

SOIL GAS SURVEY

MOBIL SERVICE STATION #10-H69

4280 FOOTHILL BOULEVARD

OAKLAND, CALIFORNIA

3/89



TARGET ENVIRONMENTAL SERVICES

SOIL GAS SURVEY
MOBIL SERVICE STATION #10-H69
4280 FOOTHILL BLVD.
OAKLAND, CALIFORNIA

PREPARED FOR

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EXECUTIVE SUMMARY

On ~~March~~ 10, 1989, TARGET Environmental Services, Inc. (TARGET) conducted a ~~soil~~ gas survey at Mobil Service Station #10-H69, ~~1230~~ Foothill Boulevard, Oakland, California. Analysis of the samples by GC/FID revealed hydrocarbons on the site and chromatogram signatures confirmed the presence of gasoline. Map patterns, concentration gradients and chromatographic data suggest two sources of subsurface hydrocarbons, one west of the main building and one between the eastern pump island and the tank field. Minimal migration to the southwest has occurred. The southeastern extent of the large feature was not defined since it extends beyond the survey limits.

Chromatogram signatures indicate slightly weathered gasoline near the eastern pump island and weathered gasoline west of the main building, supporting the two-source interpretation. There is little doubt that the easterly occurrence is more recent.

While the level of contamination on this site is not particularly severe and occurrences appear quite localized, the proximity to the property boundary may warrant further investigation.

Introduction

Mobil Oil Corporation is conducting site evaluations of service stations as part of a property transfer program with B.P. Oil. TARGET Environmental Services, Inc. (TARGET) was contracted as part of this program to perform soil gas surveys to determine the possible presence and extent of subsurface hydrocarbon contamination at these sites. The field phase of the soil gas survey performed at Mobil Service Station #10-H69, 4280 Foothill Boulevard, Oakland, California, was conducted on March 10, 1989.

Detectability

The soil gas survey data presented in this report are the result of precise sampling and measurement of contaminant concentrations in the vadose zone. Analyte detection at a particular location is representative of vapor, dissolved, and/or liquid phase contamination at that location. The presence of detectable levels of target analytes in the vadose zone is dependent upon several factors, including the presence of vapor-phase hydrocarbons or dissolved or liquid concentrations adequate to facilitate volatilization into the unsaturated zone.

Terminology

In order to prevent misunderstanding of certain terms used in this report, the following clarifications are offered:

The term "feature" is used in reference to a discernable pattern in the contoured data. It denotes a contour form rather than a definite or separate chemical occurrence.

The term "occurrence" is used to indicate an area where chemical compounds are present in sufficient concentrations to be detected by the analysis of soil vapors. The term is not indicative of any specific mode of occurrence (vapor, dissolved, etc), and does not necessarily indicate or suggest the presence of "free product" or "phase-separated hydrocarbons".

The term "trace level" represents a concentration that is detectable but is less than the formal detection limit of the analytical equipment. A statistically valid quantification of trace levels is not possible.

The term "analyte" refers to any of the hydrocarbons standardized for quantification in the chromatographic analysis.

The term "vadose zone" represents the unsaturated zone between the ground water table and the ground surface.

The term "indicates" is used when evidence dictates a unique conclusion. The term "suggests" is used when several explanations of certain evidence are possible, but one in particular seems more likely. As a result, "indicates" carries a higher degree of confidence in a conclusion than does "suggests".

Field Procedures

Soil gas samples were collected at a total of 16 locations at the site, as shown in Figure 1. To collect the samples a 1/2 inch hole was produced to a depth of approximately four feet by using a drive rod. Where pavement was present, an electric hammer drill was employed for penetration prior to using the drive rod. The entire sampling system was purged with ambient air drawn through a dust and organic vapor filter cartridge, and a stainless steel probe was inserted to the full depth of the hole and sealed off from the atmosphere. A sample of in-situ soil gas was then withdrawn through the probe and used to purge ambient air from the sampling system. A second sample of soil gas was withdrawn through the probe and encapsulated in a pre-evacuated glass vial at two atmospheres of pressure (15 psig). The self-sealing vial was detached from the sampling system, packaged, labeled, and stored for laboratory analysis.

Prior to the day's field activities all sampling equipment, drive rods, and probes were decontaminated by washing with soapy distilled water and rinsing with distilled water. Internal surfaces were flushed dry using pre-purified nitrogen, and external surfaces were wiped clean using clean paper towels.

Field control samples were collected at the beginning and the end of the day's field activities. These QA/QC samples were obtained by filtering ambient air through a dust and organic vapor filter cartridge and collecting in the same manner as described above.

Laboratory Procedures

All of the samples collected during the field phase of the survey were analyzed according to EPA Method 602 on a gas chromatograph equipped with a flame ionization detector (FID), but using direct injection instead of purge and trap. Analytes selected for standardization were:

- methyl tertiary butyl ether (MTBE)
- benzene
- toluene
- ethylbenzene
- meta- and para- xylene
- ortho-xylene

These compounds were chosen because of their utility in evaluating the presence of petroleum products such as fuels, lubricating oils, and non-halogenated solvents.

FID Total Volatiles values were generated by summing the areas of all integrated chromatogram peaks and calculating using the instrument response factor for toluene. Injection peaks, which also contain the light hydrocarbon methane, were excluded to avoid the skewing of Total Volatiles values due to injection disturbances and biogenic methane.

The analytical equipment was calibrated using an instrument-response curve and injection of known concentrations of the above standards. Retention times of the standards were used to identify the peaks in the chromatograms of the field samples, and their response factors were used to calculate the analyte concentrations. The tabulated results of the laboratory analysis of the soil gas samples are reported in micrograms per liter (ug/l) in Table 1. Because MTBE and pentane co-elute, they are listed together in the table.

For QA/QC purposes, a duplicate analysis was performed on every tenth field sample. Laboratory syringe blanks of carrier gas were also analyzed.

Discussion and Interpretation of Results

In order to provide graphic presentation of the results, individual data sets in Table 1 have been mapped and contoured to produce Figures 2 through 6. Dashed contours are used where patterns are extrapolated into areas of less complete data, or as auxiliary contours.

~~The~~ Total Volatiles (Figure 2) level was highest at Station 3, near the east corner of the eastern pump island, with a more moderate concentration at the southern corner of the pump island. Concentrations of Total Volatiles decreased sharply to the north and west. The extent of this occurrence to the east and south can not be determined due to the limits of the sampled area. ~~secondary~~ occurrence is located on the northwest side of the property, with a "high" at Station 14, west of the main building. A single point anomaly was observed west of the western pump island (Station 10).

The MTBE/pentane map pattern (Figure 3) was similar to the Total Volatiles feature, except that the concentrations in the occurrence on the northwest side of the property were comparable in magnitude rather than showing a marked high at Station 14.

Benzene (Figure 4) and o-xylene (not mapped) were limited to the immediate vicinity of the pump island (Stations 2 and 3) and Station 14, west of the main building. Unlike the previously mentioned analytes, the o-xylene concentration was higher at Station 14 than at Station 3.

Toluene (Figure 5) and ethylbenzene (not mapped) were highest at Station 3 (near the pump island). Low levels of each compound

extended northward to Station 5 and westward to Station 9. A low concentration of toluene extended southeastward to Station 12.

Like o-xylene, the m- and p-xylene level (Figure 6) was higher at Station 14 (west of the main building) rather than in the occurrence at the eastern pump island (Station 3).

The xylenes are less volatile and less soluble than the other analytes and adsorb more readily to soil particles. As a result, the xylenes are usually good indicators of source location(s). The xylene patterns suggest two sources of subsurface contamination: west of the main building and between the tank field and the eastern pump island. The origin of the hydrocarbons west of main building is not evident. It seems unlikely to be a plume encroaching from offsite, since a residential area lies adjacent to the northwest side of the site.

Examination of individual chromatograms show signatures indicative of slightly weathered gasoline in Samples 2 and 3 (adjacent to the eastern pump island) and weathered gasoline in Sample 14 (west of the main building). The remaining samples where volatile hydrocarbons were detected showed only small scattered peaks, typical in magnitude to "background" levels at service stations. These signatures and the analyte ratios in the principal samples support the interpretation that two separate sources are involved. There is little doubt that the event at the easterly pumps is the more recent.

While the level of contamination on this site is not particularly severe and occurrences appear quite localized, the proximity to the property boundary may warrant further investigation.

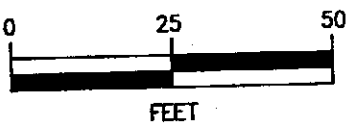
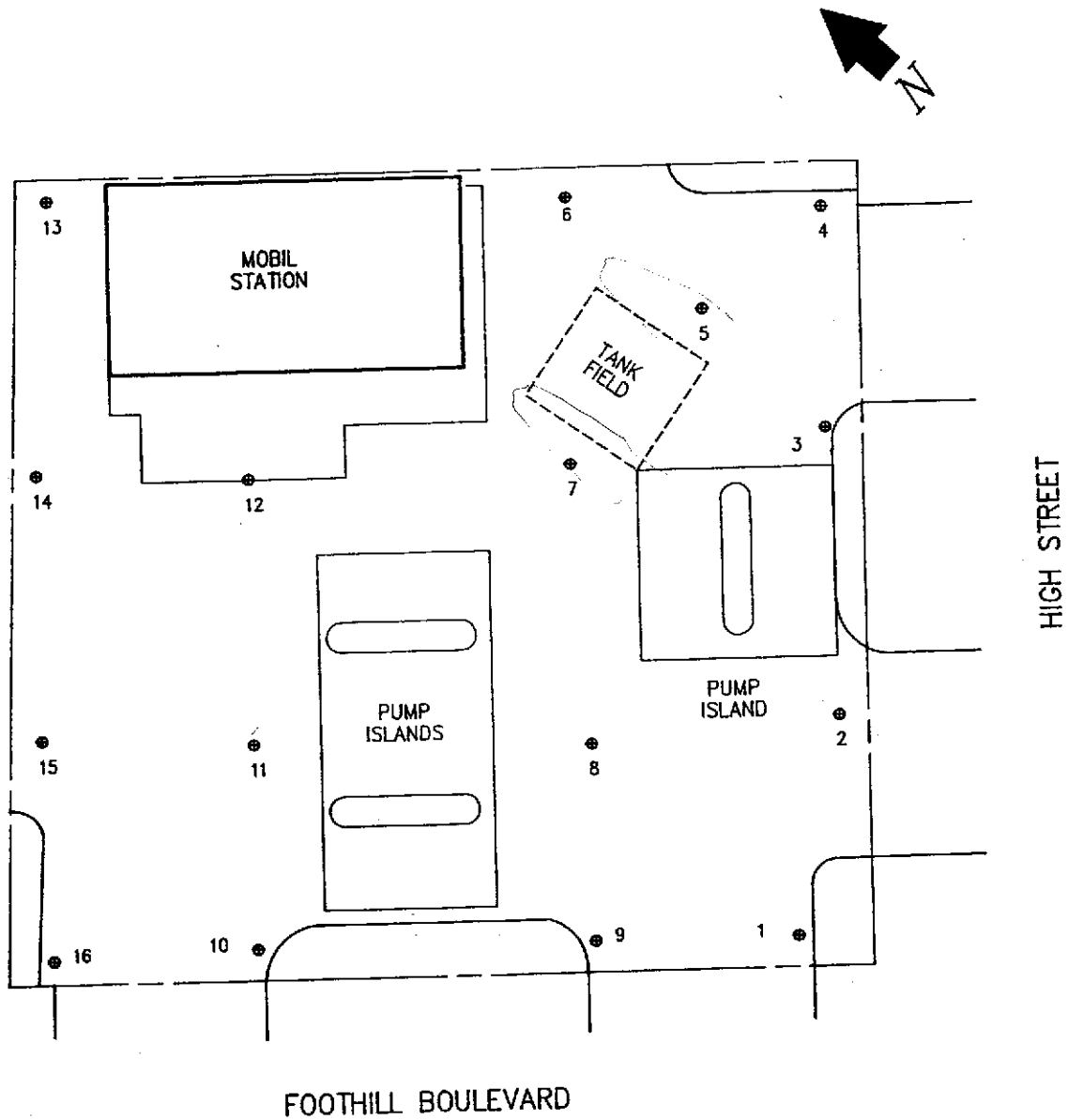
TABLE 1

**LABORATORY RESULTS
FLAME IONIZATION DETECTOR ANALYSIS
CONCENTRATIONS IN MICROGRAMS-PER-LITER**

SAMPLE	PENTANE/ MTBE¹	BENZENE	TOLUENE	ETHYL- BENZENE	m- & p- XYLENE	o- XYLENE	TOTAL VOLATILES²
1	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	7.5
2	73	2	21	13	9.6	8.9	643
3	5,497	150	91	345	81	83	500
4	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
5	13	<1.0	4.3	<1.0	<1.0	<1.0	13
6	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
7	3.8	<1.0	<1.0	<1.0	<1.0	<1.0	30
8	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
9	2.4	<1.0	3.3	2.4	<1.0	<1.0	2.4
10	4.5	<1.0	<1.0	<1.0	<1.0	<1.0	89
11	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
12	6.5	<1.0	6.3	<1.0	<1.0	<1.0	6.5
13	<1.0	<1.0	<1.0	<1.0	1.5	<1.0	19
14	10	3.0	112	64	291	120	550
15	2.9	<1.0	<1.0	<1.0	<1.0	<1.0	25
16	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
<u>FIELD CONTROL SAMPLES</u>							
17	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
18	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
<u>LABORATORY SYRINGE BLANKS</u>							
BM1-1	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
<u>DUPLICATE ANALYSES</u>							
10	4.5	<1.0	<1.0	<1.0	<1.0	<1.0	89
10R	4.1	<1.0	<1.0	<1.0	<1.0	<1.0	84

¹CONCENTRATIONS BASED ON RESPONSE FACTOR OF MTBE

²CALCULATED USING THE SUM OF THE AREAS OF ALL INTEGRATED CHROMATOGRAM PEAKS, AND THE INSTRUMENT RESPONSE FACTOR FOR TOLUENE



• SOIL GAS SAMPLE LOCATION

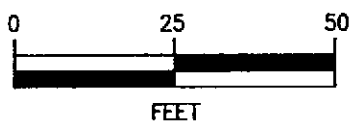
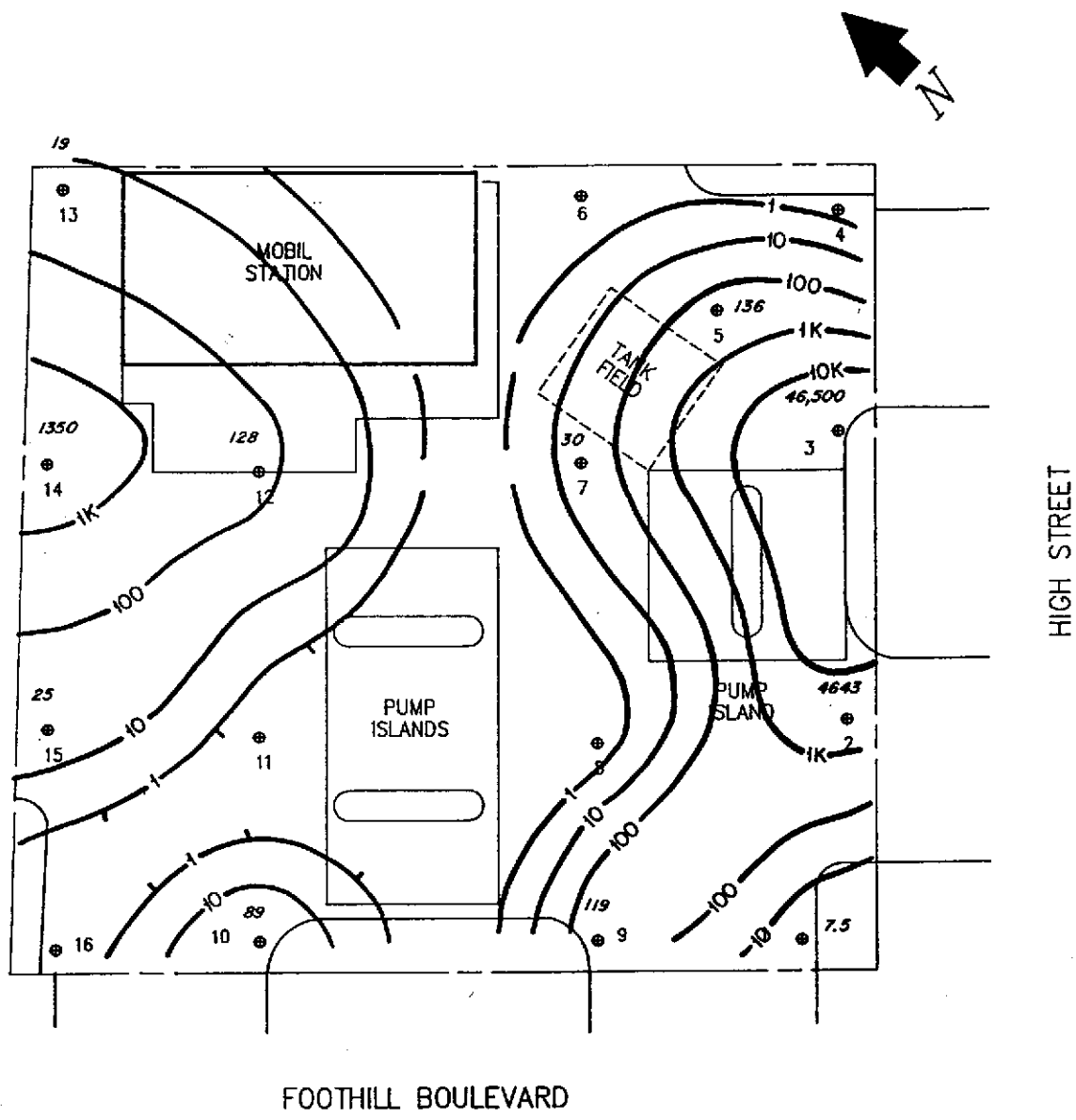
FIGURE 1. Sample Locations



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This map is integral to a written report
and should be viewed in that context.

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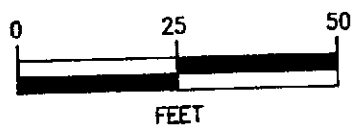
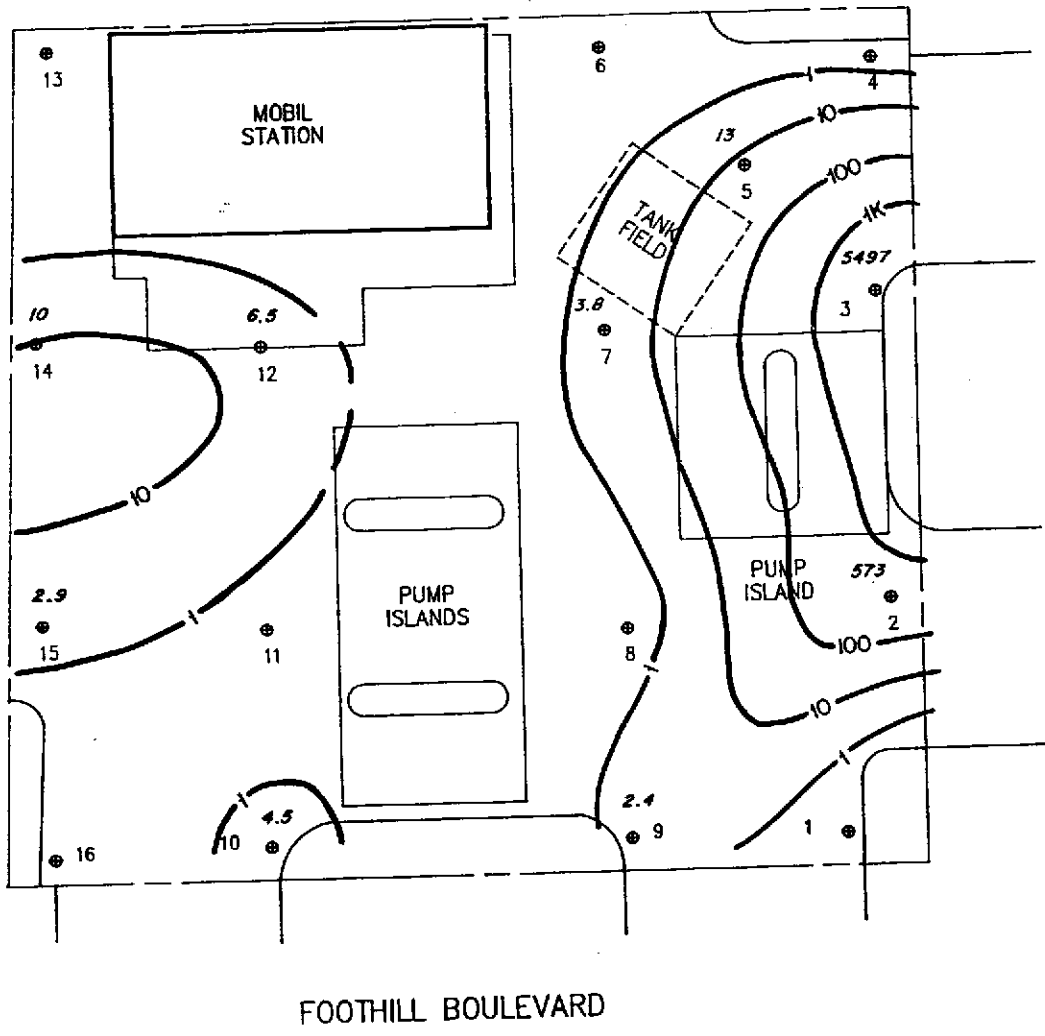
• SOIL GAS SAMPLE LOCATION

FIGURE 2. FID Total Volatiles
(calc'd µg/l)



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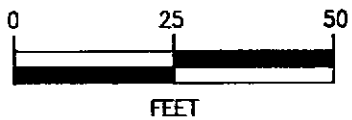
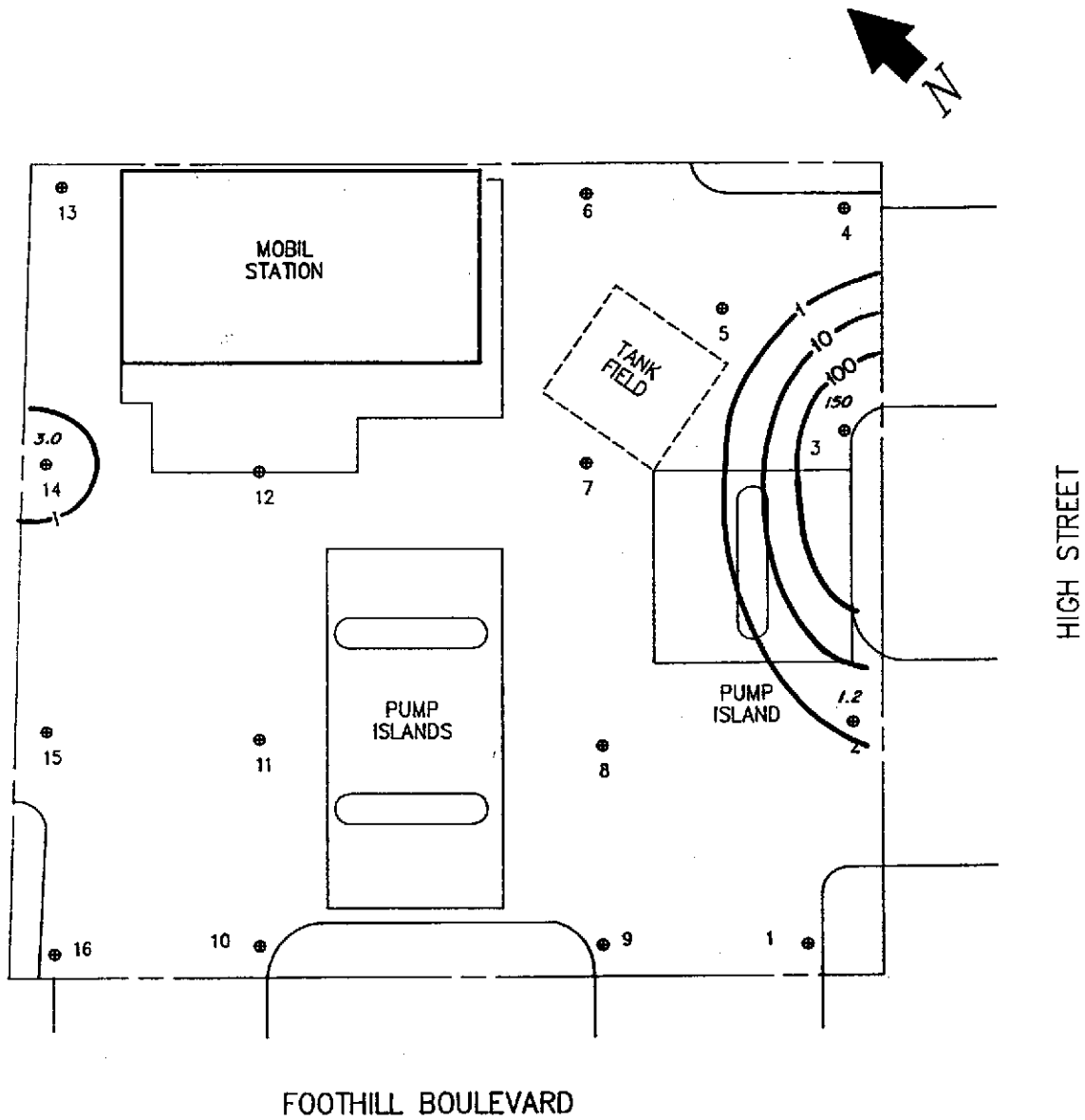
FIGURE 3. MTBE and Pentane ($\mu\text{g}/\text{l}$)



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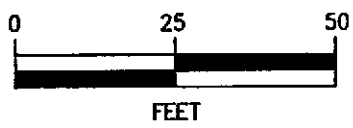
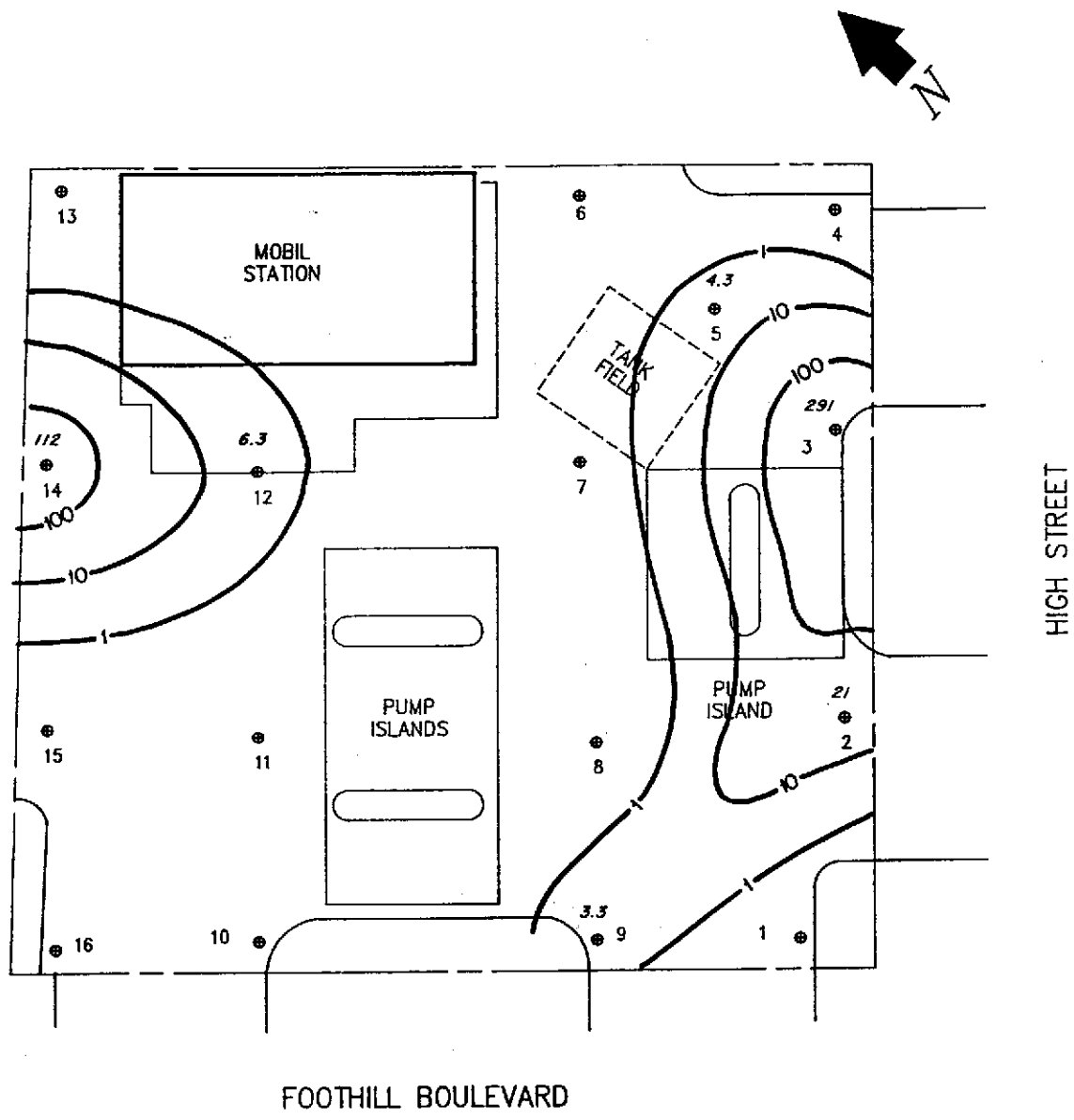
FIGURE 4. Benzene ($\mu\text{g/l}$)



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• SOIL GAS SAMPLE LOCATION

FIGURE 5. Toluene (µg/l)



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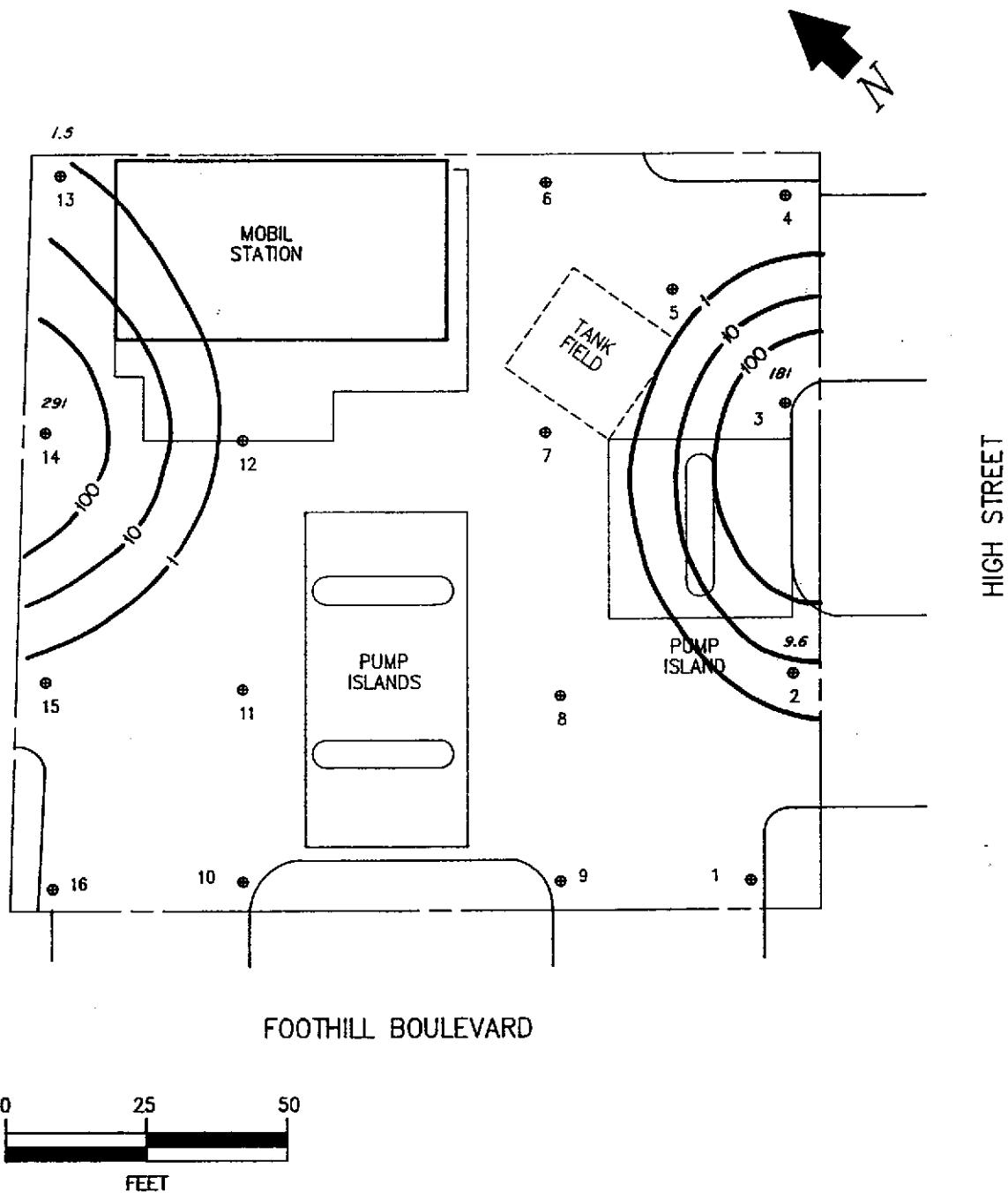


FIGURE 6. m- and p- Xylene ($\mu\text{g}/\text{l}$)



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