

APPENDIX C

WELL LOGS

Project: TOSCO CORPORATION
 AVON REFINERY
 Martinez, California

Log of Well No. 23M

Date Drilled: July 6, 1982

Remarks: Top of casing elev. 10.48'

Drilling Method: 6" Dia. Power Auger

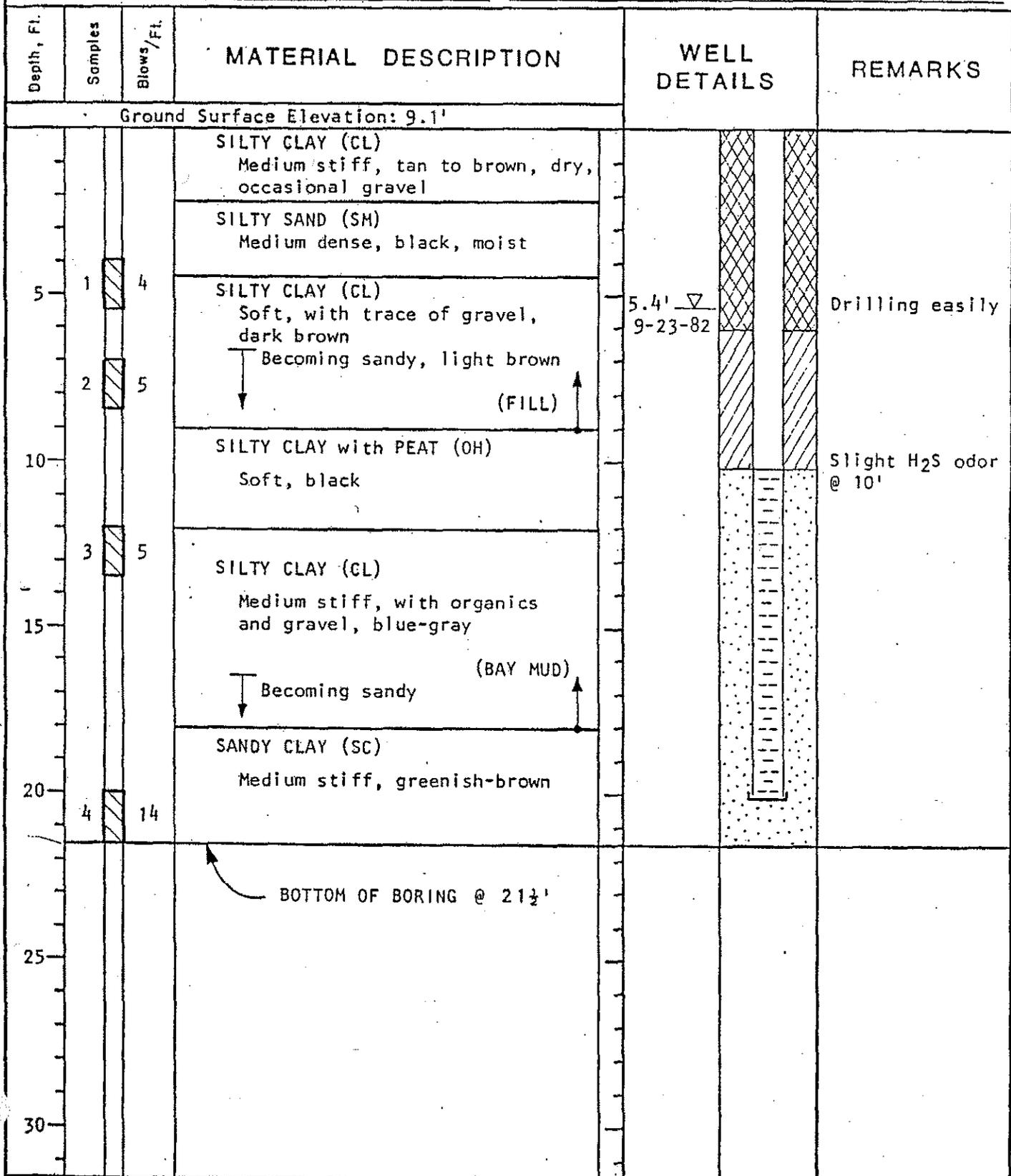
Depth, Ft.	Samples	Blows/Ft.	MATERIAL DESCRIPTION	WELL DETAILS	LABORATORY TESTS		
					Moisture Content, %	Dry Density, pcf	Unconfined Compressive Strength, psf
Ground Surface Elevation: 8.7'							
1		9	SILTY CLAY (CL) Medium stiff, black, with organics	6.0' ▽ 9-23-82	50	57	-
5			Peaty (FILL) SANDY SILT (ML): Very fine, loose, black, with organics				
			SAND (SP) Very fine, loose, black				
2		2	PEAT (Pt) Very soft, dark brown		247	20	-
3		P	(BAY MUD)		24	99	1060
4		23	SILTY CLAY (CL) Stiff, gray Very stiff, green-gray		21	107	3865
			Sandier Stiff				
5		15	SAND (SP-SM) Medium dense, gray		22	105	1015
6		10	SANDY CLAY (CL-SC) Very stiff, gray Brown sandy clay (CL)				
			SILTY SAND (SM) Loose to medium dense, brown				
			SANDY CLAY (CL)				

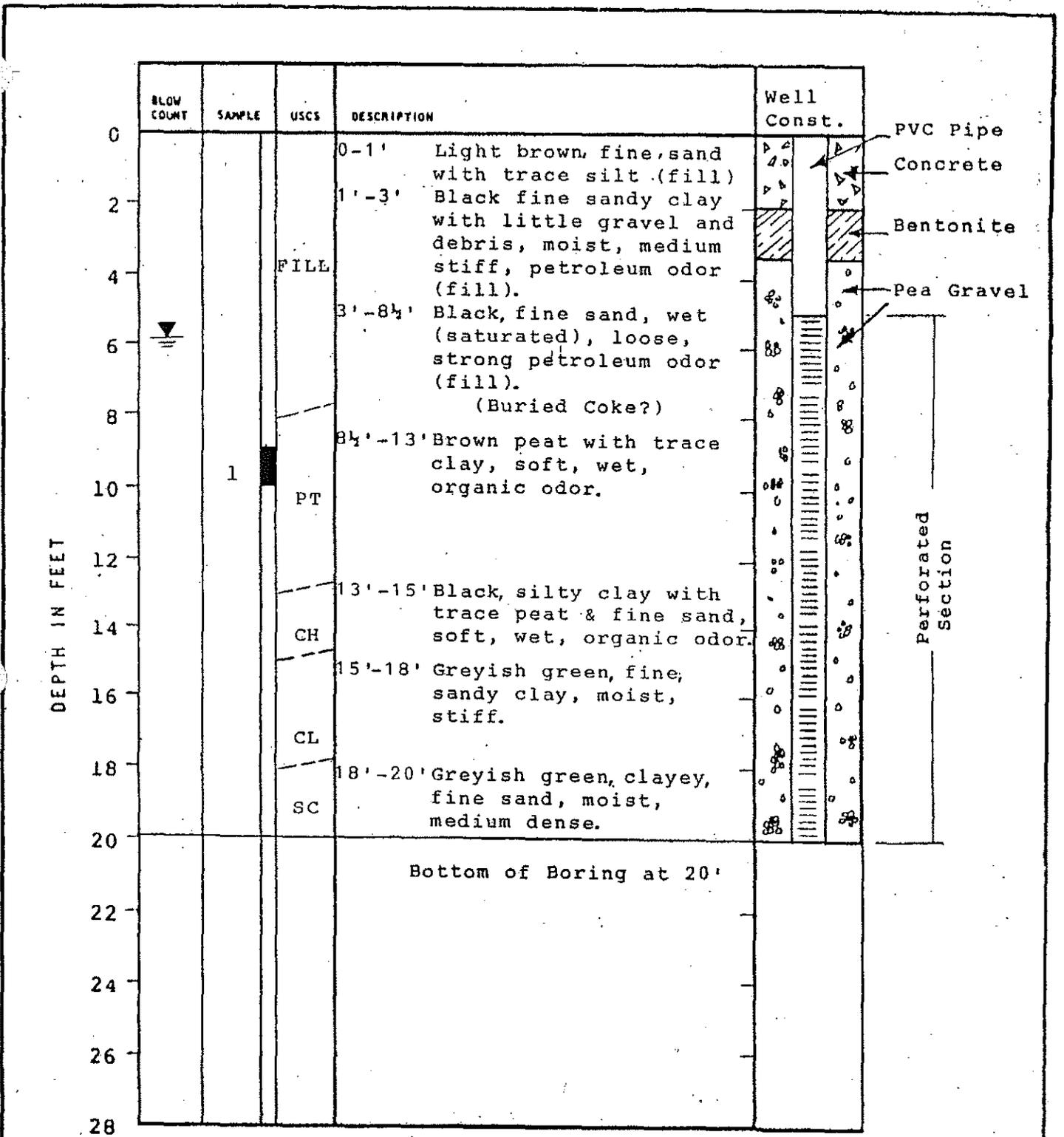
Project: TOSCO CORPORATION
 AVON REFINERY
 Martinez, California

Log of Well No. 23M
 (Continued)

Depth, Ft.	Samples	Blows/Ft.	MATERIAL DESCRIPTION	WELL DETAILS	Moisture Content, %	Dry Density, pcf	Unconfined Compressive Strength, psf
35	7	14	SANDY CLAY (CL).....Cont'd Stiff, gray-brown, interbedded with clayey sand (SC)		28	95	1365
40	8	27	SILTY CLAY (CH) Hard, gray-tan Gray-brown		18	113	10,210
45	9	41			-	-	-
50	10	18			-	-	-
55			BOTTOM OF BORING @ 52'				
60							
65							

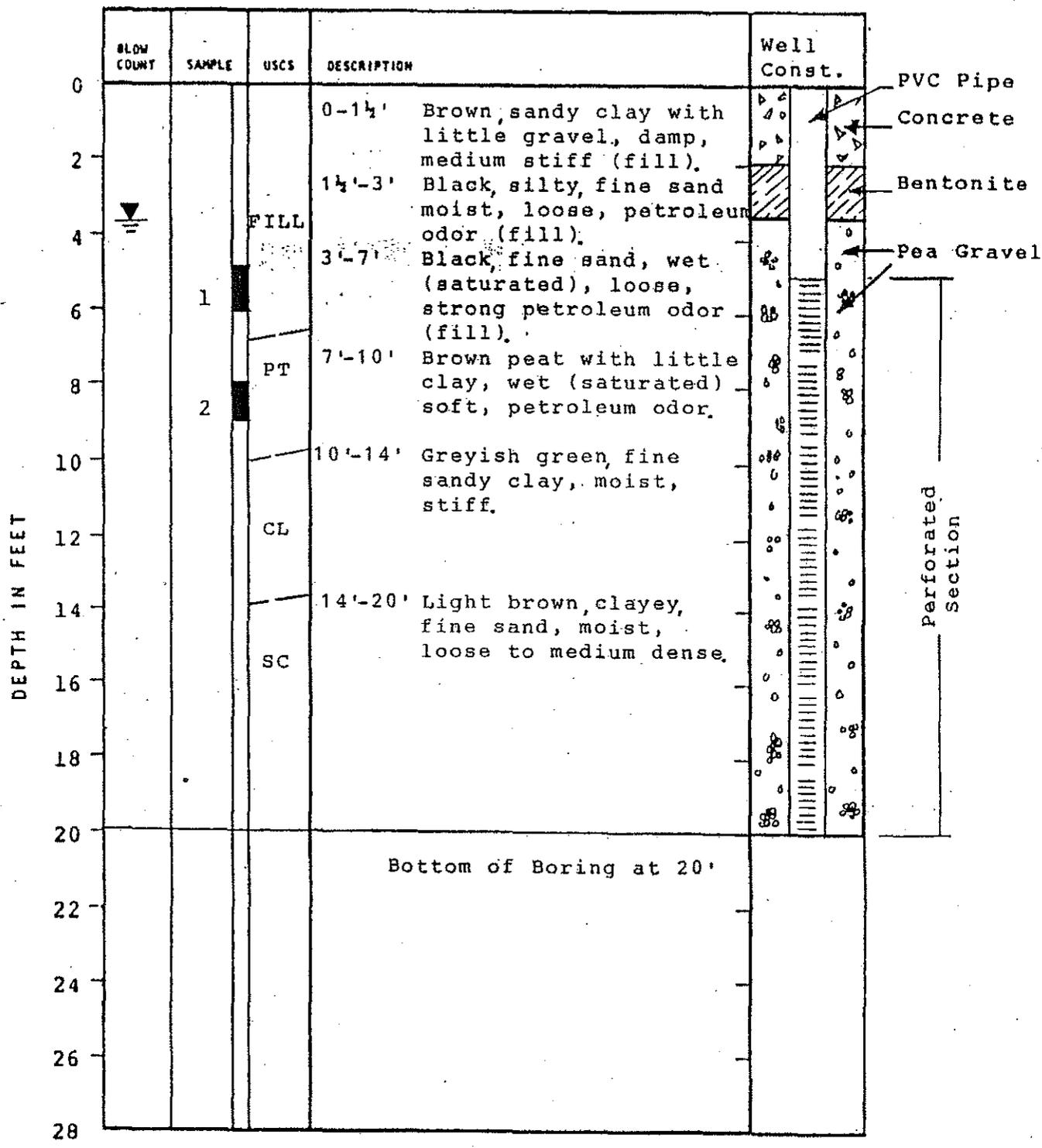
Project: TOSCO CORPORATION AVON REFINERY Martinez, California	<h2 style="margin: 0;">Log of Well No. 26S</h2>
Date Drilled: July 8, 1982	Remarks: Top of casing elev. 10.92'
Drilling Method: 8" Hollow Stem Auger	





Date Drilled: 5/16/83

TOSCO CORPORATION AVON REFINERY MARTINEZ, CALIFORNIA	LOG OF WELL NO. HC-11	
	Balbi & Chang Associates	PROJECT NO. 1089-1
		PLATE 14



Date Drilled: 5/16/83

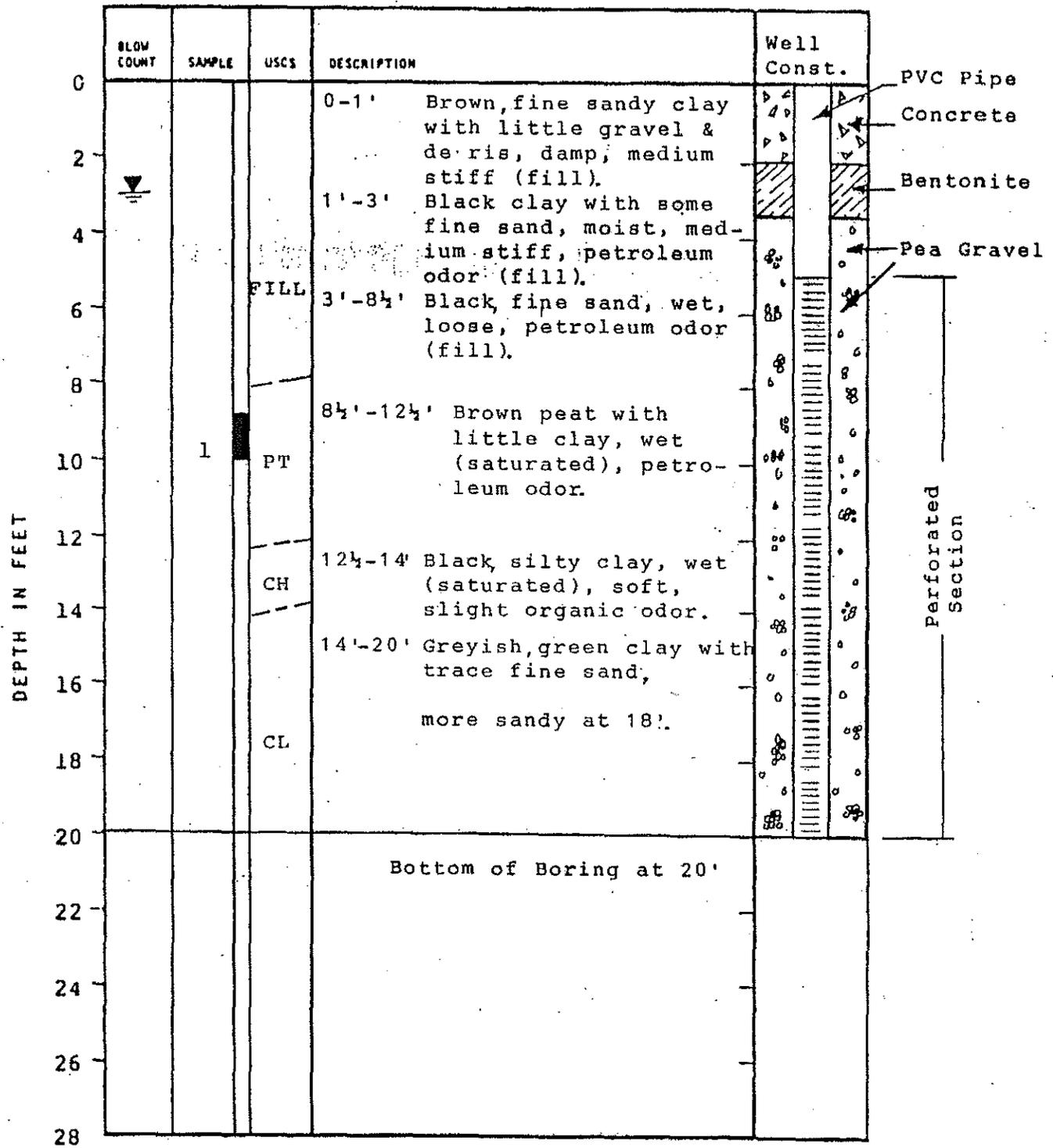
TOSCO CORPORATION
 AVON REFINERY
 MARTINEZ, CALIFORNIA

LOG OF WELL NO. HC-12

Balbi & Chang Associates

PROJECT NO. 1089-1

PLATE 13



Date Drilled: 5/16/83

TOSCO CORPORATION AVON REFINERY MARTINEZ, CALIFORNIA	LOG OF WELL NO. HC-13	
	Balbi & Chang Associates	PROJECT NO. 1089-1
		PLATE 15

LOG OF BORING No.MB-1

DATE DRILLED: 6/18/85 EQUIPMENT: Mobile B-53

DESCRIPTION: Soil Boring ELEVATION:

TESTS

SAMPLE NO. SAMPLE TYPE	BLOWS PER 6 INCHES	SPT-N	INCHES DRIVEN INCHES RECOVERED	NUMBER OF RINGS	DEPTH IN FEET	WELL OR PIEZOMETER CONSTRUCTION	GRAPHIC LOG	TESTS
MB1-1	3-12-23		18/15			Grouted to surface		
MB1-2	2-6-6		18/18					
MB1-3	5-2-2		18/12		5			
MB1-4	2-3-6				10			
MB1-5	5-11-13		18/18		15			
MB1-6	4-6-7		18/18		20			
					25			
Total Depth 25.0'								

DRILLING CONTRACTOR: Sierra Pacific
DRILLER:

BY: M. Valtermire
DATE: 6/18/85
CHK'D BY:

THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS BORING AND AT THE TIME OF DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF ACTUAL CONDITIONS ENCOUNTERED.



Shellmacker Ponds
TOSCO Avon Refinery
Martinez, California

PROJECT NO
84-1124.03
DRAWING NO
A-1

DRILLING CONTRACTOR Sierra Pacific
 DRILLER

BY M. Waltermire
 DATE 6/18/85 CHK'D BY

LOG OF BORING No.MB-2

DATE DRILLED: 6/18/85 EQUIPMENT: Mobile B-53
 DESCRIPTION: ELEVATION:

TESTS

SAMPLE NO. SAMPLE TYPE	BLOWS PER 6 INCHES	SPT-N	INCHES DRIVEN INCHES RECOVERED	NUMBER OF RINGS	DEPTH IN FEET	WELL OR PIEZOMETER CONSTRUCTION	GRAPHIC LOG	TESTS
MB2-1	5-7-12		18/8			Gouted to surface		
MB2-2	5-4-10		18/12					
MB2-3	4-3-2		18/14	5				
MB2-4	1-2-2		18/17	10				
MB2-5	5-8-9		18/12	15				
					20			
Total Depth 16.5'								

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Shellmacher Ponds
 TOSCO Avon Refinery
 Martinez, California

PROJECT NO
 84-1124.03
 DRAWING NO
 A-2

LOG OF BORING No.MB-3

DATE DRILLED: 6/18/85

EQUIPMENT: Mobile B-53

DESCRIPTION:

ELEVATION:

TESTS:

SAMPLE NO. SAMPLE TYPE	BLOWS PER 6 INCHES	SPT-N	INCHES DRIVEN RECOVERED	NUMBER OF RINGS	DEPTH IN FEET	WELL OR PIEZOMETER CONSTRUCTION	GRAPHIC LOG	DESCRIPTION:	ELEVATION:	TESTS:
MB3-1	10-10-11		18/4					<p>Silty sand (SM), tan, low moisture, stained, HNu = 10</p> <p>Coke, black, high moisture, low plasticity, HNu = 4</p> <p>HNu = 3</p> <p>Peat (Pt), high moisture, dense fibrous brown organics, HNu = 20, grading to Clay (CH), grey-green, high moisture, high plasticity, with root-like organics</p> <p>Less organics in the clay</p> <p>Sandy Silt (ML), tan, high moisture, medium plasticity, no staining, HNu = 2</p> <p>Sand (SP), tan, fine-grained, high moisture, no staining, grading to coarser-grained sand</p> <p>Clay (CL), brown, low moisture, stiff, no stain</p> <p>Total Depth 31.5'</p> <p>Note: Blow counts associated with Samples MB3-7 and MB3-8 may be in error due to viscous damping of the drive force.</p>		
MB3-2	3-5-8		18/18							
MB3-3	4-5-5		18/18		5					
MB3-4	1-2-4		18/18		10					
MB3-5	4-6-14		18/18		15					
MB3-6	5-13-28		18/12		20					
MB3-7	13-22-40		18/18		25					
MB3-8	20-70		12/12		30					
					35					

DRILLING CONTRACTOR Sierra Pacific
DRILLER

CHK'D BY M. Waltermire
DATE

Grouted to surface

Fill

THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS BORING AND AT THE TIME OF DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF ACTUAL CONDITIONS ENCOUNTERED.



Shellmacher Ponds
TOSCO Avon Refinery
Martinez, California

PROJECT NO
84-1124.03
DRAWING NO
A-3

Sierra Pacific (above 6.5'); AAA (below)

DRILLING CONTRACTOR

DRILLER

BY M. Waltermire

DATE 6/28/85 CHK'D BY REL

SAMPLE NO. SAMPLE TYPE		BLOWS PER 6 INCHES	SPT-N	INCHES DRIVEN INCHES RECOVERED	NUMBER OF RINGS	DEPTH IN FEET	WELL OR PIEZOMETER CONSTRUCTION	GRAPHIC LOG	LOG OF BORING No.MB-4	TESTS
MB4-1		13-13-18		18/14					DATE DRILLED: 6/18&28/85 EQUIPMENT: Mobile 8-53. DESCRIPTION: Soil Boring ELEVATION:	
MB4-2		4-4-5		18/12					Silty Sand (SM), tan, low moisture, low plasticity, some dark oil staining, HNu = 50	
MB4-3		2-6-8		18/18		5			Clay (CL), grey, medium moisture, stiff, HNu = 7	
									Coke, black, high moisture, low plasticity	
MB4-4		1-1-1		18/18		10			Peat (Pt), grey, high moisture, high plasticity, brown fibrous organics, HNu = 7, grading to Clay (CH)	
									6/28/85	
MB4-5		4-4-5		18/18		15			Clay (CH), grey green, high moisture, high plasticity, root-like organics in clay grading to an organics-free, stiffer clay	
MB4-20		8-8-8		18/14		20				
MB4-25		10-10-18		18/18		25			Sand (SP), tan-green, high moisture, medium-grained	
									Clay (CL), tan-green, medium moist, stiff	
									Total Depth 26.5'	

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Shellmacher Ponds
TOSCO Avon Refinery
Martinez, California

PROJECT NO
84-1124.03
DRAWING NO
A-4

LOG OF BORING No. MB-6

DATE DRILLED: 6/28/85 EQUIPMENT: Mobile B-53

DESCRIPTION: Soil Boring ELEVATION: ±5'

TESTS

SAMPLE NO. SAMPLE TYPE	BLOWS PER 6 INCHES	SPT-N	INCHES DRIVEN INCHES RECOVERED	NUMBER OF RINGS	DEPTH IN FEET	WELL OR PIEZOMETER CONSTRUCTION	GRAPHIC LOG	TESTS
MB6-1	16-19-22		18/12		5		<p>Silty Sand (SM), tan to black when stained, low moisture, low plasticity, Stiff. HNu = z</p> <p>Clay (CL), grey-green, oil stained HNu = 30 peak</p> <p>Coke, black, medium grain size, heavy oil type: staining Gets clayey at approximately higher plasticity HNu = 50 sustained</p> <p>Clay (CH), grey-green, thin layer, high plasticity, coke Peat with coke (Pt), brown, oil stained, left oil on gloves. HNu = 10 Coke (some organic fibers) Coke</p> <p>Clay (CH), grey-green, high plasticity, high moisture, stiff</p> <p>Sand (SP), grey-green, medium grained</p> <p>Clay (CL), brown, stiff, medium plasticity</p> <p>Silty Sand (SM), tan-green, medium plasticity, medium moisture, HNu = 3</p> <p>Clay (CL/CH), tan, sandy, medium to high plasticity, medium to high moisture</p> <p>Total Depth 26.5'</p>	
MB6-2	6-10-15		18/8					
MB6-3	5-7-18		18/8					
MB6-4	6-2-2		18/12					
MB6-5	6-6-11		18/18					
MB6-6	16-20-20		18/17					
MB6-7	6-10-11		18/13					

DRILLING CONTRACTOR AAA
DRILLER Bob Hillis

DATE 5/28/85
BY M. P. I. G. R. I. C. O.
CHK'D BY REL

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Shellmacker Ponds
TOSCO Avon Refinery
Martinez, California

PROJECT NO
84-1124.03
DRAWING NO
A-6

LOG OF BORING No. MB-7

DATE DRILLED: 6/28/85 EQUIPMENT: Mobile 8-53

DESCRIPTION: Boring ELEVATION:

TESTS

SAMPLE NO. SAMPLE TYPE	BLOWS PER 6 INCHES	SPT-N	INCHES DRIVEN INCHES RECOVERED	NUMBER OF RINGS	DEPTH IN FEET	WELL OR PIEZOMETER CONSTRUCTION	GRAPHIC LOG	DESCRIPTION	TESTS
MB7-1	8-9-11		18/14		5	Grouted to surface		Silt (ML), mottled yellow and brown, sandy, some rock fragments	
MB7-2	4-5-6		18/15		5			Coke with sand, dark brown, loose, 1" brown plastic clay layer. Strong odor from well	
MB7-3	4-5-5		18/0		10			Coke, black, has oily sheen and odor	
MB7-4	2-3-3		18/18		15			Peat (Pt), brown, clayey	
MB7-5	8-8-9		18/15		20			Clay (CH), grey-green, high plasticity, some minor roots	
MB7-6	10-15-15		18/18					Sand (SP), gray-green, medium grained, unconsolidated, saturated, some clay balls	
Total Depth 21.5'									

DRILLING CONTRACTOR: AAA
DRILLER: Bob Nolts

DATE: 6/28/85
CHK'D BY: Lambert

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THE MARK GROUP
ENGINEERS & GEOLOGISTS

Shellmacher Ponds
TOSCO Avon Refinery
Martinez, California

PROJECT NO
84-1124.03

DRAWING NO

A-7

LOG OF BORING No. MB-8

DATE DRILLED: 6/28/85 EQUIPMENT: Hand Auger

DESCRIPTION: ELEVATION:

TESTS

SAMPLE NO. SAMPLE TYPE	BLOWS PER 6 INCHES	SPT-N	INCHES DRIVEN INCHES RECOVERED	NUMBER OF RINGS	DEPTH IN FEET	WELL OR PIEZOMETER CONSTRUCTION	GRAPHIC LOG	DESCRIPTION
							Surface	
MB8-1					1		↑	Sand (SM), brown, slightly clayey, low plasticity, medium moisture
MB8-2					2		↓	Coke, medium grained, oil saturated H _{Nu} = 10-15 at 1.2' H _{Nu} = 30 1.5' - 1.7' H _{Nu} = 12-15
MB8-4					3		↓	Hold stood for two hours and water level raised to surface, moved over 2' to continue Coke, black, medium grained, minor brown clay with fibrous roots, saturated H _{Nu} = 15
					4		↓	Peat/Clay (Pt/CH), brown, spongy
MB8-5					5		↓	Black stained silty clay, brown peat, H _{Nu} = 20
					6		↓	
MB8-6					7		↓	Clay (CH), grey, high plasticity, medium moisture, H _{Nu} peaked at 15
							↓	Total Depth 7'

DRILLING CONTRACTOR: MARK GROUP
DRILLER: R. Lambert

BY: R. Lambert DATE: 6/28/85
CHK'D BY:

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Shellmacher Ponds
TOSCO Avon Refinery
Martinez, California

PROJECT NO.
84-1124.03
DRAWING NO.
A-8

LOG OF BORING No. MB-9

DATE DRILLED: 6/27/85 EQUIPMENT: Hand Auger

DESCRIPTION: ELEVATION:

TESTS

SAMPLE NO. SAMPLE TYPE	BLOWS PER 8 INCHES	SPT-N	INCHES DRIVEN	INCHES RECOVERED	NUMBER OF RINGS	DEPTH IN FEET	WELL OR PIEZOMETER CONSTRUCTION	GRAPHIC LOG	DESCRIPTION
						1			↑ Coke & Sand, black, dry
MB9-1						2		↓ Fill	Clayey Coke, grey, medium moisture, medium plasticity, some organics HNu = 10
						3			Less clay
MB9-2						4			Clay (CI), gray-green, high moisture, high plasticity with organics
						5			Peat (Pt), brown, clayey
MB9-3									Clay (CH), dark grey, high plasticity and moisture (Bay Mud)
									Total Depth 5.5'

DRILLING CONTRACTOR MARK GROUP
DRILLER M. Waltermire

BY A. Lambert
DATE 6/27/85
CHK'D BY

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Shellmacher Ponds
TOSCO Avon Refinery
Martinez, California

PROJECT NO.
84-1124.03
DRAWING NO
A-9

LOG OF BORING No. MB-10

DATE DRILLED: 6/28/85 EQUIPMENT: Hand Auger
 DESCRIPTION: ELEVATION:

TESTS

DRILLING CONTRACTOR MARK Group
 DRILLER M. Waltermire

DATE 6/28/85 CHK'D BY

SAMPLE NO. SAMPLE TYPE	BLOWS PER 6 INCHES	SPT-N	INCHES DRIVEN	INCHES RECOVERED	NUMBER OF RINGS	DEPTH IN FEET	WELL OR PIEZOMETER CONSTRUCTION	GRAPHIC LOG	DESCRIPTION	TESTS
MB10-1						1			Clay (CH), dark brown, stained black, high plasticity, HNu = 9 (Grey Clay at 1.5')	
MB10-2						2			Coke, black, fine- to medium-grained, saturated, low plasticity, oily sheen, leaves oil stain on gloves, HNu as high as 120.	
						3			Sloughing/caving of coke severe	
						4				
						5				
MB10-3						6			Clay (OH), grey, some organics, some coke, heavy oil on clay/coke contact.	
									Total Depth 6'	

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Shellmacher Ponds
 TOSCO Avon Refinery
 Martinez, California.

PROJECT NO
 84-1124.03
 DRAWING NO
 A-10

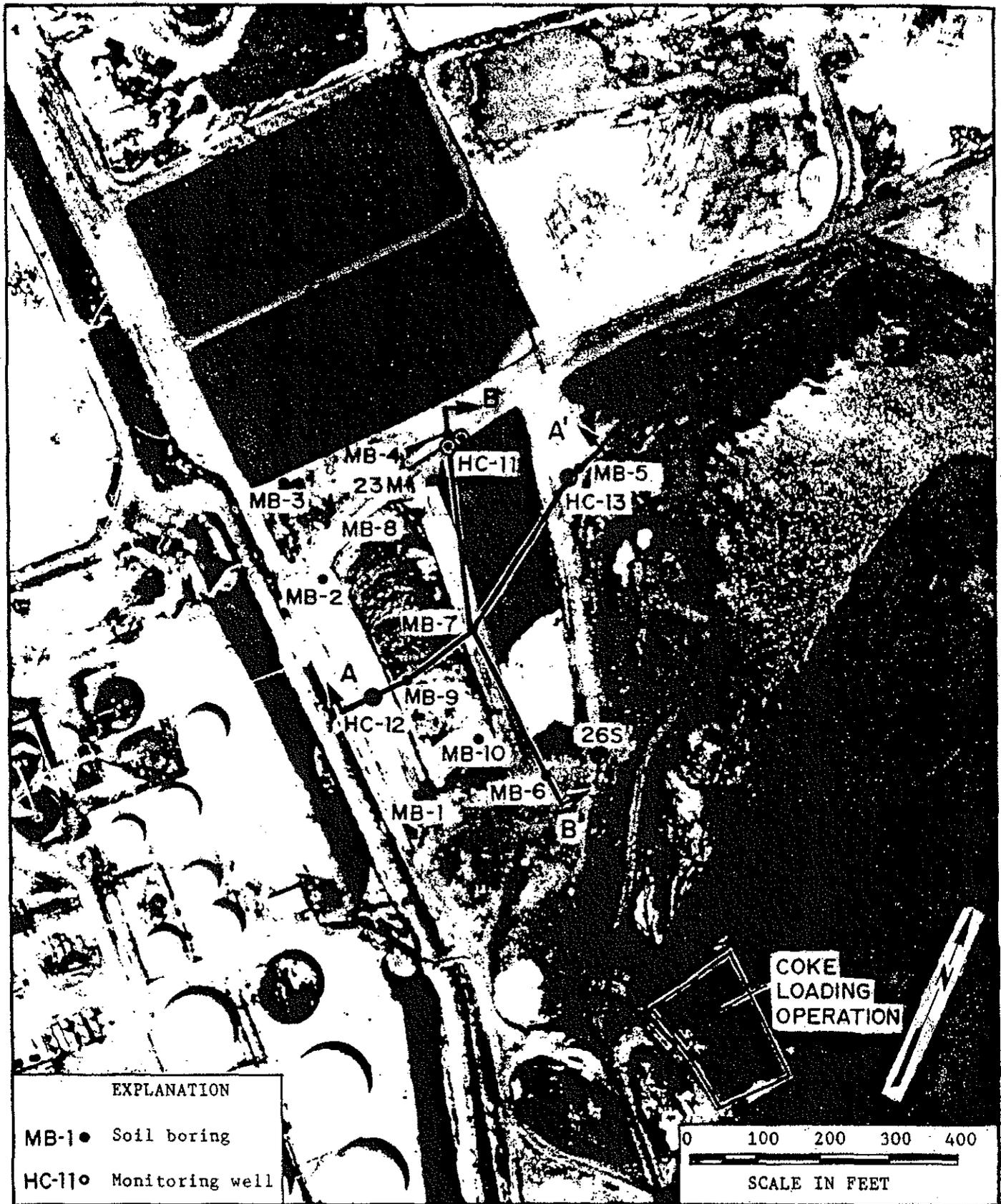
APPENDIX D

CROSS SECTIONS A-A' AND B-B'

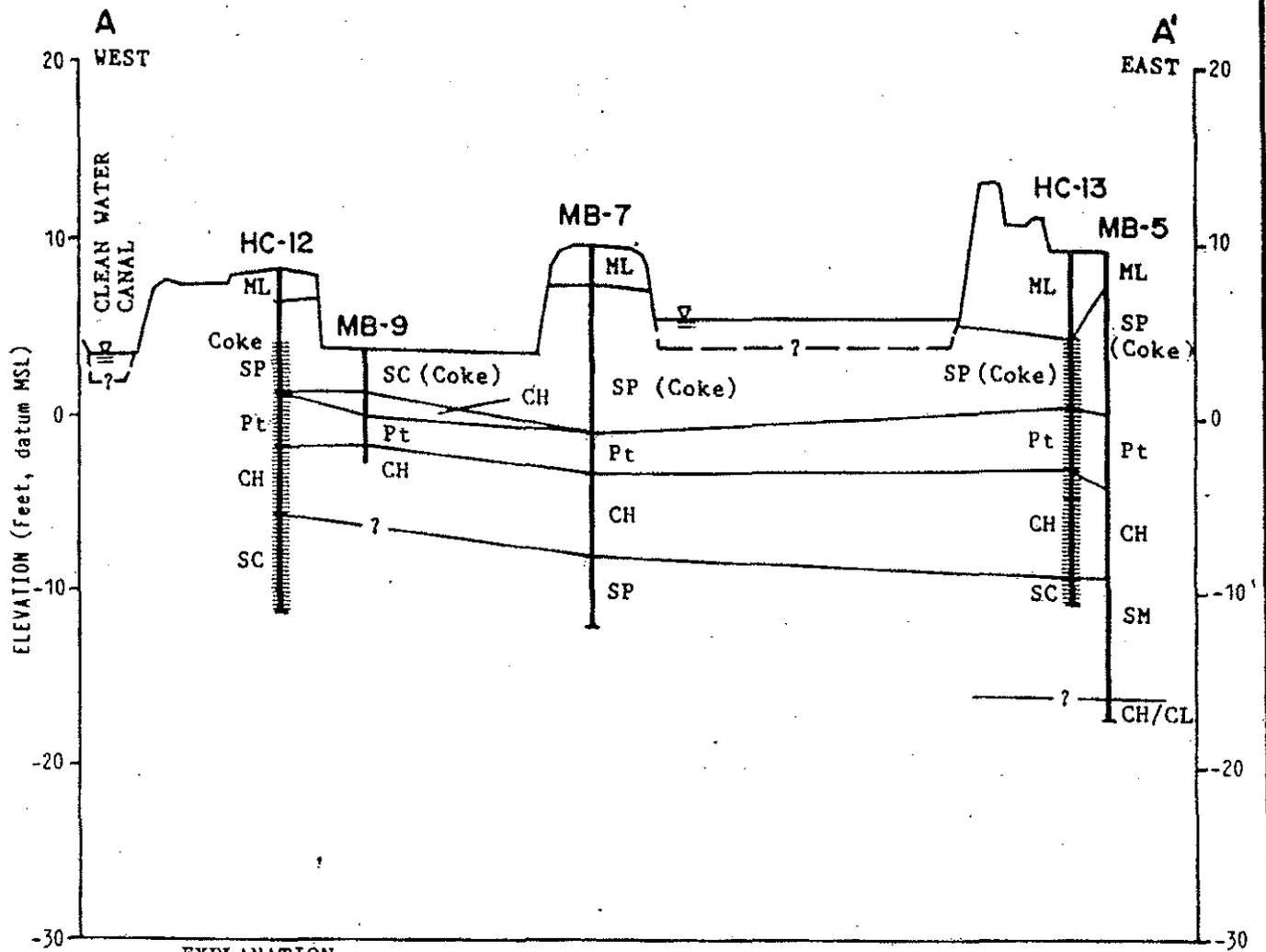
Date _____

Approved By _____

Prepared By DC

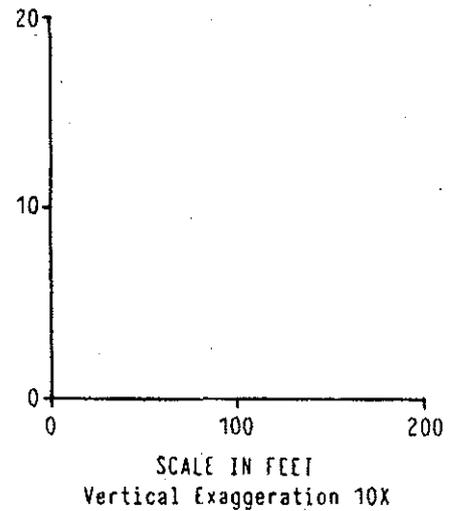


Date _____ Approved By _____ Prepared By DC

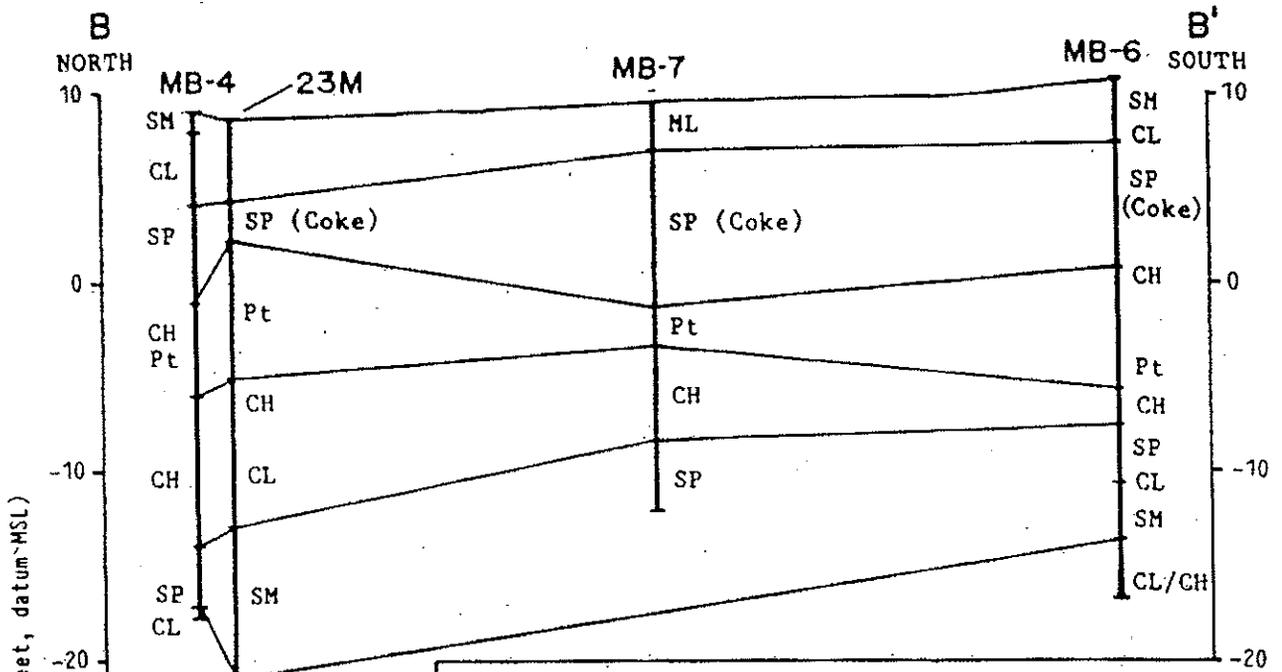


EXPLANATION

- Soil boring or well
- SP Poorly graded sands or gravelly sands, little or no fines
- SM Silty sands, sand-silt mixtures
- SC Clayey sands, sand-clay mixtures
- ML Inorganic silts and very fine sands, rock flour, silty or clayey fine sands, or clayey silts with slight plasticity
- CL Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
- CH Inorganic clays of high plasticity, fat clays
- Pt Peat and other highly organic soils
- Perforated PVC screen



CROSS-SECTION A-A'



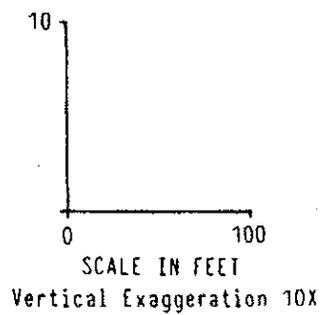
Prepared By DC

Approved By _____

Date _____

EXPLANATION

- Soil boring or well
- SP Poorly graded sands or gravelly sands, little or no fines
- SM Silty sands, sand-silt mixtures
- SC Clayey sands, sand-clay mixtures
- ML Inorganic silts and very fine sands, rock flour, silty or clayey fine sands, or clayey silts with slight plasticity
- CL Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
- CH Inorganic clays of high plasticity, fat clays
- Pt Peat and other highly organic soils
- Perforated PVC screen



CROSS-SECTION B-B'

APPENDIX E
JULY 1985 REPORT

File: 1040.13
1071

July 31, 1985

0299B

Mr. Harold Singer
California Regional Water Quality Control Board
San Francisco Bay Region
1111 Jackson Street, Room 6040
Oakland, CA 94607

Dear Mr. Singer:

This letter is in response to your letter dated June 29, 1985 which requested additional information concerning groundwater monitoring for our oily waste surface impoundment. Specifically, the following information was requested:

1. Submit all groundwater level measurements.
2. Construct a groundwater contour map specific to the surface impoundment.
3. Submit all groundwater data from wells HC-11, HC-12, HC-13, and 26S obtained since May 1984.
4. Perform a statistical analysis of indicator parameter data from the wells noted in (3) above utilizing well 26S as background.
5. Submit a groundwater assessment program outline that specifically addresses migration of hazardous waste from the surface impoundment.
6. Implement the groundwater assessment program if it is determined that well HC-11 is downgradient.

Enclosed with this letter (Attachment No. 1) is a report from The MARK Group, our hydrogeological consulting firm, which responds to Items 1 through 4. In addition to the information requested, the report contains four groundwater contour maps which are representative of groundwater flow during the four seasons of the year and presents a summary of all groundwater quality data collected from the five monitoring wells near the impoundment.

Mr. Harold Singer
California Regional Water Quality Control Board
July 31, 1985
Page Two

As discussed in the report, groundwater in the impoundment area flows from north to south. Thus, well HC-11 is upgradient and wells 26S, HC-12, and HC-13 are downgradient. Also, as discussed in the report, it is now believed that well HC-11 may be located within an area once encompassed by the impoundment. Thus, the well is not believed to be representative of groundwater quality outside of the impoundment.

For the reasons described above, we do not believe that a formal groundwater assessment program is required at this time. However, since we intend to begin closure of the impoundment in the near future, we do intend to perform several steps which are analogous to an assessment program. These steps can be outlined as follows:

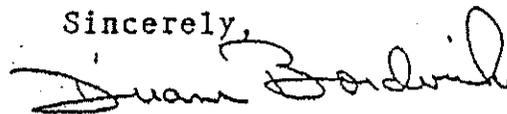
1. Collect and analyze soil samples from around the perimeter of the impoundments.
2. Evaluate the need for an additional well north of the impoundments to replace or augment well HC-11. Install a new well, if deemed necessary.
3. Collect groundwater elevation data from the impoundment monitoring wells once every two months over a year's time. Assess the groundwater flow direction each time groundwater elevations are determined.

Step one has already been completed. Ten borings were drilled by The MARK Group in June and 47 core samples were submitted for laboratory analysis. Attachment No. 2 is a figure showing the location of the borings. Following collection of the samples, each borehole was backfilled to the surface with cement.

Step two will be done by The MARK Group as part of Task 3 of our ongoing hydrogeologic investigation. Current plans call for the Task 3 report recommending further investigation to be completed in late August. Additionally, The MARK Group will be requested to conduct the routine groundwater elevation surveys and to perform the groundwater flow direction assessments.

If you have any questions or require additional information, please contact Don Comer at (415) 228-1220.

Sincerely,



D. B. Bordvick, Manager
Environmental Affairs



July 30, 1985
84-01124.03

Tosco Corporation
Avon Refinery
One Solano Way
Martinez, CA 94553

Attention: Mr. Donald L. Comer
Environmental Engineer

Subject: Response to California Regional Water Quality Control Board
letter concerning the Oily Waste Surface Impoundment

Gentlemen:

INTRODUCTION

The Tosco Corporation has recently begun work to initiate closure of an oily waste surface impoundment located at their petroleum refinery in Martinez, California. A site inspection was conducted by the Regional Water Quality Control Board (RWQCB) on April 11, 1985. Based upon their site visit and upon review of existing data, the RWQCB requested in a letter dated June 29, 1985, that Tosco complete the following tasks in order to comply with the Interim Status Groundwater Monitoring Program (ISGMP):

- 1) Submit all groundwater level measurements.
- 2) Construct a groundwater level contour map specific to the surface impoundment.
- 3) Submit all groundwater data from wells HC-11, HC-12, HC-13 and 26-S obtained since May 1984.
- 4) Perform a statistical analysis of indicator parameter data from the wells noted in (3) above utilizing well 26-S as background.
- 5) Submit a groundwater assessment program plan outline that specifically addresses migration of hazardous waste from the surface impoundment.
- 6) Implement the groundwater assessment program if it is determined that well HC-11 is downgradient.

This letter report addresses the first four concerns outlined by the RWQCB.

July 30, 1985
84-01124.03
Tosco Corporation
Mr. Donald Comer
Response to RWQCB
page 2

ANALYSIS AND CONCLUSIONS

1. Groundwater Elevation Data

Table 1 is a list of the water level elevation data for wells located in the vicinity of the oily waste surface impoundment.

2. Groundwater Level Contour Maps

Figures 1 through 4 are potentiometric surface maps for the shallow water-bearing zones. The potentiometric surface maps are representative of the water table. These contour maps were constructed using water levels measured on July 10, 1985, May 15, 1984, January 20, 1984 and September 1, 1983. Water levels measured on these dates were chosen for contouring because they generally represent water table conditions during the four seasons of the year. Water levels measured in Well 23M were not used in contouring because this well is screened and sand packed at least 18 feet deeper than the adjacent Well HC-11. Well 23M is completed in the older alluvial sedimentary deposits, whereas, HC-11's screened interval is in the Bay Mud and fill. Water level elevations in HC-11 are generally more than a foot higher than in 23M, indicating a downward groundwater flow gradient. The volume of water which is moving down has not been evaluated; however, water quality data for 23M do not indicate the presence of organic constituents which indicate transfer from the upper water bearing zones to lower zones.

Figures 1 through 4 show that the general groundwater flow direction is from north to south; whereas, the overall regional groundwater flow direction is from south to north. This apparent reversal in groundwater flow direction is judged to be due to the sludge drying beds which are acting as a groundwater recharge area. The apparent groundwater flow directions indicated in Figures 1 through 4 suggest that Well HC-11 is upgradient of the oily waste disposal ponds, whereas, Well 26-S is generally downgradient.

3. Groundwater Data

Table 2 summarizes all of the water quality data for wells HC-11, HC-12, HC-13, 23-M and 26-S. Well HC-11 is the only well which contained detectable levels of organic compounds for water samples collected prior to 1985. Water samples were collected from wells HC-11, HC-12 and HC-13 in June, 1985 and well 26-S was sampled in April, 1985. Analysis of these samples indicated the presence of methylene chloride (11ppb) and methyl ethyl ketone (4ppb) in well HC-11. The water sample from HC-13 contained very low levels of tetrahydrofuran (2ppb) and methylpropanol

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(3ppb). The source of these chemicals is not known; however, previous water samples from these wells did not contain detectable levels of these compounds.

Previous water samples from well HC-11 have contained detectable concentrations of organic compounds, especially benzene. A review of several aerial photographs from the 1970's indicated that the east impoundment may have extended slightly farther north at one time. Thus, it appears likely that well HC-11 may be located within the area once included in the impoundment.

4. Statistical Analysis

Table 3 summarizes all of the water quality indicator parameter data for the wells around the surface impoundments. Table 4 lists the results of statistical analyses for the four indicator parameters including values for the mean, variance, standard deviation and Student's t for wells HC-11, HC-12, HC-13 and 26-S. Well 23M was not compared because it is screened much deeper than the other wells, and water samples from it are not representative of shallow water bearing zones. Well 26-S is not believed to represent upgradient and background conditions. This well, as indicated on Figures 1 through 4, is downgradient of the subject ponds. Well HC-11, while strictly upgradient of the ponds, is judged not to represent background conditions because of the presence of organic compounds at this location. Viewing these difficulties, it is judged that Well HC-13 represents the most reasonable background well in the area. As such, the statistical analysis uses this well for comparison to other wells.

Table 4 lists the results of the statistical analysis for TOC, TOX, pH and specific conductance between wells HC-13 and the other wells. The Student's t-test was used to test at the 0.01 level of significance.

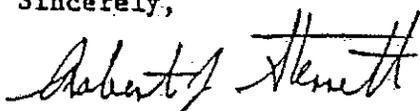
The statistical analyses suggest that there was a significant difference in TOC for well HC-11; however, the variance and standard deviation of TOC for HC-11 are extremely high.

A significant increase in specific conductance was found between wells HC-13 and 26-S. Again, the variance and standard deviation for both wells are very high which makes the value of the statistical analysis questionable. It must also be noted that there was a significant decrease in TOC between wells HC-13 and 26-S. This situation cannot be explained at this time; however, it does suggest that the oily waste disposal ponds do not contribute significant quantities of organic compounds to shallow groundwater.

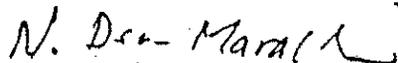
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If you have any questions or comments, please contact one of the undersigned.

Sincerely,



Robert J. Sterrett, Ph.D.
Senior Geologist



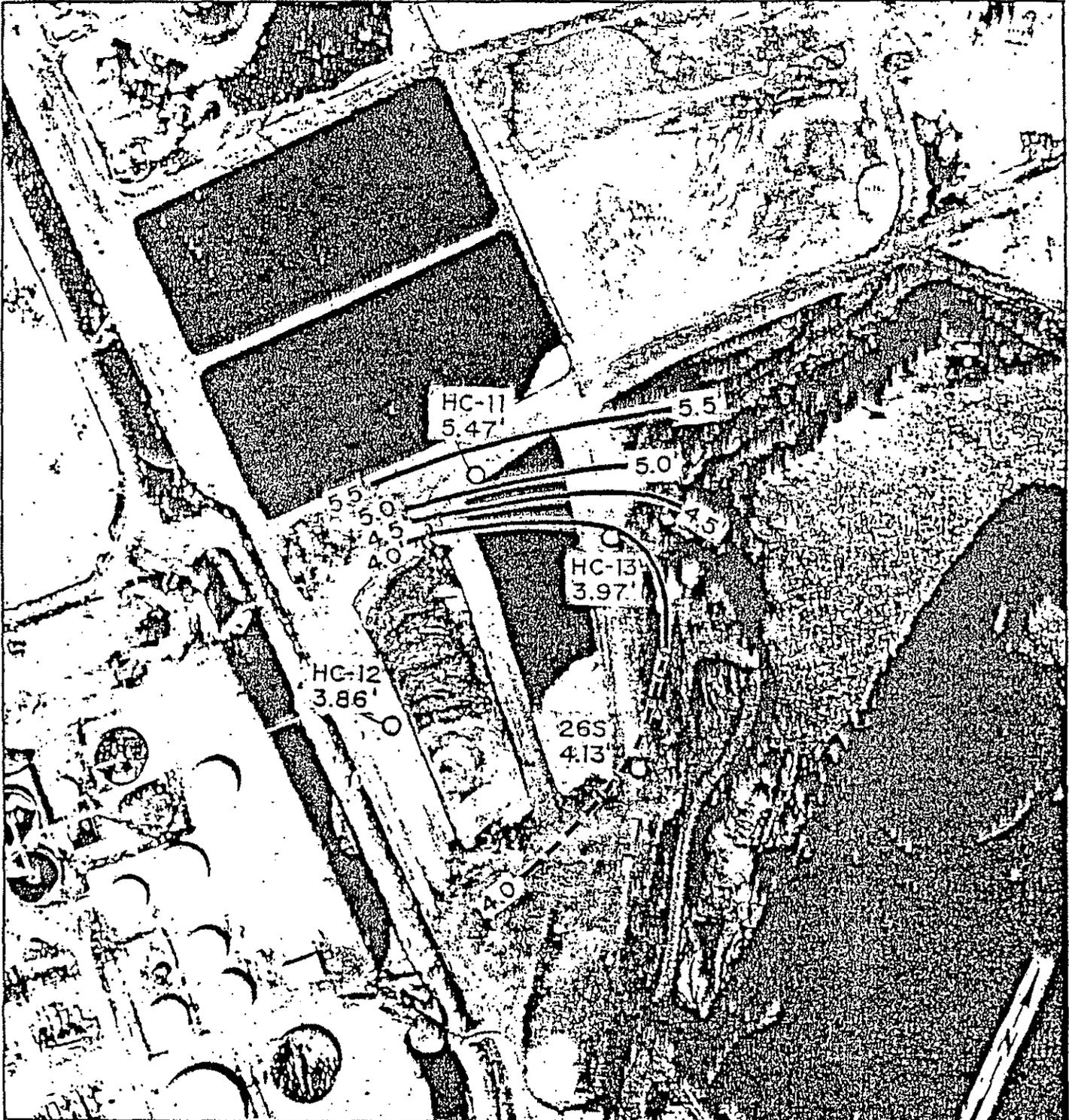
N. Dean Marachi, Ph.D.
Principal

RJS;jb
enclosures: Tables 1 through 4
Figures 1 through 4

Date 7/20/83

Approved by [Signature]

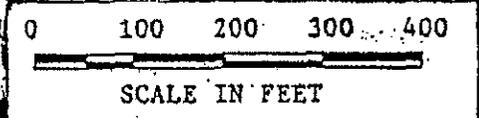
Prepared by Dr.



ELEVATION

○ Monitoring well

—4.0'— Elevation of water level, in feet, datum MSL; dashed where inferred

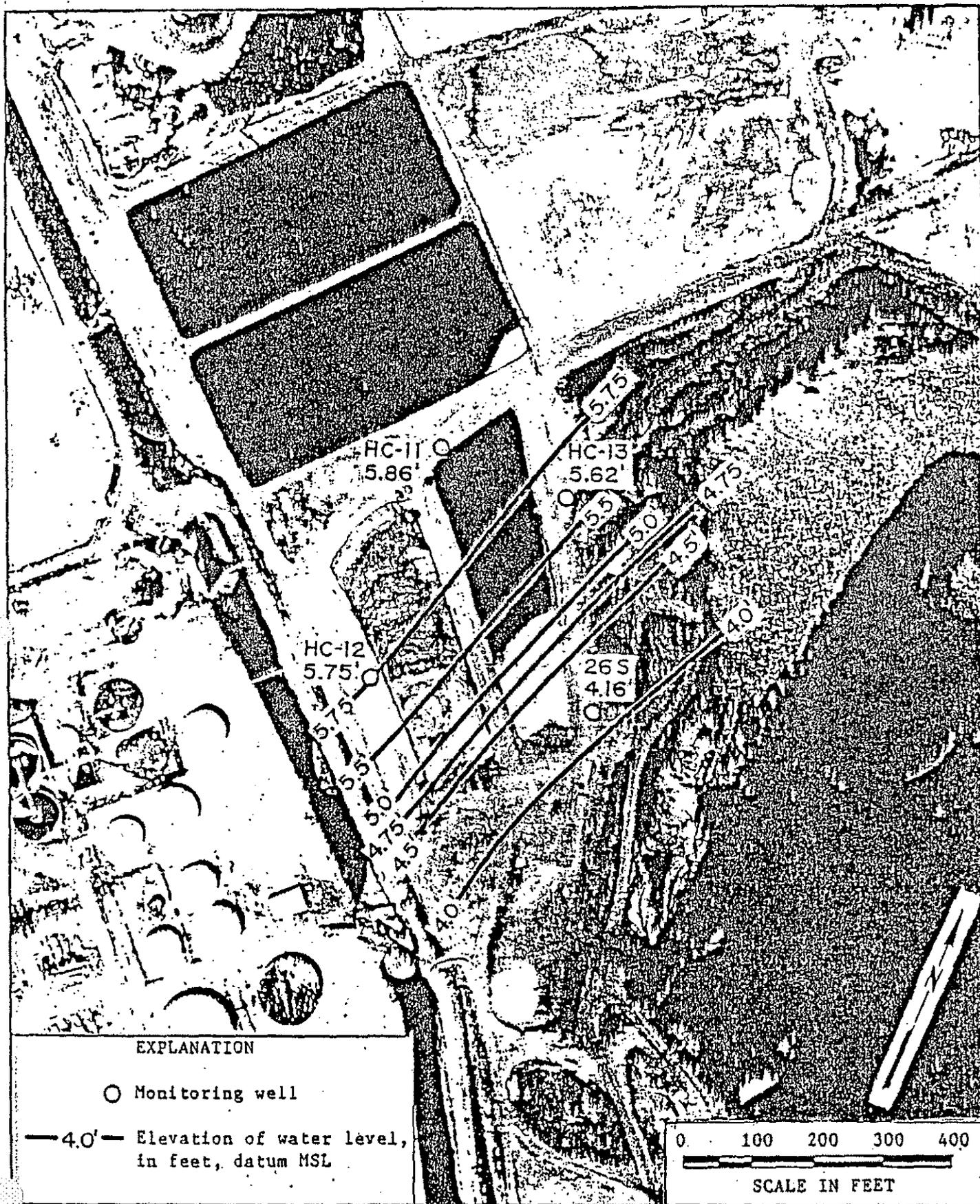


POTENTIOMETRIC MAP FOR THE SHALLOW WATER BEARING ZONE, 9-1-83



Shellmacher Ponds
TOSCO Avon Refinery
Martinez, California

PROJECT NO.
84-1124.03
DRAWING NO.



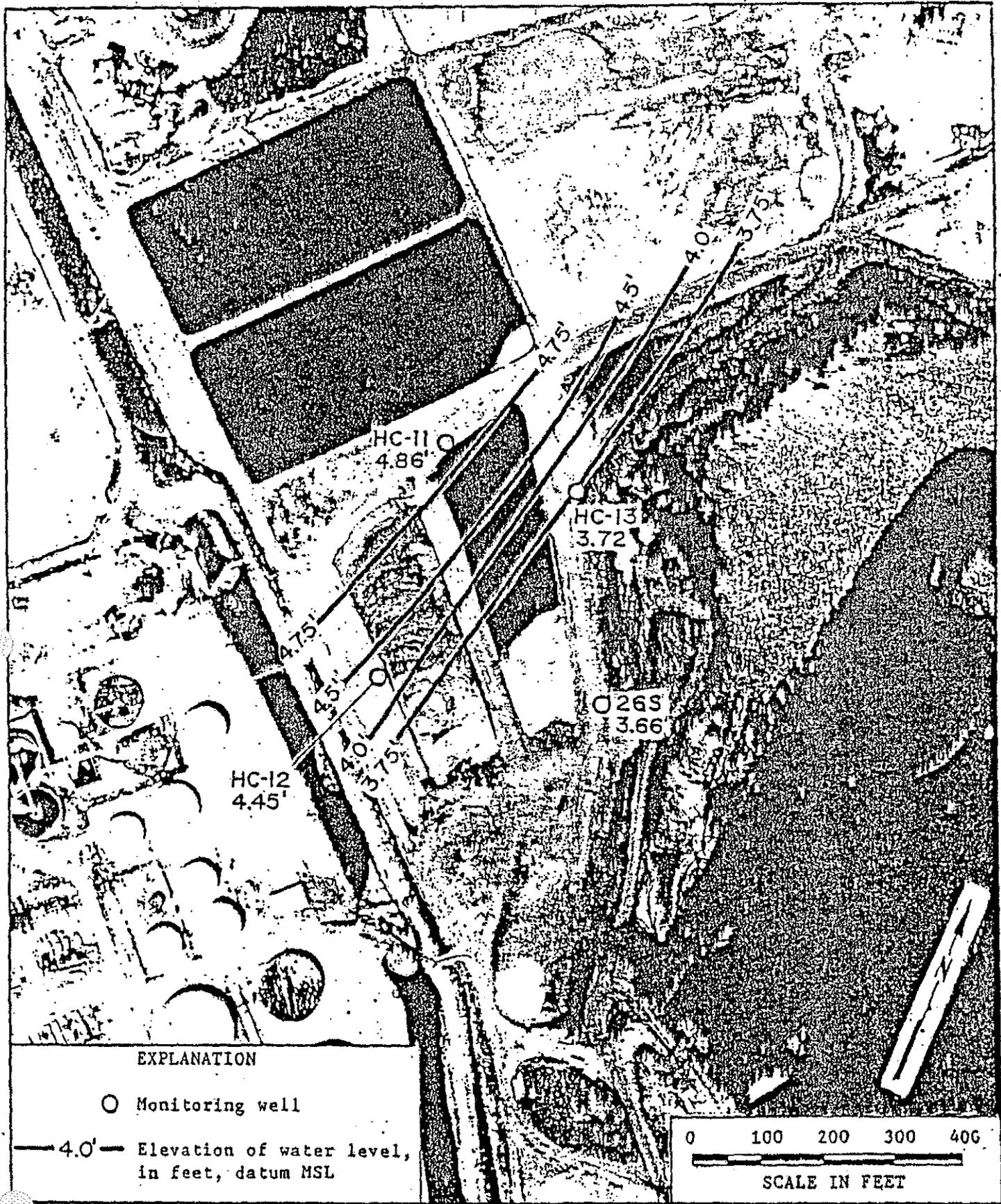
POTENTIOMETRIC MAP FOR THE SHALLOW WATER BEARING ZONE, 1-20-84

PROJECT NO.

84-1124.03

Shellmacher Ponds
TOSCO Avon Refinery

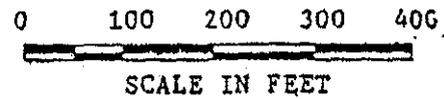
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EXPLANATION

○ Monitoring well

— 4.0' — Elevation of water level, in feet, datum MSL



POTENTIOMETRIC MAP FOR THE SHALLOW WATER BEARING ZONE, 5-15-84

PROJECT NO.

84-1124.03

Shellmacker Ponds
TOSCO Avon Refinery

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TABLE 4
STATISTICAL ANALYSIS OF GROUNDWATER QUALITY PARAMETERS

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RESULTS OF STUDENT'S T TEST

Well I.D.	HC-13	Well I.D.	HC-11
Parameter:	TOX	Parameter:	TOX
Period:	All	Period:	All
No. Obsev:	14	No. Obsev:	14
Mean:	0.75	Mean:	2.52
Variance:	0.46	Variance:	25.88
Std. Dev.:	0.68	Std. Dev.:	5.09
Min:	0.2	Min:	0.41
Max:	2.7	Max:	18
t from table:	2.65	t from table:	2.65

Student's t: 1.29

Weighted t: 2.65

Well I.D.	HC-13	Well I.D.	HC-12
Parameter:	TOX	Parameter:	TOX
Period:	All	Period:	All
No. Obsev:	14	No. Obsev:	14
Mean:	0.75	Mean:	0.28
Variance:	0.46	Variance:	0.01
Std. Dev.:	0.68	Std. Dev.:	0.1
Min:	0.2	Min:	0.16
Max:	2.7	Max:	0.44
t from table:	2.65	t from table:	2.65

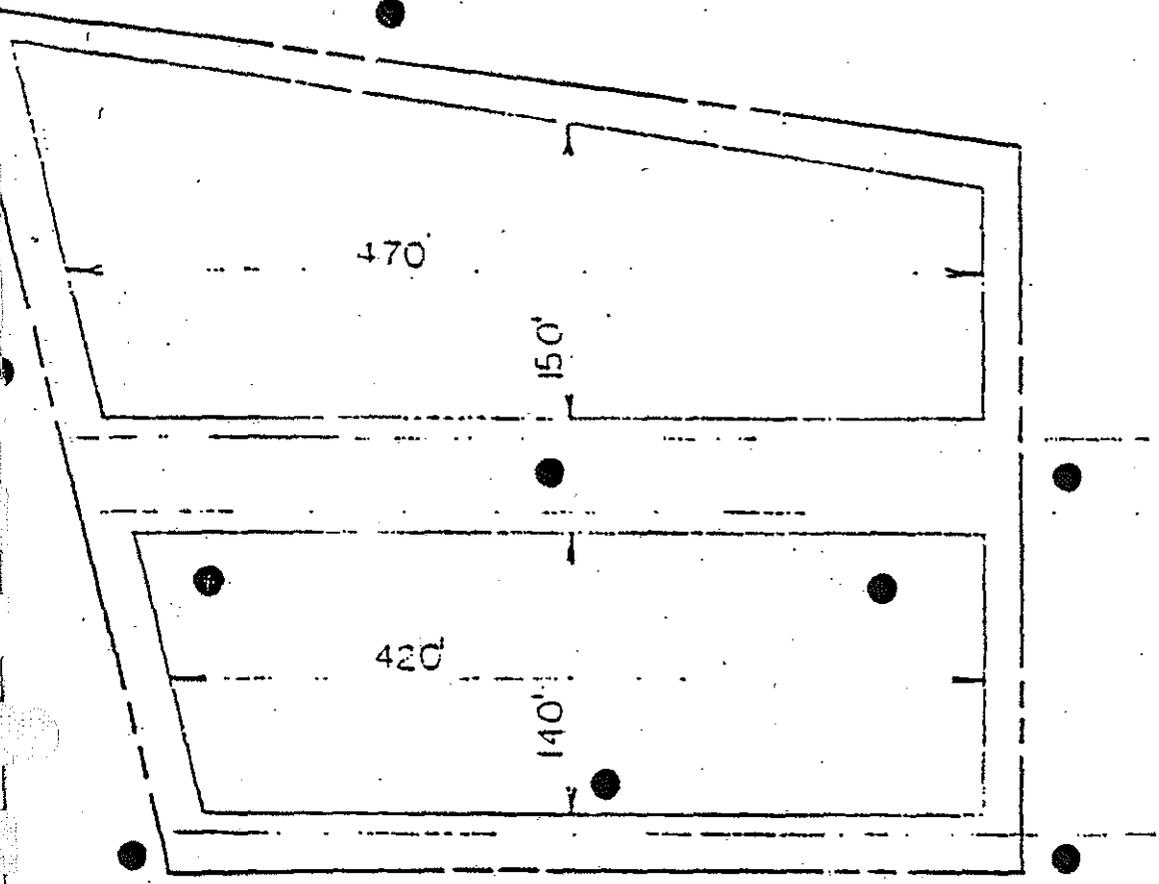
Student's t: -2.565

Weighted t: 2.65

Well I.D.	HC-13	Well I.D.	26-5
Parameter:	TOX	Parameter:	TOX
Period:	All	Period:	All
No. Obsev:	14	No. Obsev:	15
Mean:	0.75	Mean:	0.7
Variance:	0.46	Variance:	0.28
Std. Dev.:	0.68	Std. Dev.:	0.53
Min:	0.2	Min:	0.23
Max:	2.7	Max:	2.3
t from table:	2.65	t from table:	2.624

Student's t: -0.22

ORTH



CANAL

CANAL

Approximate boring locations

REV.	MARK	DESCRIPTION	DATE	MARK	DESCRIPTION	DATE
		REDRAWN				

TOSCO CORPORATION

DATE
11 12 80
DR. HPJ
CH.

W. O. A. P. E.
SCALE 1" = 100' SH. 17 OF 19
00 11 256 1

APPENDIX F

WIPE TEST

WIPE TEST PROCEDURE

H.1 SUMMARY OF METHOD

A 1-square foot area of the surface is wiped with a wetted filter paper. The paper is then placed in a plastic bottle and delivered to a laboratory. The entire filter paper is then analyzed according to U.S. EPA methods 7190 and 7420 (SW-846).

H.2 EQUIPMENT

The equipment required for wipe sampling includes:

plywood template (1-sq ft) or tape measure
marking crayon
filter paper (15-cm diameter, ashless)
squeeze bottle containing appropriate solvent (e.g., hexane, methylene chloride) depending on the substances to be tested
wide-mouth plastic bottles with caps (250 or 500 ml capacity)
disposable plastic gloves
magic marker for labeling bottles
notebook and pen
box or crate for carrying equipment
a ladder.

H.3 PROCEDURE

The wipe test procedure is as follows:

1. Select a representative sample location.
2. Mark a 1-square foot area using the template and crayon. Label the location.
3. Put on a pair of new gloves.
4. Take a filter paper, fold it into quarters, and saturate it with caustic solution.

5. Wipe the entire surface of the area to be sampled once in the horizontal direction and then once in the vertical direction. Use a uniform pressure for wiping. All sides of the filter may be used in wiping the area.
6. Place the filter paper in a wide-mouth plastic bottle. Label the bottle. Additional filter papers may be placed in the same bottle to form a composite sample.
7. Remove and dispose of the gloves.
8. Record sample location and other information in the field notebook.
9. Repeat steps 1 through 8 until all samples are collected.

H.4 QUALITY CONTROL

Quality control for field wipe sampling includes replicate (duplicate) and blank samples. A replicate sample is collected from an adjacent 1-square foot area. A blank sample consists of a clean, unused, saturated filter paper.

H.5 ANALYSIS

The entire filter paper is analyzed in the laboratory for the following:

hexavalent chromium
lead.