Corporate Offices 41674 Christy Street, Fremont, CA 94538-3114 (415) 659-0404 Fax: (415) 651-4677 Contr Lic. No. 464324

ensco environmental services, inc.

November 30, 1988

Shell Oil Company
1390 Willow Pass Road
Suite 900
Concord, CA 94520

Attn: Ms. Diane Lundquist

Re: Supplemental Soil and Ground-Water Investigation at Former Shell Service Station
7194 Amador Valley Boulevard, Dublin, California
Shell P.O. Number MOH 237138
EES Project Number 1826G

Dear Mr. Roller:

Ensco Environmental Services, Inc. (EES) has completed a supplemental soil and ground-water investigation at the above referenced site in the City of Dublin, Alameda County, California. The results of the investigation are presented in the attached report. The scope of work includes a soil gas survey, the drilling of eight exploratory borings, two of which were converted to ground-water monitoring wells, soil and ground-water sampling, and chemical analyses of selected samples.

We trust that the attached report suits your needs. If you have any questions concerning the report or if we may be of further service to Shell Oil Company, please call.

Sincerely,
Ensco Environmental Services, Inc.

Richard A. Garlow
Project Geologist

Lawrence D. Pavlak, C.E.G. 1187
Senior Program Geologist

RAG/LDP/sr
Attachment

SECTION	PAGE
EXECUTIVE SUM	1
INTRODUCTION	2
BACKGROUND	2
SCOPE OF WORK	3
FIELD OF INVESTIGATION	3
SOIL GAS SURVEY	3
EXPLORATORY BORINGS	4
Ground-Water Monitoring Well Borings	5
Ground-Water Monitoring Well Construction	6
Well Development and Ground-Water Sampling	7
Site Survey	7
SITE GEOLOGY AND HYDROGEOLOGY	7
SAMPLE ANALYSES	8
SUMMARY OF LABORATORY RESULTS	9
Soil Samples	9
Water Samples	9
Conclusions	10
REPORTING REQUIREMENTS	11
LIMITATIONS	11

TABLE OF CONTENTS
(Continued)

TABLES

1A. Soil Analyses Data
1B. Soil Analyses Data
2 Ground-Water Analyses Data

FIGURES

1. Site Location Map
2. Site Plan
3. TPHg Concentration in Soil
4. Benzene Concentration in Ground Water
5. Ground-Water Elevation Map
6. Cross Section A-A'

APPENDICES

A. Soil Gas Survey Report
B. Boring Logs and Well Construction Details
C. Surveyors Map
D. Chains-of-Custody and Laboratory Reports

SUPPLEMENTAL SOIL AND GROUND-WATER INVESTIGATION

AT

FORMER SHELL SERVICE STATION
7194 AMADOR VALLEY BOULEVARD
DUBLIN, CALIFORNIA

EXECUTIVE SUMMARY

Ensco Environmental Services, Inc. (EES) has recently completed a multiphased soil and ground-water investigation for Shell Oil Company (Shell) adjacent to the former Shell Service Station located at 7194 Amador Valley Boulevard in Dublin, California. The former service station was removed and has been replaced with an Oil Changers facility. In May of 1988, EES completed a soil and ground-water investigation of the former station site at which contamination of the soil and ground-water by gasoline and gasoline related compounds was discovered. At that time, Shell requested EES to determine the vertical and lateral extent of the contamination, which is the purpose of this investigation. The scope of work included a review of previous work done at the site by EES, a soil gas survey, drilling of exploratory borings, installation of ground-water monitoring wells, and the collection of soil and ground-water samples for analysis. The findings of the investigation may be summarized as follows.

1. Localized contamination of the soil and ground-water beneath and adjacent to the site has occurred.

2. Soil sample analyses revealed the presence of total petroleum hydrocarbons as gasoline (TPHg) and benzene, toluene, total xylenes and ethyl benzene (BTXE) in the soils adjacent to the site. Results of the laboratory analyses for TPHg ranged from below laboratory reporting limits (BRL) to 540 parts-per-million (ppm). Levels of BTXE in the soils were generally quite low, but one location did have a xylene concentration

of 42 ppm. The higher TPHg concentration levels appear to be confined to a single silty clay bed located near the eastern boundary of the site beneath Village Parkway.

3. Water sample analyses revealed the presence of TPHg and BTXE in the ground-water adjacent to the site. TPHg concentrations were quite variable. One sample had a concentration of 200 ppm while the rest had concentration levels ranging from BRL to 15 ppm. BTXE analyses detected benzene concentrations ranging from 0.0008 ppm to 4.4 ppm. Toluene results were BRL to 0.39 ppm, xylene results ranged from BRL to 1.7 ppm, and ethylbenzene results ranged from BRL to 0.69 ppm.

INTRODUCTION

At the request of Shell, EES has completed an off-site field investigation to assess the extent of potential contamination emanating from the former Shell Service Station located at 7194 Amador Valley Boulevard in Dublin, California. The location of the site is shown in Figure 1. The field investigation was conducted in accordance with a scope of work which was approved by Shell and was specified in an extension of Shell Purchase Order No. MOH 237138.

This report will present the background of the project, the scope of work, a description of the field investigation and sample analyses, a summary of findings, and conclusions.

BACKGROUND

In May, 1988 EES completed a soil and ground-water investigation at the former Shell Service Station located at 7194 Amador Valley Boulevard in Dublin, California. This study concluded that TPHg and BTEX contaminants were present in the soil and ground-water underlying the site (see Soil and Ground-Water Investigation for Shell Oil Company; Ensco Environmental Services, Inc., May 1988). As a result of these findings, Shell contracted EES to perform supplemental studies to determine the degree and extent of contamination.

SCOPE OF WORK

The scope of work for this project included a soil gas survey; the drilling, logging and sampling of six exploratory soil borings, the drilling, logging, sampling, and construction of two ground-water monitoring wells; laboratory analysis of selected soil samples; well development and ground-water sampling; and analysis of ground-water samples.

FIELD INVESTIGATION

The field investigation was performed between July 19, 1988 and August 12, 1988. This investigation was accomplished in three phases. 1) a soil gas survey, 2) six exploratory borings, and 3) two additional exploratory borings which were converted to ground-water monitoring wells (MW-6 and MW-7). The locations of these additional installations as well as previous installations are shown on Figure 2. At the conclusion of these phases, an aquifer pump test was performed. A summary of this test is included as Appendix E.

SOIL GAS SURVEY

On July 19 and July 20, 1988, a soil gas survey of the site was conducted to aid in determining the extent of possible subsurface contamination. This survey was performed by Chips Environmental Consultants, Inc. (CHIPS) under the direction of the EES project geologist. The soil gas was analyzed for total petroleum hydrocarbons TPH with a hydrocarbon analyzer and flame ionization detector.

As the study area was overlain by asphalt pavement, the procedure employed involved drilling a 1-inch diameter access hole through the asphalt at each sample location. A 1/2-inch diameter steel pipe with a forged point with several 3/16-inch diameter holes drilled through this end was then driven into the soil to an approximate depth of eight feet. A vacuum pump was then connected to the pipe and soil gas was extracted from the soil and introduced

into the hydrocarbon analyzer. Concentrations were displayed on a strip chart recorder in ppm. After a reading was obtained, the pipe was removed from the soil and the hole was backfilled with sand to within approximately 1 1/2 feet of the surface. It was then filled to the surface with a liquid asphalt sealer. During this two day study, 50 points were sampled at the locations shown on Figure 2. The CHIPS report is attached as Appendix A and presents the concentration reading for each sample point.

EXPLORATORY BORINGS

A truck mounted Mobile B-53 drill rig with 8-inch outside diameter hollow stem augers was used to drill the six exploratory soil borings. The borings were logged by an EES geologist with soil descriptions classified according to the Unified Soil Classification System and Munsell Soil Color Charts. To reduce the potential of cross contamination between borings at the site an adequate number of auger sections were steam cleaned prior to drilling. Only pre-cleaned augers were utilized to drill each boring. Additionally, all sampling equipment was broken down into its component parts and thoroughly cleaned between each sampling event.

Soil samples were collected through the hollow stem auger at 18-inch intervals beginning at a depth of four feet. When the desired sample depth was reached, a cleaned modified California split-spoon sampler, equipped with three clean brass liner tubes, each six inches long and two inches in diameter, was used to collect and retain the soil sample. The sampler was advanced 18-inches into the undisturbed soils ahead of the auger by driving it with a 140-pound rig-operated hammer. After recovery from the borehole and the sampler, the soil was visually characterized and was also tested with a portable photo-ionization detector (PID) for the presence of volatile hydrocarbons. Upon completion of field characterization, the bottom sample liner was retained for chemical analysis. Both ends of the liner were covered with aluminum foil and a plastic cap, labeled with a unique sample number and pertinent sample information, placed in a plastic "Ziploc" bag, entered onto a Chain-Of-Custody form, and packed in a chilled ice chest.

Each of the borings were advanced through the contaminated zone to determine the vertical extent of soil contamination or to a point judged to be just above the water table. Ground water was only encountered during drilling in boring B-1, at a depth of 9 feet. B-1 was drilled to a depth of 11 1/2 feet, B-2, B-3 and B-4 to 10 feet, and B-5 and B-6 to 13 feet. Product odor and positive readings on the portable PID were noted at depths of approximately 5 to 11 feet below the surface in borings B-1, B-5 and B-6. Only a faint odor, with no reaction on the PID. was noted in the soils from borings B-2, B-3, and B-4. The boring logs, with the PID readings indicated, are attached in Appendix B.

All soil cuttings derived from the drilling operation were placed into steel 55-gallon drums, sealed and placed on site. Later laboratory analyses of the soil cuttings found the soil from borings B-1, B-2, B-3, and B-4 to contain TPHg at concentrations below 100 ppm.. Analyses of soil cuttings from borings B-5 and B-6 revealed TPHg at a concentration of 100 ppm. The drums containing those contaminated soils were disposed of by Shell. After completion of drilling, the bore holes were backfilled with neat portland cement to approximately 1 1/2 feet below the surface. Approximately 1 foot of concrete was then placed in the borehole and, after setting, was overlain by asphalt patch material up to the adjacent pavement surface. The locations of these borings are shown on Figure 2.

Ground-Water Monitoring Well Borings Monitoring wells MW 5, 6, and 7 installed

A truck mounted Mobile B-53 drill rig with 10-inch outside diameter hollow stem augers was used to drill the bore holes for the two ground-water monitoring wells. Soil samples were collected through the hollow stem auger at 18-inch intervals from 4 feet to 11 1/2 feet and then at least every five feet as determined by the EES geologist. The drilling, logging, and sample handling and preservation procedures were the same as those used in the six previously described exploratory soil borings.

Each of the borings were advanced through the contaminated zone to determine the vertical extent of soil contamination. Ground-water was encountered in MW-6 at a depth of approximately 15 feet and in MW-7 at a depth of approximately 14 feet. Ground-water levels were found to stabilize at approximately 9.7 feet in MW-6 and 7.9 feet in MW-7. MW-6 was drilled to a final depth of 24.5 feet and MW-7 to a depth of 17 feet. Product odors were noted in soils from MW-6 at depths of 7 to 11 feet which generated positive readings on the PID. No product odor in the soil and no reaction on the PID was noted during the drilling of MW-7. The boring logs, with the PID readings indicated, are attached in Appendix B.

All soil cuttings generated during the drilling program were placed into steel 55-gallon drums, sealed and placed on site. Later analyses of the soil cuttings found the soils from MW-6 and MW-7 to contain TPHg at concentrations below 100 ppm.

Ground-Water Monitoring Well Construction

The monitoring wells were constructed by inserting 4-inch diameter schedule 40 polyvinyl chloride (PVC) blank and factory-slotted casing with a 0.020 inch slot size and flush-threaded couplings into the aforementioned borings. No solvents or cements were used during well construction. The screened interval of each monitoring well was determined in the field by the EES geologist, based upon the characteristics of the uppermost saturated zone.

After the casing was installed, clean No. 2/12 sand was poured through the auger, as the auger was being removed, to fill the annulus between the casing and the borehole wall to 2 feet above the top of the screened interval. One foot of 1/2-inch bentonite pellets was then placed on top of the sand and hydrated. A cement grout seal was then placed in the remaining annulus to the surface. A steel protective vault, with a locking device, was placed over the well head and into the cement grout to protect the well. The top of the protective cover was placed at grade. Construction details of each monitoring well are presented in Appendix B.

Well Development and Ground-Water Sampling

After completion of well construction, each well was developed to remove fine-grained material and turbid water, and to improve the hydraulic communication with the surrounding formation. A stainless steel bailer was used to develop the wells. Each well was bailed until either a minimum of five well volumes of ground-water was removed or until the well was dewatered (MW-7 was dewatered at 4.6 well volumes).

Prior to ground-water sampling, the monitoring wells were checked for the presence of free-floating petroleum product with a clear acrylic bailer. Product was not observed in any of the monitoring wells. The wells were then purged of approximately four more well volumes prior to sampling. Ground-water samples were collected using a clean teflon bailer. The water sample from each well was placed into two 40 milliliter (ml) vials with teflon septa caps, labeled with a unique sample number, entered onto a Chain-Of-Custody form, and placed in a chilled ice chest.

Site Survey

The elevations of the tops of the PVC well casings and the tops of the protective covers were surveyed by Ron Archer, Registered Professional Engineer, Pleasanton, California. The elevations were recorded to the nearest 0.01 foot and the reference benchmark (stamped "VL-PK-AM-VY 1977, Elevation 337.402 M.S.L.) is located in the western median of Amador Valley Boulevard at Village Parkway adjacent to the site. The property boundaries and the locations of the monitoring wells on the property were also surveyed. A copy of the original survey map is included in Appendix C.

SITE GEOLOGY AND HYDROGEOLOGY

The exploratory borings and the ground-water monitoring well borings were drilled to depths ranging from apporximately 10 to 24 1/2 feet. The soils

observed during the drilling operation were primarily silty clays interbedded with sandy clays and clayey sands. Generally, the more sandy beds were confined to the upper 5 to 10 feet. The fine-grained sand interbeds may be localized lenses or stringers.

Ground-water was encountered in the borings at depths ranging from approximately 9 to 15 feet. The static water level was measured in each of the monitoring wells on September 6, 1988, and was observed to be between 7.60 and 11.29 feet below the tops of the well casings. The apparent direction of ground-water flow is to the south-east at a gradient of approximately .0014 feet per foot.

SAMPLE ANALYSES

Soil and ground-water samples collected at the site were analyzed at Anametrix Analytical Laboratory in San Jose, California. In all borings, soil samples were collected at 1 foot intervals from 5 to 11 1/2 feet and at the bottom of the boring. This close spacing was selected to delineate the vertical extent of contamination. Below this depth, sampling was conducted approximately every 4 to 5 feet as directed by the EES geologist.

At the request of Shell, every soil sampling interval was checked for the presence of hydrocarbons with a portable PID. If the detector indicated a concentration less than 50 ppm, the soil sample was to be included in a composite sample. If the detector indicated a concentration greater than 50 ppm, the soil sample was to be analyzed separately.

In the laboratory all samples, both individual and composite, were analyzed for TPHg using modified EPA Method 8015. If the composite sample was found to contain TPHg in excess of 100 ppm, then each individual sample in the composite was analyzed for TPHg. Any individual sample containing TPHg in excess of 100 ppm was analyzed for BTXE using modified EPA Method 8020. Water samples were analyzed for TPHg and BTXE using modified EPA Methods

8015 and 8020, respectively. These methods follow CRWQCB, Region 2 guidelines.

SUMMARY OF LABORATORY RESULTS

Soil Samples

Laboratory analyses revealed the presence of TPHg and BTXE in some of the soil samples underlying the study area. The maximum TPHg concentration reported was 540 ppm. The maximum BTXE concentrations detected in the soils tested were 9.8 ppm for benzene, 5.6 ppm for toluene, 42 ppm for total xylenes, and 11 ppm for ethyl benzene. See Table 1A and 1B, Soil Analyses Data.

Two samples from boring B-5 had TPHg concentrations of 170 ppm and 420 ppm. Two samples from boring B-6 had TPHg concentrations of 130 ppm and 540 ppm (See Figure 3). The results of the TPHg analyses for all of the other samples was BRL or less than 76 ppm as detailed in Tables 1A and 1B.

One sample from exploratory boring B-6 had a xylene concentration level of 42 ppm. All other samples analyzed for BTXE consituents had benzene concentrations of less than 10 ppm, toluene concentrations of less than 7 ppm, total xylene concentrations of less than 43 ppm, and ethyl benzene concentrations of less than 12 ppm as detailed in Tables 1A and 1B.

Water Samples

Water sample analyses revealed the presence of TPHg and BTXE in the ground-water underlying the study area. The maximum TPHg concentration detected was 200 ppm, in well MW-1. BTXE were detected at concentrations up to 4.4 ppm for benzene, 0.39 ppm for toluene, 1.7 ppm for total xylenes, and 0.69 ppm for ethyl benzene.

Monitoring well MW-1 had a toluene concentration of 0.26 ppm and MW-6 had toluene, ethyl benzene and total xylenes concentrations of 0.39 ppm, 0.69 ppm

and 1.70 ppm respectively. Benzene concentrations were 4.4 ppm in MW-1, 0.23 ppm in MW-2, 0.17 ppm in MW-3, 0.64 ppm in MW-4, 0.39 ppm in MW-6, and 0.0008 ppm in MW-7 (see Figure 4). The chain-of-custody forms and the laboratory analytical reports are included in Appendix D. Summaries of the soil and ground-water analyses data are presented in Tables 1 and 2.

Conclusions

The soils observed during the drilling operations consisted primarily of silty to sandy clay interbedded with clayey sand to a depth of approximately 6 to 9 feet, overlying silty clays which extended to the maximum depths of the borings (10 to 24.5 feet). The apparent ground-water flow direction is to the southeast at an approximate gradient of 0.0014 feet per foot (see Figure 5)

An analysis of known TPHg concentrations in the soils in the study area revealed that most of it is confined to a single silty clay bed which is located approximately between 6 and 12 feet below the surface. This relationship is illustrated in Figure 6 - Cross Section A-A'. A previous investigation completed by EES in May 1988 found TPHg concentrations in excess of 100 ppm in a silty clay located approximately 10 feet below the surface in the borings for MW-3 and MW-4. These monitoring wells were located near the eastern and western site boundaries (see Figure 3).

Laboratory analyses revealed the presence of benzene concentrations in the ground water. This contamination is centered near the southeast corner and extends outward to encompass most of the former station property and also southeasterly (down gradient) to monitoring well MW-7 (see Figure 2).

Samples from all ground-water monitoring wells were found to contain benzene concentrations in excess of 0.0007 ppm. In addition, ground-water samples from wells MW-1 and MW-6 were found to contain concentrations of toluene in excess of 0.1 ppm. The ground-water sample from MW-6 was found to contain concentrations of ethyl benzene and total xylenes in excess of 0.68 ppm and 0.62 ppm respectively.

REPORTING REQUIREMENTS

A copy of this report should be forwarded by the client to the following agencies in a timely manner:

Alameda County Health Care Services
Department of Environmental Health
Hazardous Materials Division
80 Swan Way, Suite 200
Oakland, California 94621

Attn: Mr. Storm Goranson
Hazardous Materials Specialist

Regional Water Quality Control Board
San Francisco Bay Region
1111 Jackson Street, Room 6040
Oakland, California 94607

Attn: Mr. Peter Johnson
Senior Water Resources Control
Engineer

LIMITATIONS

The discussion and recommendations presented in this report are based on the following:

1. The exploratory test borings drilled at the site.
2. The observations of field personnel.
3. The results of laboratory analyses performed by a state-certified laboratory.
4. Referenced documents.
5. Our understanding of the regulations of the State of California and Alameda County and/or the City of Dublin.

It is possible that variations in the soil or ground water conditions could exist beyond the points explored in this investigation. Also, changes in the ground water conditions could occur at sometime in the future due to variations in rainfall, temperature, regional water usage or other factors.

The service performed by EES has been conducted in a manner consistent with the level of care and skill ordinarily exercised by Members of our profession

currently practicing under similar conditions in the Dublin area. Please note that contamination of soil and ground water must be reported to the appropriate agencies in a timely manner. No other warranty, expressed or implied, is made.

TABLE 1A

SOIL ANALYSES DATA

Shell Oil Company
7194 Amador Valley Boulevard, Dublin, California

EES Project No. 1826G

SAMPLE NUMBER	TPHg (ppm)	BENZENE (ppm)	TOLUENE (ppm)	TOTAL XYLENES (ppm)	ETHYL BENZENE (ppm)
B-1-(1,2,4,5) (composite)	BRL	NA	NA	NA	NA
B-1-3	22	NA	NA	NA	NA
B-2-(1,2,3) (composite)	BRL	NA	NA	NA	NA
B-3-(1,2,3,4) (composite)	BRL	NA	NA	NA	NA
B-4-(1,2,3,4) (composite)	BRL	NA	NA	NA	NA
B-5-1	BRL	NA	NA	NA	NA
B-5-2	420	9.8	1.8	36	7.5
B-5-3	43	NA	NA	NA	NA
B-5-4	170	9.3	1.3	14	11
B-5-5	10	NA	NA	NA	NA

ppm = Parts-per-million
BRL = Below Reporting Limit
TPHg = Total Petroleum Hydrocarbons as Gasoline

NA = Not Analyzed
NOTE: For reporting limits, refer to laboratory reports

TABLE 1B

SOIL ANALYSES DATA

Shell Oil Company
7194 Amador Valley Boulevard, Dublin, California

EES Project No. 1826G

SAMPLE NUMBER	TPHg (ppm)	BENZENE (ppm)	TOLUENE (ppm)	TOTAL XYLENES (ppm)	ETHYL BENZENE (ppm)
B-6-1	BRL	NA	NA	NA	NA
B-6-2	66	4.8	5.6	1.8	7.2
B-6-3	540	3.9	6.4	42	5.3
B-6-4	130	BRL	1.3	11	4.5
B-6-5	14	NA	NA	NA	NA
B-6-6	BRL	NA	NA	NA	NA
MW-6-(1,2,3,6) (composite)	BRL	NA	NA	NA	NA
MW-6-4	11	NA	NA	NA	NA
MW-6-5	75	NA	NA	NA	NA
MW-7-(1,2,3,4,5,6) (composite)	BRL	NA	NA	NA	NA

ppm = Parts per-million
BRL = Below Reporting Limit
TPHg = Total Petroleum Hydrocarbons as Gasoline

NA = Not Analyzed
NOTE: For reporting limits, refer to laboratory reports

TABLE 2

GROUND-WATER ANALYSES DATA

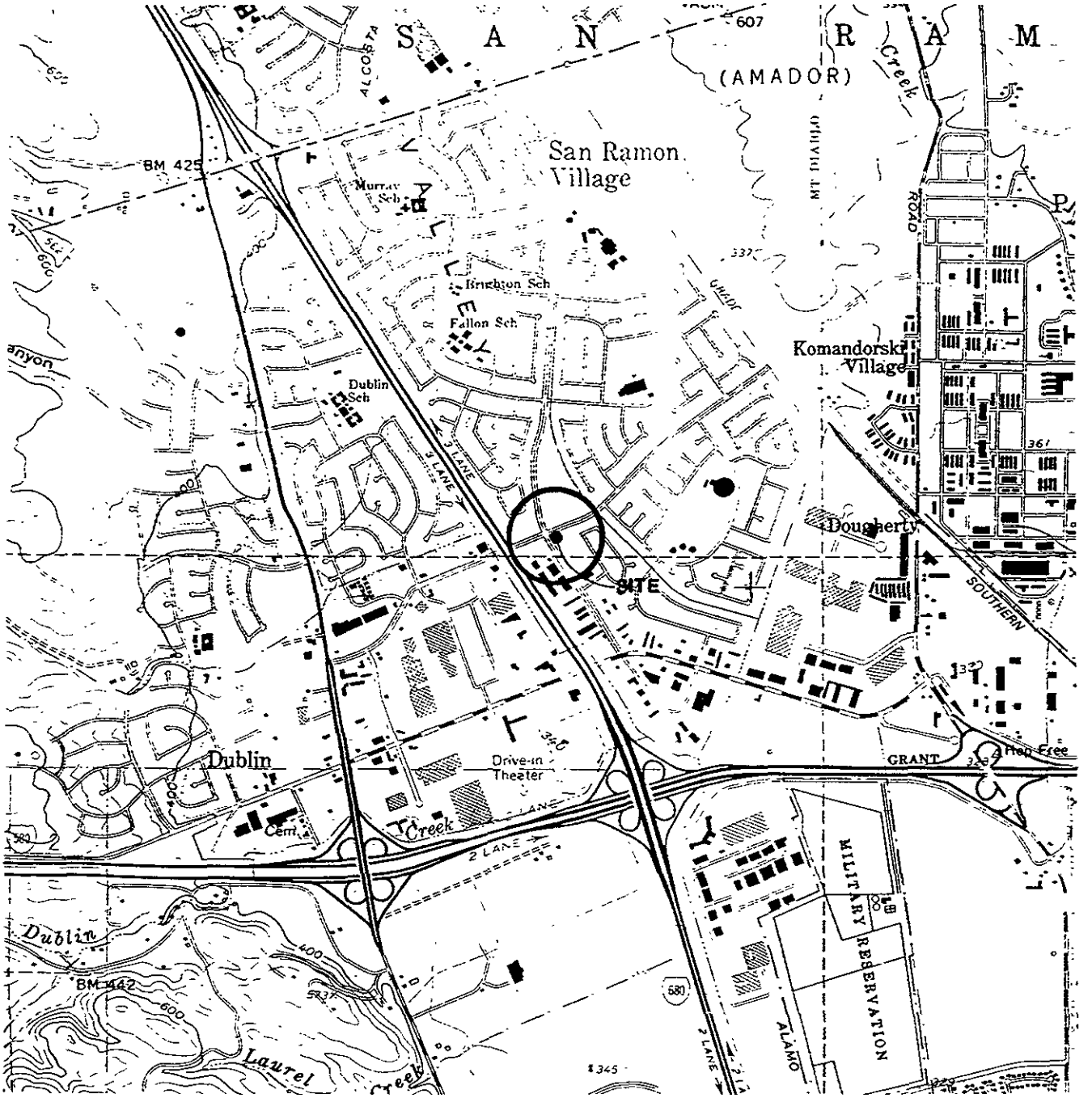
Shell Oil Company
7194 Amador Valley Boulevard, Dublin, California

EES Project No. 1826G

SAMPLE NUMBER	TPHg (ppm)	BENZENE (ppm)	TOLUENE (ppm)	TOTAL XYLENES (ppm)	ETHYL BENZENE (ppm)
MW-1	200	4.400	0.260	0.450	0.300
MW-2	1.70	0.230	0.016	0.120	0.087
MW-3	5.20	0.170	0.006	0.054	0.032
MW-4	2.10	0.640	0.041	0.160	0.110
MW-5	0.21	0.006	0.004	0.019	0.009
MW-6	150	0.390	0.390	1.700	0.690
MW-7	BRL	0.0008	BRL	BRL	BRL

ppm = Parts-per-million
BRL = Below Reporting Limit
TPHg = Total Petroleum Hydrocarbons as Gasoline

NA = Not Analyzed
NOTE: For reporting limits, refer to laboratory reports



SOURCE: USGS 7.5' MAP, DUBLIN QUADRANGLE

LEGEND

SITE LOCATION

0 1

SCALE IN MILES

N

ensco environmental services, Inc.

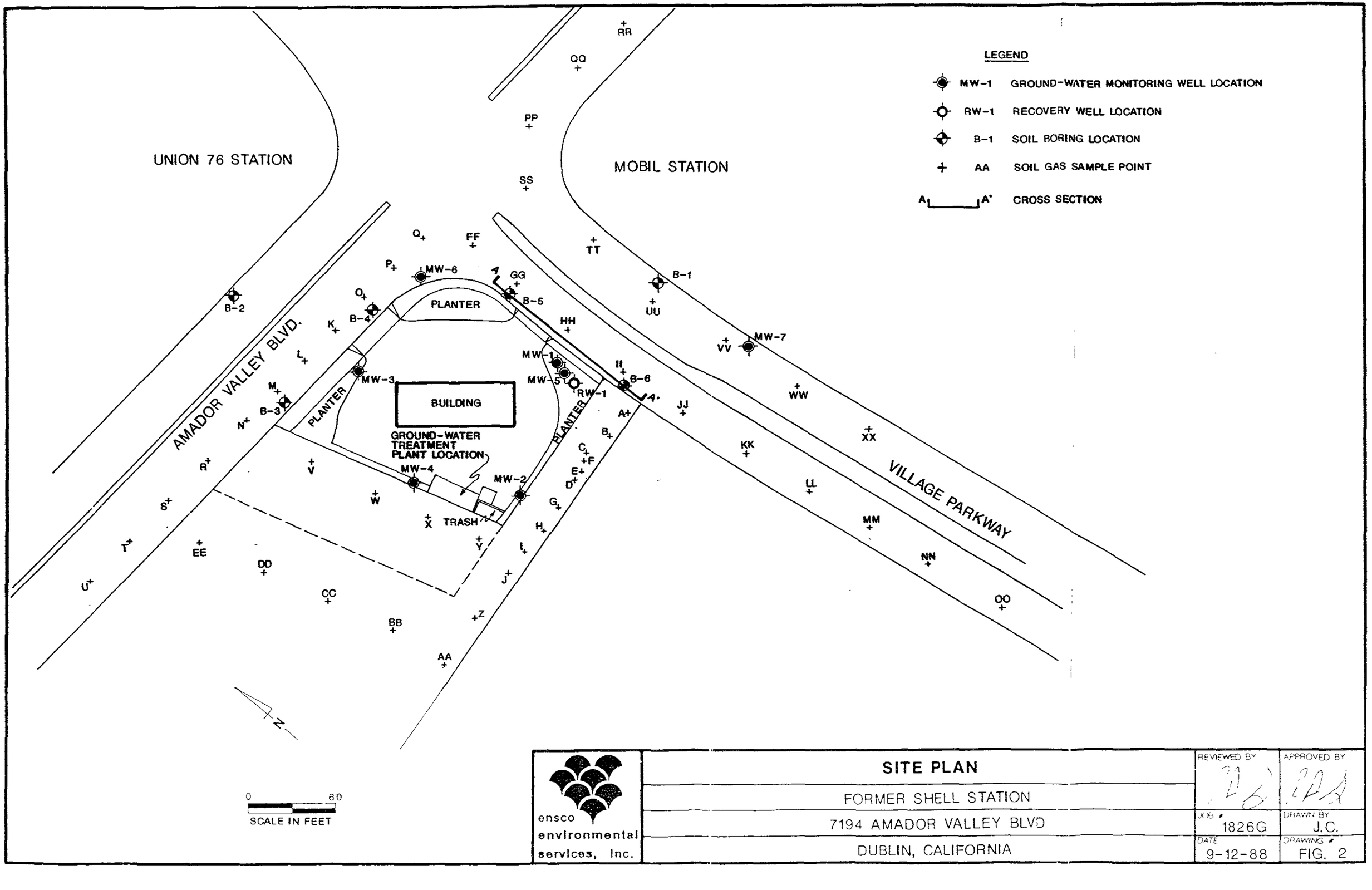
SITE LOCATION MAP

FORMER SHELL STATION

7194 AMADOR VALLEY BLVD

DUBLIN, CALIFORNIA

REVIEWED BY	APPROVED BY
JOB # 1826G	DRAWN BY J.C.
DATE 9-13-88	DRAWING # FIG. 1



ensco environmental services, Inc.

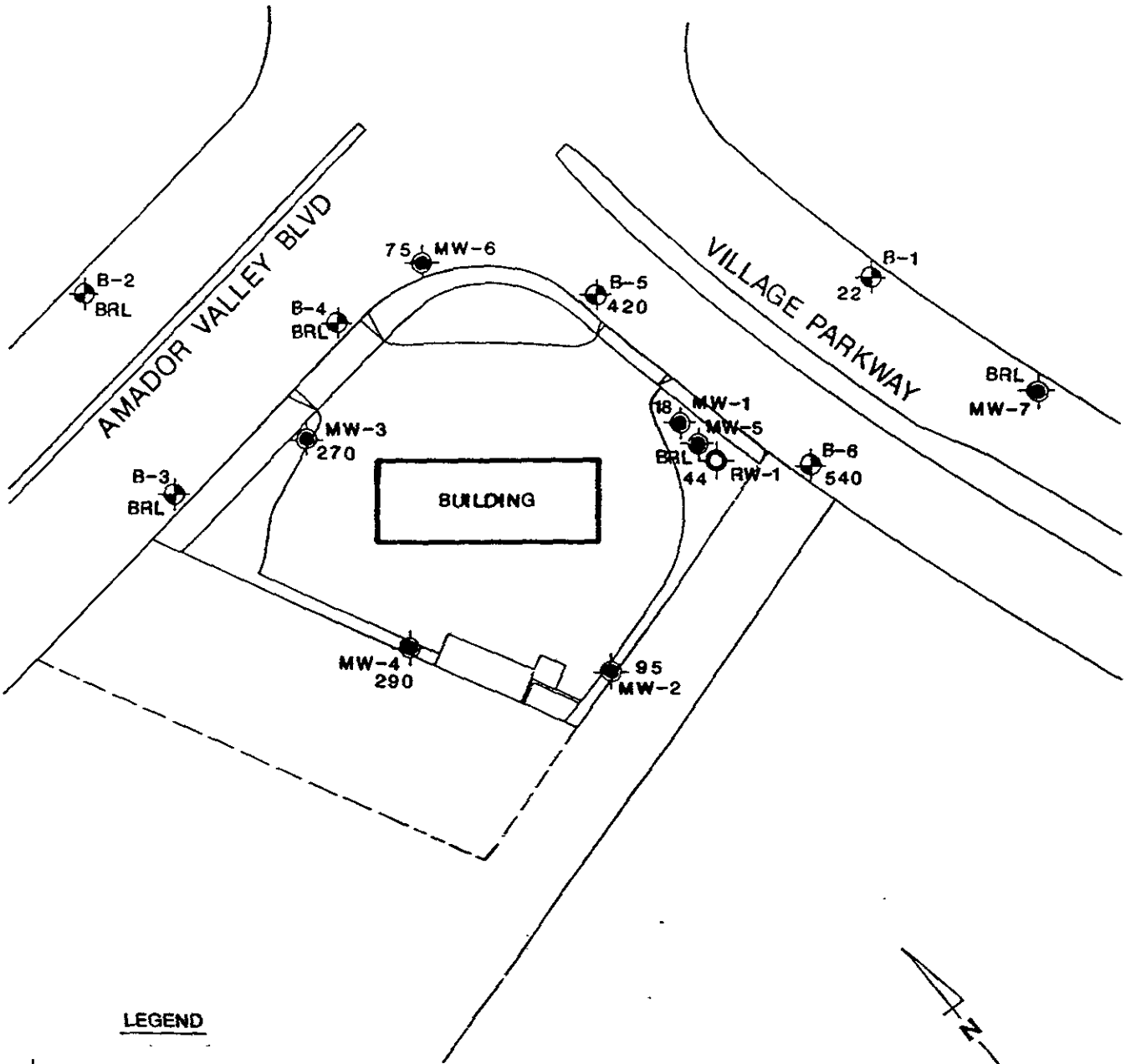
SITE PLAN

FORMER SHELL STATION

7194 AMADOR VALLEY BLVD

DUBLIN, CALIFORNIA

REVIEWED BY	APPROVED BY
JOB # 1826G	DRAWN BY J.C.
DATE 9-12-88	DRAWING # FIG. 2



LEGEND

- MW-1 — GROUND-WATER MONITORING WELL LOCATION
- B-1 — SOIL BORING LOCATION
- RW-1 — RECOVERY WELL LOCATION
- 75 — MAXIMUM DETECTED TPHg (TOTAL PETROLEUM HYDROCARBONS AS GASOLINE IN PPM (PARTS PER MILLION)
- BRL — BELOW LABORATORY REPORTING LIMIT OF 5 PPM

0 60
SCALE IN FEET

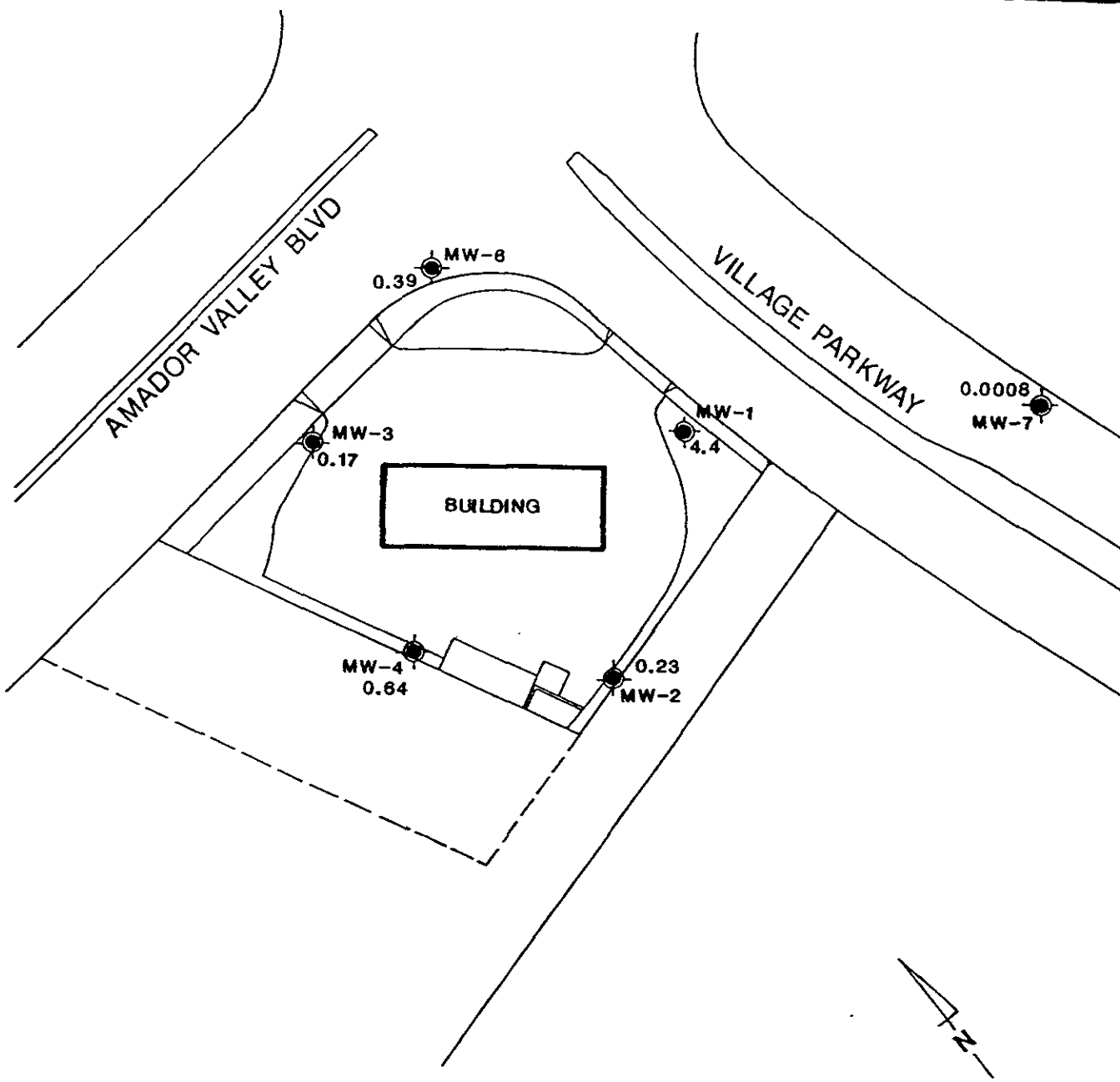
MW-1 THRU MW-5 AND RW-1 DATA FROM PREVIOUS INVESTIGATIONS

ensco environmental services, Inc.

TPHg CONCENTRATION IN SOIL

FORMER SHELL STATION
7194 AMADOR VALLEY
DUBLIN, CALIFORNIA

REVIEWED BY	APPROVED BY
JOB # 1826G	DRAWN BY J.C.
DATE 9-15-88	DRAWING # FIG. 3



LEGEND

MW-1 GROUND-WATER MONITORING WELL LOCATION

0.39 BENZENE CONCENTRATION IN PPM (Part per million)

0 60

SCALE IN FEET

SAMPLING DATE: 8/26/88

ensco environmental services, Inc.

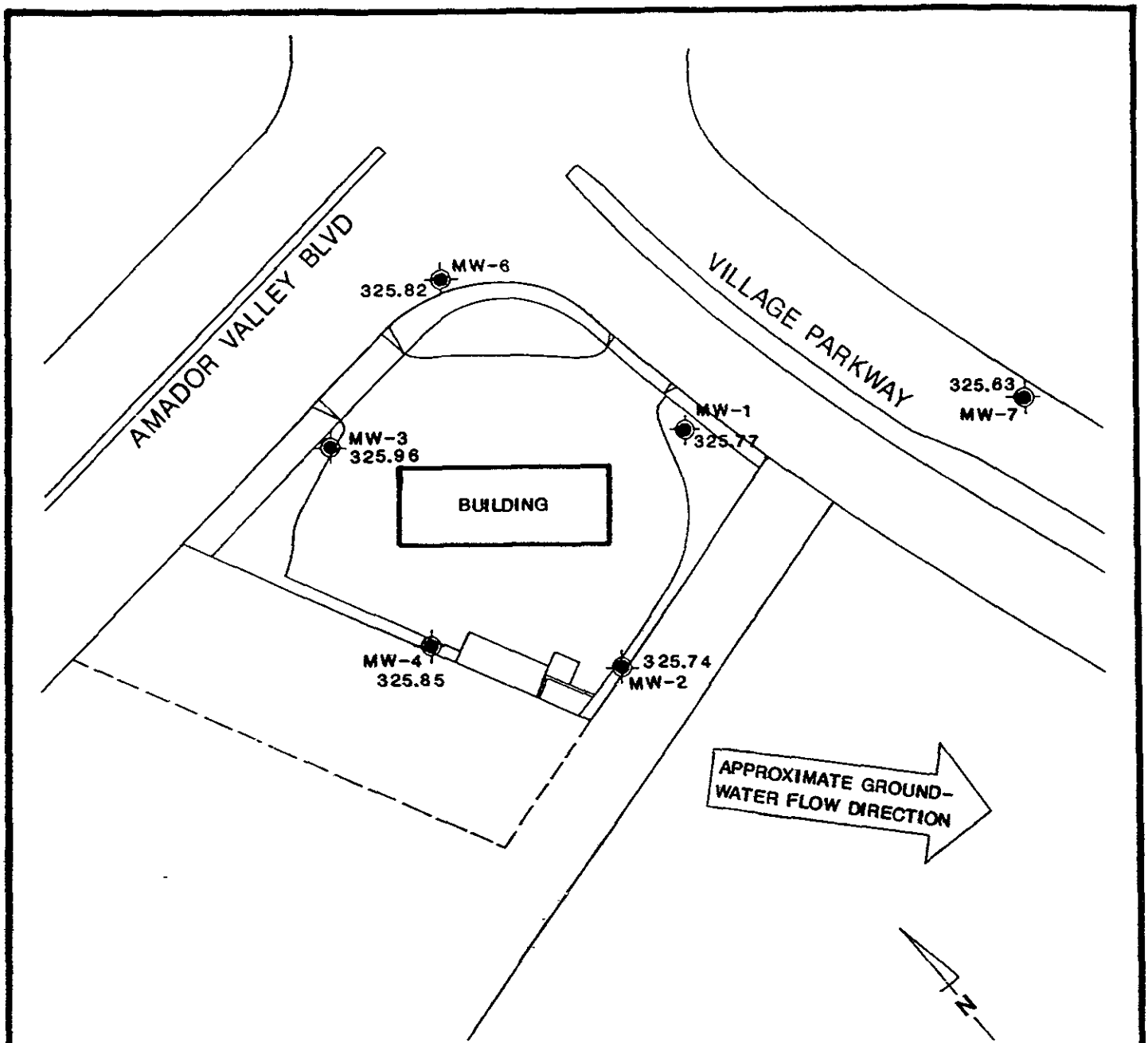
BENZENE CONCENTRATION IN GROUND WATER

FORMER SHELL STATION

7194 AMADOR VALLEY

DUBLIN, CALIFORNIA

REVIEWED BY	APPROVED BY
JOB # 1826G	DRAWN BY J.C.
DATE 9-15-88	DRAWING # FIG. 4



LEGEND

MW-1 GROUND-WATER MONITORING WELL LOCATION

325.85 GROUND-WATER ELEVATION ABOVE MEAN SEA LEVEL

ensco environmental services, Inc.

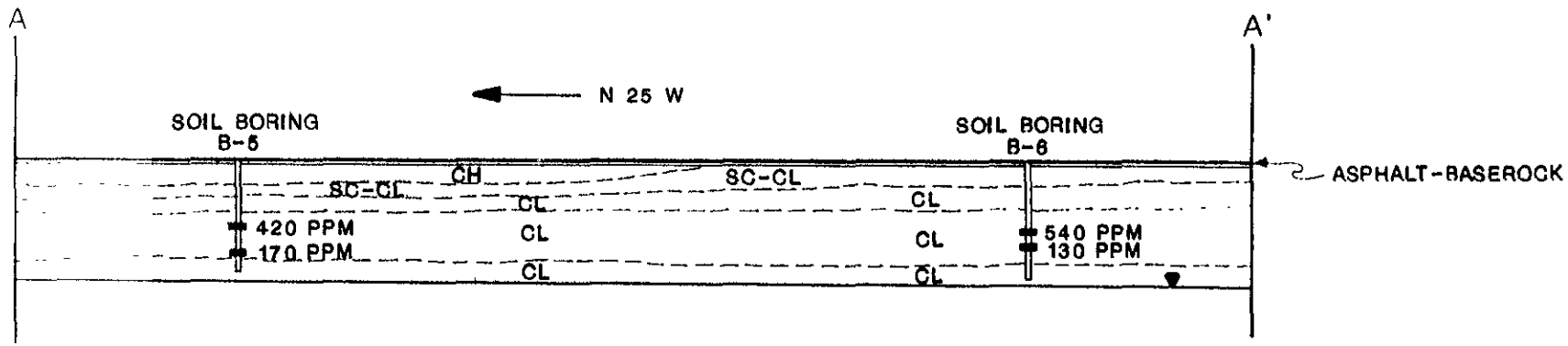
GROUND-WATER ELEVATION MAP

FORMER SHELL STATION

7194 AMADOR VALLEY

DUBLIN, CALIFORNIA

REVIEWED BY	APPROVED BY
LAL	
JOB # 1826G	DRAWN BY J.C.
DATE 9-15-88	DRAWING # FIG. 5



SCALE: 1"=20' HORZ & VERT

LEGEND

- ▼ APPROXIMATE GROUND-WATER LEVEL
- ▬ 130 PPM SOIL SAMPLES WITH TPHg LEVELS ABOVE REGIONAL WATER QUALITY CONTROL BOARD* 100 PPM "PRIORITY LEVEL"
- CL UNIFIED SOIL CLASSIFICATION SYSTEM (USCS) SILTY CLAY AND SANDY CLAY
- SC USCS CLAYEY SAND
- CH USCS HIGH PLASTICITY CLAY

*REGIONAL BOARD STAFF RECOENDATIONS FOR INITIAL EVALUATION AND INVESTIGATION OF UNDERGROUND TANKS; NORTH COAST, SAN FRANCISCO BAY AND CENTRAL VALLEY, REGIONAL WATER QUALITY CONTROL BOARD, JUNE, 1988

ensco environmental services, Inc.

CROSS SECTION A-A'

FORMER SHELL STATION

7194 AMADOR VALLEY BLVD

DUBLIN, CALIFORNIA

REVIEWED BY:	APPROVED BY:
JOB #: 1826G	DRAWN BY: J.C.
DATE: 9-14-88	DRAWING #: FIG. 6

APPENDIX A

SOIL GAS SURVEY REPORT

CHIPS
Environmental
Consultants, Inc.

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KCP-ENSGAR.DOC 461

FIELD SAMPLING AND ANALYSIS OF SOIL GASES AROUND THE FORMER SHELL STATION LOCATED ON THE SOUTHWEST CORNER OF AMADOR VALLEY BLVD. AND VILLAGE PARKWAY, DUBLIN, CALIFORNIA

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Prepared for:
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Project Officer: Richard Garlow
Purchase Order #: 9937

July 1988

DISCLAIMER

This report was furnished to ENSCO by CHIPS Environmental Consultants, Inc. in fulfillment of purchase order number 9937. The contents and results were produced solely for the use of ENSCO.

Any and all data generated by this program is considered confidential and shall not be released to a third party without the written consent of an authorized representative of ENSCO.

ABSTRACT

The intent of this program was to perform a rapid screening survey of soil gases around 7194 Amador Valley Blvd., Dublin, California, where a former Shell gas station was located. The program consisted of installation of 50 temporary exploratory probes and the subsequent analysis of soil gases from the aforementioned probes. The intent of the soil gas sampling was to define relative areas of soil contamination at this site.

CONTENTS

		Page
Disclaimer		2
Abstract		3
Section 1	Introduction	5
Section 2	Results	6
Section 3	Procedures	9
Section 4	Quality Assurance/Quality Control	10
Section 5	Sample Calculations	11
Appendix	Raw Data	12

SECTION 1

Introduction

At the request of ENSCO, CHIPS Environmental Consultants, Inc. performed a series of soil gas analyses around the property located at 7194 Amador Valley Blvd.,, California on 7/19/88 and 7/20/88. The soil gases were analyzed for total hydrocarbons employing a Beckman Model 400 Hydrocarbon Analyzer equipped with a Flame Ionization Detector (FID).

All data results can be found in Section 2. A brief description of the sampling and analysis methods can be found in Section 3. Quality assurance and quality control efforts are summarized in Section 4. Section 5 contains a set of sample calculations which show how the results were obtained from the raw data. The appendix contains all the raw data that was used to derive these results as well as our plot plan showing concentration gradients.

SECTION 2

Results

Soil Vapor Concentrations

PROBE #	DEPTH*	TH** (ppm)
A	8'	40
B	8'	55
C	8'	55
D	8'	45,000
E	8'	45,000
F	8'	750
G	8'	35,000
H	8'	26,000
I	8'	10,000
J	8'	5,000
K	8'	35,000
L	8'	23,000
M	8'	5,000
N	8'	12,500
0	8'	117,000
P	8'	114,000
Q	8'	89,000
R	8'	125
S	8'	4,900
T	8'	13,000
U	8'	ND
V	8'	12,500
W	8'	300
X	8'	300
Y	8'	ND

Probes A thru Y analyzed on 7/19/88

* Probe Depth in Feet
** Total Hydrocarbons (TH) as propane, C_3 in PPM m/m
ND Below the detection limit of 5 PPM m/m

SECTION 2

Results

Soil Vapor Concentrations

PROBE #	DEPTH*	TH**(PPM)
Z	8'	7,500
AA	8'	ND
BB	8'	ND
CC	8'	66,000
DD	8'	16,000
EE	8'	23,500
FF	8'	130,000
GG	8'	120,000
HH	8'	125,000
II	8'	129,000
JJ	8'	100,000
KK	8'	ND
LL	8'	75,000
MM	8'	1,500
NN	8'	ND
OO	8'	ND
PP	8'	1,500
QQ	8'	ND
RR	8'	400
SS	8'	ND
TT	8'	36,500
UU	8'	115,00
VV	8'	350
WW	8'	ND
XX	8'	ND

Probes Z thru XX were analyzed 7/20/88

* Probe Depth in Feet
** Total Hydrocarbons (TH) as propane, C_3 in PPM m/m
ND Below the detection limit of 5 PPM m/m

Results Discussion

The detection limits for the above analyses was 5 PPM for total hydrocarbons (TH) on a molar basis. The amount of hydrocarbons in the extracted vapor is not necessarily indicative of the contamination of the surrounding soil, but reflects contamination nearby.

SECTION 3

Procedures

1) Sampling Point Location: Each probe was installed at a location that would optimize the detection of soil contaminants around the subject location. These locations were directed by Mr. Richard Garlow of ENSCO.

2) Probe Logistics: Each probe was constructed of 1/2 inch diameter galvanized pipe. A point was forged on one end and 3/16 inch holes (50 each) were drilled into the lower 24 inches of the probe.

3) Probe Installation: Each probe was installed manually into the soil. If the probe was located over asphalt or concrete, a 1 inch diameter hole was first drilled for ease of installation. Probes were installed to a depth of 8 feet below grade.

4) Soil Gas Sampling: The following procedure was used to sample soil gases: each probe was connected to a "probe-head T" fitting. One side of the "T" was closed with a Teflon faced silicone septa, the other side of the "T" was connected to a diaphragm pump for soil gas removal. Soil gases were introduced to the Beckman Analyzer through a 1/4 inch teflon sampling line.

5) Soil Gas Analysis: Analysis was performed by introducing the soil gas sample into a Beckman Analyzer Model 400 equipped with a Flame Ionization Detector (FID) and recorded with a linear chart recorder.

6) Instrument Calibrations: The Beckman FID was calibrated using a 5,000 PPM m/m certified standard of propane in air.

SECTION 4

Quality Assurance/Quality Control

Quality assurance for the soil gas sampling and analysis was maintained as follows:

1) Field blank samples were run periodically throughout the test day.

2) Field calibrations were run periodically throughout the test day.

3) Teflon tubing was used to deliver the sample gases to the analytical instrumentation. This was done to minimize sample loss through adsorption and sample memory due to offgassing.

4) Leak checks were performed on the sample lines before the tests and throughout the day.

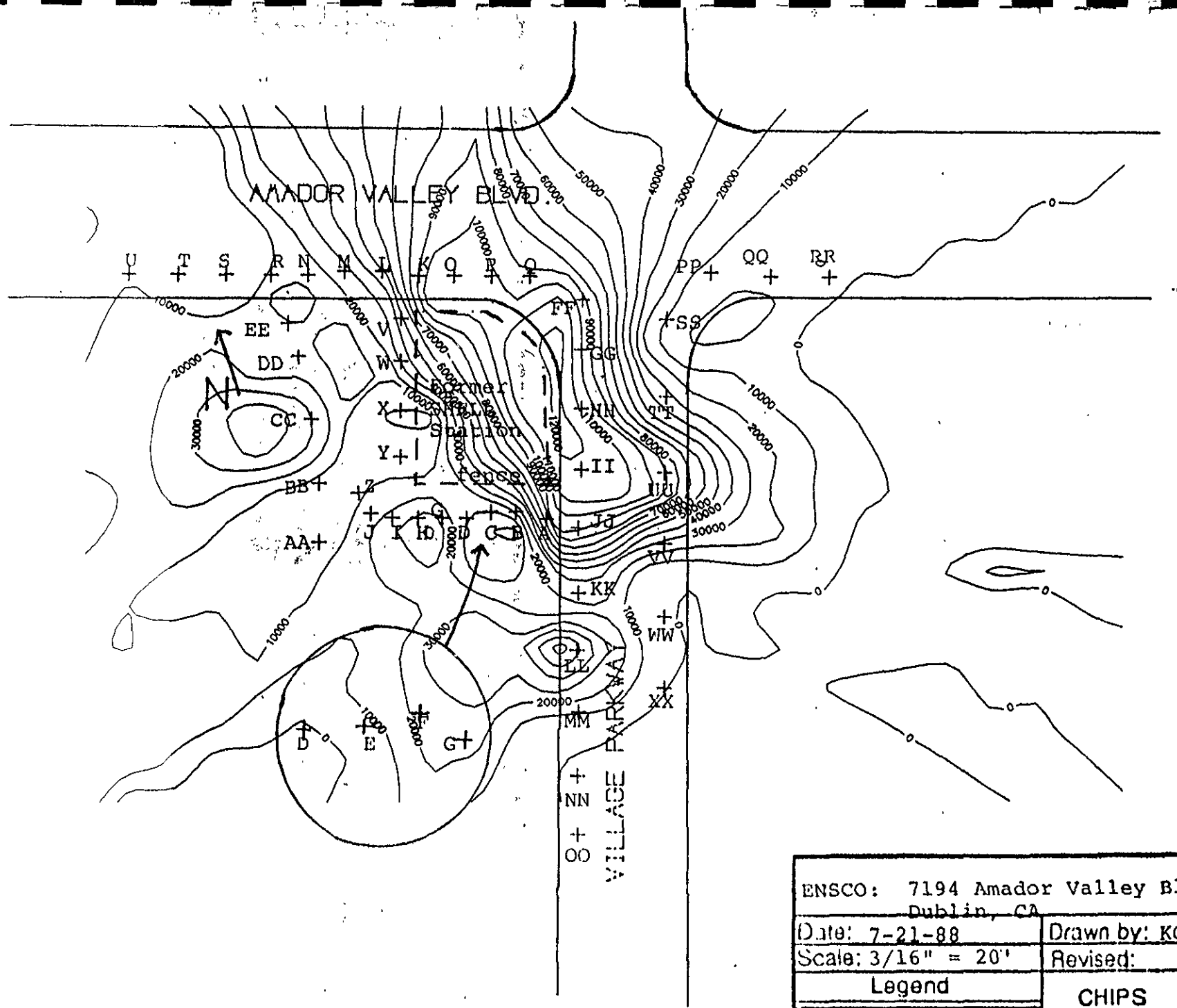
SECTION 5

Sample Calculation

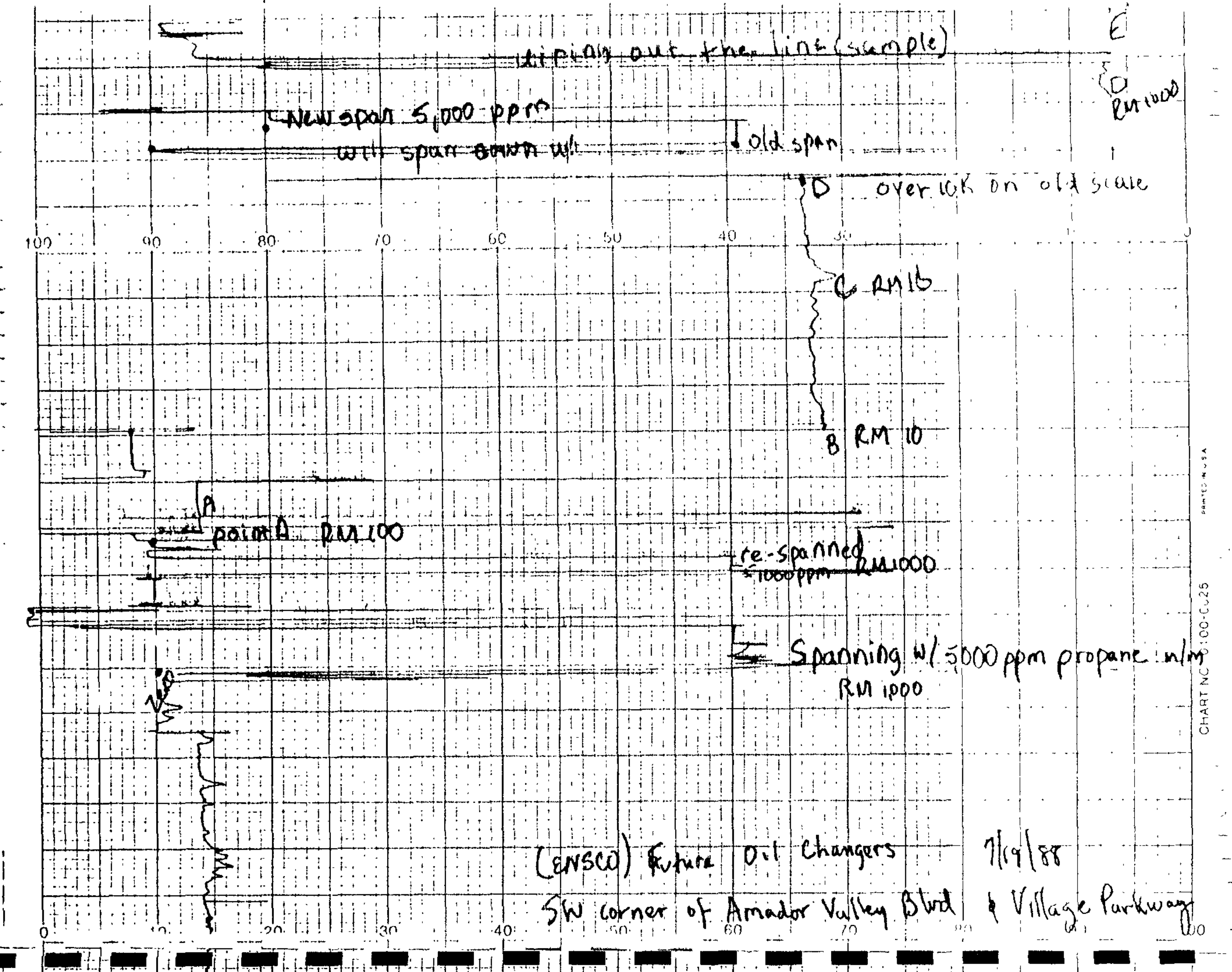
Sample concentrations were read directly off the strip chart (Appendix). Probe concentrations are compared to field calibrations to determine each reading. No special calculations were performed.

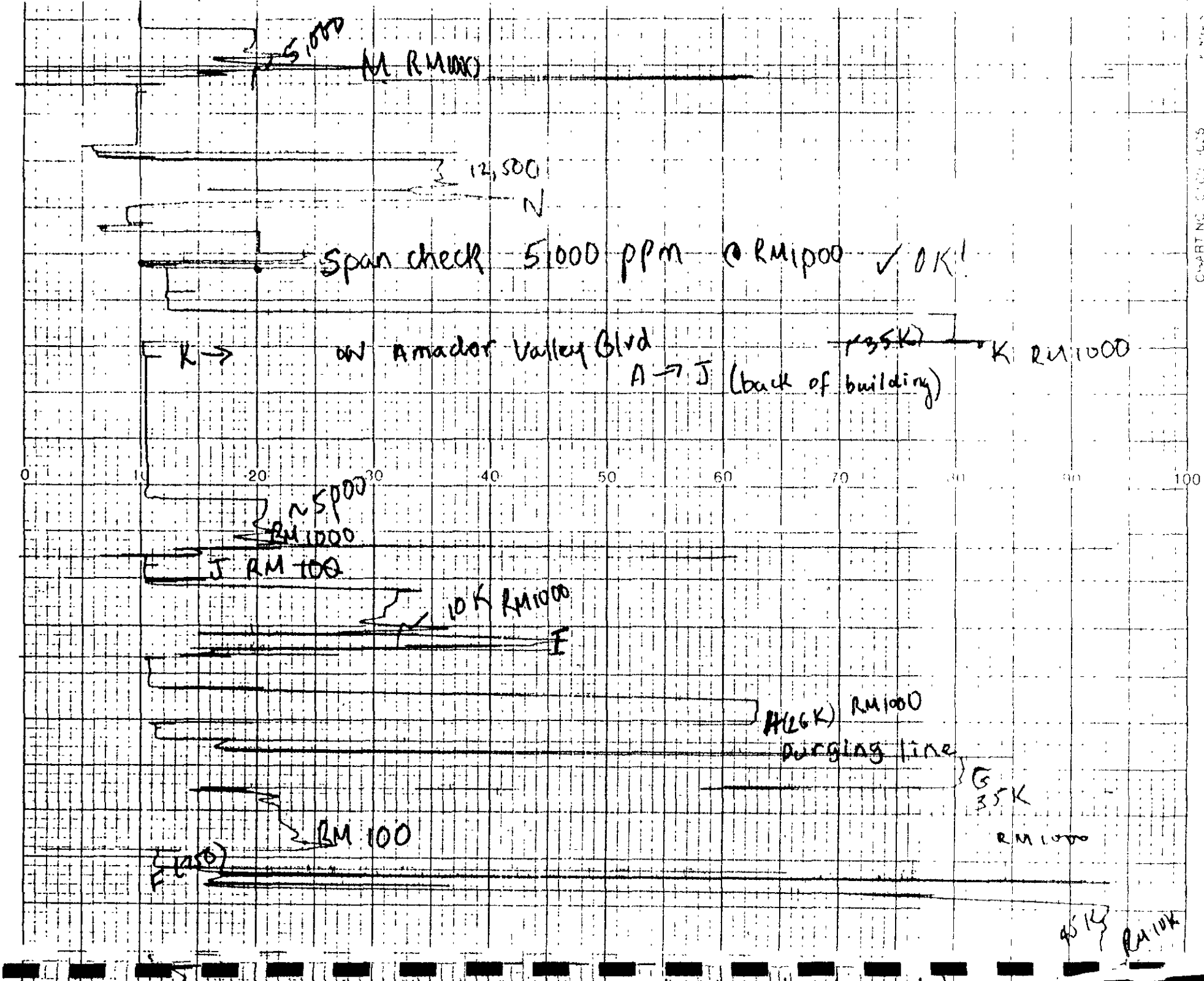
APPENDIX

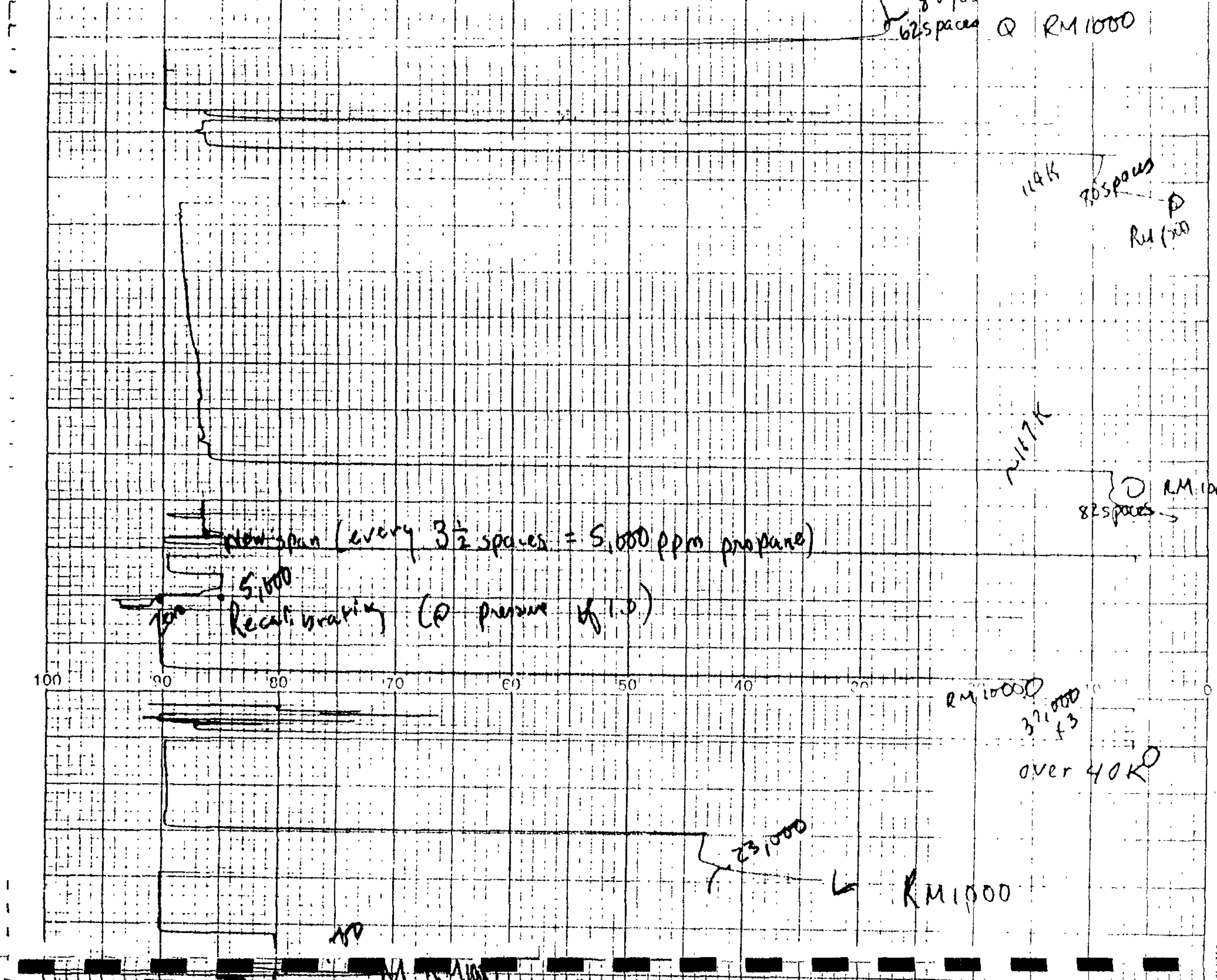
Raw Data



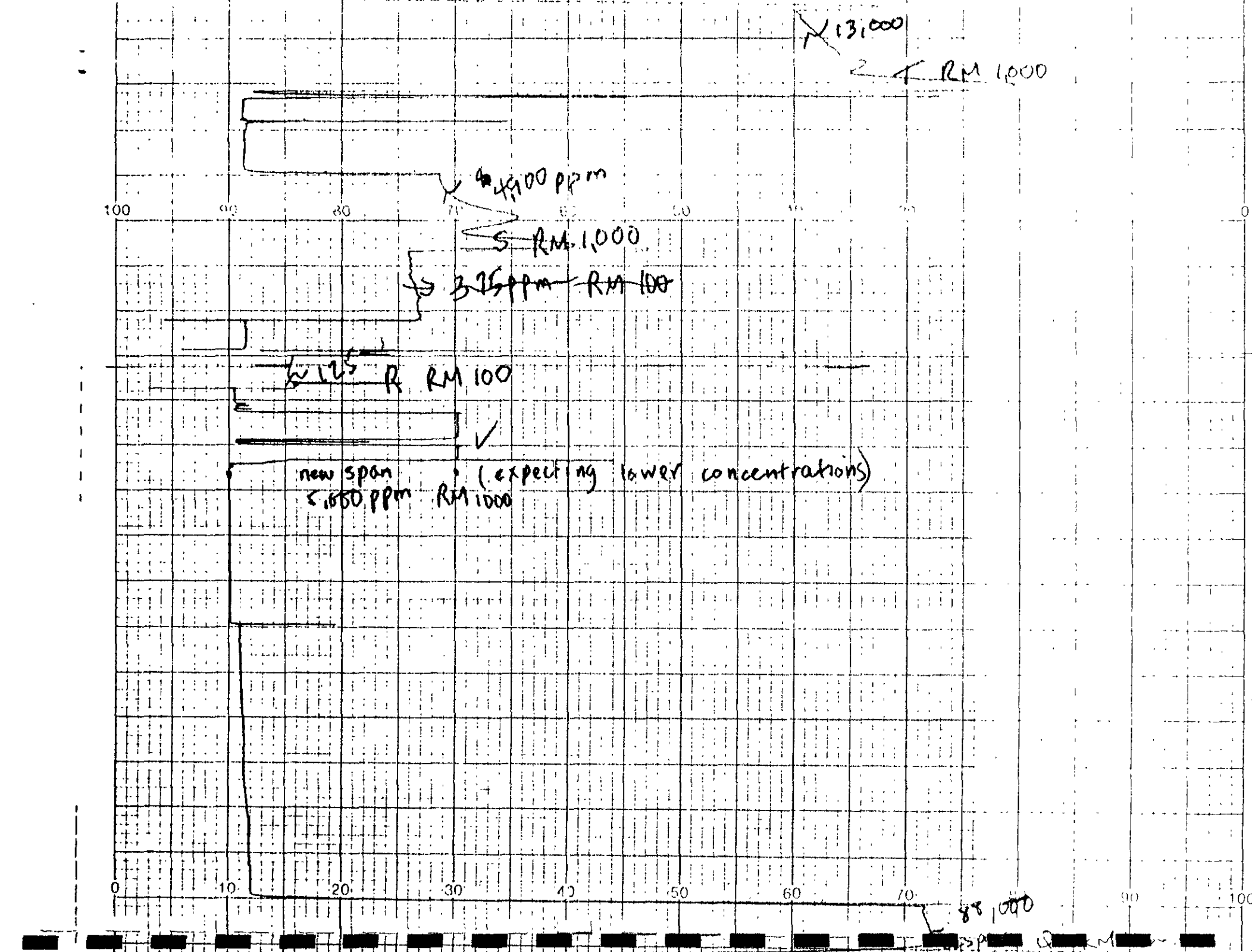
ENSCO: 7194 Amador Valley Blvd., Dublin, CA	
Date: 7-21-88	Drawn by: KCP
Scale: 3/16" = 20'	Revised: Page:1
Legend	CHIPS Environmental Consultants
+ Sample	

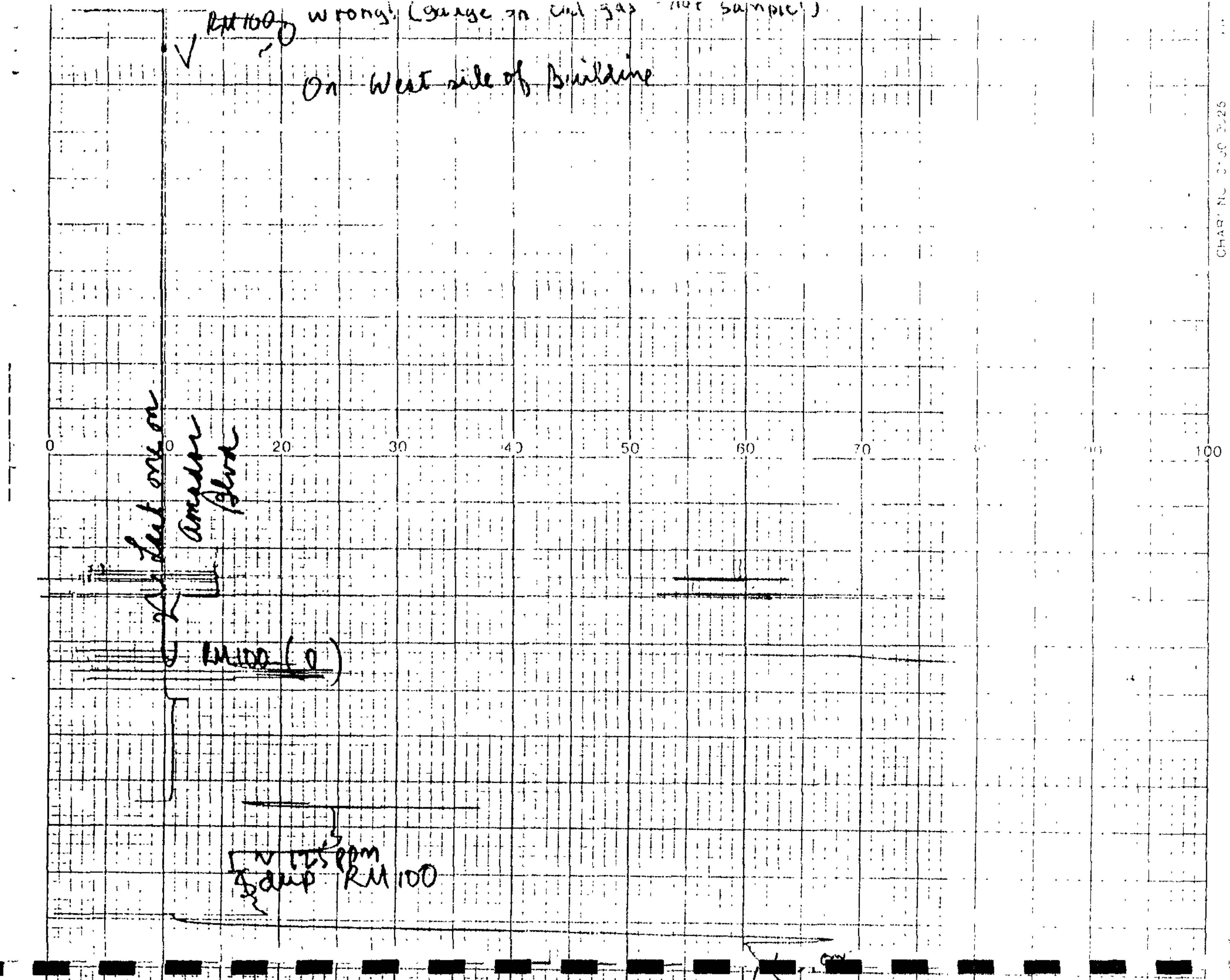

E
D
RM 1000
out the line (sample)
New span 5,000 ppm
old span
over 10K on old scale
C RM 10
B RM 10
A
point A RM 100
re-spanned
1000 ppm RM 1000
Spanning w/ 5,000 ppm propane w/m
RM 1000
(ENSCO) Future Oil Changers 7/19/88
SW corner of Amador Valley Blvd & Village Parkway
CHART NO
PRINTED IN U.S.A.


5,000
M RM100
12,500
N
Span check 5000 ppm @ RM100 ✓ OK!
K →
on Amador Valley Blvd
A → J (back of building)
(35K)
K RM1000
0
10
20
30
40
50
60
70
80
90
100
~5000
RM1000
J RM 100
10K RM1000
I
H(6K) RM1000
burglar line
G
35K
RM1000
RM 100
F (45K)
45K RM10K

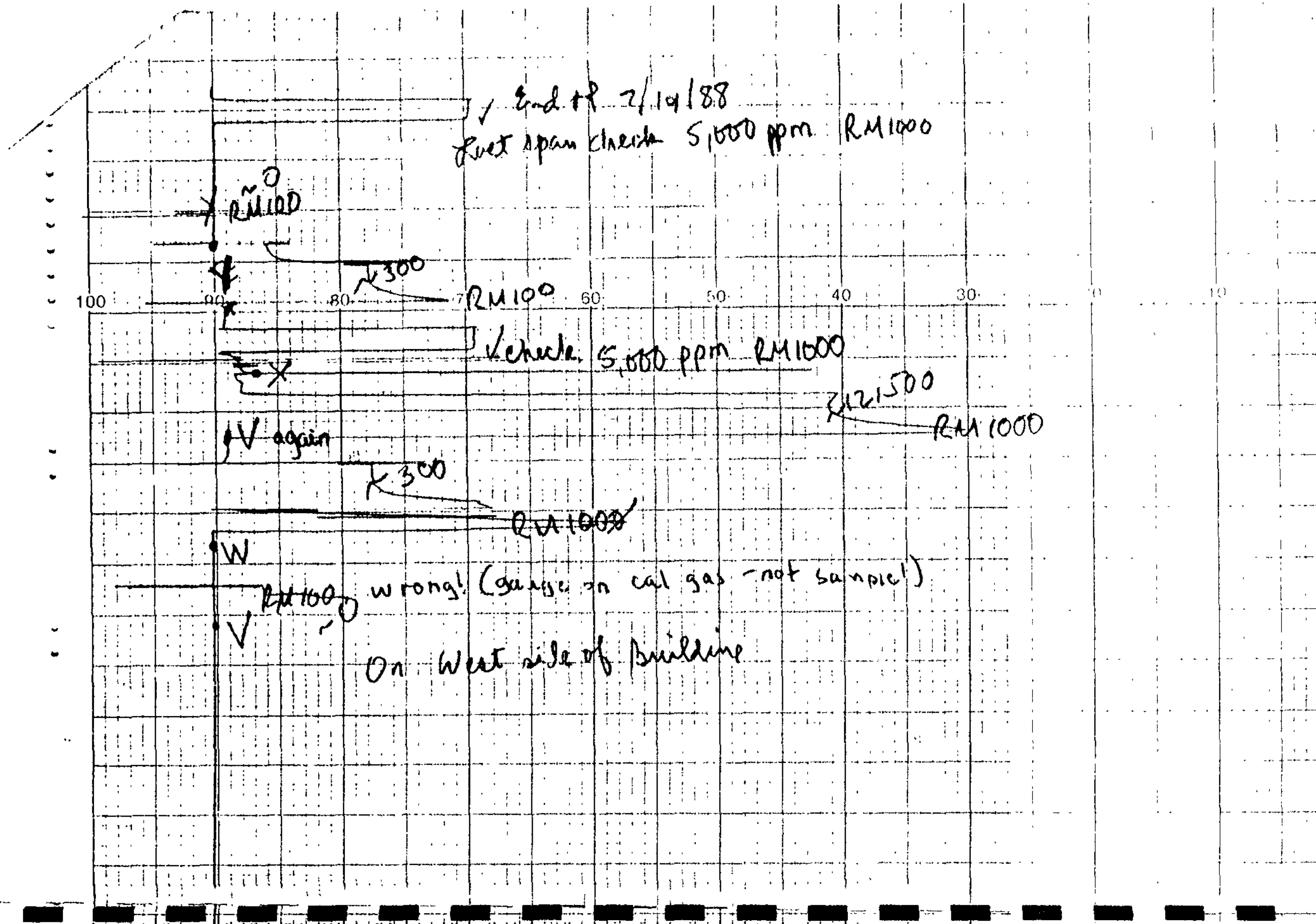


62 spaces @ RM1000
114K
~117K
82 spaces
New span (every 3½ spaces = 5,000 ppm propane)
5,000
Recalibrating (@ pressure of 1.0)
100
90
80
70
60
50
40
over 40K
23,000
RM1000

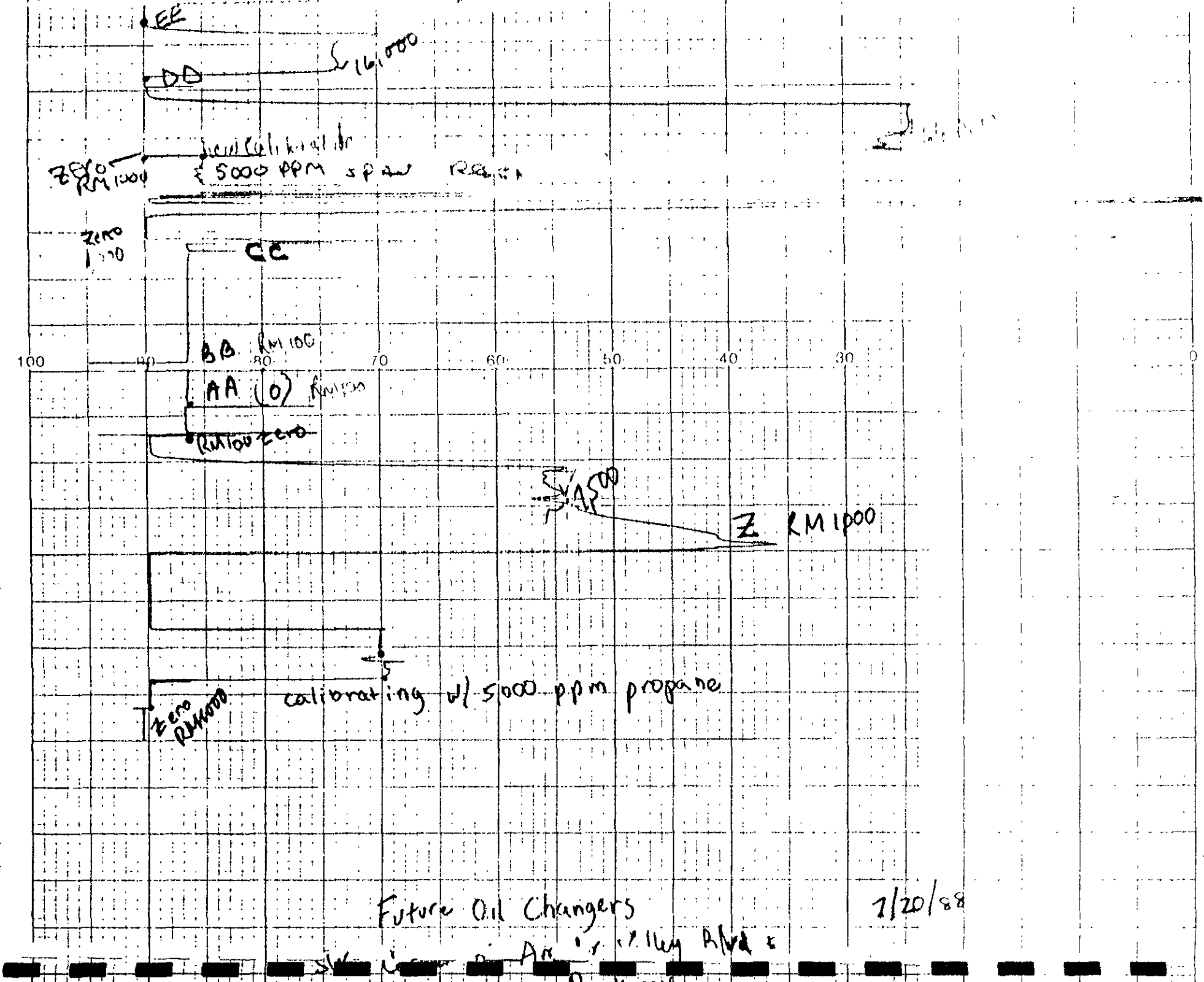

13,000
RM 1,000
4,100 ppm
RM 1,000
325ppm RM 100
12.5 RM 100
new span
1,650 ppm RM 1000
(expecting lower concentrations)
8,000
100
90
80
70
60
50
40
30
20
10
0



wrong! (gauge on cal gas - not sample!)
On West side of Building
0
20
30
40
50
60
70
100
RM100 (0)
RM100

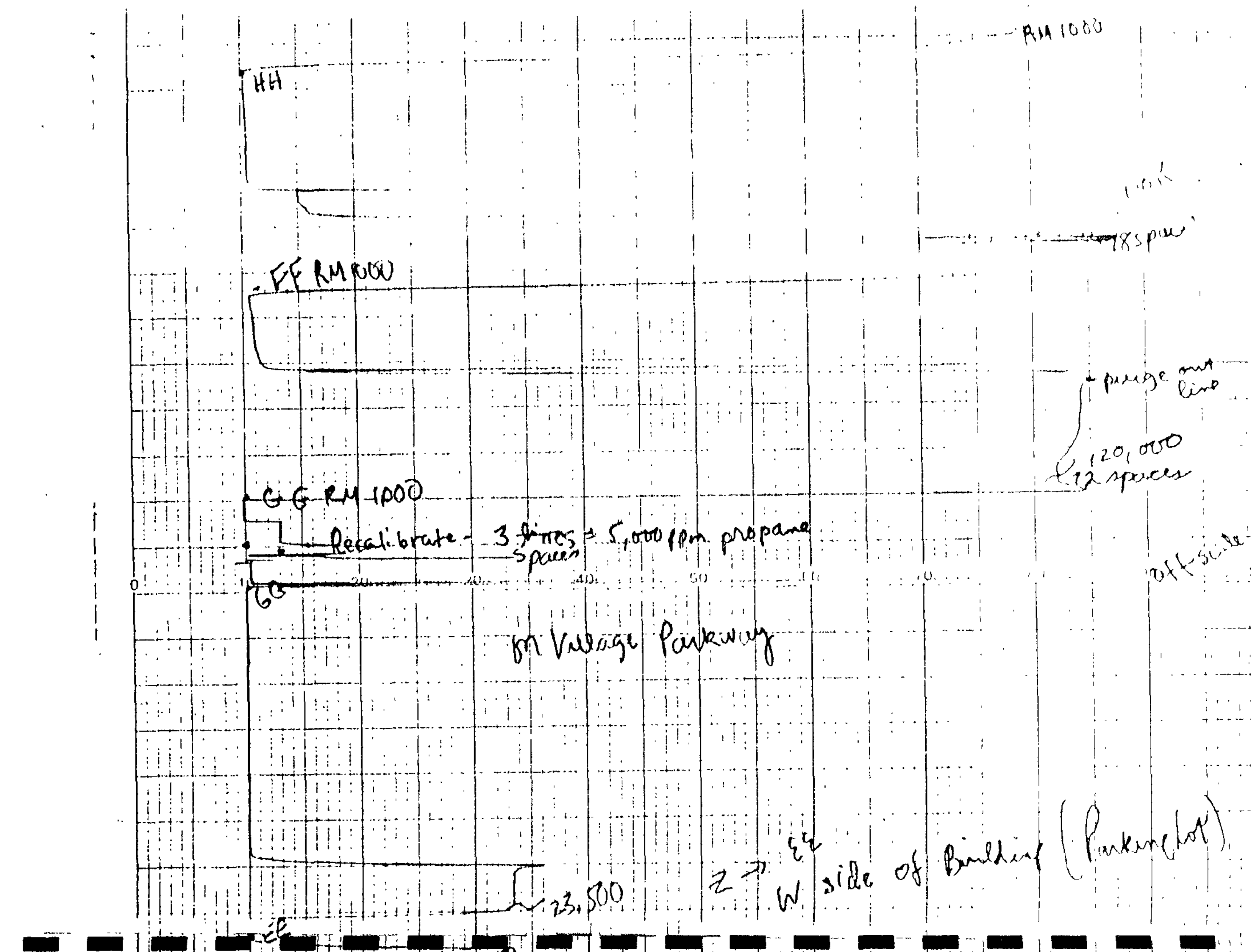


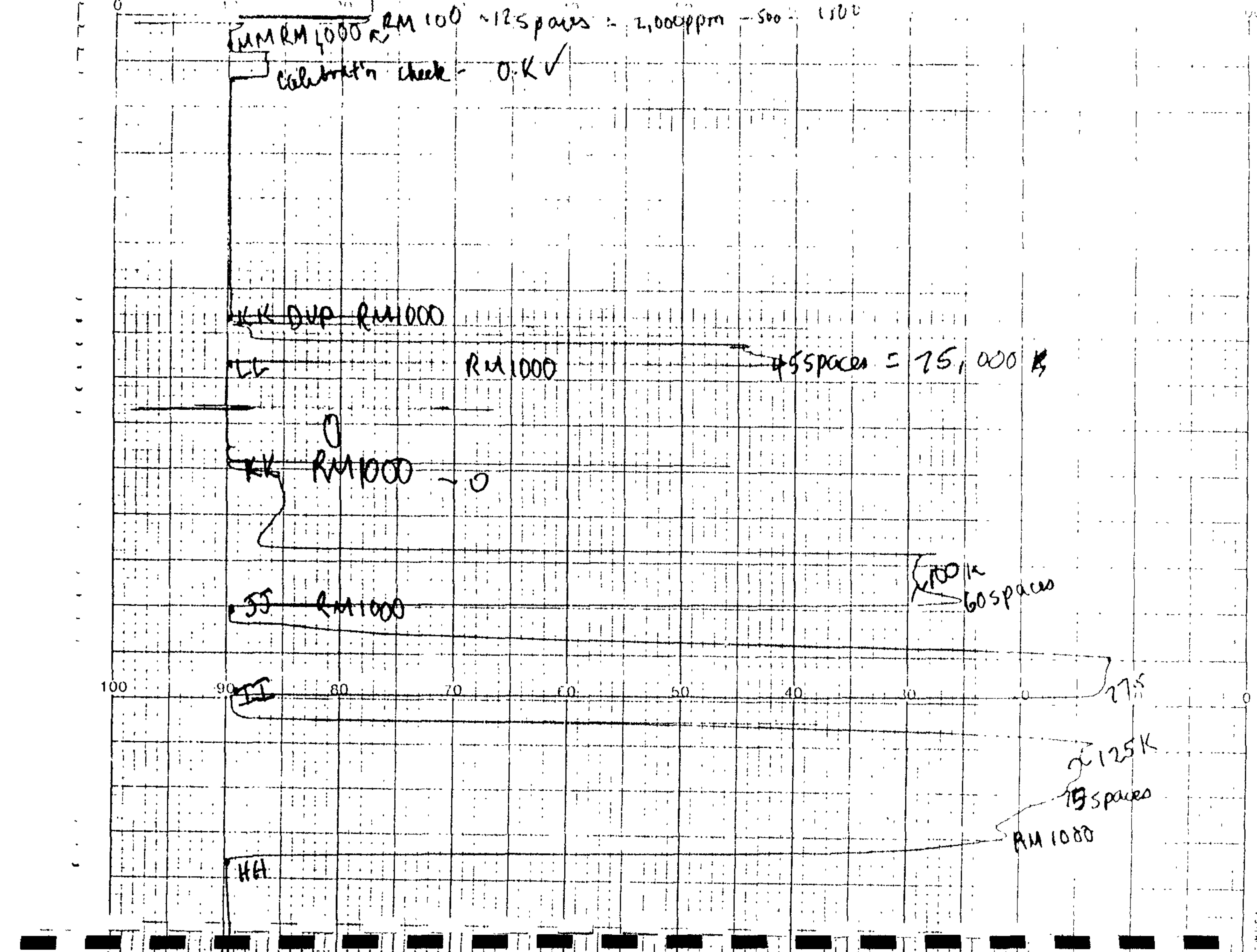
2/19/88
5,000 ppm RM1000
RM100
300
RM100
check 5,000 ppm RM1000
RM1000
again
300
W
wrong! (gauge on cal gas - not sample!)
V
On West side of Building
100
90
80
60
50
40
30

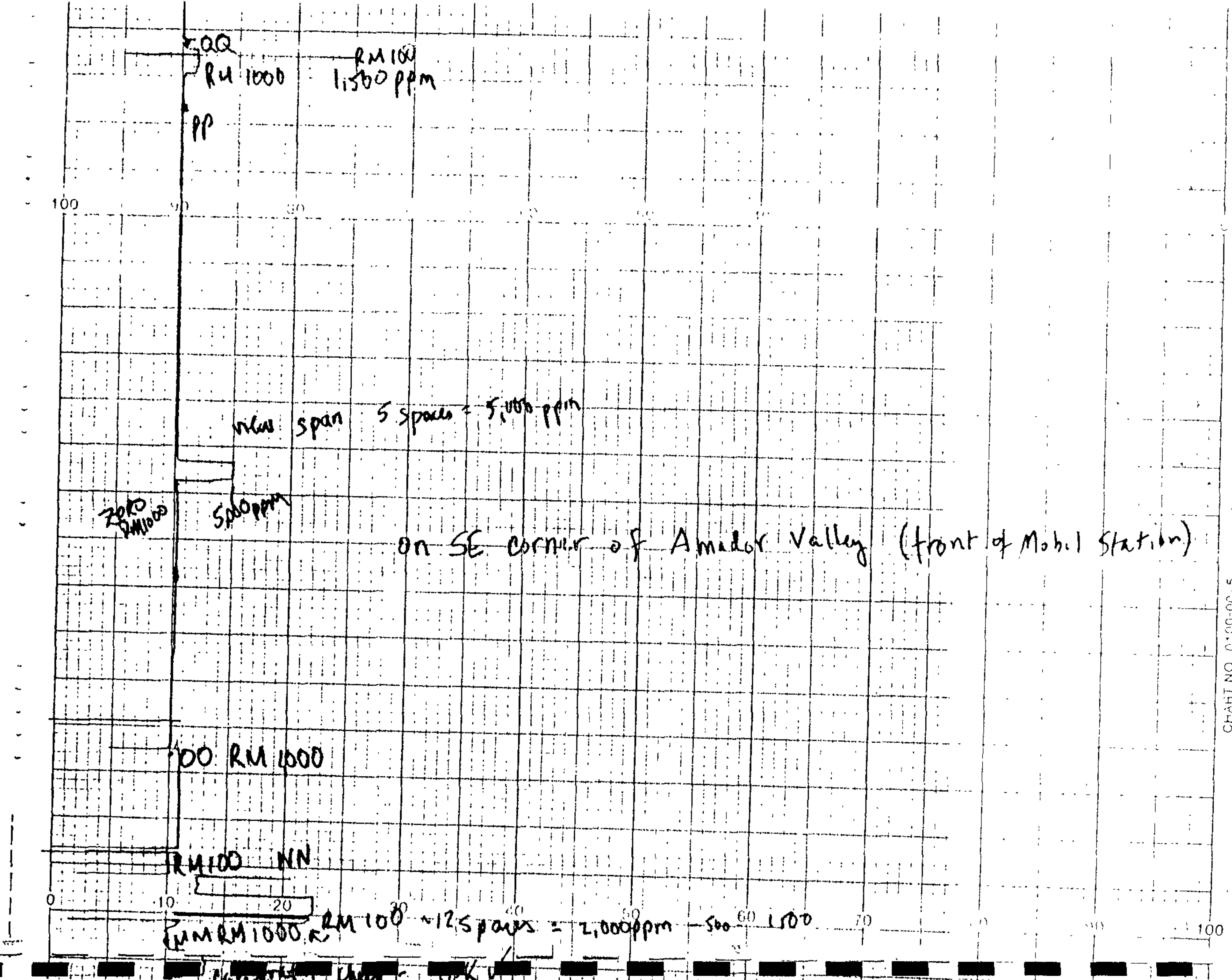


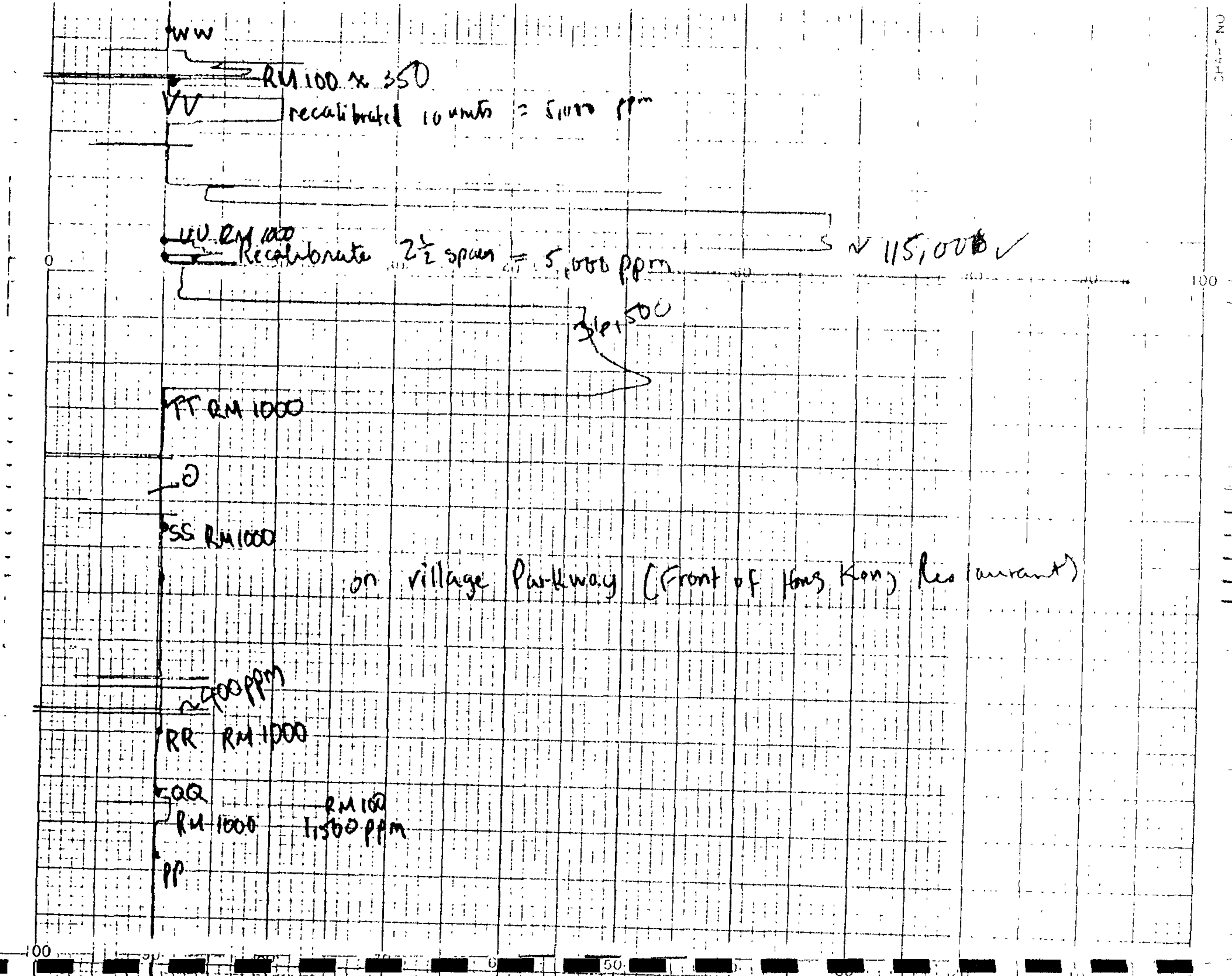
Future Oil Changers

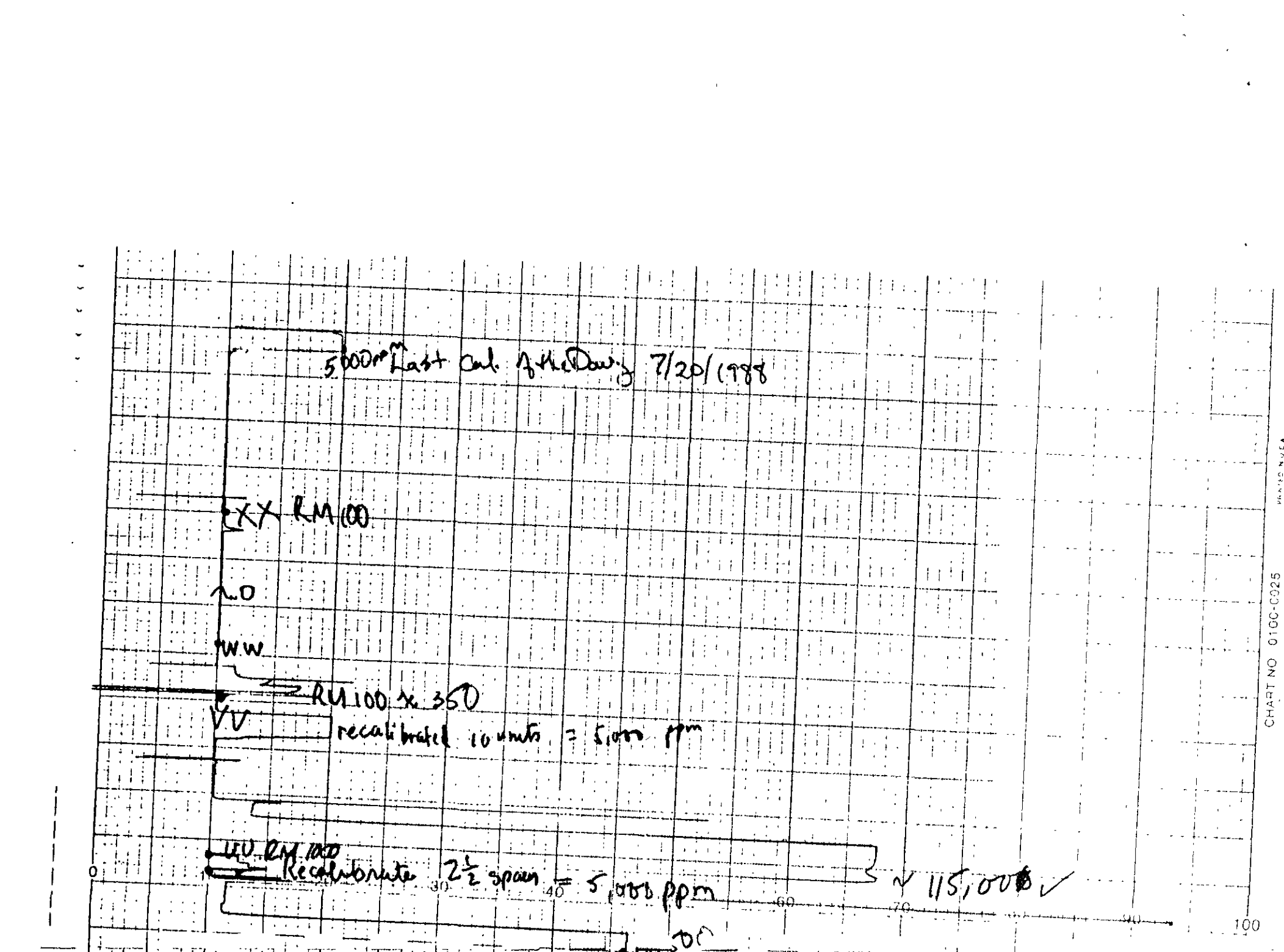
7/20/88


RM 1000
HH
8 spaces
FF RM 1000
purge out line
120,000
12 spaces
G G RM 1000
Recalibrate - 3 times - 5,000 ppm propane
5 spaces
off-scale
0
10
20
40
50
GG
on Village Parkway
23,500
W side of Building (Parking lot)
EE


MM RM 1000
RM 100 ~125 spaces = 2,000 ppm
Calibrat'n check - O.K ✓
KK DUP RM1000
LL RM1000
45 spaces = 75,000
KK RM1000 ~0
100k
60 spaces
JJ RM1000
100
90
II
80
70
60
50
40
30
275
125K
75 spaces
RM 1000
HH


QQ
RM 1000
RM 100
1,500 ppm
PP
100
view span 5 spaces = 5,000 ppm
Zero RM1000
5000ppm
on SE corner of Amador Valley (front of Mobil Station)
OO RM 1000
RM100 NN
0
10
20
MM RM1000
RM 100 ~12.5 spaces = 2,000 ppm
70
100
CHART NO. 0100-00


WW
RM 100 x 350
VV recalibrated 10 units = 5,000 ppm
UU RM 1000
Recalibrate 2½ span = 5,000 ppm
115,000
TT RM 1000
0
SS RM1000
on village Parkway (Front of Hong Kong Restaurant)
~400 ppm
RR RM 1000
QQ
RM 1000
RM 100
1,500 ppm
PP
0
100
50


5000 ppm Last Cal. of the Day 7/20/1988
XX RM 100
1.0
WW
RM 100 x 350
recalibrated 10 units = 5,000 ppm
VV
LL RM 100
Recalibrate 2½ span = 5,000 ppm
~ 115,000
0
30
40
60
70
90
100
CHART NO 0100-0025

APPENDIX B

BORING LOGS AND WELL CONSTRUCTION DETAILS

EXPLORATORY BORING LOG

ensco environmental services, inc.

PROJECT NAME: FORMER SHELL STATION 7194 AMADOR VALLEY BLVD., DUBLIN, CA

BORING NO. B-1

DATE DRILLED: 8/12/88

PROJECT NUMBER: 1826G

LOGGED BY: RAG

DEPTH (ft.)	SAMPLE No	BLOWS/FOOT 140 ft/lbs.	UNIFIED SOIL CLASSIFICATION	SOIL DESCRIPTION	WATER LEVEL	OVA READING ppm
1				Asphalt - 3", baserock - 11"		
2			CL	SILTY CLAY, very dark grayish brown (10YR 3/1), some fine to medium grained sands, no petroleum odor, moderate plasticity, stiff, moist		
3			CH	SILTY CLAY, black (10YR 2/1), some fine grained sands, no petroleum odor, moderately high plasticity stiff, moist		
4						
5	B-1-1	12	CL	SANDY CLAY, very dark gray (7YR 3/0), fine grained sands up to 40%, occasional medium to coarse sands, no petroleum odor, moderate plasticity, very stiff, moist		0
6						
7	B-1-2	25				15
8	B-1-3	6	CL-SC	SANDY CLAY to CLAYEY SAND, very dark gray to gray (7.5YR 3/0 to 7.5YR 6/0), fine to medium grained sands, sand lenses, petroelum odor especially in sands, medium stiff to loose, moist to very moist		60
9				Groundwater encountered- 9 ft.	▽	
10	B-1-4	8	CL	SILTY CLAY, dark gray (7.5YR 4/0) with light gray claystone/siltstone fragments, faint petroleum odor, moderate plasticity, stiff, moist		10
11	B-1-5	9		Some roots, no petroleum odor		0
12				Bottom of boring = 11.5 feet		
13						
14						
15						
16						
17						
18						
19						
20						
21						

SUPERVISED AND APPROVED BY R.G./C.E.G. [signature]

EXPLORATORY BORING LOG

ensco environmental services, inc.

PROJECT NAME: FORMER SHELL STATION 7194 AMADOR VALLEY BLVD., DUBLIN, CA

BORING NO. B-2

DATE DRILLED: 8/15/88

PROJECT NUMBER: 1826G

LOGGED BY: RAG

DEPTH (ft.)	SAMPLE No	BLOWS/FOOT 140 ft/lbs.	UNIFIED SOIL CLASSIFICATION	SOIL DESCRIPTION	WATER LEVEL	OVA READING ppm
1				Asphalt - 3", baserock - 11"		
2			CH	SILTY CLAY, very dark gray (7.5YR 3/0), some fine grained sands, no petroleum odor, moderately high plasticity, stiff, moist		
3						
4						
5		12	CL	SANDY CLAY, dark gray (5Y 4/1), fine grained sands up to 40%, no petroleum odor, moderate plasticity, stiff, moist		
6			SC	CLAYEY SAND, dark gray (5Y 4/1), 60 - 70% fine grained sands, no petroleum odor, loose, moist		
7	B-2-1	15	CL	SILTY CLAY, very dark gray (7.5YR 3/0), some roots, no petroleum odor, moderate plasticity, stiff, moist		0
8	B-2-2	12				0
9			CL	SILTY CLAY, dark gray (7.5YR 4/0), with light gray to white claystone/siltstone fragments, no petroleum odor, moderate plasticity, stiff, moist		
10	B-2-3	11				0
11				Bottom of boring = 10 feet		
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						

SUPERVISED AND APPROVED BY R.G./C.E.G. [signature]

EXPLORATORY BORING LOG

ensco environmental services, Inc.

PROJECT NAME: FORMER SHELL STATION 7194 AMADOR VALLEY BLVD., DUBLIN, CA

BORING NO. B-3

DATE DRILLED: 8/15/88

PROJECT NUMBER: 1826G

LOGGED BY: RAG

DEPTH (ft.)	SAMPLE No	BLOWS/FOOT 140 ft/lbs.	UNIFIED SOIL CLASSIFICATION	SOIL DESCRIPTION	WATER LEVEL	OVA READING ppm
				Asphalt - 3", baserock - 7"		
1-2			CL	SANDY CLAY, dark gray (7.5YR 4/0), some fine grained sands, no petroleum odor, moderate plasticity, stiff, moist		
3			CH	SILTY CLAY, very dark gray, (7.5YR 3/0), no petroleum odor, moderately high plasticity, stiff, moist		
4-5	B-3-1	11	CL-SC	SILTY CLAY and SANDY CLAY, dark gray to gray (7.5YR 4/0 to 7.5YR 5/0), interbedded, some rounded gravels up to 0.5" across, possible petroleum odor, moderate plasticity, stiff, moist		0
6-7	B-3-2	13				0
8	B-3-3	22	CL	SILTY CLAY, very dark gray (7.5YR 3/0) with light gray to white claystone/siltstone fragments, some roots, possible petroleum odor, moderate plasticity, stiff to very stiff, moist		0
9-10	B-3-4	12				0
				Bottom of boring = 10 feet		
11-21						

SUPERVISED AND APPROVED BY R.G./C.E.G.

EXPLORATORY BORING LOG

ensco environmental services, inc.

PROJECT NAME: FORMER SHELL STATION 7194 AMADOR VALLEY BLVD., DUBLIN, CA

BORING NO. B-4

DATE DRILLED: 8/15/88

PROJECT NUMBER: 1826G

LOGGED BY: RAG

DEPTH (ft.)	SAMPLE No	BLOWS/FOOT 140 ft/lbs.	UNIFIED SOIL CLASSIFICATION	SOIL DESCRIPTION	WATER LEVEL	OVA READING ppm
				Asphalt - 3", baserock - 5"		
1-2			CL	SANDY CLAY, dark gray (7.5YR 4/0), some fine grained sands, no petroleum odor, moderate plasticity, stiff, moist		
3-4			CH	SILTY CLAY, very dark gray to black (7.5YR 3/0 to 7.5YR 2/0), no petroleum odor, moderately high - plasticity, stiff, moist		
5	B-4-1	12	SC - CL	SANDY CLAY to CLAYEY SAND, very dark gray to dark gray (7.5YR 3/0 and 7.5YR 4/0), interbedded, fine grained sands, roots, no petroleum odor, stiff to loose, moist		0
6-7	B-4-2	11				0
8	B-4-3	14	CL	SILTY CLAY, very dark gray (7.5YR 3/0), with light gray to white claystone/siltstone fragments, roots, no petroleum odor, moderate plasticity, stiff, moist		0
9-10	B-4-4	14				0
11-21				Bottom of boring ≈10 feet		

SUPERVISED AND APPROVED BY R.G./C.E.G. RGP

EXPLORATORY BORING LOG

ensco environmental services, inc.

PROJECT NAME: FORMER SHELL STATION 7194 AMADOR VALLEY BLVD., DUBLIN, CA

BORING NO. B-5

DATE DRILLED: 8/15/88

PROJECT NUMBER: 1826G

LOGGED BY: RAG

DEPTH (ft.)	SAMPLE No	BLOWS/FOOT 140 ft/lbs.	UNIFIED SOIL CLASSIFICATION	SOIL DESCRIPTION	WATER LEVEL	OVA READING ppm
				Asphalt - 3", baserock - 5"		
1-5			CH	SILTY CLAY, dark gray, (7.5YR 4/0), some fine grained sands, no petroleum odor, moderately high plasticity, stiff, moist		
3-4			SC-CL	SANDY CLAY and CLAYEY SAND, dark gray (7.5YR 4/0), interbedded, fine grained sands, roots, no petroleum odor, stiff to loose, moist		
5	B-5-1	6	CL	SILTY CLAY, gray to dark gray (7.5YR 5/0 to 7.5YR 4/0), petroleum odor, moderate plasticity, medium stiff, moist		55
7		12	CL	SILTY CLAY, very dark gray to black (7.5YR 3/0 to 7.5YR 2/0), with light gray to white claystone/siltstone fragments, roots, moderate plasticity, strong petroleum odor, stiff, moist		
8	B-5-2	14				>200
10	B-5-3	11				190
11	B-5-4	14	CL	SILTY CLAY, mottled very dark gray to dark grayish brown (10YR 3/1 to 10YR 4/2), some angular to subrounded gravels up to 0.5" across, no petroleum odor, moderate plasticity, stiff, moist		>200
13	B-5-5	16				0
14				Bottom of boring = 13 feet		
15-21						

SUPERVISED AND APPROVED BY R.G./C.E.G.

EXPLORATORY BORING LOG

ensco environmental services, inc.

PROJECT NAME: FORMER SHELL STATION 7194 AMADOR VALLEY BLVD., DUBLIN, CA

BORING NO. B-6

DATE DRILLED: 8/15/88

PROJECT NUMBER: 1826G

LOGGED BY: RAG

DEPTH (ft.)	SAMPLE No	BLOWS/FOOT 140 ft/lbs.	UNIFIED SOIL CLASSIFICATION	SOIL DESCRIPTION	WATER LEVEL	OVA READING ppm
				Asphalt - 3", baserock -6"		
1-2			SC-CL	SANDY CLAY and CLAYEY SAND,dark gray (7.5YR 4/0), interbedded, some fine grained sands and gravels up to 0.5" across, no petroleum odor, stiff to loose, moist		
3-4			CL	SANDY CLAY, gray to dark gray (7.5YR 5/0 to 7.5YR 4/0), fine grained sands, petroleum odor, stiff, moist		
5	B-6-1	11				100
6-7	B-6-2	11	CL	SILTY CLAY, very dark gray to black (7.5YR 3/0 to 7.5YR 2/0), with light gray to white claystone/siltstone fragments, roots, petroleum odor, moderate plasticity, stiff, moist		>200
8	B-6-3	11				275
9-10	B-6-4	11				160
11	B-6-5	14				190
12			CL	SILTY CLAY, mottled very dark gray to dark grayish brown (10YR 3/1 to 10YR 4/2), some subangular gravels up to 0.5" across, possible petroleum odor, moderate plasticity, very stiff, moist		
13	B-6-6	18				10
14-21				Bottom of boring =13 feet		

SUPERVISED AND APPROVED BY R.G./C.E.G. LOP

EXPLORATORY BORING LOG

ensco environmental services, inc.

PROJECT NAME: FORMER SHELL STATION 7194 AMADOR VALLEY BLVD., DUBLIN, CA

BORING NO. MW-6

DATE DRILLED: 8/11/88

PROJECT NUMBER: 1826G

LOGGED BY: RAG

DEPTH (ft.)	SAMPLE No	BLOWS/FOOT 140 ft/lbs.	UNIFIED SOIL CLASSIFICATION	SOIL DESCRIPTION	WATER LEVEL	OVA READING ppm
1				Asphalt - 3", baserock - 11"		
2			CH	SILTY CLAY, black (10YR 2/1), some fine grained sands, no petroleum odor, high plasticity, moist		
3			CL	SILTY CLAY, very dark gray (10YR 3/1), some dark brown roots, faint petroleum odor, moderate plasticity, stiff, moist		
4						
5	MW-6-1	16	CL-SP	SANDY CLAY and SAND, dark gray 7.5YR 2/0), interbedded, fine grained sands, some roots, faint petroleum odor, stiff to medium dense, moist		0
6						
7	MW-6-2	10				0
8	MW-6-3	16	CL	SILTY CLAY, black (7.5YR 2/0) with light gray to white claystone/siltstone fragments, some roots, moderate plasticity, petroleum odor, very stiff, moist		10
9						
10	MW-6-4	18		8/26/88, Groundwater level - 9.69 ft.	▼	130
11	MW-6-5	14				125
12						
13						
14			CL	SILTY CLAY, dark grayish brown (10YR 4/7), some root holes/burrows, no petroleum odor, moderate plasticity, stiff, very moist		
15				8/11/88, Groundwater encountered - 15 ft.	▽	
16	MW-6-6	12				0
17						
18						
19						
20	MW-6-7	12				0
21						

SUPERVISED AND APPROVED BY R.G./C.E.G. LDP

EXPLORATORY BORING LOG

ensco environmental services, inc.

PROJECT NAME: FORMER SHELL STATION 7194 AMADOR VALLEY BLVD., DUBLIN, CA

BORING NO.: MW-6

DATE DRILLED: 8/11/88

PROJECT NUMBER: 1826G

LOGGED BY: RAG

DEPTH (ft.)	SAMPLE No	BLOWS/FOOT 140 ft/lbs.	UNIFIED SOIL CLASSIFICATION	SOIL DESCRIPTION	WATER LEVEL	OVA READING ppm	
22			CL	SILTY CLAY, dark grayish brown (10YR 4/4), some root hole/burrows, no petroleum odor, moderate plasticity, stiff, very moist			
23							
24	MW-6-8	22	CL	SILTY CLAY, mottled light gray to olive gray (5Y 7/2 to 5Y 5/2), some fine grained sands locally up to 15%, no petroleum odor, moderate plasticity, very stiff, moist		0	
25							
26				Bottom of boring = 24.5 feet			
27							
28							
29							
30							
31							
32							
33							
34							
35							
36							
37							
38							
39							
40							
41							
42							

SUPERVISED AND APPROVED BY R.G./C.E.G. LOP

EXPLORATORY BORING LOG

ensco environmental services, inc.

PROJECT NAME: FORMER SHELL STATION 7194 AMADOR VALLEY BLVD., DUBLIN, CA

BORING NO. MW-7

DATE DRILLED: 8/11-12/88

PROJECT NUMBER: 1826G

LOGGED BY: RAG

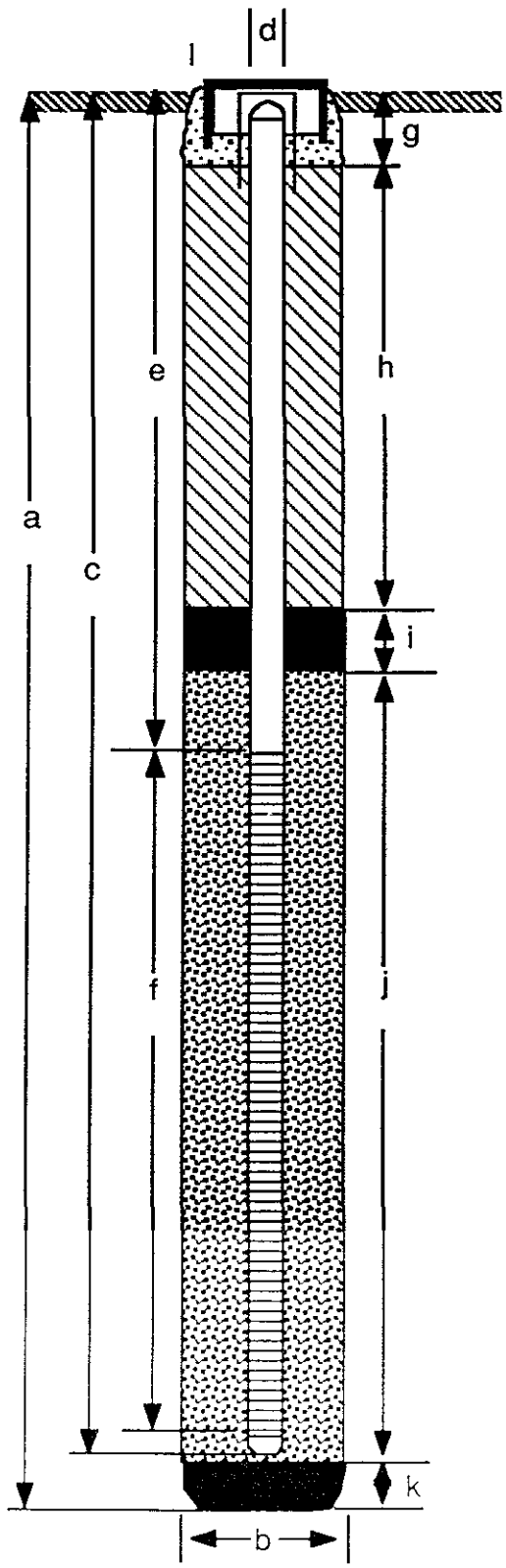
DEPTH (ft.)	SAMPLE No	BLOWS/FOOT 140 ft/lbs.	UNIFIED SOIL CLASSIFICATION	SOIL DESCRIPTION	WATER LEVEL	OVA READING ppm
1				Asphalt - 3", baserock -11"		
2			CL	SANDY CLAY, dark grayish brown (10YR 4/2), fine grained sands up to 40%, no petroleum odor, moderate plasticity, stiff, moist		
3			CH	SILTY CLAY, very dark grayish brown (10YR 3/2), some fine to medium grained sands, no petroleum odor, moderately high plasticity, stiff, moist		
4						
5	MW-7-1	9	SC	CLAYEY SAND, light brownish gray (10YR 6/2), fine grained sands up to 50%, rounded gravels up to 0.5" across, no petroleum odor, stiff, moist		0
6						
7	MW-7-2	7	CL	SANDY CLAY, light brown (10YR 5/3), fine to medium sands up to 40%, rounded gravels up to 0.5" across, no petroleum odor, stiff, moist	▼	0
8	MW-7-3	9				0
9			CL	SILTY CLAY, very dark gray (10YR 3/1) with light gray to white claystone/ siltstone fragments, roots and root holes, no petroleum odor, moderate plasticity, stiff, moist to very moist, some root holes contain "free" water	8/26/88, Groundwater level - 7.94 ft.	0
10	MW-7-4	14				
11	MW-7-5	11				0
12			CL	SILTY CLAY, mottled gray to strong brown (7.5YR 5/0 to 7.5YR 5/6), roots and root holes, no petroleum odor, moderate plasticity, stiff, moist, some root holes contain "free" water		
13						
14					8/11/88, Groundwater encountered - 14 ft. ▽	
15						
16						0
17	MW-7-6	12				
18				Bottom of boring =17 feet		
19						
20						
21						

SUPERVISED AND APPROVED BY R.G./C.E.G. LOP

Monitoring Well Detail

PROJECT NUMBER 1826G
PROJECT NAME 7194 AMADOR VALLEY BLVD.
COUNTY ALAMEDA
WELL PERMIT NO. 88383

BORING / WELL NO. MW-6
TOP OF CASING ELEV. 333.23
GROUND SURFACE ELEV. 333.72
DATUM LOCAL



EXPLORATORY BORING

a. Total Depth 24.5 ft.
b. Diameter 10 in.
Drilling method Hollow Stem Auger

WELL CONSTRUCTION

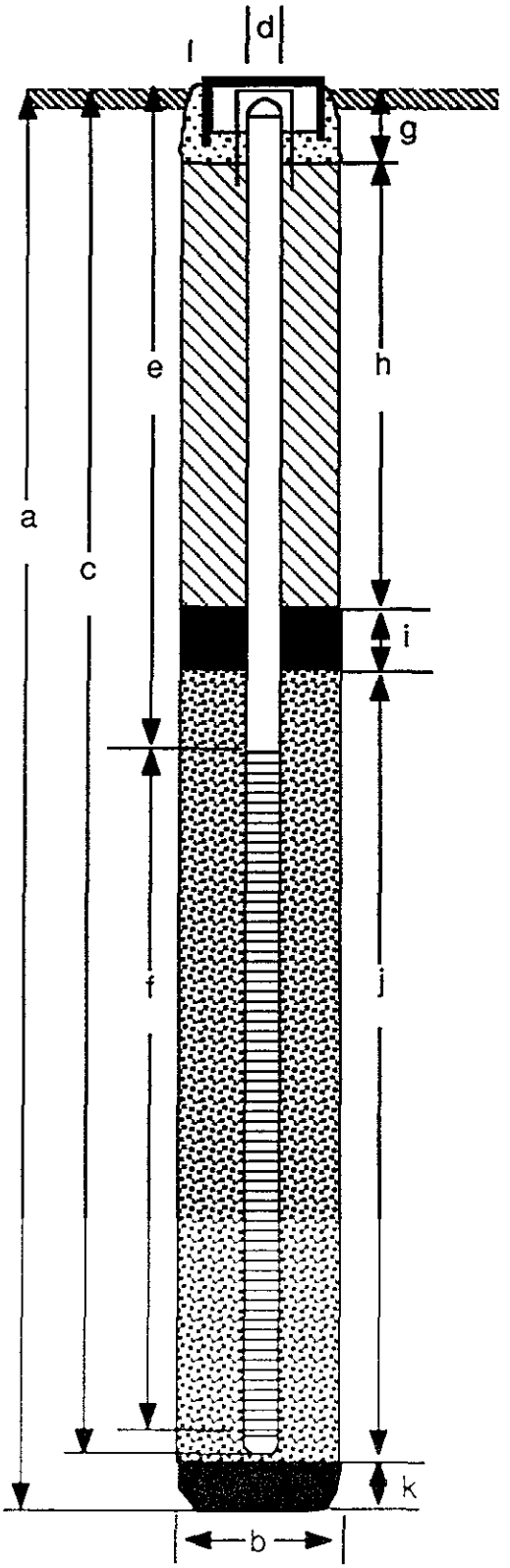
c. Casing length 23 ft.
Material Schedule 40 PVC
d. Casing diameter 4 in.
e. Depth to top perforations 13 ft.
f. Perforated length 10 ft.
Perforated interval from 13 to 23 ft.
Perforation type Machine Slot
Perforation size 0.02 in.
g. Surface seal 1 ft.
Seal Material Concrete
h. Backfill 10 ft.
Backfill material Cement Grout
i. Seal 1 ft.
Seal Material Bentonite
j. Gravel pack 11 ft.
Pack material 2/12 Sand
k. Bottom seal 1.5 ft.
Seal material Bentonite
l. Traffic Rated Vault Box With Locking Device

ensco environmental services, inc.

Monitoring Well Detail

PROJECT NUMBER 1826G
PROJECT NAME 7194 AMADOR VALLEY BLVD.
COUNTY ALAMEDA
WELL PERMIT NO. 88383

BORING / WELL NO. MW-7
TOP OF CASING ELEV. 335.42
GROUND SURFACE ELEV. 336.03
DATUM LOCAL



EXPLORATORY BORING

a. Total Depth 17 ft.
b. Diameter 10 in.
Drilling method Hollow Stem Auger

WELL CONSTRUCTION

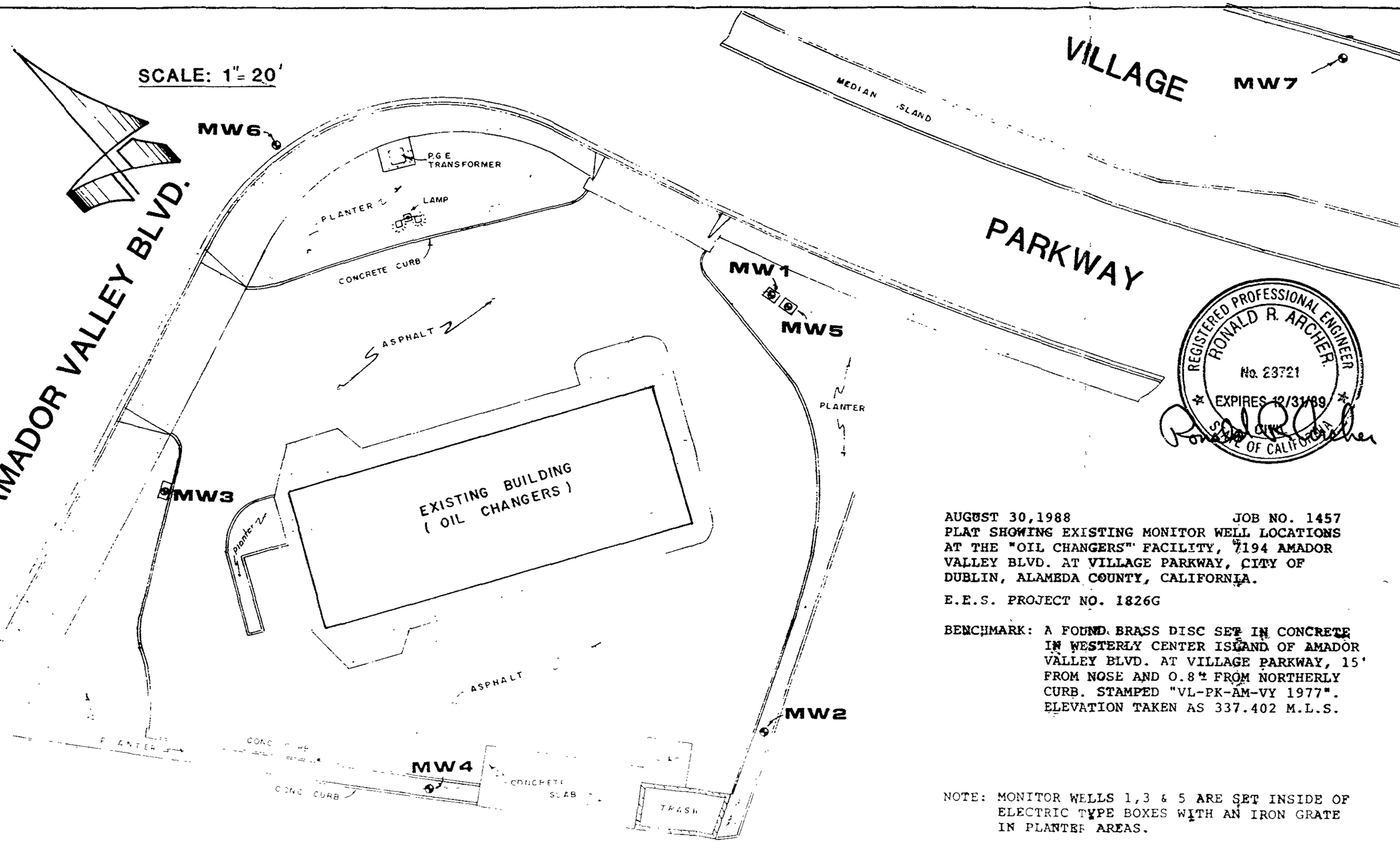
c. Casing length 17 ft.
Material Schedule 40 PVC
d. Casing diameter 4 in.
e. Depth to top perforations 7 ft.
f. Perforated length 10 ft.
Perforated interval from 7 to 17 ft.
Perforation type Machine Slot
Perforation size 0.02 in.
g. Surface seal 1 ft.
Seal Material Concrete
h. Backfill 4 ft.
Backfill material Cement Grout
i. Seal 1 ft.
Seal Material Bentonite
j. Gravel pack 11 ft.
Pack material 2/12 Sand
k. Bottom seal 0 ft.
Seal material None
l. Traffic Rated Vault Box With Locking Device

ensco environmental services, inc.

APPENDIX C

SURVEYORS MAP

SCALE: 1"= 20'



REGISTERED PROFESSIONAL ENGINEER
RONALD R. ARCHER
No. 23721
EXPIRES 12/31/89
STATE OF CALIFORNIA

AUGUST 30,1988 JOB NO. 1457

PLAT SHOWING EXISTING MONITOR WELL LOCATIONS AT THE "OIL CHANGERS" FACILITY, 7194 AMADOR VALLEY BLVD. AT VILLAGE PARKWAY, CITY OF DUBLIN, ALAMEDA COUNTY, CALIFORNIA.

E.E.S. PROJECT NO. 1826G

BENCHMARK: A FOUND BRASS DISC SET IN CONCRETE IN WESTERLY CENTER ISLAND OF AMADOR VALLEY BLVD. AT VILLAGE PARKWAY, 15' FROM NOSE AND 0.8' FROM NORTHERLY CURB. STAMPED "VL-PK-AM-VY 1977". ELEVATION TAKEN AS 337.402 M.L.S.

NOTE: MONITOR WELLS 1,3 & 5 ARE SET INSIDE OF ELECTRIC TYPE BOXES WITH AN IRON GRATE IN PLANTER AREAS.

Revised 11-30-88 To Switch Numbers on MW6 & 7 (RAH)

APPENDIX D

CHAINS-OF-CUSTODY AND LABORATORY REPORTS

24 hour RUSH

Anametrix

CHAIN OF CUSTODY RECORD

P.O. 8746

PROJECT NO	PROJECT NAME
18266	Shell-7194 Amador Valley, Dublin

SAMPLERS (Signature)
Rachel Hess and Tom Chaplin

NO	DATE	TIME	DRIVE	GRAB	STATION AND LOCATION	TEST REQUESTED: TVH/BTEX
MW2	8-26-88	10:15A			2 preserved voa ea	X
MW4		11:20A				X
MW3		12:14P				X
MW8		12:32P				X
MW7		12:52P				X
MW6		1:14P				X
MW5		2:20P				X
						X

24 hr RUSH

REMARKS

RELINQUISHED BY	DATE	TIME	RECEIVED BY:	RELINQUISHED BY:	DATE	TIME	RECEIVED BY
Rachel Hess							
RELINQUISHED BY	DATE	TIME	RECEIVED BY	RELINQUISHED BY:	DATE	TIME	RECEIVED BY LABORATORY
[illegible]	8/29/88	1131	[illegible]				

REMARKS
Report to Rich Gartlow

DISTRIBUTION

ensco environmental services, inc.
41674 Christy Street
Fremont, CA 94538-3114
(415) 659-0404
Fax. (415) 651-4677
Contr. Lic. No. 464324

FORM DATED 1-28-87

CHAIN OF CUSTODY RECORD

In freezer - in warehouse

PROJECT NO	PROJECT NAME
1826	Shell - Dublin

SAMPLERS (Signature): [signature]

NO	DATE	TIME	DRIVE	GRAB	STATION AND LOCATION	TPH Modified EPA 8015	BTEX EPA 8020									REMARKS: If TPH for composite sample is > 100ppm, then run each invidual sample for TPH. Any individual Sample in which TPH > 100ppm run that sample for BTEX
MW-7-1	8/11/88					X										Composite 1
MW-7-2						X										Composite 1
MW-7-3						X										Composite 1
MW-7-6						X										Composite 1
MW-7-4						X										Individual Sample
MW-7-5						X										Individual Sample

RELINQUISHED BY	DATE	TIME	RECEIVED BY:	RELINQUISHED BY:	DATE	TIME	RECEIVED BY
[signature]							
RELINQUISHED BY	DATE	TIME	RECEIVED BY:	RELINQUISHED BY:	DATE	TIME	RECEIVED BY LABORATORY
					8-16-88	9:35	[signature]

REMARKS: Questions to: Dave Blunt

DISTRIBUTION

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Fremont, CA 94538-3114
(415) 659-0404
Fax: (415) 651-4677
Contr. Lic. No. 464324

FORM DATED 1-28-87

Hnamatrix

CHAIN OF CUSTODY RECORD

In warm house freezer

PROJECT NO	PROJECT NAME
1826	Shell-Dublin

SAMPLERS (Signature)

NO	DATE	TIME	DRIVE	GRAB	STATION AND LOCATION	TEST REQUESTED: Modified EPA 8015 TPH	EPA 8020 BTEX	REMARKS
MW-8-1	8/11/88		/		5-5½	X		Composite 1
MW-8-2	"		/		6½-7	X		
MW-8-3	"		/		~~8~~ 8-8½	X		
MW-8-4	"		/		9½-10	X		
MW-8-5	"		/		11-11½	X		
MW-8-6	8/12/88		/		16½-17	X		
B-1-1			/		5-5½	X		Composite 2
B-1-2			/		6½-7	X		
B-1-4			/		9½-10	X		
B-1-5			/		11-11½	X		
B-1-3			/		8-8½	X		Individual Sample

If TPH for composite sample is >100ppm, then run each invidual sample for TPH. Any individual sample in which TPH > 100ppm run that sample for BTEX

RELINQUISHED BY	DATE	TIME	RECEIVED BY:	RELINQUISHED BY:	DATE	TIME	RECEIVED BY
RELINQUISHED BY	DATE	TIME	RECEIVED BY:	RELINQUISHED BY:	DATE	TIME	RECEIVED BY LABORATORY
					8/16/88	9:35	Taghi Nemazadeh

REMARKS

Questions to: Dave Blunt

DISTRIBUTION

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Fremont, CA 94538-3114
(415) 659-0404
Fax: (415) 651-4677
Contr. Lic. No. 464324

FORM DATED 1-28-87

Anametrix

CHAIN OF CUSTODY RECORD

In freezer in warehouse

PROJECT NO	PROJECT NAME
18266	Shell - Dublin

SAMPLERS (Signature): [signature]

TEST REQUESTED: TPH Modified EPA 8015; BTEX EPA 8020

REMARKS: If TPH for composite sample is >100ppm, then run each invidual sample for TPH. Any individual sample in which TPH > 100ppm run that sample for BTEX

NO	DATE	TIME	DRIVE	GRAB	STATION AND LOCATION	TPH Modified EPA 8015	BTEX EPA 8020	REMARKS
B-2-1	8/15		x		6½-7	X		Composite 1
B-2-2	↓		x		8-8½	X		Composite 1
B-2-3	↓		x		9½-10	X		Composite 1
B-3-1	8/15		x		5-5½	X		Composite 2
B-3-2	↓		x		6½-7	X		Composite 2
B-3-3	↓		x		8-8½	X		Composite 2
B-3-4	↓		x		9½-10	X		Composite 2
B-4-1	8/15		x		5-5½	X		Composite 3
B-4-2	↓		x		6½-7	X		Composite 3
B-4-3	↓		x		8-8½	X		Composite 3
B-4-4	↓		x		9½-10	X		Composite 3
B-5-1	8/15		x		5-5½	X		Individual Sample
B-5-2	↓		x		8-8½	X		Individual Sample
B-5-3	↓		x		9½-10	X		Individual Sample
B-5-4	↓		x		11-11½	X		Individual Sample
B-5-5	↓		x		12½-13	X		Individual Sample

RELINQUISHED BY	DATE	TIME	RECEIVED BY	RELINQUISHED BY	DATE	TIME	RECEIVED BY
[signature]							
RELINQUISHED BY	DATE	TIME	RECEIVED BY	RELINQUISHED BY	DATE	TIME	RECEIVED BY LABORATORY
					8-16-88	9:35	Taghi Nemaszadeh

REMARKS

DISTRIBUTION

ensco environmental services, inc.
41674 Christy Street
Fremont, CA 94538-3114
(415) 659-0404
Fax: (415) 651-4677
Contr. Lic. No. 464324

FORM DATED 1-28-87

Anametrix

CHAIN OF CUSTODY RECORD

In freezer in warehouse

PROJECT NO	PROJECT NAME
1826.6	Shell - Dublin

SAMPLERS (Signature): Richard A. Sadler

	NO	DATE	TIME	DRIVE	GRAB	STATION AND LOCATION	TEST REQUESTED: TPH Modified EPA 8015	BTEX EPA 8020	REMARKS
B	6-1	8/15		X		5-5½	X		Individual Sample
B	6-2	↓		X		6½-7	X		Individual Sample
B	6-3			X		8-8½	X		Individual Sample
B	6-4			X		9½-10	X		Individual Sample
B	6-5			X		11-11½	X		Individual Sample
B	6-6			X		12½-13	X		Individual Sample

If TPH for composite sample is >100ppm, then run each invidual sample for TPH. Any individual sample in which TPH > 100ppm run that sample for BTEX

RELINQUISHED BY	DATE	TIME	RECEIVED BY:	RELINQUISHED BY	DATE	TIME	RECEIVED BY
Angela Tolbert							
RELINQUISHED BY	DATE	TIME	RECEIVED BY	RELINQUISHED BY:	DATE	TIME	RECEIVED BY LABORATORY
					6/16/88	9135	Taghi Hemmazadeh

REMARKS

DISTRIBUTION

ensco environmental services, inc.
41674 Christy Street
Fremont, CA 94538-3114
(415) 659-0404
Fax: (415) 651-4677
Contr. Lic. No. 464324

FORM DATED 1-28-87

ANAMETRIX, INC.
LABORATORY SERVICES
ENVIRONMENTAL • ANALYTICAL CHEMISTRY
1961 CONCOURSE DR. SUITE E • SAN JOSE, CA 95131
TEL: (408) 432-8192 • FAX: (408) 432-8198

Dave Blunt
Ensco/Exceltech
41674 Christy Street
Fremont, CA 94538-3114

August 23, 1988
Work Order Number 8808118
Date Received 08/16/88
Project No. 1826G

Dear Mr. Blunt:

Fourteen soil samples were received for analysis of BTEX plus total volatile hydrocarbons as gasoline by gas chromatography, using the following EPA method(s):

ANAMETRIX I.D.	SAMPLE I.D.	METHOD(S)
8808118-01	1826G B-2-1,2,3,COMP	8015
-02	" B-3-1,2,3,4 COMP	"
-03	" B-4-1,2,3,4 COMP	"
-04	" B-5-1	"
-05	" B-5-2	8015/8020
-06	" B-5-3	8015
-07	" B-5-4	8015/8020
-08	" B-5-5	8015
-09	" B-6-1	"
-10	" B-6-2	8015/8020
-11	" B-6-3	"
-12	" B-6-4	"
-13	" B-6-5	8015
-14	" B-6-6	"

RESULTS

See enclosed data sheet, Pages 2 thru 15.

If there is any more that we can do, please give us a call. Thank you for using ANAMETRIX, INC.

Sincerely,

Sarah Schoen

Sarah Schoen, Ph.D.
GC Manager

SRS/lm

ANALYSIS DATA SHEET - PETROLEUM HYDROCARBON COMPOUNDS
ANAMETRIX, INC. (408) 432-8192

Sample I.D.	: 1826G B-2-1,2,3 COMP	Anametrix I.D.	: 8808118-01
Matrix	: SOIL	Analyst	: aw
Date sampled	: 08-15-88	Supervisor	: [illegible]
Date anl. TVH	: 08-17-88	Date released	: 08-23-88
Date ext. TEH	: NA	Date ext. TOG	: NA
Date anl. TEH	: NA	Date anl. TOG	: NA

CAS #	Compound Name	Reporting Limit (ug/kg)	Amount Found (ug/kg)
	TVH as Gasoline	5000	BRL

BRL - Below reporting limit.
TVH - Total Volatile Hydrocarbons is determined by modified EPA 8015 with either headspace or purge and trap.
TEH - Total Extractable Hydrocarbons is determined by modified EPA 8015 with direct injection.
TOG - Total Oil & Grease is determined by Standard Method 503E.
BTEX- Benzene, Toluene, Ethylbenzene, and Total Xylenes are determined by modified EPA 8020.

All testing procedures follow CRWQCB Region 2 guidelines.

ANALYSIS DATA SHEET - PETROLEUM HYDROCARBON COMPOUNDS
ANAMETRIX, INC. (408) 432-8192

Sample I.D.	: 1826G B-3-1,2,3,4 COMP	Anametrix I.D.	: 8808118-02
Matrix	: SOIL	Analyst	:
Date sampled	: 08-15-88	Supervisor	:
Date anl. TVH	: 08-17-88	Date released	: 08-23-88
Date ext. TEH	: NA	Date ext. TOG	: NA
Date anl. TEH	: NA	Date anl. TOG	: NA

CAS #	Compound Name	Reporting Limit (ug/kg)	Amount Found (ug/kg)
	TVH as Gasoline	5000	BRL

BRL - Below reporting limit.
TVH - Total Volatile Hydrocarbons is determined by modified EPA 8015 with either headspace or purge and trap.
TEH - Total Extractable Hydrocarbons is determined by modified EPA 8015 with direct injection.
TOG - Total Oil & Grease is determined by Standard Method 503E.
BTEX- Benzene, Toluene, Ethylbenzene, and Total Xylenes are determined by modified EPA 8020.

All testing procedures follow CRWQCB Region 2 guidelines.

ANALYSIS DATA SHEET - PETROLEUM HYDROCARBON COMPOUNDS
ANAMETRIX, INC. (408) 432-8192

Sample I.D.	: 1826G B-4-1,2,3,4 COMP	Anametrix I.D.	: 8808118-03
Matrix	: SOIL	Analyst	: aw
Date sampled	: 08-15-88	Supervisor	: SW
Date anl. TVH	: 08-17-88	Date released	: 08-23-88
Date ext. TEH	: NA	Date ext. TOG	: NA
Date anl. TEH	: NA	Date anl. TOG	: NA

CAS #	Compound Name	Reporting Limit (ug/kg)	Amount Found (ug/kg)
	TVH as Gasoline	5000	BRL

BRL - Below reporting limit.
TVH - Total Volatile Hydrocarbons is determined by modified EPA 8015 with either headspace or purge and trap.
TEH - Total Extractable Hydrocarbons is determined by modified EPA 8015 with direct injection.
TOG - Total Oil & Grease is determined by Standard Method 503E.
BTEX- Benzene, Toluene, Ethylbenzene, and Total Xylenes are determined by modified EPA 8020.

All testing procedures follow CRWQCB Region 2 guidelines.

ANALYSIS DATA SHEET - PETROLEUM HYDROCARBON COMPOUNDS
ANAMETRIX, INC. (408) 432-8192

Sample I.D.	: 1826G B-5-1	Anametrix I.D.	: 8808118-04
Matrix	: SOIL	Analyst	: aw
Date sampled	: 08-15-88	Supervisor	: RS
Date anl. TVH	: 08-17-88	Date released	: 08-23-88
Date ext. TEH	: NA	Date ext. TOG	: NA
Date anl. TEH	: NA	Date anl. TOG	: NA

CAS #	Compound Name	Reporting Limit (ug/kg)	Amount Found (ug/kg)
	TVH as Gasoline	5000	BRL

BRL - Below reporting limit.
TVH - Total Volatile Hydrocarbons is determined by modified EPA 8015 with either headspace or purge and trap.
TEH - Total Extractable Hydrocarbons is determined by modified EPA 8015 with direct injection.
TOG - Total Oil & Grease is determined by Standard Method 503E.
BTEX- Benzene, Toluene, Ethylbenzene, and Total Xylenes are determined by modified EPA 8020.

All testing procedures follow CRWQCB Region 2 guidelines.

ANALYSIS DATA SHEET - PETROLEUM HYDROCARBON COMPOUNDS
ANAMETRIX, INC. (408) 432-8192

Sample I.D.	: 1826G B-5-2	Anametrix I.D.	: 8808118-05
Matrix	: SOIL	Analyst	: aw
Date sampled	: 08-15-88	Supervisor	: RT
Date anl. TVH	: 08-19-88	Date released	: 08-23-88
Date ext. TEH	: NA	Date ext. TOG	: NA
Date anl. TEH	: NA	Date anl. TOG	: NA

CAS #	Compound Name	Reporting Limit (ug/kg)	Amount Found (ug/kg)
71-43-2	Benzene	200	9800
108-88-3	Toluene	200	1800
100-41-4	Ethylbenzene	200	7500
1330-20-7	Total Xylenes	200	36000
	TVH as Gasoline	5000	420000

BRL - Below reporting limit.
TVH - Total Volatile Hydrocarbons is determined by modified EPA 8015 with either headspace or purge and trap.
TEH - Total Extractable Hydrocarbons is determined by modified EPA 8015 with direct injection.
TOG - Total Oil & Grease is determined by Standard Method 503E.
BTEX- Benzene, Toluene, Ethylbenzene, and Total Xylenes are determined by modified EPA 8020.

All testing procedures follow CRWQCB Region 2 guidelines.

ANALYSIS DATA SHEET - PETROLEUM HYDROCARBON COMPOUNDS
ANAMETRIX, INC. (408) 432-8192

Sample I.D.	: 1826G B-5-3	Anametrix I.D.	: 8808118-06
Matrix	: SOIL	Analyst	: aw
Date sampled	: 08-15-88	Supervisor	: RMS
Date anl. TVH	: 08-17-88	Date released	: 08-23-88
Date ext. TEH	: NA	Date ext. TOG	: NA
Date anl. TEH	: NA	Date anl. TOG	: NA

CAS #	Compound Name	Reporting Limit (ug/kg)	Amount Found (ug/kg)
	TVH as Gasoline	5000	43000

BRL - Below reporting limit.
TVH - Total Volatile Hydrocarbons is determined by modified EPA 8015 with either headspace or purge and trap.
TEH - Total Extractable Hydrocarbons is determined by modified EPA 8015 with direct injection.
TOG - Total Oil & Grease is determined by Standard Method 503E.
BTEX- Benzene, Toluene, Ethylbenzene, and Total Xylenes are determined by modified EPA 8020.

All testing procedures follow CRWQCB Region 2 guidelines.

ANALYSIS DATA SHEET - PETROLEUM HYDROCARBON COMPOUNDS
ANAMETRIX, INC. (408) 432-8192

Sample I.D.	: 1826G B-5-4	Anametrix I.D.	: 8808118-07
Matrix	: SOIL	Analyst	: cw
Date sampled	: 08-15-88	Supervisor	: [illegible]
Date anl. TVH	: 08-19-88	Date released	: 08-23-88
Date ext. TEH	: NA	Date ext. TOG	: NA
Date anl. TEH	: NA	Date anl. TOG	: NA

CAS #	Compound Name	Reporting Limit (ug/kg)	Amount Found (ug/kg)
71-43-2	Benzene	200	9300
108-88-3	Toluene	200	1300
100-41-4	Ethylbenzene	200	11000
1330-20-7	Total Xylenes	200	14000
	TVH as Gasoline	5000	170000

BRL - Below reporting limit.
TVH - Total Volatile Hydrocarbons is determined by modified EPA 8015 with either headspace or purge and trap.
TEH - Total Extractable Hydrocarbons is determined by modified EPA 8015 with direct injection.
TOG - Total Oil & Grease is determined by Standard Method 503E.
BTEX- Benzene, Toluene, Ethylbenzene, and Total Xylenes are determined by modified EPA 8020.

All testing procedures follow CRWQCB Region 2 guidelines.

ANALYSIS DATA SHEET - PETROLEUM HYDROCARBON COMPOUNDS
ANAMETRIX, INC. (408) 432-8192

Sample I.D.	: 1826G B-5-5	Anametrix I.D.	: 8808118-08
Matrix	: SOIL	Analyst	:
Date sampled	: 08-15-88	Supervisor	:
Date anl. TVH	: 08-17-88	Date released	: 08-23-88
Date ext. TEH	: NA	Date ext. TOG	: NA
Date anl. TEH	: NA	Date anl. TOG	: NA

CAS #	Compound Name	Reporting Limit (ug/kg)	Amount Found (ug/kg)
	TVH as Gasoline	5000	10000

BRL - Below reporting limit.
TVH - Total Volatile Hydrocarbons is determined by modified EPA 8015 with either headspace or purge and trap.
TEH - Total Extractable Hydrocarbons is determined by modified EPA 8015 with direct injection.
TOG - Total Oil & Grease is determined by Standard Method 503E.
BTEX- Benzene, Toluene, Ethylbenzene, and Total Xylenes are determined by modified EPA 8020.

All testing procedures follow CRWQCB Region 2 guidelines.

ANALYSIS DATA SHEET - PETROLEUM HYDROCARBON COMPOUNDS
ANAMETRIX, INC. (408) 432-8192

Sample I.D.	: 1826G B-6-1	Anametrix I.D.	: 8808118-09
Matrix	: SOIL	Analyst	: dw
Date sampled	: 08-15-88	Supervisor	: RHS
Date anl. TVH	: 08-17-88	Date released	: 08-23-88
Date ext. TEH	: NA	Date ext. TOG	: NA
Date anl. TEH	: NA	Date anl. TOG	: NA

CAS #	Compound Name	Reporting Limit (ug/kg)	Amount Found (ug/kg)
	TVH as Gasoline	5000	BRL

BRL - Below reporting limit.
TVH - Total Volatile Hydrocarbons is determined by modified EPA 8015 with either headspace or purge and trap.
TEH - Total Extractable Hydrocarbons is determined by modified EPA 8015 with direct injection.
TOG - Total Oil & Grease is determined by Standard Method 503E.
BTEX- Benzene, Toluene, Ethylbenzene, and Total Xylenes are determined by modified EPA 8020.

All testing procedures follow CRWQCB Region 2 guidelines.

ANALYSIS DATA SHEET - PETROLEUM HYDROCARBON COMPOUNDS
ANAMETRIX, INC. (408) 432-8192

Sample I.D.	: 1826G B-6-2	Anametrix I.D.	: 8808118-10
Matrix	: SOIL	Analyst	: dw
Date sampled	: 08-15-88	Supervisor	: RJ
Date anl. TVH	: 08-22-88	Date released	: 08-23-88
Date ext. TEH	: NA	Date ext. TOG	: NA
Date anl. TEH	: NA	Date anl. TOG	: NA

CAS #	Compound Name	Reporting Limit (ug/kg)	Amount Found (ug/kg)
71-43-2	Benzene	200	4800
108-88-3	Toluene	200	5600
100-41-4	Ethylbenzene	200	7200
1330-20-7	Total Xylenes	200	1800
	TVH as Gasoline	5000	66000

BRL - Below reporting limit.
TVH - Total Volatile Hydrocarbons is determined by modified EPA 8015 with either headspace or purge and trap.
TEH - Total Extractable Hydrocarbons is determined by modified EPA 8015 with direct injection.
TOG - Total Oil & Grease is determined by Standard Method 503E.
BTEX- Benzene, Toluene, Ethylbenzene, and Total Xylenes are determined by modified EPA 8020.

All testing procedures follow CRWQCB Region 2 guidelines.

ANALYSIS DATA SHEET - PETROLEUM HYDROCARBON COMPOUNDS
ANAMETRIX, INC. (408) 432-8192

Sample I.D.	: 1826G B-6-3	Anametrix I.D.	: 8808118-11
Matrix	: SOIL	Analyst	:
Date sampled	: 08-15-88	Supervisor	:
Date anl. TVH	: 08-19-88	Date released	: 08-23-88
Date ext. TEH	: NA	Date ext. TOG	: NA
Date anl. TEH	: NA	Date anl. TOG	: NA

CAS #	Compound Name	Reporting Limit (ug/kg)	Amount Found (ug/kg)
71-43-2	Benzene	200	3900
108-88-3	Toluene	200	6400
100-41-4	Ethylbenzene	200	5300
1330-20-7	Total Xylenes	200	42000
	TVH as Gasoline	5000	540000

BRL - Below reporting limit.
TVH - Total Volatile Hydrocarbons is determined by modified EPA 8015 with either headspace or purge and trap.
TEH - Total Extractable Hydrocarbons is determined by modified EPA 8015 with direct injection.
TOG - Total Oil & Grease is determined by Standard Method 503E.
BTEX- Benzene, Toluene, Ethylbenzene, and Total Xylenes are determined by modified EPA 8020.

All testing procedures follow CRWQCB Region 2 guidelines.

ANALYSIS DATA SHEET - PETROLEUM HYDROCARBON COMPOUNDS
ANAMETRIX, INC. (408) 432-8192

Sample I.D.	: 1826G B-6-4	Anametrix I.D.	: 8808118-12
Matrix	: SOIL	Analyst	: aw
Date sampled	: 08-15-88	Supervisor	: RHS
Date anl. TVH	: 08-19-88	Date released	: 08-23-88
Date ext. TEH	: NA	Date ext. TOG	: NA
Date anl. TEH	: NA	Date anl. TOG	: NA

CAS #	Compound Name	Reporting Limit (ug/kg)	Amount Found (ug/kg)
71-43-2	Benzene	200	BRL
108-88-3	Toluene	200	1300
100-41-4	Ethylbenzene	200	4500
1330-20-7	Total Xylenes	200	11000
	TVH as Gasoline	5000	130000

BRL - Below reporting limit.
TVH - Total Volatile Hydrocarbons is determined by modified EPA 8015 with either headspace or purge and trap.
TEH - Total Extractable Hydrocarbons is determined by modified EPA 8015 with direct injection.
TOG - Total Oil & Grease is determined by Standard Method 503E.
BTEX- Benzene, Toluene, Ethylbenzene, and Total Xylenes are determined by modified EPA 8020.

All testing procedures follow CRWQCB Region 2 guidelines.

ANALYSIS DATA SHEET - PETROLEUM HYDROCARBON COMPOUNDS
ANAMETRIX, INC. (408) 432-8192

Sample I.D.	: 1826G B-6-5	Anametrix I.D.	: 8808118-13
Matrix	: SOIL	Analyst	: aw
Date sampled	: 08-15-88	Supervisor	: [illegible]
Date anl. TVH	: 08-18-88	Date released	: 08-23-88
Date ext. TEH	: NA	Date ext. TOG	: NA
Date anl. TEH	: NA	Date anl. TOG	: NA

CAS #	Compound Name	Reporting Limit (ug/kg)	Amount Found (ug/kg)
	TVH as Gasoline	5000	14000

BRL - Below reporting limit.
TVH - Total Volatile Hydrocarbons is determined by modified EPA 8015 with either headspace or purge and trap.
TEH - Total Extractable Hydrocarbons is determined by modified EPA 8015 with direct injection.
TOG - Total Oil & Grease is determined by Standard Method 503E.
BTEX- Benzene, Toluene, Ethylbenzene, and Total Xylenes are determined by modified EPA 8020.

All testing procedures follow CRWQCB Region 2 guidelines.

ANALYSIS DATA SHEET - PETROLEUM HYDROCARBON COMPOUNDS
ANAMETRIX, INC. (408) 432-8192

Sample I.D.	: 1826G B-6-6	Anametrix I.D.	: 8808118-14
Matrix	: SOIL	Analyst	: CW
Date sampled	: 08-15-88	Supervisor	: SMS
Date anl. TVH	: 08-19-88	Date released	: 08-23-88
Date ext. TEH	: NA	Date ext. TOG	: NA
Date anl. TEH	: NA	Date anl. TOG	: NA

CAS #	Compound Name	Reporting Limit (ug/kg)	Amount Found (ug/kg)
	TVH as Gasoline	5000	BRL

BRL - Below reporting limit.
TVH - Total Volatile Hydrocarbons is determined by modified EPA 8015 with either headspace or purge and trap.
TEH - Total Extractable Hydrocarbons is determined by modified EPA 8015 with direct injection.
TOG - Total Oil & Grease is determined by Standard Method 503E.
BTEX- Benzene, Toluene, Ethylbenzene, and Total Xylenes are determined by modified EPA 8020.

All testing procedures follow CRWQCB Region 2 guidelines.

ANAMETRIX INC
Environmental & Analytical Chemistry

1961 Concourse Drive Suite E
San Jose, CA 95131
(408) 432-8192 • Fax (408) 432-8198

Dave Blunt
Ensco Environmental Services
41674 Christy Street
Fremont, CA 94538-3114

August 25, 1988
Work Order Number 8808119
Date Received 08/16/88
Project No. 1826

Dear Mr. Blunt:

Six soil samples were received for analysis of total volatile hydrocarbons as gasoline by gas chromatography, using the following EPA method(s):

ANAMETRIX I.D.	SAMPLE I.D.	METHOD(S)
8808119-01	1826 MW-7-(1-6)COMP.	8015
-02	B-1-(1,2,4 & 5)COMP.	"
-03	B-1-3	"
-04	MW-6-(1,2,3 &6)COMP.	"
-05	MW-6-4	"
-06	MW-6-5	"

RESULTS

See enclosed data sheets, Pages 2 thru 7.

NOTE: At Ensco's request, samples with ID MW-7 were re-named MW-6 and samples with ID MW-8 were re-named MW-7.

If there is any more that we can do, please give us a call. Thank you for using ANAMETRIX, INC.

Sincerely,

Sarah Schoen

Sarah Schoen, Ph.D.
GC Manager

SRS/dg

ANALYSIS DATA SHEET - PETROLEUM HYDROCARBON COMPOUNDS
ANAMETRIX, INC. (408) 432-8192

Sample I.D.	: 1826 MW-7-(1-6)COMP.	Anametrix I.D.	: 8808119-01
Matrix	: SOIL	Analyst	: dw
Date sampled	: 08-11-88/08-12-88	Supervisor	: RJ
Date anl. TVH	: 08-19-88	Date released	: 08-25-88
Date ext. TEH	: NA	Date ext. TOG	: NA
Date anl. TEH	: NA	Date anl. TOG	: NA

CAS #	Compound Name	Reporting Limit (ug/kg)	Amount Found (ug/kg)
	TVH as Gasoline	5000	BRL

BRL - Below reporting limit.
TVH - Total Volatile Hydrocarbons is determined by modified EPA 8015 with either headspace or purge and trap.
TEH - Total Extractable Hydrocarbons is determined by modified EPA 8015 with direct injection.
TOG - Total Oil & Grease is determined by Standard Method 503E.
BTEX- Benzene, Toluene, Ethylbenzene, and Total Xylenes are determined by modified EPA 8020.

All testing procedures follow CRWQCB Region 2 guidelines.

ANALYSIS DATA SHEET - PETROLEUM HYDROCARBON COMPOUNDS
ANAMETRIX, INC. (408) 432-8192

Sample I.D.	: 1826 B-1-(1,2,4 & 5)COMP.	Anametrix I.D.	: 8808119-02
Matrix	: SOIL	Analyst	: dw
Date sampled	: 08-12-88	Supervisor	: [illegible]
Date anl. TVH	: 08-19-88	Date released	: 08-25-88
Date ext. TEH	: NA	Date ext. TOG	: NA
Date anl. TEH	: NA	Date anl. TOG	: NA

CAS #	Compound Name	Reporting Limit (ug/kg)	Amount Found (ug/kg)
	TVH as Gasoline	5000	BRL

BRL - Below reporting limit.
TVH - Total Volatile Hydrocarbons is determined by modified EPA 8015 with either headspace or purge and trap.
TEH - Total Extractable Hydrocarbons is determined by modified EPA 8015 with direct injection.
TOG - Total Oil & Grease is determined by Standard Method 503E.
BTEX- Benzene, Toluene, Ethylbenzene, and Total Xylenes are determined by modified EPA 8020.

All testing procedures follow CRWQCB Region 2 guidelines.

ANALYSIS DATA SHEET - PETROLEUM HYDROCARBON COMPOUNDS
ANAMETRIX, INC. (408) 432-8192

Sample I.D.	: 1826 B-1-3	Anametrix I.D.	: 8808119-03
Matrix	: SOIL	Analyst	: aw
Date sampled	: 08-12-88	Supervisor	: JW
Date anl. TVH	: 08-23-88	Date released	: 08-25-88
Date ext. TEH	: NA	Date ext. TOG	: NA
Date anl. TEH	: NA	Date anl. TOG	: NA

CAS #	Compound Name	Reporting Limit (ug/kg)	Amount Found (ug/kg)
	TVH as Gasoline	5000	22000

BRL - Below reporting limit.
TVH - Total Volatile Hydrocarbons is determined by modified EPA 8015 with either headspace or purge and trap.
TEH - Total Extractable Hydrocarbons is determined by modified EPA 8015 with direct injection.
TOG - Total Oil & Grease is determined by Standard Method 503E.
BTEX- Benzene, Toluene, Ethylbenzene, and Total Xylenes are determined by modified EPA 8020.

All testing procedures follow CRWQCB Region 2 guidelines.

ANALYSIS DATA SHEET - PETROLEUM HYDROCARBON COMPOUNDS
ANAMETRIX, INC. (408) 432-8192

Sample I.D.	: 1826 MW-6-(1,2,3 & 6)COMP.	Anametrix I.D.	: 8808119-04
Matrix	: SOIL	Analyst	:
Date sampled	: 08-11-88	Supervisor	:
Date anl. TVH	: 08-19-88	Date released	: 08-25-88
Date ext. TEH	: NA	Date ext. TOG	: NA
Date anl. TEH	: NA	Date anl. TOG	: NA

CAS #	Compound Name	Reporting Limit (ug/kg)	Amount Found (ug/kg)
	TVH as Gasoline	5000	BRL

BRL - Below reporting limit.
TVH - Total Volatile Hydrocarbons is determined by modified EPA 8015 with either headspace or purge and trap.
TEH - Total Extractable Hydrocarbons is determined by modified EPA 8015 with direct injection.
TOG - Total Oil & Grease is determined by Standard Method 503E.
BTEX- Benzene, Toluene, Ethylbenzene, and Total Xylenes are determined by modified EPA 8020.

All testing procedures follow CRWQCB Region 2 guidelines.

ANALYSIS DATA SHEET - PETROLEUM HYDROCARBON COMPOUNDS
ANAMETRIX, INC. (408) 432-8192

Sample I.D.	: 1826 MW-6-4	Anametrix I.D.	: 8808119-05
Matrix	: SOIL	Analyst	:
Date sampled	: 08-11-88	Supervisor	:
Date anl. TVH	: 08-18-88	Date released	: 08-25-88
Date ext. TEH	: NA	Date ext. TOG	: NA
Date anl. TEH	: NA	Date anl. TOG	: NA

CAS #	Compound Name	Reporting Limit (ug/kg)	Amount Found (ug/kg)
	TVH as Gasoline	5000	11000

BRL - Below reporting limit.
TVH - Total Volatile Hydrocarbons is determined by modified EPA 8015 with either headspace or purge and trap.
TEH - Total Extractable Hydrocarbons is determined by modified EPA 8015 with direct injection.
TOG - Total Oil & Grease is determined by Standard Method 503E.
BTEX- Benzene, Toluene, Ethylbenzene, and Total Xylenes are determined by modified EPA 8020.

All testing procedures follow CRWQCB Region 2 guidelines.

ANALYSIS DATA SHEET - PETROLEUM HYDROCARBON COMPOUNDS
ANAMETRIX, INC. (408) 432-8192

Sample I.D.	: 1826 MW-6-5	Anametrix I.D.	: 8808119-06
Matrix	: SOIL	Analyst	: [illegible]
Date sampled	: 08-11-88	Supervisor	: [illegible]
Date anl. TVH	: 08-18-88	Date released	: 08-25-88
Date ext. TEH	: NA	Date ext. TOG	: NA
Date anl. TEH	: NA	Date anl. TOG	: NA

CAS #	Compound Name	Reporting Limit (ug/kg)	Amount Found (ug/kg)
	TVH as Gasoline	5000	75000

BRL - Below reporting limit.
TVH - Total Volatile Hydrocarbons is determined by modified EPA 8015 with either headspace or purge and trap.
TEH - Total Extractable Hydrocarbons is determined by modified EPA 8015 with direct injection.
TOG - Total Oil & Grease is determined by Standard Method 503E.
BTEX- Benzene, Toluene, Ethylbenzene, and Total Xylenes are determined by modified EPA 8020.

All testing procedures follow CRWQCB Region 2 guidelines.

ANAMETRIX, INC.
LABORATORY SERVICES
ENVIRONMENTAL • ANALYTICAL CHEMISTRY
1961 CONCOURSE DR., SUITE E • SAN JOSE, CA 95131
TEL: (408) 432-8192 • FAX. (408) 432-8198

Rich Garlow
Ensco/Exceltech
41674 Christy Street
Fremont, CA 94538-3114

September 1, 1988
Work Order Number 8808232
Date Received 08/29/88
PO No. 8746

Dear Mr. Garlow:

Seven water samples were received for analysis of BTEX plus total volatile hydrocarbons as gasoline by gas chromatography, using the following EPA method(s):

ANAMETRIX I.D.	SAMPLE I.D.	METHOD(S)
8808232-01	1826G MW2	8015/8020
-02	" MW4	"
-03	" MW3	"
-04	" MW1	"
-05	" MW7	"
-06	" MW6	"
-07	" MW5	"

RESULTS

See enclosed data sheets, Pages 2 thru 8.

If there is any more that we can do, please give us a call. Thank you for using ANAMETRIX, INC.

Sincerely,

Sarah Schoen

Sarah Schoen, Ph.D.
GC Manager

SRS/lm

ANALYSIS DATA SHEET - PETROLEUM HYDROCARBON COMPOUNDS
ANAMETRIX, INC. (408) 432-8192

Sample I.D.	: 1826G MW2	Anametrix I.D.	: 8808232-01
Matrix	: WATER	Analyst	: mh
Date sampled	: 08-26-88	Supervisor	: RW
Date anl. TVH	: 08-29-88	Date released	: 09-01-88
Date ext. TEH	: NA	Date ext. TOG	: NA
Date anl. TEH	: NA	Date anl. TOG	: NA

CAS #	Compound Name	Reporting Limit (ug/l)	Amount Found (ug/l)
71-43-2	Benzene	1	230
108-88-3	Toluene	1	16
100-41-4	Ethylbenzene	1	87
1330-20-7	Total Xylenes	1	120
	TVH as Gasoline	50	1700

BRL - Below reporting limit.
TVH - Total Volatile Hydrocarbons is determined by modified EPA 8015 with either headspace or purge and trap.
TEH - Total Extractable Hydrocarbons is determined by modified EPA 8015 with direct injection.
TOG - Total Oil & Grease is determined by Standard Method 503E.
BTEX- Benzene, Toluene, Ethylbenzene, and Total Xylenes are determined by modified EPA 8020.

All testing procedures follow CRWQCB Region 2 guidelines.

ANALYSIS DATA SHEET - PETROLEUM HYDROCARBON COMPOUNDS
ANAMETRIX, INC. (408) 432-8192

Sample I.D.	: 1826G MW4	Anametrix I.D.	: 8808232-02
Matrix	: WATER	Analyst	:
Date sampled	: 08-26-88	Supervisor	:
Date anl. TVH	: 08-29-88	Date released	: 09-01-88
Date ext. TEH	: NA	Date ext. TOG	: NA
Date anl. TEH	: NA	Date anl. TOG	: NA

CAS #	Compound Name	Reporting Limit (ug/l)	Amount Found (ug/l)
71-43-2	Benzene	1	640
108-88-3	Toluene	1	41
100-41-4	Ethylbenzene	1	110
1330-20-7	Total Xylenes	1	160
	TVH as Gasoline	50	2100

BRL - Below reporting limit.
TVH - Total Volatile Hydrocarbons is determined by modified EPA 8015 with either headspace or purge and trap.
TEH - Total Extractable Hydrocarbons is determined by modified EPA 8015 with direct injection.
TOG - Total Oil & Grease is determined by Standard Method 503E.
BTEX- Benzene, Toluene, Ethylbenzene, and Total Xylenes are determined by modified EPA 8020.

All testing procedures follow CRWQCB Region 2 guidelines.

ANALYSIS DATA SHEET - PETROLEUM HYDROCARBON COMPOUNDS
ANAMETRIX, INC. (408) 432-8192

Sample I.D.	: 1826G MW3	Anametrix I.D.	: 8808232-03
Matrix	: WATER	Analyst	:
Date sampled	: 08-26-88	Supervisor	:
Date anl. TVH	: 08-29-88	Date released	: 09-01-88
Date ext. TEH	: NA	Date ext. TOG	: NA
Date anl. TEH	: NA	Date anl. TOG	: NA

CAS #	Compound Name	Reporting Limit (ug/l)	Amount Found (ug/l)
71-43-2	Benzene	1	170
108-88-3	Toluene	1	6
100-41-4	Ethylbenzene	1	32
1330-20-7	Total Xylenes	1	54
	TVH as Gasoline	50	5200

BRL - Below reporting limit.
TVH - Total Volatile Hydrocarbons is determined by modified EPA 8015 with either headspace or purge and trap.
TEH - Total Extractable Hydrocarbons is determined by modified EPA 8015 with direct injection.
TOG - Total Oil & Grease is determined by Standard Method 503E.
BTEX- Benzene, Toluene, Ethylbenzene, and Total Xylenes are determined by modified EPA 8020.

All testing procedures follow CRWQCB Region 2 guidelines.

ANALYSIS DATA SHEET - PETROLEUM HYDROCARBON COMPOUNDS
ANAMETRIX, INC. (408) 432-8192

Sample I.D.	: 1826G MW1	Anametrix I.D.	: 8808232-04
Matrix	: WATER	Analyst	:
Date sampled	: 08-26-88	Supervisor	:
Date anl. TVH	: 08-29-88	Date released	: 09-01-88
Date ext. TEH	: NA	Date ext. TOG	: NA
Date anl. TEH	: NA	Date anl. TOG	: NA

CAS #	Compound Name	Reporting Limit (ug/l)	Amount Found (ug/l)
71-43-2	Benzene	1	4400
108-88-3	Toluene	1	260
100-41-4	Ethylbenzene	1	300
1330-20-7	Total Xylenes	1	450
	TVH as Gasoline	50	200000

BRL - Below reporting limit.
TVH - Total Volatile Hydrocarbons is determined by modified EPA 8015 with either headspace or purge and trap.
TEH - Total Extractable Hydrocarbons is determined by modified EPA 8015 with direct injection.
TOG - Total Oil & Grease is determined by Standard Method 503E.
BTEX- Benzene, Toluene, Ethylbenzene, and Total Xylenes are determined by modified EPA 8020.

All testing procedures follow CRWQCB Region 2 guidelines.

ANALYSIS DATA SHEET - PETROLEUM HYDROCARBON COMPOUNDS
ANAMETRIX, INC. (408) 432-8192

Sample I.D.	: 1826G MW7	Anametrix I.D.	: 8808232-05
Matrix	: WATER	Analyst	:
Date sampled	: 08-26-88	Supervisor	:
Date anl. TVH	: 08-31-88	Date released	: 09-01-88
Date ext. TEH	: NA	Date ext. TOG	: NA
Date anl. TEH	: NA	Date anl. TOG	: NA

CAS #	Compound Name	Reporting Limit (ug/l)	Amount Found (ug/l)
71-43-2	Benzene	0.5	0.8
108-88-3	Toluene	1	BRL
100-41-4	Ethylbenzene	1	BRL
1330-20-7	Total Xylenes	1	BRL
	TVH as Gasoline	50	BRL

BRL - Below reporting limit.
TVH - Total Volatile Hydrocarbons is determined by modified EPA 8015 with either headspace or purge and trap.
TEH - Total Extractable Hydrocarbons is determined by modified EPA 8015 with direct injection.
TOG - Total Oil & Grease is determined by Standard Method 503E.
BTEX- Benzene, Toluene, Ethylbenzene, and Total Xylenes are determined by modified EPA 8020.

All testing procedures follow CRWQCB Region 2 guidelines.

ANALYSIS DATA SHEET - PETROLEUM HYDROCARBON COMPOUNDS
ANAMETRIX, INC. (408) 432-8192

Sample I.D.	: 1826G MW6	Anametrix I.D.	: 8808232-06
Matrix	: WATER	Analyst	: mh
Date sampled	: 08-26-88	Supervisor	: BJS
Date anl. TVH	: 08-29-88	Date released	: 09-01-88
Date ext. TEH	: NA	Date ext. TOG	: NA
Date anl. TEH	: NA	Date anl. TOG	: NA

CAS #	Compound Name	Reporting Limit (ug/l)	Amount Found (ug/l)
71-43-2	Benzene	1	390
108-88-3	Toluene	1	390
100-41-4	Ethylbenzene	1	690
1330-20-7	Total Xylenes	1	1700
	TVH as Gasoline	50	15000

BRL - Below reporting limit.
TVH - Total Volatile Hydrocarbons is determined by modified EPA 8015 with either headspace or purge and trap.
TEH - Total Extractable Hydrocarbons is determined by modified EPA 8015 with direct injection.
TOG - Total Oil & Grease is determined by Standard Method 503E.
BTEX- Benzene, Toluene, Ethylbenzene, and Total Xylenes are determined by modified EPA 8020.

All testing procedures follow CRWQCB Region 2 guidelines.

ANALYSIS DATA SHEET - PETROLEUM HYDROCARBON COMPOUNDS
ANAMETRIX, INC. (408) 432-8192

Sample I.D.	: 1826G MW5	Anametrix I.D.	: 8808232-07
Matrix	: WATER	Analyst	: mh
Date sampled	: 08-26-88	Supervisor	: DHS
Date anl. TVH	: 08-30-88	Date released	: 09-01-88
Date ext. TEH	: NA	Date ext. TOG	: NA
Date anl. TEH	: NA	Date anl. TOG	: NA

CAS #	Compound Name	Reporting Limit (ug/l)	Amount Found (ug/l)
71-43-2	Benzene	1	6
108-88-3	Toluene	1	4
100-41-4	Ethylbenzene	1	9
1330-20-7	Total Xylenes	1	19
	TVH as Gasoline	50	210

BRL - Below reporting limit.
TVH - Total Volatile Hydrocarbons is determined by modified EPA 8015 with either headspace or purge and trap.
TEH - Total Extractable Hydrocarbons is determined by modified EPA 8015 with direct injection.
TOG - Total Oil & Grease is determined by Standard Method 503E.
BTEX- Benzene, Toluene, Ethylbenzene, and Total Xylenes are determined by modified EPA 8020.

All testing procedures follow CRWQCB Region 2 guidelines.

APPENDIX E

SUMMARY OF AQUIFER TEST

Introduction

This is a summary of the aquifer testing program performed at the Shell Oil Station located at 7194 Amador Valley Boulevard in the City of Dublin, Alameda County, California. The program was performed at the subject facility from September 6 through 9, 1988. Several tests (step drawdown, constant discharge and recovery) were conducted, during which the extraction well (RW-1) was pumped and water levels in monitoring wells (MW-1, MW-2, MW-3, MW-4, MW-5, MW-6 and MW-7) were measured. Prior to initiating the aquifer tests, water levels in the monitoring wells were measured several times to establish pre-test conditions. The aquifer testing program and analytical methods used to analyze the data will be discussed in detail in a separate report.

Pump Tests

A 10 1/2-hour step drawdown test was conducted on September 7, 1988 to evaluate the performance of the extraction well and to select a pumping rate for the subsequent constant discharge test. The extraction well was pumped at four successively higher pumping rates ("steps"). The pumping rates for the four steps were approximately 0.6, 1.8, 3.0 and 5.0 gallons per minute (gpm). The well was pumped at the fourth step (5.0 gpm) for approximately 300 minutes (5.00 hours) with a total change in water level of 4.46 feet. This step was judged to be an appropriate rate for the constant discharge test.

A scheduled 24 hour constant discharge test was started at 10:01 hours on September 8, 1988 at a discharge rate of 5 gpm. The pumping rate chosen was based on the data obtained during the step drawdown test. A sharp increase in the rate of drawdown in the extraction well was observed after about 400 minutes (6.67 hours) of pumping, and the water level dropped to the top of the pump intake after approximately 728 minutes (12.13 hours). At this point the pump was turned off and recovery measuments were begun. Drawdown was noted in monitoring wells MW-1 (2.15 feet), MW-2 (0.72 feet), MW-3 (0.15 feet), MW-4 (0.26 feet) and MW-6 (0.23 feet). No influence from the pump test was observed in monitoring wells MW-5 and MW-7.

Estimates of Aquifer Parameters

Aquifer parameters (transmissivity and storage coefficient) of the upper most relatively permeable deposits in the vicinity of the 7194 Amador Valley Boulevard station were evaluated from plots of drawdown data versus time collected during the constant discharge test. The details of the analysis will be explained in a separate report specifically outlining the aquifer pump test. In the vicinity of pumping well RW-1, the analysis indicates an approximate aquifer transmissivity of 547 gpd/ft and an approximate storage coefficient of 0.0024 (method by Newman, 1975). Relating these values to the pumping rate and actual duration of pumping indicates that an optimum rate of between 1 to 2 gpm can be sustained during the pumping of RW-1. To achieve exact sustained pumping values, a long duration pump test should be performed.

Zone of Capture

Based on the performance of the extraction well during the aquifer testing program, it has been determined that long-term operation of the extraction well may not have sufficient zone of capture to contain shallow groundwater at the facility. To achieve the desired zone of capture, approximately 2 to 3 additional extraction wells may need to be installed at the facility. With the addition of supplementary extraction wells, there will be an increase in the flow rate to the treatment system. If conditions at RW-1 are assumed to be characteristic for the entire site then a total flow rate of 6 to 8 gpm can be expected.

Reference

Newman, S.P., 1975, Analysis of pumping TP&T data from anisotropic unconfined aquifers considering delayed gravity response: Water Resources Research, v. 11, p. 329-342