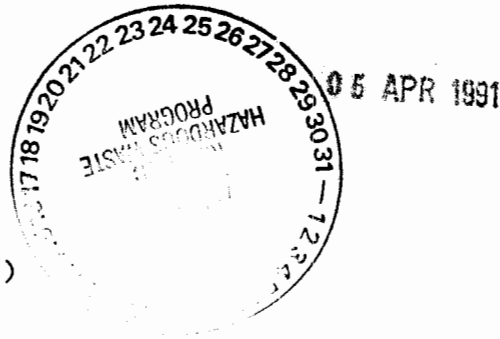




DEPARTMENT OF THE AIR FORCE
HEADQUARTERS 833D COMBAT SUPPORT GROUP (TAC)
HOLLOMAN AIR FORCE BASE, NM 88330-5000

File 310 91
HAFB

REPLY TO: 833 CSG/DE
ATTN OF:
SUBJECT: F-117A Realignment Construction



TO: Attn: Mr Rich Mayer
US Environmental Protection Agency (6H-PS)
First Interstate Bank Tower
1445 Ross Street
Dallas, TX 75202-2733

1. Attached is a Memorandum for Record from Ms Sharon Moore, Holloman AFB Environmental Coordinator, summarizing her conversations with the USEPA and NMEID personnel regarding the contamination found on the 49th West Ramp at Holloman AFB. The F-117A realignment construction is scheduled to begin in this immediate area sometime in the spring/summer of 1991. Her memo discusses Holloman's intent to pursue corrective action, concurrent with the construction, in the event hazardous wastes/hazardous constituents are encountered at any time during the F-117A realignment construction.

2. We request your coordination and concurrence on the memorandum, or provide us your comments as soon as possible. We invite you to "take a look" at the area during construction activities, upon removal of the ramp, and prior to construction of the F-117A hangars.

3. We would like to thank you in advance for any assistance you can provide. Your rapid response on the memorandum would be appreciated. If you have any questions, please contact Sharon Moore at (505) 479-3931.

Howard E. Moffitt
HOWARD E. MOFFITT
Deputy Base Civil Engineer

Atch
Memorandum for Record

cc: w/Atch
Dr Bruce Swanton, NMEID
Ron Jahns, AFREE

MEMORANDUM FOR RECORD:

02 APR 1991

SUBJECT: West Ramp Contamination related to the Stealth (F-117A) Realignment Construction

1. In recent weeks I have been in contact with Dr Bruce Swanton, New Mexico Environmental Improvement Division, and Mr Sam Bates, USEPA Region VI, with regard to the contamination problem associated with the realignment of the F-117A. They have both indicated to me if the source of the contamination cannot be tied to an underground storage tank (UST), then the soils in the area must be evaluated by the toxicity characteristic leaching procedure (TCLP) to determine if they are characteristically hazardous wastes. Although we have not ruled out the possibility of a UST source in this area, we have reviewed our records and files and, at this time, have no indication that a UST exists or has ever existed in this area.
2. To identify the extent and depth of the contamination, 49 soil gas samples were taken in the area. A report is provided describing this effort with analytical results included (see Atch 1). The soil gas analyses indicate hydrocarbon constituents are widespread throughout the area, although they do not seem to extend too deep below the ramp (based on 8 soil gas samples at 2 and 4 foot depths).
3. Per the recommendations of Dr Swanton and Mr Bates, we are moving forward with TCLP testing on approximately 20 soil borings at the West Ramp. Also, we plan to install six groundwater monitoring wells to determine if a product plume exists under the ramp. Should hydrocarbon contaminated soils that fail the TCLP test be found, these soils must be handled as hazardous wastes when removed from the construction zone. Holloman AFB may stockpile the removed soils (hazardous wastes) for a period (up to 90 days) to allow us time to establish a contract for the packaging, transporting, and disposal off-site at an EPA-approved facility. According to the regulators, TC wastes are not yet prohibited from land disposal such that land treatment disposal options may be available. An alternative to off-site disposal would be treatment on-site via land farming. However, this would require us to obtain an emergency RCRA permit for a hazardous waste land treatment facility and a hazardous waste storage area for those soils awaiting land treatment.
4. If the soils in the construction zone are hazardous due to TC characteristics, the site would be defined as a solid waste management unit (SWMU) requiring corrective action, and could include areas adjacent to the construction zone. Corrective action within any excavation/future construction area would need to be completed prior to placement of the new F-117A facilities, and corrective action in adjacent areas may have to occur concurrently. Since corrective action for a SWMU must address hazardous constituents as well as hazardous waste, additional sampling and analyses may be required for substances listed in Appendix VIII of 40 CFR 261 or Appendix IX of 40 CFR 264. Also, even though the soils may "pass" the TCLP test (i.e., not hazardous wastes), the site may still be defined as a SWMU requiring additional sampling and analyses for Appendix VIII or IX substances and, potentially, corrective action.
5. I have also talked with Mr Rich Mayer, Permitting Section, USEPA Region VI; he said we do not need a special permit to clean up this SWMU or any other SWMU. He said we have the right to clean up a SWMU at any time without their approval, blessing, coordination, etc., but our actions will be subject to EPA's determination of adequacy/inadequacy at a later date. If we fail to adequately address

all areas of concern, then at some point in the future EPA may require additional sampling and possibly the installation of in-situ treatment systems, such as soil ventilation. Mr Mayer said our current HSWA permit requires the development of a safety and health plan, and a sampling and analysis plan which, although not yet completed, would be applicable to the clean-up of this site. He emphasized the need to carefully document how/where samples are collected, chain-of-custody procedures, and safety procedures practiced during the clean-up action. He further indicated a need to determine what constituents and parameters (specified by EPA) must be addressed for proper characterization of the site, along with the appropriate EPA action levels and clean-up standards.

6. Mr Mayer said we may be allowed to leave some contaminants, including hazardous wastes, in place if it can be demonstrated the wastes pose no threat to health or the environment. A risk assessment must be accomplished to justify this action.

7. It is my understanding that if the soils are not characteristically hazardous (exceed TCLP standards) and it is a non-UST source, we may also be regulated under the authority of the NMEID Groundwater Bureau. We do not anticipate any corrective action requirements from this bureau as their regulations only regulate groundwater that contains less than 10,000 ppm total dissolved solids (TDS). The groundwater below Holloman AFB contains greater than 10,000 ppm TDS. Consequently, I foresee no corrective action requirements from the NMEID Groundwater Bureau and am only mentioning it because we may need to coordinate with them.

8. On 13 Mar 1991, a meeting was held at the USEPA Region VI offices to discuss various soil and groundwater analyses to be conducted prior to and during construction in the subject area. Meeting participants included Rich Mayer, USEPA; Roger Wilkson, Holloman AFB; Ron Jahns, Air Force Regional Environmental Office; Cedric Adams, Headquarters Tactical Air Command; David Morgan, New Mexico Environmental Improvement Division; and Larry Janis, US Army Corps of Engineers. It was decided during this meeting that the following constituents should be tested for during the upcoming sampling effort:

Benzene, Toluene, Ethylbenzene, Xylene (BETX)
Metals, including cadmium, chromium, lead, zinc, and mercury
Total Recoverable Petroleum Hydrocarbons, pH, & Specific Conductance

The above constituents shall be determined utilizing both the TCLP (where appropriate) and total concentration analytical methods.

9. Questions regarding this MFR may be directed to myself at (505) 479-3931 or DSN 867-3931.

Sharon N. Moore
SHARON N. MOORE
Ch, Envmtl Plan Branch
833 CSG/DEV; Holloman AFB, NM 88330

Atch
Soil Gas Survey

I concur with this memorandum as written.

RICH MAYER Date
Permitting Section
US EPA Region VI

received 8/27/11

SOIL GAS SURVEY
HOLLOMAN AIR FORCE BASE
ALAMOGORDO, NEW MEXICO



TARGET ENVIRONMENTAL SERVICES, INC.

**SOIL GAS SURVEY
HOLLOMAN AIR FORCE BASE
ALAMOGORDO, NEW MEXICO**

PREPARED FOR

**U.S. ARMY CORPS OF ENGINEERS
P.O. BOX 1580
ALBUQUERQUE, NEW MEXICO 87103-1580**

PREPARED BY

**TARGET ENVIRONMENTAL SERVICES, INC.
9180 RUMSEY ROAD
COLUMBIA, MARYLAND 21045
(301) 992-6622**

JANUARY 1991

EXECUTIVE SUMMARY

On January 22-24, 1991, TARGET Environmental Services, Inc. (TARGET) conducted a soil gas survey at Holloman Air Force Base, located in Alamogordo, New Mexico. The survey area was located on the western side of the base in and around a concrete apron. Analysis of the samples by GC/FID for petroleum hydrocarbons revealed the presence of moderately low levels within the survey area.

The Total Volatiles data for the soil gas samples show the most extensive occurrence southwest of Building #877. Comparable concentrations were present in the west ramp and west of Building #868. A very low level of Total Volatiles was present in the ambient air sample collected in the basement of Building #877.

The chromatogram signatures of the soil gas samples show characteristics of jet fuel.

Analyte concentrations and chromatographic data observed in samples from the survey area indicate that petroleum hydrocarbons are present in the subsurface near Buildings #877 and #868 and in several locations in the west ramp. Additional sampling and analysis would be necessary to determine the extent and severity of petroleum contamination in the soil. Furthermore, the volatile hydrocarbons present in the subsurface could pose a health hazard to individuals during excavation activities within the survey area.

Introduction

The U.S. Army Corps of Engineers, Albuquerque Division, has contracted TARGET Environmental Services, Inc. (TARGET) to perform a soil gas survey at Holloman Air Force Base, Alamogordo, New Mexico. The survey area is located in the western portion of the base in and around a concrete apron and near Buildings #868, #877 and #890. The purpose of the survey was to determine the presence, extent and nature of subsurface petroleum hydrocarbons within the survey area. The field phase of this survey was conducted on January 22-24, 1991.

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 discernible 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 "anomaly" refers to an area where hydrocarbons were measured in excess of what would normally be considered "natural" or "background" levels.

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 49 locations at the site, as shown in Figure 1. To collect the samples a 1/2 inch hole was produced to a depth ranging from 0.5 - 4 feet (Table 1) by using a drive rod. Concrete or asphalt covered most of the survey area, and a rotary hammer drill was employed for penetration prior to using the drive rod. Concrete was up to 2 feet thick at some locations. The entire sampling system was purged with ambient air drawn through an 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 atmospheric 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 (25 psig). The self-sealing vial was detached from the sampling system, packaged, labeled, and stored for laboratory analysis.

Soil gas samples were collected at dual depths (0.5 - 1.5 feet and 4 feet) at eight (8) sample locations near the western corner of Building #877 (Samples 11-18). The 4 foot samples were collected after obtaining the shallower sample and are designated by a three digit number with the depth "4" as the first digit. A comparison of data from both depths is shown in Table 2.

An ambient air sample (Sample 30) was collected over an open sump in the basement of Building #877. This sample was obtained by placing the sample probe over the sump area and collecting as described above.

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

Field control samples were collected at the beginning and end of each day's field activities. These QA/QC samples were obtained by inserting the probe tip into a tube flushed by a 20 psi flow of pre-purified nitrogen 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 (modified) on a gas chromatograph equipped with a flame ionization detector (GC/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 calculated 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. For samples with low hydrocarbon concentrations, the calculated Total Volatiles concentration is occasionally lower than the sum of the individual analytes. This is because the response factor used for the Total Volatiles calculation is a constant, whereas the individual analyte response factors vary with concentration. It is important to understand that the Total Volatiles levels reported are relative, not absolute, values.

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 ($\mu\text{g}/\text{l}$) in Table 2. Although "micrograms per liter" is equivalent to "parts per billion (v/v)" in water analyses, they are not equivalent in gas analyses, due to the difference in the mass of equal volumes of water and gas matrices.

Map sample points with no data shown indicate that the analyte concentrations in the sample were below the detection limit. Because MTBE and pentane co-elute, they are listed together in the table.

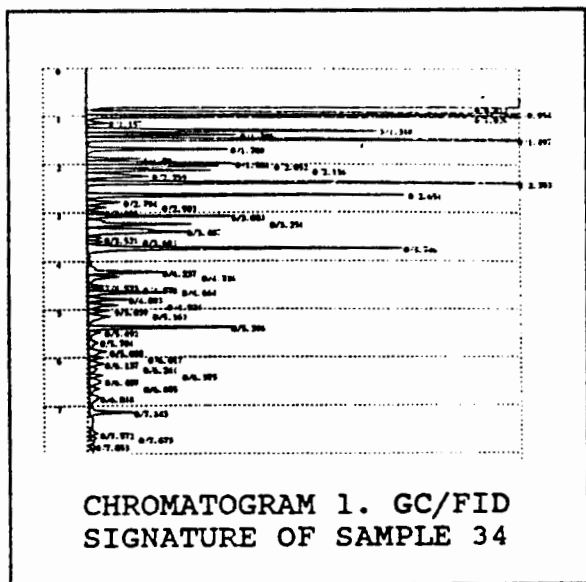
For QA/QC purposes, a duplicate analysis was performed on every tenth field sample. Laboratory blanks of carrier gas were also analysed after every tenth field sample. The very low level of Total Volatiles observed in Laboratory Blank BCACH-4 is probably due to carryover in the chromatographic column.

Discussion and Interpretation of Results

In order to provide graphic presentation of the results, individual data sets in Table 2 have been mapped and contoured to produce Figures 2 through 7. Dashed contours are used where patterns are extrapolated into areas of less complete data, or as auxiliary contours. The low sample density in some areas of the site preclude meaningful contouring.

The Total Volatiles map (Figure 2) shows several areas of moderately low concentrations. The most extensive occurrence is observed southwest of Building #877 (Stations 13, 14 and 34), with lower levels extending westward toward the west ramp and eastward to the survey boundary. Comparable concentrations are present in the west ramp and west of Building #868.

Relatively low levels of the standardized analytes were present where Total Volatiles were highest. MTBE/pentane (Figure 3) map patterns resemble those of Total Volatiles but are less extensive west and south of Building #877. Benzene, ethylbenzene,



m- and p-xylene, o-xylene (Figures 4-7) and toluene (not shown) were even less extensive near Building #877 and were not present above the 1 $\mu\text{g}/\text{l}$ detection limit along the southern side of the building.

The chromatogram signatures of samples with elevated levels of volatile hydrocarbons, as exemplified by Sample 34, Chromatogram

1, show characteristics of jet fuel. It should be noted that the chromatographic signatures of jet fuel, diesel fuel and fuel oil are indistinguishable under TARGET's analytical conditions.

The Total Volatiles and analyte concentrations for samples collected at dual depths (Table 2) near Building #877 were comparable, and the chromatogram signatures of these samples were similar.

A very low level of Total Volatiles was present in the ambient air sample (Sample 30) collected over the sump area in the basement of Building #877. None of the standardized analytes were observed above the 1 µg/l detection limit in this sample.

Analyte concentrations and chromatographic data observed in samples from the survey area indicate that petroleum hydrocarbons are present in the subsurface near Buildings #877 and #868 and in several locations in the west ramp. Additional sampling and analysis would be necessary to determine the extent and severity of petroleum contamination in the soil. Furthermore, the volatile hydrocarbons present in the subsurface could pose a health hazard to individuals during excavation activities within the survey area.

TABLE 1

SAMPLING DEPTH

<u>SAMPLE</u>	<u>FEET</u>	<u>SAMPLE</u>	<u>FEET</u>
11	0.5	37	1
12	0.5	38	1
13	1.5	39	2
14	1.5	40	2
15	1.5	41	2
16	1.5	42	2
17	1.5	43	2
18	0.5	44	2
19	2	45	2
20	2	46	2
21	2	47	2
22	2	48	2
23	3	49	2
24	3	50	2
25	3	51	2
26	4	52	2
27	4	411	4
28	4	412	4
29	4	413	4
30	4	414	4
31	4	415	4
32	4	416	4
33	2	417	4
34	2	418	4
35	2		
36	1		

TABLE 2

**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
11	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	3.7
12	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	2.6
13	53	3.6	5.5	<1.0	4.1	1.4	433
14	6.9	<1.0	2.6	<1.0	2.2	<1.0	115
15	11	1.1	3.5	<1.0	3.4	1.2	181
16	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
17	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	9.9
18	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
19	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
20	1.9	<1.0	<1.0	<1.0	<1.0	<1.0	27
21	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
22	1.2	<1.0	<1.0	<1.0	<1.0	<1.0	19
23	3.8	<1.0	<1.0	<1.0	<1.0	<1.0	58
24	1.6	<1.0	<1.0	<1.0	<1.0	<1.0	24
25	1.2	<1.0	<1.0	<1.0	<1.0	<1.0	18
26	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	26
27	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	5.7
28	1.3	<1.0	1.0	<1.0	<1.0	<1.0	44
29	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	7.7
31	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
32	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	12
33	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	10
34	48	3.0	9.9	1.4	10	3.1	646
35	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	57
36	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	11
37	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	6.0
38	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	6.7
39	2.7	<1.0	<1.0	<1.0	<1.0	<1.0	47
40	1.9	<1.0	<1.0	<1.0	<1.0	<1.0	32
41	7.0	<1.0	1.1	<1.0	1.1	<1.0	88
42	32	3.4	17	3.3	3.1	<1.0	331
43	12	13	12	4.1	4.8	1.9	148
44	45	25	22	6.6	6.6	2.8	448

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

TABLE 2 (cont)

LABORATORY RESULTS
 FLAME IONIZATION DETECTOR ANALYSIS
 CONCENTRATIONS IN MICROGRAMS PER LITER

SAMPLE	PENTANE/ MTBE ¹	BENZENE	TOLUENE	ETHYL- BENZENE	m- & p- XYLENE	o- XYLENE	TOTAL VOLATILES ²
45	83	36	27	8.0	7.4	2.7	755
46	10	6.2	6.9	1.7	2.4	<1.0	118
47	65	29	25	6.4	9.7	3.1	658
48	47	39	26	7.2	6.7	2.6	504
49	93	89	85	24	28	12	1,150
50	12	17	16	5.1	4.4	2.0	166
51	22	24	18	6.4	6.3	3.0	274
52	10	13	11	3.7	3.1	1.2	130

COMPARISON OF SAMPLES COLLECTED AT 2 DEPTHS

11	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	3.7
411	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	2.7
12	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	2.6
412	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.8
13	53	3.6	5.5	<1.0	4.1	1.4	433
413	7.1	<1.0	1.8	<1.0	1.4	<1.0	92
14	6.9	<1.0	2.6	<1.0	2.2	<1.0	115
414	1.2	<1.0	<1.0	<1.0	<1.0	<1.0	34
15	11	1.1	3.5	<1.0	3.4	1.2	181
415	2.4	<1.0	1.8	2.6	<1.0	1.1	70
16	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
416	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
17	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	9.9
417	<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
418	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0

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

TABLE 2 (cont)

LABORATORY RESULTS
FLAME IONIZATION DETECTOR ANALYSIS
CONCENTRATIONS IN MICROGRAMS PER LITER

<u>SAMPLE</u>	<u>PENTANE/ MTBE¹</u>	<u>BENZENE</u>	<u>TOLUENE</u>	<u>ETHYL- BENZENE</u>	<u>m- & p- XYLENE</u>	<u>o- XYLENE</u>	<u>TOTAL VOLATILES²</u>
<u>AMBIENT AIR SAMPLE</u>							
30	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	3.1
<u>FIELD CONTROL SAMPLES</u>							
1	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
2	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
3	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
4	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
6	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
<u>LABORATORY DUPLICATE ANALYSES</u>							
15	11	2.2	3.5	<1.0	3.4	1.2	181
15R	11	1.1	3.5	<1.0	3.5	1.2	104
27	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	5.7
27R	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	8.8
37	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	6.0
37R	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	6.2
46	10	6.2	6.9	1.7	2.4	<1.0	118
46R	10	6.4	7.0	1.6	2.3	<1.0	121
<u>LABORATORY BLANKS</u>							
BCACH-1	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
BCACH-2	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
BCACH-3	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
BCACH-4	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	3.9

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

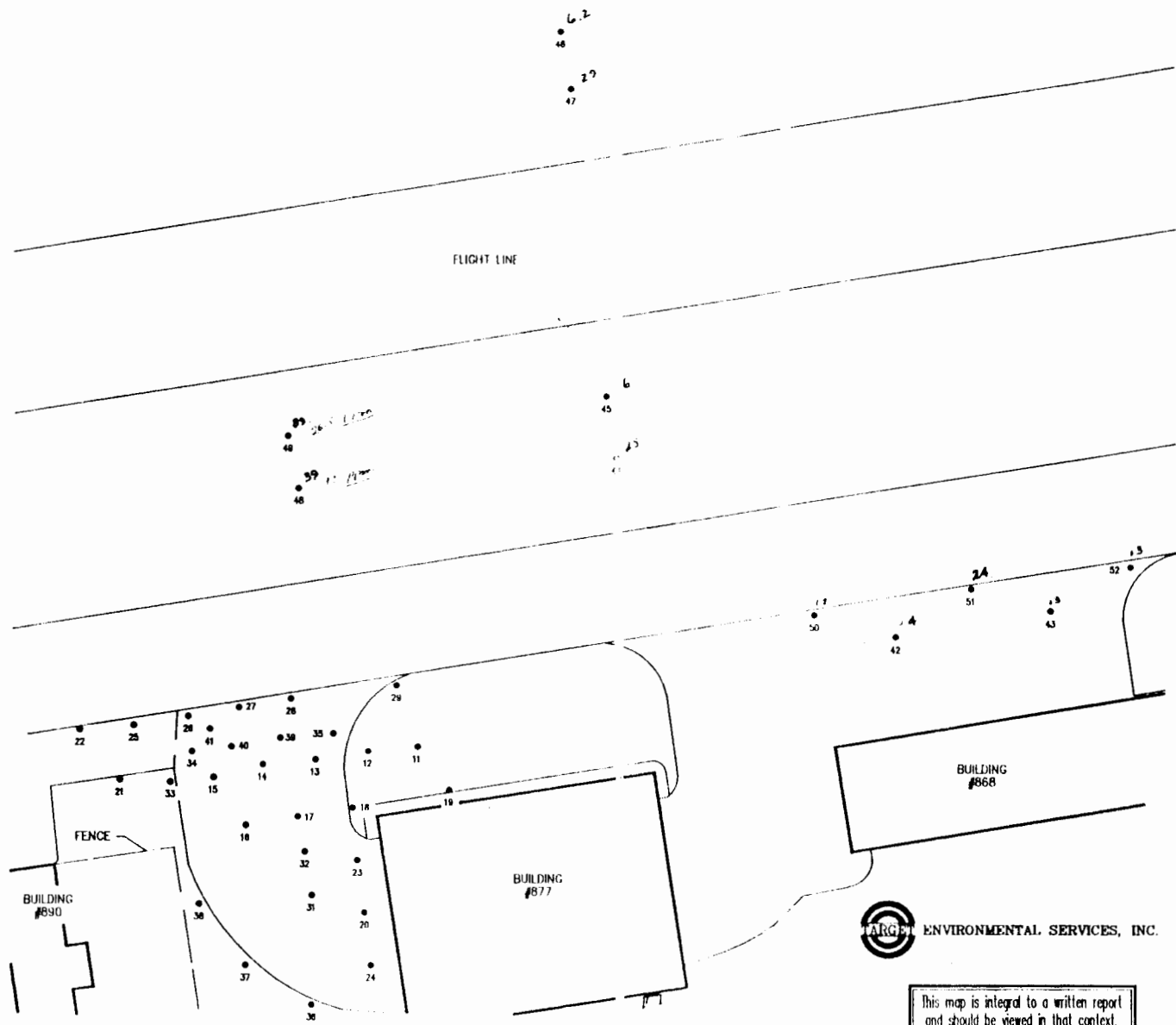


FIGURE 1. Sample Locations

HOLLOMAN AIR FORCE BASE
ALAMOGORDO, NEW MEXICO

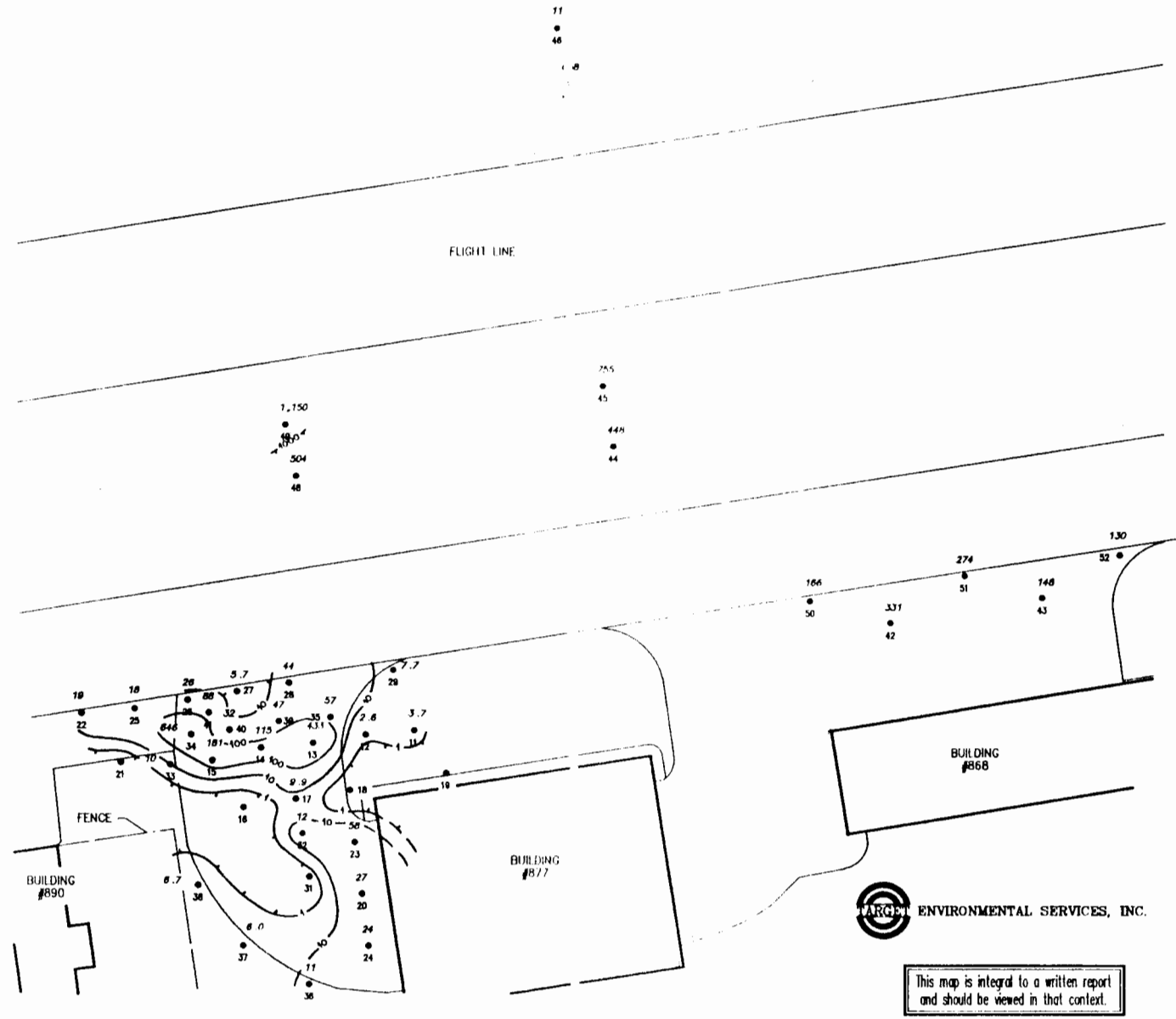
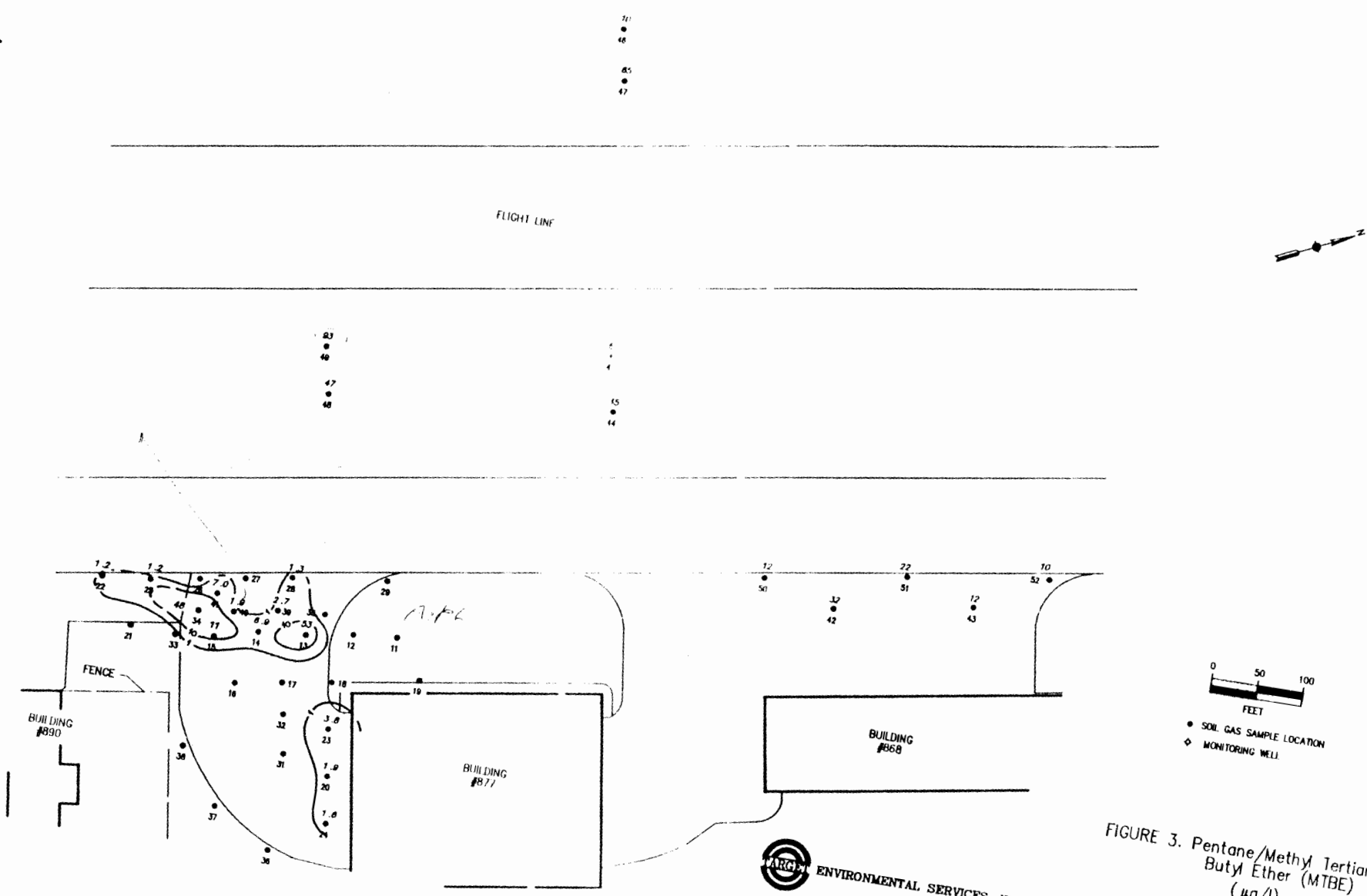


FIGURE 2. FID Total Volatiles (calc'd $\mu\text{g/l}$)

HOLLOMAN AIR FORCE BASE
ALAMOGORDO, NEW MEXICO



47
 ●
 46
 ●
 45
 ●
 47

43
 ●
 46
 ●
 47
 ●
 48
 ●

4
 ●
 4
 ●
 45
 ●
 44

72
 ●
 50
 ●

22
 ●
 51
 ●

70
 ●
 52
 ●

12
 ●
 43
 ●

1.2
 ●
 20
 ●

1.2
 ●
 21
 ●

7.0
 ●
 22
 ●

27
 ●
 28
 ●

1.0
 ●
 29
 ●

2.7
 ●
 30
 ●

6.0
 ●
 31
 ●

10
 ●
 32
 ●

5.3
 ●
 33
 ●

14
 ●
 34
 ●

13
 ●
 35
 ●

12
 ●
 36
 ●

11
 ●
 37
 ●

18
 ●
 38
 ●

17
 ●
 39
 ●

16
 ●
 40
 ●

3.0
 ●
 41
 ●

2.3
 ●
 42
 ●

1.0
 ●
 43
 ●

2.0
 ●
 44
 ●

1.0
 ●
 45
 ●

24
 ●
 46
 ●

36
 ●
 47
 ●

MARGENT ENVIRONMENTAL SERVICES, INC.

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

FIGURE 3. Pentane/Methyl Tertiary Butyl Ether (MTBE) ($\mu\text{g/l}$)

HOLLOMAN AIR FORCE BASE
 ALAMOGORDO, NEW MEXICO

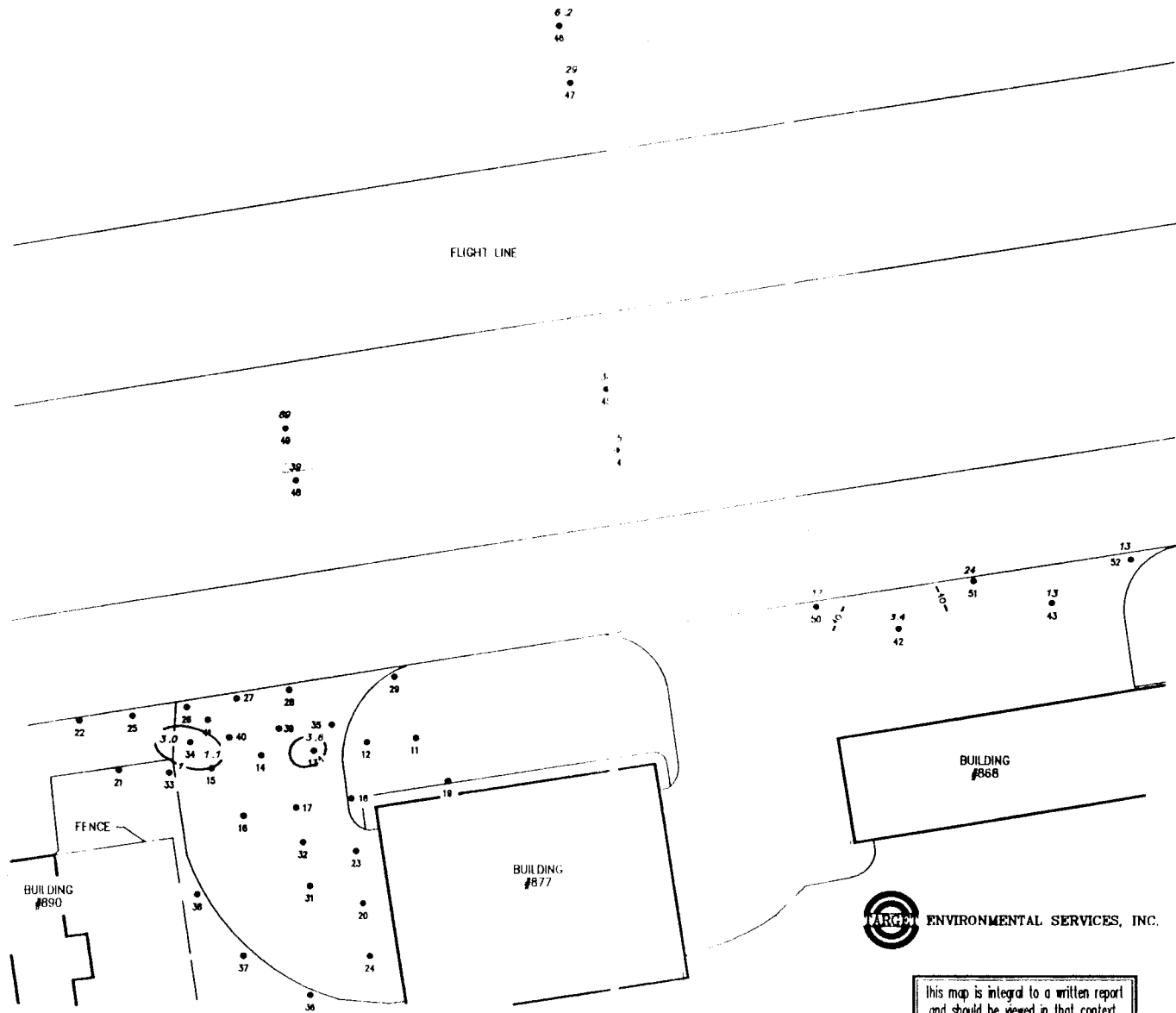


FIGURE 4. Benzene ($\mu\text{g/l}$)

HOLLOMAN AIR FORCE BASE
ALAMOGORDO, NEW MEXICO



FIGURE 5. Ethylbenzene ($\mu\text{g/l}$)

HOLLOMAN AIR FORCE BASE
ALAMOGORDO, NEW MEXICO

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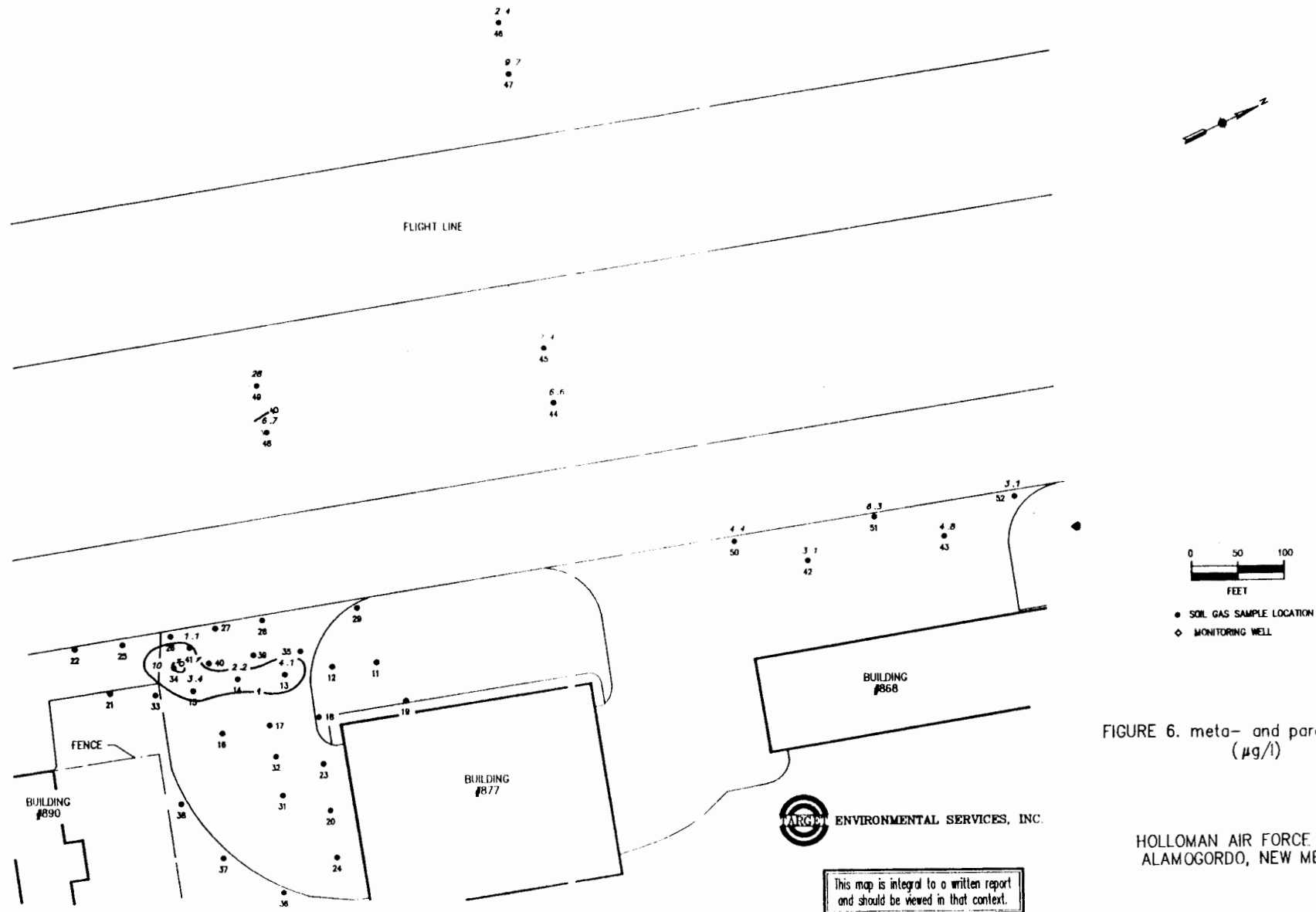
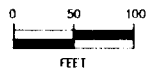
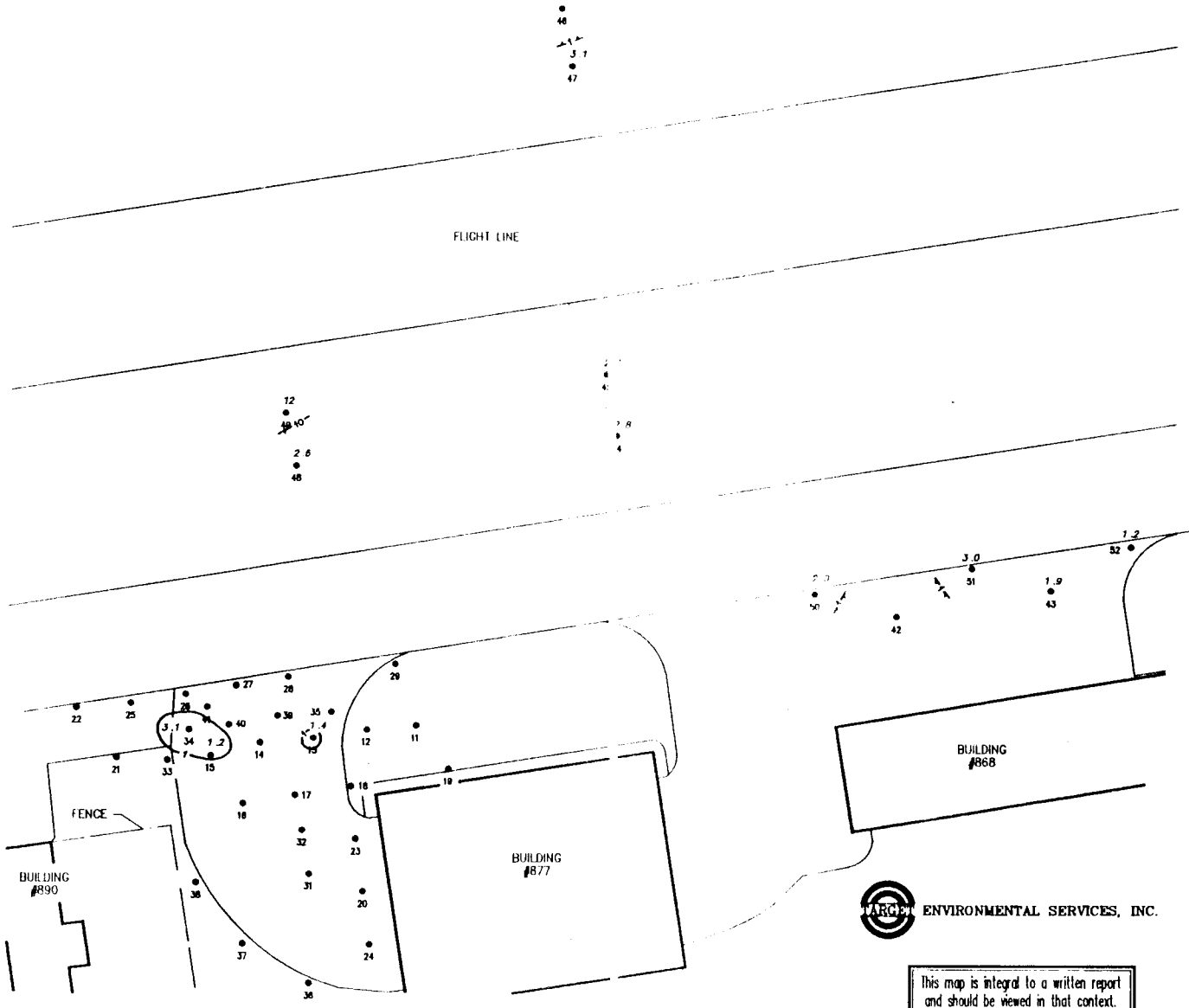


FIGURE 6. meta- and para-Xylene ($\mu\text{g/l}$)

HOLLOMAN AIR FORCE BASE
ALAMOGORDO, NEW MEXICO



- SOIL GAS SAMPLE LOCATION
- ◇ MONITORING WELL

FIGURE 7. ortho-Xylene (µg/l)

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HOLLOMAN AIR FORCE BASE
ALAMOGORDO, NEW MEXICO