21/89		124.7	123.6	114.2	91.4	92.1	101.2	101.7	101.6
9/8/89		124.7	123.6	113.2	84.5	83.3	99.5	99.8	100.3
10/24/89		124.5	123.1	113.4	86.1	85.1	95.3	95.8	95.6
12/3/89		125.4	123.7	116.0	94.9	95.1	96.1	96.1	95.4
2/13/90		125.2	124.2	118.8	110.5	110.8	104.0	104.9	102.8
3/20/90		124.7	123.9	118.5	109.4	109.8	107.4	108.0	105.7
4/16/90		124.7	123.7	118.6	109.0	109.9	108.5	109.2	106.9
5/16/90		124.5	123.5	116.1	102.8	103.4	107.8	108.1	100.0
6/28/90		124.0	123.2	113.3	99.6	97.4	105.5	106.0	103.6
7/10/90		124.0	122.8	113.2	100.7	99.5	104.3	105.1	103.3
8/8/90	RETOFIT	121.5	122.0	109.2	93.3	86.1	101.2	101.9	101.0
10/17/90		122.4	121.5	111.8	88.5	88.5	95.4	101.5	98.4
10/31/90		122.4	120.5	109.3	84.0	85.1	93.1	95.1	94.2
12/4/90		122.3	120.5	109.8	84.4	84.8	92.2	93.1	92.5
1/8/91		122.1	120.4	111.3	91.9	93.8	93.2	94.4	92.8
1/31/91		122.0	121.1	111.9	91.3	93.0	95.6	96.5	95.2
3/7/91		122.2	120.6	113.9	100.3	101.7	96.2	97.4	95.6
4/17/91		122.2	121.5	115.9	106.3	108.1	102.0	103.0	99.8
5/30/90		122.9	121.4	113.7	97.3	97.7	102.7	103.5	102.0

PRESSURE PROFILE DATA FOR WELL NO. MCAS-3

PIEZOMETRIC LEVELS (FEET ABOVE MSL)

DATE	ZONE NO.:	1	2	3	4	5	6
	ZONE DEPTH: (FEET BGS)	90	165	225	345	425	495
11/16/88		139.5	140.6	140.0	135.5	133.4	135.4
12/29/88		139.7	141.4	141.7	138.2	136.7	138.3
2/23/89		141.0	141.5	142.0	139.8	138.5	140.4
3/24/89		141.0	141.4	141.2	136.1	135.0	137.3
5/5/89		140.9	141.2	138.1	125.1	121.8	125.0
6/2/89		140.7	141.0	138.1	126.3	123.3	126.3
7/5/89		140.5	140.8	137.0	123.5	120.5	122.6
8/17/89		140.5	140.6	135.8	120.7	118.2	119.6
9/8/89		140.1	140.4	134.0	117.2	109.9	113.0
10/24/89		138.0	140.1	134.1	118.2	112.8	115.9
12/4/89		138.0	140.2	136.7	128.2	123.0	125.2
1/15/90		138.2	140.8	139.0	133.7	130.9	132.7
3/20/90		138.9	140.6	140.9	137.0	133.2	135.5
4/16/90		139.1	140.7	140.1	134.6	130.8	132.5
5/16/90		140.3	140.6	138.1	126.0	125.6	128.2
6/28/90		140.3	140.2	137.0	124.0	121.1	123.6
7/10/90		140.0	140.2	136.7	125.3	122.6	124.7
8/8/90	RETROFIT	139.8	139.8	134.3	118.7	113.5	115.7
10/12/90		139.9	140.0	134.3	117.9	112.1	115.2
10/31/90		139.4	138.8	132.8	117.2	114.7	117.7
12/4/90		139.1	138.7	134.3	122.2	118.3	121.8
1/8/91		139.1	138.9	135.7	127.9	124.6	127.3
1/31/91		138.1	139.4	135.1	121.7	120.0	123.2
3/7/91		138.9	138.9	136.8	130.4	127.5	129.4
4/17/91		138.9	139.2	139.2	133.6	132.1	134.1
5/30/91		138.8	139.3	135.9	123.2	121.5	124.3

PRESSURE PROFILE DATA FOR WELL NO. MCAS-7

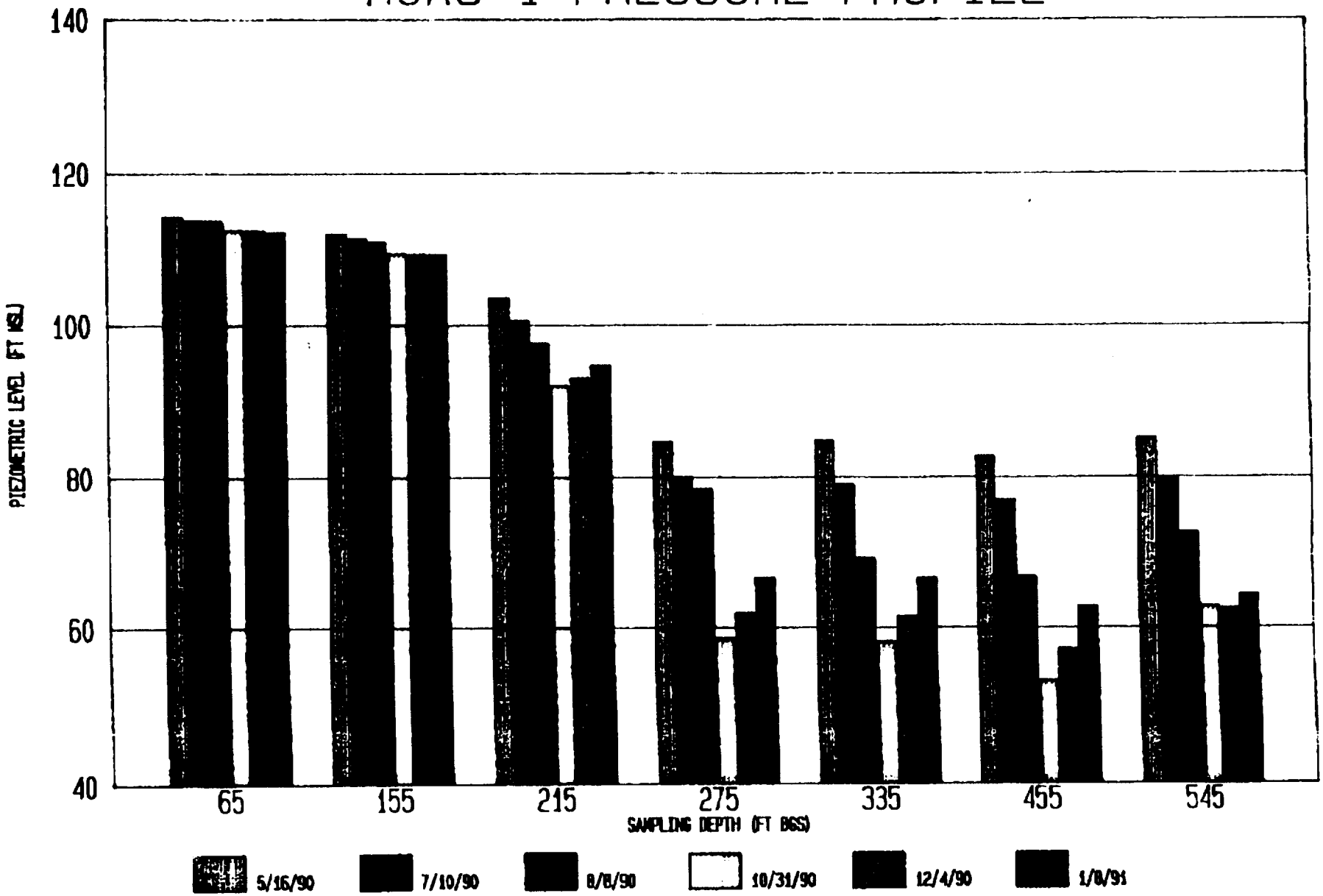
APPROX. GROUND SURFACE ELEV.: 101.9 FEET
(Mean Sea Level Datum)

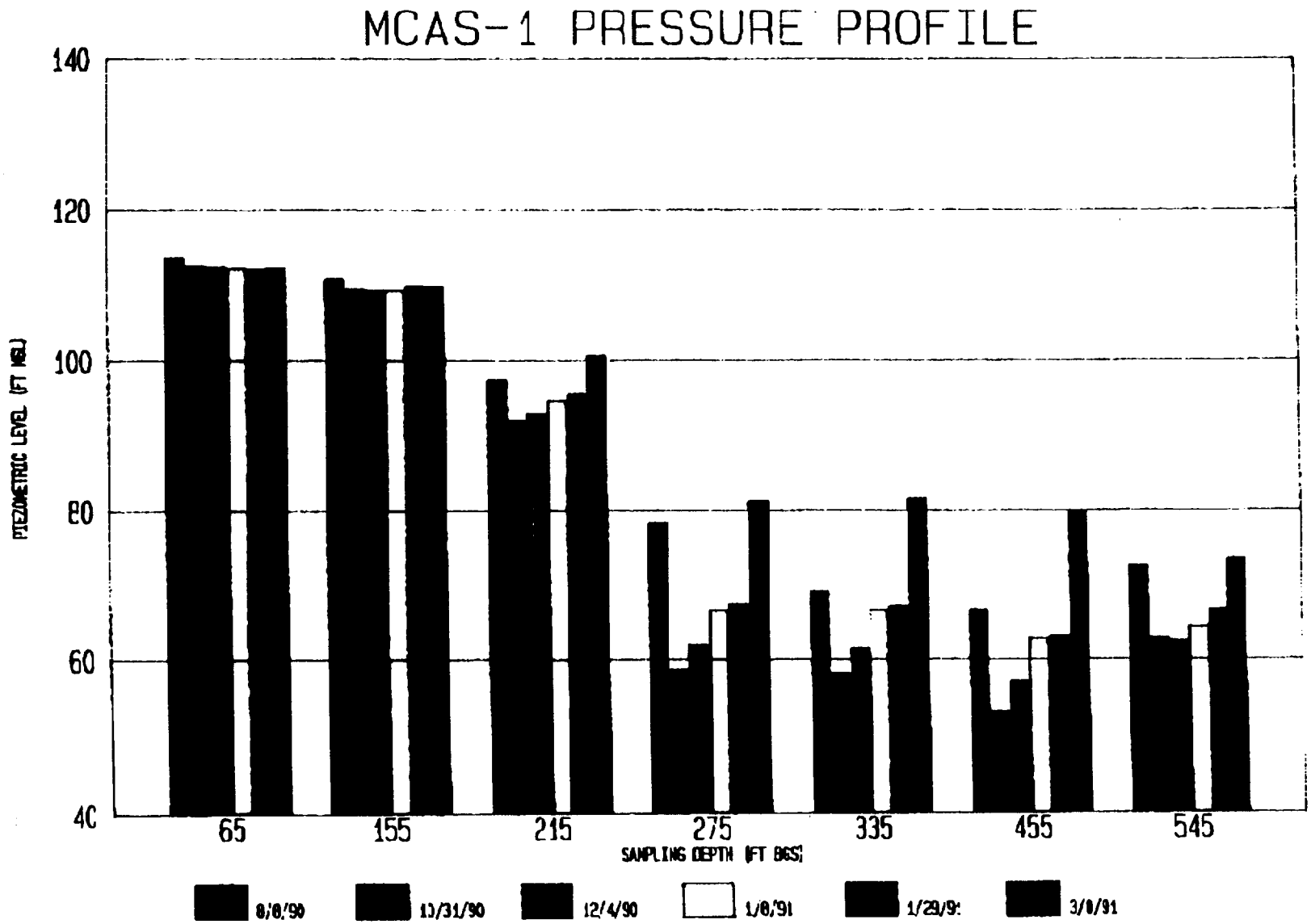
PIEZOMETRIC LEVELS (FEET MSL)

DATE	ZONE DEPTH: (FEET BGS)	94	194	354	444	514	804	914	984	1104
9/20/88		87.7	84.9	58.5	41.8	35.7	61.5	59.0	61.6	64.5
11/10/88		87.7	87.0	38.0	20.6	29.0	NT	57.1	53.4	45.9
12/30/88		88.0	90.7	56.2	40.2	48.0	55.9	55.9	52.0	35.9
3/24/89		87.5	88.7	42.8	26.9	36.5	44.0	56.5	53.0	47.8
5/2/89		87.7	85.4	32.2	23.0	28.6	30.8	55.1	52.0	46.8
6/2/89		88.3	82.6	27.9	14.8	21.1	21.8	52.8	52.7	46.2
7/7/89		87.7	79.8	52.9	10.1	37.4	37.4	54.7	54.5	50.8
8/18/89		NT	75.2	54.7	39.6	39.9	39.9	46.9	46.9	42.4
9/8/89		86.6	74.0	56.0	43.0	40.2	40.3	45.1	45.5	42.7
10/24/89		86.3	73.8	61.3	54.6	53.0	53.4	49.5	49.6	45.8
11/8/89		86.3	74.2	61.6	52.9	51.5	52.1	49.9	50.0	45.2
12/4/89		86.1	77.2	64.7	56.8	55.0	55.6	55.6	52.3	49.0
1/15/90		86.8	83.3	76.2	72.6	72.2	71.9	72.1	72.2	52.7
3/20/90		87.0	87.0	81.8	81.9	81.1	80.8	80.4	80.3	47.9
	WELL	RETROFITTED								
6/23/90		86.3	79.1	28.1	14.8	22.8	60.8	61.0	58.1	58.8
8/8/90		86.3	73.2	11.2	−4.1	0.9	56.1	55.5	54.3	52.7
10/29/90		85.4	67.7	−0.3	−13.8	−10.5	51.9	51.6	54.2	53.1
12/4/90		85.4	68.6	3.8	−7.8	−2.8	50.5	50.3	53.7	52.9
1/8/91		85.4	71.5	14.1	2.2	6.5	49.5	49.3	53.6	53.0
1/29/91		85.4	72.5	11.2	−0.8	5.2	49.0	48.8	53.5	NT
3/8/91		86.1	77.3	30.4	18.2	23.9	48.1	47.8	52.4	52.3

* NT = Not Tested

MCAS-1 PRESSURE PROFILE





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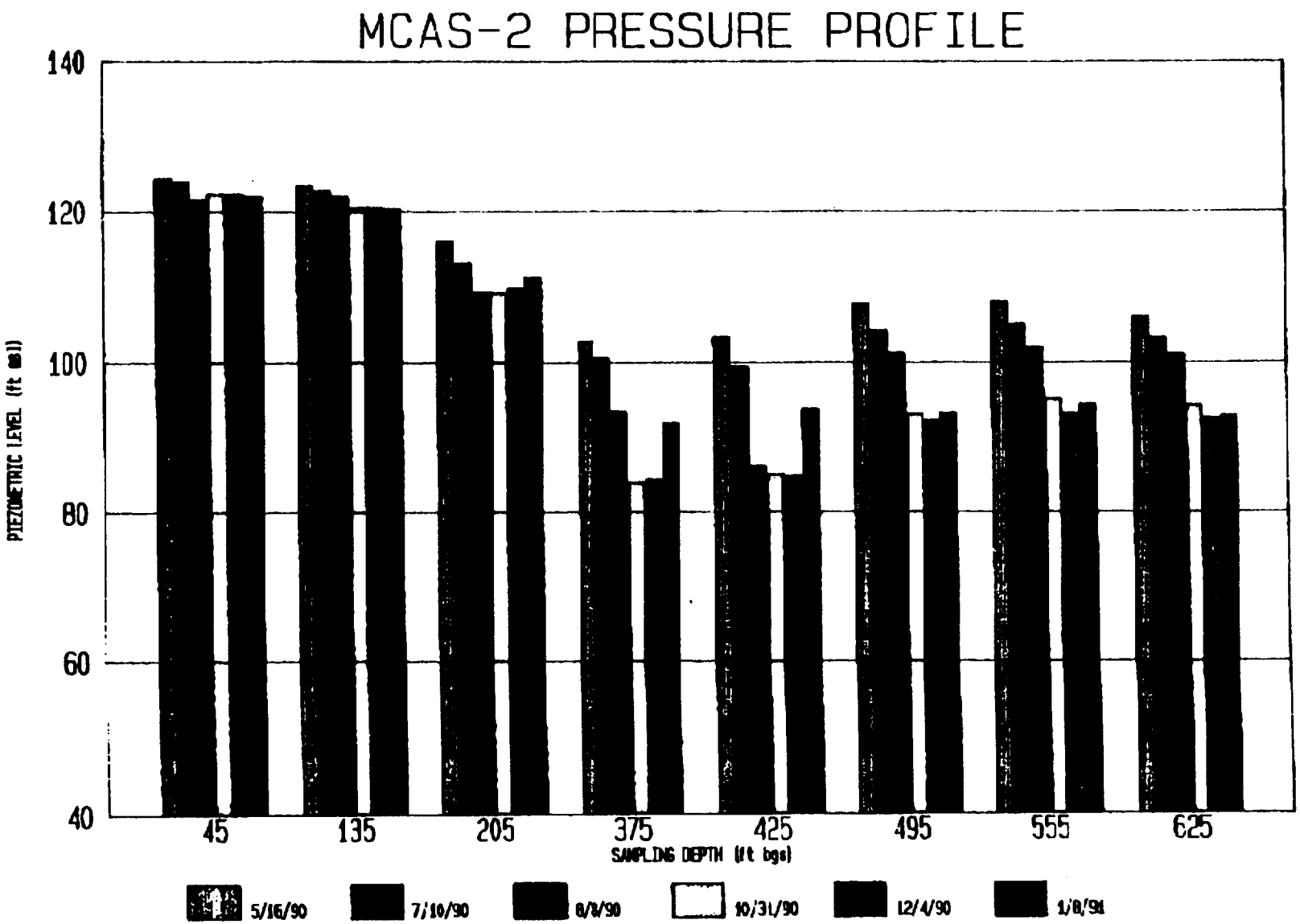
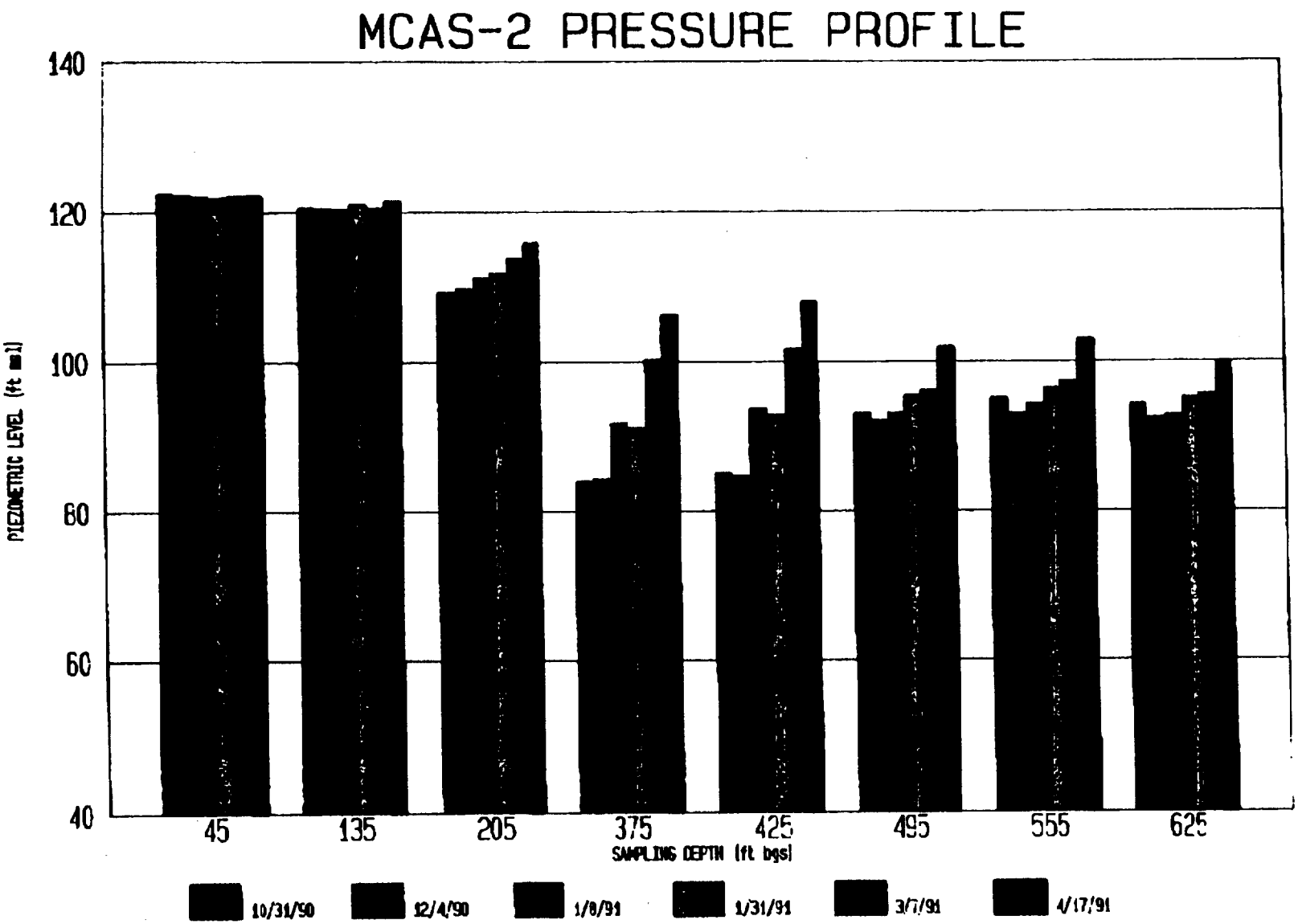
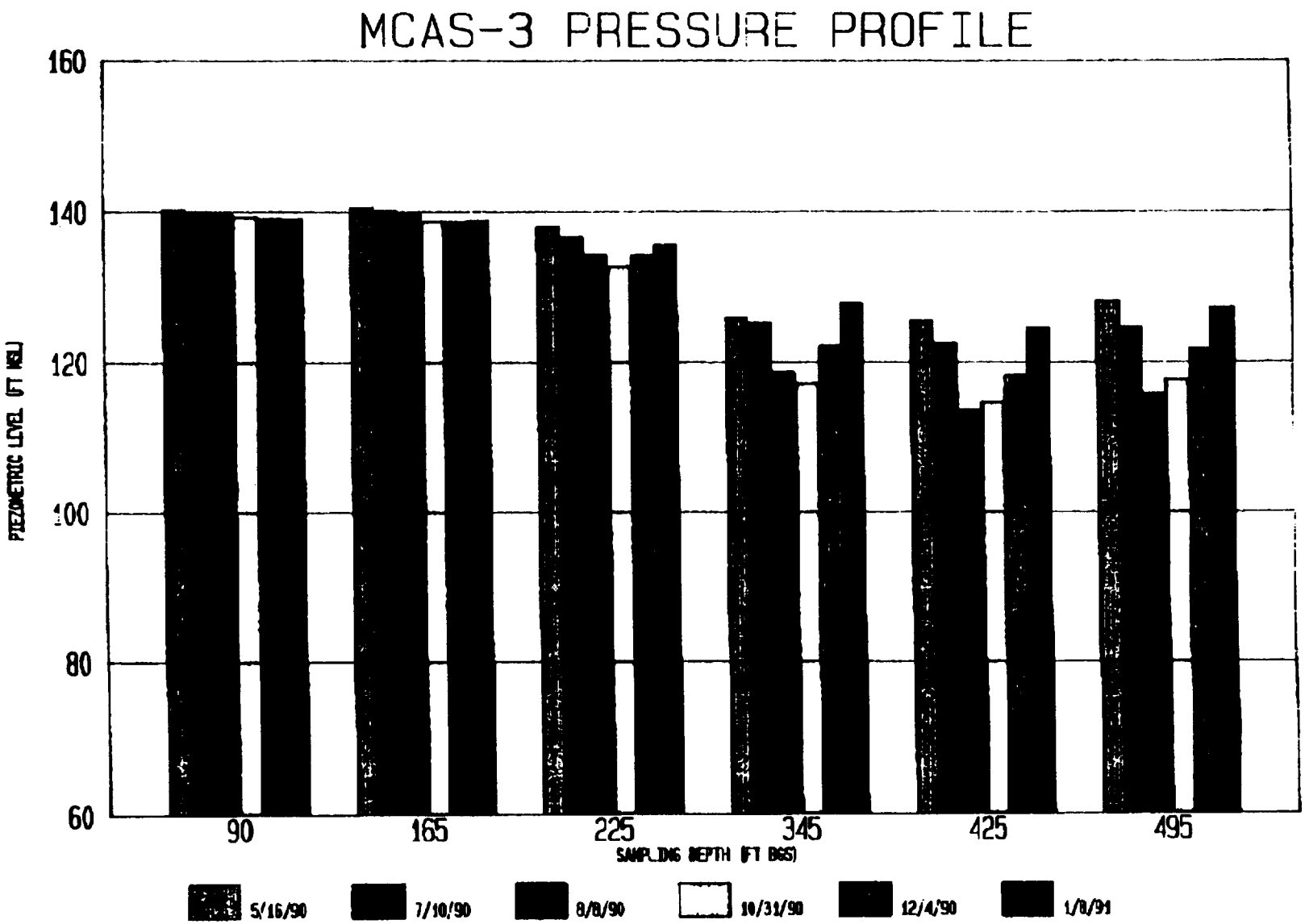
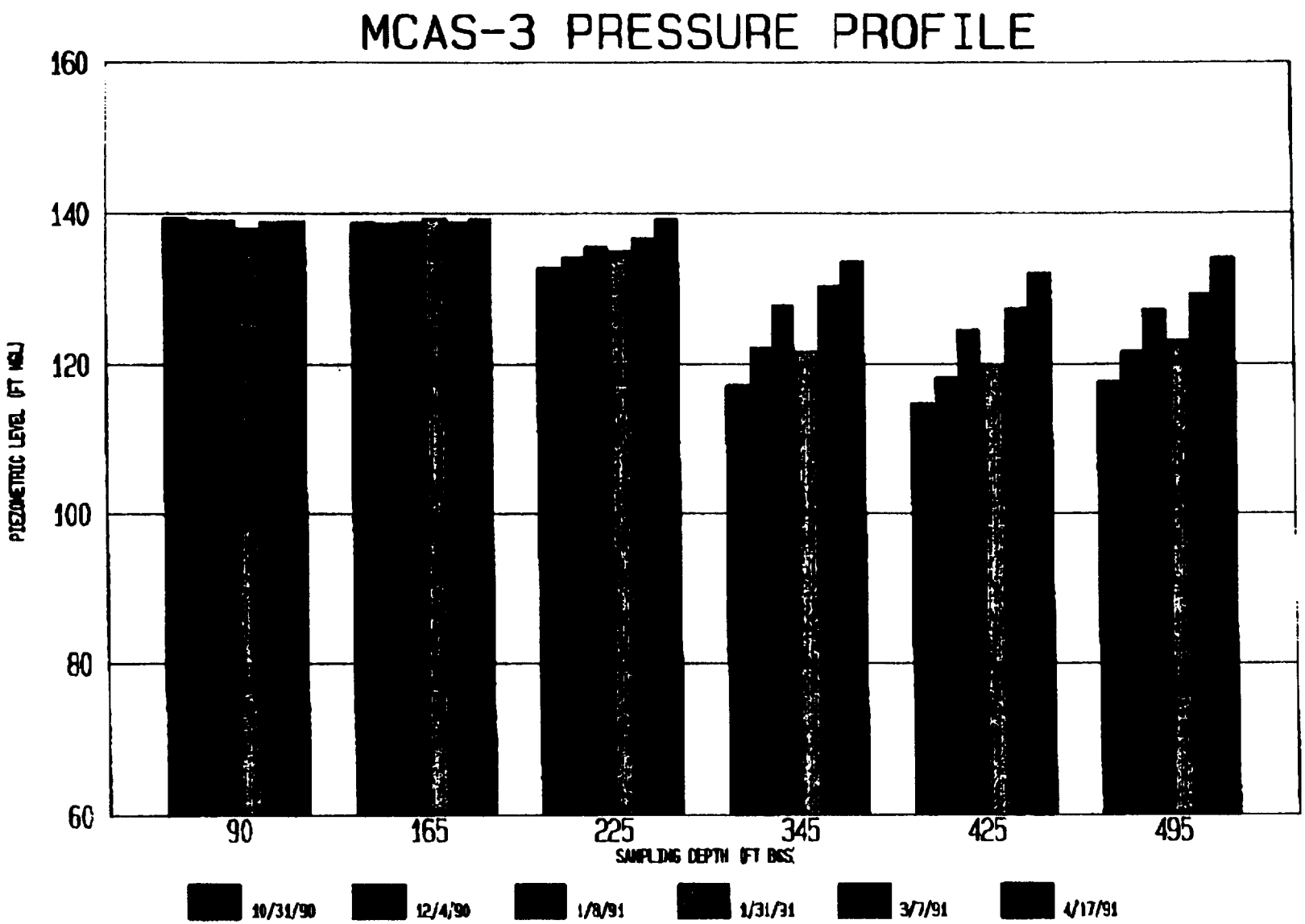

MCAS-2 PRESSURE PROFILE
PIEZOMETRIC LEVEL (ft msl)
140
120
100
80
60
40
45
135
205
375
425
495
555
625
SAMPLING DEPTH (ft bgs)
5/16/90
7/10/90
8/8/90
10/31/90
12/4/90
1/8/91


MCAS-2 PRESSURE PROFILE
140
120
100
80
60
40
PIEZOMETRIC LEVEL (ft msl)
45
135
205
375
425
495
555
625
SAMPLING DEPTH (ft bgs)
10/31/90
12/4/90
1/8/91
1/31/91
3/7/91
4/17/91


MCAS-3 PRESSURE PROFILE
160
140
120
100
80
60
PIEZOMETRIC LEVEL (FT MSL)
90
165
225
345
425
495
SAMPLING DEPTH (FT BGS)
5/16/90
7/10/90
8/8/90
10/31/90
12/4/90
1/8/91



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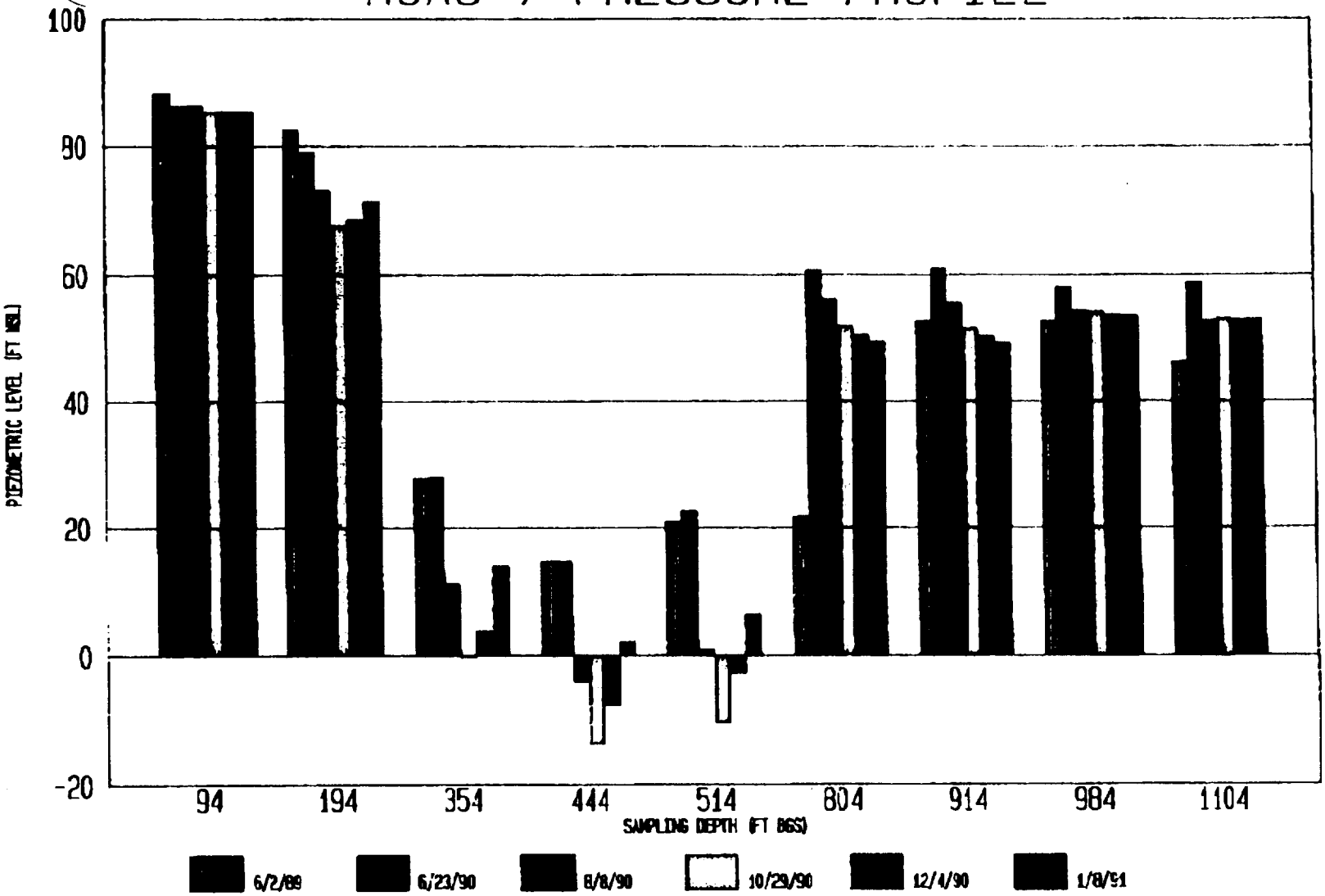
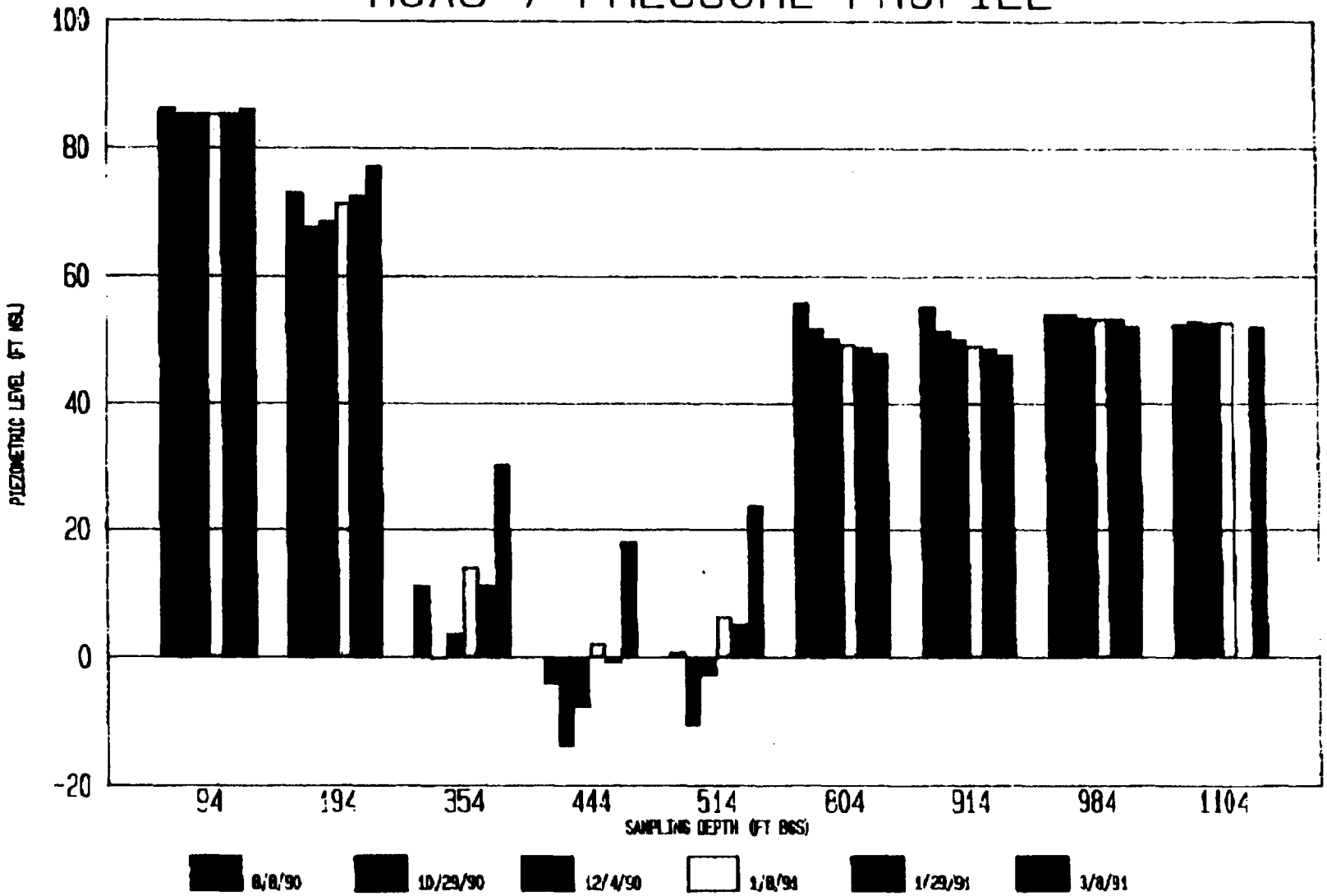
MCAS-7 PRESSURE PROFILE



MCAS-7 PRESSURE PROFILE